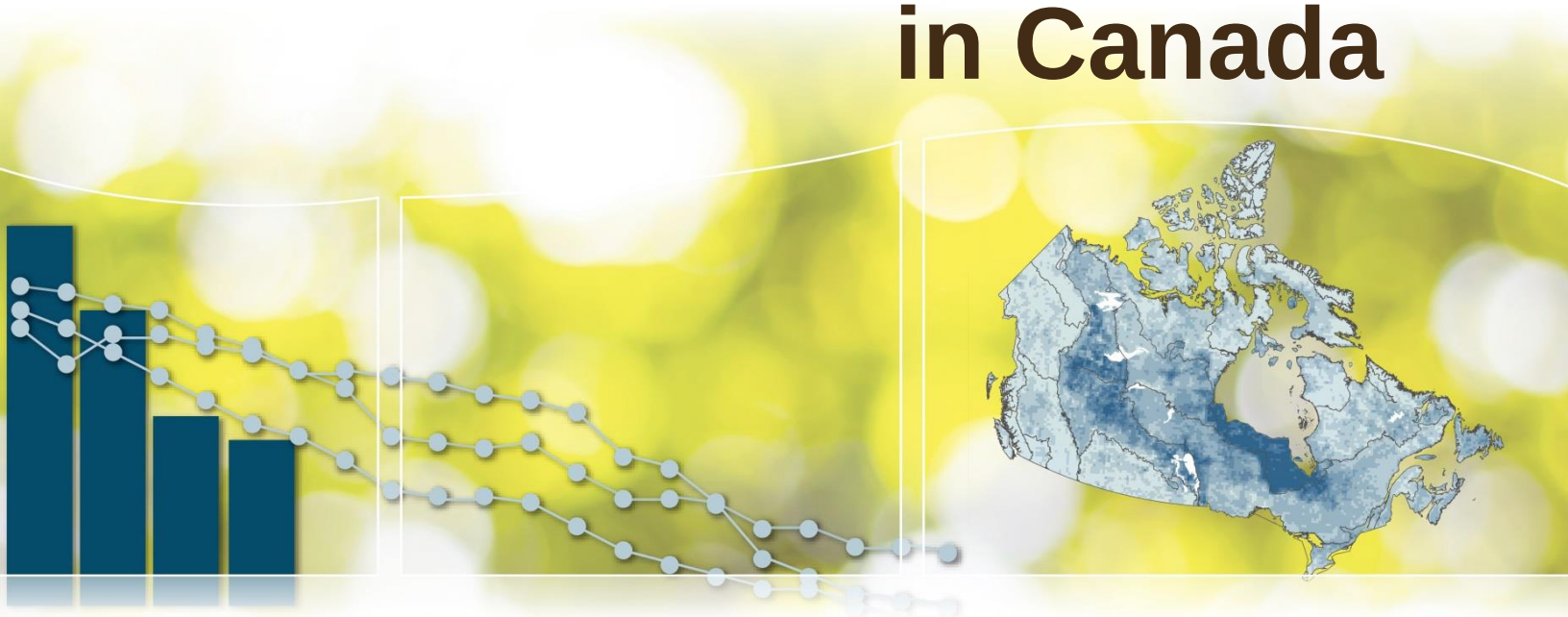
Environment and Climate Change Canada
Environnement et Changement climatique Canada

Canadian Environmental Sustainability Indicators

Managing Pulp and Paper Effluent Quality in Canada



Canada

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Table of Contents

List of Figures

List of Tables

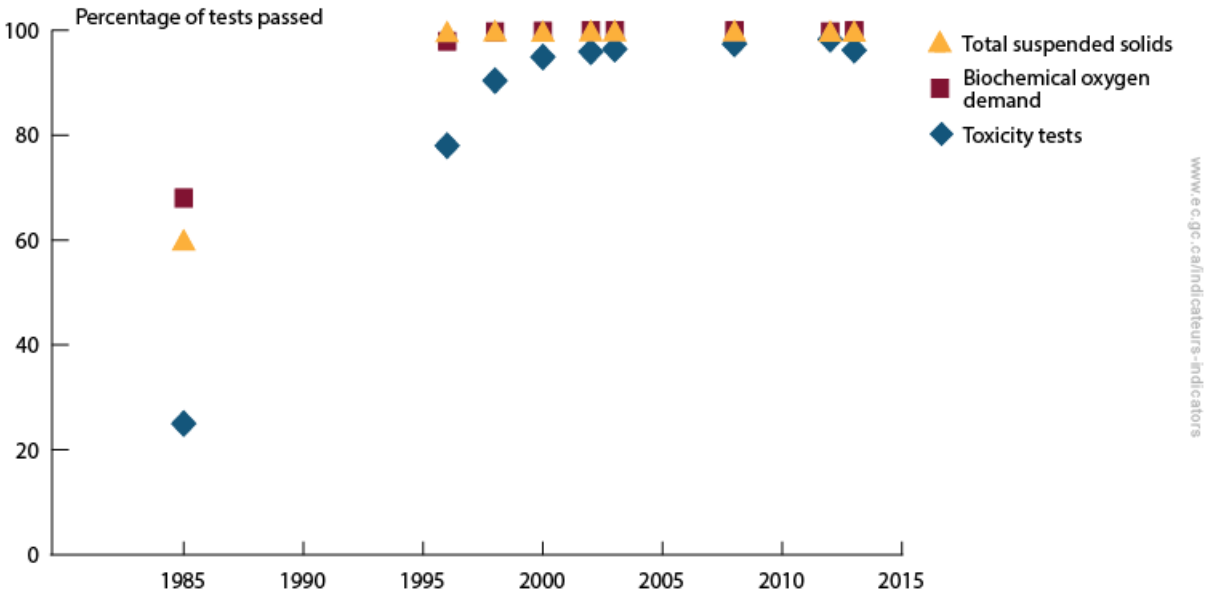
Part 1. Managing Pulp and Paper Effluent Quality in Canada Indicator

The *Pulp and Paper Effluent Regulations* (PPER) were first published in 1971 to oversee the discharge of harmful substances from pulp and paper mills into water frequented by fish. The PPER set limits on the amounts of total suspended solids (TSS) and biochemical oxygen demanding (BOD) matter, and prohibit deposits of effluents that display acute lethality to fish. The limits originally applied to mills that began operation after the PPER came into force and served as non-enforceable guidelines for older mills. In 1992, the PPER were updated to introduce enforceable effluent quality standards for all mills. After a transition period, all mills became subject to the PPER on January 1, 1996.

In 1985, about 10% of mills were subject to the regulations. That year, 25% of effluent samples met regulatory requirements for toxicity tests on fish, while 68% of samples met those requirements for BOD and 60% for TSS.

Since 1985, the quality of pulp and paper effluent released directly to the environment has improved considerably. In 2013, 96.2%, 99.9% and 99.8% of effluent samples met regulatory requirements for toxicity tests on fish, BOD, and TSS, respectively.

Figure 1. **Percentage of regulatory tests passed by pulp and paper mills, Canada, 1985 to 2013 (selected years)**



Data for Figure 1

Note: "Toxicity test" refers 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" include 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 animals.
Source: For 1985–2008: Environment and Climate Change Canada (2012) *Status Report on the Pulp and Paper Effluent Regulations*. For 2012 and 2013: Environment and Climate Change Canada's Fisheries Act and Forest Products (Water) office based on submissions from regulated pulp and paper mills and off-site treatment facilities.

Pulp is produced from wood, fiber crop or waste paper. It can be produced using chemical, semi-chemical or mechanical processes to break the raw materials into fibers to be used to create paper. Canada is one of the world leaders in the production of pulp and paper products. In 2014, the paper manufacturing industry employed 56 289 Canadians,[1] and contributed to 0.4% of Canada's gross domestic product.[2]

Large volumes of water are used in pulp production with the industry ranking second to municipalities in wastewater output to the Canadian environment. For example, a typical kraft mill discharges between 80 000 and 130 000 cubic metres of effluent per day into water, or roughly three to five Olympic swimming pools of effluent a day. Effluents are 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 effluents are treated prior to release, typically in two 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 – 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.

This indicator is used to measure progress toward Target 3.11: Wastewater and Industrial Effluent: Reduce risks associated with effluent from wastewater (sewage) and industrial sectors by 2020 of the Federal Sustainable Development Strategy 2013–2016.

[1] Statistics Canada, Table 281-0024 – Employment (SEPH), unadjusted for seasonal variation, by type of employee for selected industries classified using the North American Industry Classification System (NAICS), for the paper manufacturing industry (NAICS 322), annual (persons). Retrieved on 11 August, 2015.

[2] Statistics Canada, Table 379-0031 – Gross domestic product (GDP) at basic prices, by the North American Industry Classification System (NAICS), for the paper manufacturing industry (NAICS 322), annual (2007 constant million dollars). Retrieved on 11 August, 2015.

Part 2. Data Sources and Methods for the Managing Pulp and Paper Effluent Quality in Canada Indicator

Introduction

The Managing Pulp and Paper Effluent Quality in Canada indicator is part of the Canadian Environmental Sustainability Indicators (CESI) program, which provides data and information to track Canada's performance on key environmental sustainability issues. This indicator is also used to measure progress towards the goals and targets of the Federal Sustainable Development Strategy.

Description and rationale of the Managing Pulp and Paper Effluent Quality in Canada indicator

Description

The Managing Pulp and Paper Effluent Quality in Canada indicator reports the percentage of acute lethality, biochemical oxygen demand (BOD) and total suspended solid (TSS) tests that met their regulatory limits from 1985 to 2013. The indicator provides information about whether Canada's *Pulp and Paper Effluent Regulations* (PPER) are able to sustainably manage the impact of Canada's pulp and paper industry on the environment.

Rationale

The PPER were developed under the Fisheries Act in 1971 to govern the discharge of deleterious substances into waters frequented by fish. The PPER have the overall objective of protecting water quality that sustains fish, fish habitat and the use of fisheries resources. This indicator summarizes the results achieved since the mid 1980's under the PPER.

The PPER 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. Prior to 1992, the PPER set mass-based limits for deposits of TSS and BOD matter, and prohibited the release of effluents that were acutely lethal to fish. In 1992, the 1971 PPER were updated to expand coverage to all mills, and to drive further effluent quality improvements based on standards achievable using secondary wastewater treatment. Since 1992, the regulatory standards have remained unchanged.

Data

Data source

Data for the Managing Pulp and Paper Effluent Quality in Canada indicator for 1985–2008 are taken from Environment and Climate Change Canada's Status Report on the *Pulp and Paper Effluent Regulations*. Data for 2012 and 2013 comes from Environment and Climate Change Canada's Fisheries Act and Forest Products (Water) office based on submissions from regulated pulp and paper mills and off-site treatment facilities as required under section 7 of the *Pulp and Paper Effluent Regulations* (PPER) pursuant to the *Fisheries Act*.

Spatial coverage

For this indicator, data for all active pulp and paper mills across Canada are used. There are mills operating in all provinces except Prince Edward Island.

Temporal coverage

Environment and Climate Change Canada receives monthly or annual reports from pulp and paper mills across Canada. The reports include monitoring results and production information.

Effluent samples for biochemical oxygen demand (BOD), total suspended solid (TSS) and toxicity are taken throughout the year as laid out in the *Pulp and Paper Effluent Regulations* (PPER). Biochemical oxygen demand tests are taken at least three times a week for each outfall structure discharging directly to the environment. TSS are sampled daily for each outfall structure discharging directly to the environment. Toxicity tests are run once a month for each outfall structure discharging directly to the environment.

Data from selected years (1985, 1996, 1998, 2000, 2002, 2003, 2008, 2012 and 2013) are included to represent effluent quality at key points in the evolution of the PPER and during the rationalization of the industry.

Data completeness

The indicator includes all compliance data sent to Environment and Climate Change Canada for the years reported in this indicator.

Data timeliness

The most recent data available at the time this indicator was produced are for 2013.

Methods

The Managing Pulp and Paper Effluent Quality in Canada indicator is based on the compliance rate, which is calculated as the number of tests passing their maximum limits in a year for all mills divided by the total number tests of taken in a given year.

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. An 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 Managing Pulp and Paper Effluent Quality in Canada indicator only assesses the quality of effluent releases to surface waters. Groundwater is not considered in this indicator.

Part 3. Annexes

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

Table A.1. Data for Figure 1. Percentage of regulatory tests passed by pulp and paper mills, Canada, 1985 to 2013 (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	n/a	68	n/a	60	n/a
1996	78	2517	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	1966	99.9	33 585	99.9	41 926
2008	97.4	1847	99.9	20 883	99.9	35 646
2012	98.3	1535	99.7	16 706	99.8	29 383
2013	96.2	1540	99.9	16 851	99.8	29 012

Note: n/a = not available. "Toxicity test" refers 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" include 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 animals.
Source: For 1985–2008: Environment and Climate Change Canada (2012) *Status Report on the Pulp and Paper Effluent Regulations*. For 2012 and 2013: Environment and Climate Change Canada's Fisheries Act and Forest Products (Water) office based on submissions from regulated pulp and paper mills and off-site treatment facilities.

Annex B. References and additional information

References and further reading

Environment Canada (2000) Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout, Report EPS 1/RM/13. Environmental Protection Series. 2nd ed., December 2000. Retrieved on 3 September, 2014.

Environment Canada (2003) National Assessment of Pulp and Paper Environmental Effects Monitoring Data: A Report Synopsis. National Water Research Institute, Burlington, Ontario. NWRI Scientific Assessment Report Series No. 2. 28 p. Retrieved on 3 September, 2014.

Environment Canada (2012) Status Report on the *Pulp and Paper Effluent Regulations*. Retrieved on 3 September, 2014.

Fisheries and Oceans Canada (2012) *Pulp and Paper Effluent Regulations*. Retrieved on 2 September, 2015.

McMaster ME, Parrott JL and Hewitt LM (2003) A Decade of Research on the Environmental Impacts of Pulp and Paper Mill Effluent in Canada (1992–2002). National Water Research Institute, Burlington, Ontario. NWRI Scientific Assessment Report Series No. 4. 84 p. Retrieved on 3 September, 2014.

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