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Data Sources and Methods for the Air Pollutant Emissions Indicators

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1 Introduction

The air pollutant emissions indicators are part of the Canadian Environmental Sustainability Indicators (CESI) program (<http://www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=47F48106-1>), which provides data and information to track Canada's performance on key environmental sustainability issues.

The air pollutant emissions indicators track the emissions of key air pollutants that contribute to smog and acid rain in Canada, and that can adversely affect the health of Canadians and the environment. These indicators inform Canadians on the levels of air pollutants that are emitted in Canada. The air pollutant emissions indicators also help the government to identify priorities, track progress, and develop strategies and policies for reducing or controlling air pollution.

2 Description and rationale of the air pollutant emissions indicators

2.1 Description

The air pollutant emissions indicators track the total emissions of key air pollutants from anthropogenic (human-related) sources. These air pollutants are sulphur oxides (SO_x), nitrogen oxides (NO_x), volatile organic compounds (VOCs), ammonia (NH₃), carbon monoxide (CO), total particulate matter (TPM), respirable particulate matter (PM₁₀) and fine particulate matter (PM_{2.5}).

For each air pollutant, the indicators are provided at the national, provincial and territorial levels. They also identify the major sources of emissions and provide links to the detailed information on air pollutant emissions from industrial facilities.

3 Data

3.1 Data source

The air pollutant emissions indicators used in CESI come from the air pollutant emissions summaries and trends (<http://www.ec.gc.ca/inrp-npri/default.asp?lang=En&n=F98AFAE7-1>) compiled by Environment Canada's National Pollutant Release Inventory (NPRI) (<http://www.ec.gc.ca/inrp-npri/default.asp?lang=en>) program.

The air pollutant emissions summaries and trends are compiled in collaboration with provincial, territorial and regional environmental agencies. The emissions inventory (summaries and trends) includes emissions reported by facilities to the NPRI, as well as emissions estimated by Environment Canada using the latest estimation methods, published statistics or other sources of information such as surveys and reports. For the mapping application, the emissions are directly retrieved from the NPRI database (<http://www.ec.gc.ca/inrp-npri/default.asp?lang=en&n=0EC58C98-1#Facility>).

3.2 Spatial coverage

The indicators are calculated at the national, provincial and territorial levels. Air pollutant emissions are also available at the facility level in the CESI mapping application.

3.3 Temporal coverage

The latest year available for the air pollutant emissions indicators is 2011. Past years (1990-2010) are also available at the national level. For facility emissions, information on key air pollutants is available for 2002 to 2011. All emissions used for the air pollutant emissions indicators are annual values.

3.4 Data completeness

The air pollutant emissions summaries and trends (<http://www.ec.gc.ca/inrp-npri/default.asp?lang=En&n=F98AFAE7-1>) are compiled to provide the best information available on all significant sources of the key air pollutants. As such, improvements to data completeness are made periodically as new emission estimation methodologies are adopted and additional information is made available. The historical emissions are also updated with these new improvements.

3.5 Data timeliness

The data are current up to 2011. The CESI air pollutant emissions indicators are reported approximately two years after data collection, once validation, calculation and interpretation of the data have been completed.

4 Methods

Emissions are estimated or measured through one of the following methods:

- Continuous emission monitoring systems (CEMS)
- Predictive emission monitoring (PEM)
- Source testing
- Mass balance
- Site-specific emission factors
- Published emission factors
- Engineering estimates
- Special studies

The methodologies used to estimate emissions are reviewed, updated and improved on a periodic basis. Collaborative work with sector experts from within or outside Environment Canada is undertaken to incorporate available expertise and the latest advancements in scientific knowledge. Further information on these methods is available through the Environment Canada NPRI website on air pollutant emissions (<http://www.ec.gc.ca/inrp-npri/default.asp?lang=En&n=5C71562D-1>) and through the Manual for the Compilation of Canada's Air Pollutant Emissions.

In the comprehensive emissions tables, the NPRI includes three emissions sources: area, mobile, and point (stationary) sources. Emissions are compiled using top-down and bottom-up approaches, which are described below.

Area source emissions are sources too small or too numerous to be reported individually as point sources. They are usually compiled through a top-down approach using activity-level statistics and emission factors that are specific to the source. Activity levels are multiplied by emission factors to estimate the emissions for the specific source.

Mobile source (transportation) emissions are compiled using a combination of bottom-up and top-down approaches. Emissions are estimated using models that consider the number of

vehicles, the fuel consumed, the distance travelled, and many other parameters (e.g., MOBILE Canadian model).

Point source emissions are compiled through a bottom-up approach starting with emissions from facilities. The facility information reported to the NPRI is used in combination with some provincial information to compile the emissions from point sources.

The comprehensive emissions tables contain all three emissions sources (area, mobile and point sources). Care is taken to avoid double counting of emissions for the same source. A reconciliation of the emissions is conducted when point source emissions are already accounted for in the area source estimates. In these cases, the area source estimates are modified (reduced or removed) 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 national and provincial emissions charts show total emissions without natural sources, such as forest fires. Open sources such as construction operations and road dust are also excluded, with the exception of ammonia emissions from the agricultural source. The agricultural source is the largest source of ammonia emissions in Canada.

CESI classifies emissions by summarizing emissions from multiple sources as defined in the NPRI Air Pollutant Emissions Summaries and Trends. The CESI emission contribution comparisons do not include emissions from open and natural sources (except for ammonia for the same reason as stated above).

Table 1: Comparison of Sources Used in CESI and NPRI	
CESI Sources	NPRI Air Pollutant Emissions Sources
PAINTS AND SOLVENTS	General Solvent Use
	Surface Coatings
INCINERATION AND MISCELLANEOUS	Incineration Sources
	Cigarette Smoking
	Dry Cleaning
	Marine Cargo Handling Industry
	Meat Cooking
	Refined Petroleum Products Retail
	Printing
	Structural Fires
	Human
	Other Miscellaneous Sources
HOME FIREWOOD BURNING	Residential Fuel Wood Combustion
FUEL FOR ELECTRICITY AND HEATING	Electric Power Generation (utilities)
	Commercial Fuel Combustion
	Residential Fuel Combustion

Table 1: Comparison of Sources Used in CESI and NPRI	
CESI Sources	NPRI Air Pollutant Emissions Sources
OFF-ROAD VEHICLES	Off-road Use of Diesel
	Off-road Use of Gasoline/LPG/CNG
TRANSPORTATION (ROAD, RAIL, AIR, MARINE)	Air Transportation
	Heavy-duty Diesel Vehicles
	Heavy-duty Gasoline Trucks
	Light-duty Diesel Trucks
	Light-duty Diesel Vehicles
	Light-duty Gasoline Trucks
	Light-duty Gasoline Vehicles
	Marine Transportation
	Motorcycles
	Rail Transportation
	Tire Wear and Brake Linings
OIL AND GAS INDUSTRY	Upstream Petroleum Industry
	Downstream Petroleum Industry
OTHER INDUSTRIES	Abrasives Manufacture
	Aluminum Industry
	Asbestos Industry
	Asphalt Paving Industry
	Bakeries
	Cement and Concrete Industry
	Chemicals Industry
	Mineral Products Industry
	Foundries
	Grain Industries
	Iron and Steel Industries
	Iron Ore Mining Industry
	Mining and Rock Quarrying
	Non-Ferrous Smelting and Refining Industry
	Pulp and Paper Industry
	Wood Industry
	Petroleum Product Transportation and Distribution
	Other Industries
	Metal Fabrication
	Glass Manufacture
	Vehicle Manufacture (Engines, Parts, Assembly, Painting)

Table 1: Comparison of Sources Used in CESI and NPRI	
CESI Sources	NPRI Air Pollutant Emissions Sources
	Electronics
	Plastics Manufacture
	Food Preparation
	Paint and Varnish Formulation
	Textiles
	Miscellaneous Industrial Sectors
	Biofuel Production
AGRICULTURE (LIVESTOCK AND FERTILIZER)	Agriculture

The air pollutant emissions indicators continue to evolve. Improvements are made every year to methodologies for estimating and compiling emissions summaries and analyzing trends. As a result of these improvements, emissions for a given year may be different from those previously published by Environment Canada, other governmental agencies and international organizations. Caution is advised when comparing different reports.

Some area sources emissions were not updated for 2011 due to activity level statistics not available at the time of the compilation. In these cases, the emission estimates from the most recent year were used (2010 data).

6 References and further reading

6.1 References

Environment Canada (2012) Manual for the Compilation of Canada's Air Pollutant Emissions. Retrieved on 8 January, 2013.

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Environment Canada (2012) National Pollutant Release Inventory (NPRI) - Pollution Data and Reports. Retrieved in February, 2013. Available from: <http://www.ec.gc.ca/inrp-npri/default.asp?lang=En&n=B85A1846-1>

6.2 Further reading

Environment Canada (2011) Guide for Using and Interpreting National Pollutant Release Inventory (NPRI) data. Retrieved on 8 January, 2013. Available from: <http://ec.gc.ca/inrp-npri/default.asp?lang=En&n=B5C1EAB8-1>

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