Environment and Climate Change Canada
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RELEASES OF HARMFUL SUBSTANCES TO WATER

CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

Canada

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CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

RELEASES OF HARMFUL SUBSTANCES TO WATER

October 2021

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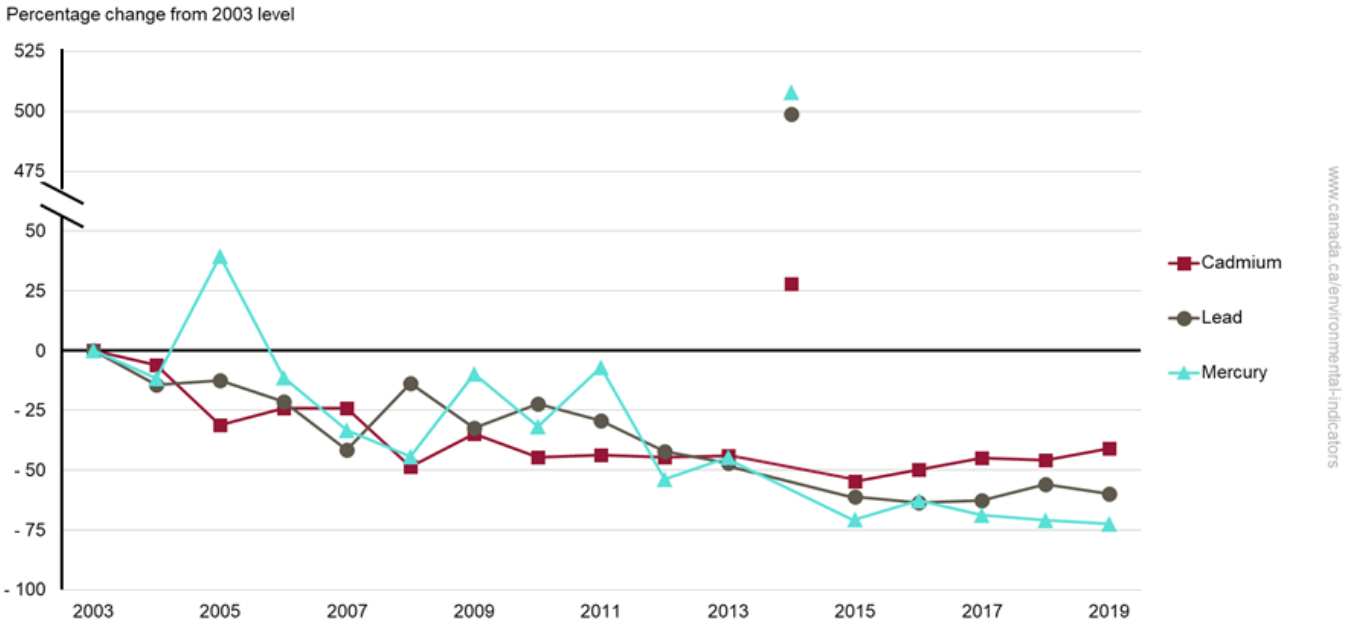
Releases of harmful substances to water

The release of some substances to the environment can harm human health, wildlife and biological diversity. Toxic metals released to water can enter the food web and accumulate in the tissues of living organisms. Exposure to these substances, even in small amounts, can be hazardous to both humans and wildlife. Mercury and its compounds, lead, and inorganic cadmium compounds are listed as toxic[1] under the *Canadian Environmental Protection Act, 1999*. The mercury, lead and cadmium releases to water indicators track facility-based releases of these substances to water.[2]

Key results

- Facility-based releases of mercury, lead and cadmium to water were 72%, 60% and 41% lower in 2019 than in 2003, respectively
- In 2014, a significant spill[3] accounted for 92%, 92% and 59% of total releases of mercury, lead and cadmium, respectively

Figure 1. Facility-based releases of mercury, lead and cadmium to water, Canada, 2003 to 2019



Data for Figure 1

Note: The indicator reports facility-based releases only. This chart accounts only for the releases to water reported in the National Pollutant Release Inventory based on the inventory reporting criteria for releases of mercury, lead and cadmium and their compounds. These amounts should not be interpreted as comprehensive totals of releases to water of these pollutants in Canada. In 2014, a significant spill at the Mount Polley mine in central British Columbia accounted for large releases of mercury, lead and cadmium to water.
Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

Mercury, lead and cadmium are naturally occurring elements. Most releases of mercury, lead and cadmium to water are contained in effluent from wastewater treatment facilities. Wastewater treatment facilities do not

[1] Section 64 of the *Canadian Environmental Protection Act, 1999* defines a substance as toxic if it is "entering or may enter the environment in a quantity or concentration or under conditions that (a) have or may have an immediate or long-term harmful effect on the environment or its biological diversity; (b) constitute or may constitute a danger to the environment on which life depends; or (c) constitute or may constitute a danger in Canada to human life or health."

[2] The indicators only track releases from facilities reporting to the National Pollutant Release Inventory.

[3] On August 4, 2014, a dam securing a tailings pond at the Mount Polley mine in central British Columbia was breached, spilling mining waste into Polley Lake and surrounding waters.

generate mercury, lead or cadmium. Mercury, lead and cadmium found in wastewater effluents usually comes from industrial discharges to sewers.

In 2019, releases from wastewater treatment facilities accounted for 57%, 48% and 56% of total releases of mercury, lead and cadmium, respectively. From 2003 to 2019, releases of mercury, lead, and cadmium from this source declined by 80%, 70% and 49%, respectively.

From 2015 to 2019, releases of cadmium to water have increased slightly. This was mainly due to reported increases from wastewater treatment facilities, and ore and mineral industries (except non-ferrous metal production and processing).

Releases of mercury to water

Industrial sources such as the pulp and paper industry, mining operations and metal processing release mercury to water both directly to the environment and indirectly through wastewater treatment facilities. Mercury found in wastewater effluents usually comes from industrial discharges to sewers and effluent from waste landfills. Releases of mercury can also occur when a product containing mercury is manufactured, used, recycled and disposed of.[4]

National mercury releases to water by source

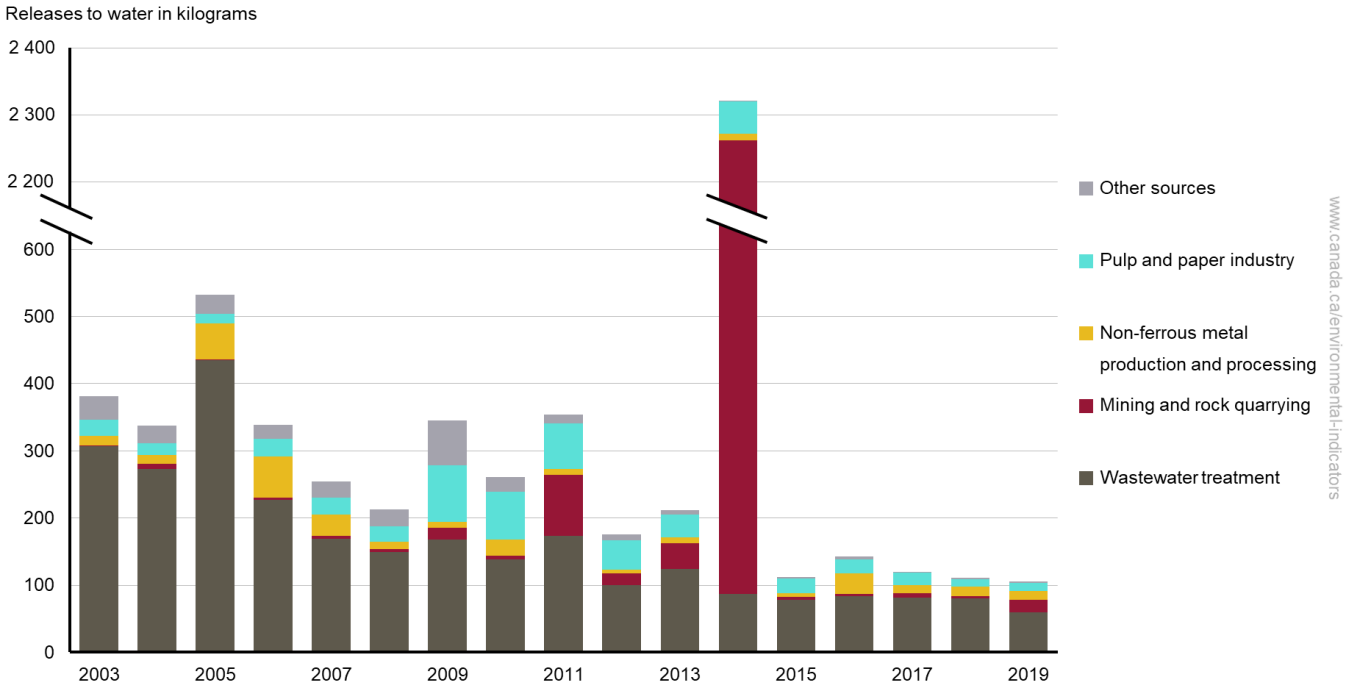
Key results

- Since 2003, mercury releases to water have declined by 72% or 276 kilograms (kg)
- In 2019, national releases totalled 106 kg
    - the largest source was wastewater treatment, representing 57% (60 kg) of the total
- In 2014, a significant spill[5] accounted for 92% (2 143 kg) of the 2 321 kg of mercury released

[4] The *Products Containing Mercury Regulations*, which came into force in November 2015, prohibit the manufacture and import of mercury or any of its compounds, with some exemptions for essential products that have no technically or economically viable alternatives (such as certain medical and research applications and dental amalgam).

[5] On August 4, 2014, a dam securing a tailings pond at the Mount Polley mine in central British Columbia was breached, spilling mining waste into Polley Lake and surrounding waters.

Figure 2. Facility-based mercury releases to water by source, Canada, 2003 to 2019



Data for Figure 2

Note: The indicator reports facility-based releases only. The indicator includes the amount of elemental mercury and mercury in any compound, alloy or mixture reported in the National Pollutant Release Inventory based on the inventory reporting criteria. As a result, the reported mercury releases to water account for only a portion of the releases of this toxic pollutant to water in Canada. Other sources include electric utilities, manufacturing (except the pulp and paper industry), the oil and gas industry, ore and mineral industries (except non-ferrous metal production and processing), solid waste management and other miscellaneous sources. For more details on sources, please consult the Data sources and methods.
Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

In 2019, 4 sectors contributed 98% (103 kg) of total national releases of mercury to water: wastewater treatment, mining and rock quarrying, non-ferrous metal production and processing, and the pulp and paper industry.

The largest reduction in mercury releases to water between 2003 and 2019 was in wastewater treatment, with a reduction of 247 kg (80%). This decline contributed to 89% of the total decline in mercury releases to water.

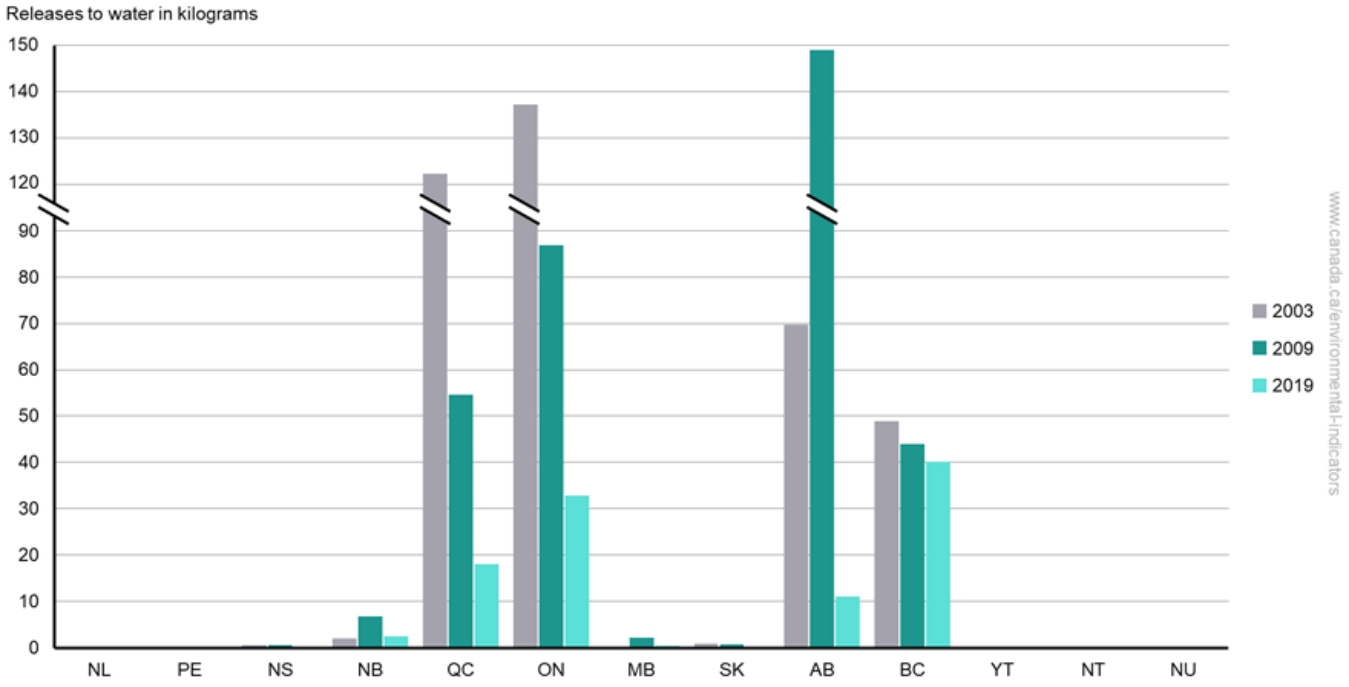
From 2018 to 2019, releases from mining and rock quarrying increased by 612% (16 kg). This increase can mostly be attributed to a single copper-zinc ore mine in British Columbia.

Releases of mercury to water by province and territory

Key results

- In 2019, British Columbia, Ontario and Quebec made up 86% (91 kg) of national mercury releases to water
- Between 2003 and 2019
    - the largest reduction in releases of mercury to water was from Ontario, which reduced its releases by 76% (104 kg)
    - a slight increase of less than 0.5 kg was reported for New Brunswick

Figure 3. Facility-based mercury releases to water by province and territory, Canada, 2003, 2009 and 2019



Data for Figure 3

Note: The indicator reports facility-based releases only. The indicator includes the amount of elemental mercury and mercury in any compound, alloy or mixture reported in the National Pollutant Release Inventory based on the inventory reporting criteria. As a result, the reported mercury releases to water represent only a portion of the releases of this toxic pollutant to water in Canada. Some reported releases from Newfoundland and Labrador, Nova Scotia, Manitoba, Saskatchewan and the Northwest Territories are too small to see in the figure. The figure provides a snapshot of mercury releases by province and territory, to access the complete dataset please refer to the National Pollutant Release Inventory.
Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

Mercury releases to water were highest in British Columbia in 2019, accounting for 38% (40 kg) of the national total. Mining and rock quarrying was the primary source of releases in the province.

Quebec had the largest decline in mercury releases between 2003 and 2019. Ontario had the second largest decline in mercury releases over this period. The declines in these provinces were mostly due to large mercury reductions in releases from wastewater treatment facilities as a result of reduced industrial and residential discharges to wastewater systems.

In 2019, the largest source of mercury releases to water within each province and territory was:

- wastewater treatment in Ontario, Alberta, Quebec and Nova Scotia
- the pulp and paper industry in New Brunswick
- mining and rock quarrying in British Columbia, Manitoba, Newfoundland and Labrador and the Northwest Territories

Alberta and New Brunswick had higher mercury releases in 2009 compared to 2003. Mercury releases in Alberta peaked in 2009 at 149 kg as a result of reported releases from a pulp and paper mill, an oil and gas extraction facility and a wastewater treatment facility. Although not shown in Figure 3, releases to water in Alberta remained above 2003 levels for 2 additional years (2010 and 2011) before declining. Mercury releases to water in New Brunswick were above 2003 levels annually from 2004 to 2019. Releases in the province fluctuated from 2003 to 2014 before declining sharply. Between 2009 and 2019 reported releases in Alberta and New Brunswick declined by 93% and 63%, respectively.

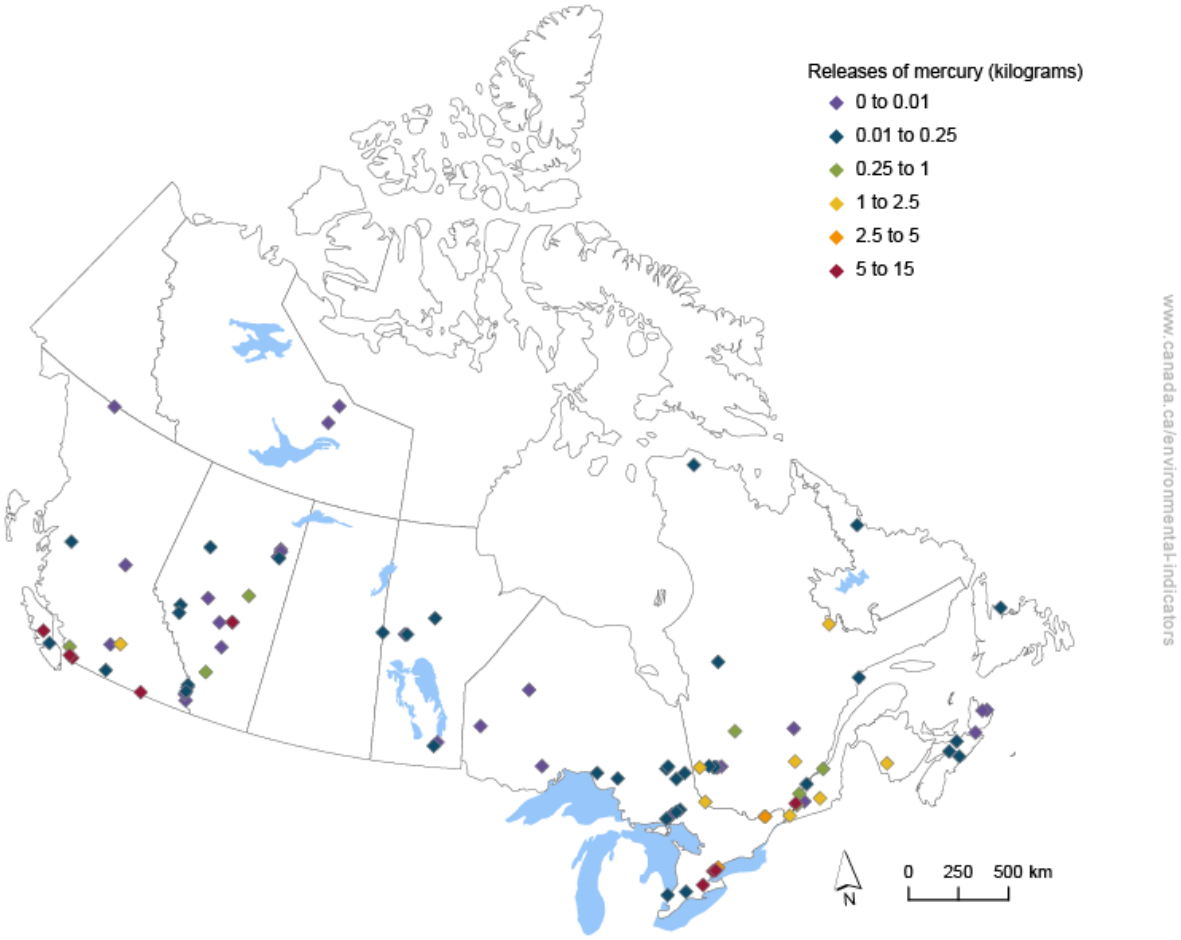
Prince Edward Island, Yukon and Nunavut have never reported releases to the National Pollutant Release Inventory of mercury to water. Manitoba had no reported releases in 2003, the Northwest Territories had no reported releases in 2003 and 2009, and Saskatchewan has not reported releases since 2017.

Releases of mercury to water from facilities

The National Pollutant Release Inventory provides detailed information on emissions and releases 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 releases of mercury to water from individual facilities.

Figure 4. Releases of mercury to water by facility, Canada, 2019



Navigate data using the interactive map

Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

Health and environmental impacts of mercury releases

Mercury has significant negative effects on human health and the environment. It persists and accumulates in ecosystems and biota. Exposure of Canadians to mercury poses a particular risk to populations such as indigenous people who rely heavily on the consumption of predatory fish, such as freshwater trout or Arctic char, and traditional food items, including marine mammals.

Releases of lead to water

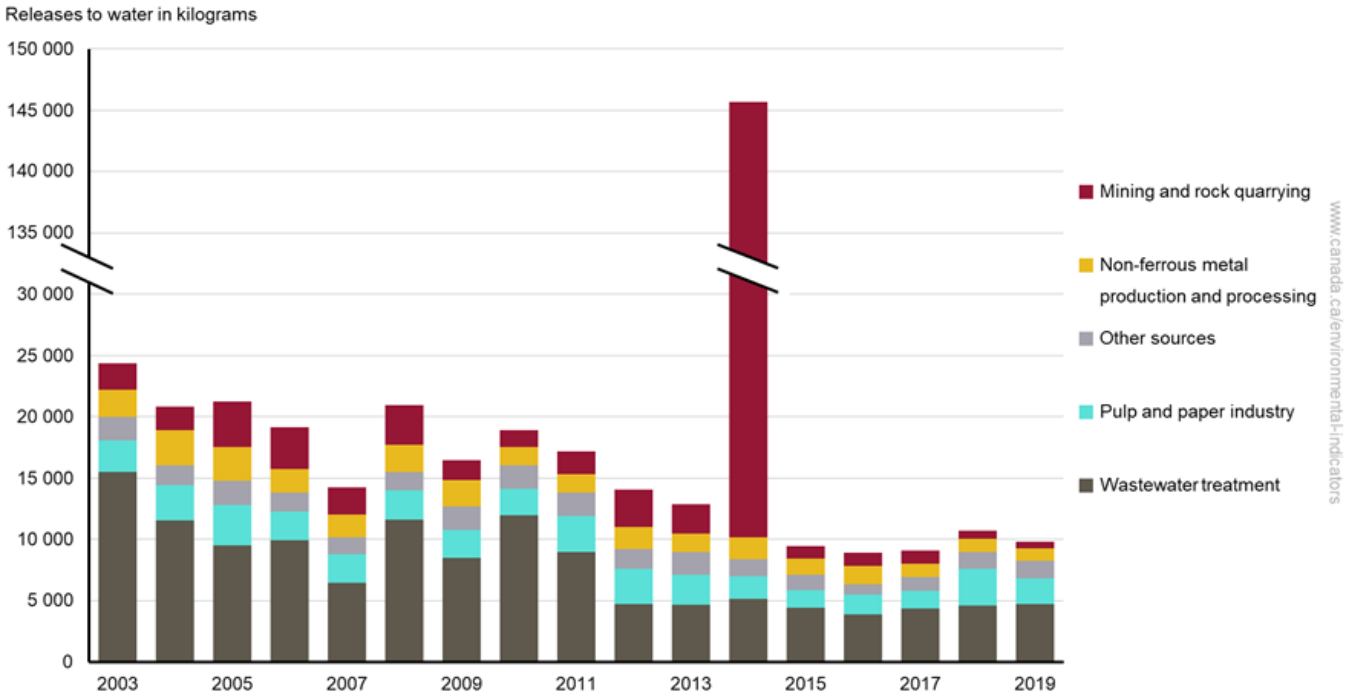
Lead is released directly to the environment from sources such as the pulp and paper industry, metal processing, mining and rock quarrying, and indirectly through wastewater treatment facilities. Lead found in wastewater effluents usually comes from industrial discharges to sewers. Lead emitted to air can be deposited on land or water surfaces and then build up in soils, sediments, humans and wildlife.

National lead releases to water by source

Key results

- Since 2003, lead releases to water have decreased by 60% or 14 551 kilograms (kg)
- In 2019, national releases totalled 9 787 kg
    - the largest source was wastewater treatment, representing 48% (4 708 kg) of the total
- In 2014, a significant spill generated 92% (134 235 kg) of the 145 709 kg of lead released[6]

Figure 5. Facility-based lead releases to water by source, Canada, 2003 to 2019



Data for Figure 5

Note: The indicator reports facility-based releases only. The indicator includes the amount of elemental lead and lead in any compound, alloy or mixture reported in the National Pollutant Release Inventory based on the inventory reporting criteria. As a result, the reported lead releases to water account for only a portion of the releases of this toxic pollutant to water in Canada. Other sources include electric utilities, manufacturing (except the pulp and paper industry), the oil and gas industry, ore and mineral industries (except non-ferrous metal production and processing), solid waste management and other miscellaneous sources. For more details on sources, please consult the Data sources and methods.
Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

In 2019, 70% (6 812 kg) of national releases of lead to water came from wastewater treatment facilities and the pulp and paper industry.

Wastewater treatment contributed to 74% (10 779 kg) of the total reduction in lead releases to water since 2003. This was largely due to decreases in upstream discharges to wastewater effluent. Mining and rock quarrying, and

[6] On August 4, 2014, a dam securing a tailings pond at the Mount Polley mine in central British Columbia was breached, spilling mining waste into Polley Lake and surrounding waters.

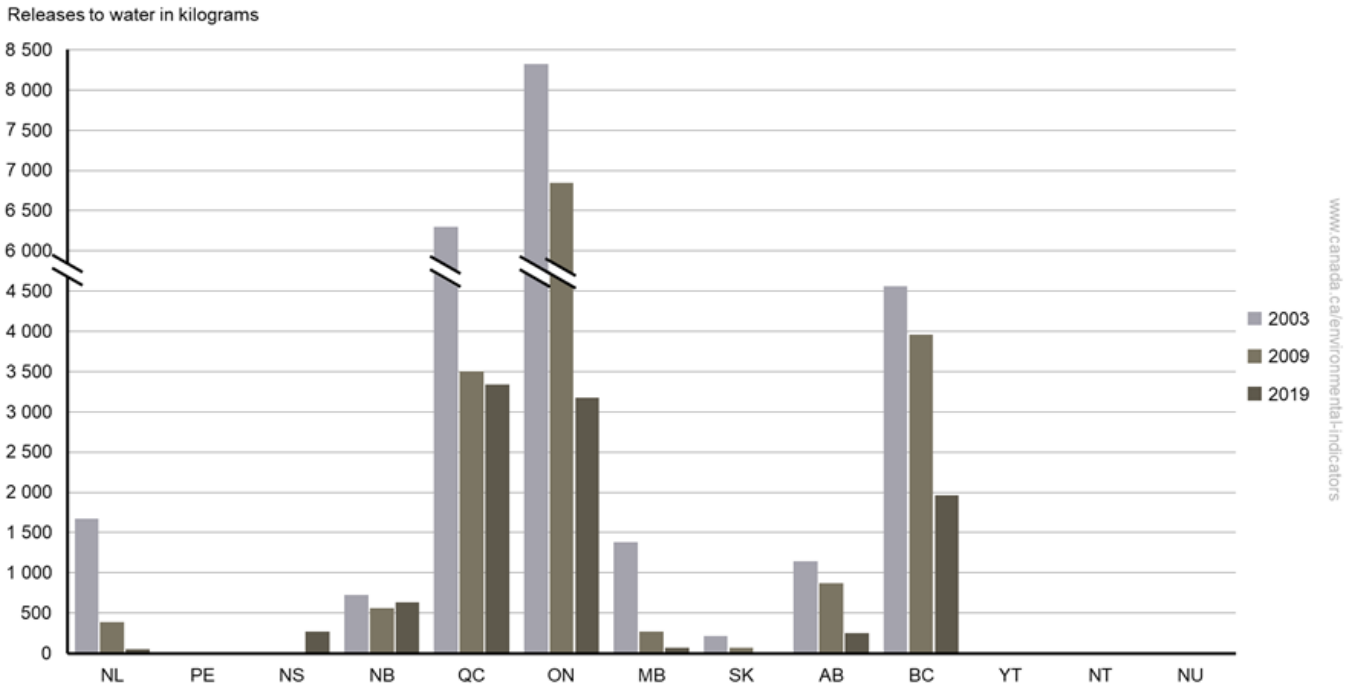
non-ferrous metal production and processing contributed a further 11% (1 595 kg) and 8% (1 216 kg), respectively to the decrease in releases.

Releases of lead to water by province and territory

Key results

- In 2019, Quebec, Ontario and British Columbia made up 87% (8 479 kg) of national lead releases to water
- Between 2003 and 2019
    - the largest reduction in releases of lead to water was from Ontario, which reduced its releases by 62% (5 149 kg)
    - the largest increase in lead releases to water was from Nova Scotia, which had a 263 kg increase in releases

Figure 6. Facility-based lead releases to water by province and territory, Canada, 2003, 2009 and 2019



Data for Figure 6

Note: The indicator reports facility-based releases only. The indicator includes the amount of elemental lead and lead in any compound, alloy or mixture reported in the National Pollutant Release Inventory based on the inventory reporting criteria. As a result, the reported lead releases to water represent only a portion of the releases of this toxic pollutant to water in Canada. Some reported releases from Newfoundland and Labrador, Prince Edward Island, Nova Scotia, Saskatchewan, the Northwest Territories and Nunavut are too small to see in the figure. The figure provides a snapshot of lead releases by province and territory, to access the complete dataset please refer to the National Pollutant Release Inventory.
Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

Lead releases to water were highest in Quebec in 2019, accounting for 34% (3 343 kg) of the national total.

Ontario had the largest decline in lead releases between 2003 and 2019. This decline was mostly due to reductions in releases from wastewater treatment facilities. Nova Scotia had the largest increase in releases over this period, although actual releases in 2019 represented less than 3% of the national total. The results in Nova Scotia were mostly due to releases from a single wastewater treatment facility.

In 2019, the largest source of lead releases to water within each province and territory was:

- wastewater treatment in Ontario, Nova Scotia, Alberta, Manitoba, Saskatchewan and Prince Edward Island

- the pulp and paper industry in Quebec, and Newfoundland and Labrador
- mining and rock quarrying in New Brunswick, Nunavut and the Northwest Territories
- non-ferrous metal production and processing in British Columbia

Nova Scotia had higher lead releases in 2009 (10.9 kg) compared to 2003 (3.9 kg). Between 2009 and 2019 reported releases increased further. While not shown in Figure 6, lead releases in Nova Scotia peaked in 2011 at 723 kg as a result of 2 wastewater treatment facilities reporting high releases due to influxes of upstream influent. Provincially-reported releases from the wastewater treatment sector fluctuated from 2012 to 2016 as releases from facilities exceeded or remained below the minimum reporting threshold. Reported releases from a single wastewater treatment facility accounted for 98% of the total lead releases for Nova Scotia from 2017 to 2019.

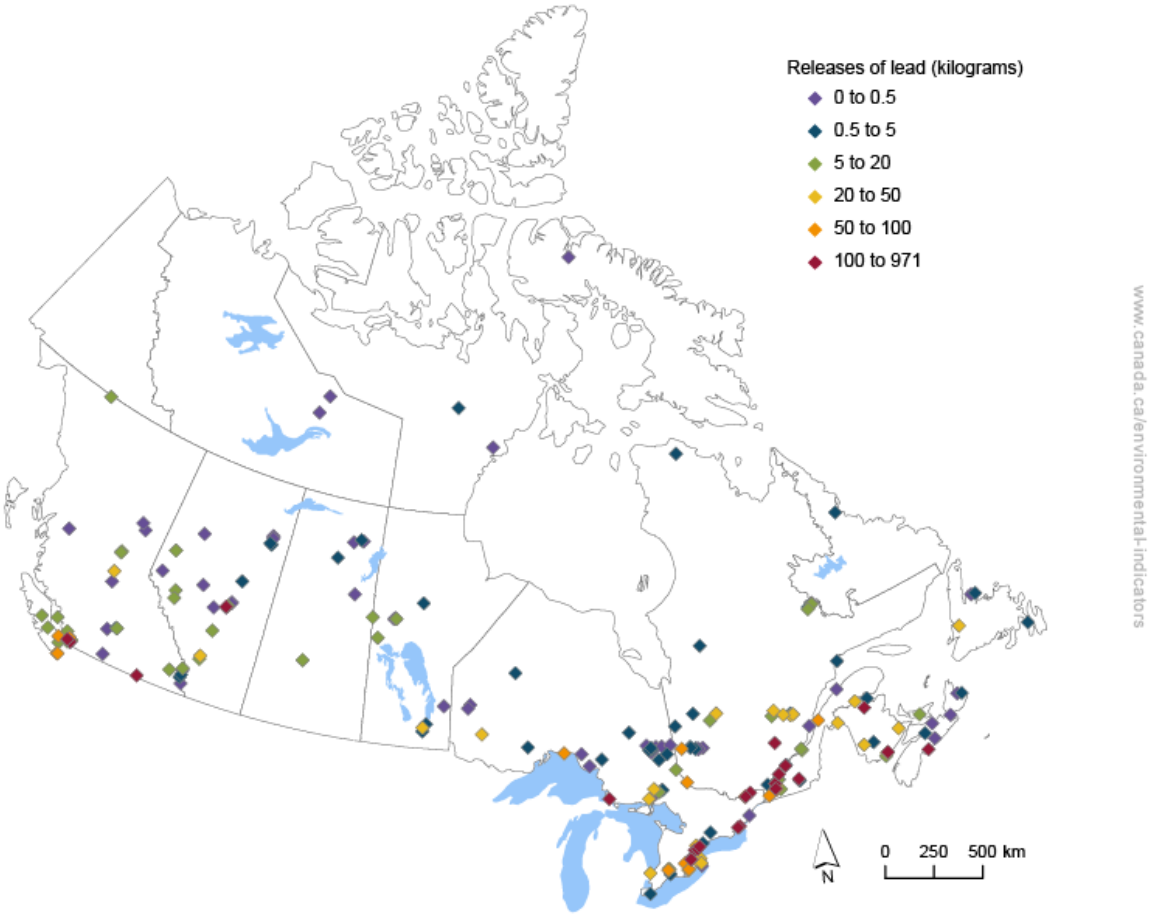
In 2003, there were no reported releases to the National Pollutant Release Inventory of lead in Prince Edward Island, Yukon and the Northwest Territories. In 2009, there were no reported releases in Prince Edward Island, Yukon and Nunavut. All provinces and territories reported releases in 2019, except for Yukon.

Releases of lead to water from facilities

The National Pollutant Release Inventory provides detailed information on emissions and releases 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 releases of lead to water from individual facilities.

Figure 7. Releases of lead to water by facility, Canada, 2019



Navigate data using the interactive map

Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

Health and environmental impacts of lead releases

Lead is a highly toxic metal. Canadians are exposed to low levels of lead through food, drinking water, air, household dust, soil and various products. Exposure to lead, even in small amounts, can be hazardous to both humans and wildlife. In humans, chronic exposure to relatively low levels may affect the central and peripheral nervous systems, blood pressure, and renal function and may result in reproductive problems and developmental neurotoxicity.

Other sources of lead releases to the environment

Other sources of lead releases correspond to non-industrial releases that are not included in the National Pollutant Release Inventory. Releases from these sources are therefore not considered in the analysis of the indicators.

Lead releases to water

Fishing tackle containing lead can pose a serious threat to birds if ingested. Ingestion can lead to blindness, muscle paralysis, reduced reproductive ability, seizures and death. A single sinker or jig containing several grams of lead is enough to kill a bird. It is estimated every year approximately 460 tonnes of lead sinkers and jigs are lost into Canada's lakes and waterways.[7] This represents the most significant annual source of lead releases to water in Canada.

Lead releases to land

In Canada, the largest source of lead releases onto land is ammunition. Lead ammunition releases can eventually end up in water through leaching into soils and groundwater and by hunting over or near water bodies. Annually, ammunition used for recreational shooting, hunting and enforcement releases about 5 200 tonnes of lead into the environment.[8] Migratory bird hunters are required by law to use non-toxic shot. However, recreational shooting and other game hunting remain a significant source of lead releases. The use of lead-free ammunition would help prevent contamination of soil, water and game meat that may be consumed by Canadians or by scavenging animals.

Releases of cadmium to water

Cadmium can be released directly to the environment from human activities such as non-ferrous metal production and processing, and fuel consumption for electricity or heating, and indirectly through wastewater treatment facilities. Cadmium found in wastewater effluents usually comes from industrial discharges to sewers. Cadmium is used in batteries and in electroplating to protect other metals from corrosion.

National cadmium releases to water by source

Key results

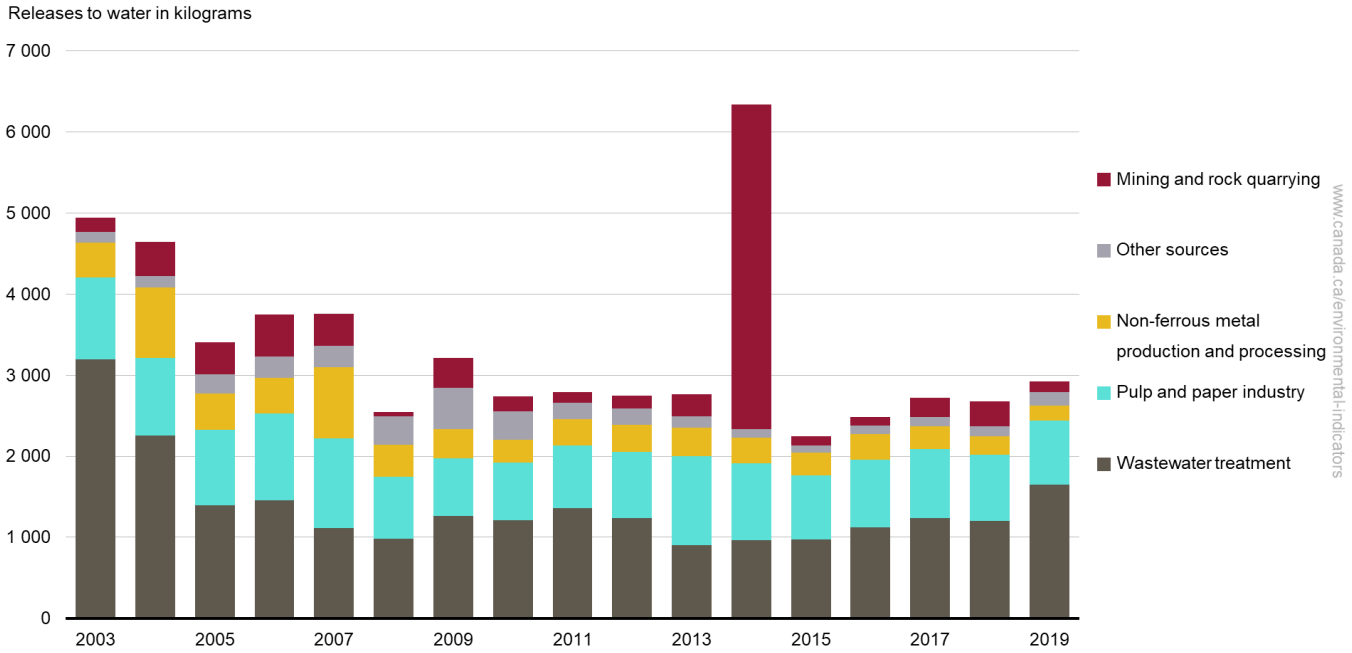
- Since 2003, cadmium releases to water have declined by 41% or 2 023 kilograms (kg)
- In 2019, national releases totalled 2 921 kg
    - the largest source was wastewater treatment, representing about 56% (1 645 kg) of national releases
- In 2014, a significant spill accounted for 59% (3 768 kg) of the 6 339 kg of cadmium released[9]

[7] Environment and Climate Change Canada (2018) Study to gather use pattern information on lead sinkers and jigs and their non-lead alternative in Canada. Retrieved on August 2, 2021.

[8] Environment and Climate Change Canada (2018) Moving towards using more lead-free ammunition. Retrieved on August 2, 2021.

[9] On August 4, 2014, a dam securing a tailings pond at the Mount Polley mine in central British Columbia was breached, spilling mining waste into Polley Lake and surrounding waters.

Figure 8. Facility-based cadmium releases to water by source, Canada, 2003 to 2019



Data for Figure 8

Note: The indicator reports facility-based releases only. The indicator includes the amount of elemental cadmium and cadmium in any compound, alloy or mixture reported in the National Pollutant Release Inventory based on the inventory reporting criteria. As a result, the reported cadmium releases to water account for only a portion of the releases of this toxic pollutant to water in Canada. Other sources include electric utilities, manufacturing (except the pulp and paper industry), the oil and gas industry, ore and mineral industries (except non-ferrous metal production and processing), solid waste management and other miscellaneous sources. For more details on sources, please consult the Data sources and methods.
Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

In 2019, 83% (2 436 kg) of cadmium released to water came from wastewater treatment facilities and the pulp and paper industry.

Wastewater treatment contributed to 77% (1 550 kg) of the total reduction in cadmium releases to water since 2003. This was largely due to decreases in upstream discharges to wastewater effluent. The pulp and paper and non-ferrous metal production and processing industries together contributed an additional 23% (222 kg and 236 kg, respectively) to the total reduction in cadmium releases from 2003 to 2019.

Between 2003 and 2019, the largest reduction in releases of cadmium to water was from wastewater treatment, with a reduction of 49% (1 550 kg). The non-ferrous metal production and processing, pulp and paper, and mining and rock quarrying industries also had decreases over the same period. Conversely, releases from other sources (led by iron and steel mills and ferro-alloy manufacturing, foundries, and petroleum and coal product manufacturing) increased by 30% (39 kg).

In recent years (from 2015 to 2019), releases of cadmium to water have increased. This was mainly due to reported increases from wastewater treatment facilities, and ore and mineral industries (except non-ferrous metal production and processing).

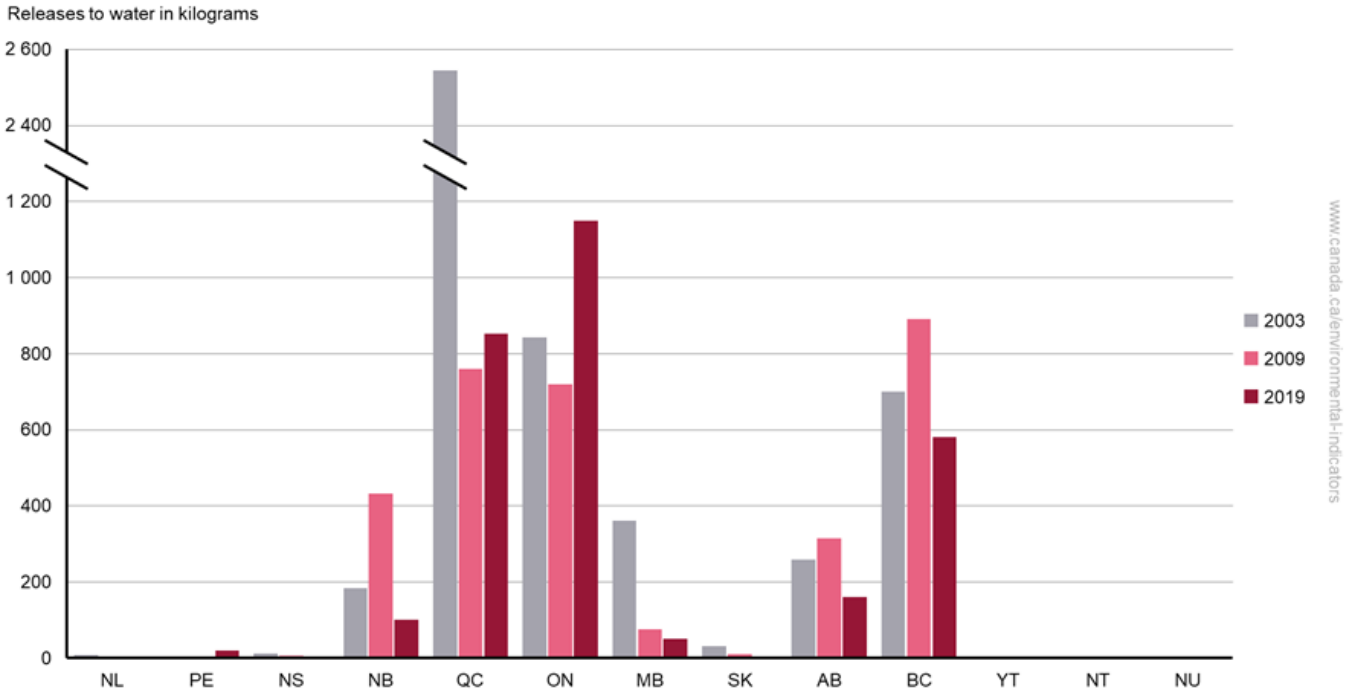
Releases of cadmium to water by province and territory

Key results

- In 2019, Ontario, Quebec and British Columbia made up 88% (2 582 kg) of national cadmium releases to water
- Between 2003 and 2019
    - the largest reduction in releases of cadmium to water was from Quebec, which reduced its releases by 67% (1 693 kg)

- the largest increase in cadmium releases to water was from Ontario, which had a 36% (305 kg) increase in releases

Figure 9. Facility-based cadmium releases to water by province and territory, Canada, 2003, 2009 and 2019



Data for Figure 9

Note: The indicator reports facility-based releases only. The indicator includes the amount of elemental cadmium and cadmium in any compound, alloy or mixture reported in the National Pollutant Release Inventory based on the inventory reporting criteria. As a result, the reported cadmium releases to water represent only a portion of the releases of this toxic pollutant to water in Canada. Some reported releases from Newfoundland and Labrador, Prince Edward Island, Nova Scotia, Saskatchewan, the Northwest Territories and Nunavut are too small to see in the figure. The figure provides a snapshot of cadmium releases by province and territory, to access the complete dataset please refer to the National Pollutant Release Inventory.
Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

Cadmium releases to water were highest in Ontario in 2019, accounting for 39% (1 149 kg) of the national total. Wastewater treatment was the main source of these releases.

Between 2003 and 2019, Quebec had the largest decrease in cadmium releases. This decrease was mostly due to reported reductions from wastewater treatment facilities. Ontario had the largest increase in releases over this period. This was mostly due to increases in cadmium releases from wastewater treatment facilities.

In 2019, the largest source of cadmium releases to water within each province and territory was:

- wastewater treatment in Ontario, Quebec, Prince Edward Island and Saskatchewan
- the pulp and paper industry in British Columbia, Alberta, New Brunswick, and Newfoundland and Labrador
- mining and rock quarrying in Manitoba, Nunavut and the Northwest Territories
- electric utilities in Nova Scotia

New Brunswick, Alberta and British Columbia, had higher cadmium releases in 2009 compared to 2003. However, between 2009 and 2019 reported releases declined by 77%, 49% and 35%, respectively. Although not shown in Figure 9, reported releases of cadmium to water in New Brunswick peaked in 2007 at 966 kg. Releases within the province were above 2003 levels from 2004 to 2009 and again in 2013. In Alberta, releases exceeded 2003 levels in 2009 and from 2011 to 2014, peaking at 353 kg in 2012. Reported releases of cadmium to water in British Columbia exceeded 2003 levels from 2009 to 2015 and again in 2017. Releases peaked in 2014 at 4 646 kg, primarily as a result of the significant tailings pond spill at the Mount Polley mine.

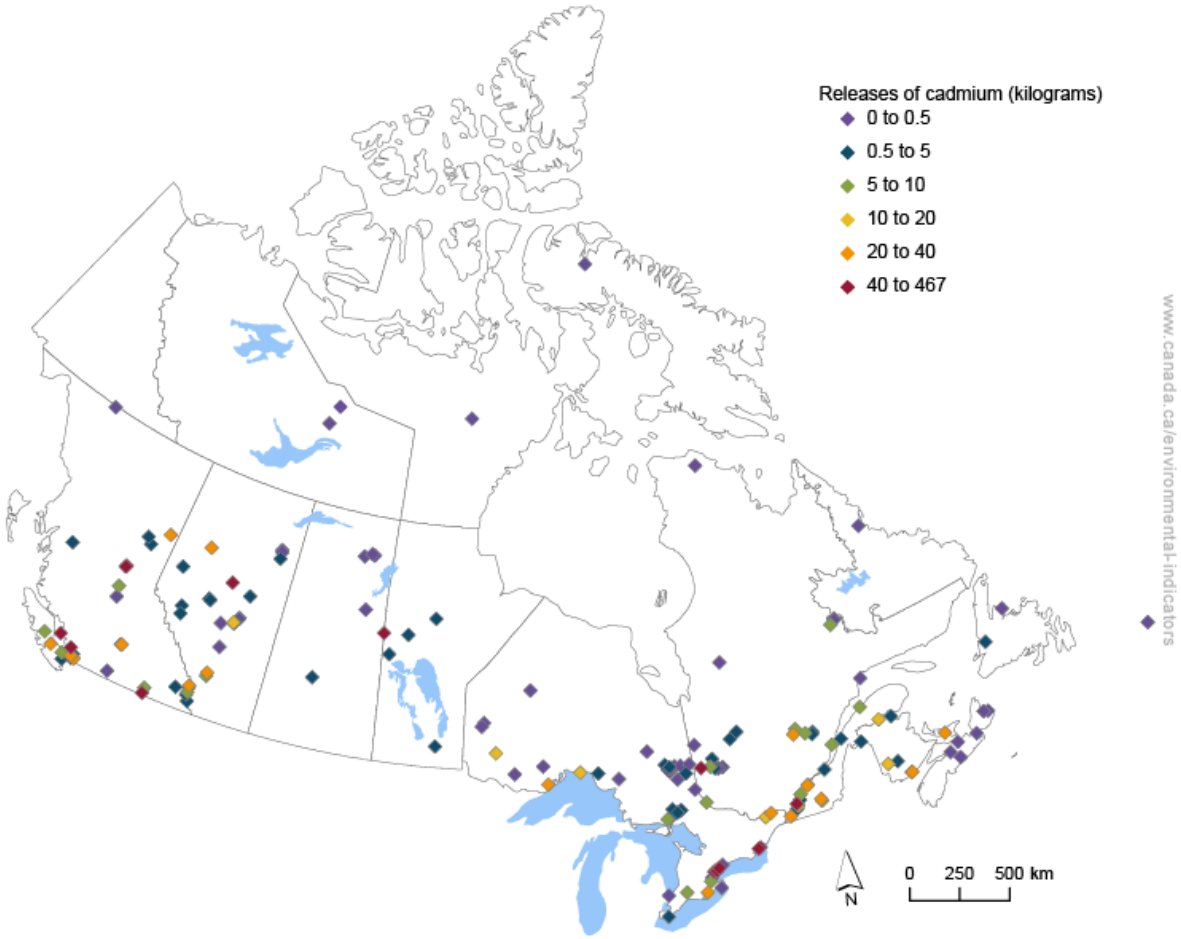
Yukon has never reported releases to the National Pollutant Release Inventory of cadmium to water. In 2003, there were no reported releases of cadmium in Prince Edward Island and the Northwest Territories. In 2009, there were no reported releases in Prince Edward Island, the Northwest Territories and Nunavut.

Releases of cadmium to water from facilities

The National Pollutant Release Inventory provides detailed information on emissions and releases 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 releases of cadmium to water from individual facilities.

Figure 10. Releases of cadmium to water by facility, Canada, 2019



Navigate data using the interactive map

Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

Health and environmental impacts of cadmium releases

Exposure to cadmium can be hazardous to both humans and wildlife since it accumulates in the food chain over time. The Government of Canada concluded cadmium compounds may be harmful to the environment and may constitute a danger based on their carcinogenic potential. Exposure to cadmium has been associated with gastrointestinal irritation and harmful effects to the kidneys and bones.

About the indicators

What the indicators measure

These indicators track facility-based releases to water of 3 substances that are defined as toxic under the *Canadian Environmental Protection Act, 1999*: mercury, lead and cadmium and their compounds. For each substance, data are provided at the national, regional (provincial and territorial) and facility level and by source.

Why these indicators are important

Mercury and its compounds, lead and inorganic cadmium compounds are on the Toxic substances list under Schedule 1 of the *Canadian Environmental Protection Act, 1999*. This means that these substances are "entering or may enter the environment in a quantity or concentration or under conditions that (a) have or may have an immediate or long-term harmful effect on the environment or its biological diversity; (b) constitute or may constitute a danger to the environment on which life depends; or (c) constitute or may constitute a danger in Canada to human life or health."

The indicators inform Canadians about releases to water of these 3 substances from facilities in Canada. The Releases of harmful substances to water indicators also help the government to identify priorities and develop or revise strategies to inform further risk management and to track progress on policies put in place to reduce or control these 3 substances and water pollution in general.

Safe and healthy communities

These indicators support the measurement of progress towards the following 2019 to 2022 Federal Sustainable Development Strategy long-term goal: All Canadians live in clean, sustainable communities that contribute to their health and well-being.

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 12, Responsible consumption and production and Target 12.4, "By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment."

Related indicators

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 Human exposure to harmful substances indicators track the concentrations of 4 substances (mercury, lead, cadmium and bisphenol A) in Canadians.

Data sources and methods

Data sources

Data for the indicators and the interactive maps are taken from the National Pollutant Release Inventory (the inventory). These indicators include the amount of elemental mercury, lead and cadmium in any compound, alloy or mixture released to water as reported to the inventory based on its reporting criteria as listed in section 5.3 of the 2020-2021 Guide to Reporting to the National Pollutant Release Inventory (PDF; 3.11 MB).

More information

The inventory is compiled by Environment and Climate Change Canada (the department), and includes releases reported by industrial, commercial and institutional facilities. It is Canada's legislated, publicly accessible inventory of pollutant releases (to air, water and land), disposals and transfers for recycling. It consists of information reported by facilities to the department under the *Canadian Environmental Protection Act, 1999* (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 that meet reporting thresholds and other requirements must report their pollutant releases annually.

Estimation of releases to water

Releases to water are estimated or measured through one of the following methods:

- continuous emission monitoring systems
- predictive emission monitoring
- source testing
- mass balance
- site-specific emission factors
- published emission factors
- engineering estimates

These measurement methods and estimation techniques are used by the facilities to report their releases (point sources) to the inventory. The Report to the National Pollutant Release Inventory program web page provides information to owners or operators of facilities required to report to the inventory, as well as details on the program's calculation methods.

Data completeness

Because the indicators are derived solely from the inventory's database, they reflect only releases from facilities that met the reporting criteria. As a result, the indicators do not include all releases in Canada. They are limited to the main point sources for each selected toxic substance.

Data timeliness

The data are current up to 2019. The indicators are reported approximately 1.5 years after data collection because of the time required for data validation, analysis and interpretation.

Methods

The indicators are produced by grouping data from the inventory to report on the key sources that contribute to the majority of mercury, lead and cadmium releases to water.

More information

Indicator coverage

Historical data are provided at the national level and by source for the period from 2003 to 2019. The year 2003 was selected as the first year for releases to water because it was the year the inventory updated its reporting criteria for mercury, lead and cadmium. For the provincial/territorial charts, releases to water are provided for 2003, 2009 and 2019. Releases of mercury, lead and cadmium to water by facility are displayed on the Canadian Environmental Sustainability Indicators' interactive maps.

Source classification

Source descriptions for the indicators were taken from Statistics Canada's North American Industry Classification System. The 4-digit code of the classification system, as reported by the facilities, was used for source classification for the data reported by the inventory. These sources were then classified into the following sources for reporting in the indicators:

- electric utilities
- manufacturing (except pulp and paper)
- mining and rock quarrying
- miscellaneous
- non-ferrous metal production and processing
- oil and gas industry
- ore and mineral industries (except non-ferrous metal production and processing)
- pulp and paper industry
- solid waste management
- wastewater treatment

Table 1 shows the allocation of sources of harmful substances reported in the indicators compared with those reported by the inventory.

Table 1. Alignment of sources reported in the Canadian Environmental Sustainability Indicators and the National Pollutant Release Inventory

Sources in the Canadian Environmental Sustainability Indicators	Sources in the National Pollutant Release Inventory (based on the North American Industry Classification System)
Electric utilities	Electric power generation, transmission and distribution
Manufacturing (except pulp and paper)	Forest nurseries and gathering of forest products
Manufacturing (except pulp and paper)	Sawmills and wood preservation
Manufacturing (except pulp and paper)	Aerospace product and parts manufacturing
Manufacturing (except pulp and paper)	Basic chemical manufacturing
Manufacturing (except pulp and paper)	Cement and concrete product manufacturing
Manufacturing (except pulp and paper)	Coating, engraving, cold and heat treating and allied activities
Manufacturing (except pulp and paper)	Electrical equipment manufacturing
Manufacturing (except pulp and paper)	Engine, turbine and power transmission equipment manufacturing
Manufacturing (except pulp and paper)	Forging and stamping
Manufacturing (except pulp and paper)	Glass and glass product manufacturing
Manufacturing (except pulp and paper)	Motor vehicle parts manufacturing
Manufacturing (except pulp and paper)	Other chemical product manufacturing
Manufacturing (except pulp and paper)	Other electrical equipment and component manufacturing
Manufacturing (except pulp and paper)	Other fabricated metal product manufacturing
Manufacturing (except pulp and paper)	Other miscellaneous manufacturing
Manufacturing (except pulp and paper)	Pesticide, fertilizer and other agricultural chemical manufacturing

Sources in the Canadian Environmental Sustainability Indicators	Sources in the National Pollutant Release Inventory (based on the North American Industry Classification System)
Manufacturing (except pulp and paper)	Petroleum and coal product manufacturing
Manufacturing (except pulp and paper)	Pharmaceutical and medicine manufacturing
Manufacturing (except pulp and paper)	Rubber product manufacturing
Manufacturing (except pulp and paper)	Semiconductor and other electronic component manufacturing
Manufacturing (except pulp and paper)	Spring and wire product manufacturing
Manufacturing (except pulp and paper)	Veneer, plywood and engineered wood product manufacturing
Mining and rock quarrying	Coal mining
Mining and rock quarrying	Metal ore mining
Mining and rock quarrying	Non-metallic mineral mining and quarrying
Miscellaneous	Support activities for water transportation
Miscellaneous	General medical and surgical hospitals
Miscellaneous	Other professional, scientific and technical services
Miscellaneous	Recyclable material merchant wholesalers
Non-ferrous metal production and processing	Non-ferrous metal (except aluminum) production and processing
Oil and gas industry	Oil and gas extraction
Ore and mineral industries (except non-ferrous metal production and processing)	Alumina and aluminum production and processing
Ore and mineral industries (except non-ferrous metal production and processing)	Foundries
Ore and mineral industries (except non-ferrous metal production and processing)	Iron and steel mills and ferro-alloy manufacturing
Ore and mineral industries (except non-ferrous metal production and processing)	Steel product manufacturing from purchased steel
Pulp and paper industry	Converted paper product manufacturing
Pulp and paper industry	Pulp, paper and paperboard mills
Solid waste management	Remediation and other waste management services
Solid waste management	Waste collection
Solid waste management	Waste treatment and disposal
Wastewater treatment	Water, sewage and other systems

For display purposes, sources with smaller releases are sometimes grouped together under the category "Other sources" in the figures and corresponding data tables of releases by source. The grouped sources may differ by substance and are listed in the notes of each figure and data table.

Recent changes

The wastewater and waste management source in the Canadian Environmental Sustainability Indicators was split into 2 separate sources, wastewater treatment and solid waste management. These sources are listed under 2 different North American Industry Classification System codes.

The provincial/territorial comparison of releases to water was expanded to include 2003, the first year data was available. Also included are 2019, the latest year data was available and a 10-year comparison to the latest year, 2009.

Caveats and limitations

The indicators reflect only facility-based releases to water as reported to the inventory. They do not include estimates of releases from other sources, such as runoff from cities, transboundary pollution or from consumer products in Canada.

Occasional updates and data quality checking can be done after initial release of the inventory.

The number and composition of facilities that report releases to water to the inventory vary each year. This variation is due to the fact that only facilities that meet or exceed the reporting threshold are required to report. An analysis of how this might affect the apparent trends has not been undertaken.

Facilities reporting to the inventory may use different methods to calculate releases. These methods vary depending on the substance and/or facility, and may also change from year to year.

Resources

References

Environment and Climate Change Canada (2017) Using and interpreting data from the National Pollutant Release Inventory. Retrieved on August 2, 2021.

Environment and Climate Change Canada (2018) Study to gather use pattern information on lead sinkers and jigs and their non-lead alternatives in Canada. Retrieved on August 2, 2021.

Environment and Climate Change Canada (2021) Bulk data files for all years – releases, disposals, transfers and facility locations. Retrieved on August 2, 2021.

Related information

NPRI sector overview: Aluminium

NPRI sector overview: Electricity

NPRI sector overview: Metal ore mining

NPRI sector overview: Oil sands extraction

NPRI sector overview: Wastewater

Annex

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

Table A.1. Data for Figure 1. Facility-based releases of mercury, lead and cadmium to water, Canada, 2003 to 2019

Year	Mercury (percentage change from 2003 level)	Lead (percentage change from 2003 level)	Cadmium (percentage change from 2003 level)
2003	0	0	0
2004	-11	-14	-6
2005	40	-13	-31
2006	-11	-21	-24
2007	-33	-41	-24
2008	-44	-14	-49
2009	-10	-32	-35
2010	-32	-22	-45
2011	-7	-29	-44
2012	-54	-42	-45
2013	-45	-47	-44
2014	508	499	28
2015	-71	-61	-55
2016	-63	-64	-50
2017	-69	-63	-45
2018	-71	-56	-46
2019	-72	-60	-41

Note: The indicator reports facility-based releases only. This table accounts only for the releases to water reported in the National Pollutant Release Inventory based on the inventory reporting criteria for releases of mercury, lead and cadmium and their compounds. These amounts should not be interpreted as comprehensive totals of releases to water of these pollutants in Canada. In 2014, a significant spill at the Mount Polley mine in central British Columbia accounted for large releases of mercury, lead and cadmium to water.
Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

Table A.2. Data for Figure 2. Facility-based mercury releases to water by source, Canada, 2003 to 2019

Year	Wastewater treatment (releases to water in kilograms)	Mining and rock quarrying (releases to water in kilograms)	Non-ferrous metal production and processing (releases to water in kilograms)	Pulp and paper industry (releases to water in kilograms)	Other sources (releases to water in kilograms)	Total (releases to water in kilograms)
2003	306.7	1.5	14.1	24.1	35.3	381.6
2004	272.7	8.2	13.3	17.5	26.1	337.8
2005	435.2	1.0	53.4	14.0	29.1	532.6
2006	226.9	3.5	61.6	26.3	20.8	339.1
2007	169.4	4.1	31.2	25.6	24.0	254.3
2008	149.7	3.9	10.7	22.8	25.3	212.4
2009	167.5	17.7	9.4	83.6	66.6	344.9

Year	Wastewater treatment (releases to water in kilograms)	Mining and rock quarrying (releases to water in kilograms)	Non-ferrous metal production and processing (releases to water in kilograms)	Pulp and paper industry (releases to water in kilograms)	Other sources (releases to water in kilograms)	Total (releases to water in kilograms)
2010	137.9	6.4	23.4	71.0	21.9	260.5
2011	173.6	90.2	9.3	68.2	13.2	354.5
2012	100.3	17.0	5.9	43.9	9.1	176.0
2013	123.6	38.6	8.5	34.6	6.2	211.5
2014	87.4	2 174.4	10.4	47.8	1.4	2 321.4
2015	77.9	5.1	5.5	21.7	1.6	111.8
2016	83.2	3.4	30.7	21.0	4.1	142.5
2017	81.4	6.9	12.0	18.1	0.7	119.0
2018	80.8	2.6	14.3	11.3	1.8	110.9
2019	59.8	18.3	13.5	11.8	2.0	105.5

Note: Totals may not add up due to rounding. The indicator reports facility-based releases only. The indicator includes the amount of elemental mercury and mercury in any compound, alloy or mixture reported in the National Pollutant Release Inventory based on the inventory reporting criteria. As a result, the reported mercury releases to water account for only a portion of the releases of this toxic pollutant to water in Canada. Other sources include electric utilities, manufacturing (except the pulp and paper industry), the oil and gas industry, ore and mineral industries (except non-ferrous metal production and processing), solid waste management and other miscellaneous sources. For more details on sources, please consult the Data sources and methods.
Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

Table A.3. Data for Figure 3. Facility-based mercury releases to water by province and territory, Canada, 2003, 2009 and 2019

Province or territory	2003 (releases to water in kilograms)	2009 (releases to water in kilograms)	2019 (releases to water in kilograms)
Newfoundland and Labrador	< 0.1	< 0.1	0.1
Prince Edward Island	n/a	n/a	n/a
Nova Scotia	0.6	0.6	0.2
New Brunswick	2.0	6.8	2.5
Quebec	122.2	54.6	18.1
Ontario	137.2	86.9	32.9
Manitoba	n/a	2.2	0.5
Saskatchewan	0.9	0.8	n/a
Alberta	69.7	149.0	11.1
British Columbia	48.9	44.0	40.2
Yukon	n/a	n/a	n/a
Northwest Territories	n/a	n/a	< 0.1
Nunavut	n/a	n/a	n/a
Canada	381.6	344.9	105.5

Note: n/a = not available, it indicates that the province or territory has no reported releases. Totals may not add up due to rounding. The indicator reports facility-based releases only. The indicator includes the amount of elemental mercury and mercury in any compound, alloy or mixture reported in the National Pollutant Release Inventory based on the inventory reporting criteria. As a result, the reported mercury releases to water represent only a portion of the releases of this toxic pollutant to water in Canada.
Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

Table A.4. Data for Figure 5. Facility-based lead releases to water by source, Canada, 2003 to 2019

Year	Wastewater treatment (releases to water in kilograms)	Pulp and paper industry (releases to water in kilograms)	Other sources (releases to water in kilograms)	Non-ferrous metal production and processing (releases to water in kilograms)	Mining and rock quarrying (releases to water in kilograms)	Total (releases to water in kilograms)
2003	15 487.1	2 583.0	1 901.8	2 253.9	2 112.9	24 338.7
2004	11 526.4	2 886.4	1 631.8	2 881.5	1 925.5	20 851.7
2005	9 472.5	3 340.5	1 964.5	2 778.4	3 713.5	21 269.4
2006	9 899.8	2 365.9	1 569.5	1 874.6	3 429.6	19 139.3
2007	6 417.4	2 370.8	1 396.1	1 819.4	2 252.4	14 256.2
2008	11 582.8	2 424.6	1 493.6	2 194.1	3 274.9	20 970.0
2009	8 475.9	2 252.7	1 971.6	2 148.8	1 611.5	16 460.4
2010	11 973.3	2 117.4	1 938.8	1 526.6	1 341.9	18 898.0
2011	8 990.8	2 908.8	1 886.3	1 518.9	1 876.0	17 180.8
2012	4 698.6	2 864.8	1 642.4	1 773.6	3 074.4	14 053.8
2013	4 660.3	2 423.3	1 905.9	1 483.6	2 388.7	12 861.9
2014	5 114.7	1 849.4	1 417.6	1 768.1	135 559.6	145 709.4
2015	4 395.9	1 459.9	1 236.7	1 336.7	996.8	9 426.0
2016	3 880.0	1 576.9	855.7	1 524.2	1 045.4	8 882.2
2017	4 375.8	1 399.0	1 131.3	1 107.5	1 082.3	9 096.0
2018	4 596.9	3 013.7	1 343.8	1 114.2	624.1	10 692.7
2019	4 707.7	2 104.0	1 420.0	1 038.1	517.6	9 787.3

Note: Totals may not add up due to rounding. The indicator reports facility-based releases only. The indicator includes the amount of elemental lead and lead in any compound, alloy or mixture reported in the National Pollutant Release Inventory based on the inventory reporting criteria. As a result, the reported lead releases to water account for only a portion of the releases of this toxic pollutant to water in Canada. Other sources include electric utilities, manufacturing (except the pulp and paper industry), the oil and gas industry, ore and mineral industries (except non-ferrous metal production and processing), solid waste management and other miscellaneous sources. For more details on sources, please consult the Data sources and methods.
Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

Table A.5. Data for Figure 6. Facility-based lead releases to water by province and territory, Canada, 2003, 2009 and 2019

Province or territory	2003 (releases to water in kilograms)	2009 (releases to water in kilograms)	2019 (releases to water in kilograms)
Newfoundland and Labrador	1 670.0	386.0	51.7
Prince Edward Island	n/a	n/a	11.5
Nova Scotia	3.9	10.9	267.0
New Brunswick	724.9	557.6	630.2
Quebec	6 296.2	3 504.3	3 342.9
Ontario	8 321.2	6 841.4	3 171.7
Manitoba	1 385.0	270.7	72.8
Saskatchewan	217.1	64.0	17.6
Alberta	1 141.5	869.4	254.9

Province or territory	2003 (releases to water in kilograms)	2009 (releases to water in kilograms)	2019 (releases to water in kilograms)
British Columbia	4 563.9	3 955.5	1 964.3
Yukon	n/a	n/a	n/a
Northwest Territories	n/a	0.6	0.1
Nunavut	15.0	n/a	2.7
Canada	24 338.7	16 460.4	9 787.3

Note: n/a = not available, it indicates that the province or territory has no reported releases. Totals may not add up due to rounding. The indicator reports facility-based releases only. The indicator includes the amount of elemental lead and lead in any compound, alloy or mixture reported in the National Pollutant Release Inventory based on the inventory reporting criteria. As a result, the reported lead releases to water represent only a portion of the releases of this toxic pollutant to water in Canada.
Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

Table A.6. Data for Figure 8. Facility-based cadmium releases to water by source, Canada, 2003 to 2019

Year	Wastewater treatment (releases to water in kilograms)	Pulp and paper industry (releases to water in kilograms)	Non-ferrous metal production and processing (releases to water in kilograms)	Other sources (releases to water in kilograms)	Mining and rock quarrying (releases to water in kilograms)	Total (releases to water in kilograms)
2003	3 195.1	1 012.2	426.4	129.7	181.2	4 944.6
2004	2 258.8	957.7	867.8	136.5	423.8	4 644.6
2005	1 391.2	931.6	454.0	229.4	402.1	3 408.3
2006	1 452.3	1 076.4	435.3	267.6	514.9	3 746.5
2007	1 115.0	1 104.2	877.7	264.2	396.6	3 757.7
2008	979.1	766.1	394.8	348.1	54.2	2 542.2
2009	1 260.1	710.4	365.4	511.6	368.9	3 216.4
2010	1 212.8	704.5	289.0	345.6	189.0	2 741.0
2011	1 356.3	777.4	321.5	201.8	134.5	2 791.5
2012	1 233.2	823.7	327.0	200.9	158.9	2 743.6
2013	902.2	1 095.6	352.2	145.9	268.0	2 763.8
2014	968.0	941.5	319.5	107.9	4 001.7	6 338.6
2015	976.7	783.0	287.3	83.8	114.7	2 245.5
2016	1 117.7	738.6	314.1	103.5	110.5	2 484.5
2017	1 234.6	853.7	282.2	116.5	237.7	2 724.7
2018	1 199.3	814.3	229.6	130.1	301.6	2 674.9
2019	1 645.2	790.4	190.0	168.5	127.1	2 921.2

Note: Totals may not add up due to rounding. The indicator reports facility-based releases only. The indicator includes the amount of elemental cadmium and cadmium in any compound, alloy or mixture reported in the National Pollutant Release Inventory based on the inventory reporting criteria. As a result, the reported cadmium releases to water account for only a portion of the releases of this toxic pollutant to water in Canada. Other sources include electric utilities, manufacturing (except the pulp and paper industry), the oil and gas industry, ore and mineral industries (except non-ferrous metal production and processing), solid waste management and other miscellaneous sources. For more details on sources, please consult the Data sources and methods.
Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

Table A.7. Data for Figure 9. Facility-based cadmium releases to water by province and territory, Canada, 2003, 2009 and 2019

Province or territory	2003 (releases to water in kilograms)	2009 (releases to water in kilograms)	2019 (releases to water in kilograms)
Newfoundland and Labrador	8.4	3.5	4.5
Prince Edward Island	n/a	n/a	20.1
Nova Scotia	12.1	7.3	0.8
New Brunswick	184.8	432.7	100.2
Quebec	2 544.8	759.7	852.1
Ontario	843.6	719.6	1 148.6
Manitoba	360.3	76.1	51.2
Saskatchewan	31.8	10.2	1.1
Alberta	258.3	315.2	161.2
British Columbia	700.3	892.1	581.2
Yukon	n/a	n/a	n/a
Northwest Territories	n/a	n/a	< 0.1
Nunavut	0.2	n/a	0.2
Canada	4 944.6	3 216.4	2 921.2

Note: n/a = not available, it indicates that the province or territory has no reported releases. Totals may not add up due to rounding. The indicator reports facility-based releases only. The indicator includes the amount of elemental cadmium and cadmium in any compound, alloy or mixture reported in the National Pollutant Release Inventory based on the inventory reporting criteria. As a result, the reported cadmium releases to water represent only a portion of the releases of this toxic pollutant to water in Canada.
Source: Environment and Climate Change Canada (2021) National Pollutant Release Inventory.

Additional information can be obtained at:

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