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PULP AND PAPER EFFLUENT QUALITY

CANADIAN ENVIRONMENTAL
SUSTAINABILITY INDICATORS



Canada 

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CANADIAN ENVIRONMENTAL SUSTAINABILITY INDICATORS

PULP AND PAPER EFFLUENT QUALITY

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Pulp and paper effluent quality

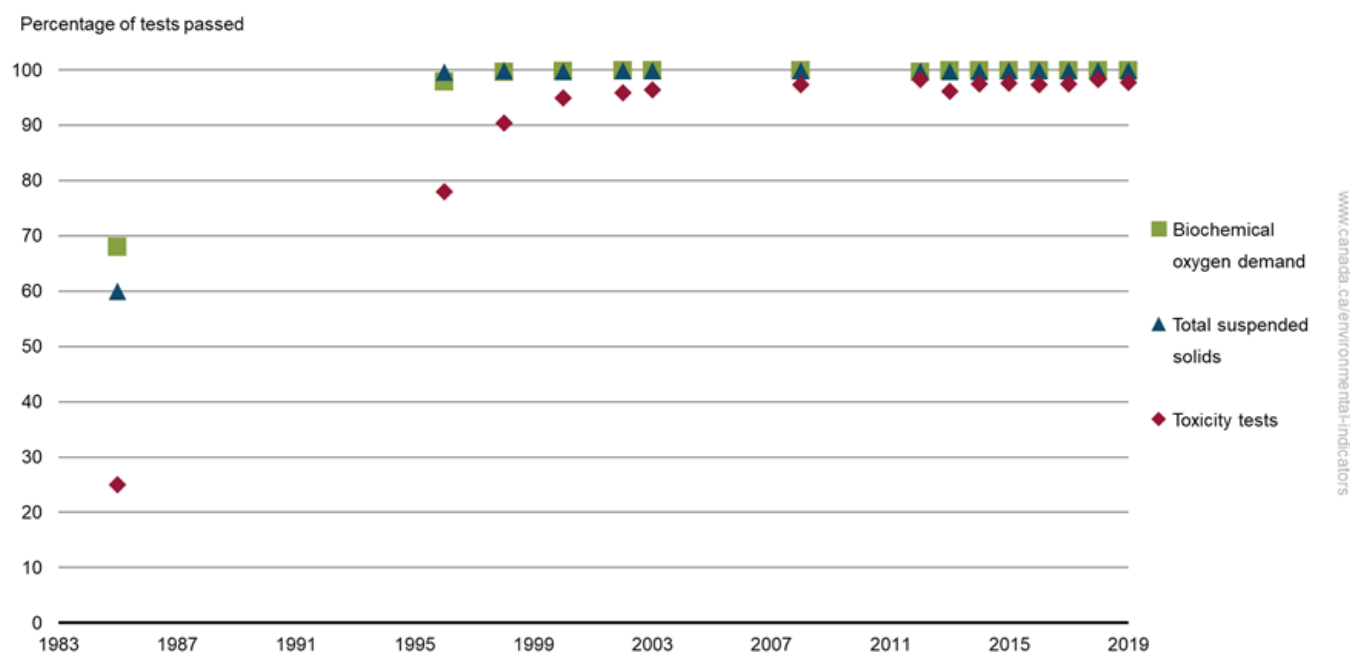
The *Pulp and Paper Effluent Regulations* govern the discharge of harmful substances from pulp and paper mills into water frequented by fish. This indicator shows the results achieved since the mid 1980's under these regulations.

Key results

Between 1985 and 2019, 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 97.8% of the time in 2019
- 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 2019

Figure 1. Percentage of regulatory tests meeting regulatory standards by pulp and paper mills, Canada, 1985 to 2019 (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 1985 to 2008: Environment and Climate Change Canada (2012) [Status report on the Pulp and Paper Effluent Regulations](#). For 2009 to 2019: 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 is produced from wood, fibre crop or waste paper. It can be produced using chemical, semi-chemical or mechanical processes to break the raw materials into fibres to be used to create paper. Large volumes of water are used in pulp production. The pulp and paper industry also ranks second to municipalities in wastewater output to the Canadian environment. A typical kraft mill discharges between 80 000 and 130 000 cubic metres (or roughly 3 to 5 Olympic swimming pools) of effluent per day into water.

The 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, thus reducing biochemical oxygen demand, toxicity and levels of total suspended

solids that can damage fish habitat downstream from the mill. Secondary biological treatment became common by 1996 following the establishment of current regulatory limits in 1992.

Canada is one of the world leaders in the production of pulp and paper products. In 2019, the pulp, paper and paperboard mills industry employed more than 26 000 Canadians¹ and accounted for 0.2% of Canada's gross domestic product.²

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 2019.

Why this indicator is important

The *Pulp and Paper Effluent Regulations* (the regulations) were developed under the *Fisheries Act* in 1971 to govern the discharge of deleterious substances into waters frequented by fish. The regulations were designed to encourage mills to modify their processes in order to improve water quality and protect fish, fish habitat and the use of fisheries resources. They set limits on the amounts of total suspended solids and biochemical oxygen demanding matter, and prohibit deposits of acutely lethal effluent.

The 1971 regulations differentiated between new, expanded, altered and existing mills. New, expanded and/or altered mills were subject to the prescribed limits. For mills already in operation, the limits served as non-enforceable guidelines. In 1992, the 1971 regulations were updated to expand coverage to all mills, and to drive further effluent quality improvements based on standards achievable using secondary wastewater treatment. After a transition period, all mills became subject to the regulations in 1996. The regulatory standards have remained unchanged since.



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.

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."

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.

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 February 24, 2021.

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 February 24, 2021.

Data sources and methods

Data sources

Data from 1985 to 2008 are taken from Environment and Climate Change Canada's [Status report on the Pulp and Paper Effluent Regulations](#). Data from 2009 to 2019 comes 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 2019.

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. Since 2012, the regulations have remained unchanged and data are reported annually to 2019.

Resources

References

Environment and Climate Change Canada (2000) [Biological test method: acute lethality of effluents to rainbow trout. Méthode de référence SPE/RM/13](#). Reference method EPS 1/RM/13. Environmental Protection Series. Second ed., December 2000 (with May 2007 amendments). Retrieved on February 24, 2021.

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 February 24, 2021.

Fisheries and Oceans Canada (2012) [Pulp and Paper Effluent Regulations](#). Retrieved on February 24, 2021.

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 2019 (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

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 1985 to 2008: Environment and Climate Change Canada (2012) [Status report on the Pulp and Paper Effluent Regulations](#). For 2009 to 2019: 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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