TRACKING CANADIAN MERCURY EMISSIONS FROM PRODUCTS CONTAINING MERCURY

IEIC Conference
Dallas, Texas
July 29 to August 2, 2019

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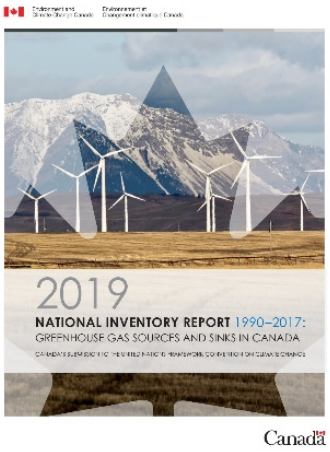
INVENTORY REPORTING AT ECCC SCIENCE AND TECHNOLOGY BRANCH

- Greenhouse Gas Inventory
- Air Pollutant Emissions Inventory
- Black Carbon Inventory



AIR POLLUTANT EMISSIONS INVENTORY

- Canada has international reporting obligations under the 1979 Convention on Long Range Transboundary Air Pollution (CLRTAP) and the associated protocols; we report 17 pollutants annually to the United Nations

AIR POLLUTANT EMISSIONS INVENTORY

- Overall Hg emissions have declined in the last ~25-years, compiled from a number of sources

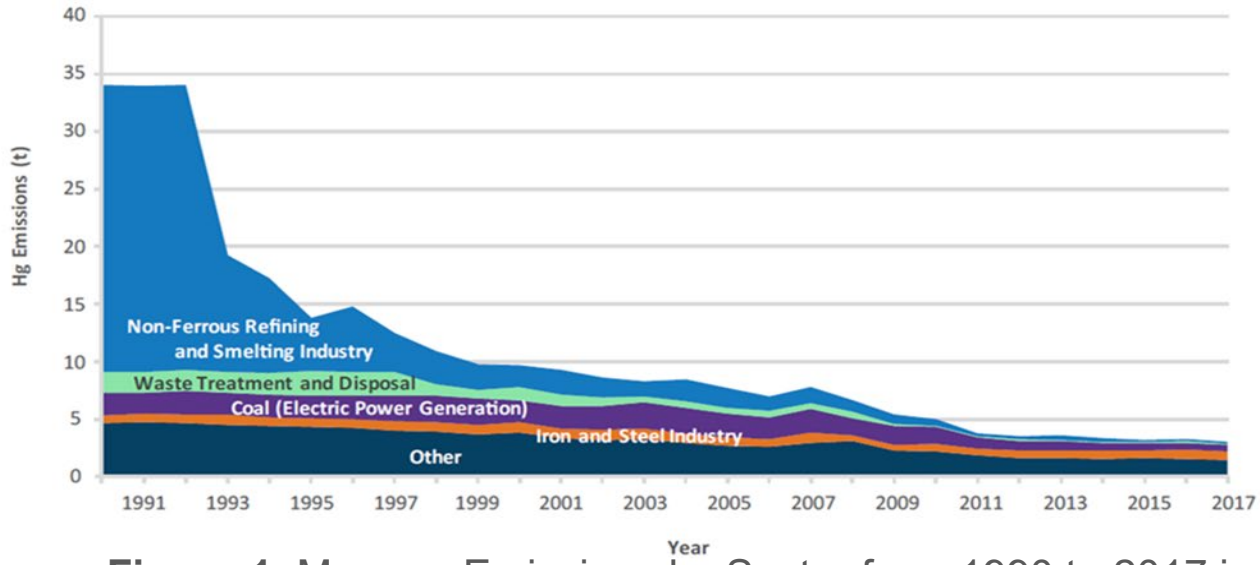


Figure 1. Mercury Emissions by Sector from 1990 to 2017 in the 2019 Publication of the APEI

CONTEXT OF PRESENTATION

Hg Initiatives in Canada and Beyond

- **Canada**:
  - Hg is listed as a toxic substance under the Canadian Environmental Protection Act (1999)
  - Risk Management Strategy on Mercury (2010)
  - Products Containing Mercury Regulations (2015)
  - Canadian Mercury Science Assessment (2016)

- **International**:
  - Minamata Convention on Mercury

CONTEXT OF PRESENTATION

- In the past, Hg-in-Products models incorporated very little Canadian data
- The last update to the models occurred in 2008, and emissions have been carried forward ever since

- *Purpose of the updates:*
  - To provide an updated perspective for the lifecycle of products containing Hg in Canada over a nine-year period (2009 to 2017) and their associated atmospheric releases

HG-IN-PRODUCTS TRACKING IN CANADA

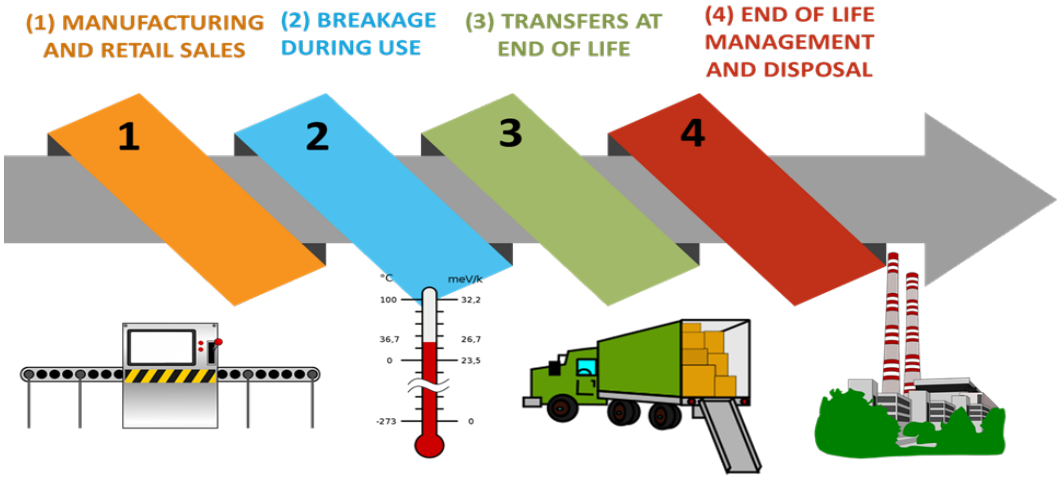
- *10 product categories considered:*
  - Tire Balancers
  - Batteries
  - Fluorescent Lamps
  - Non-Fluorescent Lamps
  - Automotive Switches
  - Switches and Relays
  - Measurement and Control Devices
  - Thermometers
  - Thermostats
  - Dental Amalgams

DEVELOPMENT OF MODELLING COMPONENTS

- **Hg In-Service Reservoir:** Hg available by product category based on product lifespan, importation and manufacture in Canada and mercury content
- **Hg Distribution Pathways**: Percentage of Hg sent to a specific destination in the lifecycle, developed based on manufacturing, retail sales and end-of-life management practices for the product category
- **Emission Factors:** Determines the relative quantity of Hg released to air, land, and water at each Hg distribution pathway

MODELLING HG-IN-PRODUCTS IN CANADA

- Mass-balance estimation used for each product category with an in-service Hg reservoir, distribution pathways for Hg (e.g., breakage, landfills, recycling) and releases to air through the use of emission factors



Graphics modified from: www.presentationgo.com

SCOPE OF HG-IN-PRODUCTS UPDATES

- Updates considered changes in Hg reservoirs and Hg distribution pathways for each of the 10 product categories from 2009 to 2017
- Emission factors were carried forward from previous models
- Splicing method provided by the International Panel on Climate Change (IPCC) was used for time series consistency for APEI publishing (1990 to 2017)

METHODOLOGICAL APPROACH TO UPDATES

- Hg In-Service Reservoirs (kg) & Distribution Pathways (%):
  - A literature review of scientific articles, data and/or reports, regulations and product stewardship or extended producer responsibility programs
  - Consultation with the Canadian Thermostat Recovery Program to gain additional information for this product category
  - Distribution pathways were updated with product specific information when available
  - US data apportioned for Canada was considered when Canadian data was limited

FINDINGS: HG IN-SERVICE RESERVOIR AND DISTRIBUTION PATHWAYS

- Size of Hg in-service reservoirs declined over the nine-year study period
  - Several initiatives and regulations have phased out the use of Hg in products and overall reduction in mercury content

- Major shifts in distribution pathways
  - Majority of products are no longer manufactured in Canada; higher recycling rates compared to other end-of-life management options

FINDINGS: ATMOSPHERIC HG EMISSIONS

- Hg emissions in 2009 were 1629 kg and declined by 30% to 1188 kg in 2017
- Hg emissions in 2017 compared to 1990 (4079 kg); more than a threefold reduction in emissions

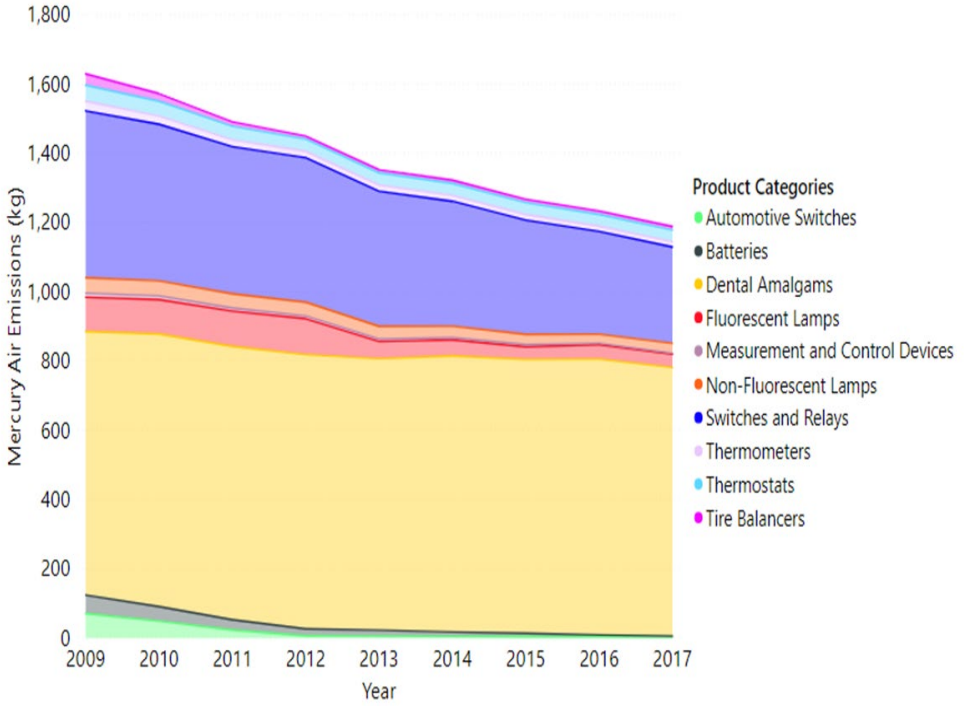


Figure 2. Hg-in-Product Emissions by Product Category from 2009 to 2017

FINDINGS: HIGHEST EMISSIONS BY SECTOR

Table 1. Highest atmospheric emissions of Hg from products for 2009 to 2017 in Canada

Sector	Product Category	Emissions Trends
Cremation	Dental Amalgams	21% of Hg or 341 kg in 2009; 44% of Hg or 525 kg in 2017
Foundries	Switches and Relays, Tire Balancers, Automotive Switches	25% of Hg or 410 kg in 2009; 17% of Hg or 192 kg in 2017
Use in Dental Offices	Dental Amalgams	11% of Hg or 172 kg in 2009; 11% of Hg or 126 kg in 2017

FINDINGS: LOWEST HG EMISSIONS BY SECTOR

Table 2. Lowest atmospheric emissions of Hg from products for 2009 to 2017 in Canada

Sector	Product Category	Emission Trends
Land Application of Sludge	A Number of Categories	0.29% of Hg or 1.8 kg in 2009; 0.15% of Hg or 1.8 kg in 2017
Landfill Disposal of Sludge	A Number of Categories	0.63% of Hg or 3.8 kg landfills in 2009; 0.32% of Hg or 3.8 kg landfills in 2017
Manufacturing of Lamps	Fluorescent Lamps Non-Fluorescent Lamps	0.44% of Hg or 7.2 kg in 2009
Live Canadians	Dental Amalgams	0.01% of Hg or 0.12 kg in 2007

CONCLUSIONS

- To our knowledge, this is the first study in recent years that has re-evaluated the distribution and associated atmospheric releases of Hg from products following implementation of initiatives to control Hg use and releases in Canada

- Hg emissions from products have declined due to:
  - Discontinued use or restrictions of Hg use in products
  - Increased recycling
  - Stricter Hg removal regulations

PLANNED IMPROVEMENTS AND NEXT STEPS FOR THE HG-IN-PRODUCTS MODEL

- Improve provincial distribution allocations
- Consider updates to emission factors
- Harmonize Hg product and facility reported emissions for APEI publishing
- Continue to build partnerships and improve data collection opportunities moving forward

QUESTIONS OR COMMENTS?

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CITATIONS

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