



Environment and
Climate Change Canada

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AIR POLLUTANT EMISSIONS

CANADIAN ENVIRONMENTAL
SUSTAINABILITY INDICATORS



Canada 

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CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

AIR POLLUTANT EMISSIONS

June 2023

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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](#) (NH₃), [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 (2021) was marked by the 2nd year of the COVID-19 pandemic. This coincides with observed emission decreases between the years 2019 and 2021 for almost all pollutants with the exception of NH₃. The long-term trends presented must be interpreted with caution as the economic slowdown influenced the results.

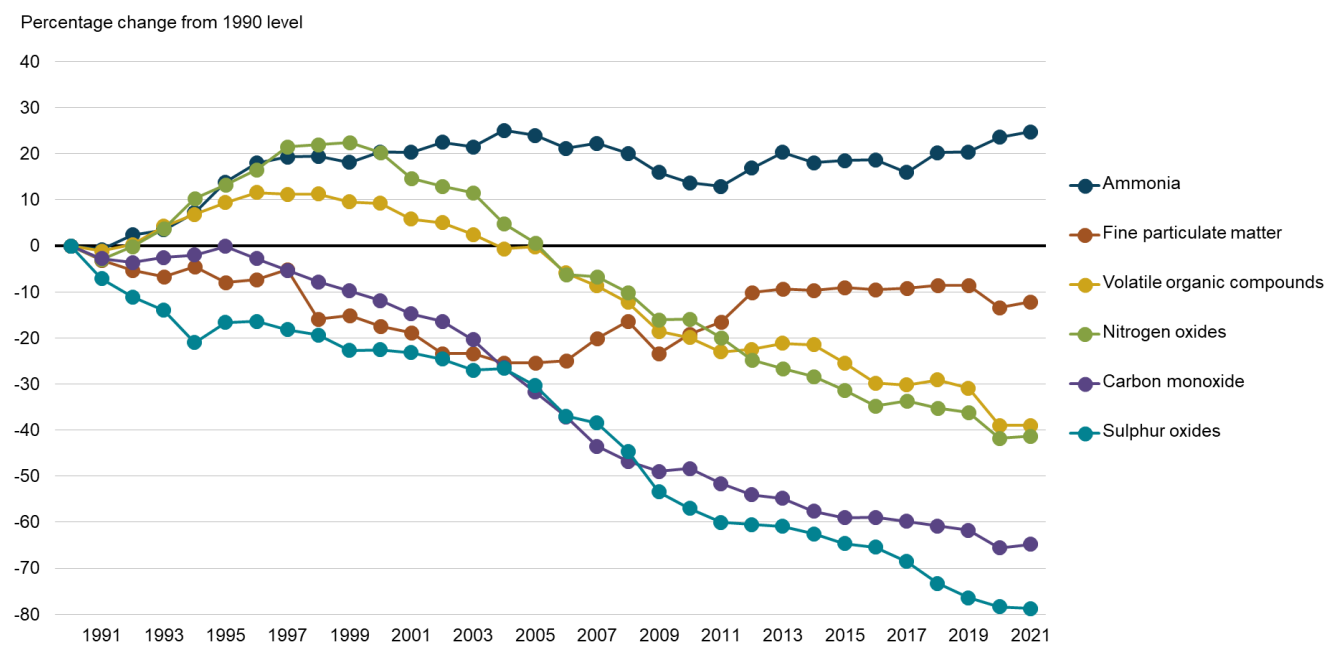
National air pollutant trends

This section presents a summary of Canada's emissions of 6 key air pollutants between 1990 to 2021 along with highlights of the main sources and provincial and territorial distributions for 2021. 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 2021, emissions of 5 key air pollutants were lower than in 1990:
 - SO_x 79% lower,
 - NO_x 41% lower,
 - VOCs 39% lower,
 - CO 65% lower, and
 - PM_{2.5} 12% lower
- Emissions of NH₃ were 25% higher in 2021 than in 1990

Figure 1. Air pollutant emissions, Canada, 1990 to 2021



[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 (2023) [Air Pollutant Emissions Inventory](#).

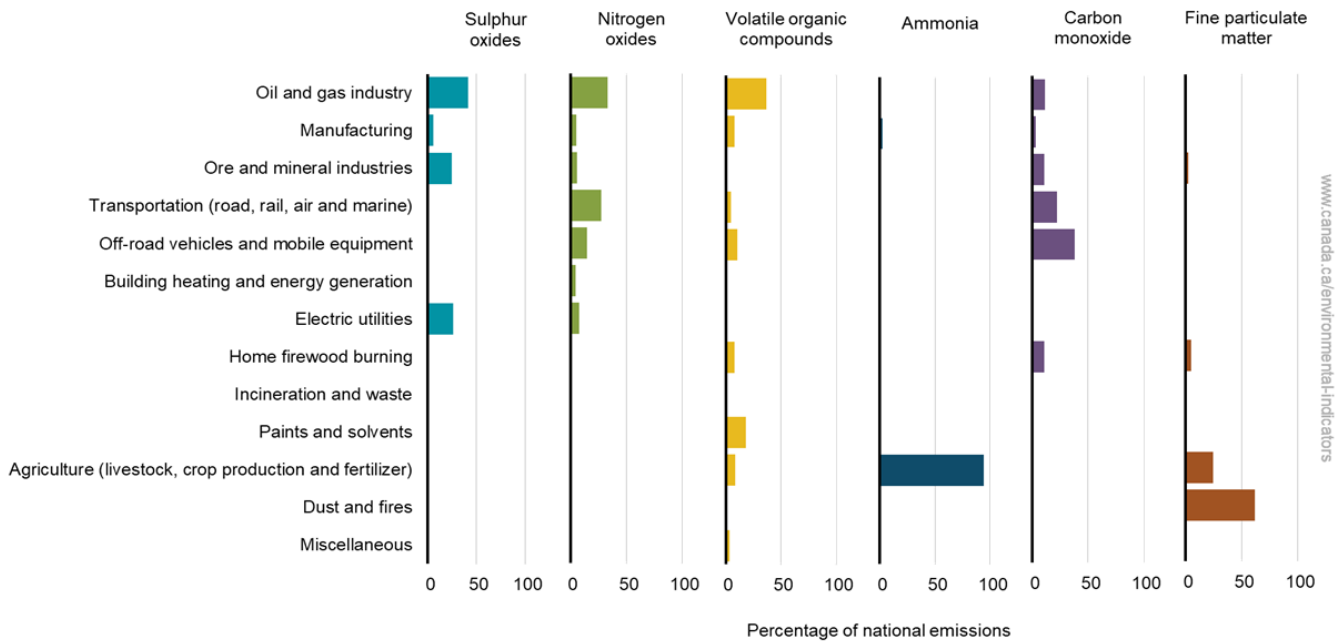
Between 1990 and 2021, the largest emission reductions were observed for SO_x, which decreased by 79%. It was followed by CO emissions (65% reduction), NO_x (41%), VOCs (39%), and PM_{2.5} (12%). These reductions since 1990 are due in part to [government actions](#) and voluntary initiatives from key 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 2021, the largest sources of emissions of the 6 key air pollutants in Canada were the oil and gas industry, transportation, off-road vehicles and mobile equipment, 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, 2021



[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 (2023) [Air Pollutant Emissions Inventory](#).

In 2021, the human made sources most contributing to Canada's air pollutant emissions were the following:

- the oil and gas industry, electric utilities and ore and mineral industries together represented the majority of SO_x emissions
- transportation (road, rail, air and marine), the oil and gas industries and off-road vehicles and mobile equipment were key sources 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 NH₃ emissions

- off-road vehicles and mobile equipment, transportation and the oil and gas industry were major sources of CO emissions
- dust and fires were the most important sources of PM_{2.5} emissions, agriculture being the second largest source

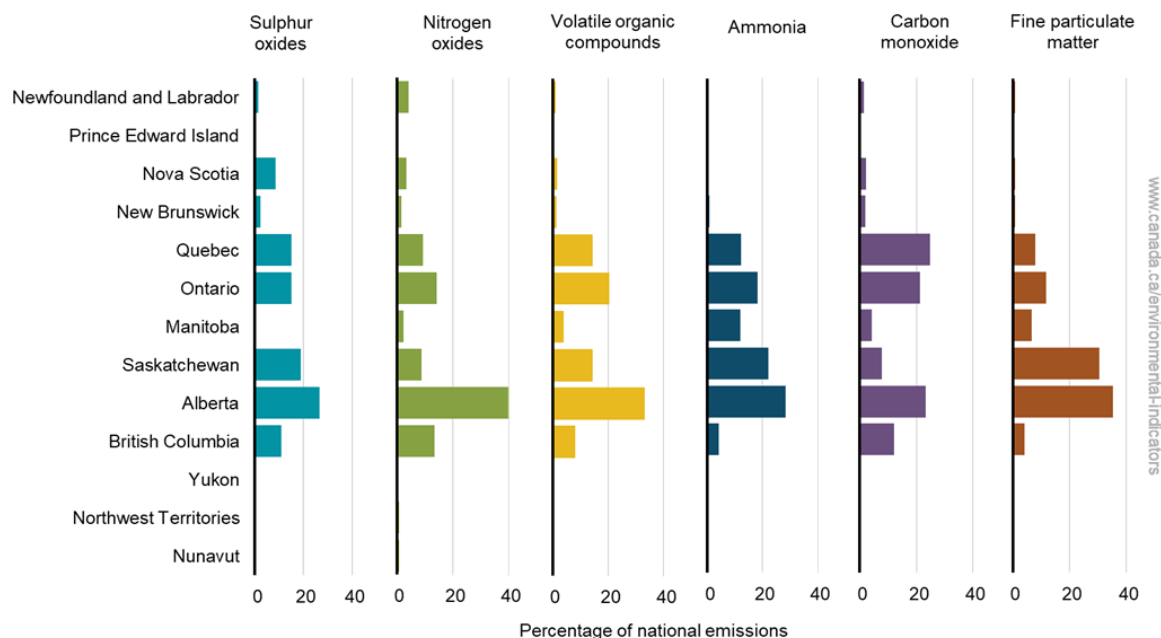
Air pollutant emissions by province and territory

Key results

At the provincial and territorial level, emissions of the 6 key air pollutants in 2021 were:

- the highest in Alberta for SO_x (27% of national emissions), NO_x (40%), VOCs (33%), NH₃ (29%) and PM_{2.5} (35%); second highest for CO (23%)
- the highest in Quebec for CO (25%)
- the second highest in Saskatchewan for SO_x (19% of national emissions), NH₃ (22%) and PM_{2.5} (31%)
- the second highest in Ontario for NO_x (14% of national emissions) and VOCs (21%)
- also important in British Columbia for NO_x, accounting for 14% of the national emissions of this pollutant, Quebec for SO_x, NO_x and VOCs, accounting for 15%, 9% and 14% of the national emissions of these pollutants and in Ontario for NH₃, CO, PM_{2.5}, accounting for 18%, 21%, and 12% of the national emissions of these pollutants

Figure 3. Distribution of air pollutant emissions by province and territory, Canada, 2021



[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 (2023) [Air Pollutant Emissions Inventory](#).

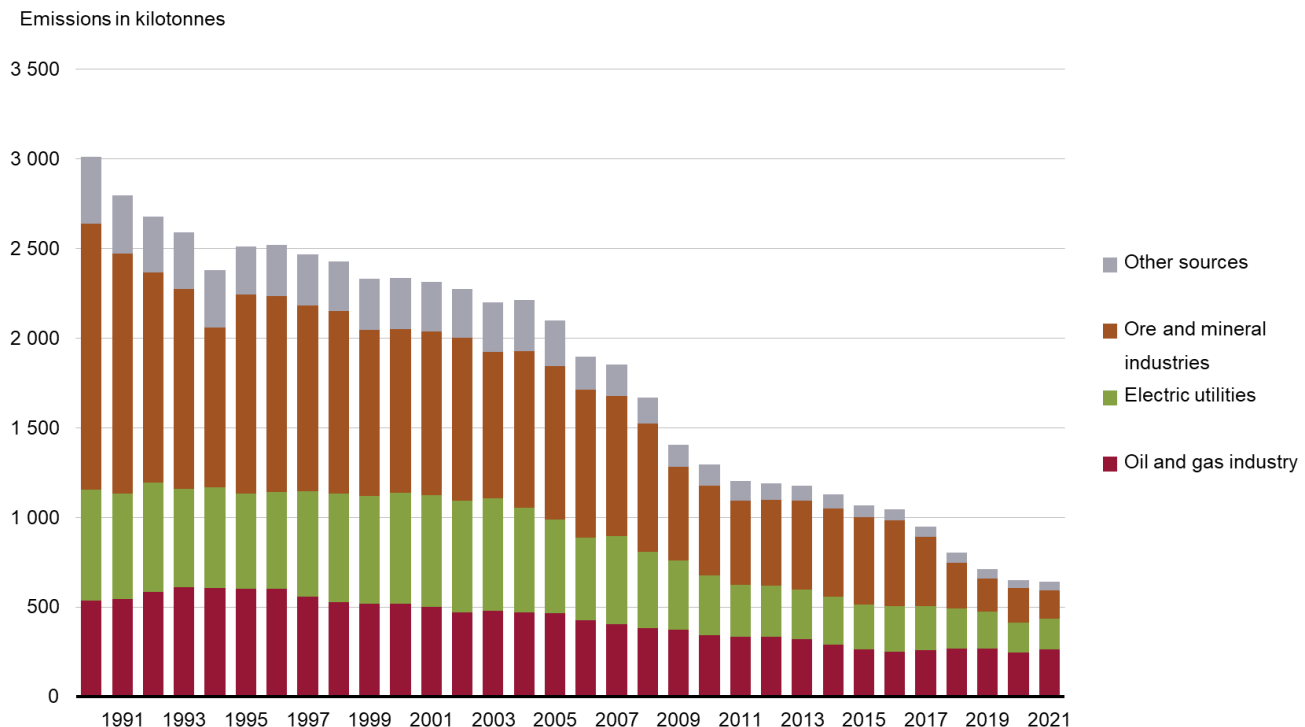
Sulphur oxide emissions by source

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 (SO₂). 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 2021, SO_x emissions decreased by 79% from 3 013 kilotonnes (kt) to 641 kt
- In 2021, 3 sources accounted for 93% (594 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 2021



[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 (2023) [Air Pollutant Emissions Inventory](#).

In 2021, the [oil and gas industry](#) accounted for approximately 41% of total national SO_x emissions (264 kt). [Electric utilities](#) and ore and mineral industries followed with 26% (169 kt) and 25% (161 kt) of national emissions. For the ore and mineral industries, 36% (57 kt) of its SO_x emissions came from the non-ferrous refining and smelting industry.

The largest reduction in emissions between 1990 and 2021 was from ore and mineral industries with a reduction in emissions of approximately 1 323 kt. The largest driver of the reduction from the source was from the non-ferrous refining and smelting industry with a reduction of 1 208 kt over the period.

This significant decrease in SO_x emissions from 1990 to 2021 (79%) 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)
- implementation of regulations on low-sulphur fuels^{3,4}

More recently, between 2020 and 2021, SO_x emissions have declined due to decreases in emissions from ore and mineral industries of 34 kt (17%). On the other side, an increase in SO_x emissions was observed for almost all of the other sources, lead by the oil and gas industry which experienced an increase of 19 kt (8%).

Sulphur oxide emissions by province and territory

Key results

- In 2021, Alberta and Saskatchewan accounted for 46% (293 kt) of national SO_x emissions
- Between 1990 and 2021
 - the largest reductions were observed in Ontario and Manitoba. Emissions in these provinces decreased by 1 029 kt (92%) and 507 kt (99.6%)
 - Saskatchewan was the only province that experienced an increase in SO_x (19%, or 19 kt)

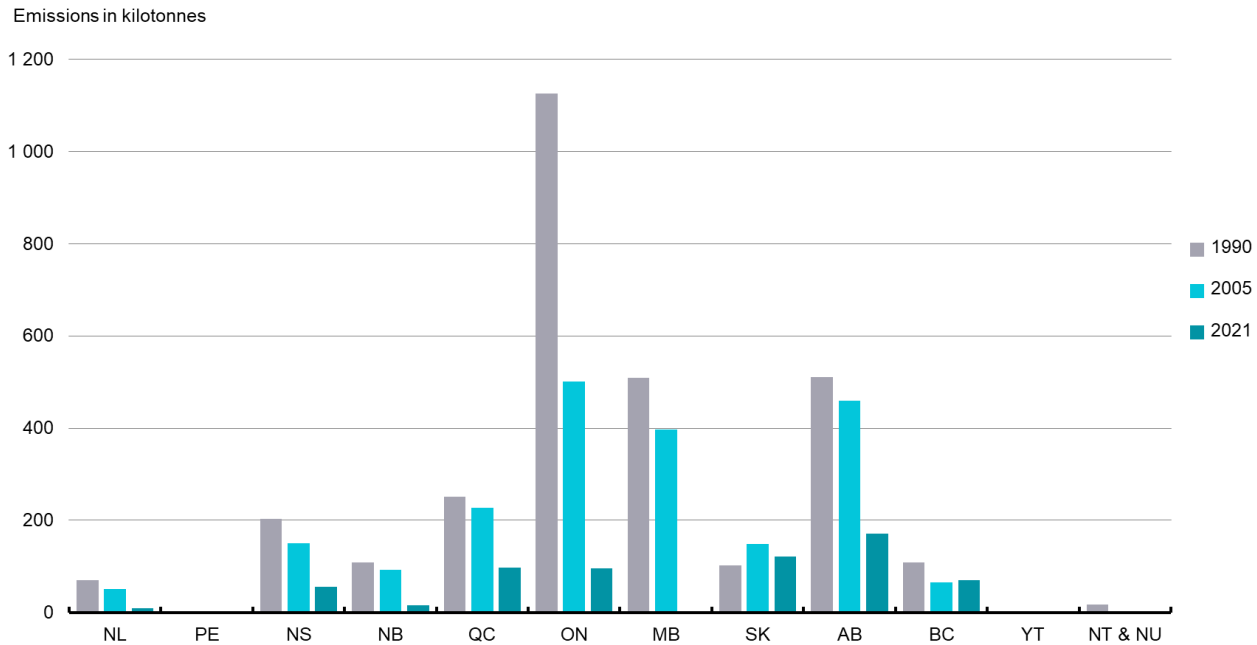
¹ Environment and Climate Change Canada (1991) [Canada-United States Air Quality Agreement](#). Retrieved on March 20, 2023.

² Canadian Council of Ministers of the Environment (1998) [The Canada-Wide Acid Rain Strategy for Post-2000](#). Retrieved on March 20, 2023.

³ Environment and Climate Change Canada (2020) [Sulphur in Gasoline Regulations](#). Retrieved on March 20, 2023.

⁴ Environment and Climate Change Canada (2017) [Sulphur in Diesel Fuel Regulations](#). Retrieved on March 20, 2023

Figure 5. Sulphur oxide emissions by province and territory, Canada, 1990, 2005 and 2021



www.canada.ca/environmental-indicators

[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 (2023) [Air Pollutant Emissions Inventory](#).

Alberta had the highest SO_x emissions level in 2021, accounting for 27% (171 kt) of total national emissions. Emissions in the province mainly came from the oil and gas industry and electric utilities, combined accounting for 95% (162 kt) of the emissions. Between 2005 to 2021, the province experienced a 63% decline in emissions (289 kt) with the oil and gas industry, notably reductions from natural gas processing and oil sands mining extraction and processing, accounting for a large part of the reductions since 2005.

Saskatchewan was the second-highest emitter of SO_x in 2021, accounting for 19% (122 kt) of total national emissions. Emissions from electric utilities, specifically coal electric power generation, was the largest contributor to SO_x emissions in the province.

Quebec ranked third, with 15% (97 kt) of total national emissions of SO_x; the ore and mineral industries sector was the most important source of emissions in the province in 2021.

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.⁵

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.

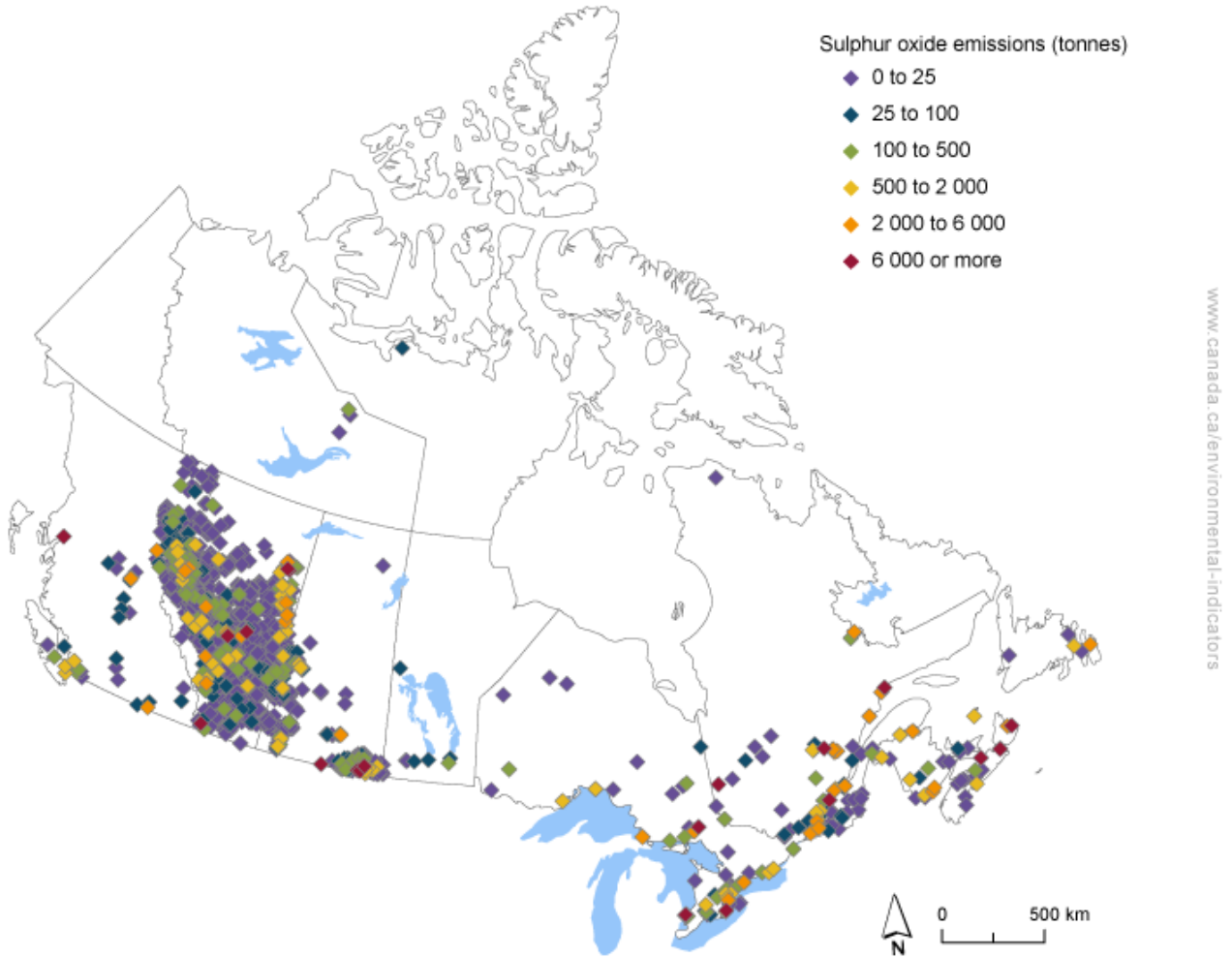
In 2021, 2 600 facilities across Canada reported SO_x emissions representing 89% of total national emissions. Of these facilities:

- 2 187 facilities reported emissions under 25 tonnes (t)
- 392 facilities reported emissions between 25 to 6 000 t

⁵ The National Pollutant Release Inventory only collects data for sulphur dioxide (SO₂), which is the predominant member of the SO_x group of gases.

- 21 facilities reported emissions of 6 000 t or more located in Alberta (5), Ontario (4), Quebec (4), Saskatchewan (4), Nova Scotia (3) and British Columbia (1)

Figure 6. Sulphur oxide emissions by reporting facilities, Canada, 2021



Source: Environment and Climate Change Canada (2023) [National Pollutant Release Inventory](#).

Navigate data using the [interactive map](#)

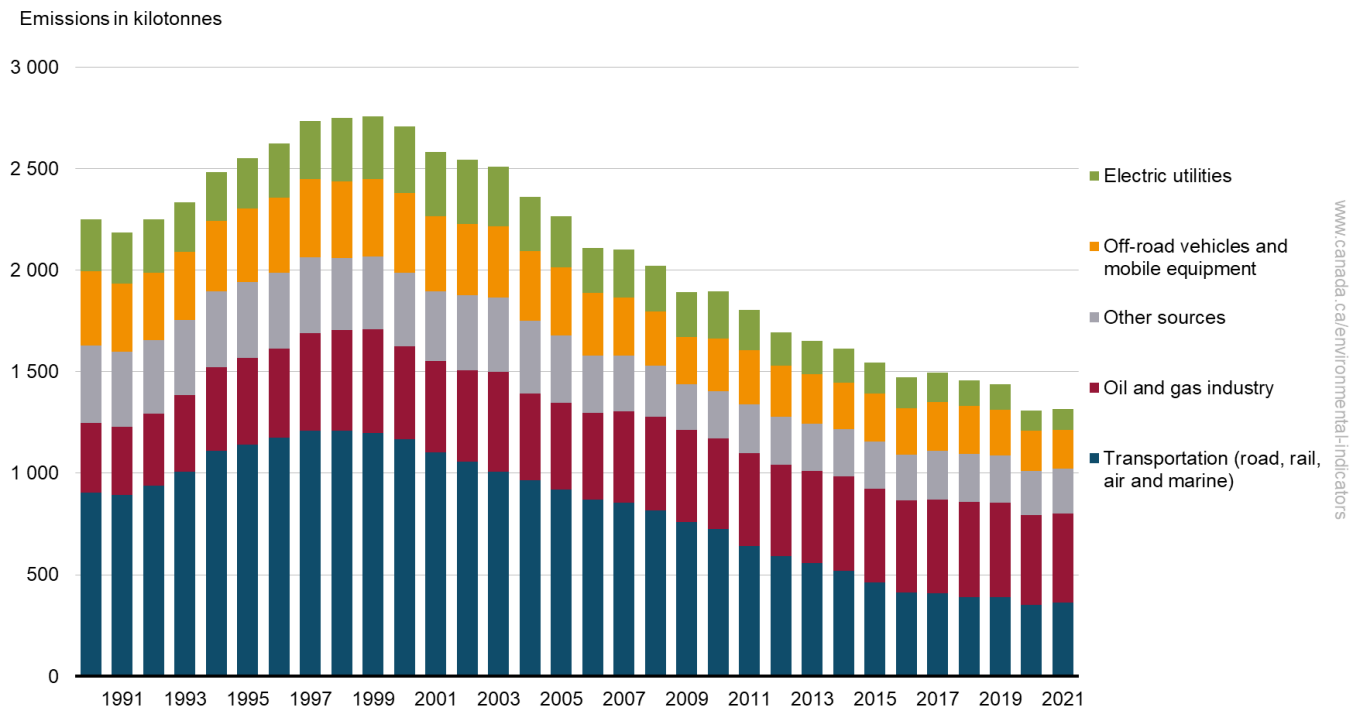
Nitrogen oxide emissions by source

[Nitrogen oxides](#) (NO_x) include emissions of nitric oxide (NO) and nitrogen dioxide (NO₂). Nitrogen dioxide can have adverse effects on human health and the environment. Nitrogen oxides contribute to acid rain, which can lead to the acidification of aquatic and terrestrial ecosystems. It also contributes to the eutrophication of lakes and to the formation of ground-level ozone (O₃) and fine particulate matter (PM_{2.5}).

Key results

- In 2021, NO_x emissions were 1 321 kilotonnes (kt). This is 41% lower than in 1990
- The oil and gas industry was the largest source of NO_x representing 33% (439 kt) of total emissions in 2021

Figure 7. Total nitrogen oxide emissions by source, Canada, 1990 to 2021



[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 (2023) [Air Pollutant Emissions Inventory](#).

The [oil and gas industry](#) was the largest contributor of NO_x emissions between 1990 and 2021. Emissions of NO_x from this sector increased by 95 kt (28%) during that period.

The transportation (road, rail, air, and marine) sector emitted the next largest proportions of NO_x emissions in 2021, representing 28% (365 kt) of total national emissions. This sector also experienced the largest decrease in emissions (60% or 539 kt) between 1990 and 2021.

The decline in NO_x emissions between 1990 and 2021 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)

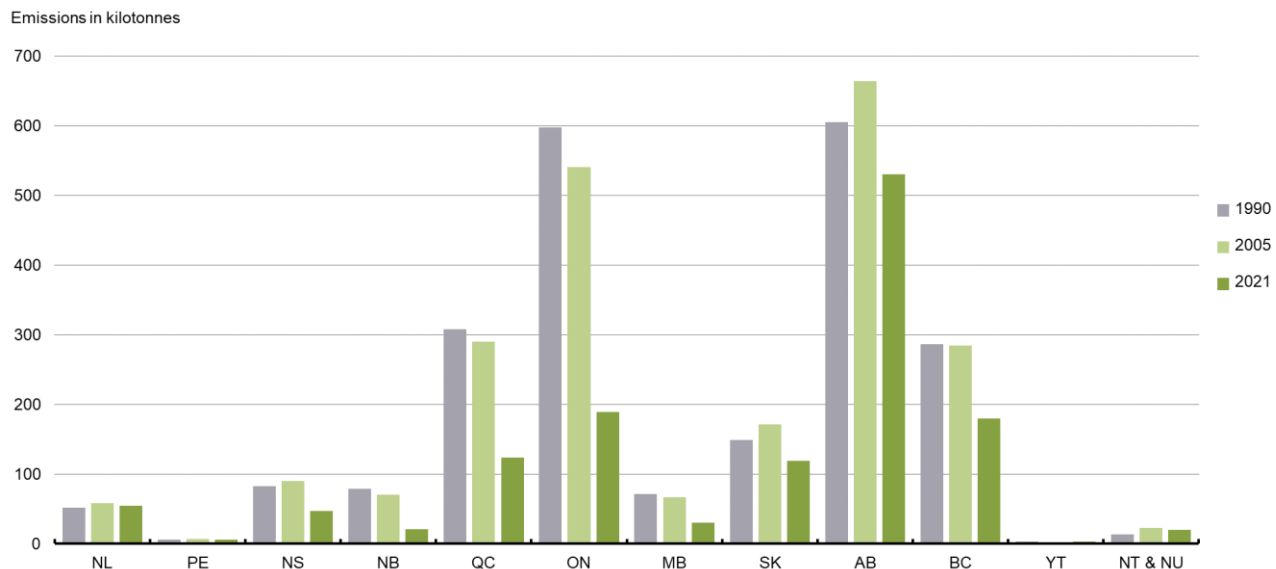
More recently, between 2020 and 2021, NO_x emissions have increased mainly due to increases in emissions from transportation (road, rail, air and marine) sources of 13 kt (4%), notably from domestic marine navigation.

Nitrogen oxide emissions by province and territory

Key results

- In 2021, among provinces and territories, Alberta emitted the most NO_x. The province accounted for 40% (530 kt) of national emissions
- Between 1990 and 2021,
 - the largest reduction was observed in Ontario. Emissions decreased by 68% (409 kt) in the province
 - NO_x emissions increased in Northwest Territories and Nunavut by 45% (6 kt)

Figure 8. Nitrogen oxide emissions by province and territory, Canada, 1990, 2005 and 2021



[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 (2023) [Air Pollutant Emissions Inventory](#).

The oil and gas industry is an important source of NO_x emissions in Alberta, accounting for 65% (344 kt) of the province's NO_x emissions in 2021. The increasing contribution of this sector to the province's emissions between 1990 and 2021 was more than offset by emission reductions from the transport and electric utilities sectors.

Ontario and British Columbia contributed the second and third largest proportion of NO_x emissions in 2021, both accounting for 14% (189 kt and 180 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 (409 kt) between 1990 and 2021 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 2021 (352 kt).

Quebec ranked fourth, with 9% (124 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 (166 kt) between 2005 and 2021 due to emission reductions from transportation (road, rail, air and marine).

Nitrogen oxide emissions by facilities

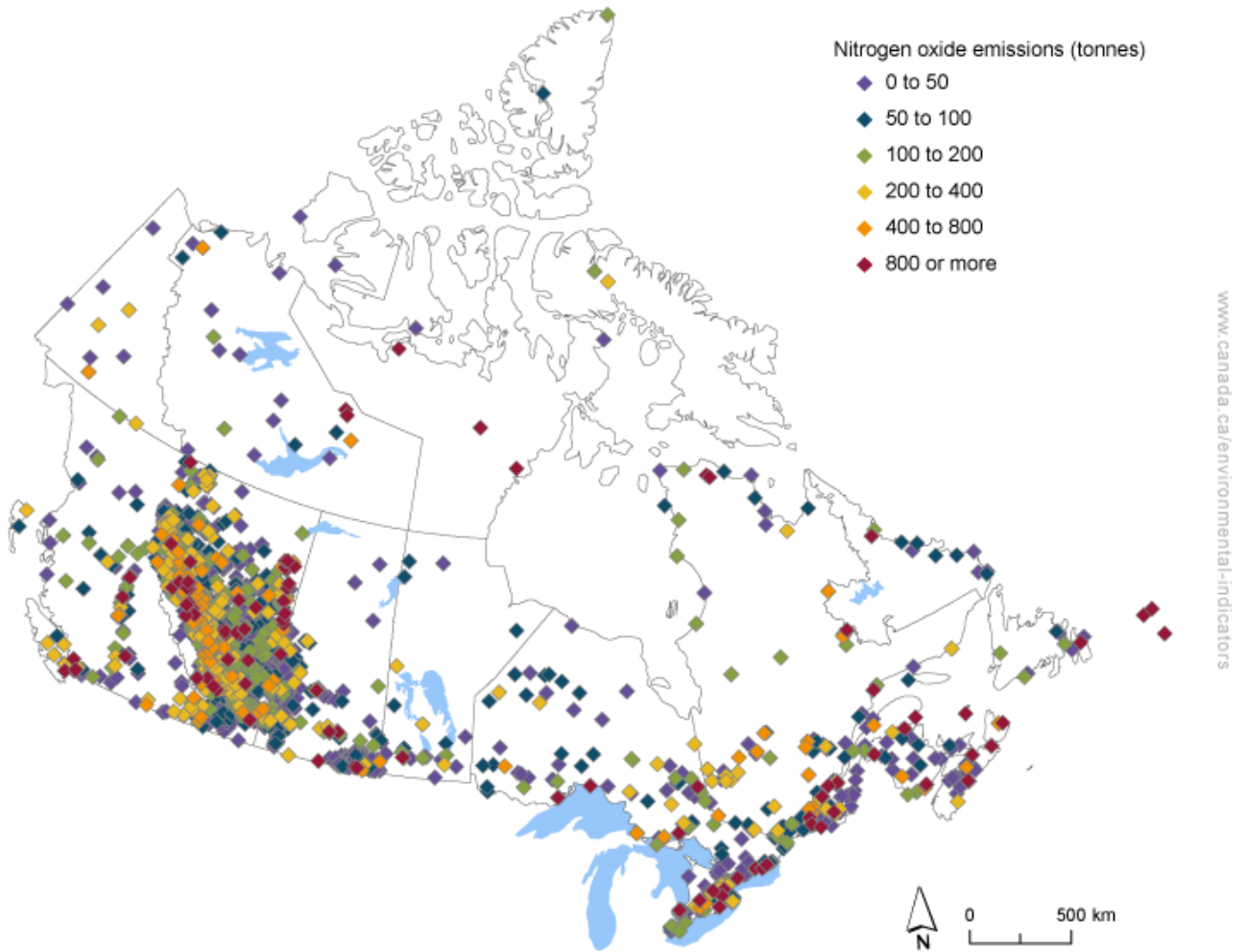
The National Pollutant Release Inventory provides detailed information on air pollutant emissions from industrial and commercial facilities that meet its reporting criteria.

The Canadian Environmental Sustainability Indicators provide access to this information through an [interactive map](#). The map allows you to explore NO_x emissions from individual facilities.

In 2021, 3 458 facilities across Canada reported NO_x emissions representing 39% of total national emissions. Of these facilities:

- 2 006 facilities reported emissions under 50 tonnes (t)
- 1 341 facilities reported emissions between 50 to 800 t
- 111 facilities reported emissions of 800 t or more located in Alberta (45), Ontario (18), Quebec (12), British Columbia (9), Saskatchewan (7), Newfoundland and Labrador (6), Northwest Territories and Nunavut (5), Nova Scotia (4), New Brunswick (4) and Manitoba (1)

Figure 9. Nitrogen oxide emissions by reporting facilities, Canada, 2021



Source: Environment and Climate Change Canada (2023) [National Pollutant Release Inventory](#).

Navigate data using the [interactive map](#)

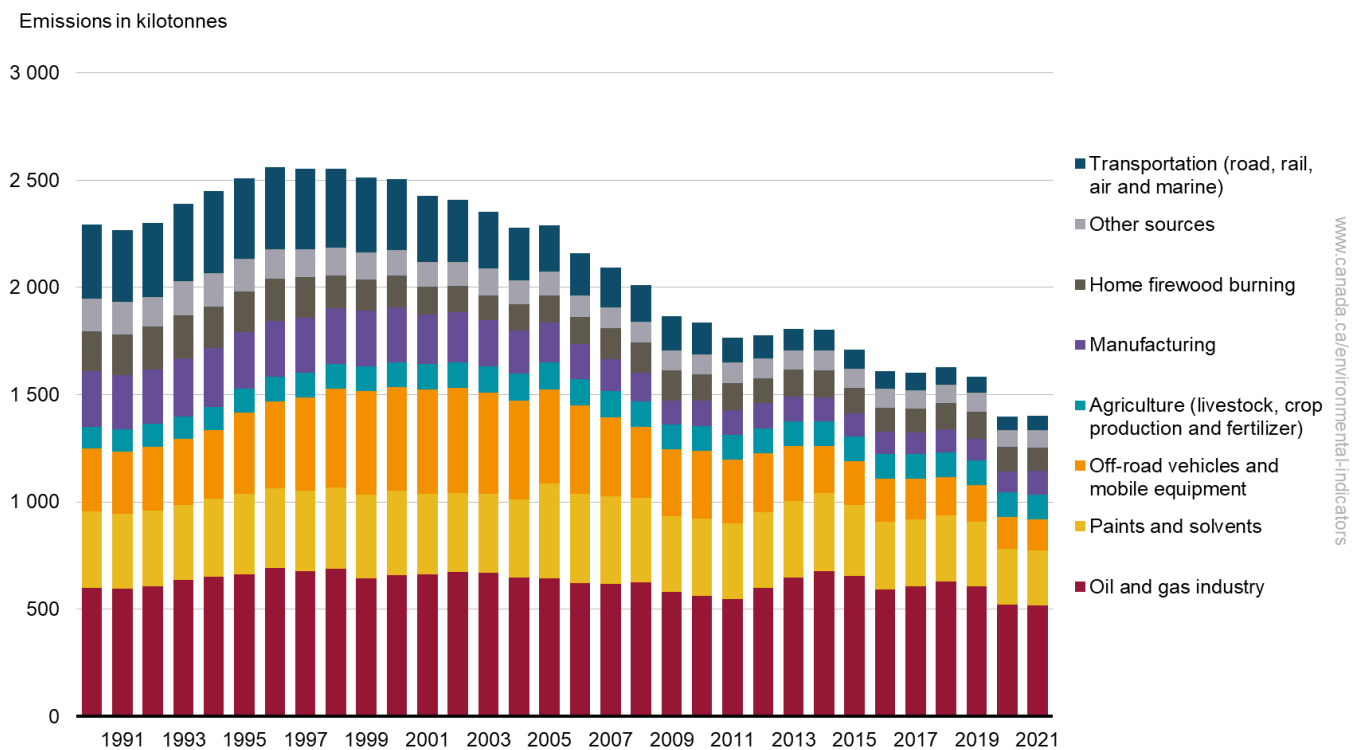
Volatile organic compound emissions by source

[Volatile organic compounds](#) (VOCs) are carbon-containing gases and vapours released into the atmosphere by natural sources and human activities.⁶ 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 2021, VOC emissions in Canada were 1 400 kilotonnes (kt). This is a 894 kt (39%) decrease from 1990 levels
- Since 2000, the oil and gas industry has been the highest contributor to VOC emissions. In 2021, the sector accounted for 37% (516 kt) of total emissions

Figure 10. Total volatile organic compound emissions by source, Canada, 1990 to 2021



[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 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 (2023) [Air Pollutant Emissions Inventory](#).

Paints and solvents, and off-road vehicles and mobile equipment were also important sources of VOC emissions in 2021 contributing 18% (257 kt) and 10% (145 kt) of total emissions.

The largest emissions reduction between 1990 and 2021 was from transportation (road, rail, air and marine), with emissions reductions of 281 kt (81%).

⁶ Under the *Canadian Environmental Protection Act*, carbon dioxide, carbon monoxide, methane and chlorofluorocarbons are not considered volatile organic compounds.

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

- 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 facility closures, decrease in production and improved emission controls
- lower levels of VOCs in products such as paints, solvents and cleaners

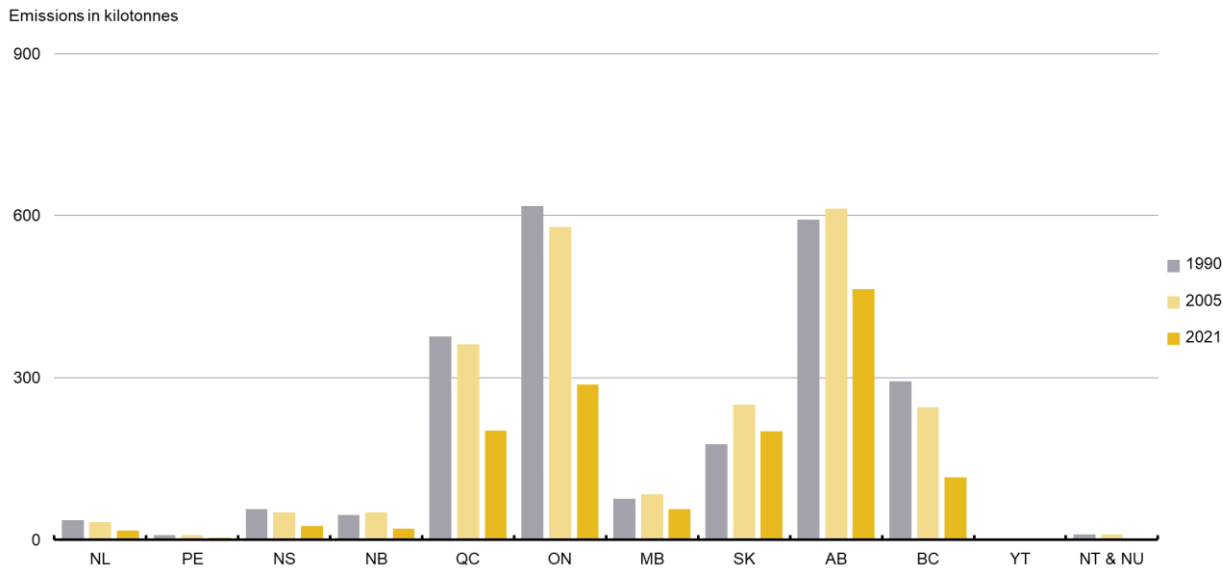
Compared to the previous year, VOC emissions increased by less than 1 kt (0.03%) in 2021. The largest increase was from manufacturing 15 kt (15%), notably wood products.

Volatile organic compound emissions by province and territory

Key results

- Alberta emitted the highest proportion of VOCs in 2021. The province represented 33% (464 kt) of national emissions
- Between 1990 and 2021,
 - Ontario experienced the largest reduction in VOC emissions. Emissions in the province decreased by 53% (330 kt)
 - Saskatchewan was the only province that experienced an increase in VOC emissions, with +14% (24 kt)

Figure 11. Volatile organic compound emissions by province and territory, Canada, 1990, 2005 and 2021



[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 (2023) [Air Pollutant Emissions Inventory](#).

Alberta was the highest emitting province of VOCs in 2021 (464 kt), with the oil and gas industry as the main source, contributing 70% (326 kt) of the province's emissions.

Ontario was the second-highest emitter of VOCs, accounting for 21% (288 kt) of total national emissions in 2021. 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 330 kt (-53%) between 1990 and 2021, mainly as a result of emission reductions from off-road vehicles and mobile equipment and transportation (road, rail, air and marine). Majority of the reductions in Ontario occurred between 2005 and 2021 (291 kt).

Quebec was the third largest emitter, with 14% (203 kt) of total national emissions in 2021, where paints and solvents and home firewood burning collectively accounted for 49% of the emissions in that province.

Most provinces and territories experienced significant reductions in emissions between 1990 and 2021 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

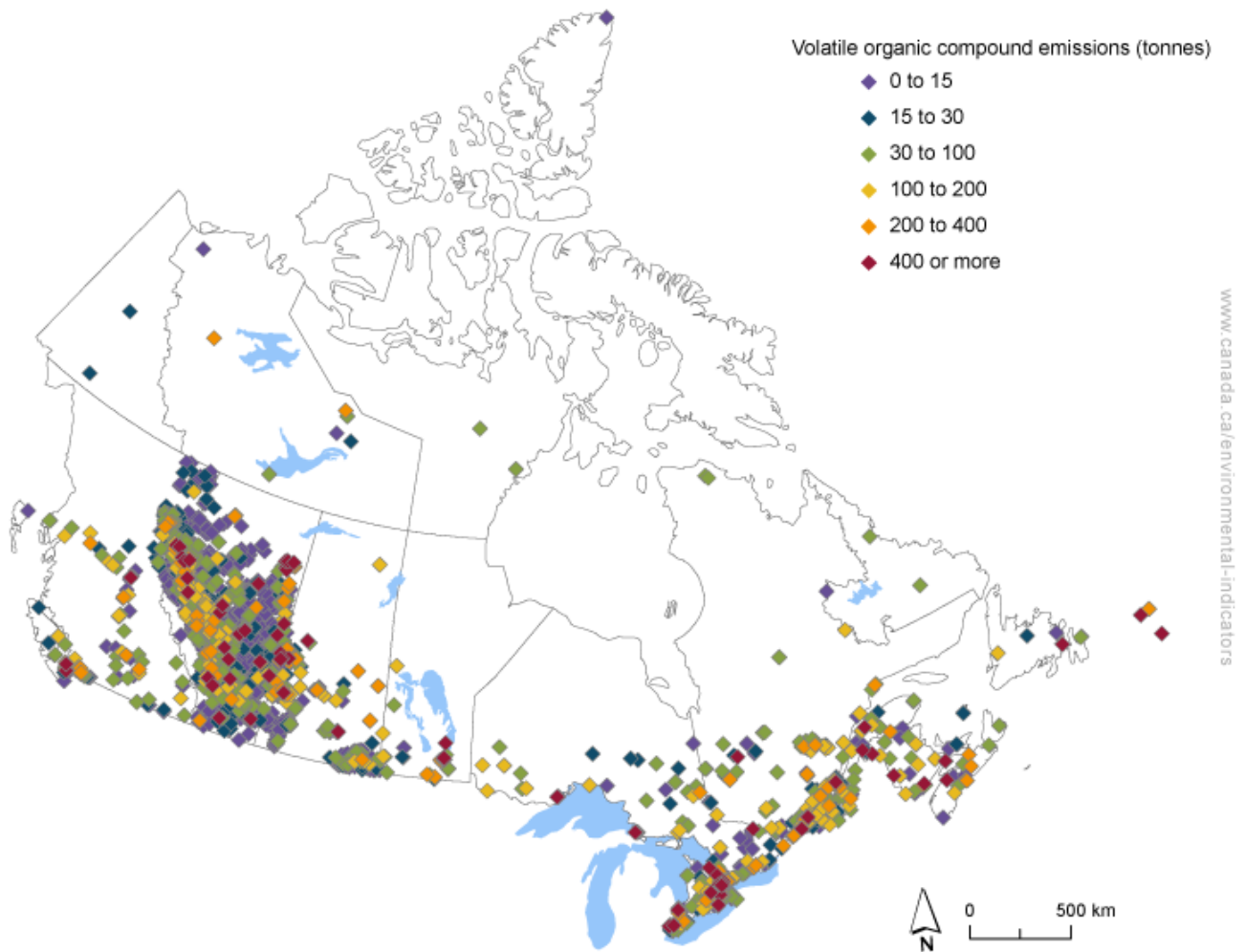
The National Pollutant Release Inventory provides detailed information on air pollutant emissions from industrial and commercial facilities that meet its reporting criteria.

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 2021, 4 264 facilities across Canada reported VOC emissions representing 18% of total national emissions. Of these facilities:

- 2 558 facilities reported emissions under 15 tonnes (t)
- 1 620 facilities reported emissions between 15 to 400 t
- 86 facilities reported emissions of 400 t or more located in Alberta (36), Ontario (18), Saskatchewan (8), Quebec (7), British Columbia (6), Manitoba (3), Newfoundland and Labrador (3), New Brunswick (3) and Nova Scotia (2)

Figure 12. Volatile organic compound emissions by reporting facilities, Canada, 2021



Source: Environment and Climate Change Canada (2023) [National Pollutant Release Inventory](#).

Navigate data using the [interactive map](#)

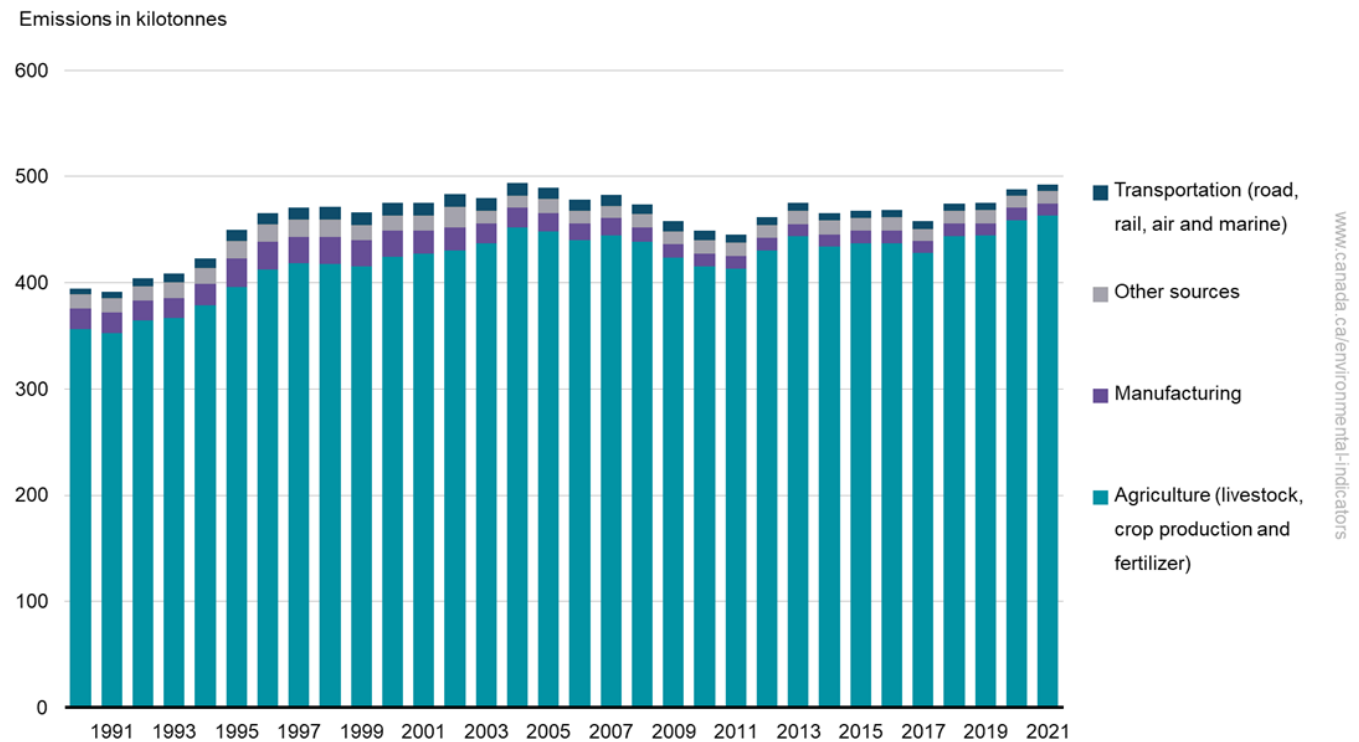
Ammonia emissions by source

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

Key results

- In 2021, NH₃ emissions were 493 kilotonnes (kt). This is 25% higher than in 1990
- Agriculture (livestock, crop production and fertilizer) was the main source of NH₃ emissions in 2021. Emissions from this source accounted for more than 94% (463 kt) of total national emissions

Figure 13. Total ammonia emissions by source, Canada, 1990 to 2021



[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 (2023) [Air Pollutant Emissions Inventory](#).

Between 1990 and 2021, agriculture (livestock, crop production and fertilizer) experienced the largest increase (30% or 107 kt) in NH₃ emissions. It also remained the key source of NH₃ emissions throughout that period. Emissions from manufacturing (11 kt), other sources (6 kt), incineration and waste (6 kt) and transportation (road, rail, air and marine) (6 kt) combined represented 6% of national emissions in 2021.

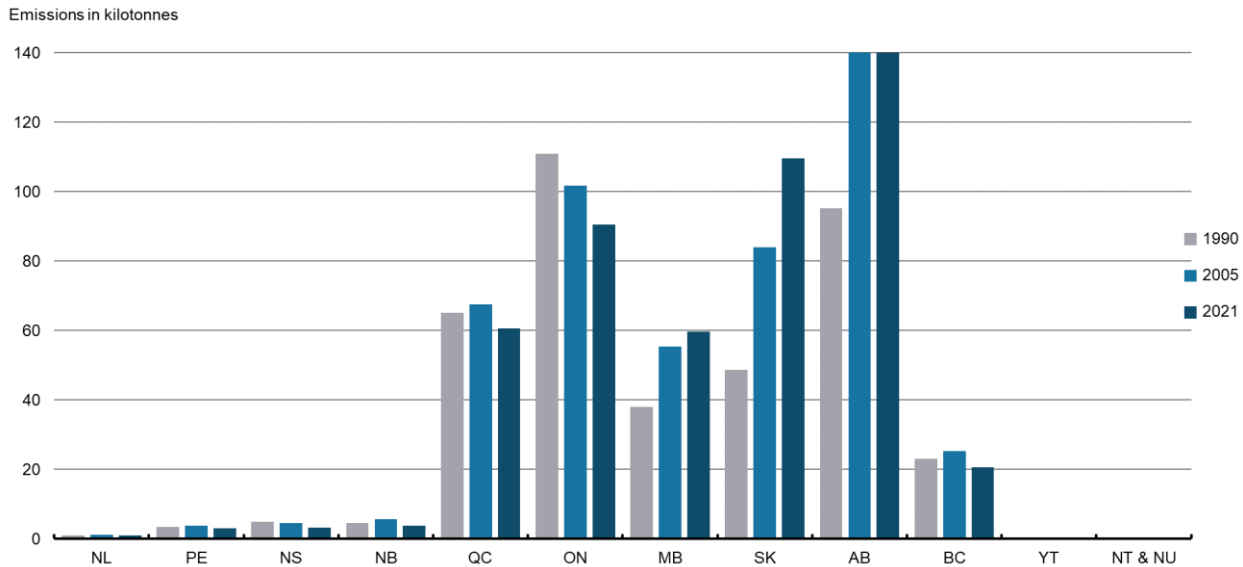
The growth in NH₃ emissions from agriculture (livestock, crop production and fertilizer) between 1990 and 2021 is mainly due to the increased use of synthetic nitrogen fertilizers. Up to 2005, larger livestock populations also added to the growth. However, from 2006 to 2011, livestock populations decreased and NH₃ 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 2021, Alberta and Saskatchewan accounted for more than half (250 kt) of national NH₃ emissions
- Between 1990 and 2021,
 - Ontario experienced the largest emissions reduction with 20 kt (18%)
 - The largest increase in NH₃ emissions was in Saskatchewan with emissions more than doubling (a 61 kt increase)

Figure 14. Ammonia emissions by province and territory, Canada, 1990, 2005 and 2021



[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 (2023) [Air Pollutant Emissions Inventory](#).

In 2021, Alberta emitted the most NH₃ of all the provinces and territories, accounting for 29% (141 kt) of total national emissions. Saskatchewan contributed the second-largest proportion of NH₃, representing 22% (109 kt).

Ontario followed with 18% (90 kt) of total national emissions, respectively. Livestock farms and the application of fertilizers were the most important sources of NH₃ emissions.

Virtually all of the increase in emissions between 1990 and 2021 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.

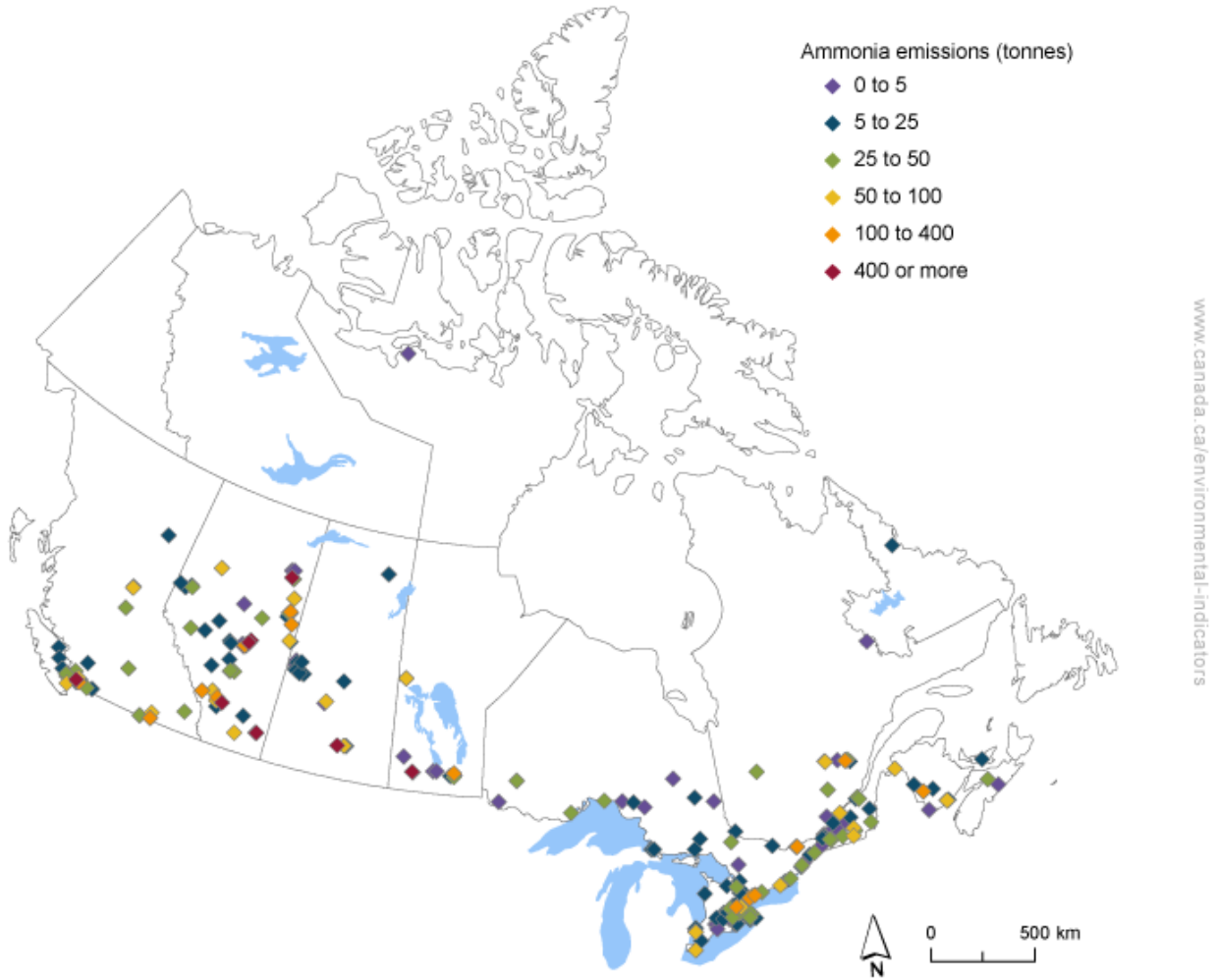
The Canadian Environmental Sustainability Indicators provide access to this information through an [interactive map](#). The map allows you to explore NH₃ emissions from individual facilities.

In 2021, 271 facilities across Canada reported NH₃ emissions representing 4% of total national emissions. Of these facilities:

- 172 facilities reported emissions under 25 tonnes (t)
- 91 facilities reported emissions between 25 to 400 t

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

Figure 15. Ammonia emissions by reporting facilities, Canada, 2021



Source: Environment and Climate Change Canada (2023) [National Pollutant Release Inventory](#).

Navigate data using the [interactive map](#)

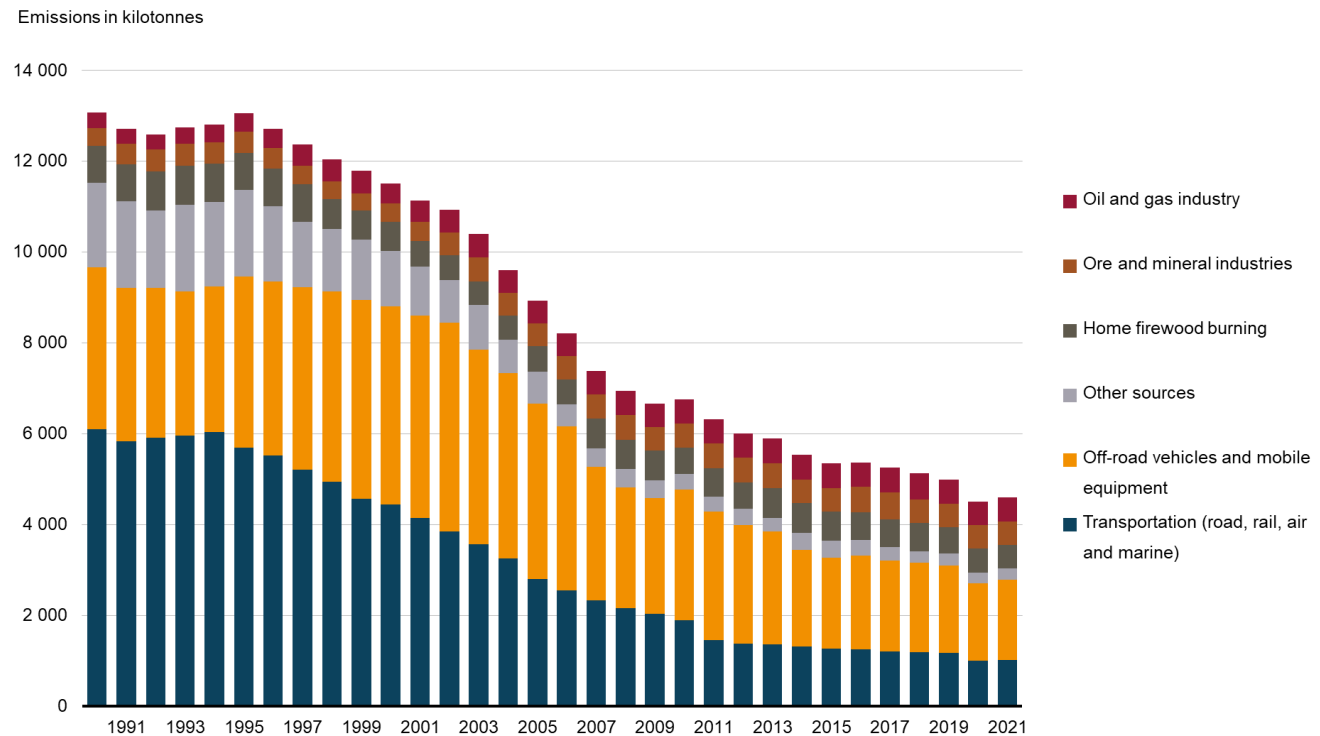
Carbon monoxide emissions by source

[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 2021,
 - CO emissions in Canada were 4 596 kilotonnes (kt), a decrease of 65% from 1990 levels
 - Off-road vehicles and mobile equipment was the largest source of CO emissions in Canada representing 38% (1 761 kt) of total emissions

Figure 16. Total carbon monoxide emissions by source, Canada, 1990 to 2021



[Data for Figure 16](#)

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, 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 (2023) [Air Pollutant Emissions Inventory](#).

In 2021, [transportation, and off-road vehicles and mobile equipment](#) were the 2 most important sources of CO. These sources combined represented 61% (2 780 kt) of national emissions.

The largest reduction in emissions between 1990 and 2021 occurred in transportation (road, rail, air and marine) with an emission decrease of 5 079 kt (83%).

The decline in CO emissions between 1990 and 2021 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).

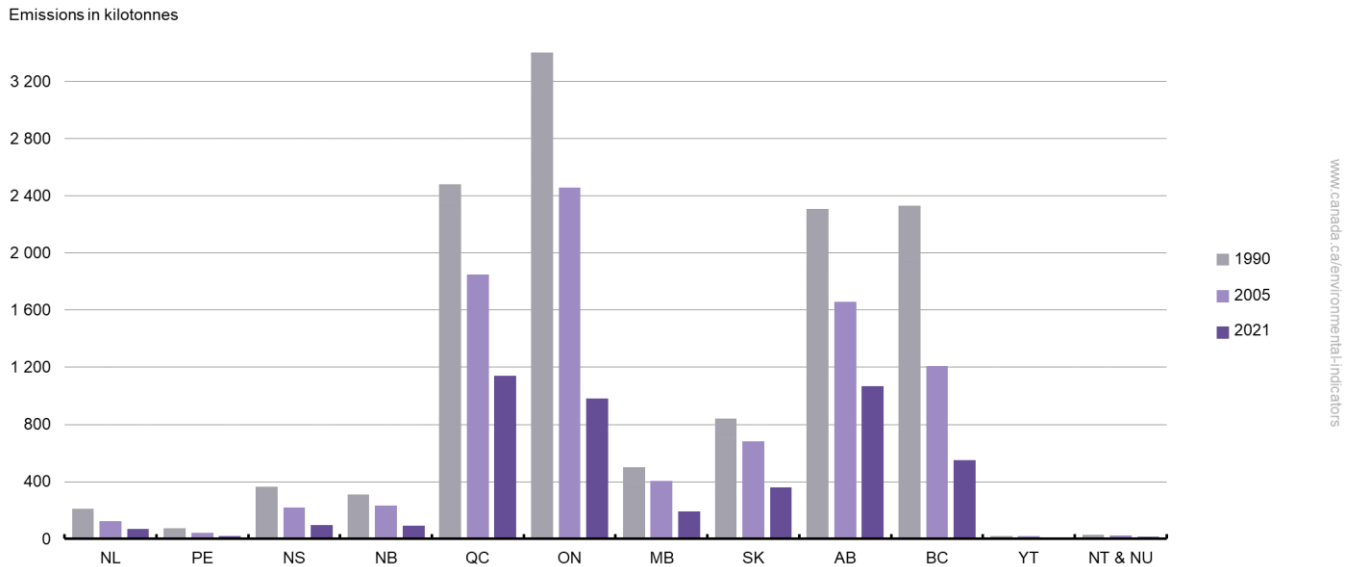
CO emissions decreased significantly between 2019 and 2020. More recently, between 2020 and 2021, CO emissions have increased mainly due to increases in emissions from off-road vehicles and mobile equipment sources of 51 kt (3 %). Although, CO emissions in 2021 are still notably below emission levels in 2019.

Carbon monoxide emissions by province and territory

Key results

- In 2021, Quebec and Alberta accounted for 48% (2 211 kt) of national CO emissions
- Between 1990 and 2021,
 - all provinces and territories experienced significant reductions in emissions
 - the largest reductions occurred in Ontario (2 613 kt or 73%), British Columbia (1 777 kt or 76%) and Quebec (1 339 kt or 54%)

Figure 17. Carbon monoxide emissions by province and territory, Canada, 1990, 2005 and 2021



[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 (2023) [Air Pollutant Emissions Inventory](#).

In 2021, Quebec emitted the most CO of all the provinces and territories, representing 25% (1 143 kt) of the total national emissions. Ore and mineral industries, specifically the aluminum industry representing 93% (354 kt) of the sector’s emissions, was the most important source of CO emissions for Quebec.

The province of Alberta ranked second, with 23% (1 069 kt) of total national emissions in 2021, with 75% of those emissions from 2 sources, namely off-road vehicles and mobile equipment and the oil and gas industry.

Ontario, the third largest CO emitter, accounted for 21% (981 kt) of total national emissions. The off-road vehicles and mobile equipment sector accounted for 44% of the province's CO emissions.

The sharp decrease in emissions between 1990 and 2021 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 2005 and 2021 notably for Ontario with emissions decreasing by 1 474 kt (60%).

Carbon monoxide emissions by facilities

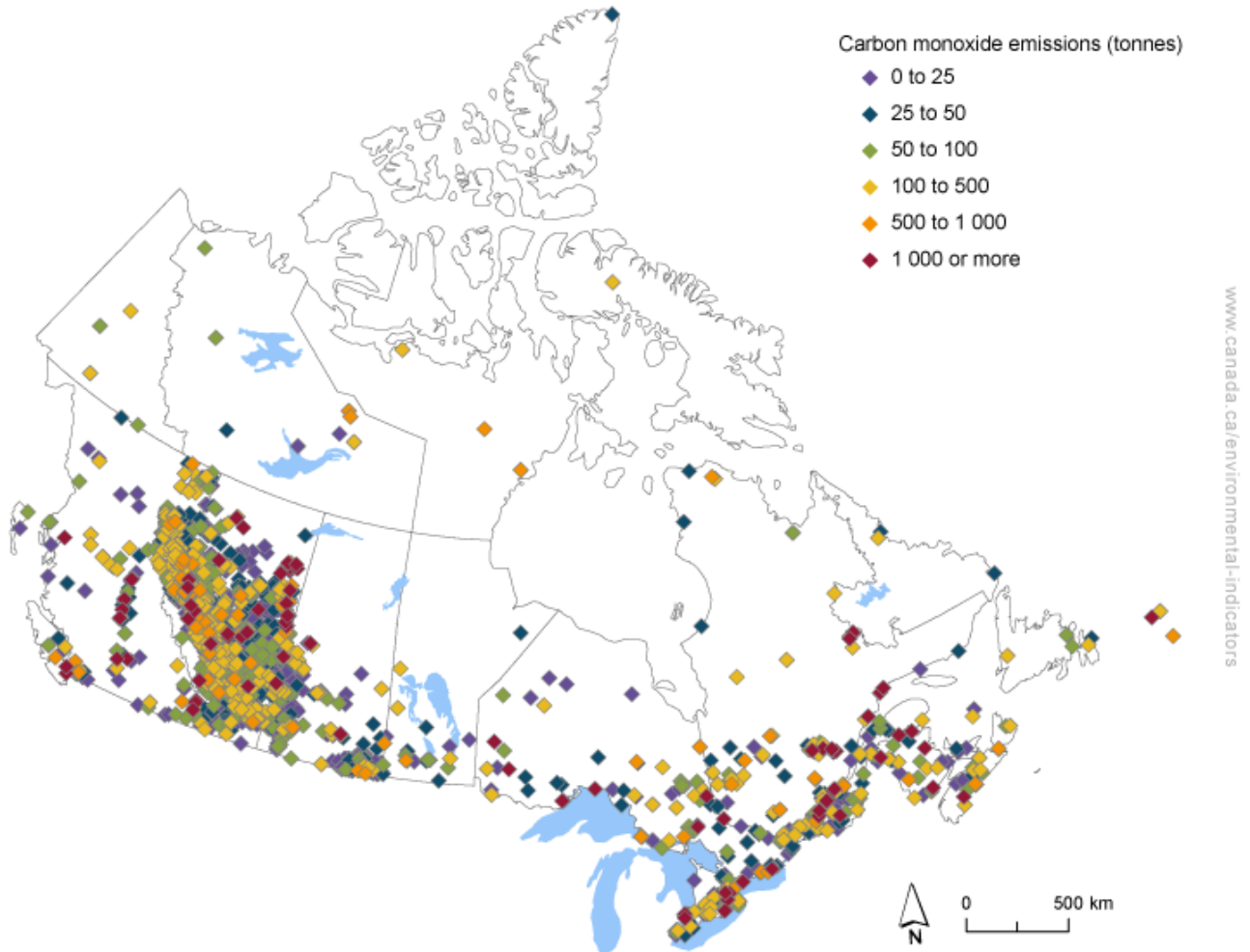
The National Pollutant Release Inventory provides detailed information on air pollutant emissions from industrial and commercial facilities that meet its reporting criteria.

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 2021, 3 269 facilities across Canada reported CO emissions representing 19% of total national emissions. Of these facilities:

- 1 512 facilities reported emissions under 25 tonnes (t)
- 1 663 facilities reported emissions between 25 to 1 000 t
- 94 facilities reported emissions of 1 000 t or more located in Alberta (30), Quebec (19), Ontario (19), British Columbia (13), New Brunswick (6), Saskatchewan (4), Newfoundland and Labrador (2) and Nova Scotia (1)

Figure 18. Carbon monoxide emissions by reporting facilities, Canada, 2021



Source: Environment and Climate Change Canada (2023) [National Pollutant Release Inventory](#).

Navigate data using the [interactive map](#)

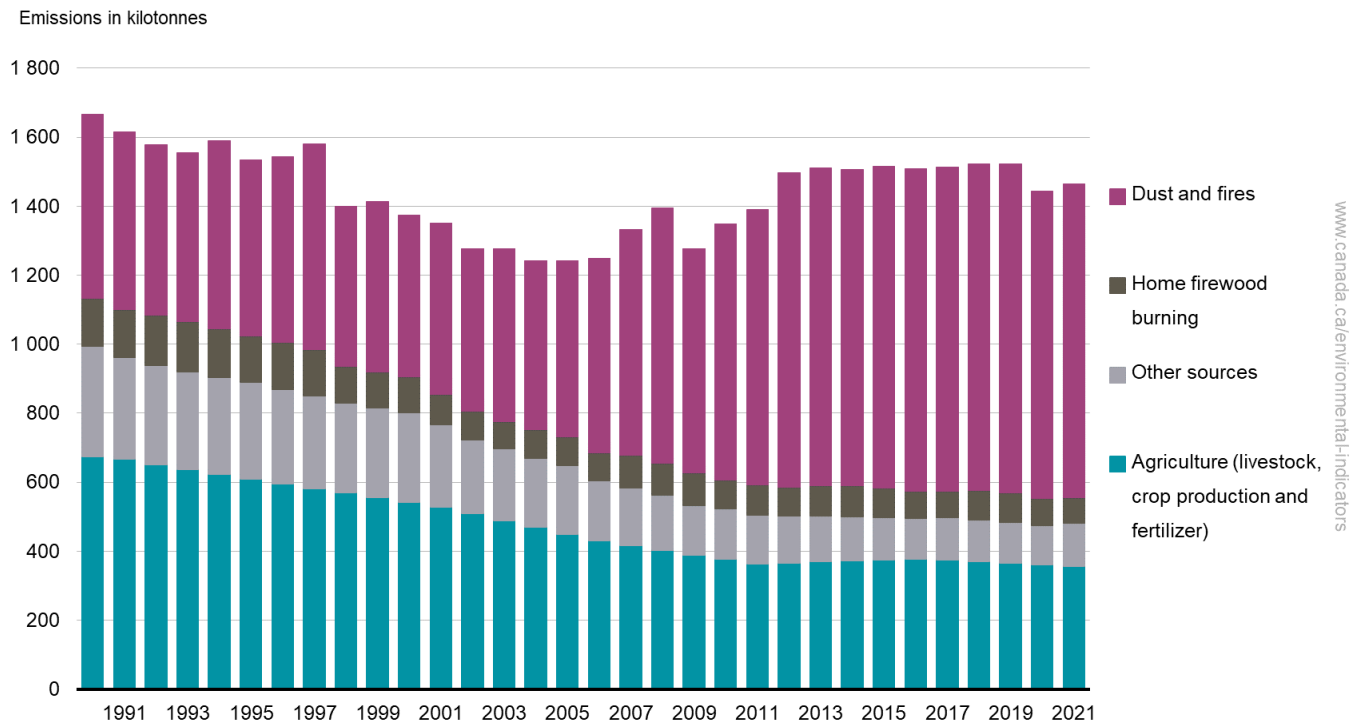
Fine particulate matter emissions by source

[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.⁷ 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 2021, PM_{2.5} emissions were 1 463 kilotonnes (kt). This is 14% 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% (907 kt) of total national emissions in 2021.
 - These emissions increased by 71% (377 kt) between 1990 and 2021. Dust from construction operations, specifically oil and gas engineering, and unpaved roads accounted for the majority of the increase.

Figure 19. Total fine particulate matter emissions by source, Canada, 1990 to 2021



[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 (2023) [Air Pollutant Emissions Inventory](#).

⁷ PM formed in the air from chemical and physical reactions involving the precursor substances are not included in the indicator.

In 2021, 86% of PM_{2.5} emissions came from open source emissions, such as dust and fires, and agriculture (livestock⁸, crop production and fertilizer). PM_{2.5} emissions does not include emissions from natural sources such as forest fires and vegetation. In general, these open source 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 2021 came from home firewood burning (75 kt or 5%) and other sources, including:

- ore and mineral industries, representing 3% (38 kt) of the emissions
- manufacturing and miscellaneous sources, such as emissions from commercial cooking, each representing about 1% (20 kt and 16 kt) of emissions
- off-road vehicles and mobile equipment, representing about 1% (17 kt)
- the oil and gas industry, representing 1% (14 kt)
- transportation (road, rail, air and marine), representing less than 1% (9 kt)
- other emissions (less than 1%; 10 kt) coming from building heating and energy generation, electric utilities, incineration and waste, and the use of paints and solvents

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

The decreases in PM_{2.5} emissions between 1990 and 2021 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 significant decrease between 2019 and 2020, offsetting reductions from the other sources. The increase in emission in 2021 is driven predominantly by increased use of unpaved roads.

⁸ 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 2021

Source	PM _{2.5} (change in kilotonnes from 1990 to 2021)	PM _{2.5} (percentage change from 1990 to 2021)
Dust and fires	376.8	71.1
Oil and gas industry	2.3	19.2
Miscellaneous	1.6	11.7
Building heating and energy generation	0.3	7.2
Paints and solvents	0.04	n/a
Incineration and waste	-0.7	-20.9
Ore and mineral industries	-16.1	-29.8
Off-road vehicles and mobile equipment	-20.1	-54.1
Transportation (road, rail, air and marine)	-24.2	-72.6
Electric utilities	-46.5	-95.8
Home firewood burning	-64.4	-46.1
Manufacturing	-94.2	-82.7
Agriculture (livestock, crop production and fertilizer)	-316.4	-46.9
All sources	-201.4	-13.8

Note: n/a = not available. The changes have been calculated using source data that are not rounded.

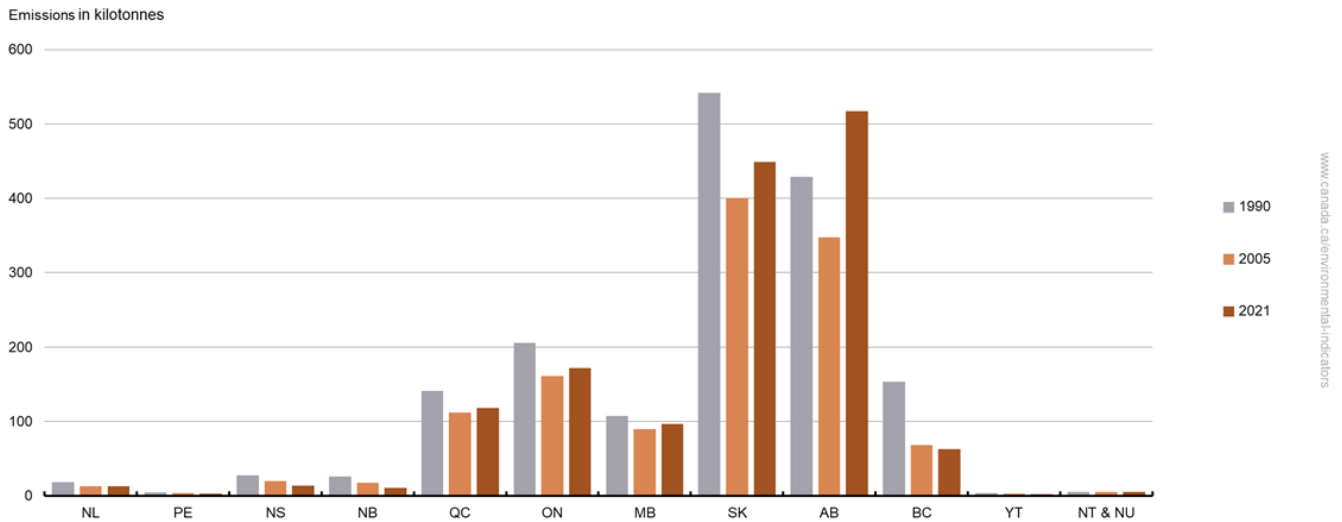
Source: Environment and Climate Change Canada (2023) [Air Pollutant Emissions Inventory](#).

Fine particulate matter emissions by province and territory

Key results

- In 2021, Alberta emitted the most PM_{2.5}. The province represented 35% (517 kt) of total national emissions
- Between 1990 and 2021, all provinces and territories, with the exception of Alberta, decreased their emissions
 - The largest decrease was observed in Saskatchewan with 93 kt (17%)
 - Alberta's PM_{2.5} emissions increased by 88 kt (21%)

Figure 20. Fine particulate matter emissions by province and territory, Canada, 1990, 2005 and 2021



[Data for Figure 20](#)

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 (2023) [Air Pollutant Emissions Inventory](#).

In 2021, Alberta was the highest emitting province of PM_{2.5} emissions, accounting for 35% (517 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 2021 can be attributed to growth in construction operations for the oil and gas industries. Since 2005, total emissions in the province increased by 170 kt (49%).

Saskatchewan ranked second in 2021, with 31% (449 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 these 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 2021, representing 28% (56 kt) of total emissions (199 kt). Ontario ranks second with 23% (46 kt) of emissions. Alberta and British Columbia rank third and fourth, representing 15% and 14% (30 kt and 28 kt, respectively) of emissions. Between 1990 and 2021, with dust, fires and agriculture excluded, all of the provinces and territories experienced emissions reductions between 72% (British Columbia, with a 71 kt emission reduction) and 39% (Prince Edward Island, with a 0.8 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.

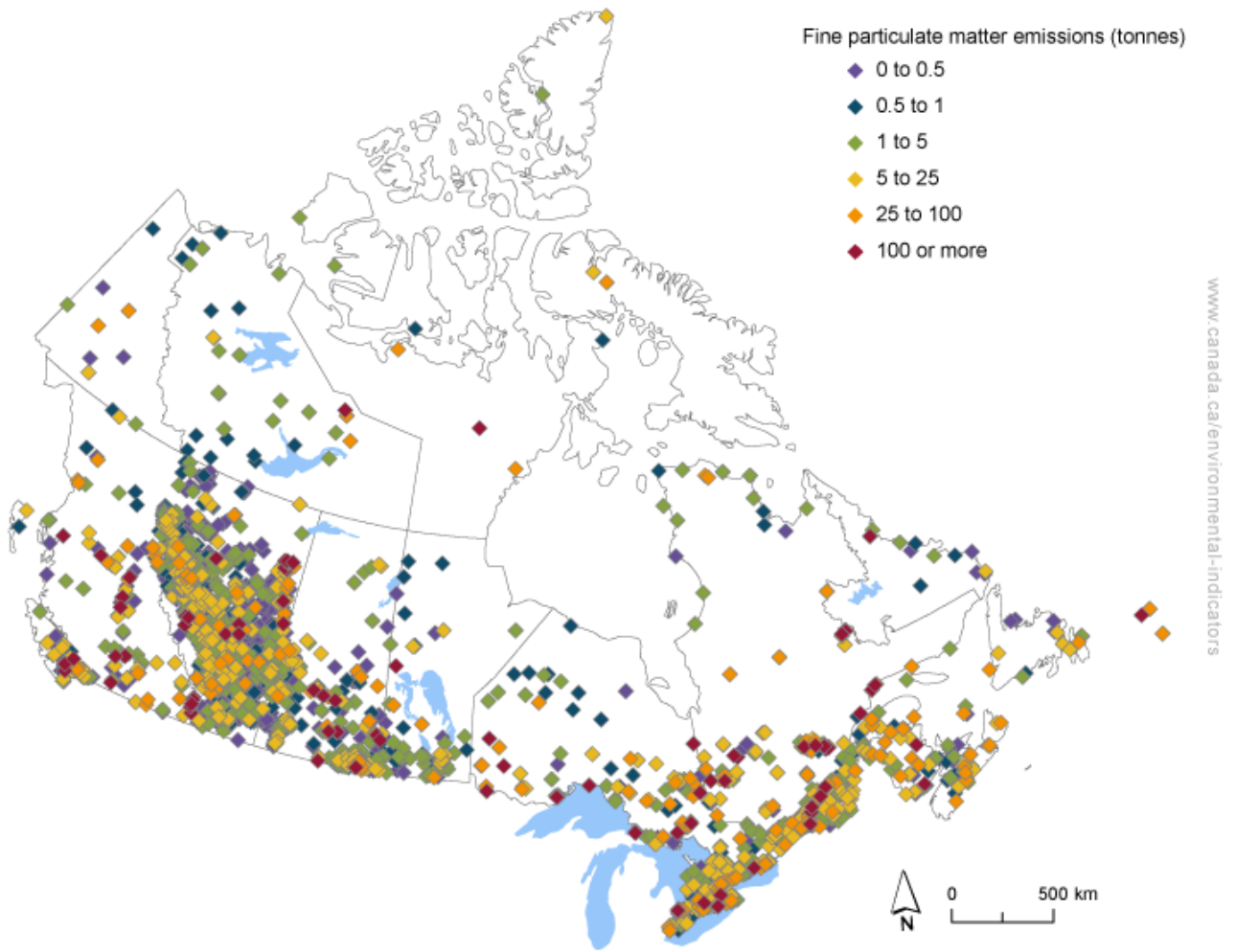
The Canadian Environmental Sustainability Indicators provide access to this information through an [interactive map](#). The map allows you to explore PM_{2.5} emissions from individual facilities.

In 2021, 4 416 facilities across Canada reported PM_{2.5} emissions representing 4% of total national emissions. Of these facilities:

- 2 445 facilities reported emissions under 1 tonne (t)
- 1 882 facilities reported emissions between 1 to 100 t

- 89 facilities reported emissions of 100 t or more located in Quebec (20), Alberta (17), British Columbia (17), Ontario (17), Saskatchewan (9), Newfoundland and Labrador (4), New Brunswick (2), Northwest Territories and Nunavut (2) and Manitoba (1)

Figure 21. Fine particulate matter by reporting facilities, Canada, 2021



Source: Environment and Climate Change Canada (2023) [National Pollutant Release Inventory](#).

Navigate data using the [interactive map](#)

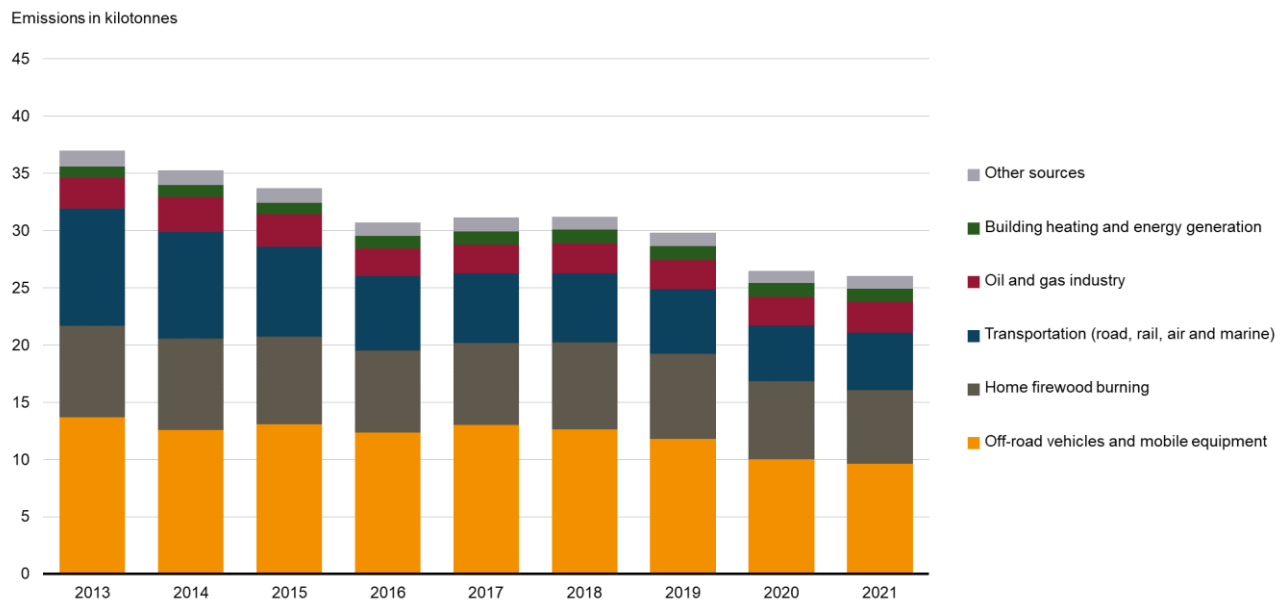
Black carbon emissions by source

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 climate and local benefits.

Key results

- Emissions of black carbon were 26 kt in 2021, a decrease of 30% from 2013
- In 2021, 3 sectors accounted for 81% of national black carbon emissions:
 - off-road vehicles and mobile equipment
 - home firewood burning
 - transportation (road, rail, air and marine)

Figure 22. Total black carbon emissions by source, Canada, 2013 to 2021



[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 (2023) [Canada's Black Carbon Emissions Inventory](#).

In 2021, off-road vehicles and mobile equipment (for example, lawn and garden equipment, recreational vehicles, excavators, graders) accounted for the largest proportion of total national emissions, representing 37% (10 kt) of emissions. Home firewood burning and transportation (road, rail, air and marine) were also large contributors, representing 25% (6 kt) and 19% (5 kt) of total national emissions. The remaining 19% of emissions came from the oil and gas industry, building heating and energy generation and other sources (such as ore and mineral industries).

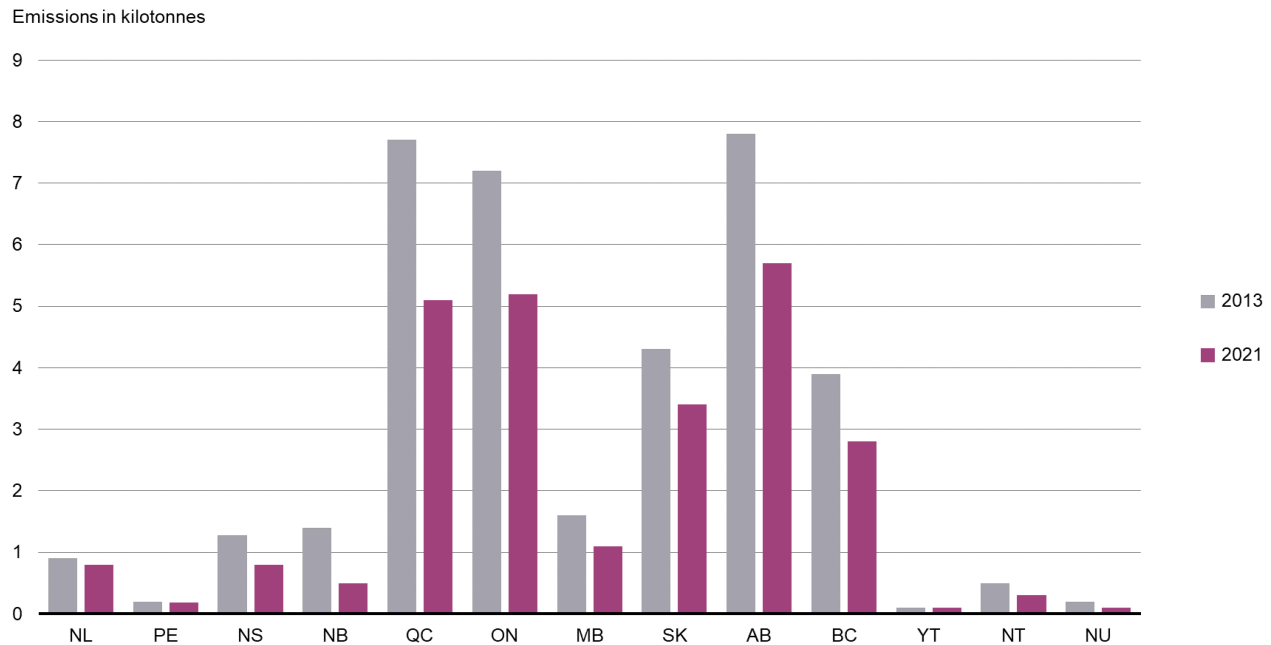
Black carbon emissions by province and territory

Key results

- In 2021, 3 provinces, Alberta, Ontario and Quebec, accounted for 61% (16 kt) of total national black carbon emissions
- Between 2013 and 2021:

- all provinces and territories, with the exception of Prince Edward Island, experienced reductions in black carbon emissions between 12% to 64%
- Ontario and Quebec experienced the largest reductions in emissions with decreases of 2.1 kt and 2.6 kt, respectively. For both provinces, the reductions were mainly attributable to lower emissions from transportation (road, rail, air and marine) and off-road vehicles and mobile equipment

Figure 23. Black carbon emissions by province and territory, Canada, 2013 and 2021



[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 (2023) [Canada's Black Carbon Emissions Inventory](#).

Alberta, Ontario and Quebec had the highest black carbon emissions in 2021.

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 91% (5 kt) of the emissions.

Ontario's emissions also came primarily from off-road vehicles and mobile equipment (1.7 kt), and transportation (road, rail, air and marine) (1.1 kt) as well as home firewood burning (1.6 kt), representing 84% of emissions in the province.

In Quebec, emissions came primarily from home firewood burning representing 54% (2.7 kt) of emissions.

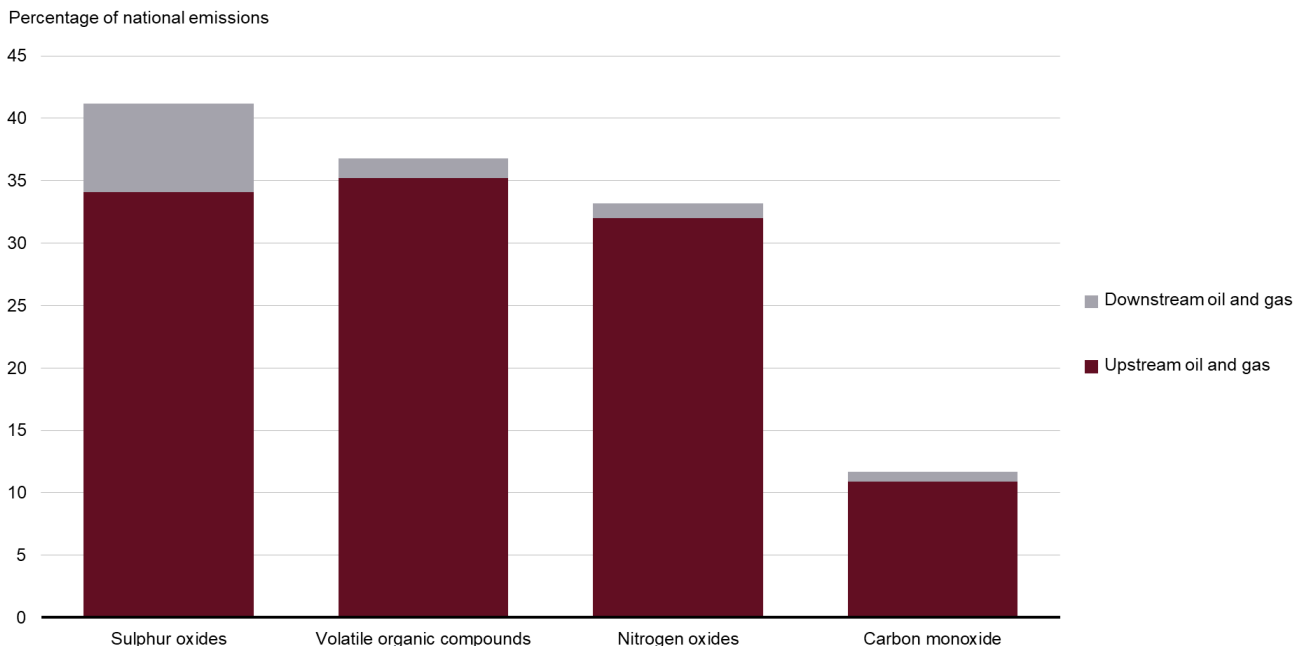
Air pollutant emissions from the oil and gas industry

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 from downstream (i.e., refining, storage and distribution) activities. Air pollutants are responsible for the formation of fine particulate matter (PM_{2.5}), ozone (O₃), smog and acid rain. They also adversely affect human health, the environment, and the economy.

Key results

- In 2021, the oil and gas industry was a major contributor to total national emissions of [sulphur oxides](#) (SO_x) (41%), [volatile organic compounds](#) (VOCs) (37%), [nitrogen oxides](#) (NO_x) (33%) and [carbon monoxide](#) (CO) (12%)
- The oil and gas industry is also a source of emissions of [fine particulate matter](#) (PM_{2.5}) and [ammonia](#) (NH₃). However, in 2021, it made up less than 1% of the respective total emissions of these pollutants

Figure 24. Contribution of the oil and gas industry to total air pollutant emissions by activity type, Canada, 2021



[Data for Figure 24](#)

Note: Fine particulate matter and ammonia are not shown in the chart due to their low share ($\leq 1\%$) of total emissions in 2021. 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 (2023) [Air Pollutant Emissions Inventory](#).

In 2021, the oil and gas industry was the sector contributing the most to total national emissions of SO_x, VOCs and NO_x. It was also the third-largest contributor to emissions of CO.

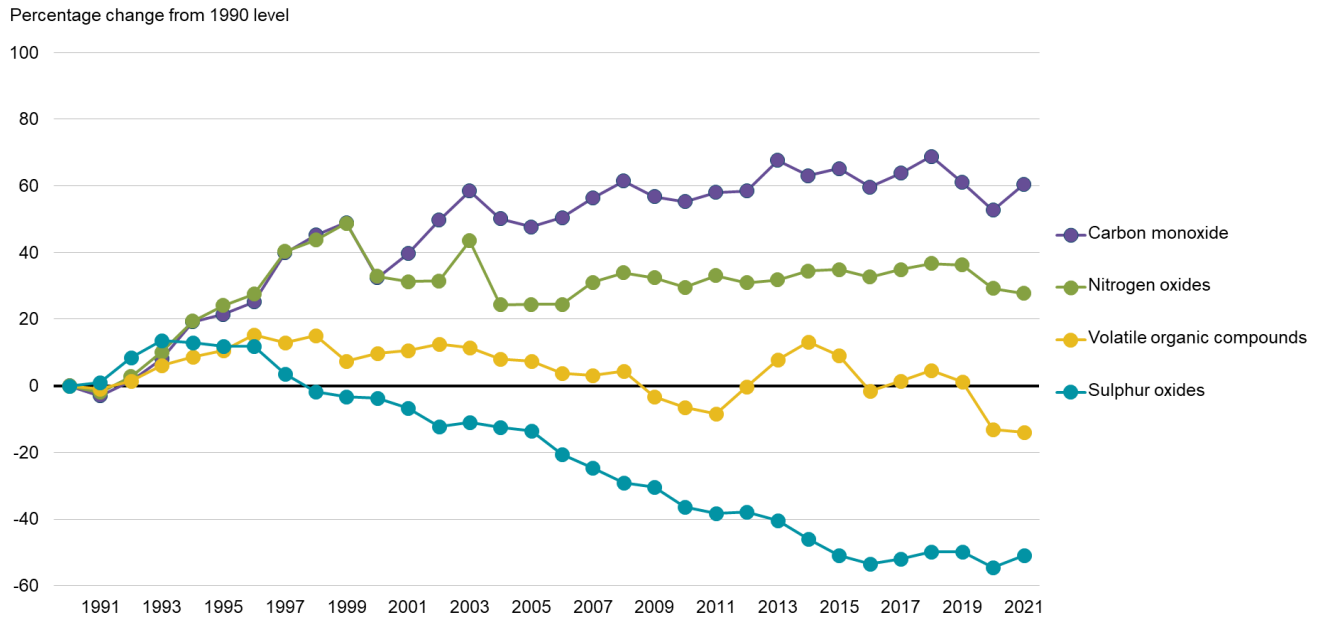
Most emissions from the oil and gas industry came from upstream activities compared to downstream activities. In 2021, 98% of NH₃, 96% of VOC and NO_x, 93% of CO, 91% of PM_{2.5} and 83% of SO_x emissions from the oil and gas sector were from upstream activities.

Changes in emissions from the oil and gas industry

Key results

- Emissions of SO_x and VOC emissions decreased 51% and 14% , respectively, between 1990 and 2021
- CO and NO_x increased by 61% and 28% over that period

Figure 25. Changes in emissions of key air pollutants from the oil and gas industry, Canada, 1990 to 2021



[Data for Figure 25](#)

Note: Fine particulate matter and ammonia are not shown in the chart due to their low share ($\leq 1\%$) of total emissions in 2021.

Source: Environment and Climate Change Canada (2023) [Air Pollutant Emissions Inventory](#).

The increases in CO and NO_x emissions between 1990 and 2021 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.⁹ 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.

⁹ In the oil and gas industry, upstream activities include exploration, drilling, production and field processing and downstream activities include refining, storage and distribution.

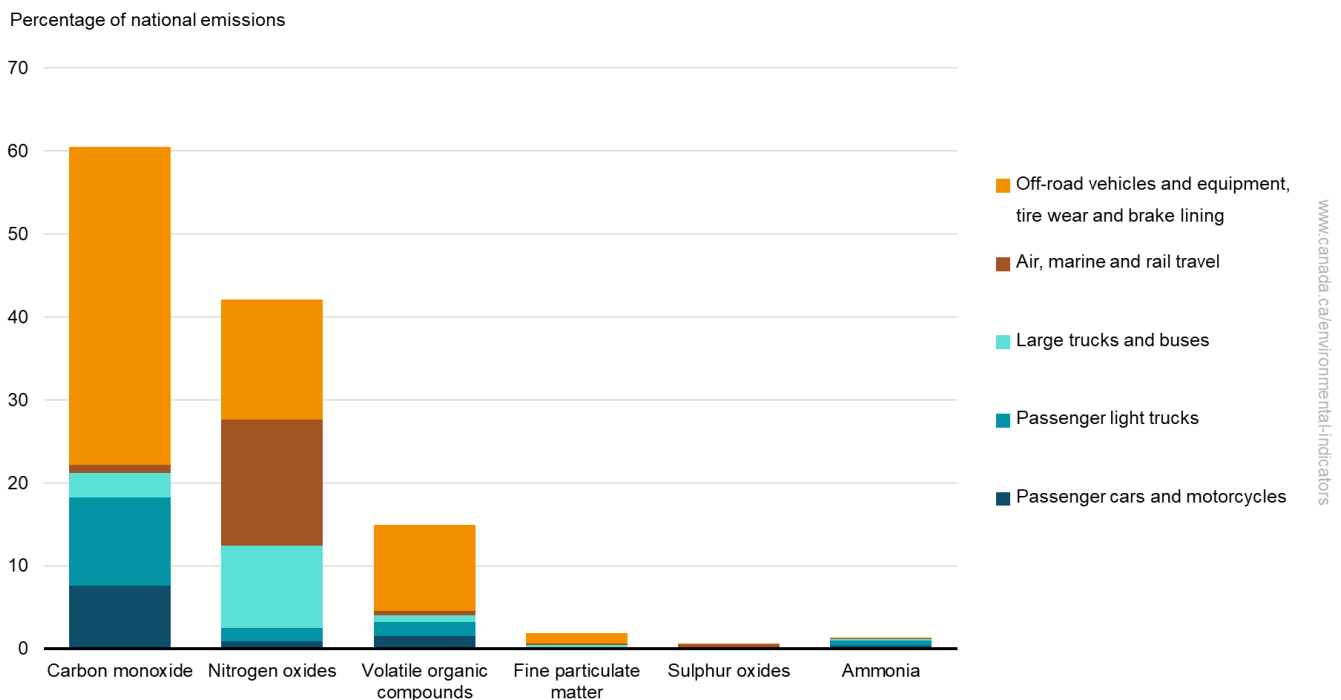
Air pollutant emissions from transportation, off-road vehicles and mobile equipment

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 2021, transportation, off-road vehicles and mobile equipment accounted for more than half (61%) of total national emissions of [carbon monoxide](#) (CO), 42% of [nitrogen oxides](#) (NO_x) and 15% of total emissions of [volatile organic compounds](#) (VOCs)
- While also a source of emissions for [fine particulate matter](#) (PM_{2.5}), [ammonia](#) (NH₃) and sulphur oxides (SO_x), the sectors represented less than 2% of total emissions of these pollutants, respectively

Figure 26. Contribution of transportation, off-road vehicles and mobile equipment to total air pollutant emissions by transportation mode, Canada, 2021



[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 (2023) [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 35% (461 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 2021, emissions from passenger cars, motorcycles and light trucks amounted to 836 kt of CO, 34 kt of

NO_x and 45 kt of VOCs. These emissions represented 18%, 3% and 3% of all emissions of these pollutants respectively.

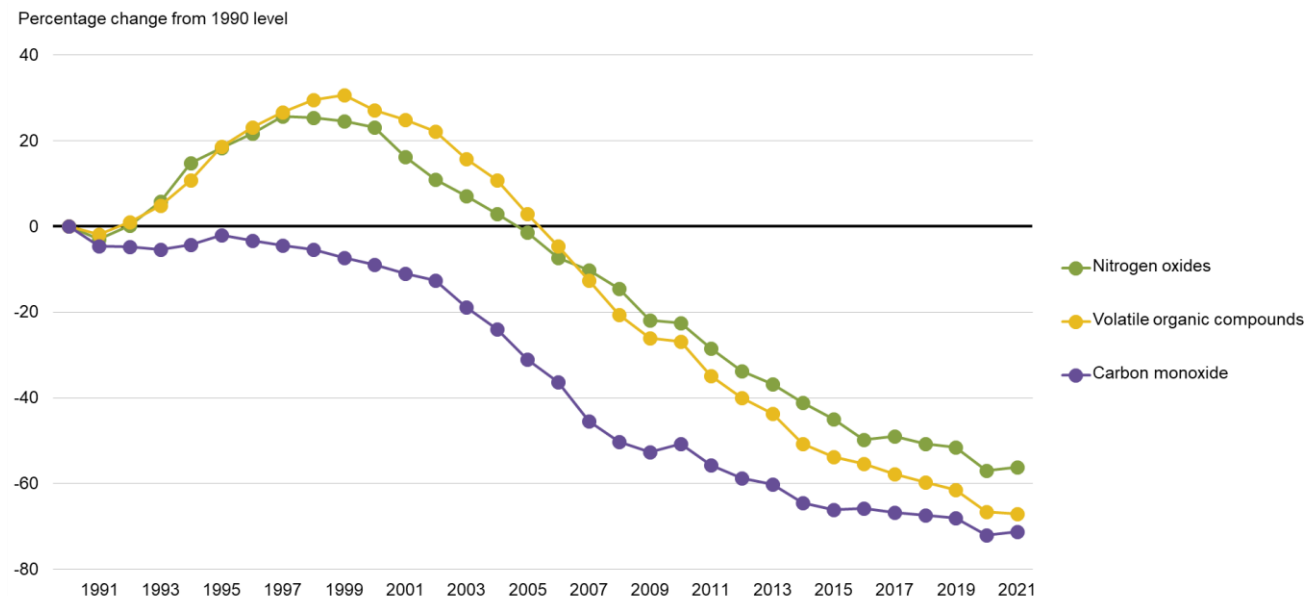
Other sources (mainly composed of off-road vehicles and equipment)¹⁰ are also a significant source of pollution. Their combined emissions make up 38%, 15% and 10% of the total emissions of CO, NO_x and VOCs, respectively. Emissions mostly come from household use of gasoline- or diesel-powered recreational 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 2021, total emissions of NO_x, VOCs and CO from transportation, off-road vehicles and mobile equipment decreased by 56%, 67% and 71%, 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 2021



[Data for Figure 27](#)

Note: Fine particulate matter, sulphur oxides and ammonia are not shown in the chart due to their low share ($\leq 5\%$) of total emissions in 2021.

Source: Environment and Climate Change Canada (2023) [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 2021. 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 (116%), large trucks and buses (20%) and marine transportation (19%). From 2000 to 2021, [new regulations](#) contributed to a decrease in emissions from light trucks (91%), large trucks and buses (71%) and emissions from

¹⁰ 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 65%. Emissions from air, marine and rail travel represented 15% of national emissions of NO_x in 2021.

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.

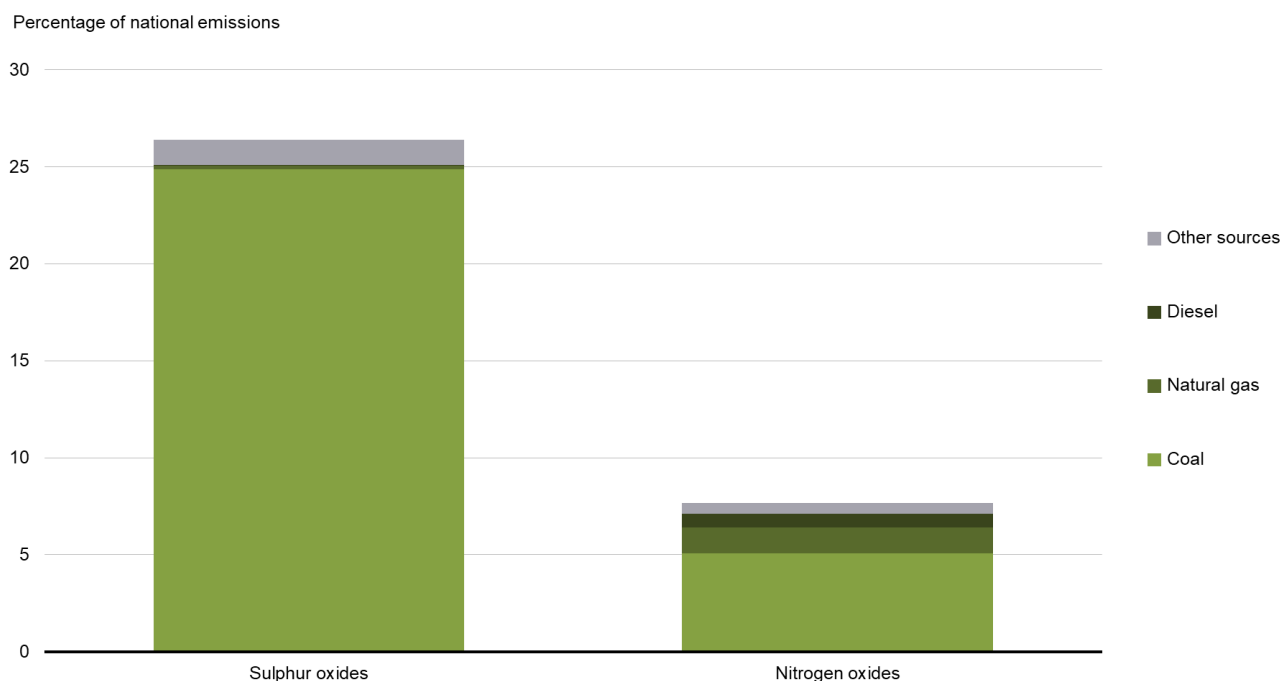
Air pollutant emissions from electric utilities

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 2021, electric utilities were the source of 26% and 8% 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](#) (NH₃) emissions. However, they account for 1% of the total national emissions of these pollutants

Figure 28. Contribution of electric utilities to total air pollutant emissions by fuel source, Canada, 2021



[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 ($\leq 1\%$) of total emissions in 2021. 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 (2023) [Air Pollutant Emissions Inventory](#).

In 2021, 94% 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:

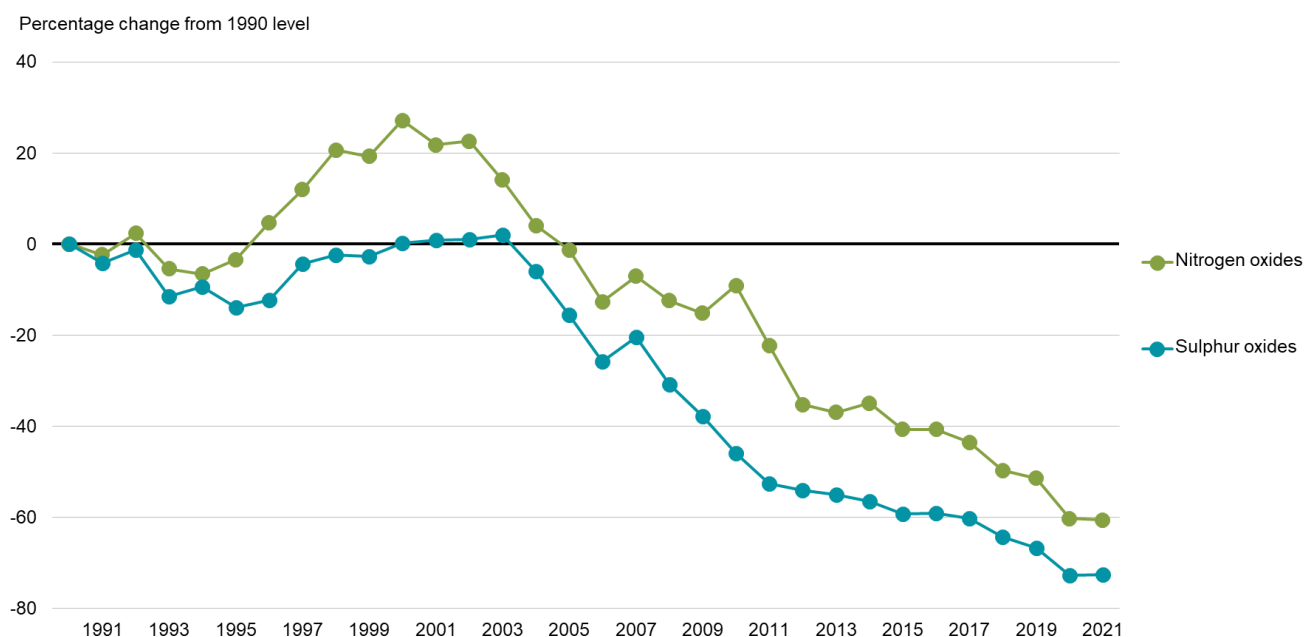
- 60% of electricity comes from hydro
- 15% comes from nuclear power plants
- 8% comes from non-hydro renewable sources, such as wind, solar, tidal power and biomass¹¹

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 2021
- Most of that decline occurred from 2005 onward

Figure 29. Changes in emissions of key air pollutants from electric utilities, Canada, 1990 to 2021



[Data for Figure 29](#)

Note: Carbon monoxide, fine particulate matter, volatile organic compounds and ammonia are not shown in the chart due to their low share ($\leq 1\%$) of total emissions in 2021. 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 (2023) [Air Pollutant Emissions Inventory](#).

The majority of the decline in SO_x and NO_x emissions between 1990 and 2021 occurred from 2005 onwards. Between 2005 and 2021, the share of electricity that came from burning fossil fuels fell from 22% to 20%. This decrease was mostly the result of a drop in electricity generation from coal power plants.¹² 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

¹¹ Natural Resources Canada (2021) [Clean Power and Low Carbon Fuels](#). Retrieved on March 20, 2023.

¹² Statistics Canada (2022) [CANSIM Table 127-0007 - Electric power generation, by class of electricity producer, annual \(megawatt hour\)](#). Retrieved on March 20, 2023.

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 (NH₃), carbon monoxide (CO) and fine particulate matter (PM_{2.5}). Black carbon, which is a component of PM_{2.5}, is also reported.¹³ 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.¹⁴

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

Consult [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 an air pollutant as well as a powerful climate forcer. 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. Climate modelling shows that cutting emissions of black carbon is the most powerful action available to countries to slow the pace of near-term warming in the Arctic, a region that is already warming at 3 times the global average.

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.

Related initiatives

These indicators support the measurement of progress towards the following [2022 to 2026 Federal Sustainable Development Strategy](#) Goal 11: Improve access to affordable housing, clean air, transportation, parks, and green spaces, as well as cultural heritage in Canada.

In addition, the indicators contribute to the [Sustainable Development Goals of the 2030 Agenda for Sustainable Development](#). They are linked to the 2030 Agenda's Goal 11: Sustainable Cities and Communities and Target 11.6: "By 2030, reduce the adverse per capita environmental impact of cities, including by paying special attention to air quality and municipal and other waste management."

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 and beyond for 4 air pollutants:

¹³ 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 (2023) [Canada's Black Carbon Emissions Inventory](#). Retrieved on March 20, 2023.

¹⁴ Only facilities that had air pollutant emissions over a certain reporting threshold were included in the National Pollutant Releases Inventory (NPRI) reported data.

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

Canada has been able to meet its emissions reduction commitments. In 2021, emissions were:

- 69% below 2005 levels for SO_x
- 42% below 2005 levels for NO_x
- 39% 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 [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 fine particulate matter (PM_{2.5}), ozone (O₃), sulphur dioxide (SO₂), nitrogen dioxide (NO₂), and volatile organic compounds (VOCs) at the national and regional levels 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 [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 (OECD).

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 (NH₃), 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 2021.

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 2021 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 1993 to 2021.

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,¹⁵ 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, 2023, and cover the period from 1990 to 2021. 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, 2023.

Black carbon is considered a short-lived climate pollutant, meaning it has a relatively short lifespan in the atmosphere (from a few days to a few weeks) compared to carbon dioxide (CO₂) (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

¹⁵ 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.¹⁶ When black carbon deposits on snow and ice, it darkens the surface, accelerating heating and melting, creating a warming impact that is particularly strong in the Arctic and other snow covered areas (including glaciers).¹⁷ 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. 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 2021 are current as of January 4, 2023.

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](#) (PDF;4,81 MB) 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.

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

¹⁶ Environment and Climate Change Canada (2019) [Short-lived climate pollutants](#). Retrieved on March 20, 2023.

¹⁷ Climate and Clean Air Coalition (2022) [Science: Black carbon](#). Retrieved on March 20, 2023.

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.¹⁸ 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.¹⁹

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](#) (PDF;4.81 MB) 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 estimated using detailed vehicle movement statistics coupled with fuel consumption, engine information, and emission rates by vehicle types.

¹⁸ 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)."

¹⁹ 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.

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 profiles²⁰ 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](#) (PDF;4,81 MB) 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](#) (PDF;4,81 MB) of the Air Pollutant Emissions Inventory Report.

Temporal coverage

Historical data are provided at the national level for the period from 1990 to 2021. For the regional indicators (provincial/territorial), emissions are presented for 1990 and 2021. Facility level emissions information are available from 2011 to 2021.

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
11. ore and mineral industries
12. paints and solvents

²⁰ 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 (2023) [Canada's Black Carbon Emissions Inventory 2023](#). Retrieved on March 20, 2023.

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): Landfill Gas ^[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 pelletizing
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
Paints and solvents	Paints and solvents: Dry cleaning
Paints and solvents	Paints and solvents: General solvent use
Paints and solvents	Paints and solvents: Printing

Sources in the indicators	Sources and sectors in the Air Pollutant Emissions Inventory and Black Carbon Emissions Inventory
Paints and solvents	Paints and solvents: Surface coatings
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: Marine transportation
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.

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 2021. They also provide information about emissions of selected pollutants, by sector, for the period from 1990 to 2021.

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
Other	Electric power generation (utilities): Waste materials ^[A]

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): 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 and mobile equipment, agriculture, commercial/residential/institutional sources, and incineration and waste, following the implementation of improved quantification methods. For more information about these recent changes, consult [Annex 3](#) (PDF;4,81 MB) 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 2021 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 (APEI) 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.

The Black Carbon Emissions Inventory generally use the same sources as the APEI, however, emissions from certain sectors are not yet captured, for example, fires, incineration and waste, non-ferrous refining and smelting and the chemicals industry. It is estimated that emissions from home firewood burning, off-road vehicles and mobile equipment, oil and gas and transportation represent approximately 91% of the national anthropogenic black carbon emissions.

The latest year reported (2021) coincides with the second 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 2021 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

References

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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 2021

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	0.0	0.0	0.0
1991	-7.1	-2.9	-1.1	-0.8	-2.7	-3.1
1992	-11.1	-0.1	0.3	2.4	-3.6	-5.2
1993	-14.0	3.7	4.3	3.5	-2.5	-6.6
1994	-21.0	10.3	6.8	7.2	-2.0	-4.5
1995	-16.6	13.3	9.4	13.9	-0.1	-8.0
1996	-16.4	16.6	11.6	18.0	-2.7	-7.3
1997	-18.2	21.5	11.2	19.3	-5.3	-5.1
1998	-19.4	22.1	11.3	19.4	-7.8	-16.0
1999	-22.7	22.4	9.5	18.1	-9.8	-15.1
2000	-22.5	20.3	9.2	20.4	-11.9	-17.5
2001	-23.1	14.6	5.8	20.4	-14.8	-18.9
2002	-24.6	13.0	5.0	22.5	-16.4	-23.4
2003	-27.0	11.5	2.5	21.5	-20.4	-23.3
2004	-26.6	4.9	-0.7	25.0	-26.5	-25.4
2005	-30.3	0.6	-0.2	24.0	-31.7	-25.5
2006	-37.0	-6.2	-5.9	21.2	-37.1	-25.0
2007	-38.5	-6.6	-8.7	22.2	-43.5	-20.0
2008	-44.6	-10.2	-12.3	20.1	-46.8	-16.3
2009	-53.4	-16.0	-18.6	15.9	-49.0	-23.4
2010	-57.0	-15.8	-19.9	13.7	-48.3	-19.1
2011	-60.1	-19.9	-23.0	12.9	-51.6	-16.5
2012	-60.5	-24.7	-22.5	16.9	-54.0	-10.2

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	-60.9	-26.7	-21.2	20.3	-54.8	-9.3
2014	-62.6	-28.4	-21.5	18.0	-57.6	-9.6
2015	-64.7	-31.3	-25.4	18.5	-59.1	-9.0
2016	-65.4	-34.7	-29.8	18.7	-59.0	-9.4
2017	-68.5	-33.6	-30.2	16.0	-59.8	-9.2
2018	-73.3	-35.2	-29.1	20.2	-60.8	-8.6
2019	-76.4	-36.1	-30.9	20.4	-61.8	-8.6
2020	-78.4	-41.8	-39.0	23.6	-65.5	-13.3
2021	-78.7	-41.3	-39.0	24.8	-64.8	-12.1

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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 2. Data for Figure 2. Distribution of air pollutant emissions by source, Canada, 2021

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	41.2	33.2	36.8	0.4	11.7	1.0
Manufacturing	6.0	5.1	8.0	2.3	3.0	1.3
Ore and mineral industries	25.1	6.1	0.9	0.3	11.1	2.6
Transportation (road, rail, air and marine)	0.4	27.6	4.7	1.2	22.2	0.6
Off-road vehicles and mobile equipment	<0.1	14.5	10.3	<0.1	38.3	1.2
Building heating and energy generation	0.4	4.5	0.2	0.1	0.7	0.3
Electric utilities	26.4	7.7	<0.1	<0.1	0.8	<0.1
Home firewood burning	0.2	0.7	7.7	0.2	11.1	5.1
Incineration and waste	0.2	0.4	1.1	1.2	0.3	0.2
Paints and solvents	n/a	<0.1	18.3	n/a	n/a	<0.1

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)
Agriculture (livestock, crop production and fertilizer)	<0.1	0.2	8.3	94.0	<0.1	24.4
Dust and fires	<0.1	<0.1	<0.1	<0.1	0.6	62.0
Miscellaneous	<0.1	<0.1	3.4	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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 3. Data for Figure 3. Distribution of air pollutant emissions by province and territory, Canada, 2021

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	1.6	4.1	1.2	0.2	1.5	0.9
Prince Edward Island	<0.1	0.4	0.3	0.6	0.4	0.2
Nova Scotia	8.7	3.5	1.8	0.7	2.1	1.0
New Brunswick	2.4	1.6	1.5	0.7	2.0	0.7
Quebec	15.2	9.4	14.5	12.3	24.9	8.1
Ontario	15.0	14.3	20.6	18.4	21.3	11.7
Manitoba	0.3	2.3	4.1	12.1	4.2	6.6
Saskatchewan	19.0	9.0	14.4	22.2	7.8	30.7
Alberta	26.7	40.1	33.1	28.5	23.3	35.4
British Columbia	11.1	13.6	8.2	4.2	12.0	4.3
Yukon	<0.1	0.2	<0.1	<0.1	0.1	0.2
Northwest Territories	<0.1	0.7	0.2	<0.1	0.2	0.2
Nunavut	<0.1	0.8	<0.1	<0.1	0.1	0.1

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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 4. Data for Figure 4. Total sulphur oxide emissions by source, Canada, 1990 to 2021

Year	Oil and gas industry (emissions in kilotonnes)	Electric utilities (emissions in kilotonnes)	Ore and mineral industries (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Total emissions (emissions in kilotonnes)
1990	537.0	618.4	1 483.3	374.8	3 013.5
1991	542.6	592.1	1 336.3	327.4	2 798.4
1992	582.6	610.7	1 171.5	313.9	2 678.7
1993	610.4	547.2	1 114.8	319.0	2 591.4
1994	606.9	559.8	894.5	319.7	2 380.9
1995	600.9	532.6	1 108.3	271.7	2 513.5
1996	600.3	542.2	1 091.2	285.0	2 518.6
1997	556.2	591.3	1 034.1	284.0	2 465.6
1998	527.2	603.6	1 021.7	276.8	2 429.3
1999	519.4	601.1	927.7	281.8	2 330.0
2000	516.7	619.2	916.8	282.0	2 334.7
2001	501.1	623.9	914.2	276.8	2 316.0
2002	470.9	624.3	905.7	271.5	2 272.4
2003	477.9	630.4	814.1	278.6	2 201.0
2004	470.2	581.5	876.3	284.0	2 212.0
2005	464.1	521.9	859.1	254.2	2 099.4
2006	426.3	458.9	827.6	185.6	1 898.5
2007	404.7	491.9	779.8	177.4	1 853.7
2008	380.3	427.5	716.1	144.6	1 668.5
2009	373.7	384.0	523.1	123.5	1 404.3
2010	341.9	333.9	502.1	116.8	1 294.7
2011	331.2	293.2	467.8	111.4	1 203.7
2012	333.1	284.2	478.1	95.3	1 190.8
2013	319.9	278.2	492.9	86.8	1 177.8
2014	290.2	269.2	487.8	81.3	1 128.4
2015	263.8	251.5	483.5	65.8	1 064.5

Year	Oil and gas industry (emissions in kilotonnes)	Electric utilities (emissions in kilotonnes)	Ore and mineral industries (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Total emissions (emissions in kilotonnes)
2016	249.7	253.1	481.7	58.4	1 042.9
2017	258.0	245.5	389.4	55.2	948.1
2018	269.6	220.2	258.5	56.8	805.1
2019	269.5	205.4	183.7	53.3	711.9
2020	244.8	168.2	194.4	43.6	651.0
2021	264.3	169.0	160.8	46.6	640.6

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. 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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 5. Data for

Figure 5. Sulphur oxide emissions by province and territory, Canada, 1990, 2005 and 2021

Province or territory	1990 (emissions in kilotonnes)	2005 (emissions in kilotonnes)	2021 (emissions in kilotonnes)
Newfoundland and Labrador	70.3	51.6	10.0
Prince Edward Island	3.7	2.7	0.2
Nova Scotia	203.5	150.3	55.5
New Brunswick	109.1	93.4	15.4
Quebec	251.5	226.5	97.5
Ontario	1 124.9	500.8	96.1
Manitoba	508.8	397.0	1.8
Saskatchewan	102.7	148.5	121.8
Alberta	511.1	459.5	170.8
British Columbia	109.3	65.2	70.8
Yukon	0.6	1.3	<0.1
Northwest Territories	18.0 ^[A]	0.9	0.5
Nunavut ^[A]	n/a	1.7	0.3

Note: ^[A] 1990 emissions data for the Northwest Territories include emissions for Nunavut, which was part of the Northwest Territories until 1999. n/a = not applicable. 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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 6. Data for Figure 7. Total nitrogen oxide emissions by source, Canada, 1990 to 2021

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	903.6	343.6	382.0	365.8	257.0	2 251.9
1991	892.4	337.1	368.4	338.0	250.9	2 186.8
1992	939.7	353.1	362.8	331.9	262.9	2 250.4
1993	1 007.4	378.5	370.0	336.1	243.0	2 335.0
1994	1 110.1	410.4	375.7	347.8	240.0	2 484.1
1995	1 141.5	426.4	375.3	360.2	248.1	2 551.5
1996	1 177.1	438.3	372.9	367.7	269.0	2 625.0
1997	1 208.3	482.2	372.3	386.0	287.7	2 736.5
1998	1 209.8	493.9	354.8	380.6	310.1	2 749.1
1999	1 198.2	511.2	358.1	383.3	306.4	2 757.1
2000	1 169.1	456.5	361.6	394.2	326.8	2 708.2
2001	1 102.8	451.0	340.6	373.4	313.0	2 580.8
2002	1 056.1	451.9	368.2	352.6	314.9	2 543.8
2003	1 006.5	493.0	365.7	352.3	293.0	2 510.6
2004	964.2	427.3	361.2	342.0	267.5	2 362.2

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)
2005	918.5	427.6	332.5	333.9	253.7	2 266.1
2006	869.8	427.5	282.9	306.7	224.3	2 111.2
2007	856.1	450.3	274.3	283.3	238.8	2 102.8
2008	817.5	460.1	253.3	266.4	225.1	2 022.5
2009	758.4	455.1	226.5	232.8	218.0	1 890.8
2010	724.5	445.3	233.6	258.5	233.7	1 895.6
2011	641.5	457.2	240.1	265.8	199.8	1 804.5
2012	592.3	450.0	237.8	249.5	166.3	1 695.8
2013	557.8	453.0	233.5	245.0	162.0	1 651.3
2014	521.2	462.0	235.1	226.9	167.2	1 612.4
2015	461.4	463.5	231.6	237.2	152.3	1 546.0
2016	410.8	455.7	226.0	226.1	152.4	1 471.1
2017	408.4	463.5	238.3	240.1	145.0	1 495.3
2018	389.4	469.7	234.7	236.2	129.0	1 459.1
2019	388.3	468.2	230.9	226.2	124.8	1 438.4
2020	351.5	444.1	216.9	195.6	101.9	1 310.0
2021	364.5	439.0	224.5	191.8	101.2	1 321.0

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, 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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 7. Data for Figure 8. Nitrogen oxide emissions by province and territory, Canada, 1990, 2005 and 2021

Province or territory	1990 (emissions in kilotonnes)	2005 (emissions in kilotonnes)	2021 (emissions in kilotonnes)
Newfoundland and Labrador	51.2	58.6	54.2
Prince Edward Island	6.3	6.8	5.9
Nova Scotia	82.2	89.6	46.6
New Brunswick	78.7	70.1	20.8
Quebec	307.8	290.1	124.0
Ontario	597.3	540.7	188.6
Manitoba	71.4	66.6	29.8
Saskatchewan	148.6	171.4	118.5
Alberta	605.3	663.4	530.2
British Columbia	286.2	284.0	180.0

Province or territory	1990 (emissions in kilotonnes)	2005 (emissions in kilotonnes)	2021 (emissions in kilotonnes)
Yukon	3.3	2.5	2.7
Northwest Territories	13.6 ^[A]	14.5	9.5
Nunavut ^[A]	n/a	7.8	10.3

Note: ^[A] 1990 emissions data for the Northwest Territories include emissions for Nunavut, which was part of the Northwest Territories until 1999. n/a = not applicable. 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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 8. Data for Figure 10. Total volatile organic compound emissions by source, Canada, 1990 to 2021

Year	Oil and gas industry (emissions in kilotonnes)	Paints and solvents (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Manufacturing (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Agriculture (livestock, crop production and fertilizer) (emissions in kilotonnes)	Transportation (road, rail, air and marine) (emissions in kilotonnes)	Total emissions (emissions in kilotonnes)
1990	599.4	357.5	150.5	290.6	257.0	188.3	103.6	346.8	2 293.8
1991	594.0	350.0	151.8	290.0	253.7	189.5	103.6	335.4	2 268.0
1992	607.9	352.2	136.7	298.3	254.6	199.2	105.3	345.4	2 299.6
1993	635.5	351.4	160.0	305.9	271.1	200.0	105.1	362.3	2 391.4
1994	651.8	362.1	156.4	321.7	273.0	194.3	107.5	384.0	2 450.8
1995	663.0	375.2	151.3	379.6	262.8	189.6	111.5	376.8	2 509.8
1996	690.5	373.0	140.6	404.6	262.2	193.7	114.5	380.0	2 559.3
1997	677.3	374.9	128.8	433.5	257.4	191.1	115.2	373.3	2 551.5
1998	689.4	377.5	129.8	459.3	261.5	153.1	115.6	366.2	2 552.4
1999	643.5	389.5	123.3	481.8	259.2	148.1	116.0	351.2	2 512.7
2000	657.8	395.9	120.3	480.3	254.5	149.7	116.9	330.0	2 505.2
2001	662.4	375.7	115.9	486.1	229.5	128.8	119.9	309.6	2 428.0
2002	674.2	366.9	111.3	488.8	232.8	124.1	121.0	289.9	2 409.0
2003	668.0	368.8	123.5	473.9	216.0	116.5	120.6	263.4	2 350.7
2004	647.2	364.3	111.6	462.3	200.9	123.4	124.5	243.8	2 278.1
2005	643.5	441.0	109.2	440.0	187.1	126.8	125.6	215.8	2 289.1
2006	621.5	417.1	100.1	409.9	165.2	124.0	123.0	198.1	2 159.0
2007	617.6	409.4	96.6	368.5	149.7	142.9	120.9	188.3	2 093.9
2008	625.2	392.3	95.5	333.0	133.8	140.3	118.9	173.0	2 012.0
2009	579.9	353.3	94.6	311.4	113.0	139.0	116.2	160.2	1 867.6

Year	Oil and gas industry (emissions in kilotonnes)	Paints and solvents (emissions in kilotonnes)	Other sources (emissions in kilotonnes)	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Manufacturing (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Agriculture (livestock, crop production and fertilizer) (emissions in kilotonnes)	Transportation (road, rail, air and marine) (emissions in kilotonnes)	Total emissions (emissions in kilotonnes)
2010	560.5	361.4	94.4	317.8	118.1	120.8	115.2	148.7	1 836.9
2011	548.8	349.7	96.0	300.4	116.0	125.7	114.1	115.2	1 766.0
2012	598.0	354.6	93.4	274.8	117.6	116.5	114.8	107.8	1 777.4
2013	646.3	357.0	87.8	255.2	115.9	126.1	116.1	103.4	1 807.9
2014	678.8	363.6	93.5	218.3	109.9	125.7	115.3	96.0	1 801.1
2015	654.2	331.6	90.2	205.7	105.6	120.3	114.0	89.1	1 710.7
2016	590.6	315.4	89.0	200.7	104.4	111.8	114.6	84.0	1 610.5
2017	608.1	311.2	86.7	189.4	100.6	110.6	114.9	79.9	1 601.3
2018	627.2	311.2	86.6	178.2	106.8	122.2	115.7	79.0	1 626.9
2019	606.2	301.9	87.7	168.6	103.5	124.2	115.4	77.0	1 584.4
2020	520.5	260.4	79.8	148.4	97.1	113.5	115.2	64.3	1 399.2
2021	515.7	256.7	81.2	144.6	112.1	108.4	115.7	65.4	1 399.7

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 incineration and waste, ore and mineral industries, dust and fires, building heating and energy generation, electric utilities 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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 9. Data for Figure 11. Volatile organic compound emissions by province and territory, Canada, 1990, 2005 and 2021

Province or territory	1990 (emissions in kilotonnes)	2005 (emissions in kilotonnes)	2021 (emissions in kilotonnes)
Newfoundland and Labrador	36.0	32.5	17.4
Prince Edward Island	9.2	8.8	4.5
Nova Scotia	57.0	50.5	25.2
New Brunswick	45.5	50.6	20.7
Quebec	376.0	362.1	202.8
Ontario	617.7	579.0	287.8
Manitoba	76.5	84.4	56.9
Saskatchewan	176.8	250.3	201.1
Alberta	592.8	613.3	463.8
British Columbia	294.1	245.4	115.4
Yukon	1.7	2.2	1.0
Northwest Territories	10.4 ^[A]	8.6	2.3
Nunavut ^[A]	n/a	1.3	0.9

Note: ^[A] 1990 emissions data for the Northwest Territories include emissions for Nunavut, which was part of the Northwest Territories until 1999. n/a = not applicable. 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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 10. Data for Figure 13. Total ammonia emissions by source, Canada, 1990 to 2021

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	355.9	20.0	13.2	5.6	394.7
1991	352.9	19.0	13.5	6.2	391.6
1992	364.2	19.0	13.8	7.2	404.2
1993	367.0	18.5	14.7	8.3	408.4
1994	379.0	19.9	14.9	9.4	423.2
1995	396.2	26.6	16.7	9.9	449.4
1996	412.6	26.1	16.3	10.7	465.7
1997	418.1	25.2	16.4	11.1	470.8
1998	417.3	26.0	16.6	11.5	471.4
1999	415.1	24.8	14.7	11.6	466.2
2000	424.2	24.9	14.4	11.8	475.3
2001	427.4	21.7	14.0	11.9	475.1
2002	430.6	21.6	19.6	11.7	483.5

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)
2003	437.1	18.8	12.1	11.4	479.5
2004	452.0	18.5	11.8	11.3	493.6
2005	448.4	17.2	13.3	10.7	489.5
2006	439.8	16.1	12.1	10.2	478.2
2007	444.9	16.0	11.5	10.1	482.5
2008	438.3	13.6	12.7	9.5	474.0
2009	423.6	12.6	12.4	9.0	457.7
2010	415.7	11.5	13.0	8.7	448.9
2011	413.3	11.8	12.8	7.7	445.6
2012	430.4	11.9	11.8	7.4	461.4
2013	443.5	11.2	12.9	7.3	474.9
2014	434.4	11.3	13.3	7.0	465.9
2015	437.4	11.7	11.9	6.9	467.9
2016	437.3	12.0	12.3	6.9	468.4
2017	427.9	11.3	11.7	6.8	457.7
2018	443.5	12.0	12.1	6.9	474.5
2019	444.8	11.1	12.5	6.9	475.3
2020	458.4	12.0	11.7	5.8	488.0
2021	463.0	11.4	12.1	6.1	492.6

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. 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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 11. Data for Figure 14. Ammonia emissions by province and territory, Canada, 1990, 2005 and 2021

Province or territory	1990 (emissions in kilotonnes)	2005 (emissions in kilotonnes)	2021 (emissions in kilotonnes)
Newfoundland and Labrador	1.0	1.1	0.9
Prince Edward Island	3.4	3.7	3.1
Nova Scotia	4.9	4.5	3.3
New Brunswick	4.6	5.7	3.7
Quebec	65.1	67.6	60.7
Ontario	110.8	101.8	90.5

Province or territory	1990 (emissions in kilotonnes)	2005 (emissions in kilotonnes)	2021 (emissions in kilotonnes)
Manitoba	38.0	55.4	59.7
Saskatchewan	48.6	84.0	109.5
Alberta	95.2	140.4	140.6
British Columbia	23.0	25.3	20.6
Yukon	<0.1	<0.1	<0.1
Northwest Territories	<0.1 ^[A]	<0.1	<0.1
Nunavut ^[A]	n/a	<0.1	<0.1

Note: ^[A] 1990 emissions data for the Northwest Territories include emissions for Nunavut, which was part of the Northwest Territories until 1999. n/a = not applicable. 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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 12. Data for Figure 16. Total carbon monoxide emissions by source, Canada, 1990 to 2021

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)	Ore and mineral industries (emissions in kilotonnes)	Total emissions (emissions in kilotonnes)
1990	6 099.1	3 556.1	1 866.5	812.1	334.1	389.8	13 057.7
1991	5 829.7	3 375.5	1 903.1	817.1	323.9	453.5	12 702.7
1992	5 906.2	3 294.7	1 702.0	859.4	338.8	482.8	12 584.0
1993	5 950.0	3 177.8	1 901.2	863.0	361.1	478.2	12 731.3
1994	6 039.0	3 197.1	1 866.1	838.6	398.3	461.9	12 801.1
1995	5 694.9	3 759.4	1 907.7	817.5	405.8	457.7	13 043.1
1996	5 517.8	3 820.5	1 663.6	835.2	418.1	447.2	12 702.4
1997	5 210.2	4 015.3	1 431.5	825.8	467.3	413.7	12 363.7
1998	4 932.6	4 201.8	1 361.2	661.9	485.3	397.9	12 040.8
1999	4 563.5	4 382.9	1 316.6	643.1	497.6	374.0	11 777.8
2000	4 435.8	4 355.5	1 221.6	652.0	442.5	396.1	11 503.5
2001	4 140.5	4 452.1	1 085.3	561.8	466.7	421.9	11 128.2
2002	3 837.5	4 596.1	951.0	542.9	500.2	491.0	10 918.8
2003	3 567.4	4 272.5	996.5	512.6	529.4	521.0	10 399.4
2004	3 256.6	4 078.4	722.6	544.2	501.6	499.7	9 603.2
2005	2 795.1	3 869.6	692.2	560.7	493.2	505.3	8 916.0
2006	2 544.6	3 607.5	493.6	549.7	502.8	509.4	8 207.6
2007	2 330.1	2 931.2	415.5	645.0	522.4	531.6	7 375.9
2008	2 154.3	2 652.6	407.7	645.0	539.5	546.4	6 945.4
2009	2 034.6	2 544.4	393.5	651.7	523.8	512.4	6 660.3

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)	Ore and mineral industries (emissions in kilotonnes)	Total emissions (emissions in kilotonnes)
2010	1 891.3	2 869.7	350.9	577.5	518.8	536.7	6 744.8
2011	1 458.2	2 820.1	336.8	614.0	527.8	560.0	6 316.9
2012	1 368.2	2 616.6	357.0	582.5	529.4	552.1	6 005.8
2013	1 356.4	2 493.0	298.6	643.8	560.1	546.2	5 898.1
2014	1 319.2	2 111.8	386.1	656.9	544.6	515.0	5 533.5
2015	1 263.2	2 009.7	363.1	643.9	552.0	513.3	5 345.1
2016	1 248.3	2 060.9	346.6	608.2	533.2	559.0	5 356.2
2017	1 198.1	2 013.7	286.7	609.7	547.1	589.3	5 244.6
2018	1 188.6	1 961.5	259.7	618.2	564.1	527.0	5 119.2
2019	1 165.8	1 925.4	269.1	586.1	537.8	508.4	4 992.6
2020	1 000.2	1 709.1	233.3	534.9	510.2	512.2	4 499.8
2021	1 019.9	1 760.5	256.8	510.7	536.2	511.6	4 595.6

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. 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, 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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 13. Data for Figure 17. Carbon monoxide emissions by province and territory, Canada, 1990, 2005 and 2021

Province or territory	1990 (emissions in kilotonnes)	2005 (emissions in kilotonnes)	2021 (emissions in kilotonnes)
Newfoundland and Labrador	208.8	122.8	70.1
Prince Edward Island	73.2	42.3	17.9
Nova Scotia	366.5	217.3	98.5
New Brunswick	307.8	234.7	90.1
Quebec	2 481.4	1 849.3	1 142.7
Ontario	3 593.6	2 454.8	980.8
Manitoba	502.2	403.6	193.1
Saskatchewan	841.2	683.7	360.6
Alberta	2 307.9	1 658.4	1 068.6
British Columbia	2 329.2	1 207.6	552.2
Yukon	17.2	17.5	6.1
Northwest Territories	28.9 ^[A]	17.7	8.8
Nunavut ^[A]	n/a	6.4	6.3

Note: ^[A] 1990 emissions data for the Northwest Territories include emissions for Nunavut, which was part of the Northwest Territories until 1999. n/a = not applicable. 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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 14. Data for Figure 19. Total fine particulate matter emissions by source, Canada, 1990 to 2021

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	529.7	674.0	321.0	139.7	1 664.4
1991	510.5	666.9	295.9	139.6	1 612.9
1992	492.2	652.2	287.6	145.8	1 577.7
1993	488.2	638.1	282.2	145.6	1 554.0
1994	543.6	623.9	280.6	140.6	1 588.7
1995	506.4	609.8	279.4	136.2	1 531.8
1996	535.7	596.2	272.0	138.4	1 542.4
1997	594.0	582.6	267.9	135.3	1 579.8
1998	462.0	569.2	259.9	107.6	1 398.8
1999	493.1	555.8	260.8	103.5	1 413.2
2000	467.6	542.6	259.0	103.8	1 373.0
2001	494.3	529.4	237.4	88.6	1 349.6
2002	467.6	509.6	213.5	84.7	1 275.3
2003	500.6	489.9	206.9	78.9	1 276.3
2004	488.5	469.7	200.7	82.7	1 241.5
2005	507.4	450.2	198.7	84.2	1 240.6
2006	562.6	430.7	173.4	81.6	1 248.3
2007	651.2	416.7	167.8	95.1	1 330.8
2008	736.1	403.1	159.0	94.5	1 392.6
2009	648.2	389.8	142.9	94.8	1 275.7
2010	739.8	376.9	146.1	83.5	1 346.3
2011	797.2	363.7	140.7	88.1	1 389.8
2012	908.7	366.8	137.0	82.9	1 495.4
2013	918.3	369.7	132.2	89.5	1 509.7
2014	914.1	372.6	128.8	88.9	1 504.5
2015	931.2	375.7	122.9	84.8	1 514.6
2016	932.1	378.7	118.1	78.5	1 507.3
2017	937.1	374.4	123.3	77.2	1 511.9
2018	944.8	370.1	121.7	85.1	1 521.7
2019	950.5	365.9	118.9	86.4	1 521.7

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)
2020	888.3	361.3	113.9	78.9	1 442.4
2021	906.5	357.6	123.6	75.3	1 463.0

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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 15. Additional information for Figure 19. Total fine particulate matter emissions by source, Canada, 1990 to 2021

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	54.0	33.4	113.9	14.0	37.1	12.0	4.6	48.5	3.5	<0.1
1991	51.2	31.9	103.0	12.1	33.6	12.4	4.6	43.5	3.6	<0.1
1992	49.2	32.2	99.8	12.1	32.4	12.8	4.7	40.7	3.7	<0.1
1993	49.0	32.4	100.5	12.4	33.7	13.0	4.9	32.6	3.8	<0.1
1994	50.9	33.9	100.4	12.9	35.0	13.9	4.9	25.0	3.9	<0.1
1995	50.9	34.8	101.4	13.3	35.3	14.2	4.9	20.9	3.7	<0.1
1996	52.2	34.6	93.1	13.4	36.4	14.3	5.2	19.1	3.7	<0.1
1997	52.8	34.4	85.2	13.8	38.2	14.7	5.0	20.2	3.6	<0.1
1998	50.4	32.6	80.1	14.6	37.8	16.4	4.6	19.9	3.6	<0.1
1999	50.2	33.3	79.7	15.2	38.4	14.0	4.8	21.6	3.6	<0.1
2000	51.0	32.1	74.7	15.6	39.7	13.7	5.3	23.2	3.7	<0.1
2001	47.5	30.3	64.0	15.9	37.9	13.6	5.0	19.3	3.7	<0.1
2002	37.6	29.7	55.2	16.4	36.3	14.1	5.2	15.3	3.7	<0.1
2003	37.6	31.3	53.0	16.5	35.4	12.8	5.6	11.1	3.8	<0.1
2004	36.0	31.7	50.5	16.9	34.2	12.1	5.3	10.3	3.6	<0.1
2005	41.2	32.1	44.8	17.2	33.0	12.5	5.2	9.1	3.4	<0.1
2006	40.1	30.8	28.9	17.4	30.3	11.8	4.9	6.0	3.3	<0.1
2007	38.5	30.0	27.0	17.4	27.9	11.6	5.2	7.0	3.2	<0.1
2008	36.7	29.0	24.0	17.8	26.2	10.1	5.1	6.8	3.1	<0.1
2009	31.2	27.2	19.8	17.9	23.4	9.2	5.0	6.1	2.9	<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)
2010	34.9	26.2	19.5	17.6	25.4	9.2	4.8	5.7	2.8	<0.1
2011	33.9	22.4	20.0	16.8	25.8	9.6	5.0	4.3	2.7	<0.1
2012	35.9	20.0	19.3	16.9	24.2	10.2	4.6	3.2	2.6	<0.1
2013	32.6	18.4	19.5	16.8	23.5	10.8	4.8	3.2	2.6	<0.1
2014	32.4	16.5	18.6	16.1	21.4	12.8	4.9	3.6	2.5	<0.1
2015	30.9	13.7	18.6	15.3	22.0	11.7	4.8	3.5	2.6	<0.1
2016	31.3	11.7	17.1	15.3	21.2	10.7	4.8	3.4	2.6	<0.1
2017	34.8	11.0	17.2	15.4	21.9	12.0	5.0	3.3	2.6	<0.1
2018	33.9	10.9	17.2	15.4	21.3	12.1	5.3	3.2	2.7	<0.1
2019	33.8	10.3	16.3	15.5	20.2	11.9	5.3	2.8	2.7	<0.1
2020	32.9	8.9	16.4	15.6	17.4	12.4	5.1	2.4	2.8	<0.1
2021	37.9	9.2	19.7	15.7	17.0	14.3	4.9	2.0	2.8	<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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 16. Data for Figure 20. Fine particulate matter emissions by province and territory, Canada, 1990, 2005 and 2021

Province or territory	1990 (emissions in kilotonnes)	2005 (emissions in kilotonnes)	2021 (emissions in kilotonnes)	1990, excluding open sources ^[A] (emissions in kilotonnes)	2005, excluding open sources ^[A] (emissions in kilotonnes)	2021, excluding open sources ^[A] (emissions in kilotonnes)
Newfoundland and Labrador	18.6	13.0	13.3	12.6	8.6	5.1
Prince Edward Island	4.6	3.9	3.3	2.1	1.8	1.3
Nova Scotia	27.7	19.7	14.0	18.8	12.8	6.9
New Brunswick	26.3	17.8	10.8	18.0	13.1	5.4
Quebec	140.9	112.2	118.1	96.1	72.3	56.3
Ontario	205.6	161.3	171.6	108.2	70.6	45.9
Manitoba	107.5	89.5	96.4	13.4	9.6	6.2
Saskatchewan	541.6	400.2	448.5	21.9	17.6	12.8
Alberta	429.0	347.2	517.2	68.2	33.5	29.6
British Columbia	153.4	68.0	62.5	99.4	41.2	28.3
Yukon	4.1	2.7	2.3	0.5	0.3	0.2
Northwest Territories	5.2 ^[B]	3.8	3.4	1.6 ^[B]	0.9	0.6
Nunavut ^[B]	n/a	1.3	1.6	n/a	0.6	0.3

Note: ^[A] Open sources include emissions associated with dust and fires and agriculture (livestock, crop production and fertilizer). ^[B] 1990 emissions data for the Northwest Territories include emissions for Nunavut, which was part of the Northwest Territories until 1999. n/a = not applicable. 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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 17. Data for Figure 22. Total black carbon emissions by source, Canada, 2013 to 2021

Year	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Transportation (road, rail, air and marine) (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	13.7	8.0	10.3	2.6	1.0	1.4	37.0
2014	12.6	8.0	9.3	3.0	1.1	1.3	35.3
2015	13.1	7.7	7.8	2.8	1.0	1.3	33.7
2016	12.3	7.2	6.5	2.4	1.1	1.1	30.7
2017	13.0	7.2	6.0	2.5	1.2	1.2	31.1
2018	12.6	7.6	6.0	2.6	1.2	1.1	31.2
2019	11.8	7.4	5.6	2.5	1.3	1.1	29.8
2020	10.0	6.8	4.8	2.5	1.2	1.0	26.4

Year	Off-road vehicles and mobile equipment (emissions in kilotonnes)	Home firewood burning (emissions in kilotonnes)	Transportation (road, rail, air and marine) (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)
2021	9.6	6.5	5.0	2.7	1.2	1.1	26.0

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. The numbers have been rounded off and their sum may not correspond to the total.

Source: Environment and Climate Change Canada (2023) [Canada's Black Carbon Emissions Inventory](#).

Table A. 18. Data for In 2021, 3 provinces, Alberta, Ontario and Quebec, accounted for 61% (16 kt) of total national black carbon emissions

- Between 2013 and 2021:
 - all provinces and territories, with the exception of Prince Edward Island, experienced reductions in black carbon emissions between 12% to 64%
 - Ontario and Quebec experienced the largest reductions in emissions with decreases of 2.1 kt and 2.6 kt, respectively. For both provinces, the reductions were mainly attributable to lower emissions from transportation (road, rail, air and marine) and off-road vehicles and mobile equipment

Figure 23. Black carbon emissions by province and territory, Canada, 2013 and 2021

Province or territory	2013 (emissions in kilotonnes)	2021 (emissions in kilotonnes)
Newfoundland and Labrador	0.9	0.8
Prince Edward Island	0.2	0.2
Nova Scotia	1.3	0.8
New Brunswick	1.4	0.5
Quebec	7.7	5.1
Ontario	7.2	5.2
Manitoba	1.6	1.1
Saskatchewan	4.3	3.4
Alberta	7.8	5.7
British Columbia	3.9	2.8
Yukon	0.1	0.1
Northwest Territories	0.5	0.3
Nunavut	0.2	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 (2023) [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, 2021

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	34.1	35.2	32.0	10.9	0.9	0.4
Downstream oil and gas	7.1	1.6	1.2	0.8	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 (2023) [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, 2021

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	218.5	493.2	422.5	500.3	13.0	2.2
Downstream oil and gas	45.8	22.5	16.5	35.9	1.3	<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 (2023) [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 2021

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	1	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	7	-3
2000	32	33	10	-4

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)
2001	40	31	11	-7
2002	50	32	12	-12
2003	58	43	11	-11
2004	50	24	8	-12
2005	48	24	7	-14
2006	51	24	4	-21
2007	56	31	3	-25
2008	62	34	4	-29
2009	57	32	-3	-30
2010	55	30	-6	-36
2011	58	33	-8	-38
2012	58	31	0	-38
2013	68	32	8	-40
2014	63	34	13	-46
2015	65	35	9	-51
2016	60	33	-1	-54
2017	64	35	1	-52
2018	69	37	5	-50
2019	61	36	1	-50
2020	53	29	-13	-54
2021	61	28	-14	-51

Note: Fine particulate matter and ammonia are not shown in the table due to their low share ($\leq 1\%$) of total emissions in 2021.

Source: Environment and Climate Change Canada (2023) [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 2021

Year	Carbon monoxide (emissions in kilotonnes)	Nitrogen oxides (emissions in kilotonnes)	Volatile organic compounds (emissions in kilotonnes)	Sulphur oxides (emissions in kilotonnes)
1990	334	344	599	537
1991	324	337	594	543
1992	339	353	608	583
1993	361	379	636	610
1994	398	410	652	607
1995	406	426	663	601
1996	418	438	691	600

Year	Carbon monoxide (emissions in kilotonnes)	Nitrogen oxides (emissions in kilotonnes)	Volatile organic compounds (emissions in kilotonnes)	Sulphur oxides (emissions in kilotonnes)
1997	467	482	677	556
1998	485	494	689	527
1999	498	511	644	519
2000	443	457	658	517
2001	467	451	662	501
2002	500	452	674	471
2003	529	493	668	478
2004	502	427	647	470
2005	493	428	644	464
2006	503	427	622	426
2007	522	450	618	405
2008	539	460	625	380
2009	524	455	580	374
2010	519	445	561	342
2011	528	457	549	331
2012	529	450	598	333
2013	560	453	646	320
2014	545	462	679	290
2015	552	463	654	264
2016	533	456	591	250
2017	547	464	608	258
2018	564	470	627	270
2019	538	468	606	270
2020	510	444	521	245
2021	536	439	516	264

Note: Fine particulate matter and ammonia are not shown in the table due to their low share ($\leq 1\%$) of total emissions in 2021.

Source: Environment and Climate Change Canada (2023) [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, 2021

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	7.6	0.9	1.5	<0.1	<0.1	0.4

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 light trucks	10.6	1.6	1.7	<0.1	<0.1	0.6
Large trucks and buses	3.0	9.9	0.8	0.3	<0.1	0.2
Air, marine and rail travel	1.0	15.2	0.6	0.2	0.4	<0.1
Off-road vehicles and equipment, tire wear and brake lining	38.3	14.5	10.3	1.2	<0.1	<0.1

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

Source: Environment and Climate Change Canada (2023) [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, 2021

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	347.1	11.8	21.3	0.4	0.1	1.9
Passenger light trucks	489.1	21.8	24.1	0.8	0.3	3.0
Large trucks and buses	138.6	130.2	11.0	3.9	0.1	1.1
Air, marine and rail travel	45.1	200.8	9.0	2.9	2.3	<0.1
Off-road vehicles and equipment, tire wear and brake lining	1 760.5	191.8	144.6	18.1	0.2	0.4

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 (2023) [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 2021

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	-3	-5	-2
1992	0	-5	1
1993	6	-5	5
1994	15	-4	11
1995	18	-2	19
1996	22	-3	23
1997	26	-4	27
1998	25	-5	29
1999	25	-7	31
2000	23	-9	27
2001	16	-11	25
2002	11	-13	22
2003	7	-19	16
2004	3	-24	11
2005	-1	-31	3
2006	-7	-36	-5
2007	-10	-46	-13

Year	Nitrogen oxides (percentage change from 1990 level)	Carbon monoxide (percentage change from 1990 level)	Volatile organic compounds (percentage change from 1990 level)
2008	-15	-50	-21
2009	-22	-53	-26
2010	-23	-51	-27
2011	-29	-56	-35
2012	-34	-59	-40
2013	-37	-60	-44
2014	-41	-64	-51
2015	-45	-66	-54
2016	-50	-66	-55
2017	-49	-67	-58
2018	-51	-67	-60
2019	-52	-68	-61
2020	-57	-72	-67
2021	-56	-71	-67

Note: Fine particulate matter, sulphur oxides and ammonia are not shown in the table due to their low share ($\leq 5\%$) of total emissions in 2021.
Source: Environment and Climate Change Canada (2023) [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 2021

Year	Nitrogen oxides (emissions in kilotonnes)	Carbon monoxide (emissions in kilotonnes)	Volatile organic compounds (emissions in kilotonnes)
1990	1 269	9 655	637
1991	1 230	9 205	625
1992	1 272	9 201	644
1993	1 344	9 128	668
1994	1 458	9 236	706
1995	1 502	9 454	756
1996	1 545	9 338	785
1997	1 594	9 226	807
1998	1 590	9 134	825
1999	1 581	8 946	833
2000	1 563	8 791	810
2001	1 476	8 593	796
2002	1 409	8 434	779
2003	1 359	7 840	737
2004	1 306	7 335	706
2005	1 252	6 665	656

Year	Nitrogen oxides (emissions in kilotonnes)	Carbon monoxide (emissions in kilotonnes)	Volatile organic compounds (emissions in kilotonnes)
2006	1 177	6 152	608
2007	1 139	5 261	557
2008	1 084	4 807	506
2009	991	4 579	472
2010	983	4 761	466
2011	907	4 278	416
2012	842	3 985	383
2013	803	3 849	359
2014	748	3 431	314
2015	699	3 273	295
2016	637	3 309	285
2017	649	3 212	269
2018	626	3 150	257
2019	614	3 091	246
2020	547	2 709	213
2021	556	2 780	210

Note: Fine particulate matter, sulphur oxides and ammonia are not shown in the table due to their low share ($\leq 5\%$) of total emissions in 2021.

Source: Environment and Climate Change Canada (2023) [Air Pollutant Emissions Inventory](#).

Table A.23. Data for Figure 28. Contribution of electric utilities to total air pollutant emissions by fuel source, Canada, 2021

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	24.9	5.1	0.4	<0.1	<0.1	<0.1
Natural gas	0.2	1.3	0.2	<0.1	<0.1	<0.1
Diesel	<0.1	0.7	<0.1	<0.1	<0.1	n/a
Other sources	1.3	0.5	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 (2023) [Air Pollutant Emissions Inventory](#).

Additional information for Figure 28. Contribution of electric utilities to total air pollutant emissions by fuel source, Canada, 2021

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	159.2	66.8	17.1	1.2	0.3	<0.1
Natural gas	1.3	17.7	11.3	0.3	1.0	0.1
Diesel	<0.1	9.6	2.0	0.2	0.1	n/a
Other sources	8.4	7.0	6.8	0.3	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 (2023) [Air Pollutant Emissions Inventory](#).

Table A. 24. Data for Figure 29. Changes in emissions of key air pollutants from electric utilities, Canada, 1990 to 2021

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

Year	Sulphur oxides (percentage change from 1990 level)	Nitrogen oxides (percentage change from 1990 level)
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	-60
2021	-73	-61

Note: Carbon monoxide, fine particulate matter, volatile organic compounds and ammonia are not shown in the table due to their low share (\leq 1%) of total emissions in 2021. 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 (2023) [Air Pollutant Emissions Inventory](#).

Additional information for Figure 29. Changes in emissions of key air pollutants from electric utilities, Canada, 1990 to 2021

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	267
2005	522	254
2006	459	224
2007	492	239

Year	Sulphur oxides (emissions in kilotonnes)	Nitrogen oxides (emissions in kilotonnes)
2008	427	225
2009	384	218
2010	334	234
2011	293	200
2012	284	166
2013	278	162
2014	269	167
2015	251	152
2016	253	152
2017	245	145
2018	220	129
2019	205	125
2020	168	102
2021	169	101

Note: Carbon monoxide, fine particulate matter, volatile organic compounds and ammonia are not shown in the table due to their low share (\leq 1%) of total emissions in 2021. 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 (2023) [Air Pollutant Emissions Inventory](#).

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