



Data Sources and Methods for the Emission of Toxic Substances to Air Indicators

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1 Introduction

The emissions of toxic substances to air indicators are part of the Canadian Environmental Sustainability Indicators (CESI) program (http://www.ec.gc.ca/indicateurs-indicators), which provides data and information to track Canada's performance on key environmental sustainability issues.

The indicators track emissions of toxic substances released to the air by human activity in Canada. These indicators help to inform Canadians about key air pollutants that have been listed as toxic to human health and the environment. The indicators also help the government to identify priorities and to develop and track progress on strategies and policies put in place to reduce or control air pollution.

2 Description and rationale of the Emission of Toxic Substances to Air Indicators

2.1 Description

The indicators track anthropogenic emissions of two toxic substances to air: mercury (Hg) and hexavalent chromium (Cr(VI)). For each toxic substance, emissions are provided at the national, provincial or territorial, source and facility level. International information is also provided for mercury.

2.2 Rationale

Mercury and hexavalent chromium are on the List of Toxic Substances (www.ec.gc.ca/lcpecepa/default.asp?lang=En&xml=0DA2924D-E77E-2E16-A9D2-95388AD49B21) under Schedule 1 of the *Canadian Environmental Protection Act*, 1999 (CEPA 1999). This means that they are "entering or may enter the environment in a quantity or concentration or under conditions that 1) have or may have an immediate or long-term harmful effect on the environment or its biological diversity and/or 2) constitute or may constitute a danger to the environment on which life depends and/or 3) constitute or may constitute a danger in Canada to human life or health."

3 Data

3.1 Data source

The mercury (Hg) emissions indicators reported in CESI come from the air pollutant emission summaries and trends (also referred to as "Air Pollutant Emissions Data") (ec.gc.ca/pdb/websol/emissions/ap/ap_query_e.cfm) compiled by Environment Canada's National Pollutant Release Inventory (NPRI) program (www.ec.gc.ca/inrp-npri/default.asp?lang=en).

The air pollutant emission summaries and trends are compiled in collaboration with provincial/territorial, and regional environmental agencies. They include emissions reported by industrial facilities to the NPRI as well as provincial/territorial and municipal inventories, and emissions estimated for other sources by Environment Canada using the latest published statistics or sources of information such as surveys, special emissions studies, and emissions estimation techniques.

The Hg emissions for international comparison are retrieved from the Global Atmospheric Mercury Assessment: Sources, Emissions and Transport report of the United Nations Environment Programme (UNEP) (http://www.unep.org/hazardoussubstances/Mercury/

MercuryPublications/GlobalAtmosphericMercuryAssessmentSourcesEm/tabid/3618/language/en-US/Default.aspx).

The hexavalent chromium (Cr(VI)) emissions indicators come solely from the NPRI database of reported facility emissions.

Emissions reported on the interactive map were retrieved directly from the NPRI database only (http://www.ec.gc.ca/inrp-npri/default.asp?lang=en&n=0EC58C98-1#Facility) (also referred to as "Facility Reported Data": ec.gc.ca/pdb/websol/querysite/query_e.cfm) for both Cr(VI) and Hg.

3.2 Spatial coverage

The indicators are calculated at the national, provincial or territorial, and source level. Air toxic emissions are displayed by facility on the interactive map. International data are presented for Hg only.

3.3 Temporal coverage

Previous years are available at the national level for Hg (1990 to 2010) and for Cr(VI) (2003 to 2010). The year 1990 was selected for the Hg trend because it is the base year for Canada's international commitment for reporting on Hg to the Convention on Long-Range Transboundary Air Pollution (CLRTAP). For Cr(VI), the base year selected is 2003 because it is the first year with the latest NPRI reporting thresholds for this substance. Hg international comparisons are provided for the year 2005 only.

3.4 Data completeness

Some portions of the 2010 Hg emissions in NPRI's air pollutant emission summaries and trends (http://ec.gc.ca/pdb/websol/emissions/ap/ap_query_e.cfm) were approximated using 2009 data because 2010 information was unavailable at the time of inventory production. Estimates for 2009 were used for some area and mobile-source emissions.

For Cr(VI) emissions, trends were developed using the emissions reported by facilities to the NPRI database, which only represent a portion of the air emissions of this pollutant. The table below indicates the number of facilities reporting Cr(VI) emissions since 2003.

Year	2003	2004	2005	2006	2007	2008	2009	2010
Number of facilities	119	129	129	123	118	115	104	101

Table 1: Number of NPRI facilities in Canada r	reporting Cr(VI)	air emissions
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Number of facilities that reported in all years from 2003 to 2010: 70.

3.5 Data timeliness

The data are current up to 2010 (except as described in section 3.4 above). The indicators are reported approximately two years after data collection because of the time required for data validation, analysis and interpretation.

4 Methods

Emissions of toxic substances to air are measured or estimated through one of the following:

• Continuous Emission Monitoring Systems (CEMS)

Canadian Environmental Sustainability Indicators

- Predictive Emission Monitoring (PEM)
- Source testing
- Mass balance
- Site-specific emission factor
- Published emission factor
- Engineering estimates
- Special studies

These measurement methods and estimation techniques are used by the facilities to report their releases to the NPRI (point sources) and by Environment Canada in their estimations of the other sources (area and mobile sources) included in the Air Pollutant Emissions Data (ec.gc.ca/pdb/websol/emissions/ap/ap_query_e.cfm).

The emissions estimation methods are reviewed, updated and improved on a periodic basis in collaboration with sector experts from within and outside Environment Canada. Additional information on these methods is available through the Environment Canada NPRI website on air pollutant emissions (www.ec.gc.ca/inrp-npri/default.asp?lang=En&n=5C71562D-1).

In the comprehensive emissions tables for Hg, three different emissions sources are included: area, mobile and point (stationary) sources. Emissions are compiled using top-down and bottom-up approaches.

Area source emissions are from sources that are too small or too numerous to be reported as individual point sources. They are usually compiled through a top-down approach by applying emission factors to activity levels to estimate emissions.

Mobile source (transportation) emissions are compiled using a combination of bottom-up and top-down approaches. Emissions are estimated using models that include fuel consumption, number of vehicles, movement, distance travelled, and many other parameters (e.g. MOBILE Canadian model).

Point-source emissions are compiled through a bottom-up approach starting with facility-level emissions from combustion, processes and fugitive sources. The NPRI and the provincial and territorial emissions inventories are used to compile emissions from point sources.

Double counting of emissions for the same source is eliminated through data reconciliation. If emissions can be compiled from point sources, the reconciliation process assures that they are not included in the area-source summation to avoid double counting. A data quality-control process is also in place to avoid discrepancies in the database, both in data compilation and in the production of summary tables.

5 Caveats and Limitations

The mercury (Hg) total emissions charts in CESI exclude open and natural sources. This is consistent with Environment Canada's 2010 Air Pollutant Emission Summaries and Historical Emission Trends (http://www.ec.gc.ca/inrp-npri/default.asp?lang=En&n=F98AFAE7-1).

Mercury emissions from products are included in the 2007-2010 estimates. However, they are not yet included in the estimates for previous years. Updates to historical trends are currently being compiled by NPRI.

The number and composition of NPRI facilities that reported Cr(VI) each year varies. This variation is due to the fact that only facilities that exceed a certain threshold of emissions should report to the NPRI. An analysis of how this might affect the apparent trends has not been done.

Data reported from emitting facilities (NPRI) may be updated from time to time by the reporter as new and more up-to-date information is received and reviewed.

Facilities reporting to the NPRI may use different calculation methods to report how much of a particular substance they release. These methods vary depending on the substance and/or facility and may also change from year to year.

CESI classifies emission sources for Hg by summarizing emissions from multiple categories and sources as defined in the NPRI.

CESI	NPRI Air Pollutant Emissions Sources	
Sources		
Iron Ore Mining Industry	Iron Ore Mining Industry	
Petroleum Industry	Upstream Petroleum Industry	
5	Downstream Petroleum Industry	
Cement and Concrete	Cement and Concrete Industry	
Industry		
Iron and Steel Industries	Iron and Steel Industries	
Non-Ferrous Smelting and	Non-Ferrous Smelting and Refining	
Refining Industry	Industry	
Incineration	Crematorium	
	Industrial and Commercial Incineration	
	Municipal Incineration	
	Other Incineration and Utilities	
Electric Power Generation (Utilities)	Electric Power Generation (Utilities)	
Other Sources	Abrasives Manufacture	
	Aluminum Industry	
	Asbestos Industry	
	Asphalt Paving Industry	
	Bakeries	
	Chemicals Industry	
	Mineral Products Industry	
	Foundries	
	Grain Industries	
	Mining and Rock Quarrying	
	Pulp and Paper Industry	
	Wood Industry	
	Petroleum Product Transportation and Distribution	
	Other Industries	
	Metal Fabrication	
	Glass Manufacture	
	Vehicle Manufacture (Engines, Parts,	

Table 2: Comparison of sources for Hg used in CESI and NPRI

CESI	NPRI Air Pollutant Emissions Sources
Sources	Assembly Painting)
	Flectronics
	Plastics Manufacture
	Food Preparation
	Paint and Varnish Formulation
	Miscellaneous Industrial Sources
	Commercial Fuel Combustion
	Posidontial Fuel Combustion
	Residential Fuel Wood Compustion
	Air Transportation
	Heavy-duty Diesel Vehicles
	Heavy-duty Diesel Venicles
	Light duty Diosol Trucks
	Light duty Diesel Vohiclos
	Light duty Casolino Trucks
	Light duty Casoline Vobiclos
	Marino Transportation
	Matercyclos
	Pail Transportation
	Tiro Woar and Brako Linings
	Off road Use of Diesel
	Off road Use of Caseline / I PC / CNC
	Cigaratta Smaking
	Dry Cleaning
	General Solvent Use
	Maine Cargo Handing Industry
	Defined Detroloum Droducts Detail
	Refined Petroleum Products Retain
	Structural Eiros
	Structurd Files
	Duilidii Other Missellaneous Sources
1	other miscenarieous sources

Mercury emissions in different countries are being estimated using the best data, measurements and methods available. Even though the national Hg emissions used for the comparison follow the same reporting structure as the Global Atmospheric Mercury Assessment report (http://www.unep.org/hazardoussubstances/Mercury/MercuryPublications/ GlobalAtmosphericMercuryAssessmentSourcesEm/tabid/3618/language/en-US/Default.aspx), users must be cautious when comparing the data as emissions estimation methodologies differ among countries.

6 References and further reading

6.1 References

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www.ec.gc.ca

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