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PULP AND PAPER EFFLUENT QUALITY

CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS



Canada 

Suggested citation for this document: Environment and Climate Change Canada (2022) Canadian Environmental Sustainability Indicators: Pulp and paper effluent quality. Consulted on *Month day, year*. Available at: www.canada.ca/en/environment-climate-change/services/environmental-indicators/pulp-paper-effluent-quality.html.

Cat. No.: En4-144/60-2022E-PDF
ISBN: 978-0-660-44109-2
Project code: EC22011

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PULP AND PAPER

EFFLUENT QUALITY

June 2022

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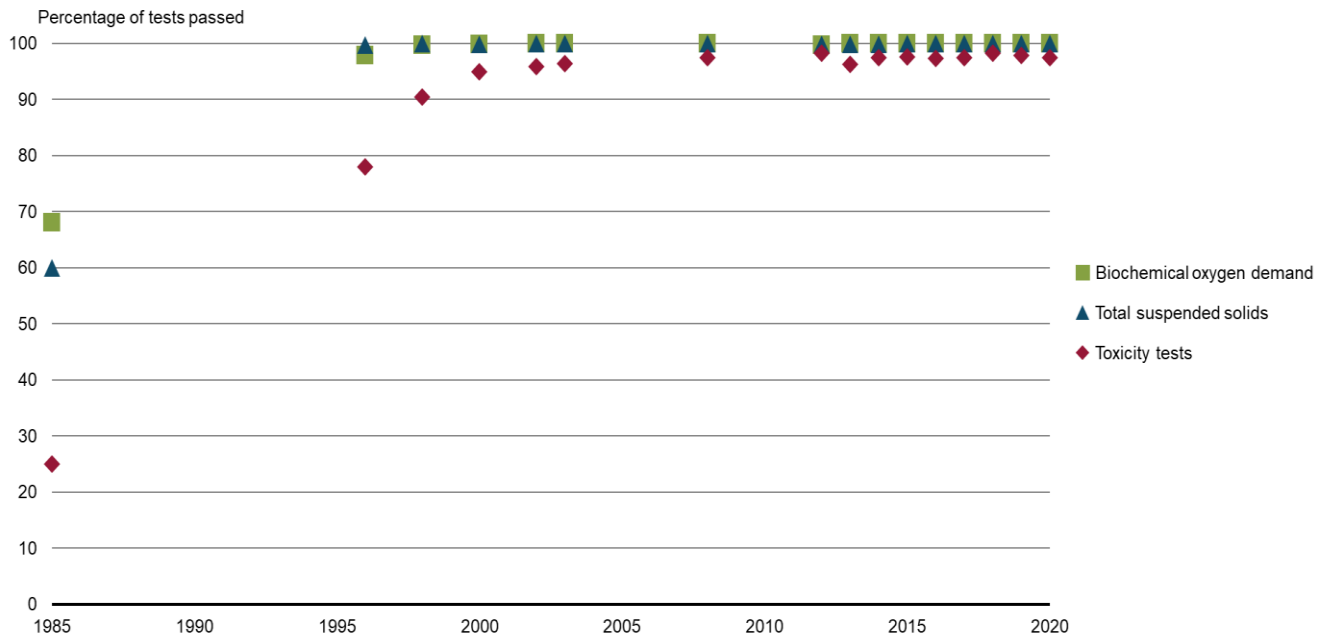
Pulp and paper effluent quality

The *Pulp and Paper Effluent Regulations* govern the discharge of harmful substances from pulp and paper mills into water frequented by fish. This indicator shows the results achieved since the mid 1980's under these regulations.

Key results

- Between 1985 and 2020, the quality of pulp and paper effluent released directly to the environment has improved
- Tests for toxicity met regulatory standards 25% of the time in 1985 and 97.4% of the time in 2020
- Tests for biochemical oxygen demand and total suspended solids met regulatory standards 68% and 60% of the time, respectively, in 1985. Both tests met the standards 99.9% of the time in 2020

Figure 1. Percentage of regulatory tests meeting regulatory standards by pulp and paper mills, Canada, 1985 to 2020 (selected years)



[Data for Figure 1](#)

Note: Toxicity tests refer to tests of effluent toxicity on fish. Biochemical oxygen demand refers to the amount of dissolved oxygen needed to break down organic material in water. Total suspended solids includes all particles in water that will not pass through a filter. As levels of biochemical oxygen demand and total suspended solids rise, a water body begins to lose its ability to support aquatic life.

Source: For 1995 to 2008: Environment and Climate Change Canada (2012) [Status report on the Pulp and Paper Effluent Regulations](#). For 2009 to 2020: Environment and Climate Change Canada's Forest Products and Fisheries Act Division based on submissions from regulated pulp and paper mills and off-site treatment facilities.

Pulp and paper effluent treatment

Pulp is produced from wood, fibre crop or waste paper. It can be produced using chemical, semi-chemical or mechanical processes to break down the raw materials into fibres to be used to create paper.

Effluent is a complex combination of waste produced during the pulp and paper making process including wastewater from debarking, pulp washing, bleaching, and regeneration of cooking chemicals. The effluent is treated prior to release, typically in 2 stages: primary and secondary treatment. In primary treatment, suspended solids are removed in clarifiers and/or settling basins. In secondary treatment, bacteria break down biodegradable material and toxic components. This helps reduce biochemical oxygen demand, toxicity, and levels of total suspended solids that can damage fish habitat downstream from the mill.

Evolution of the *Pulp and Paper Effluent Regulations*

The *Pulp and Paper Effluent Regulations* (the regulations) were first published under the *Fisheries Act* in 1971 to control the release of harmful substances and reduce the effects on fish and fish habitat that had been observed at pulp and paper mills across Canada. At that time, the regulations were applied differently to new, expanded, and altered mills than to existing mills. New, expanded, and/or altered mills were subject to the limits outlined in the regulations. For mills already in operation, the limits served as non-enforceable guidelines.

By the late 1980s, Environment and Climate Change Canada had determined that the 1971 regulations had not produced all of the desired effluent quality improvements. The regulations were amended in 1992 to introduce enforceable effluent quality standards for all mills. These standards included requirements for effluents to be non-lethal to rainbow trout in small amounts, and a requirement to conduct thorough environmental effects monitoring studies to assess potential impacts of mill effluent on receiving environments. The environmental protection measures were developed using the performance of some Canadian mills in the late 1980s and what was achievable through secondary wastewater treatment at the time.

Secondary biological treatment became common by 1996 following the establishment of current regulatory limits in 1992.

About the indicator

What the indicator measures

This indicator reports the percentage of acute lethality, biochemical oxygen demand and total suspended solid tests that are within the regulatory limits for selected years between 1985 and 2020.

Why this indicator is important

Canada is one of the world leaders in the production of pulp and paper products. In 2020, the pulp, paper and paperboard mills industry employed more than 23 000 Canadians¹ and accounted for 0.2% of Canada's gross domestic product.²

The purpose of the *Pulp and Paper Effluent Regulations* is to manage threats to fish, fish habitat, and human health from fish consumption by limiting the deposit of deleterious substances from pulp and paper mills into water frequented by fish. Ensuring that pulp and paper mill operators meet environmental protection standards helps to protect our aquatic environment for future generations.



Pristine lakes and rivers

This indicator supports the measurement of progress towards the following [2019 to 2022 Federal Sustainable Development Strategy](#) long-term goal: Clean and healthy lakes and rivers support economic prosperity and the well-being of Canadians. This indicator is being proposed to track progress in the [draft 2022 to 2026 Federal Sustainable Development Strategy](#).

In addition, the indicator contributes to the [Sustainable Development Goals of the 2030 Agenda for Sustainable Development](#). It is linked to Goal 6, Clean water and sanitation and Target 6.3, "By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally."

¹ Statistics Canada, [Table 36-10-0489-01](#): Labour statistics consistent with the System of National Accounts, by job category and Industry, for the pulp, paper and paperboard mills industry (NAICS 3221), annual (persons). Retrieved on March 28, 2022.

² Statistics Canada, [Table 36-10-0434-03](#): Gross domestic product at basic prices, by Industry, annual average (x 1,000,00), 2012 constant prices and [Table 36-10-0434-06](#): Gross domestic product at basic prices, by industry, annual average, industry detail (x 1,000,000) for the pulp, paper and paperboard mills industry (NAICS 3221), 2012 constant prices. Retrieved on March 28, 2022.

Related indicators

The [Metal and diamond mining effluent quality](#) indicator summarizes the results achieved since the *Metal and Diamond Mining Effluent Regulations* came into effect in 2002.

The [Releases of harmful substances to water](#) indicators track human-related releases to water of 3 toxic substances, namely mercury, lead and cadmium, and their compounds. For each substance, data are provided at the national and regional (provincial and territorial) levels, by facility and by source.

Data sources and methods

Data sources

Data from 1995 to 2008 are taken from Environment and Climate Change Canada's [Status report on the Pulp and Paper Effluent Regulations](#). Data from 2009 to 2020 come from Environment and Climate Change Canada's Forest Products and Fisheries Act Division.

More information

All data were submitted by regulated pulp and paper mills and off-site treatment facilities to Environment and Climate Change Canada. These submissions are required under section 7 of the *Pulp and Paper Effluent Regulations* (the regulations).

Effluent samples for biochemical oxygen demand, total suspended solids, and acute toxicity are taken throughout the year as outlined in the regulations. For each outfall structure discharging directly to the environment:

- biochemical oxygen demand tests are run at least 3 times a week
- total suspended solids are sampled daily
- toxicity tests are run at least once a month

Data for all active pulp and paper mills across Canada are used. There are mills operating in all provinces except Prince Edward Island and Saskatchewan. At the time this indicator was produced, the most recent data available were from 2020.

Methods

The indicator shows the rate of compliance with the regulations. The compliance rate is calculated as the number of tests within the regulatory limits in a year divided by the total number of tests taken in a given year for all mills.

Toxicity tests refer to effluent acute lethality tests conducted on Rainbow Trout (*Oncorhynchus mykiss*). Tests are run once a month for each outfall structure discharging directly to water following [Environment and Climate Change Canada's Reference Method EPS 1/RM/13](#). Effluent is considered acutely lethal if the effluent at 100% concentration kills more than 50% of the Rainbow Trout during a 96-hour period.

Caveats and limitations

The indicator only assesses the quality of effluent released to surface waters. Groundwater is not considered in this indicator.

Other deleterious effects of effluent from pulp and paper mills are not considered with this indicator since the focus is on monitoring under the regulations.

The indicator does not present all the years of data available since 1985. Instead, data for the years 1985, 1996, 1998, 2000, 2002, 2003 and 2008 have been selected to represent effluent quality at key points in the evolution of the regulations and during restructuring of the industry. Further, before 1996, all mills were not required to report data on biochemical oxygen demand or suspended solids. Thus, there is insufficient data between 1985 and 1996. Since 2012, the regulations have remained unchanged and data have been reported annually up to 2020.

Resources

References

Environment and Climate Change Canada (2000) [Biological test method: acute lethality of effluents to rainbow trout. Reference method EPS 1/RM/13](#). Environmental Protection Series. Second ed., December 2000 (with May 2007 amendments). Retrieved on March 28, 2022.

Environment and Climate Change Canada (2012) [Status report on the Pulp and Paper Effluent Regulations / \[by\] Forest Products and Fisheries Act Division, Industrial Sectors Directorate](#). Retrieved on March 28, 2022.

Fisheries and Oceans Canada (2012) [Pulp and Paper Effluent Regulations](#). Retrieved on March 28, 2022.

Annex

Annex A. Data table for the figure presented in this document

Table A.1. Data for Figure 1. Percentage of regulatory tests meeting regulatory standards by pulp and paper mills, Canada, 1985 to 2020 (selected years)

| Year | Toxicity tests passed (percentage) | Total number of toxicity tests | Biochemical oxygen demand tests passed (percentage) | Total number of biochemical oxygen demand tests | Total suspended solids tests passed (percentage) | Total number of total suspended solids tests |
|------|------------------------------------|--------------------------------|---|---|--|--|
| 1985 | 25.0 | n/a | 68.0 | n/a | 60.0 | n/a |
| 1996 | 78.0 | 2 517 | 97.9 | 37 453 | 99.7 | 45 366 |
| 1998 | 90.4 | n/a | 99.7 | n/a | 99.9 | n/a |
| 2000 | 94.9 | n/a | 99.8 | n/a | 99.8 | n/a |
| 2002 | 95.9 | n/a | 99.9 | n/a | 99.9 | n/a |
| 2003 | 96.4 | 1 966 | 99.9 | 33 585 | 99.9 | 41 926 |
| 2008 | 97.4 | 1 847 | 99.9 | 20 883 | 99.9 | 35 646 |
| 2012 | 98.3 | 1 535 | 99.7 | 16 706 | 99.8 | 29 383 |
| 2013 | 96.2 | 1 540 | 99.9 | 16 851 | 99.8 | 29 012 |
| 2014 | 97.5 | 1 457 | 99.9 | 16 559 | 99.8 | 28 670 |
| 2015 | 97.6 | 1 319 | 99.9 | 15 373 | 99.9 | 27 607 |
| 2016 | 97.3 | 1 279 | 99.9 | 14 610 | 99.9 | 26 871 |
| 2017 | 97.5 | 1 277 | 99.9 | 14 848 | 99.9 | 26 936 |
| 2018 | 98.3 | 1 256 | 99.9 | 14 687 | 99.9 | 26 639 |
| 2019 | 97.8 | 1 297 | 99.9 | 15 049 | 99.9 | 28 616 |
| 2020 | 97.4 | 1 206 | 99.9 | 14 522 | 99.9 | 25 997 |

Note: n/a = not available. Toxicity tests refer to tests of effluent toxicity on fish. Biochemical oxygen demand refers to the amount of dissolved oxygen needed to break down organic material in water. Total suspended solids includes all particles in water that will not pass through a filter. As levels of biochemical oxygen demand and total suspended solids rise, a water body begins to lose its ability to support aquatic life.

Source: For 1995 to 2008: Environment and Climate Change Canada (2012) [Status report on the Pulp and Paper Effluent Regulations](#). For 2009 to 2020: Environment and Climate Change Canada's Forest Products and Fisheries Act Division based on submissions from regulated pulp and paper mills and off-site treatment facilities.

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