Project report

Enhancing the Alignment of North American Trade Statistics on Elemental Mercury and Mercury–added Products

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List of abbreviations and acronyms

ABI	Automated Broker Interface
AES	Automated Export System
ASGM	artisanal and small-scale gold mining
CAS	Chemical Abstracts Service (Registry Number)
CBP	US Customs and Border Protection
CBSA	Canada Border Services Agency
CCFL	cold cathode fluorescent lamp
CDAT	Chemical Data Access Tool
CDR	Chemical Data Reporting (CDR) Rule
CEC	Commission for Environmental Cooperation
CFL	compact fluorescent lamp
CIMT	Canadian International Merchandise Trade database
Cofepris	*Comisión Federal para la Protección contra Riesgos Sanitarios* (Federal Commission for Protection Against Sanitary Risks)
ECCC	Environment and Climate Change Canada
EEFL	external electrode fluorescent lamp
EPA (or USEPA)	US Environmental Protection Agency
EU	European Union
FOB	Free on Board
FTZ	Foreign Trade Zone
g	gram
Hg	mercury
HID	high-intensity discharge
HPMV	high-pressure mercury-vapor lamp
HS	Harmonized (Commodity Description and Coding) System
HTS	Harmonized Tariff Schedule
HTSA or HTSUSA	Harmonized Tariff Schedule of the United States Annotated (for Statistical Reporting Purposes)
IMERC	Interstate Mercury Education and Reduction Clearinghouse
INECC	*Instituto Nacional de Ecología y Cambio Climático* (National Institute of Ecology and Climate Change)
Inegi	*Instituto Nacional de Estadística y Geografía* (National Institute of Statistics and Geography)
kg	kilogram(s)
lb(s)	pound(s)
LED	light-emitting diode
LFL	linear fluorescent lamp
MEBA	Mercury Export Ban Act of 2008
mg	milligram(s)

MIA	Minamata Initial Assessment
mm	millimeter(s)
NAFTA	North American Free Trade Agreement
NEMA	National Electrical Manufacturers Association
NPRI	National Pollutant Release Inventory (Canada's Pollutant Release and Transfer Register)
NV	Nevada
oz.	ounce (28 grams) or ounces
PCMR	Products Containing Mercury Regulations
ppm	parts per million
PRTR	Pollutant Release and Transfer Register
RCRA	Resource Conservation and Recovery Act
RETC	*Registro de Emisiones y Transferencia de Contaminantes* (Mexico's Pollutant Release and Transfer Register)
SAT	*Servicio de Administración Tributaria* (Federal Tax Authority)
Sedena	*Secretaría de la Defensa Nacional* (Ministry of National Defense)
Semarnat	*Secretaría de Medio Ambiente y Recursos Naturales* (Ministry of Environment and Natural Resources)
SHCP	*Secretaría de Hacienda y Crédito Público* (Ministry of Finance and Public Credit)
SIAVI	*Sistema de información arancelaria vía internet* (Internet Tariff Data System)
Siceteca or Siiceteca	*Biblioteca virtual que contiene información sobre instrumentos jurídicos relacionados con el comercio exterior en diferentes versiones* (Virtual library of foreign trade regulations with updates)
Siicex	*Sistema Integral de Información de Comercio Exterior* (Comprehensive Database on Foreign Trade)
t or tonne	metric ton (1,000 kg)
ton	short ton (2,000 pounds)
TRI	Toxics Release Inventory (the US Pollutant Release and Transfer Register)
TSCA	US Toxic Substances Control Act
US	United States
US$	US dollar(s)
UNEP	United Nations Environment Programme (UN Environment)
UNSD	United Nations Statistics Division
USGS	US Geological Survey
USITC	US International Trade Commission
WCO	World Customs Organization
Zn	zinc

Abstract

This report presents an assessment of the available information on trade in mercury, mercury compounds, and certain mercury-added products among Canada, Mexico and the United States, and on primary and byproduct mercury production in North America. It describes the available databases, responsible agencies, and procedures for generating and managing the data. By identifying areas where there are gaps and limitations in available mercury trade statistics, it offers an opportunity for government officials in Canada, Mexico and the United States to improve the accuracy of mercury trade data generated within the three countries, thus allowing better tracking of these data over time.

It is intended that the information herein will be most immediately relevant to Canada, Mexico and the United States. A better understanding of the sources, movements and destinations of mercury and mercury-added products will enable the three countries to enhance their quality assurance and quality control measures related to trade data, and facilitate continued implementation of the provisions of the Minamata Convention on Mercury, which entered into force on 16 August 2017.

In addition to the North American governments, this report may be useful to other governments and policy makers, trade and statistical specialists, nongovernmental organizations, and others interested in the global management of mercury.

Disclaimer

The trade data presented in this report were accessed from databases and other sources prior to October 2016. As such, they represent the information available at that time and do not reflect revisions and updates that may have occurred since then. Before citing or using the information from this report, therefore, readers are cautioned to consider the temporal nature of the source data, as well as the findings based on those data, which in some cases may no longer be valid.

The views and findings presented in this report, unless otherwise indicated, represent those of the authors and do not necessarily reflect the views of the CEC, or the governments of Canada, Mexico or the United States.

Preface

As mercury in all forms comes under enhanced scrutiny and regulation due to human health and environmental concerns, Canada, Mexico and the United States have expressed interest in having a better understanding of the North American market for mercury, mercury compounds and certain mercury-added products. The report identifies the national trade databases available in Canada, Mexico and the United States, and the agencies responsible for generating and managing the data on imports and exports of mercury, mercury compounds and mercury-added products. It also provides a summary of the sources of mercury in North America.

Through this report, each country will have a clearer picture of both the historic and recent regional trade in these commodities. More importantly, these countries will be better able to assess the discrepancies that may occur with respect to the reporting of such trade through the harmonized tariff code system, which have been identified in the databases used as the main sources of information to develop this report. For example, one national trade database may show the import of mercury from a North American trading partner that the partner's database does not record as an export. This report describes the research carried out, including an extensive interview process with officials from the relevant government agencies and other stakeholders for insights into possible reasons for discrepancies in the data.

The report's presentation of findings and related options will allow each country to focus future efforts on improving or optimizing current systems for assessing, monitoring and reporting on trade in mercury, mercury compounds and mercury-added products, and to enhance the quality of their trade data. A better understanding of the sources, movements and destinations of these commodities will enhance the three countries' ability to monitor progress in implementing their respective regulations, as well as the Minamata Convention on Mercury.

While this report is primarily intended for use by the North American governments, it may also be useful to other governments and policy makers, trade and statistical specialists, nongovernmental organizations and others interested in the global management of mercury.

Executive summary

The purpose of this project is to identify possible improvements that Canada, Mexico, and the United States could make to their current systems for assessing, monitoring and reporting on trade in mercury, mercury compounds and certain mercury-added products. This is important because mercury in all forms has come under enhanced scrutiny and regulation in North America, and there is an increasing need for reliable information about its sources and uses. In addition, this report could provide important information relevant to the implementation of the Minamata Convention on Mercury, which has been ratified by all three countries.

The main focus of this report is the comparison of mercury trade statistics for Canada, Mexico and the United States, and the possible causes of discrepancies in these statistics with regard to the same cross-border transaction. The trade data collected by the three countries can be most useful if their scope and limitations are well understood. In this report, the relevant data on mercury trade among the three countries are analyzed and presented for the calendar years 2010 and 2014—before and after the US Mercury Export Ban Act was implemented. The mercury commodities of primary interest are those addressed within the Minamata Convention, i.e., the exported and imported quantities of elemental mercury, mercury compounds, and products to which mercury has been added.

The main tasks involved in this important research included summarizing the information available in reference documents and national trade databases; identifying gaps and inconsistencies in the trade data; and identifying the procedures, data quality control and other issues that need to be further evaluated. The report describes the available databases, responsible agencies, and procedures for generating and managing the data relating to trade among the three countries in these three commodities. It also assesses the information on primary and byproduct mercury production in North America.

Of particular importance in the preparation of this report is the series of interviews carried out with key officials from agencies and organizations in each of the three countries who assisted in identifying, validating and providing context for the reasons for data gaps or discrepancies in the trade data. More than two dozen individuals were contacted, representing all of the key federal agencies as well as state agencies and private industry. These interviews permitted a better understanding of the limitations of the available data, the procedures, responsibilities and levels of collaboration, agency familiarity with the Minamata Convention, and so on.

The report also identifies the various sources of mercury in North America, and provides a rough assessment of the region's markets for mercury, mercury compounds and a number of mercury-added products, and where these compounds are coming from and going to in relation to other parts of the world. Import data, especially, are recorded by customs, subject to tariffs, and entered into national databases. The data on exports, which are not subject to tariffs, tend to receive less scrutiny but are formally registered as well. This analysis of the trade data identifies discrepancies such as the import into one country of mercury from a North American trading partner whose own database does not show an equivalent export; and differences between the recorded and actual origins and destinations of transshipments in storage. The report discusses possible reasons for such discrepancies, and presents findings and options to improve the quality of the data.

The document explains that the Harmonized Commodity Description and Coding System, also known as the "Harmonized System (HS)," does not provide sufficient detail to reliably differentiate between mercury-added and mercury-free products. A few specific codes (e.g., for amalgams of precious

metals, silver oxide button cells, etc.) could benefit from this additional level of detail, but they are not widely shared with, or used by, many countries. The report also makes the observation that despite the existence of extensive national databases, data on domestic production of elemental mercury, mercury compounds and mercury-added products cannot be easily found or accessed through the public domain. Other information and tools, such as the IMERC database and the recent Products Containing Mercury Regulations in Canada and amendments to the US Toxic Substances Control Act (TSCA), are mentioned as possible additional sources that could contribute to efforts to better track imports and exports of mercury and mercury-containing products.

There may also be avenues, now better clarified by this report, to formulate suggestions for the composition and responsibilities of a more formal, and broader, Canada-Mexico-United States working group to address data sharing arrangements among the three countries. Such arrangements could include the agreement among importers/exporters for access to certain shipping data that would help track mercury trade more accurately, which would clear up some discrepancies. There is no doubt that improved North American collaboration would provide a good model for the many countries faced with the need to better understand their own mercury movements and uses.

Acknowledgments

The Commission for Environmental Cooperation (CEC) extends its sincere appreciation to Peter Maxson, José Castro Díaz and Michael Bender from the Mercury Policy Project/Tides Center, who prepared or assisted in the preparation of this publication, and coordinated the input of experts from the three North American countries. Members of the project Steering Committee provided valuable guidance and expert review during this process: Canada (Environment and Climate Change Canada); Mexico (*Instituto Nacional de Ecología y Cambio Climático);* United States (Environmental Protection Agency).

The CEC also wishes to thank the customs and statistical agencies of the three governments for providing valuable insight and helping the project team to better understand the complexity of the tasks faced by their agencies in keeping trade statistics current, calculating and reconciling trade balances, carrying out quality control, constantly working to better harmonize activities with trade partners, and so on—including the challenges each agency faces with regard to its own structure, networks, budget limitations, priorities, culture, rules and constraints—while jointly they handle a half million trade transactions per day, seven days a week.

Finally, the CEC acknowledges the staff of the CEC Secretariat's Environmental Quality Unit involved in bringing this project to fruition: Orlando Cabrera-Rivera, head of unit; Heidy Rivasplata Maldonado and Danielle Vallée, project leads; Erika Hercules, program assistant; and the CEC publications editors, Douglas Kirk, Jacqueline Fortson, and Johanne David.

1 Background

1.1 Purpose

As part of its 2015–2016 Operational Plan, CEC's Council approved the project, *Greening of Chemicals Management in North America.* One of the two components of this project dealt with enhancing the alignment of North American trade statistics on elemental mercury and mercury–added products. The purpose of this effort is to provide a better understanding of the available data on the region's mercury trade and to identify how that information can be improved to enhance the quality of reporting within North America and support implementation of the Minamata Convention on Mercury, ratified by all three countries and which entered into force on 16 August 2017.

One of the key tasks of this research was to determine the causes of discrepancies in the respective mercury export and import statistics generated among the North American trading partners. The report identifies gaps and discrepancies in the mercury trade statistics, and their possible causes, and formulates options for addressing them in order to improve the accuracy and comparability of mercury trade data generated within the region and allow better tracking of these data over time.

1.2 Scope

This report provides an overview of the data sources for trade in elemental mercury, mercury compounds, and mercury-added products among Canada, Mexico and the United States. It discusses the procedures for generating and recording trade data, and the agencies responsible. The desk research has been supplemented by further information gathered during subsequent interviews with officials representing all of the key federal agencies (customs, statistics, environment), state agencies and private industry in each of the three countries to assist in validating, providing context and identifying the reasons for data gaps or discrepancies in trade data.

The relevant data on mercury trade among the three countries are presented for the calendar years 2010 and 2014—before and after the US Mercury Export Ban Act was implemented. The mercury commodities of primary interest are those of concern to the Minamata Convention on Mercury, as listed in section 3.1 of this report. This research focuses primarily on the quantities of elemental mercury, mercury compounds, and mercury-added products that are exported, imported and re-exported, as well as information on primary and byproduct mercury production in North America. While the Minamata Convention does not restrict the trade of mercury compounds, these have been included in the report as useful additional information.

Subsequently, monthly North American mercury trade data for the year 2014 are analyzed, with a particular focus on those areas where the trade data for any two of the North American trading partners do not appear to match up, so as to identify the reasons for any discrepancies in the data. After identifying and describing such data discrepancies, options are presented to improve the quality of the data.

1.3 Methodology

The main steps in this analysis include:

- describing the procedures for collecting and verifying data and summarizing the information available in reference documents, concentrating on the main sources of statistics;

- consulting the Canadian, Mexican and US national databases for 2010 and 2014 mercury trade data (databases consulted prior to October 2016, unless otherwise noted);
- for each mercury commodity for which statistics are available, identifying the gaps and inconsistencies in the trade data;
- identifying questions concerning procedures, data quality control, etc., and highlighting those gaps and inconsistencies that need to be further assessed through the interview process;
- carrying out interviews in Canada, Mexico and the United States, the relevant highlights of which are integrated in this report;
- identifying, to the extent possible, those cases where mercury wastes may have been aggregated in the trade data for elemental mercury and mercury compounds; and
- describing the origins of the elemental mercury and mercury compounds found in North America, and their export destinations.

The project consulted reliable sources of statistics on North American trade, which incorporate rigorous procedures for data collection and quality control, comprehensive data, and close links to the primary data sources. These sources include:

- CIMT, the Canadian International Merchandise Trade database, reflecting Departmental Consolidation of the Customs Tariff, and populated with data collected by the Canada Border Services Agency;
- SIAVI, the Mexican online commodity tariff database that consolidates annual and monthly trade data on the value and volume of Mexican imports and exports received from the General Customs Administration;
- USITC, the US International Trade Commission Harmonized Tariff Schedule of the United States (HTS), Annotated for Statistical Reporting Purposes. All trade statistics are compiled from official data retrieved from the US Census Bureau, an agency within the US Department of Commerce; and
- Comtrade, or UN Comtrade, the commodity trade database of the United Nations Statistics Division (UNSD). This database contains monthly and annual trade data as submitted by reporting countries worldwide.

Relevant data from other sources were also consulted, as useful, including the Pollutant Release and Transfer Registers (PRTRs) of Canada, Mexico and the United States; the database of the Interstate Mercury Education and Reduction Clearinghouse (IMERC); the USA Trade Online (UTO) database; and so on.

In order to explain gaps and inconsistencies in the data, it was anticipated that it might be necessary to examine individual shipments or transactions that make up the annual or monthly trade totals. However, for reasons of commercial confidentiality, detailed import and export data at the transaction level were not publicly available, and were therefore not used for this study. It was confirmed during the project that the active collaboration of Customs and related government agencies with access to shipping data at the transaction level was necessary to fully understand the sources of discrepancies.

Officials at the following agencies and organizations responded to requests for interviews:

- International Accounts and Trade Division, Statistics Canada, Government of Canada
- Environmental Operations Division, Comptrollership Branch, Canada Border Services Agency
- Trade Operations Unit, Operations Branch, Canada Border Services Agency

- Strategic Analysis Section, Program Integration Division, Environment & Climate Change Canada
- *Administración de Asuntos Internacionales, Administración General de Aduanas* (International Affaires Administration, General Customs Administration, Government of Mexico)
- *Administración Central de Planeación Aduanera, Administración General de Aduanas* (Central Customs Planning Administration, General Customs Administration, Government of Mexico)
- *Administración Central de Operación Aduanera, Administración General de Aduanas* (Central Customs Operations Administration, General Customs Administration, Government of Mexico)
- *Dirección General de Comercio Exterior, Secretaría de Economía* (General Directorate of Foreign Trade, Ministry of Economy, Government of Mexico)
- *Dirección de Nomenclatura Arancelaria, Secretaría de Economía* (Directorate of Tariff Nomenclature, Ministry of Economy, Government of Mexico)
- Inspection and Monitoring of Hazardous Substances in Ports, Airports and Borders (Federal Attorney's Office for Environmental Protection, Mexico)
- *Secretaría de Medio Ambiente y Recursos Naturales* (Ministry of Environment and Natural Resources, Government of Mexico)
- *Instituto Nacional de Estadística y Geografía* (National Institute of Statistics and Geography, Government of Mexico)
- Commercial Operations and Entry Division, Office of International Trade (US Customs and Border Protection)
- Commodity Analysis Branch, International Trade Management Division (US Census Bureau, US Department of Commerce)
- International Trade Macro Analysis Branch, Economic Indicators Division (US Census Bureau, US Department of Commerce)
- Interstate Mercury Education & Reduction Clearinghouse (Northeast Waste Management Officials Association, United States)
- Hazardous Waste and Toxics Reduction (Washington State Department of Ecology)
- Technology Development, Science, Pollution Prevention, and Technology Program, Office of Pollution Prevention and Technology Development, Department of Toxic Substances Control (California Environmental Protection Agency)
- Office of Research and Standards (Massachusetts Department of Environmental Protection)
- Environmental Council of the States Quicksilver Caucus, United States
- Resource Management and Assistance Division (Minnesota Pollution Control Agency)
- Planning Division (Minnesota Pollution Control Agency)
- Four industry sources—recyclers, traders and brokers based in the United States and Europe.

2 International trade

2.1 Standardization of data

The Harmonized Commodity Description and Coding System, also known as the Harmonized System (HS) of commodity nomenclature, is an internationally standardized system used to classify traded commodities. As of 2015, there were 180 countries or territories applying the Harmonized System worldwide. HS codes are used by customs authorities, statistical agencies and other government regulatory bodies to monitor and control the import and export of commodities,[1] to produce economic reports such as trade balances, to develop customs tariffs, to track international trade statistics, rules of origin, monitoring of controlled goods (e.g., hazardous wastes, endangered species, weapons), and so on.

Generally, the sections and chapters of the Harmonized System are sequenced in order of a product's degree of manufacturing or technological complexity. An HS commodity code consists of 6 digits. The first two digits designate the HS chapter. The first four digits designate the HS heading. The full six digits designate the HS subheading. HS code 8506.10, for example, indicates Chapter 85 (*Electrical machinery and equipment and parts thereof...*), Heading 8506 (*Primary cells and primary batteries, parts thereof*), and Subheading 8506.10 (*Manganese dioxide*). In addition to the HS codes and commodity descriptions, each section and chapter of the HS is prefaced by legal notes, which are intended to clarify the proper classification of goods. To enhance harmonization, the contracting Parties (i.e., countries or territories) to the Convention on the Harmonized Commodity Description and Coding System have agreed to base their national tariff schedules on the HS nomenclature and legal notes.[2]

Contracting Parties to the Convention on Harmonized Commodity Description and Coding may subdivide the HS nomenclature beyond 6 digits and add their own legal notes according to their own tariff and statistical requirements. Parties often set their customs duties at the 8-digit "tariff code" level,[3] generating their own Harmonized Tariff Schedule (HTS). HS code 8506.10.10, for example, specifically identifies those manganese dioxide primary cells and batteries "having welded connectors or designed to receive welded connectors, for use in electronic lock systems or in components thereof...." In case even more detail is required, statistical suffixes may be further added to the 8-digit tariff code for a total of 10 digits. It is common, therefore, for the HTS to be more detailed than the HS as the former is used for the imposition of import tariffs.

Further details on the Harmonized System and the tariff codes of interest to this study may be found in Appendix 1.

2.2 Sources of statistics

Among the available sources of North American trade statistics, the following are considered to be the most reliable by virtue of having, among other features, the most rigorous procedures for data

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[1] Available online at <https://en.wikipedia.org/wiki/Harmonized_Tariff_Schedule>, consulted 15 September 2016.

[2] Ibid.

[3] Ibid.

collection and quality control, the most comprehensive data, and the closest links to the primary data sources:

- CIMT, the Canadian International Merchandise Trade database (as updated to 17 September 2016), Departmental Consolidation of the Customs Tariff, Canada Border Services Agency. The CIMT database offers detailed online trade data using the World Customs Organization's (WCO) Harmonized Commodity Description and Coding System (HS) classification of goods (based on the 6-digit commodity level). The Canadian Customs Tariff is based on the Harmonized System (CIMT 2016).
- SIAVI, the Mexican online commodity tariff database, as updated to 16 September 2016. SIAVI is an online tool that provides information on regulations and tariffs, as well as annual and monthly trade data on the value and volume of Mexican imports and exports. The SIAVI database reflects the raw trade data received from the General Customs Administration (SIAVI 2016).
- USITC Data Web, which is the platform to view trade statistics compiled by the US Bureau of the Census, an agency within the US Department of Commerce. The method of collection is the US International Trade Commission Harmonized Tariff Schedule of the United States (HTS), Annotated for Statistical Reporting Purposes, as updated to 15 September 2016 (USITC 2016). UTO is the official source of US trade statistics.[4]
- Comtrade, or UN Comtrade, the commodity trade database of the United Nations Statistics Division (UNSD), as updated to 30 September 2016, unless otherwise indicated in the text. The UNSD maintains a detailed merchandise trade statistics database as mandated by the United Nations Statistical Commission. This database contains annual trade data (imports, exports and re-exports) as submitted by reporting countries or areas, commodity and trading partner country, for most countries of the world (Comtrade 2016).

Relevant data from other sources, by no means less important for their own specialized purposes than those listed above, have also been consulted for the report, including:

- the three North American Pollutant Release and Transfer Registers (PRTRs), i.e., NPRI, RETC and TRI databases;
- the Taking Stock Online database (drawn from the NPRI, RETC and TRI);
- the database of the Interstate Mercury Education and Reduction Clearinghouse (IMERC); and
- publications of the US Geological Survey (USGS).

2.3 Key agencies

Each of the North American countries has two key agencies involved with international trade data. One agency is typically responsible for customs and border security while the other is responsible for economic and commercial affairs, including management of the trade statistics database and the generation of routine reports on the trade balance, and so on.

[4] Available online at <https://usatrade.census.gov/>

Canada

The **Canada Border Services Agency** (CBSA) provides clearance, control and examination services, on behalf of other government departments and agencies, for travelers, importers and exporters at close to 1,200 points of entry, including land border offices, international mail processing centers, airports, sufferance warehouses (privately owned and operated facilities licensed by the CBSA for the control, short-term storage, transfer, delivery and examination of in-bond goods until the goods are released by the CBSA or exported from Canada), and so on.[5]

Statistics Canada, a member of the United Nations Statistical Commission, produces and manages statistics on the Canadian population, resources, economy, society and culture, including the trade statistics received via the CBSA. As Canada's central statistical office, Statistics Canada is legislated to serve this function for the whole of Canada and each of the provinces and territories.[6] Among other reports, Statistics Canada's periodic trade reconciliation report is a systematic quality control exercise that helps to identify and explain disparities in the import/export data, and that serves as a basis for recommending changes to improve the overall quality of foreign trade data.

It is important to note that Canada and the United States have a longstanding memorandum of understanding concerning the exchange of confidential trade data on their imports of goods and services from each other. As a result, each country uses the other's import data in place of its own export data. Canada's international merchandise export statistics are, therefore, not derived exclusively from the administrative records of the CBSA, but from United States Custom and Border Protection (CBP) records as well. And the same is true for the United States.

Mexico

The **General Customs Administration** (*Administración General de Aduanas*—AGA) is a Federal Government agency under the Tax Administration Service (*Servicio de Administración Tributaria*—SAT), which is itself an agency of the Ministry of Finance and Public Credit (*Secretaría de Hacienda y Crédito Público*—SHCP). The main function of the General Customs Administration is to supervise, monitor and control the entry and exit of goods, ensuring compliance with the provisions on foreign trade issued by the Ministry of Finance and Public Credit and other ministries of the Federal Executive.[7]

Customs deals with all administrative formalities regarding the import and export of goods, whether consignees, recipients, owners, export shipping firms, customs agents, and so on. A customs broker may be duly authorized by the respective customs authorities to act on behalf of a third party that contracts its services to engage in import, export or transit operations.

Once the customs information is collected, the General Customs Administration forwards the data to the External Commerce (*Comercio Exterior*) Department of the Ministry of Economy (*Secretaría de Economía*), which maintains the online commodity tariff database, SIAVI.

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5 Available online at <http://www.cbsa-asfc.gc.ca/do-rb/menu-eng.html>

6 Available online at <http://statcan.gc.ca/eng/about/about>

7 Available online at <http://www.sat.gob.mx/que_sat/Paginas/aduanas.aspx>

United States

US Customs and Border Protection (CBP), under the US Department of Homeland Security, is charged with regulating and facilitating international trade, collecting import duties, and enforcing US regulations on trade, customs, and immigration. The CBP Office of Field Operations is the agency responsible for customs operations at field offices, ports of entry, and pre-clearance stations in six countries, including Canada, Ireland, United Arab Emirates, and the Caribbean region.

Data collected by CBP is forwarded to the **US Census Bureau** (under the US Department of Commerce), which handles 7 to 10 million new records per month, all subject to different levels of review. Due to the large volume of records, most of the review consists of up-front edits that catch poor reporting, and contacts with transport companies or agents ("filers") to verify information.

It bears repeating, though already mentioned above, that with regard to their trade with each other, the United States and Canada mostly use each other's import data in place of their own export data.

United Nations

As mentioned, the United Nations Statistics Division maintains the Comtrade database. UNSD recognizes that customs departments around the world are the primary producers of basic data on trade transactions, whereas the national statistical offices are mostly responsible for processing and disseminating the trade statistics.[8] Statistics Canada, the External Commerce Department of the Mexican Ministry of Economy, and the US Census Bureau periodically submit detailed trade data to the United Nations. UNSD collects, compiles and publishes the data online as the UN Comtrade database.

2.4 Key concepts

International commerce has its own special terminology, for which some of the key terms are summarized below. Further details of these key terms and definitions, as well as the source documents and additional terms, may be found in Table 30 in Appendix 5.

Imports for consumption include only goods that have been cleared through customs.

General imports are defined as all goods that have crossed Country A's territorial boundary, whether they enter Country A's consumption channels immediately, or whether they enter bonded customs warehouses or Foreign Trade Zones under customs custody. In the latter two cases customs duties are not payable unless the goods are released for consumption in Country A.

Domestic exports include goods extracted or manufactured in Country A, including goods of foreign origin that have been materially transformed in Country A.

Re-exports are exports of goods of foreign origin that have previously entered but have not been materially transformed in Country A, including foreign goods withdrawn for export from bonded customs warehouses.

Total exports are the sum of domestic exports and re-exports.

[8] Available online at <http://unstats.un.org/unsd/trade>

Thus the **general trade system**, in principle, includes all goods entering the country (imports) and all goods leaving the country (exports). Conceptually, under the general trade system, the statistical frontier coincides with the geographical boundary. The general trade system differs from the **special system of trade** in the treatment of goods that are imported into bonded customs warehouses.

Definitions of some of these terms are not entirely consistent among Canada, Mexico and the United States. For example, the data exchange, in which Canada's data on imports from the United States are used to replace US data on exports to Canada, requires certain adjustments to make the two comparable, such as:

- The **US export value** is the value at the US port of export and includes inland freight charges. The **Canadian import value** is the value at the point of origin in the United States and does not include inland freight to the US port of export. To compensate, Canada adds 4.5 percent of the value to each import transaction from the United States to approximate the cost of inland freight.
- Moreover, the Canadian import data shared with the United States under the data exchange agreement apply only to US exports whose final destination is Canada, and do not include US exports to third countries (i.e., re-exports) via routes passing through Canada.

The **Canadian export value** to the United States is generally the value at the point of exit from Canada. Canada's exports to Mexico and other countries are valued at Free On Board (FOB) port of exit, including domestic freight charges to that point, but net of discounts and allowances.

The **US import value** is generally the price actually paid for goods when sold for export to the United States, excluding US import duties, freight, insurance, and other charges incurred in bringing the goods to the United States.

For customs purposes, the **country of origin** of an import is the country in which the goods were extracted or manufactured. Imports to Canada from the United States are further attributed to the State of origin.

Similarly the **country of destination** of an export is the last known destination of the goods at the time of export. Exports from Canada to the United States are further attributed to the State of destination.

2.5 Regulation of mercury trade

A variety of restrictions on the trade of mercury and mercury-added products are in place in Canada, Mexico and the United States.

Canada

In November 2015 Canada's *Products Containing Mercury Regulations* (PCMR) took effect. These Regulations prohibit the manufacture and import of products containing mercury or any of its compounds, with some exemptions for essential products that have no technically or economically viable alternatives. The objective of these Regulations is to protect human health and the environment by reducing mercury releases from products used in Canada to the lowest level that is technically and economically feasible (PCMR 2014). As a result, according to the Regulatory Impact Analysis Statement published by Environment and Climate Change Canada in November 2014, from 2015 to 2032 these Regulations are expected to reduce the use of mercury in products by a cumulative total of about 41,000 kg. During the same period, releases of mercury to the environment from mercury-

added products are estimated to decrease by a cumulative total of about 21,000 kg, of which approximately 4,100 kg would be mercury emissions to the atmosphere.

Also under the *Canadian Environmental Protection Act*, Canada recently introduced comprehensive restrictions on the export of mercury, consistent with provisions set out in the Minamata Convention. The *Export of Substances on the Export Control List Regulations* restricts the export of mercury. These regulations allow the export of mixtures containing mercury at a concentration of 95 percent or more by weight only if the mixture:

- is, or is contained in, a hazardous waste or hazardous recyclable material regulated by the *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations* (this implements Canada's obligations under the Basel Convention);
- is exported for use in a laboratory for analysis, in scientific research or as a laboratory analytical standard, if the total quantity exported by the exporter during the calendar year in question does not exceed 10 kg; or
- is contained in a manufactured item that during manufacture is formed into a specific physical shape or design, and has for its final use a function or functions wholly or partly dependent on its shape or design.

Mexico

In Mexico the development of regulations related to the trade of mercury and mercury-added products in line with the Minamata and Basel Conventions is in progress. A preliminary initiative of the Ministry of Economy (*Secretaría de Economía*) targets mercury-added batteries. It is the draft Official Mexican Standard, PROY-NOM-212-SCFI-2016: *Primary cells and primary batteries – maximum permissible levels of mercury and cadmium, specifications, test methods and labeling*, published in December 2016 (see section 3.6 Batteries).

Likewise, an official standard was published in 2016 establishing measures for the reduction of risks related to mercury and mercury waste management in dental practice. Further details of these regulations are provided in the following sections dealing specifically with these applications.

United States

Apart from a variety of restrictions imposed by a number of States on the production, marketing and use of a range of mercury-added products, the main regulations at the Federal level are described below.

The *Mercury-Containing and Rechargeable Battery Management Act of 1996* (Battery Act) prohibited the marketing and sale of zinc-carbon and alkaline-manganese batteries to which mercury was intentionally added, with the exception of alkaline-manganese button cells for which the added mercury may not exceed 25 mg per button cell. It also prohibited the marketing and sale of mercuric oxide button cells. Larger mercuric oxide batteries were permitted only if an appropriate collection system was put in place by the battery manufacturer or importer.

The *Mercury Export Ban Act* (MEBA), which became law on 14 October 2008, was intended to reduce the availability of elemental (metallic) mercury in international markets. By reducing the supply of elemental mercury in commerce, the Act primarily aimed to encourage use of affordable alternatives in the developing world. The Act included three main elements:

- It prohibited the export of elemental mercury as of 1 January 2013.

- It required the Department of Energy (DOE) to designate and operate a facility (or facilities) for long-term management and storage of elemental mercury generated in the United States.
- It prohibited the transfer of elemental mercury held by federal agencies as of the date of enactment, so as to control the flow of elemental mercury in the domestic market.

The Frank R. Lautenberg Chemical Safety for the 21st Century Act, signed into law on 22 June 2016, amends the Toxic Substances Control Act (TSCA), which is the nation's primary chemicals management law. The improvements in TSCA most relevant to this study include:

- A requirement for increased public transparency of chemical information, and especially a requirement (Section 8(b) of the Act) for EPA to publish every three years an inventory of supply, use, and trade of mercury and mercury compounds. To assist in carrying out the inventory, EPA will be developing a rule for manufacturers to report mercury information to EPA, including information on products and compounds; and
- A ban (Section 12(c) of the Act) on the export of five named mercury compounds by the year 2020. EPA may add other mercury compounds to the list through a rulemaking process.

3 Mercury trade in North America

3.1 Types of statistics consulted

This report presents data for elemental mercury, mercury compounds and mercury-added products traded across North American borders.[9] For these commodities the data include, as available:

- Quantities and values of imports and exports among Canada, Mexico, and the United States;
- Quantities and values of imports and exports outside North America for each of the three countries.

In order to provide a better understanding of North American trade and demand for mercury, information was also collected on mercury sources in North America and the main uses of mercury in mercury-added products.

For the purposes of this study, in addition to mercury (HS code 280540) and mercury compounds (HS code 285200), the products of primary interest are those mercury-added products identified in Annex A, Parts I and II, of the Minamata Convention on Mercury.[10] These are:

[9] As indicated in the data tables included in this report, the trade data presented have been accessed from databases and other sources prior to October 2016, and some of these sources have been revised or updated since that time. Readers are cautioned to consider the temporal nature of the information, including the findings based on the information, before citing or using the information in this report.

[10] Note that the following products are excluded from Annex A: a) Products essential for civil protection and military uses; b) Products for research, calibration of instrumentation, for use as reference standard; c) Where no feasible mercury-free alternative for replacement is available, switches and relays, cold cathode fluorescent lamps (CCFL) and external electrode fluorescent lamps (EEFL) for electronic displays, and measuring devices; d) Products used in traditional or religious practices; and e) Vaccines containing thiomersal as a preservative.

- Batteries, except for button zinc silver oxide [or simply "silver oxide"] batteries with a mercury content <2 percent and button zinc-air [or air-zinc] batteries, with a mercury content <2 percent.
- Switches and relays, except very high accuracy capacitance and loss measurement bridges and high frequency radio frequency switches and relays in monitoring and control instruments, with a maximum mercury content of 20 mg per bridge, switch or relay.
- Compact fluorescent lamps (CFLs) for general lighting purposes that are ≤30 watts, with a mercury content exceeding 5 mg per lamp burner.
- Linear fluorescent lamps (LFLs) for general lighting purposes:
  - Triband phosphor <60 watts with a mercury content exceeding 5 mg per lamp;
  - Halophosphate phosphor ≤40 watts with mercury content exceeding 10 mg per lamp.
- High pressure mercury vapor lamps (HPMV) for general lighting purposes.
- Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays:
  - short length (≤500 mm), with mercury content exceeding 3.5 mg per lamp;
  - medium length (>500 mm and ≤1,500 mm), with mercury content exceeding 5 mg per lamp;
  - long length (>1,500 mm), with mercury content exceeding 13 mg per lamp.
- Cosmetics (with mercury content above 1 ppm), including skin lightening soaps and creams, and not including eye area cosmetics, where mercury is used as a preservative and no effective and safe substitute preservatives are available.[11]
- Pesticides, biocides and topical antiseptics.
- The following non-electronic measuring devices except non-electronic measuring devices installed in large-scale equipment or those used for high precision measurement, where no suitable mercury-free alternative is available: barometers; hygrometers; manometers; thermometers; sphygmomanometers.
- Dental amalgam (identified in Annex A, Part II).

Incidental uses of mercury such as in catalysts for curing polyurethane elastomers, and rotational wheel balancers have been included in the report as well.

The focus is primarily on statistics for 2010 and 2014, representing years before and after the EU (2011) and US (2013) mercury export bans were implemented. Also, it should be noted that these statistics represent years before Canada's Products Containing Mercury Regulations, Canada's restrictions on the exports of mercury, and the United States' Lautenberg Chemical Safety Act entered into force.

The main types of data discussed in this section focus on trade among Canada, Mexico, and the United States. Trade data pertaining to transfers between North American countries and other countries are presented in section 7.

The main statistics of interest include imports, exports and re-exports of elemental mercury, mercury compounds and mercury-added products. With regard to commodities considered to be re-exports, the

[11] The intention is to restrict the production, marketing and use of cosmetics, soaps or creams to which mercury has been intentionally added, but not to restrict those that may contain trace contaminants of mercury.

definition accepted by Canada, Mexico and the United States is quite consistent and refers to goods, materials or articles originally imported into the country that are subsequently exported, either in the same condition in which they were imported, or after some minor handling (e.g., blending, packaging, bottling, cleaning or sorting) that leaves them essentially unchanged.[12]

This definition of a re-export applies to what some may refer to as an international transshipment, which would typically imply a change in the mode of transport, and/or the consolidation or deconsolidation of an import shipment prior to re-export, likewise without any essential change in the commodity.

The relevant commodity codes may be found in Appendix 1, while the respective trade data may be found in Appendix 3.

3.2 Quality control

This section describes the various measures taken by the North American governments to enhance the quality of their trade statistics.

Canada

In the interview with Statistics Canada, it was pointed out that trade reconciliation is a systematic program of comparisons that identifies and explains disparities in the import/export data, and serves as a basis for recommending changes that will improve the overall quality of foreign trade data,[13] and that can be applied consistently to the trade flows. At a macro level, discrepancies arise from a number of factors such as conceptual differences (e.g., in the recording of transshipments, especially the treatment of goods that are imported into bonded customs warehouses), as well as differences in timing, valuation, country attribution, the inclusion or exclusion of insurance and freight charges, and so on. Micro-level discrepancies may arise from differences in the classification of goods, the inclusion or exclusion of certain types of special commodities, or a myriad of other practical reporting problems that may distort detailed commodity comparisons.[14]

Mexico

The Mexican General Customs Administration (AGA) described the quality control measures carried out by AGA to ensure the reliability of their statistics:

- Performing spot checks at ports: the goods in transit are subject to random selection, which can determine whether they freely clear customs or whether there must be a physical inspection of the goods. In the case of a physical examination, the goods are transferred to the inspection area where the verifier ensures compliance with fiscal obligations, as well as tariff and non-tariff restrictions. Also, the accuracy of the information provided in the shipping manifest (*pedimento*) is controlled with respect to quantity, units of measurement,

[12] Available online at <http://clouddc.chass.utoronto.ca/ds/trade/index.do?action=doc&lang=en>.

[13] Available online at <http://www.oecd.org/std/its/31651749.pdf>.

[14] Further information on revisions to the Canadian International Merchandise Trade database may be found on Statistics Canada's website: <http://www5.statcan.gc.ca/cimt-cicm/page-page?lang=eng&mode=releasesAndRevisions>.

description, nature and other characteristics of the commodities. In the case of unusual goods, AGA may take samples and carry out analytical techniques.

- With regard to the existence of a mechanism to alert the authorities when a person or a company has entered the commodity code for mercury in its shipping documents, the AGA has an institutional information system that identifies any such shipment and checks if the appropriate regulations are complied with (such as Semarnat permits for importing or exporting mercury).
- With regard to procedures to track or prevent imports or exports in cases such as the US export ban, AGA already has in place a mechanism to detect prohibited tariff numbers. Also, the Automated Customs System (*Sistema Automatizado Aduanero*) can identify any administrative mistake if the competent authority had previously regulated the import or export of mercury or mercury-added products, and their corresponding "banned" tariff numbers had been communicated to AGA.

Nevertheless, with regard to identifying and correcting mistakes in the SIAVI database such as those discussed in section 3.6, AGA provided revised data but offered no information about the internal process for revising the data.

United States

In the interview with a senior management official at the US Census Bureau, it was discussed that one of the responsibilities of the Census Bureau is to periodically calculate the trade balance. However, the main focus of the trade balance is the value of imports and exports rather than quantities of commodities, which are likely not examined unless there is a glaring discrepancy in the values. The official emphasized, however, that since January 2013, commodity code 280540 (mercury) has been on the Census Bureau's short-list of commodities that are subject to special scrutiny. This fact, as well as the TSCA certification of imports to the United States, which is required for mercury, leads the Census Bureau to believe that records of elemental mercury movements are likely fairly accurate, at least as far as US reporting requirements are concerned.

According to the US Census Bureau, quality assurance procedures are performed at every stage of collection, processing, and tabulation. The data are also subjected to specific error detection, including validations for data reported electronically through the Automated Export System (AES) or the Automated Broker Interface (ABI). Such validations immediately refer potential errors back to the filer for correction. Data from all sources can be edited and corrected through clerical means (time consuming and expensive) and electronic means (less expensive, but susceptible to introducing further error into the statistics).[15]

3.3 Trade in elemental mercury

Trade data

Table 5 of Appendix 1 shows that elemental mercury is always identified in the Harmonized System by HS code 2805.40. Table 18 in Appendix 3 summarizes the trade of elemental mercury for 2010

[15] See section 17 of the Guide to Foreign Trade Statistics, available at <https://www.census.gov/foreign-trade/guide/sec2.html>, consulted on 3 August 2016.

and 2014 as recorded by each of the North American countries and published in their own national databases. Each country also reported its data to the United Nations Statistics Division (UNSD) for inclusion in the Comtrade database.

Analysis and discussion

Among the three North American countries, and according to their national statistics:

- in both 2010 and 2014 Canada exported mercury only to the United States, with just over 4 metric tons reported in each year;
- in 2010 Canada reported that it imported just over 4 metric tons of mercury, solely from the United States, while in 2014 Canada imported just over one metric ton of mercury from Mexico and less than one metric ton from the United States;
- in 2010 Mexico exported somewhat more than one metric ton of mercury to the United States and, in 2014, less than one metric ton to Canada;
- in 2010 Mexico imported more than 14 metric tons of mercury from the United States, and following the US export ban, Mexico imported no mercury from the United States or Canada in 2014;
- the US reported mercury exports to Canada in 2010 of nearly 6 metric tons, although this includes more than 2 metric tons of re-exports;
- US imports of mercury from Canada in 2010 and 2014 correspond to the Canadian export data.

The most important observable change from 2010 to 2014 is the clear and abrupt end of mercury exports from the United States to Canada and to Mexico following the export ban.

3.4 Trade in mercury compounds

Trade data

Table 19 in Appendix 3 summarizes the North American trade of mercury compounds identified by HS code 2852 (Inorganic or organic compounds of mercury, whether or not chemically defined, excluding amalgams) for the years 2010 and 2014, as reported by each of the North American countries in their own national databases, as well as the Comtrade database.

As seen in Table 6 of Appendix 1, commodity code HS 2852 (Inorganic or organic compounds of mercury) is further divided into two main subheadings, “chemically defined” or “other.” These subheadings may be useful for identifying more precisely the nature of the compounds that are traded across North American borders, for identifying the sources of any discrepancies and for following longer-term trends in the use and trade of mercury compounds.

Table 20 in Appendix 3 summarizes cross-border trade of mercury compounds under HS commodity Subheading 2852.10 (Inorganic or organic mercury compounds, excluding amalgams, chemically defined) for the years 2010 and 2014, as reported by each of the North American countries in their own national databases, as well as the Comtrade database.

Table 21 in Appendix 3 summarizes cross-border trade of mercury compounds under commodity Subheading HS 2852.90 (Inorganic or organic compounds of mercury, excluding amalgams, not chemically defined) for the years 2010 and 2014, as reported by each of the North American countries in their own national databases, as well as the Comtrade database.

Analysis and discussion

Referring back to Table 19 summarizing North American trade in mercury compounds, one can see that Canada's exports of mercury compounds to its North American partners declined from 148 metric tons to 49 metric tons between 2010 and 2014, while US exports to its North American partners declined from 283 metric tons (including re-exports) to 248 metric tons.[16] Canada exported no mercury compounds to Mexico in 2010 or 2014, while Mexico in 2010 exported just over 8 metric tons of mercury compounds to the United States and none to Canada. In 2014 there were minimal exports of mercury compounds from the United States to Mexico. However, whereas Mexico reported no exports of mercury compounds to Canada in 2014, Canada reported that it imported 87 metric tons of mercury compounds from Mexico in that year.

Market data

There are no viable statistics on the marketing and use in North America of the range of mercury compounds included in HS 2852.

The Interstate Mercury Education and Reduction Clearinghouse (IMERC) collects information on the use of mercury-added "formulated products," or chemical products that are sold as a "consistent mixture of chemicals." These include laboratory chemicals, cleaning products, coating materials, acids, alkalis, bleach, stains, reagents, preservatives, fixatives, buffers, and dyes.[17] These products are grouped into two categories: 1) preservatives and reagents (e.g., thimerosal) and 2) mercury compounds (e.g., mercuric chloride, mercuric nitrate, mercuric oxide and others). Based on industry reporting, IMERC has calculated the amount of mercury sold in the United States in formulated products in 2013 at 2,590 pounds (1,175 kg), which is only a tiny fraction of the trade indicated in these tables.

Clearly IMERC's definition of "formulated products" as a group of mercury-added products does not cover the vast majority of uses for mercury compounds in the United States, and so is not a helpful guide to understanding or estimating the national consumption of mercury compounds.

3.5 Amalgams, other than dental materials

Trade data

By definition an "amalgam" is a chemical bonding between another metal and mercury, therefore, all amalgams contain mercury. The commodity code HS 2843 includes compounds of precious metals (whether or not chemically defined) and amalgams of precious metals, as shown in Table 7 of

[16] Simply to have a rough idea of the actual mercury content of 248 metric tons of mercury compounds, it may be assumed that mercury makes up most of the weight of those compounds. For example, mercury (II) chloride is 74 percent mercury by weight, and mercury (I) chloride, also known as calomel, is 85 percent mercury by weight; etc. These 248 metric tons of mercury compounds therefore likely comprise 180-200 metric tons of mercury.

[17] The data available online at <http://www.newmoa.org/prevention/mercury/imerc/factsheets/formulated_products_2015.pdf> do not include mercury-added pharmaceuticals and personal care products that are regulated by the US Food and Drug Administration.

Appendix 1. The North American countries use the HS Subheading 2843.90, which includes compounds of precious metals (other than silver and gold) as well as amalgams, but they have not designated a specific subheading for amalgams. The United Kingdom, on the other hand, has allocated HS commodity Subheading 2843.90.10 specifically for amalgams.

Commodity code HS 2853 includes "other inorganic compounds…; amalgams, other than amalgams of precious metals," but again, there is no specific subheading designated only for amalgams.

Analysis and discussion

Because the available data combine cross-border trade in compounds with the trade in amalgams, they do not permit the user to have a clear understanding of the quantities of actual amalgams transferred among the North American countries. Given the evident limitations of the Harmonized System, therefore, it is impossible to compare the trade of amalgams among the three countries.

Market data

In summary, no North American statistics specifically identify North American production, marketing or use of non-dental amalgams. However, other evidence suggests that non-dental amalgams are produced and exported by the United States. One example is amalgam spheres (also referred to as amalgam pills or amalgam balls) sold for use in the production of fluorescent lamps and tubes.

More specifically, this product appears under the Indian import tariff code HS 2853.00.40, which is not found in any of the North American lists of tariff codes. In one example, the product is described as a "Mercury pill for CFL (Zn-Hg, 50-50%, 8 mg) (Batch no. 3611-180, 8 x 50,000 piece bottle)." A variety of other import tariff codes also appear in the Indian statistics referring to the same product. According to the Indian import statistics, the tens of millions of zinc-mercury amalgam spheres and tin-mercury amalgam spheres imported annually by India are produced in the United States, Germany, China and other countries. There is no evidence that they are produced in Mexico or Canada.[18]

3.6 Batteries

Trade data

There are three main types of button-cell battery that commonly contain mercury (USGS 2013), although all three types are also available in mercury-free varieties:

- alkaline manganese (oxide), also known as alkaline or manganese dioxide batteries, are used in toys, calculators, remote controls and cameras (IMERC 2015b).
- silver-oxide, or zinc/silver oxide batteries are used in various devices, such as hearing aids, watches, cameras and clocks (IMERC 2015b).

[18] Further information is available online at <https://www.zauba.com/import-/hs-code-28530040-hs-code.html> and <https://www.thedollarbusiness.com/exim-maps/connections?type=sellers&hscode=28054000&searchkey=>.

- air-zinc batteries are mostly used in hearing aids because of their high energy concentration and their ability to continuously discharge energy (IMERC 2015b). These button cells are more likely to contain mercury than the other two varieties.

A fourth type, the mercuric oxide battery, contains some 30-40 percent mercury by weight, and was widely used in the past (including in button cells, for such applications as hearing aids). They are now prohibited for most uses (see "Analysis and discussion" below).

The commodity codes for mercury-added (together with mercury-free) batteries traded by Canada, Mexico and the United States are presented in Table 8 of Appendix 1, and the trade data can be seen in Tables 22 though 25 of Appendix 3.

Analysis and discussion

The United States is a key exporter of the three main battery types to both Canada and Mexico. The United States exported some 500 million manganese dioxide batteries (mostly button cells) to Canada and Mexico in 2010, and more than 300 million in 2014, of which 80-90 percent were manufactured in the United States (i.e., 10 to 20 percent were re-exports). The United States exported about 10 million silver oxide batteries to Canada and Mexico in 2010, and 7-8 million in 2014. The United States exported about 9 million air-zinc batteries to Canada and Mexico in 2010, and more than 30 million in 2014, most of them to Canada, of which nearly half were re-exports.

Despite the availability of reasonably good data on these three battery types, there are a number of reasons why these commodity codes are not useful for understanding the trade in mercury-added batteries:

- They do not segregate mercury-added batteries from mercury-free batteries; the only mercury-added batteries specifically identified by an HS code are mercuric oxide batteries.
- The data do not separate larger batteries from button-cell batteries (in this respect, it is interesting that India has created a tariff code 8506.80.10 specifically for button cells).
- The data do not specify whether batteries contain more or less than two percent mercury, which is the upper limit for batteries as defined under the Minamata Convention (see section 3.1).
- They do not include the many batteries integrated in imported (or exported) products.

With regard to national restrictions, Canada's Products Containing Mercury Regulations prohibit the manufacture and import of batteries containing mercury. It should be noted, however, that this does not apply to batteries that have a mercury concentration of no more than 0.0005 percent by weight in homogeneous materials, or, until 31 December 2019, to button cell batteries that are incorporated into medical devices intended to remain within the body for at least 30 consecutive days (e.g., pacemakers).

In Mexico, a recent initiative of the Ministry of Economy (*Secretaría de Economía*) is the draft Official Mexican Standard PROY-NOM-212-SCFI-2016, Primary cells and primary batteries – maximum permissible levels of mercury and cadmium, specifications, test methods and labeling.[19] This draft standard, published on 12 December 2016, applies to all primary cells and batteries

[19] Proyecto de Norma Oficial Mexicana PROY-NOM-212-SCFI-2016, pilas y baterías primarias-límites máximos permisibles de mercurio y cadmio-especificaciones, métodos de prueba y etiquetado. Available online at <http://www.dof.gob.mx/nota_detalle.php?codigo=5465033&fecha=12/12/2016>.

imported or marketed in the national territory; and it prescribes, among other conditions, a maximum mercury content of 0.0005 percent by weight.

In the United States the mercury content of batteries is also regulated, and mercuric oxide batteries are prohibited—with some possible medical exceptions—for all but civil protection and military uses, which typically use batteries larger than button cells.

The National Electrical Manufacturers Association (NEMA), whose members include the major US battery producers, reported that achievement of mercury-free battery manufacture for its US members was feasible and on track for 2016 (USEPA 2013). It is unclear, however, whether this applied only to their members' US-based production. Moreover, this limitation on manufacturing may not address the importation of individual batteries or batteries contained in products that are manufactured outside of the United States by companies that are not members of NEMA.

Market data

While the IMERC database is not comprehensive, US companies reported nationwide sales of batteries containing 509 kg of mercury in 2013. This represented a notable 92 percent decrease from the mercury content of batteries sold in the United States in 2010, as reported by industry to IMERC (IMERC 2015b). The IMERC database does not include data on mercuric oxide batteries, which are still used in special applications. As mentioned, federal law allows these batteries to be sold for military and medical uses, but only if the manufacturer has established a system to collect the waste batteries and ensure that the mercury is properly managed (IMERC 2015b). With regard to more recent trade data, the Comtrade database shows US imports of over 900,000 mercuric oxide batteries in 2015, and exports of over 300,000 units (see Table 25).

It was estimated that Canada imported about 900 kg of mercury in all types of batteries in 2008 (Environment Canada 2009). The Comtrade statistics for 2015 show substantially greater imports of mercuric oxide batteries into Canada than exports—a difference equivalent to an estimated 4-5 metric tons of mercury content. It is likely that the amount of mercury in imported button cells has decreased since the 2015 estimate, given that the Products Containing Mercury Regulations prohibit the manufacture or import of mercury-containing batteries.

Securing reliable information on mercuric oxide batteries has long been a challenge. The Mexican Mercury Market Report examined SIAVI trade data and concluded that mercury use in mercuric oxide batteries amounted to 237 kg during a 12-month period in 2007–2008 (CEC 2011, 61). Comtrade statistics for 2015 show Mexican imports of over 77 metric tons of mercuric oxide batteries (representing a potential content of 25 metric tons of mercury), and no exports. However, during the development of the Mercury Emissions Inventory for Mexico (in progress), INECC reviewed confidential information in individual shipping manifests provided by the *Secretaría de Economia*, and identified mistakes in the coding of these batteries, which resulted in far lower apparent domestic use than indicated by the published statistics.[20]

Based on the above information, it appears that the use of mercuric oxide batteries in all three countries has greatly declined in response to regulations.

[20] INECC communication with José Castro Díaz, May 2017.

3.7 Switches and relays

Trade data

Mercury-added switches are used to open or close an electric circuit or a liquid or gas valve, and include float, tilt, pressure and temperature switches. They have been used most commonly in pumps, appliances, space heaters, ranges/ovens and a variety of machinery.

Mercury-added relays are used to open or close electrical contacts to control another device on the same circuit and are often used to switch off large electrical currents by supplying a small amount of electricity to the control circuit. They can generally be found in telecommunications circuit boards and industrial ovens, among other equipment.[21]

In recent years mercury-added switches and relays have come under increasing scrutiny. The IMERC member states of California, Connecticut, Illinois, Louisiana, Maine, Massachusetts, Minnesota, New Hampshire, New York, North Carolina, Rhode Island, Vermont and Washington have imposed restrictions or bans on the sale and/or distribution of mercury-added switches and relays, individually or as a component in another product (e.g., those used in automobiles such as convenience light and anti-lock brake system switches; those used in gas ranges/stoves, referred to as diostats; flame sensors; etc.). Other states that restrict the sale of one or more types of mercury-added switches or relays include Iowa, Oregon and Wisconsin. In response to these bans and phase-outs, many companies have ceased manufacturing mercury switches and relays and/or stopped selling products that contain these devices.[22] Exemptions to these restrictions may include specialized applications such as very high accuracy capacitance and loss measurement bridges; high-frequency radio frequency (RF) switches and relays in monitoring and control instruments; products required for refurbishment or as replacement parts; and so on (IMERC 2014). Canada's *Products Containing Mercury Regulations* prohibit the import and manufacture of mercury-added switches and relays. Similar to the restrictions imposed by some of the states in the United States, very high accuracy capacitance and loss measurement bridges and high-frequency RF switches and relays in monitoring and control instruments, with a maximum mercury content of 20 mg per bridge, switch or relay are exempted (PCMR 2014).

The commodity code and subheadings for switches and relays traded by Canada, Mexico and the United States are presented in Table 9 of Appendix 1.

Analysis and discussion

Once again, since commodity code 8536 does not differentiate between mercury-added and mercury-free switches and relays, the CIMT, SIAVI, USITC and Comtrade databases cannot provide useful information on North American trade in mercury-added switches and relays. No other databases with this level of detail were found.

[21] Available online at <https://www.nrdc.org/sites/default/files/minamata-convention-on-mercury-manual.pdf>

[22] Other classes of mercury-added products subject to state bans and phase-out regulations may be consulted online at <http://www.newmoa.org/prevention/mercury/imerc/banphaseout.cfm>.

Market data

Based on industry reporting, the IMERC database calculated the amount of mercury contained in mercury-added switches and relays marketed in the United States in 2010 at 38,869 pounds (17,631 kg). The year 2010 is the latest for which country-wide data on mercury-added switches and relays are available because IMERC no longer collects information on those uses. Although IMERC has suggested that the use of mercury has decreased since then, there is no information available to quantify the decrease (IMERC 2014). Separately, the IMERC database shows that thermostats marketed nationwide in the United States in 2013 contained only 102 pounds (46 kg) of mercury, as many states have passed legislation restricting the sale of mercury-added thermostats (IMERC 2015f).

The estimate of the Canadian market in 2008 was nearly 600 kg of mercury contained in roughly 600,000 switches and relays, and an estimated 735 kg of mercury in 188,361 thermostats (ToxEcology 2009). While more recent estimates are not available, Canada's PCMR prohibited the import and manufacture of mercury containing switches and relays since 2015, as mentioned above.

The Mexican Mercury Market Report examined SIAVI trade data and concluded that mercury use in switches and relays amounted to 12,260 kg during a 12-month period in 2007–2008 (CEC 2011, 67). A separate estimate for thermostats was not presented, although the report confirmed that mercury-free thermostats were not being marketed at that time. It would be reasonable to assume that mercury use in this sector has declined since then.

3.8 Mercury-added lamps

Trade data

Mercury-added lamps can be grouped into the following categories:

- Compact fluorescent
- Linear fluorescent
- Other fluorescent, especially cold cathode and external electrode fluorescent
- High intensity discharge (including metal halide, ceramic metal halide, high pressure sodium, and mercury vapor)
- Neon
- Mercury short-arc
- Miscellaneous

Of particular interest to this project are the first three categories, as some lamps belonging to each of these are specifically restricted under the Minamata Convention, as detailed in section 3.1.

The commodity codes relevant to mercury-added lamps are shown in Table 10 of Appendix 1.

Analysis and discussion

It should be noted that these data are for lamps traded as separate items and do not include similar lamps that have been incorporated in, or sold with fixtures and other commodities. The relevance of this observation may be evident from the following examples. In a given year Country A could fabricate CFLs, export them as independent items to Country B under Subheading 8539.31 (fluorescent, hot cathode lamps), where they could be packaged together with light fixtures, which could then be exported to Country C and/or back to Country A under entirely different tariff codes.

Or Country C could manufacture both discharge lamps and light fixtures, combine them in the same packaging and export them to Country A as light fixtures.

It is evident, therefore, that merely tracking the commodity codes for mercury-added lamps, even when the codes refer exclusively to a mercury-added product, is not sufficient to acquire a complete picture of the trade of that mercury-added product. Furthermore, these commodity codes do not provide information about the mercury content of the lamps, which may vary greatly even for one type of lamp, depending on the manufacturing process and technology used. Therefore, it is impossible to extract data from these databases that are useful for the purposes of this study. Nevertheless, HS codes 8539.31 and 8539.32 (mercury- or sodium-vapor lamps; metal halide lamps) reflect virtually all trade in independently packaged mercury-added lamps, i.e., excluding those lamps that are shipped together with their fixtures or luminaires, integrated as back-lighting for LCD displays, and so on.

Market data

As seen in Table 26 of Appendix 3, North American trade in discharge lamps used for general lighting purposes greatly exceeds the trade in special-purpose vapor and halide lamps (Table 27), all of which contain mercury. Although there are several inconsistencies in the numbers reported by trading partners, in 2010 there were between 42 and 44 million units of discharge lamps traded each way between the United States and Canada, 13 to 23 million were exported from the United States to Mexico, and 4 to 8 million were exported from Mexico to the United States. In 2014, between 21 and 23 million units were exported from Canada to the United States, and between 25 and 46 million went in the other direction. Likewise 24 to 29 million units were exported from the United States to Mexico, and 3 to 6 million went in the other direction.

As mentioned previously, the United States includes re-exports in its numbers for total exports, while Canada and Mexico do not include US re-exports in their reporting of imports. This accounts for some of the discrepancies in the data, as the US re-exports of discharge lamps used for general lighting purposes may be as much as 25 to 30 percent of their total exports to Canada.

"Neon lighting" is a widely used form of cold-cathode fluorescent lighting consisting of long tubes filled with various gases at low pressure,[23] typically used as advertising in neon signs. While they may contribute significantly to the total mercury use in lamps, most of these are produced as a cottage industry and are not included in the tables mentioned above. While the word "neon" is commonly used to describe this type of lamp, neon gas is only one of the gases used in commercial applications. Neon gas (without added mercury) is primarily used to generate shades of red and orange. Most other colors, however, are produced from argon gas with mercury added to the tube. Commercially produced neon lights may contain 250 to 600 mg of mercury per bulb, depending on the manufacturer (IMERC 2015d).

In Canada all mercury-containing lamps accounted for an estimated 2,078 kg of mercury consumed in 2008, including over 300 thousand meters of new or replaced neon light tubes solely for the domestic market, with an estimated mercury content of 59 kg (Environment Canada 2009).

In spite of some acknowledged uncertainties related to the IMERC database, it reported US nationwide sales of 10,473 pounds (4,750 kg) of mercury in lamps in the United States in 2013, not including mercury used in neon lights (IMERC 2015d), which may add 5 percent or more to the total

[23] Available online at <https://en.wikipedia.org/wiki/Gas-discharge_lamp>

mercury in lamps marketed during the year.[24] These figures may be compared to a USGS calculation that in 2010 the estimated mercury inventory of about 4 billion lamps in use in the United States was 28.8 metric tons (USGS 2013), not including neon lamps. Assuming an average four-year lamp lifetime, about 7 metric tons of mercury in lamps were going to waste and recycling in 2010, and often being replaced by other mercury-added lamps (LEDs had not yet shown significant market strength) but with likely lower average mercury content per lamp.

Although presented with a "low level of confidence," it was estimated that about 0.5 metric ton of mercury was used in general lighting and another (one) metric ton for artisanal neon signs in Mexico during a 12-month period in 2007–2008 (CEC 2011, 65-67). The quantity of mercury used for general lighting in Mexico would have increased significantly after this period with the increased use of CFLs (despite a reduced level of mercury in some CFLs), and likely continued to increase through 2014 as a result of the National Program for the Sustainable Use of Energy (2014–2018). That program was designed to support the local economy, decrease energy consumption and contribute to the reduction of greenhouse gas emissions, and included the distribution of 40 million free CFLs to the citizens of towns with fewer than 100,000 inhabitants.[25]

3.9 Cosmetics

Trade data

International attention is periodically drawn to cosmetics with mercury content above 1ppm, especially skin-lightening soaps and creams, due to their potential health effects. Many countries have banned the intentional use of mercury in cosmetics and related products, although such bans normally exclude eye area cosmetics, where mercury is used as a preservative and no effective and safe substitute preservative is available (WHO 2011).

The commodity codes for cosmetics are presented in Table 11 of Appendix 1.

Analysis and discussion

As in other cases, these commodity codes do not permit the separation of data on mercury-added cosmetics—which are not often traded openly in any case—from the data for mercury-free cosmetics. Therefore, it is impossible to extract data from the CIMT, SIAVI and USITC databases that are useful for this study.

[24] IMERC (2015d) reported that neon lights consumed 1,071 pounds (486 kg) of mercury in 2004, based on the reports of only a small percentage of neon light manufacturers. The United States has approximately 10 times the population of Canada, and likely an even greater multiple of commercial outlets. It is therefore conservatively estimated that the United States consumed 10 times as much mercury in neon signs as Canada, or about 600 kg in 2008. For similar reasons as presented for Canada, the amount of mercury used in neon signs in the United States in 2014 is estimated to have declined to some 450–500 kg.

[25] Further information on the *Programa Nacional para el Aprovechamiento Sustentable de la Energía 2014-2018*, is available online at <http://www.dof.gob.mx/nota_detalle.php?codigo=5469371&fecha=19/01/2017>.

Market data

There is no routinely collected data on mercury-added cosmetics in North America. Mercury-added skin lightening soaps and creams are occasionally produced in the region, but more often are clandestinely brought into the region for sale (MPP undated).

3.10 Pesticides, biocides and topical antiseptics

Trade data

There is increasing international scrutiny of mercury-containing pesticides, topical antiseptics such as thiomersal (e.g., Merthiolate brand) and other uses such as a fungicide and preservative (biocide) in paints.

The commodity codes for pesticides, biocides and topical antiseptics are shown in Table 12 of Appendix 1.

Analysis and discussion

In Canada, no mercury-based pesticide active ingredients have been registered for use since 1998. The Pest Control Products Act allows Health Canada to prevent their introduction into the Canadian market, according to the Pest Management Regulatory Agency (PMRA), which is responsible for pesticide regulation in Canada.

In Mexico, according to the list of banned pesticides published in the Official Journal of the Federation, 3 January 1991,[26] the import, manufacture, formulation, marketing and use of phenylmercury acetate (CAS 62-38-4) and phenylmercury propionate (CAS 103-27-5) were prohibited. More recently, the official Catalog of Pesticides published in 2016 (Cofepris 2016) does not include any mercurial pesticides.

All US registrations for mercury containing pesticides were cancelled as of early 1995. The last four uses to be cancelled were mercury-containing preparations marketed for use as a turf fungicide, as a mildew-cide for fresh-cut wood, as a latex paint fungicide/preservative and for outdoor fabric treatment.

It should be noted that the HS commodity codes pertaining to pesticides, biocides and topical antiseptics do not permit the separation of data on mercury-added substances from those for mercury-free substances. Therefore, it is impossible to extract data from the CIMT, SIAVI and USITC databases that are useful for this study.

Market data

The IMERC database covers the marketing in the United States of "formulated products," which include laboratory chemicals, cleaning products, coating materials, acids, alkalis, bleach, stains, reagents, preservatives, fixatives, buffers, and dyes. While the scope of the IMERC database clearly does not cover all pesticides, biocides and topical antiseptics, it nevertheless concluded that in 2013

[26] Available online at: <http://www.dof.gob.mx/nota_detalle.php?codigo=4697687&fecha=03/01/1991>

mercury use in formulated products sold nationwide in the United States amounted to 2,590 pounds (1,175 kg) (IMERC 2015a).

In Mexico a very tenuous estimate was developed for a 12-month period in 2007–2008 for mercury used in "basic inorganic chemical production and other industrial uses" (CEC 2011), but no recent estimate is available.

In Canada, since1998 there have been no mercury-added pesticides or biocides allowed in the marketplace.

3.11 Non-electronic measuring devices

Trade data

Apart from thermostats and other non-electronic measuring devices installed in heavy equipment or those used for high-precision measurements where no suitable mercury-free alternative is available, there are increasing international efforts to phase out mercury-added non-electronic measuring devices, including:

- barometers
- hygrometers
- manometers
- thermometers
- sphygmomanometers (blood pressure cuffs)

Thousands of hospitals, pharmacies, and medical device purchasers have already eliminated the use of mercury–added thermometers and sphygmomanometers, for example.

The commodity codes for non-electronic measuring devices are shown in Table 13 of Appendix 1.

Analysis and discussion

These commodity codes do not permit the separation of data on mercury-added products from those for mercury-free products. Therefore, it is impossible to extract data from the CIMT, SIAVI and USITC databases that are useful for this study.

Market data

The IMERC database summarized the nationwide US market for mercury-added measuring devices including barometers, thermometers, manometers, sphygmomanometers and others. Based on industry reporting, IMERC calculated that approximately 1,607 pounds (729 kg) of mercury were marketed in such measuring devices in the United States in 2013 (IMERC 2015e). In the United States, mercury use in several measuring devices is prohibited without prior notification to the Environmental Protection Agency. A number of states have prohibited the sale of mercury-containing thermometers and sphygmomanometers.

In Canada, approximately 50,000 thermometers containing 94 kg of mercury were imported in 2008, most of them assumed to be for domestic consumption. It was also estimated that the market for other measuring devices used 130 kg of mercury in 2008 (Environment Canada 2009). It should be noted that Canada's Products Containing Mercury Regulations, which entered into force in November 2015,

prohibit the import and manufacture of mercury-containing thermometers and other measuring devices containing mercury, with some exemptions for specific scientific applications.

In Mexico it was estimated that, during a 12-month period in 2007–2008, 5.4 metric tons of mercury were used in sphygmomanometers and other manometers (and related maintenance, mostly consisting of topping up or repairing and refilling leaking mercury columns), 2.4 metric tons were used in medical thermometers, and another 1.6 metric tons were used in barometers, non-medical thermometers and psychrometers/hygrometers (CEC 2011, 73). Sphygmomanometers have consistently consumed more mercury in Mexico than other measuring devices and all are gradually being replaced by mercury-free devices, although replacement has been slowed by the real or perceived cost of mercury-free alternatives.

3.12 Dental amalgam

Trade data

Mercury is widely used in the dental industry in amalgam fillings for teeth. Dental amalgam contains mercury and varying amounts of silver, tin, copper and other metallic elements. The mercury content is typically about 50 percent.

Modern dental amalgams are not sold in amalgam form, but generally as capsules with separate compartments for metal powders and mercury (that remain separate until they are combined into an amalgam at the dental clinic). More traditionally, and still in some parts of North America, the amalgam materials are purchased independently as elemental mercury and separate metal powders that are mixed to form the amalgam shortly before use.

Analysis and discussion

As seen in Table 14 of Appendix 1, the mixes or formulations for dental filling materials may be found under HS Subheading 3006.40, “dental cements and other dental fillings; bone reconstruction cements.” This and related tariff codes do not permit the separation of data for dental amalgams, which always contain mercury, from the data for mercury-free filling cements and other materials. As a result, it is impossible for national authorities to determine, on the basis of these trade statistics, how much mercury their country has imported for dental purposes. Likewise, it is impossible to extract data from the CIMT, SIAVI and USITC databases that are useful for this study.

Market data

In the United States, while there are limitations to the IMERC database, which among other things probably does not include some imported amalgam materials, five firms reported nationwide sales of 15.5 metric tons of mercury for dental amalgams in 2013 (IMERC 2015c). A 2012 report demonstrated that the IMERC database may underestimate the actual US consumption of mercury in amalgam by as much as 30 to 40 percent (CEW 2012).

In Canada, an estimated 4,700 kg of mercury were used in dental amalgams in 2008 (Environment Canada 2009). Since then, Canada has put in place measures to address the use of dental amalgam, in line with the phase down provisions of the Minamata Convention.

In Mexico, the Federal Commission for Protection Against Sanitary Risks (Cofepris) in 2011 published the Guide to Good Practices for the Use of Mercury in Dental Clinics, which discouraged the hand mixing of amalgam tablets in a mortar.[27] Data from the Ministry of Health (*Secretaría de Salud*) indicate that 1.5 million amalgams were placed by the public health services (89 percent of total fillings) in 1995, while in 2014 approximately 1.3 million amalgams (31 percent of total fillings) were placed by the public health services. Assuming the public health sector accounts for about one-third of the total number of fillings placed, the total for Mexico is estimated at around 4 million amalgams per year, equivalent to 3 to 4 metric tons of mercury used.

The dental sector is further supported by the important recent Mexican Official Standard (*Norma Oficial Mexicana*) NOM-013-SSA2-2015 for the prevention and control of oral diseases, published on 23 November 2016.[28] As concerns mercury, this standard mandates measures to be taken for the reduction of risks in the use of mercury and mercury waste management in dental practice, including the use of only pre-dosed capsules when placing amalgam fillings.

3.13 Incidental uses of mercury in products

Trade data

Incidental uses of mercury may include the use of mercury catalysts in polyurethane elastomer production, or the use of mercury in pyrometers, fireworks, flow meters, toys, jewelry, novelty items, balancers and wheel weights, food additives and colorings, analytical, testing and calibration equipment, and so on. In addition, mercury has cultural, religious and artisanal uses among some communities in North America, as in a number of other countries.[29]

However, none of these goods or uses is specifically identified by tariff codes, let alone separating mercury-added from mercury-free products. For example, with regard to mercury catalysts such as those used in some polyurethane elastomer production, trade statistics would probably be included in the tariff codes for "Reaction initiators, reaction accelerators and catalytic preparations," shown in Table 15 of Appendix 1.

Analysis and discussion

As none of the relevant commodity codes permit the separation of the data on mercury-added goods from the data on mercury-free goods, it is impossible to extract data from the CIMT, SIAVI and USITC databases that are relevant to this study.

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[27] *Guía de Buenas Prácticas de Uso de Mercurio en Consultorios Dentales*, available online at <http://www.cofepris.gob.mx/Biblioteca%20Virtual/mercurio/prelum.pdf>

[28] *Norma Oficial Mexicana NOM-013-SSA2-2015, para la prevención y control de las enfermedades bucales*, available online at <www.dof.gob.mx/nota_detalle.php?codigo=5462039&fecha=23/11/2016>

[29] Cultural, religious and artisanal uses may include traditional cures such as for indigestion; religious traditions such as *Espiritismo* and *Santería* (most commonly practiced by people of Puerto Rican and Cuban origin, respectively), Voodoo, and Palo; folk remedies such as wearing mercury in amulets, sprinkling it around the home, burning it in a candle or oil lamp or adding it to perfumes; fireworks; etc. (CEC 2013b)

Market data

The markets for incidental uses of mercury are particularly difficult to estimate. This category may comprise such diverse applications of mercury and mercury compounds as laboratory chemicals, catalysts,[30] chemical intermediates, porosimeters, pycnometers, pharmaceuticals, organic mercury compounds used as preservatives in paints, traditional medicine, cultural and ritual uses, and so on. For some of these applications, the consumption of mercury may be significant. In particular, one such use is the continued employment of mercury catalysts in the production of polyurethane elastomers, where the catalysts remain in the final product. Likewise, the use of considerable quantities of mercury in porosimetry had until relatively recently not been reported (European Commission 2008).

For the US market the IMERC database includes sales of some of the incidental uses of mercury mentioned above, but these product categories are not distinct enough to be helpful. For example, a "lamp kit" containing a fluorescent lamp is included in the product category for "Industrial machinery." However, relays may also be found in the category for "Industrial machinery" rather than in the category for "Relays." The use of mercury in rotational (wheel) balancers and wheel weights is roughly estimated at 2 to 3 metric tons (see Appendix 2).

In Canada, the manufacture and importation of mercury-containing rotational (wheel) balancers and wheel weights have been prohibited since November 2015 under the Products Containing Mercury Regulations.

In Mexico it was estimated that 3.9 metric tons of mercury were used in "biopharmaceutical and laboratory uses" during a 12-month period in 2007–2008 (CEC 2011, 73).

Globally, these incidental uses of mercury were estimated to consume between 230 and 430 metric tons of mercury in 2010 (AMAP 2013), although reliable estimates at the national level are unavailable.

3.14 Conclusions regarding the available trade data

For most of the mercury-added products discussed in this chapter, the available statistics do not permit separation of the mercury-added goods from those without mercury. One exception is mercury-added lamps, where certain categories would theoretically align themselves with the products listed in the Minamata Convention. However, in the case of lamps, the Convention is specifically concerned with the mercury content per lamp, which is not addressed at all in the national trade databases.

The existing trade data on mercury and mercury compounds, on the other hand, could facilitate measures to implement the Minamata Convention, to the extent that the quality of the data can be better understood through access to more of the details.

[30] This excludes consideration of such catalysts as mercuric oxide used in vinyl chloride monomer (VCM) production, since that catalyst is not intentionally added to the final product.

4 Specific discrepancies in North American statistics

Based on the databases for mercury trade described previously, which are the sources of the data presented in Appendix 3: Mercury trade in North America, it is possible to identify the main data discrepancies for trade in mercury and mercury compounds. A review of the 2010 and 2014 trade data in Tables 18 and 19 of Appendix 3 highlights the discrepancies identified below.

As mentioned previously, the trade data presented in this section were accessed from databases and other sources prior to October 2016, unless otherwise indicated. As such, they present the data available at that time, and do not reflect revisions and updates to the data that may have occurred since that time. Before citing or using information in this report, therefore, readers are cautioned to consider the temporal nature of the source data, as well as findings based on those data, which in some cases may no longer be valid.

4.1 Discrepancies between Canadian and Mexican databases

Elemental mercury (HS 280540)

In 2014 Mexico reported in its SIAVI database that it exported 138 kg of mercury in July and again in October – total value US$22,399 – to its trading partner, Canada. Mexico sent the same data to UNSD for the Comtrade database. However, in the same year Canada recorded in its CIMT database (according to revised data consulted on 3 May 2017) only one import from its trading partner, Mexico, of 138 kg of mercury in July, valued at US$10,904. From the publicly available data, it is not possible to explain why the second shipment in October was recorded in Mexico but not in Canada.

Mercury compounds (HS 2852)

Considering the number of compounds that may be traded, and the possibility for different codes to be applied to the same compounds (e.g., some mercury compounds could also be coded as research chemicals, medical supplies, etc.), it is not surprising that discrepancies in the data on imports and exports of mercury compounds occurred.

In 2010, Mexico reported exports of zero kilograms of mercury compounds to Canada, as compared with Canada's reported imports from Mexico of 89 kg of mercury compounds.

In 2010, Canada reported exports of zero kilograms of mercury compounds to Mexico, as compared with Mexico's reported imports from Canada of only 2 kg of mercury compounds.

In 2014, Mexico reported exports of zero kilograms of mercury compounds to Canada, as compared with Canada's reported imports from Mexico of 87,425 kg of mercury compounds.

In all of these cases it is possible that the discrepancies could be explained as re-exports, which are not specifically identified in the Canadian or Mexican statistics. Theoretically, in 2014 a third country could have exported 87,425 kg of mercury compounds to Canada by transshipping the mercury via Mexico. The Canadian authorities would have recorded these as imports, although Mexico would not have recorded them as exports with final destination Canada. Alternatively, a third country could have transshipped mercury compounds through Canada from Mexico.

It is possible to examine the transshipment theory a bit further:

- One can look at the trade databases to determine whether Mexico exported large quantities of mercury compounds (that may have been transhipped via Canada) to any other country as

final destination in 2014 – or shortly before or after. Such a search reveals only that Mexico reported exporting 122 kg, 111 kg and 63 kg of compounds during the years 2013, 2014 and 2015, respectively.

- One can also look at the trade databases to determine whether a third country shipped large quantities of mercury compounds (that may have been transhipped via Mexico) to Canada in 2014 or thereabouts. In fact Canada reported imports of 771,507 kg of mercury compounds in 2014, so it is quite possible that 87,425 kg of that total could have been transhipped via Mexico.

Transshipment via multiple countries is also possible although a bit less common. Overall, however, it is impossible to definitively identify the causes of these discrepancies merely through the analysis of the publicly available data.

4.2 Discrepancies between Mexican and US databases

Elemental mercury (HS 280540)

In 2010, Mexico reported exports to the United States of 1,329 kg of mercury as compared with the US reported imports from Mexico of zero kilograms of mercury.

In 2010, the United States reported exports to Mexico of zero kilograms of mercury as compared with Mexico's reported imports from the United States of 14,541 kg of mercury.

Mercury compounds (HS 2852)

In 2010, the United States reported exports of 176,955 kg (which includes 14 kg of re-exports) of mercury compounds to Mexico, but Mexico recognized only 13,880 kg of imports from the United States, which leaves unexplained a difference of 163,061 kg more reported by the United States.

In 2010, Mexico reported exports of 8,409 kg of mercury compounds to the United States, as compared with the US reported imports from Mexico of 16,672 kg of mercury compounds.

4.3 Discrepancies between US and Canadian databases

Elemental mercury (HS 280540)

In 2010, the United States reported exports to Canada of 5,863 kg (which included re-exports of 2,434 kg) of mercury as compared with Canada's reported imports from the United States of 4,107 kg of mercury, which leaves unexplained a difference of 678 kg more reported by Canada. This is a good example of a case where the USITC database provides separate figures for total US exports (including re-exports) and re-exports. Meanwhile, in line with its own procedures, the CIMT database provides only one corresponding figure for Canadian imports, and that figure does not include commodities re-exported from the United States. So if one consults only the raw "export" and "import" figures in the two databases, one sees a sizable discrepancy. In this case, however, even after subtracting the US re-exports from the total exports, there remains a discrepancy of 678 kg between US reported exports (not including re-exports) and Canadian reported imports for 2010.

In 2014, the United States reported exports to Canada of zero kilograms of mercury as compared with Canada's reported imports from the United States of 665 kg of mercury, according to the CIMT

database consulted in September 2016. However, a later review of the CIMT database (3 May 2017) revealed that Canada's 2014 mercury imports from the United States had been revised to zero.

Mercury compounds (HS 2852)

In 2010, the United States reported exports of 106,046 kg (which includes 42,896 kg of re-exports) of mercury compounds to Canada, but Canada recognized only 66,891 kg of imports from the United States, which leaves unexplained a difference of 3,741 kg more reported by Canada.

In 2014, the United States reported exports of 248,025 kg (which includes 30,874 kg of re-exports) of mercury compounds to Canada, but Canada recognized only 205,017 kg of imports from the United States, which leaves unexplained a difference of 12,134 kg more reported by the United States.

4.4 Following up on data discrepancies

The above discrepancies were brought to the attention of the relevant authorities for assistance in identifying the possible causes. The main agencies involved in this process included the following:

- Canada Border Services Agency
- Statistics Canada
- Mexico's General Customs Administration (*Administración Central de Planeación Aduanera*)
- Mexico's Ministry of Economy (*Secretaría de Economía*)
- US Customs and Border Protection
- US Census Bureau

After a number of exchanges, Statistics Canada responded that the data are revised on an ongoing basis, through amendments and internal revisions. The numbers have been adjusted since the initial data request, both through amendments from import brokers, as well as through Statistics Canada's own revisions.

The Mexican agencies offered to review any data that was specifically highlighted by their Canadian and US counterparts.

Both the US Census Bureau and US Customs and Border Protection were unable to provide more detail than what was available in the public databases. However, Customs and Border Protection offered to work more closely with EPA to explain data discrepancies that had been identified.

Commercial confidentiality

With regard to the above responses, during the course of a number of interviews it was confirmed that the laws governing confidential business information are significant in all three countries, and are strictly enforced by the respective government agencies to avoid the release of any information that might compromise the commercial or competitive position of any of the companies submitting shipping manifests to the agencies. For example, the US Census Bureau has published the following notice:

> "The Census Bureau is bound by the provisions of Title 13, United States Code, Section 301(g) to protect the confidentiality of the export data it collects and makes the information available only when the Secretary of Commerce's delegate, the Director of the Census Bureau, determines that withholding of information would be contrary to the national interest. …

> Additionally, all employees of the Census Bureau are prohibited from disclosing confidential information under the provisions of Title 18, United States Code, Section 1905. Violations may result in the imposition of penalties up to US$250,000 or imprisonment and removal from employment.
>
> "Information detailing the names of importers, shippers, consignees and other manifest data is not released by the Census Bureau. Manifest data are collected and disclosed by the US Customs and Border Protection (CBP) in accordance with Title 19, United States Code. Section 103.31(a) allows accredited representatives of the press to collect manifest data at every port of entry. Reporters may collect and publish names of importers and shippers from vessel manifest data unless an importer, shipper, or consignee requests confidentiality in accordance with Section 103(d)."[31]

Similarly, in Mexico the Law Governing the National System of Statistics and Geography (*Cámara de Diputados* 2015), Articles 37 and 38, prevents Inegi from providing information related to company-to-company transactions. This is due to the need for confidentiality of commercial information, of course, but further reinforced by the small number of importing and exporting companies.

In Canada, the disclosure of confidential trade data may be requested by federal, provincial or foreign government departments or agencies under section 107 of the Customs Act. A request may be approved as long as it satisfies one of the exceptions outlined in section 107. Once a request is approved, the data may be used only by the requesting department or agency for the specific purpose that it was disclosed. Furthermore, it cannot be forwarded by the recipient to another entity without the permission of the department that provided the disclosure.

A way forward

It would appear to be possible to determine the causes for many of these discrepancies without disclosing confidential information. With the knowledge that any trade data in the public database is simply the sum of a number of (confidential) individual transactions, the government agencies could:

- focus on a limited set of (public) discrepancies from a previous year;
- focus only on discrepancies in the quantity and ignore the value;
- isolate the party requesting the information from the confidential part of this process to avoid any danger or perception of disclosure;
- note the quantity of each (confidential) individual transaction that adds up to each (public) discrepancy previously identified;
- ask the counterpart in the parallel agency of the country in which the discrepancy has been observed to compare the individual transaction quantities from the given database with their own database, thereby helping to identify the source of the problem;
- communicate their findings to the party requesting the information by explaining how the discrepancy occurred, without any need to provide confidential data concerning individual shipping transactions.

[31] US Census Bureau Data Confidentiality Notice available online at <https://www.census.gov/foreign-trade/statistics/notices/20091113_privacy.html>, consulted on 17 October 2016.

In parallel with this request, and to encourage the support of the government agencies, the research was refocused by delving into the publicly available monthly data underpinning discrepancies in 2010 and 2014. Tables 1 and 2 of comparative monthly trade data highlight those months in 2010 and 2014 where there are data discrepancies.

In Table 1, for example, in April 2010 the United States exported 348 kg of mercury to Canada, while Canada imported only 140 kg from the United States. This appeared all the more unusual in light of the US-Canada Data Exchange in which the two have agreed to publish each other's import data as a proxy for their own official export data. If that were the case in this instance, the two countries' data should appear identical.

In Table 2 for 2014, the two shipments of 138 kg of mercury from Mexico to Canada, as mentioned previously, are evident, as compared to Canada's acknowledgment that it received only one of them (the figure of 1,147 kg in this table, which was consulted on 17 September 2016, was later revised to 138 kg in a subsequent review of the CIMT data by Statistics Canada). Table 2 also shows the monthly imports of mercury by Canada from the United States adding up to 665 kg for the year, according to the CIMT database (as of September 2016), that were later revised to zero, according to the CIMT database consulted on 3 May 2017.

One possible explanation for data discrepancies between the United States and Canada could be that the mercury was being transshipped via Canada, and Canada was not the final country of destination, in which case the US exporter was not formally exporting the mercury to Canada.

Another explanation for some discrepancies arose during interviews with the agencies, where attention was drawn to the fact that "low-value" shipments below the exemption levels of US$2,000 for imports into the United States, and US$2,500 for exports from the United States are not subject to the same reporting requirements as higher value shipments. In the following tables, therefore, the higher value discrepancies are highlighted in yellow.

Table 1. Comparative North American elemental mercury (HS 280540) trade data, 2010

2010	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Canada exports to Mexico, as reported by Canada													
Quantity (kg)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Value (CAN)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Mexico imports from Canada, as reported by Mexico													
Quantity (kg)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Value (US$)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**

2010	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Canada exports to the U.S., as reported by Canada													
Quantity (kg)	938	0	0	714	0	0	1,720	798	0	0	0	0	**4,170**
Value (CAN)	$4,953	$0	$0	$4,205	$0	$0	$4,124	$4,829	$0	$0	$0	$0	**$18,111**
U.S. imports from Canada, as reported by the U.S.													
Quantity (kg)	938	0	0	714	0	0	1,720	798	0	0	0	0	**4,170**
Value (US$)	$4,650	$0	$0	$3,934	$0	$0	$3,792	$4,397	$0	$0	$0	$0	**$16,773**

2010	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Mexico exports to Canada, as reported by Mexico													
Quantity (kg)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Value (US$)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Canada imports from Mexico, as reported by Canada													
Quantity (kg)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Value (CAN)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**

2010	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Mexico exports to the U.S., as reported by Mexico													
Quantity (kg)	0	0	0	0	1,252	0	0	0	0	77	0	0	**1,329**
Value (US$)	$0	$0	$0	$0	$125	$0	$0	$0	$0	$7	$0	$0	**$132**
U.S. imports from Mexico, as reported by the U.S.													
Quantity (kg)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Value (US$)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**

2010	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
U.S. exports to Canada, as reported by the U.S.:													
Domestic exports (kg)	945	0	289	348	0	253	0	795	0	799	0	0	**3,429**
Value dom. exp. (US$)	$9,827	$0	$3,038	$3,624	$0	$2,556	$0	$8,133	$0	$8,355	$0	$0	**$35,533**
Re-exports (kg)	0	0	0	0	354	0	0	0	0	419	0	1,661	**2,434**
Total exports (kg)	945	0	289	348	354	253	0	795	0	1,218	0	1,661	**5,863**
Canada imports from the U.S., as reported by Canada													
Quantity (kg)	1,092	152	306	140	27	253	52	838	113	809	169	156	**4,107**
Value (CAN)	$11,459	$1,599	$3,292	$1,466	$284	$2,654	$549	$8,797	$1,187	$8,501	$1,783	$1,633	**$43,204**

2010	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
U.S. exports to Mexico, as reported by the U.S.													
Quantity (kg)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Value (US$)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Mexico imports from the U.S., as reported by Mexico													
Quantity (kg)	0	5,012	9,528	0	0	0	0	0	0	0	0	0	**14,540**
Value (US$)	$0	$90,557	$180,269	$0	$0	$0	$0	$0	$0	$247	$177	$0	**$271,250**

Notes:

1) Blue shading is used for discrepancies that can be explained by low-value reporting exemptions.

2) Yellow shading is used for discrepancies for which the cause has not been identified.

3) Trade data are subject to revisions. In general, any monthly data for the current year may be revised until the release of the December data; any annual data for the three preceding years may be revised.

Sources: CIMT (2016), consulted on 17 September 2016; SIAVI (2016), consulted on 16 September 2016; USITC (2016), consulted on 15 September 2016; UTO (2016), consulted on 7 September 2016.

Table 2. Comparative North American elemental mercury (HS 280540) trade data, 2014

2014	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Canada exports to Mexico, as reported by Canada													
Quantity (kg)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Value (CAN)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Mexico imports from Canada, as reported by Mexico													
Quantity (kg)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Value (US$)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
2014	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
Canada exports to the U.S., as reported by Canada													
Quantity (kg)	0	0	0	2105	0	0	0	0	0	0	0	1960	**4,065**
Value (CAN)	$0	$0	$0	$51,007	$0	$0	$0	$0	$0	$0	$0	$49,892	**$100,899**
U.S. imports from Canada, as reported by the U.S.													
Quantity (kg)	0	0	0	2105	0	0	0	0	0	0	0	1960	**4,065**
Value (US$)	$0	$0	$0	$46,400	$0	$0	$0	$0	$0	$0	$0	$43,210	**$89,610**
2014	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
Mexico exports to Canada, as reported by Mexico													
Quantity (kg)	0	0	0	0	0	0	138	0	0	138	0	0	**276**
Value (US$)	$0	$0	$0	$0	$0	$0	$11,200	$0	$0	$11,199	$0	$0	**$22,399**
Canada imports from Mexico, as reported by Canada													
Quantity (kg)	0	0	0	0	0	0	1147	0	0	0	0	0	**1,147**
Value (CAN)	$0	$0	$0	$0	$0	$0	$12,043	$0	$0	$0	$0	$0	**$12,043**
2014	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
Mexico exports to the U.S., as reported by Mexico													
Quantity (kg)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Value (US$)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
U.S. imports from Mexico, as reported by the U.S.													
Quantity (kg)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Value (US$)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
2014	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
U.S. exports to Canada, as reported by the U.S.													
Quantity (kg)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Value (US$)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Canada imports from the U.S., as reported by Canada													
Quantity (kg)	142	14	142	12	13	106	6	79	1	55	8	87	**665**
Value (CAN)	$1,489	$151	$1,500	$121	$146	$1,114	$63	$928	$12	$580	$89	$917	**$7,110**
2014	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
U.S. exports to Mexico, as reported by the U.S.													
Quantity (kg)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Value (US$)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	**$0**
Mexico imports from the U.S., as reported by Mexico													
Quantity (kg)	14	0	0	0	14	0	0	0	0	0	0	0	**28**
Value (US$)	$2,748	$0	$0	$0	$2,620	$0	$0	$0	$0	$0	$0	$0	**$5,368**

Notes:

1) Blue shading is used for discrepancies that can be explained by low-value reporting exemptions.

2) Yellow shading is used for discrepancies for which the cause has not been identified.

3) Trade data are subject to revisions. In general, any monthly data for the current year may be revised until the release of the December data; any annual data for the three preceding years may be revised.

Sources: CIMT (2016), consulted on 17 September 2016; SIAVI (2016), consulted on 16 September 2016; USITC (2016), consulted on 15 September 2016; UTO (2016), consulted on 7 September 2016.

5 Understanding discrepancies in trade data

5.1 Significant discrepancies are relatively rare

The research and interviews carried out for this study have enabled the identification of a range of possible causes for the specific trade data discrepancies described in this report. There is a risk of misinterpreting trade data when the transaction details are not available. Moreover, there is an enormous amount of trade that occurs among these three countries, and mercury is not an especially easy tariff category to report on, given the complexity of the overall reporting system. Despite these challenges, Canada, Mexico and the United States appear to be in general agreement with regard to the majority of their joint trade data, since most of the discrepancies identified are relatively small. Nevertheless, this raises the question as to why further efforts at harmonization are not directed at the relatively few statistics that are not identical—especially if a discrepancy is fairly large, or if one country shows trade activity during a given time period while its trading partner shows none.

5.2 Sources of errors and discrepancies

It is useful to consider the difference between data errors and discrepancies:

- There are a number of potential sources of error in any country's own database. Errors in one national database may (or may not) lead to discrepancies between two countries' data concerning the same transaction.
- In addition, even if neither database is in error with regard to the way a given transaction is posted, there may still be a discrepancy between two countries' databases if the same transaction is not reported in the same manner by the responsible agencies in each country. For example, differences in the way two countries formally record the same transaction are responsible for a number of discrepancies.

While data errors would not be expected to have much effect on overall trade balances, they may be more significant at the level of specific commodities. Where not attributed otherwise, the following descriptions of common sources of errors, and efforts to reduce their occurrence, are drawn from the US Census Bureau's Guide to Foreign Trade Statistics,[32] and are representative of the challenges facing Canada and Mexico as well.

> **Reporting errors:** Reporting errors are mistakes or omissions made by importers, exporters and/or their agents when filing shipping documents.[33] Most reporting errors involve missing or invalid commodity classification codes, missing or incorrect quantities or shipping weights, and missing, multiple, or incorrect state/province/country of origin designations. Such errors can significantly impact detailed commodity statistics if not corrected or corrected inaccurately, but have a negligible effect on export, import and balance of trade statistics. In addition, errors

[32] See US Census Guide to Foreign Trade Statistics, available online at <https://www.census.gov/foreign-trade/guide/sec2.html>. Consulted on 3 August 2016.

[33] This problem is more common for some countries than others. In a recent study (World Bank 2016) of the mercury supply chain to ASGM in Sub-Saharan Africa, the consultant had the opportunity to examine original shipping documents and discovered that misreporting using the wrong commodity codes was very common, and helped to explain what otherwise seemed to be surprising entries in the Comtrade database (personal communication with Carsten Lassen, COWI).

may result from the correction of misreported data. For all these reasons, the data are subjected to several types of quality checks.

Undocumented shipments may include any of the following:

- Federal regulations require importers, exporters or their agents to submit documentation for all merchandise shipments above established exemption levels, e.g., US$2,000 for imports and US$2,500 for exports. "Low-value" shipments below the exemption levels are not subject to the same requirements.
- The US Census Bureau has determined that not all required documents are filed, particularly for exports, as import information is subject to greater scrutiny by US Customs and Border Protection due to the administration of tariffs, quotas and other enforcement activities.
- Goods withdrawn from Foreign Trade Zones (FTZs) for export, and exports of US goods through Canadian ports *en route* to other destinations, are two examples of commonly unreported shipments that can lead to errors in export statistics.
- Likewise, undocumented foreign merchandise entering FTZs or bonded warehouses, which should be recorded as "general imports," is an example of missing import data that contributes to the problem of import under-coverage.

Timeliness: "Carryover" is the term used to identify the import and/or export records that were either not received or not processed in time to be included in the current month's statistics. This could result from late filing or processing problems, such as rejection of a shipment because the documentation failed to meet certain quality criteria. Such records may be carried over into a subsequent month's statistics.

Data capture errors: The US Census Bureau captures import and export information either from paper documents that are keyed manually, or from automated collection programs, such as AES, ABI, and the US-Canada Data Exchange. Lost documents, errors in the on-line validations and edits of electronically reported data, and incorrectly keyed, coded or recorded documents are examples of data capture errors that can emerge in the statistics.

Transiting goods: Shipments of goods moving through Country A en route from one country to another, where Country A is not the ultimate destination, can affect trade statistics. When such "transiting goods" are shipped under bond, they are not subject to duties and are excluded from the merchandise trade statistics in accordance with the guidelines established by the United Nations. Many companies, however, enter transiting goods into Country A using an import entry summary and file an export declaration when the goods leave Country A. While this practice does not affect the total trade balance, it does affect bilateral trade balances, and creates discrepancies between Country A's export and Country B's import of the same commodity, and vice versa. This issue is especially problematic for bilateral trade between Canada and the United States, where goods transiting through the United States from Canada are entered as US imports from Canada. Conversely, goods transiting through Canada from the United States are not entered as Canadian imports from the United States.

Differences in treatment of commodity data: Data users are cautioned that comparison of US exports with corresponding Canadian (or Mexican) import data at detailed commodity levels is not recommended. Depending on the commodity, periodic corrections, differences of opinion with regard to the proper classification, and differences in the editing and processing environments make such comparisons uncertain.

Disclosure of identity: When publication of data under a particular commodity classification lends itself to disclosure of an individual firm's transactions, it is sometimes necessary to combine several classifications. In such a case, even though the detail is reported, it is published only under the combined classification.

Suppression of quantity and/or shipping weight: When the content of the public database risks disclosing a given company's transactions, it may be necessary to suppress quantity and/or shipping weight data to or from one or more partner countries.

Comments during interviews touched on a number of these factors. For example, Statistics Canada mentioned that at the macro level, discrepancies arise from factors such as conceptual differences (e.g., in the recording of transshipments, especially the treatment of goods that are imported into bonded customs warehouses), and differences in timing, valuation, country attribution, the inclusion or exclusion of insurance and freight charges or other reasons. Micro level differences may arise from differences in the classification of goods, the inclusion or exclusion of certain types of special commodities, or other practical reporting problems that may distort detailed commodity comparisons. Re-exports and transhipments are the most common sources of discrepancies between statistical agencies.

Interviews with Canadian officials revealed that there may be data quality issues associated with goods in transit, i.e., goods that are simply passing through Canada (or another country) on their way to a third country, and which should therefore not be counted as trade for Canada. These goods are typically placed in bond in the country of transit, exempt from duties. When these goods are sent under bond, the exporter is supposed to declare the goods as exports to the final country of destination, which would result in the transaction being properly reported with regard to both origin and destination. However, in a number of cases the required declarations are not filed. Through interviews and research, it was learned that many companies have reduced or eliminated their use of the bonded in-transit procedures. Mostly for logistical reasons, companies may enter goods into the United States that are simply transiting through that country on their way elsewhere. With no US tariffs or fees on imports from Canada, many companies see no reason to incur the greater procedural burden of the in-bond process.

With or without a data exchange, this practice distorts bilateral trade statistics. For example, if a Canadian good being shipped to Mexico is entered into the United States, and then re-exported to Mexico, the United States will show an import from Canada and an export to Mexico. This would overstate the trade deficit with Canada and understate the trade deficit with Mexico. In addition, this practice creates significant discrepancies between Canadian and Mexican statistics, since Mexico records these goods as imports from Canada while Canada shows them as exports to the United States. It may be noted that this practice is much less common for US goods transiting through Canada, since Canada imposes a value-added tax on imports.

A senior official with the Mexican General Customs Administration (AGA) confirmed that discrepancies can occur when goods are in transit through another country that is not the country of origin or destination. The Mexican Ministry of Economy noted that re-exports (the shipment abroad of goods previously imported on a temporary basis) are not included in the calculation of Mexico's Trade Balance (BCMM) because the Customs procedures do not track them in a comprehensive manner.

A senior management official with the US Census Bureau noted that US trade data do not always agree with Canada's data for a number of reasons, among which are:

- The United States may use codes that require reporting of different quantities than the Canadian codes, like the number of items rather than the weight. This could be a problem for some data, e.g., batteries, but not for elemental mercury.
- Canadian exports are valued Free on Board (FOB), port of exit, including domestic freight charges to that point, while US imports are typically valued CIF (cost, insurance and freight), which represents the landed value of the merchandise at the first port of arrival in the United States.[34]
- US exports are valued Free Alongside Ship (FAS), which is the value at the US seaport, airport, or border port of export, based on the commodity sales price plus inland freight, insurance, and other charges incurred in placing the merchandise alongside the carrier at the US port of export. Canadian imports, on the other hand, are valued FOB at the place of direct shipment to Canada. The import valuation therefore excludes costs of freight and insurance in bringing the goods to Canada from the point of direct shipment.[35]
- Shipping agents can enter only the information they have at the time of export; filers may not provide complete information at that time. Filers are supposed to make corrections to their earlier filings once they have the complete information. Such revisions are published every June.[36] However, it is impossible to know how many incomplete or incorrect entries remain uncorrected.

In the interest of continually improving harmonization of trade statistics, a senior official with the International Trade Indicators Program of the US Census Bureau confirmed that US and Canadian counterparts meet twice a year to discuss data exchange.

Based on research and interviews, it was concluded that the most likely factors behind the observed mercury trade data discrepancies (with a focus on the volume of trade rather than the price) are primarily the following:

- statistical treatment of re-exports and transiting goods
- reporting errors
- undocumented shipments, especially goods passing through Foreign Trade Zones (FTZs) or bonded warehouses
- different treatment by Canada and the United States of each other's import data which is exchanged under their data-sharing agreement

[34] See US Census Guide to Foreign Trade Statistics, available online at <https://www.census.gov/foreign-trade/guide/sec2.html>, consulted on 3 August 2016.

[35] Ibid.

[36] The US Census Bureau revision policy is available online at <https://www.census.gov/foreign-trade/guide/revisions.html>.

6 Sources of mercury in North America

6.1 Mercury mining

Mexico is the only country in North America where mercury mining continues. The most important mercury reserves are located in the states of Zacatecas, Querétaro, San Luis Potosí, Durango and Guerrero (ERA 2016, citing CEC 2013a).

As shown in Table 3 below, Mexico's formal exports of primary mined mercury have increased substantially since 2010, reaching about 300 metric tons in both 2014 and 2015. Bolivia, Colombia and Peru were main destinations for these exports--all known to have extensive artisanal and small-scale gold mining (ASGM) operations, whose releases of mercury to the environment are large and diffuse enough to have warranted an entire article of the Minamata Convention. But there are also reports of other informal mercury mining in Mexico. In June 2016, UN Environment officials verified the existence of five resurrected mines during a field visit. In addition, studies from the University of Querétaro and the University of San Luis Potosí, in a neighboring state, support estimates that total mercury mining is significantly higher than the formal exports would suggest (UN Environment 2017). This informal mercury output could be exported without proper documentation.[37] When funding becomes available from the Global Environment Facility, and in collaboration with the United Nations Environment Programme (UN Environment), a detailed assessment of mercury mining operations is to be carried out by Semarnat.

Table 3. Mexican formal mercury exports to all countries, 2010-2015

	Value (US$)	Quantity (kg)	Price per kg (average, US$)	Price per flask (average, US$)
2010	958,941	25,513	$37.59	$1,297
2011	8,669,938	134,302	$64.56	$2,227
2012	21,454,783	261,841	$81.94	$2,827
2013	23,406,327	267,645	$87.45	$3,017
2014	17,681,581	300,931	$58.76	$2,027
2015	13,909,189	306,695	$45.35	$1,565

Source: SIAVI (2016), consulted on 24 July 2016.

6.2 Recycled and byproduct mercury

Mercury may be recycled from mercury-added products (such as a medical sphygmomanometer) or from the wastes and residues of industrial or chemical processes (such as chlor-alkali electrolysis) that intentionally use mercury in some manner. Mercury may also be present as a trace contaminant in oil and natural gas, for example, from which it may be removed with an activated carbon filter, which

[37] Available online at <http://www.zocalo.com.mx/seccion/articulo/decomisan-casi-5-toneladas-de-mercurio-en-chiapas-1408558156>.

is in turn sent elsewhere for recycling or disposal. Mercury may also be recovered as a byproduct of refining or smelting operations where mercury occurs as a trace element in non-ferrous (especially zinc, copper and lead) ores and concentrates.

Canada

Facilities in Canada report to NPRI the quantities of mercury transferred to off-site recycling, although similar information for mercury recovered from on-site recycling has not been identified. While the figures may include a relatively small amount of double-counting, in 2010 companies reported 15.2 metric tons of mercury (including the mercury content of mercury compounds) transferred off-site for recycling, and in 2014 a total of 13.3 metric tons.

According to NPRI, the following are key contributors to off-site recycling:

- Teck Metals Ltd./Cominco/Trail Operations in Trail, British Columbia, is involved in non-ferrous metal production and processing. According to NPRI, in 2010 it sent 10 metric tons and in 2014 it sent 3.7 metric tons of mercury (including the mercury content of mercury compounds) off-site for recycling. The NPRI report indicates that Teck Metals sends these materials to the United States for recycling.[38]
- Aevitas, Inc., with four facilities in Canada, provides waste management services including recycling of various mercury wastes. According to its website, Aevitas owns and operates the only approved mercury retort in Canada.[39] Among other information reported to NPRI, the Aevitas facility in Edmonton, Alberta, sent 5.4 metric tons of mercury (including the mercury content of mercury compounds) to off-site recycling in 2014.
- Syncrude Canada Ltd./Mildred Lake Plant Site, located in Fort McMurray, Alberta, is in the oil and gas extraction business. According to NPRI, in 2010 it sent 0.2 metric tons and in 2014 it sent 1.2 metric tons of mercury in catalysts and other mercury wastes to off-site recycling at Metallurg Vanadium Corporation (Ohio, United States), Gulf Chemical and Metallurgical Corp (Texas, United States) and Clean Harbors (Alberta, Canada).[40]
- Clean Harbors Canada, Inc. has 16 waste management facilities in seven Canadian Provinces. According to NPRI, in 2010 its Delta (British Columbia) and Thurso (Quebec) facilities sent 2.9 metric tons and in 2014 they sent nearly 0.5 metric tons of mercury (including the mercury content of mercury compounds) to off-site recycling.

Without access to details from the shipping manifests, it is not possible to determine whether the transfers across the border are included in trade statistics previously reported for mercury and mercury compounds. Based on NPRI data and interviews with one US recycler, mercury and mercury compounds are occasionally sent from Canada to the United States for recycling and conversion to mercury sulfide, after which the mercury sulfide may be returned to Canada for permanent disposal.

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[38] Available online at <http://ec.gc.ca/inrp-npri/donnees-data/index.cfm?do=substance_details&lang=En&opt_npri_id=0000003802&opt_cas_number=NA%20-%2010&opt_report_year=2014#recycling>

[39] Available online at < http://www.aevitas.ca/mercury-recovery.html>

[40] Available online at <http://ec.gc.ca/inrp-npri/donnees-data/index.cfm?do=facility_history&lang=En&opt_npri_id=0000002274&opt_report_year=2002>

Mexico

Mexico has one facility that recycles amalgams and mercury-added lamps, and other operations that recover mercury from mine tailings in Zacatecas. These tailings were generated by silver mines (operating between 1556 and 1900) that used the amalgamation method. During the last 100 years, seven plants have recovered silver and mercury from these tailings using the lixiviation method (CEC 2013a). One of the seven plants is still functioning and produced around 25 metric tons of mercury in 2015. A new plant has been constructed and has applied to Semarnat for an operating permit. Its mercury production capacity is also estimated at 25 metric tons per year.[41] INECC will officially request information on these operations and related activities as it compiles information for the next emissions/releases inventory.

There is also a potential for recovery of eight to nine metric tons of byproduct mercury from the metal extraction and processing industry, although at present this mercury is sent to disposal (CEC 2013a). According to the RETC database, in 2010 ArcelorMittal Las Truchas S.A. de C.V. transferred to recycling 7.1 metric tons of mercury from its open pit iron ore mining activities. However, in 2013 (2014 data were not available) only 3.6 metric tons of mercury altogether were transferred to recycling by companies working in the electronics, food and drinks, metal extraction and processing, automotive, paper/cardboard, chemical, and other industries, according to their reports to RETC.[42]

National mercury consumption (primarily by chlor-alkali plants and the health sector) in Mexico is estimated at between 10 and 15 metric tons/year (CEC 2013a), plus an estimated 7.5 metric tons in ASGM (AMAP 2013). INECC will soon be able to improve some of these estimates when it requests official information from the health sector and other users. The chlor-alkali plant in Monterrey is in the process of decommissioning. The remaining chlor-alkali plant in Coatzacoalcos is under pressure from the authorities to close as well, but will continue operating for now, probably using the excess mercury from the closed plant, estimated at 50–60 metric tons.[43]

United States

In the United States, mercury has routinely been recovered from the chlor-alkali industry, steel processing, as a byproduct of the processing of gold and silver ores, and so on. The EPA requires reporting of both byproduct mercury and mercury recovered from recycling through its Chemical Data Reporting requirements, as well as quantities of mercury imported and exported. Only companies producing more than 2,500 lbs (1,134 kg) in one year must report to EPA. In addition, importers and manufacturers of mercury compounds that produce more than 25,000 lbs (11,340 kg) per year must report to EPA. The data may be found on the EPA's Chemical Data Access Tool

[41] Personal communication, Manuel Macias, Professor, University of Zacatecas and former Semarnat Sub-Delegate in Zacatecas, 25 July 2016.

[42] Available online at: <http://apps1.semarnat.gob.mx/retc/retc/index.php>.

[43] Personal communications, Octavio Valdivia and Jose de Jesús García Said, *Cydsa Corporativo*, 29 June 2016.

(CDAT)[44] and the newer ChemView;[45] reporting is required every four years and the most recent data available are from 2011. The data show that in 2010 the Barrick Goldstrike Elko mine generated 13 metric tons of byproduct mercury and nearly 42 metric tons of mercury (II) chloride that were sent for recycling. Another source of information on mercury recycling is EPA's Toxics Release Inventory. The information for 2010 and 2014 follows.

On-site recycling

According to the TRI (see Table 4 below), 577 metric tons of mercury were recycled on-site in 2010 from elemental mercury and mercury compounds, and an estimated 160 metric tons in 2014.

- In 2010 the main sources were the chlor-alkali industry and byproduct mercury from mining operations (US mines included Newmont Carlin South Area—NV, Newmont Twin Creeks Golconda—NV, Barrick Goldstrike Elko—NV, and Hycroft Mine Winnemucca—NV). Bethlehem Apparatus (Hellertown, PA) handled 442 metric tons of the 2010 total, most of which was mercury from the chlor-alkali industry (a number of facilities had abandoned mercury cell technology), but also including significant byproduct mercury from mines in South America. WM Mercury Waste Inc. (Union Grove, Wisconsin) generated another 40 metric tons of mercury from diverse wastes.[46]
- In 2014, the main sources of (on-site) recycled mercury were similar, but Bethlehem Apparatus recycled only 35 metric tons. WM Mercury Waste Inc. generated another 73 metric tons of mercury from diverse wastes, and the chlor-alkali industry recycled more of its own mercury in 2014 than it did in 2010.[47]

Off-site recycling

The TRI data (see Table 4) indicate that off-site recycling of mercury (and the mercury content of mercury compounds) amounted to 65 metric tons in 2010 and 292 metric tons in 2014. It is not clear why so much mercury was recovered in 2014 since the US market is too small to absorb this quantity. It is possible that some of the mercury came from chlor-alkali plants and was ultimately destined for disposal after recycling, but that hypothesis has not been confirmed.

It may be noted that the reported off-site recycling of mercury compounds in 2014 far exceeds the on-site recycling. Ideally, for every facility that sends mercury compounds off-site for recycling, there should be another facility or facilities that report the recycling of those materials on-site. However, there are several reasons this may not be the case: 1) Mercury sent off-site for recycling could be sent to a facility that does not report to the US TRI. The receiving facility need only report if it belongs to a covered sector and meets the employee number threshold, even if it recycles large quantities. It is not known how many such receiving facilities may exist. 2) A large quantity of material intended for

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[44] As described in <https://19january2017snapshot.epa.gov/chemical-data-reporting_.html>, the Chemical Data Reporting (CDR) Rule, issued under the Toxic Substances Control Act (TSCA), requires manufacturers (including importers) to give EPA information on the chemicals they manufacture domestically or import into the United States. The EPA's Chemical Data Access Tool (CDAT) permits a search of the reported data by chemical name, and company. Available online at <https://java.epa.gov/oppt_chemical_search/>, consulted on 21 June 2016.

[45] Available online at <https://chemview.epa.gov/chemview>, consulted on 21 June 2016.

[46] Available online at <https://iaspub.epa.gov/triexplorer/tri_quantity.chemical>.

[47] Ibid.

off-site recycling may transit through another facility—each of which could report shipping the same material for off-site recycling—before it arrives at the recycling facility. 3) Material sent off-site for recycling during a specific year may not be recycled by the receiving facility in the same year.

Even accepting some double-counting of off-site transfers, however, the fact that so few companies are responsible for the vast majority of the off-site transfers suggests that double-counting does not entirely explain the difference. Further research regarding the true extent of off-site mercury recycling is beyond the scope of this report.

The TRI database, which considers "recycling" to embrace recovery of byproduct mercury as well, includes facility reports of mercury (and the mercury content of mercury compounds) recycled both on-site and off-site.[48] Since materials to be recycled off-site may be reported by another TRI facility as on-site recycling, some double-counting cannot be excluded. However, it is not possible that the same materials can be recycled on-site at more than one site; therefore, on-site recycling may be considered to be the bare minimum of mercury recovered in the United States in this manner. Furthermore, recycled mercury can no longer automatically be considered as a "source," since there is evidence in both the United States and the European Union of mercury being recycled merely for the purpose of subsequent stabilization and disposal.

Table 4 summarizes TRI mercury recycling reports. Note, however, that since some mining operations may not consider byproduct mercury and mercury compounds recovered on-site as "waste," they may not have been reported to the TRI.

[48] Available online at <https://iaspub.epa.gov/triexplorer/tri_quantity.chemical>.

Table 4. TRI mercury (and mercury compounds) recycling data (rounded)

US TRI on-site recycling and transfers off-site for recycling, for all industries				
	Recycled on-site* (pounds)	**Recycled off-site**** (pounds)	**Recycled on-site*** (metric tons)	**Recycled off-site**** (metric tons)
2014				
Mercury***	**10,916,073**	135,680	**4,951**	62
Mercury compounds****	259,220	508,138	118	230
2013				
Mercury	99,739	151,586	45	69
Mercury compounds****	225,047	264,063	102	120
2012				
Mercury	1,301,608	52,991	590	24
Mercury compounds****	235,281	121,524	107	55
2011				
Mercury	1,110,151	119,638	504	54
Mercury compounds****	239,899	140,836	109	64
2010				
Mercury	1,149,101	77,273	521	35
Mercury compounds****	124,669	63,680	57	29

Notes:
*The total amount of the toxic chemical recycled on-site during the calendar year (January 1–December 31) for which the report was submitted. This includes only the amount of the toxic chemical actually recovered for reuse, not the total amount of the toxic chemical in the wastestream entering recycling units on-site.
**The total amount of the toxic chemical sent off-site for recycling during the calendar year (January 1–December 31) for which the report was submitted. This includes all amounts of the toxic chemical intended to be recycled and sent off-site for that purpose, not just the amount of the toxic chemical actually recovered.
***TRI officials contacted two facilities regarding the evidently mistaken entry (10,916,073 pounds, and equivalent metric tons, shown in red in the table) for on-site recycled mercury and compounds. The facilities promised to revise their reports as necessary, but no revisions had been received at the date of publication.
****These quantities represent the actual mercury recovered from mercury compounds recycled on-site, and estimates of the mercury portion of mercury compounds transferred off-site for recycling (see <https://www.epa.gov/sites/production/files/documents/2001hg.pdf>).
Source: United States Environmental Protection Agency (2016). TRI Explorer (2014 Dataset (released March 2016)) [Internet database]. Retrieved from <https://iaspub.epa.gov/triexplorer/tri_release.chemical> (July 20, 2016).

According to one recycler, in recent years, due to the Mercury Export Ban Act (MEBA), US mercury recycling companies have shifted from recycling and reselling larger quantities of mercury to recycling only enough to satisfy US demand of 40–50 metric tons per year, and recycling more than that only if they were paid to do so as part of the disposal process.[49]

[49] Personal communication, B. Lawrence, Bethlehem Apparatus, 29 July 2016.

7 Mercury trade between North America and the rest of the world

7.1 Impact of the US mercury export ban

The previously sizable US exports of mercury have stopped due to the US Mercury Export Ban Act. In response, it has been confirmed that at least one US recycler is adapting its business model to provide a mercury stabilization service to clients needing to manage mercury recovered from any of a number of sources. In this case, the stabilized mercury is being sent to a landfill in Canada.[50]

The MEBA coincided with a number of changes in the North American mercury market between 2010 and 2014:

- Table 28 demonstrates that the volume of US elemental mercury trade with the rest of the world greatly decreased during this period, while Mexican exports significantly increased, and Canadian imports and exports of mercury were also much higher in 2014 than in 2010;
- Table 29 reveals that the volume of US and Canadian trade in mercury compounds, which are not subject to the MEBA, remained strong during this period, while Mexican trade declined modestly;
- a two-tier pricing system has developed whereby the value of mercury inside the United States is substantially lower than its value on the world market;[51]
- in the past, it was expected that virtually all mercury recycled and recovered in the United States would be sold; now, due to limited commercial options, mercury is increasingly recovered from products and wastes, only to be stabilized and sent for final disposal;[52]
- while other stakeholders may have different experiences, one US recycler noted that when mercury had a higher value in the domestic market before the ban, scrap metal dealers would routinely collect and sell mercury scrap to recyclers; now that mercury scrap has a "negative" value, this business has declined, suggesting that such mercury scrap may be stored or disposed of in another manner;[53]
- some industrial facilities, such as major US gold mines, are storing mercury (rather than paying to dispose of it) in the apparent expectation that the government will take ownership of it under the Resources Conservation and Recovery Act (RCRA).[54]

[50] Personal communication, B. Lawrence, Bethlehem Apparatus, 29 July 2016.

[51] Ibid.

[52] Ibid.

[53] Ibid.

[54] <www.barrick.com/responsibility/environment/tailings-waste/default.aspx> Under "Mercury Waste Management": "Therefore, elemental mercury captured from air pollution controls at our US operations is currently stored pending the construction of the federal mercury repository." Website accessed on 15 October 2017.

7.2 Elemental mercury

Table 28 in Appendix 4 shows the mercury trade among Canada, Mexico and the United States and with the rest of the world in 2010 and 2014, according to the Comtrade database on 27 April 2016. One can make the following observations:

- In 2014 Canada reported importing 142 metric tons of mercury from Malaysia and exporting 175 metric tons to Cuba (data later revised by Statistics Canada to 20 metric tons imported from Malaysia and 16 metric tons exported to Cuba), suggesting that most of this mercury was likely simply transshipped via Canada, and Canada was not the origin or destination of these shipments.
- Mexico's exports to other countries have increased dramatically since 2010. Moreover, according to SIAVI only three countries—Colombia, Peru and Bolivia—accounted for 80 percent of Mexico's formal mercury exports, which totaled 1,137 metric tons during 2012-2015. Although the end uses of this mercury have not been confirmed by Semarnat, the quantities involved and the knowledge that the importing countries do not have major uses for mercury other than ASGM, strongly suggest that most of this mercury was likely destined for use in ASGM activities.[55]
- The United States reported no exports of mercury in 2014, but a number of its trading partners reported receiving "US-origin" mercury that year; it would be interesting to know if that mercury was exported from the United States before the export ban, and held in storage somewhere outside the United States until these purported sales in 2014.

7.3 Mercury compounds

Table 29 in Appendix4 shows the trade in mercury compounds among Canada, Mexico and the United States and with the rest of the world, in 2010 and 2014. One can make the following observations:

- Canadian imports of mercury compounds in 2014 totaled nearly 772 metric tons. More than 200 metric tons of this amount were imported from the United States; more than 100 metric tons each from China and Germany; and more than 50 metric tons each from Austria, India and Mexico.
- According to other data not included in Table 29, the United States has reported exporting large amounts of "mercury compounds" to Canada at low prices in recent years, i.e., 1,274 metric tons at about US$5.40/kg in 2012, 539 metric tons at about US$6.80/kg in 2013, and 248 metric tons at about US$7.50/kg in 2014 (Comtrade 2016). These prices could suggest that most of these shipments were waste intended for disposal. According to one recycler, US

[55] It should be noted that Semarnat is able to confirm the intended end use of mercury exports by means of the confidential form SEMARNAT-07-16 required to be completed for exports of hazardous materials, etc. Relevant regulations available online at <http://dof.gob.mx/nota_to_doc.php?codnota=2117525>.

(Nevada) gold mines are one source of mercury compounds exported to Canada for disposal.[56]

- The 2014 Canadian imports from China and Germany were similarly low in value.
- According to Comtrade and Table 29, Mexico was very active trading mercury compounds in 2010. The SIAVI database does not record trade in compounds for 2010, but shows that trade has greatly declined since at least 2012. Since then Mexico appears to carry on a very limited, but high-value, trade in mercury compounds, rarely importing or exporting more than a couple of hundred kilograms per year.

8 Findings and options for consideration

8.1 Context

Parties to the Minamata Convention on Mercury could benefit from the information provided by more comprehensive and consistent data collection systems concerning mercury production, trade, stocks, products and processes.

In its Strategy to Address Mercury-Containing Products (USEPA 2014), the EPA acknowledged the need for "more robust" data on mercury used in products and processes, and the need to "enhance" data on the manufacture, import and export for some categories of mercury-added products. During interviews with authorities in Canada and Mexico, it was clear that they also shared this view. In its Strategy, the EPA noted that an adequate national mercury supply and use database serves a twofold purpose: (1) to prioritize and guide additional reductions in mercury uses in order to prevent unreasonable risks to human health and the environment from mercury releases; and (2) to support US implementation of the Minamata Convention.

With the information provided by the key agencies in Canada, Mexico and the United States, as well as a number of other interviewees, it was possible to closely examine the data on mercury trade among Canada, Mexico and the United States in order to determine to what extent these data can contribute to the information needs identified above. Further insights could have been gained had it been permitted to consult, directly or indirectly, some of the individual transactions behind the trade data discrepancies identified. The laws of all three countries, however, do not permit such access to confidential business information.

As a result of the interview process, this report better reflects the complexity of the tasks faced by the customs and statistical agencies in controlling the ports of entry, managing shipping manifests, reconciling trade balances, carrying out quality control, constantly working to better harmonize activities with trade partners, and so on—each agency with its own structure, networks, budget, priorities, culture, rules and constraints—while jointly they handle half a million transactions per day, seven days a week. It should also be recognized that the collection and management of trade data are

[56] Confirmed during personal communication, B. Lawrence, Bethlehem Apparatus, 29 July 2016; note also: "Barrick has a cross-functional Mercury Task Force that is currently focused on mercury management. 142 tonnes of mercury were produced in 2015. It is our practice to ship elemental mercury and mercury compounds to a reputable refiner or stabilizer or to store it securely on site. … Consistent with US law, we ceased the export of elemental mercury from US facilities in January 2013." Available online at <http://www.barrick.com/responsibility/environment/tailings-waste/default.aspx>.

designed primarily to monitor the economics of international trade, and so there may be less attention given to reconciling information at the transaction level.

The following paragraphs present the findings and suggested options for improving the quality of the relevant data generated by the three countries, thus enhancing both the quality of North American trade information and the countries' ability to monitor progress in implementing the Minamata Convention. Some of these options are expected to be useful for countries outside North America as well.

8.2 Findings

The main focus of this report is the imports and exports of relevant commodities (specifically, elemental mercury, mercury compounds, and mercury-added products) for Canada, Mexico and the United States. Import data, especially, are recorded by customs, subject to tariffs, and entered into the national CIMT, SIAVI and USITC databases. The data on exports, which are not subject to tariffs, tend to receive less scrutiny but are formally registered as well. Import and export statistics are then forwarded to the UN Statistics Division for entry into the Comtrade database. Despite a range of quality controls, however, these trade data also have some limitations:

- They tend to focus primarily on the need to periodically reconcile trade balances, in which less attention may be devoted to product characteristics, and the data may be less adapted to setting a baseline and monitoring the changes in movements of specific commodities.
- The values reported are sometimes subject to revisions/corrections in future months/years.
- The three countries interpret or record some of the data in different ways, and there are a number of other sources of occasional discrepancies, where trading partners may show different data for the same commodity and period of time.
- The details of individual trade transactions are not available for public review, which makes the analysis of specific data discrepancies of transit quantities and dates challenging.
- In the case of mercury compounds, information on the end uses of specific compounds traded is not generally available in the databases, as importers and exporters may not have this information.[57]
- In the case of products, the trade data for mercury-added products are not generally separated from similar products that are mercury-free; moreover, even in the case where mercury-added lamps are coded separately, the mercury content is not indicated.
- In the case of elemental mercury, the recorded origins and destinations of transshipments or shipments in storage or passing through bonded warehouses may not be the actual origins and destinations. As a result, even after the export ban, a US trading partner may report the receipt of "US-origin" mercury.

[57] For example, in Canada, information on mercury compounds collected through export notifications includes the substance name, the exporter name, and the country of destination (available online at <https://www.canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/substances-list/export-control-list-all-versions.html>), but information on their uses in the destination country is generally not available.

It is the experience of the authors of this report that data on domestic production of elemental mercury, mercury compounds or mercury-added products for Canada, Mexico and the United States cannot be easily found or accessed through public domains. For example:

- There seem to be no readily available data on the generation of mercury compounds in Canada.
- Mexico documents the export of large quantities of primary mined mercury, but there are credible reports of additional undocumented transfers of mercury across Mexico's southern border.[58]
- Although the US federal government collects information on the amount of mercury and mercury compounds produced, the most recent publically available data (apart from broad ranges of quantity in 2015) are from the year 2011,[59] and smaller producers are not included. In addition, there are no federal statistics on production of mercury-added products in the United States. Even under the United States' TRI, no data are requested or provided on specific industrial processes or product manufacturing, on the quantities of mercury or mercury compounds that are produced or imported,[60] or on the quantities of mercury or mercury compounds involved in a particular product or its use. Nor is it possible to identify this information indirectly. As an example, the TRI database and other available information were not sufficient to determine the magnitude of mercury use in polyurethane manufacturing. These shortcomings were confirmed in a 2009 Report to Congress (USEPA 2009).

The national databases on imports and exports of elemental mercury were found to be more comprehensive than the data on other mercury commodities. They can be used, in particular, for identifying key mercury transit points, the general direction and magnitude of major flows of mercury, the emergence of important mercury sources, and key final destinations. For example, Mexico's national trade statistics confirm that in recent years the country has become an important exporter of mercury. It also confirms that 80 percent of these exports have been destined for Colombia, Peru and Bolivia—countries with substantial ASGM activities. The low level of Mexican imports, together with field reports, confirms that domestic mercury mining is the main source of Mexico's mercury exports. While comprehensive information on mercury mining is not yet available, Mexico's trade statistics provide important evidence relevant to the implementation of the Minamata Convention, which prohibits the use or export of primary (mined) mercury in artisanal gold production. It is suggested that Mexico should establish a joint mechanism with partner countries to ensure that exported mercury will go only to uses permitted under the Minamata Convention.

While outside the scope of this project, it is interesting to recall the state-based initiative[61] in the United States that has required all manufacturers, importers and distributors selling mercury-added products in collaborating states to provide nationwide information every three years on the amount

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[58] See both <http://www.zocalo.com.mx/seccion/articulo/decomisan-casi-5-toneladas-de-mercurio-en-chiapas-1408558156> and UN Environment (2017).

[59] https://chemview.epa.gov/chemview

[60] Note, however, that there is historic Chemical Data Reporting (CDR) information—up to 2012—on the production and use of mercury, mercury(I) chloride and mercury(II) chloride manufactured or imported into the United States. Available online at <https://www.epa.gov/chemical-data-reporting/2016-chemical-data-reporting-results>, consulted on 24 October 2016.

[61] Launched in 2001 and spearheaded by the Northeast Waste Management Officials Association (NEWMOA).

and purpose of mercury in these products. Despite some limitations,[62] the resulting IMERC database has compiled valuable information not available elsewhere. ECCC and IMERC have also had communications on product labeling and reporting requirements.[63]

In November 2015, Canada's Products Containing Mercury Regulations (PCMR) entered into force and included reporting requirements. Meanwhile, the United States amended TSCA in 2016,[64] which has some similarities to the Canadian PCMR requirements. The amended TSCA legislation requires EPA to periodically carry out and publish an inventory of mercury supply, use and trade in the United States.

It should also be mentioned that UN Environment has recently commissioned an update to its 2006 report, "Summary of supply, trade and demand information on mercury" (UNEP 2006). The update will be an important contribution to an understanding of the global situation in 2015 for regional activity levels and mercury trade flows. It will not, however, include the detailed information at country level that should be available in Minamata Initial Assessments (MIAs) and similar reports.

Already referred to above, Article 21 (Reporting) of the Minamata Convention is one of the principal mechanisms for obtaining information on the progress being made by Parties to reduce global mercury supplies, uses, and emissions/releases of mercury. Parties need to consider how best to obtain the information needed to facilitate implementation of their commitments under the Minamata Convention.

8.3 Options

Presented below are options to consider for improving the collection of information on the trade of mercury and mercury-added products, including helping the North American countries assess progress with their respective implementation of the provisions of the Minamata Convention.

Some of these options may also be appropriate for countries outside North America. Moreover, all options should try to balance the importance of improved data, the magnitude of any reporting burden for the governments involved, and careful consideration of whether the data are available elsewhere.

The two main sources of relevant information are international trade statistics and mercury-added product databases and it appears that there would be clear benefits from linking these data sources.

International mercury trade statistics

International trade databases may not provide a complete picture of the trade of mercury and mercury-added products, partly due to data gaps and discrepancies, but also because many of the useful details on file are not publicly accessible. The data records should be reviewed to determine what additional information may be made public, or how information may be used in other ways while still respecting all confidentiality requirements.

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[62] "Although several states require manufacturers, [importers and distributors] of mercury-added products to report their mercury use to IMERC, many states do not participate and available information suggests incomplete or non-existent reporting in some sector categories (ECOS 2013)."

[63] Personal communications with officials of the Minnesota Pollution Control Agency.

[64] The Lautenberg Chemical Safety Act amended the Toxic Substances Control Act (TSCA), which is the primary chemicals management law of the United States.

Perhaps this report can lead to suggestions for the composition and responsibilities of a more formal, or broader (e.g., including the business community dealing with mercury imports and exports), Canada-Mexico-United States working group that could address data-sharing arrangements among the three countries. These could include the agreement among importers/exporters to authorize access to certain shipping data that would help track mercury trade more accurately and clear up some discrepancies. The countries could monitor changes in mercury trade to assess the performance of the regulatory instruments each country has in place regarding the imports and exports of mercury.

Current international trade classification codes (HS codes) are in many cases not sufficiently specific to identify products containing mercury. In cases where distinct codes exist, they are often not widely shared with or used by many countries.[65] A working group could evaluate and propose HS code subheadings that need to be more widely used or newly created for certain mercury compounds and products. The following compounds and product categories could be considered as key candidates for closer scrutiny, listed here roughly in order of priority:

- mercury (I) chloride (also known as calomel)
- mercury (II) oxide
- mercury (II) sulfate
- mercury (II) nitrate
- cinnabar
- mercury sulfide
- dental cements and fillings intended to be used with mercury, including pre-dosed capsules, mercury pillows for use in dental capsules, metal tablets to be amalgamated with mercury, etc.
- amalgam spheres or "pills" for use in fluorescent lamp manufacture
- amalgam (other than dental uses) of precious metals
- amalgam (other than dental uses) of other metals
- mercury-added switches or relays
- mercury-added measuring devices including barometers; flow meters; hygrometers; manometers; thermometers; and sphygmomanometers
- mercury-added air-zinc button cell batteries
- mercury-added air-zinc batteries other than button cells
- mercury-added silver oxide button cell batteries
- mercury-added silver oxide batteries other than button cells
- mercury-added manganese dioxide button cell batteries
- mercury-added manganese dioxide batteries other than button cells
- mercury compounds or mixtures intended for use as pesticides, biocides or topical antiseptics
- linear fluorescent lamps (LFLs) for general lighting purposes

[65] Some countries use tariff code 2843.90.10 specifically for amalgams of precious metals. The tariff code 8506.40.30 has been designated for silver oxide button cells; the tariff code 8506.60.30 has been designated for air-zinc button cells; etc.

- compact fluorescent lamps (CFLs) for general lighting purposes
- high pressure mercury vapor lamps (HPMV) for general lighting purposes
- mercury in cold cathode fluorescent lamps (CCFL) and external electrode fluorescent lamps (EEFL) for electronic displays

It has been suggested above that certain HS code subheadings could be more widely used, or new ones created, for certain mercury compounds and products in order to provide a better understanding of the sources and uses of products and compounds listed in the Minamata Convention. Alternatively, however, the Parties might decide that putting resources towards new HS codes and better trade data might not be as effective as devoting their efforts directly to enforcement of national regulations on mercury products and compounds. In the latter instance there could be additional focus on tracking applications that are not necessarily listed under the Minamata Convention.

Work could also be undertaken to better differentiate between mercury and mercury compounds destined for disposal and those destined for recycling or recovery.

In Mexico the Ministry of Economy has already formed a working group with representatives of other agencies to discuss the addition of two-digit subheadings to existing HS codes in order to differentiate specific types of goods. In addition, other countries are discussing new HS codes related to mercury.[66] In order to better harmonize any new HS codes to facilitate the sharing and possible reporting of data in line with the needs of the Minamata Convention, countries may wish to work together and pool their efforts in this area.

Mercury import and export permits are controlled in Mexico by Semarnat, which should be encouraged to share more information with AGA about the US and EU export bans. These two agencies could then collaborate more closely on international mercury trade data, which should be more routinely scrutinized in the interest of the environment as well as the economy. The two Mexican agencies (with others as necessary) could develop a joint work program to:

- specify new HS subheadings for certain mercury compounds and products;
- look into any discrepancies between the relevant international trade data in the SIAVI database and the trade databases of key trading partners; and
- develop a joint (Semarnat and AGA) communications strategy for customs officials and others to better understand the Minamata Convention and their role in supporting its objectives. Key issues include the need to obtain written consent from an importing country before exporting mercury from Mexico, periodic reporting of mercury mine production, how to ensure that mined mercury is not used in ASGM, how to dispose of excess mercury coming from the chlor-alkali industry, etc. It would be especially useful to determine how other countries plan to deal with these issues.

The analysis highlighted the problem of different interpretations and implementation of the rules for declaring or reporting origin and destination, re-export, transshipment, bonded warehousing, low-value transactions, and so on, among the three countries, which may contribute to data discrepancies. A Canada-Mexico-United States working group could be established, which could include customs and statistics officials, to help identify ways to reduce the incidence of these sorts of data

[66] Mexico may consider collaborating with Uruguay in this area, since the Uruguayan authorities are also reviewing customs codes for the purpose of facilitating the identification of all mercury entering or leaving the country. New customs codes are expected to be published in 2017.

discrepancies, as well as ways to resolve discrepancies that arise. For example, in the case of international mercury trade, it may make sense for the United States to document certain (e.g., mercury-related) low-value transactions that presently go undocumented.[67]

Resolving discrepancies does not necessarily have to involve "public" access to information contained in individual shipping transactions, which is typically protected as confidential business information.

Mercury product (and compound) reporting and data

There are some similarities in reporting requirements of the Canadian and US national legislation for mercury production, imports, uses, and so on. For example, the federal governments of both countries require private sector reporting on mercury-added products (through Canada's Products Containing Mercury Regulations and the United States' amended Toxic Substances Control Act).

The contributions of the Interstate Mercury Education and Reduction Clearinghouse (IMERC) and its database, which processes periodic reports coming from industry and commerce, have been previously mentioned. Likewise, the role of the Quicksilver Caucus—both as a vast repository of knowledge, and as an important bridge between state and federal initiatives—should not be overlooked in this regard (ECOS 2013).

Mexico could take further steps to work with Canada and the United States regarding reporting on mercury-added products. There is a possibility for further collaboration on information collection and reporting, as well as great value in harmonizing mercury reporting and data management throughout North America. Whatever the level of harmonization of information collection and database structure, it may be preferable that each country should maintain its own independent database.

Reliable data on mercury production and its use in products and processes are basic to understanding current North American mercury demand and to monitoring the trends for products listed under the Minamata Convention. It is important federal laws be in place to ensure these data are made available.

- The amended TSCA in the United States is an ideal instrument for obtaining such data, and may also support further regulatory actions to reduce mercury use in products and processes.
- Canada's PCMR collect data on the manufacture and import of products exempted by the Regulations.
- In Mexico, the COA (*Cédula de Operación Anual*), which covers industrial sectors under federal jurisdiction, not only provides information for the Mexican Pollutant Release and Transfer Register (*RETC*) related to releases and transfers, but also legally requires production facilities to report on raw materials consumed and finished goods produced, although certain process information could be subject to confidentiality provisions.

In parallel with measures to obtain more detailed information through additions to the HS codes for international trade data, the measures described above will help to take full advantage of the information provided through enhanced reporting by industry. Together, these two pathways could

[67] US federal regulations do not require importers, exporters or their agents to submit documentation for merchandise shipments at or below established exemption levels, e.g., US$2,000 for imports and US$2,500 for exports.

assist the North American countries in assessing progress with their respective implementation of the provisions of the Minamata Convention.

Appendix 1: Tariff codes for mercury, mercury compounds and products

A1.1 The Harmonized System

The Harmonized Commodity Description and Coding System, also known as the Harmonized System (HS) of tariff nomenclature, is an internationally standardized system to classify traded commodities. It came into effect in 1988 and has since been developed and maintained by the World Customs Organization (WCO), an independent intergovernmental organization based in Brussels, Belgium, with over 200 member countries.[68]

Since its creation, the Harmonized System has undergone several revisions, the most recent of which took effect on 1 January 2017. As of 2015, there were 180 countries or territories applying the Harmonized System worldwide. HS codes are used by customs authorities, statistical agencies, and other government regulatory bodies to monitor and control the import and export of commodities through customs tariffs, collection of international trade statistics, rules of origin, monitoring of controlled goods (e.g., wastes, endangered species), and so on.[69]

Generally, the sections and chapters of the Harmonized System are arranged in order of a product's degree of manufacturing or technological complexity. An HS code consists of six digits. The first two digits designate the HS Chapter. The first four digits designate the HS heading. The full six digits designate the HS subheading. HS code 8506.10, for example indicates Chapter 85 (*Electrical machinery and equipment and parts thereof...*), Heading 8506 (*Primary cells and primary batteries, parts thereof*), and Subheading 8506.10 (*Manganese dioxide*). In addition to the HS codes and commodity descriptions, each section and chapter of the HS is prefaced by legal notes, which are intended to clarify the proper classification of goods.

To enhance harmonization, the contracting Parties to the Convention on the Harmonized Commodity Description and Coding System, have agreed to base their national tariff schedules on the HS nomenclature and Legal Notes. Parties may subdivide the HS nomenclature beyond six digits and add their own Legal Notes according to their own tariff and statistical requirements. Parties often set their customs duties at the eight-digit "tariff code" level.[70] HS code 8506.10.10, for example, specifically identifies those manganese dioxide primary cells and batteries "having welded connectors or designed to receive welded connectors, for use in electronic lock systems or in components thereof...." Finally, statistical suffixes may be further added to the eight-digit tariff code for a total of 10 digits.

The Harmonized Tariff Schedule (HTS) commodity codes that apply to elemental mercury, mercury compounds and mercury-added products are in some cases more detailed than those of the Harmonized (Commodity Description and Coding) System.

A1.2 Elemental mercury

The commodity code that applies uniquely to elemental mercury is HS code 2805.40. Some countries outside North America sometimes include other mercury commodities under the same code number,

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[68] Available online at <http://everything.explained.today/Harmonized_System>

[69] Available online at <https://en.wikipedia.org/wiki/Harmonized_System>

[70] Available online at <http://everything.explained.today/Harmonized_System>

but this has not been observed in the North American statistics. As in Table 5 below, all of the North American countries use the same code.

Table 5. Commodity codes for elemental mercury

Country	HS code	Description
Canada	2805.40	Mercury
Mexico	2805.40	Mercury
Unites States	2805.40	Mercury

A1.3 Mercury compounds

Mercury compounds are identified by commodity code HS 2852: inorganic or organic compounds of mercury. However, HS 2852 does not cover amalgams,[71] which are distinguished by a different chemical process or structure, and are found under commodity code HS 2843. Finally, although relevant to much smaller quantities of compounds, commodity code HS 3824.90.33 covers mixtures of two or more inorganic compounds of mercury.

It should also be noted that none of the commodity codes mentioned here is intended to include dental amalgams, which are discussed in a separate section of this report under the commodity code for "Dental cements and other dental fillings."

The vast majority of internationally traded mercury compounds are recorded under commodity code HS 2852, which includes the various subheadings in Table 6 below. Reasonable data exist (after 2011) in all three national databases for Subheadings 2852.10 and 2852.90. For the more detailed tariff codes below those subheadings the data are limited, inconsistent and/or non-existent, depending on the database.

Table 6. Commodity codes for mercury compounds

Country	HS code	Description
Canada	2852	Inorganic or organic compounds of mercury, whether or not chemically defined, excluding amalgams.
	2852.10*	Chemically defined*
	2852.90	Other
	2852.90.10	Mercury albuminate; nucleoproteids of mercury
	2852.90.90	Other

[71] According to the online Merriam-Webster dictionary <www.merriam-webster.com/dictionary/amalgam>, an amalgam is an "alloy of mercury with another metal that is solid or liquid at room temperature according to the proportion of mercury present…."

Country	HS code	Description
Mexico	2852	Inorganic or organic compounds of mercury, whether or not chemically defined, excluding amalgams.
	2852.10*	Chemically defined*
	2852.10.01	Inorganic
	2852.10.02	Phenylmercury acetate or propionate
	2852.10.03	Ethylmercurithiosalicylic acid sodium salt (Thimerosal)
	2852.10.99	Other
	2852.90	Other
	2852.90.01	Inorganic
	2852.90.99	Other
United States	2852	Inorganic or organic compounds of mercury, whether or not chemically defined, excluding amalgams:
	2852.10*	Chemically defined*
	2852.10.10	Mercuric oxide, mercuric cyanide, mercuric oxycyanide and mercuric potassium cyanide
	2852.10.90	Other
	2852.90	Other
	2852.90.05	Albuminates, tannates and phosphides of mercury
	2852.90.90	Other

Sources: HTS 2016, CBSA 2016, LIGIE 2007
Note: According to the relevant notes for Subheading 2852.10, the expression "chemically defined" means all organic or inorganic compounds of mercury meeting the requirements of paragraphs (a) to (e) of Note 1 to Chapter 28 or paragraphs (a) to (h) of Note 1 to Chapter 29 (HTS 2016):
Paragraphs (a) to (e) of Note 1 to Chapter 28 state that "chemically defined" compounds of mercury include: (a) Separate chemical elements and separate chemically defined compounds, whether or not containing impurities; (b) The products mentioned in (a) above dissolved in water; (c) The products mentioned in (a) above dissolved in other solvents provided that the solution constitutes a normal and necessary method of putting up these products adopted solely for reasons of safety or for transport and that the solvent does not render the product particularly suitable for specific use rather than for general use; (d) The products mentioned in (a), (b) or (c) above with an added stabilizer (including an anti-caking agent) necessary for their preservation or transport; (e) The products mentioned in (a), (b), (c) or (d) above with an added anti-dusting agent or a coloring substance added to facilitate their identification or for safety reasons, provided that the additions do not render the product particularly suitable for specific use rather than for general use.
Paragraphs (a) to (h) of Note 1 to Chapter 29 state that "chemically defined" compounds of mercury include: (a) Separate chemically defined organic compounds, whether or not containing impurities; (b) Mixtures of two or more isomers of the same organic compound (whether or not containing impurities), except mixtures of acyclic hydrocarbon isomers (other than stereoisomers), whether or not saturated (chapter 27); (c) The products of headings 2936 to 2939 or the sugar ethers, sugar acetals and sugar esters, and their salts, of heading 2940, or the products of heading 2941, whether or not chemically defined; (d) Products mentioned in (a), (b) or (c) above dissolved in water; (e) Products mentioned in (a), (b) or (c) above dissolved in other solvents provided that the solution constitutes a normal and necessary method of putting up these products adopted solely for reasons of safety or for transport and that the solvent does not render the product particularly suitable for specific use rather than for general use; (f) The products mentioned in (a), (b), (c), (d) or (e) above with an added stabilizer (including an anticaking agent) necessary for their preservation or transport; (g) The products mentioned in (a), (b), (c), (d), (e) or (f) above with an added antidusting agent or a coloring or odoriferous substance added to facilitate their identification or for safety reasons, provided that the additions do not render the product

particularly suitable for specific use rather than for general use; (h) The following products, diluted to standard strengths, for the production of azo dyes: diazonium salts, couplers used for these salts and diazotizable amines and their salts.

A1.4 Amalgams

As seen in Table 7 below, amalgams (apart from dental materials) are included in commodity code HS 2843.90—Other compounds or amalgams (of precious metals). While the United Kingdom, for example, has allocated commodity HS Subheading 2843.90.10 specifically for amalgams, the North American countries continue to use the more general HS code 2843.90, which includes compounds of precious metals as well as amalgams, and does not allocate a specific subheading for amalgams.

Because the available data combine the movements of compounds of precious metals with the movements of amalgams, they do not permit the user to have a clear understanding of the quantities of mercury-containing substances or materials transferred among the North American countries. Given the evident limitations of the Harmonized System, therefore, it is impossible to compare the trade of amalgams among the three countries.

Table 7. Commodity codes for (non-dental) amalgams

Country	HS code	Description
Canada	2843 2843.90 2853	Colloidal precious metals; inorganic or organic compounds of precious metals, whether or not chemically defined; amalgams of precious metals. Other compounds; amalgams Other inorganic compounds (including distilled or conductivity water and water of similar purity); liquid air (whether or not rare gases have been removed); compressed air; amalgams, other than amalgams of precious metals
Mexico	2843 2843.90 2843.90.99 2853	Colloidal precious metals; inorganic or organic compounds of precious metals, whether or not chemically defined; amalgams of precious metals. Other compounds; amalgams Other Other inorganic compounds (including distilled or conductivity water and water of similar purity); liquid air (whether or not rare gases have been removed); compressed air; amalgams, other than amalgams of precious metals

Country	HS code	Description
United States	2843	Colloidal precious metals; inorganic or organic compounds of precious metals, whether or not chemically defined; amalgams of precious metals.
	2843.90	Other compounds; amalgams
	2853	Other inorganic compounds (including distilled or conductivity water and water of similar purity); liquid air (whether or not rare gases have been removed); compressed air; amalgams, other than amalgams of precious metals
	3824	Prepared binders for foundry molds or cores; chemical products and preparations of the chemical or allied industries (including those consisting of mixtures of natural products), not elsewhere specified or included.
	3824.90	Other: Mixtures of two or more inorganic compounds:
	3824.90.33	Of mercury

Sources: HTS 2016, CBSA 2016, LIGIE 2007

A1.5 Batteries

There are three main types of button-cell battery that commonly contain mercury (USGS 2013), although all three types are also available in mercury-free varieties:

- alkaline manganese (oxide), also known as alkaline or manganese dioxide batteries, are used in toys, calculators, remote controls and cameras. In these batteries, the cathode consists of manganese dioxide, which is produced through an electrolytic process, and the anode is made up of powdered zinc metal. The electrolyte typically used in this type of button-cell battery is potassium hydroxide (IMERC 2015b).
- silver-oxide, or zinc/silver oxide batteries are used in various devices, such as hearing aids, watches, cameras and clocks. In these batteries, the silver oxide makes up the cathode, and powdered zinc provides the anode. Usually sodium hydroxide or potassium hydroxide is added as an alkaline electrolyte. Silver oxide batteries are made in larger sizes as well as the button-cell size; however, the number of larger batteries is limited due to the high price of silver (IMERC 2015b).
- air-zinc batteries are mostly used in hearing aids because of their high energy concentration and their ability to continuously discharge energy. This type of battery uses oxygen from the air to produce electrochemical energy. A hole in the cell allows the surrounding air to enter the battery and react with the cathode. They are also used for small devices, such as wristwatch pagers and ear speech processors (IMERC 2015b).

A fourth type that has received less attention in recent years, the mercuric oxide battery, contains some 30–40 percent mercury by weight, and was widely used in the past for such applications as hearing aids.

The commodity codes for batteries (including those that may contain mercury) traded by Canada, Mexico and the United States are shown in Table 8 below.

Table 8. Commodity codes for batteries

Country	HS code	Description
Canada	8506	Primary cells and primary batteries
	8506.10	Manganese dioxide
	8506.30	Mercuric oxide
	8506.40	Silver oxide
	8506.60	Air-zinc
Mexico	8506	Primary cells and primary batteries
	8506.10	Manganese dioxide
	8506.30	Mercuric oxide
	8506.40	Silver oxide
	8506.60	Air-zinc
United States	8506	Primary cells and primary batteries
	8506.10	Manganese dioxide
	8506.30	Mercuric oxide
	8506.40	Silver oxide
	8506.60	Air-zinc

Sources: HTS 2016, CBSA 2016, LIGIE 2007

A1.6 Switches and relays

Mercury-added switches are devices used to open or close an electric circuit or a liquid or gas valve,[72] and include float, tilt, pressure and temperature switches. They have been used most commonly in pumps, appliances, space heaters, ranges/ovens and a variety of machinery.

Mercury-added relays are devices used to open or close electrical contacts to control another device in the same circuit, and are often used to turn off large electrical currents by supplying a small amount of electricity to the control circuit. They can generally be found in telecommunication circuit boards and industrial ovens, among other equipment.[73]

While most mercury-added switches and relays may be readily replaced by mercury-free alternatives, there are some exceptions such as very high accuracy capacitance and loss measurement bridges; high-frequency radio frequency switches and relays in monitoring and control instruments; products for use in refurbishment and replacement parts; and so on.

The commodity codes for switches and relays (including those that may contain mercury) traded by Canada, Mexico and the United States are presented in Table 9 below.

[72] Available online at <https://www.nrdc.org/sites/default/files/minamata-convention-on-mercury-manual.pdf>

[73] Ibid.

Table 9. Commodity codes for switches and relays

Country	HS code	Description
Canada	8536	Electrical apparatus for switching or protecting electrical circuits, or for making connections to or in electrical circuits (for example, switches, relays, fuses, surge suppressors, plugs, sockets, lamp-holders and other connectors, junction boxes), for a voltage not exceeding 1,000 volts; connectors for optical fibers, optical fiber bundles or cables.
Mexico	8536	Electrical apparatus for switching or protecting electrical circuits, or for making connections to or in electrical circuits (for example, switches, relays, fuses, surge suppressors, plugs, sockets, lamp-holders and other connectors, junction boxes), for a voltage not exceeding 1,000 volts
United States	8536	Electrical apparatus for switching or protecting electrical circuits, or for making connections to or in electrical circuits (for example, switches, relays, fuses, surge suppressors, plugs, sockets, lamp-holders and other connectors, junction boxes), for a voltage not exceeding 1,000 V; connectors for optical fibers, optical fiber bundles or cables:

Sources: HTS 2016, CBSA 2016, LIGIE 2007

A1.7 Mercury-added lamps

Mercury-added lamps can be grouped into the following categories:

- Compact fluorescent
- Linear fluorescent
- Other fluorescent, especially cold cathode and external electrode fluorescent
- High-intensity discharge (including metal halide, ceramic metal halide, high pressure sodium- and mercury-vapor)
- Neon
- Mercury short-arc
- Miscellaneous

Of particular interest to this study are three of these types of mercury-added lamps, which are not allowed under the Minamata Convention:

1. Compact fluorescent lamps (CFLs) for general lighting purposes that are ≤30 watts with a mercury content exceeding 5 mg per lamp burner.
2. Linear fluorescent lamps (LFLs) for general lighting purposes:
   a) Triband phosphor <60 watts with a mercury content exceeding 5 mg per lamp;
   b) Halophosphate phosphor ≤40 watts with a mercury content exceeding 10 mg per lamp;
   c) High-pressure mercury vapor lamps (HPMV) for general lighting purposes.
3. Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays:
   a) short length (≤500 mm) with mercury content exceeding 3.5 mg per lamp;
   b) medium length (>500 mm and ≤1,500 mm) with mercury content exceeding 5 mg per lamp;
   c) long length (>1,500 mm) with mercury content exceeding 13 mg per lamp.

The mercury content of many CFLs is already below internationally proposed thresholds. The required mercury content of CFLs under the USEPA "Energy Star" program is below the thresholds established in the Minamata Convention for CFLs for general lighting purposes. Energy Star limits are now 2.5 mg of mercury for lamps up to 23 watts and 3 mg of mercury for lamps of higher wattage. Market research suggested that already in 2013 more than 77 percent of the US market in CFLs qualified for the Energy Star label (USEPA 2013).

Two of the most common types of linear fluorescent lamps (LFLs) for general lighting purposes are:

1. halophosphate phosphor and
2. triband phosphor.

Halophosphate phosphor technology, which is older, is used mostly in large, long fluorescent lamps (size T12) and requires significant amounts of mercury. These have been phased out in the United States in favor of the newer, more efficient triband phosphor lamps (mostly T5 and T8 with average mercury content of 3.5 mg), whose mercury content is consistent with the European Union Restriction of Hazardous Substances (RoHS) Directive, and also goes beyond what is required under the Minamata Convention.

High-pressure mercury-vapor lamps for general lighting purposes have been effectively phased out in the United States. Other "high intensity discharge" lamps that use mercury include metal halide lamps and high pressure sodium lamps, although they are not covered by the Minamata Convention.

According to the National Electrical Manufacturers Association (NEMA) and USEPA's Energy Star program, cold cathode and external electrode fluorescent lamps (CCFLs and EEFLs) for electronic displays account for a very small and declining percentage of the US market for CCFLs and EEFLs, which has been dominated by TVs and computer screens, and have been mostly replaced in this sector by light-emitting diode (LED) technology.

The commodity codes for mercury-added lamps traded by Canada, Mexico and the United States are shown in Table 10 below.

Table 10. Commodity codes for mercury-added lamps

Country	HS code	Description
Canada	8539	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infrared lamps; arc-lamps.
	8539.31	Fluorescent, hot cathode
	8539.31.00 20	Single-end connection tubes, including compact
	8539.31.00 90	Other
	8539.32	Mercury- or sodium-vapor lamps; metal halide lamps
	8539.32.10	For use in measuring, checking or testing instruments of Chapter 90, or for use in electrically operated apparatus for indicating intervals of time; High pressure (190-200 atmospheres), 100W to 300W mercury discharge lamps with arc gaps from 1.0mm to 1.3 mm, mounted within a parabolic or elliptical dichroic glass reflector, and with a luminous efficiency of 60 (+/- 5) lumens per watt, for use in Canadian manufactures
	8539.32.90	Other
	8539.32.90 10	Mercury-vapor
		Sodium vapor:
	8539.32.90 21	High pressure sodium
	8539.32.90 29	Other
	8539.32.90 30	Metal halide
	8539.39	Other
	8539.39.10 00	For use in measuring, checking or testing instruments of Chapter 90, or for use in electrically operated apparatus for indicating intervals of time; Neon glow lamps, with an attached resistor, for use in the manufacture of indicator light assemblies; Photographic flash lamps; Xenon discharge lamps
Mexico	8539	Electric filament or discharge lamps, including sealed beam lamp units and ultraviolet or infrared lamps; arc-lamps.
	8539.31	Fluorescent, hot cathode
	8539.31.01	Fluorescent lamps types “O” or “U” form
	8539.31.99	Other
	8539.32	Mercury- or sodium-vapor lamps; metal halide lamps
	8539.32.01	High pressure sodium-vapor
	8539.32.02	Mercury-vapor lamps
	8539.32.03	Low pressure sodium-vapor
	8539.32.99	Other
	8539.39	Other
	8539.39.03	Fluorescent lamps types “O” or “U” form
	8539.39.05	Neon lamps

Country	HS code	Description
United States	8539	Electrical filament or discharge lamps, including sealed beam lamp units and ultraviolet or infrared lamps; arc lamps;
	8539.31	Discharge lamps, other than ultraviolet lamps: Fluorescent, hot cathode
	8539.31.00 40	1.2 m, straight tube, of a power 30 W or more but not exceeding 40 W
	8539.31.00 50	With a single plug-in base
	8539.31.00 60	With a single screw-in base
	8539.31.00 70	Other
	8539.32	Mercury- or sodium-vapor lamps; metal halide lamps
	8539.32.00 20	Sodium-vapor
	8539.32.00 40	Mercury-vapor
	8539.32.00 90	Other
	8539.39.00	Other

Sources: HTS 2016, CBSA 2016, LIGIE 2007

A1.8 Cosmetics

International attention is periodically drawn to cosmetics with mercury content above 1ppm, especially skin lightening soaps and creams. Many countries have banned the intentional use of mercury in cosmetics and related products, although such bans normally exclude eye area cosmetics where mercury is used as a preservative, and where no effective and safe substitute preservative is available (WHO 2011):

- Health Canada's Guidance on Heavy Metal Impurities in Cosmetics (Health Canada 2012) specifies a limit of one mg/kg for mercury as an impurity in cosmetic products, in line with the Minamata Convention. Mercury is listed on Health Canada's Cosmetic Ingredient Hotlist.
- In Mexico, according to the Agreement on Prohibited and Restricted Substances in Perfumes and Beauty Products,[74] mercury and its compounds are banned. Exceptions include phenylmercury salts and thimerosal used in eye area cosmetics and eyewash products; in both cases the maximum permitted concentration is 0.007 percent mercury by weight.
- The United States Food and Drug Administration allows mercury compounds in eye area cosmetics at concentrations at or below 65 mg/kg expressed as mercury (approximately 100 mg/kg expressed as phenylmercuric acetate or nitrate). All other cosmetics must contain mercury at a concentration less than 1.0 mg/kg. The presence of mercury must be unavoidable under good manufacturing practice (WHO 2011).
- Distribution of mercury-containing creams and soaps is banned in various African nations (WHO 2011).
- A European Union Directive specifies that mercury and mercury compounds are not allowed as ingredients in cosmetics (including soaps, lotions, shampoos and skin bleaching products).

[74] Acuerdo por el que se determinan las sustancias prohibidas y restringidas en la elaboración de productos de perfumería y belleza. Available online at: <www.cofepris.gob.mx/MJ/Documents/AcuerdosSecretario/salud21may10.pdf>

However, phenylmercury salts for use as a preservative in eye makeup and eye makeup removal products are allowed at concentrations equal to or less than 0.007 percent mercury by weight (WHO 2011).

- The Philippines reportedly banned in 2011 skin lightening products with mercury levels exceeding the regulatory limit of 1.0 mg/kg.

The commodity codes for cosmetics (including those that may contain mercury compounds) traded by Canada, Mexico and the United States are presented in Table 11 below.

Table 11. Commodity codes for cosmetics

Country	HS code	Description
Canada	3401	Soap; organic surface-active products and preparations for use as soap, in the form of bars, cakes, molded pieces or shapes, whether or not containing soap; organic surface-active products and preparations for washing the skin, in the form of liquid or cream and put up for retail sale, whether or not containing soap; paper, wadding, felt and nonwovens, impregnated, coated or covered with soap or detergent.
	3401.30.00	Organic surface-active products and preparations for washing the skin, in the form of liquid or cream and put up for retail sale, whether or not containing soap
Mexico	3401	Soap; organic surface-active products and preparations for use as soap, in the form of bars, cakes, molded pieces or shapes, whether or not containing soap; organic surface-active products and preparations for washing the skin, in the form of liquid or cream and put up for retail sale, whether or not containing soap; paper, wadding, felt and nonwovens, impregnated, coated or covered with soap or detergent.
	3401.30.01	Organic surface-active products and preparations for washing the skin, in the form of liquid or cream and put up for retail sale, whether or not containing soap

Country	HS code	Description
United States	3401	Soap; organic surface-active products and preparations for use as soap, in the form of bars, cakes, molded pieces or shapes, whether or not containing soap; organic surface-active products and preparations for washing the skin, in the form of liquid or cream and put up for retail sale, whether or not containing soap; paper, wadding, felt and nonwovens, impregnated, coated or covered with soap or detergent:
	3401.30	Organic surface-active products and preparations for washing the skin, in the form of liquid or cream and put up for retail sale, whether or not containing soap:
	3401.30.10	Containing any aromatic or modified aromatic surface-active agent

Sources: HTS 2016, CBSA 2016, LIGIE 2007

A1.9 Pesticides, biocides and topical antiseptics

There is increasing international scrutiny of mercury-containing pesticides, topical antiseptics such as Merthiolate and other uses such as a fungicide and preservative (biocide) in paints.

The commodity codes for pesticides, biocides and topical antiseptics (including those that may contain mercury compounds) traded by Canada, Mexico and the United States are shown in Table 12 below.

Table 12. Commodity codes for pesticides and biocides

Country	HS code	Description
Canada	3808	Insecticides, rodenticides, fungicides, herbicides, anti-sprouting products and plant-growth regulators, disinfectants and similar products, put up in forms or packings for retail sale or as preparations or articles (for example, sulphur-treated bands, wicks and candles, and flypapers).
	3808.50	Goods specified in Subheading Note 1 to this Chapter, that includes different pesticides, including mercury compounds.
Mexico	3808	Insecticides, rodenticides, fungicides, herbicides, anti-sprouting products and plant-growth regulators, disinfectants and similar products, put up in forms or packings for retail sale or as preparations or articles (for example, sulphur-treated bands, wicks and candles, and fly-papers).
	3808.50.01	Goods specified in Subheading Note 1 to this Chapter, that includes different pesticides, including mercury compounds.

Country	HS code	Description
United States	3808	Insecticides, rodenticides, fungicides, herbicides, anti-sprouting products and plant-growth regulators, disinfectants and similar products, put up in forms or packings for retail sale or as preparations or articles (for example, sulphur-treated bands, wicks and candles, and flypapers).
	3808.50	Goods specified in Subheading Note 1 to this Chapter, that includes different pesticides, including mercury compounds.

Sources: HTS 2016, CBSA 2016, LIGIE 2007

A1.10 Non-electronic measuring devices

Apart from thermostats and non-electronic measuring devices installed in large-scale equipment or those used for high-precision measurement, where no suitable mercury-free alternative is available, there are increasing international efforts to phase out mercury-added, non-electronic measuring devices, including:

- barometers
- hygrometers
- manometers
- thermometers
- sphygmomanometers (blood pressure cuffs)

Thousands of hospitals, pharmacies, and other purchasers of medical devices have already eliminated the use of mercury–added thermometers and sphygmomanometers. The commodity codes for these devices (including those that may contain mercury) traded by Canada, Mexico and the United States are shown in Table 13 below.

Table 13. Commodity codes for non-electronic measuring devices

Country	HS code	Description
Canada	9025	Hydrometers and similar floating instruments, thermometers, pyrometers, barometers, hygrometers and psychrometers, recording or not, and any combination of these instruments.
		Thermometers and pyrometers, not combined with other instruments:
	9025.11	Liquid-filled, for direct reading:
	9025.11.10 00	Clinical thermometers
	9025.11.90 00	Other
	9025.80.10 00	Barometers, not combined with other instruments

Country	HS code	Description
Mexico	9025	Aerometers, hydrometers, and similar floating instruments, thermometers, pyrometers, barometers, hygrometers and psychrometers, recording or not, and any combination of these instruments; parts and accessories thereof:
		Thermometers and pyrometers, not combined with other instruments:
	9025.11	Liquid-filled, for direct reading:
	9025.11.01	Glass, with or without mercury
	9025.11.99	Other
	9025.19.04	Pyrometers
	9025.80.01	Hydrometers
	9025.80.02	Hygrometers
Unites States	9025	Hydrometers and similar floating instruments, thermometers, pyrometers, barometers, hygrometers and psychrometers, recording or not, and any combination of these instruments; parts and accessories thereof: Thermometers and pyrometers, not combined with other instruments:
	9025.11	Liquid-filled, for direct reading:
	9025.11.20 00	Clinical
	9025.11.40.00	Other
	9025.19.40.00	Pyrometers
	9025.80.15 00	Barometers, not combined with other instruments
	9025.80.20 00	Hydrometers and similar floating instruments, whether or not incorporating a thermometer, non-recording.
	9025.80.35 00	Hygrometers and psychrometers, non-recording.

Sources: HTS 2016, CBSA 2016, LIGIE 2007

A1.11 Dental amalgam

Mercury is widely used in the dental industry in amalgam fillings for teeth. Dental amalgam contains mercury and varying amounts of silver, tin, copper and other metallic elements. The mercury content is typically about 50 percent.

Modern dental amalgams are not sold in amalgam form, but generally as capsules with separate compartments for metal powders and mercury (that remain separate until they are combined into an amalgam at the dental clinic). More traditionally, and still in some parts of North America, the amalgam materials are purchased independently as elemental mercury and separate metal powders that are mixed to form an amalgam shortly before use.

The commodity codes for dental cements and other dental fillings (including amalgam) traded by Canada, Mexico and the United States are shown in Table 14 below.

Table 14. Commodity codes for dental filling materials

Country	HS code	Description
Canada	3006.40.00 3006.40.00 10 3006.40.00 90	Dental cements and other dental fillings; bone reconstruction cements: Dental cements and bone reconstruction cements Other
Mexico	3006.40 3006.40.01	Dental cements and other dental fillings; bone reconstruction cements Dental fillings made from acrylic resins
United States	3006.40.00	Dental cements and other dental fillings; bone reconstruction cements

Sources: HTS 2016, CBSA 2016, LIGIE 2007

A1.12 Incidental uses of mercury in products

Incidental uses of mercury may include the use of mercury catalysts in polyurethane elastomer production, or the use of mercury in pyrometers, fireworks, flow meters, toys, jewelry, novelty items, balancers and wheel weights, food additives and colorings, among many others. However, none of these categories have their own tariff codes.

With regard to mercury catalysts such as those used in some polyurethane elastomer production, trade statistics would normally be included among the tariff codes in Table 15.

Table 15. Commodity codes for catalysts

Country	HS code	Description
Canada	3815 3815.90	Reaction initiators, reaction accelerators and catalytic preparations, not elsewhere specified or included: Supported catalysts: Other
Mexico	3815 3815.90	Reaction initiators, reaction accelerators and catalytic preparations, not elsewhere specified or included: Supported catalysts: Other
United States	3815 3815.90.20	Reaction initiators, reaction accelerators and catalytic preparations, not elsewhere specified or included: Supported catalysts: Of mercury or of molybdenum

Sources: HTS 2016, CBSA 2016, LIGIE 2007

A1.13 Mercury wastes

The commodity codes generally covering wastes that may contain mercury or mercury compounds are included in Table 16.

Table 16. Commodity codes for wastes

Country	HS code	Description
Canada	2620	Slag, ash and residues (other than from the manufacture of iron or steel) containing metals, arsenic or their compounds
	2620.60	Containing arsenic, mercury, thallium or their mixtures, of a kind used for the extraction of arsenic or those metals or for the manufacture of their chemical compounds
Mexico	2620	Ash and residues (other than from the manufacture of iron or steel) containing metals, arsenic or their compounds
	2620.60	Containing arsenic, mercury, thallium or their mixtures, of a kind used for the extraction of arsenic or those metals or for the manufacture of their chemical compounds
	2620.60 01	May include mercury
United States	2620	Slag, ash and residues (other than from the manufacture of iron or steel), containing arsenic, metals or their compounds
	2620.60	Includes mercury

Sources: HTS 2016, CBSA 2016, LIGIE 2007

Based on the analysis carried out for this report, it is not clear whether any mercury wastes have been aggregated in the trade data for elemental mercury and mercury compounds. However, in light of some large discrepancies identified, it is possible that some wastes containing mercury may have been mistakenly classified as mercury or mercury compounds.

Appendix 2: Rotational (wheel) balancers and wheel weights

This product is included here because it is somewhat off the international "radar screen," but it provides an example of a source of potential mercury releases in significant quantities if measures are not taken to restrict such uses of mercury. Similar examples are firearm recoil dampers, mercury devices to reduce the effects of "tennis elbow," and other such novelty items.

Rotational (wheel) balancers, also sometimes called wheel weights, are marketed to balance wheels and tires, as well as many other rotating devices. The manufacture and marketing of patented mercury-containing wheel weights was introduced in the United States in the late 1980s and in Canada in the early 2000s. Meanwhile, mercury-free alternatives have become readily available at lower cost and, at least according to some online reviews, with superior performance (ECOS 2013).

There is no evidence that mercury-containing rotational wheel balancers and wheel weights are intentionally marketed in Mexico. Nevertheless, the extent of the application of these devices in the United States, and the known frequency of just one of those uses—i.e., on the wheels of heavy goods vehicles travelling between the United States and Mexico—suggest that these devices may be found in Mexico.

Mercury-added rotational balancing products are designed for:

- aftermarket use on large wheels such as those of semi-tractors and trailers, as well as large recreational vehicles (e.g., campers and Hummers) and buses
- motorcycle, truck and other drive shafts
- propellers of light aircraft
- motorcycle belt drives, sprockets, clutch assemblies, etc.

The technology consists basically of a mercury-filled neoprene tube attached at both ends to form a closed circle, which is then inserted into a groove or flange on a metal disk that is subsequently attached to whatever mechanism is rotating, e.g., between a truck wheel and the hub of the axle. Once the wheel or other mechanism is rotating at a certain speed, the mercury in the neoprene tube distributes itself in such a way as to provide a dynamic balance for the rotating mechanism.[75] The marketing literature claims not only significantly reduced vibration, but decreased tire wear and increased fuel efficiency, as well.[76]

In a 2012 *Road Iron* magazine article, Sun-Tech Innovations, the US manufacturer of Balance Masters® since the late 1980s, indicated that it manufactured "a couple hundred" wheel balancers per week. The company website[77] shows 108 different Balance Masters® products for a range of rotational balancing applications. At that level of output, and based on the actual and estimated mercury content of these various products (Table 17), the company could be placing two to three metric tons of mercury on the market each year.

[75] Available online at <http://www.balancemasters.com/how-it-works.html>, consulted on 14 August 2016.

[76] Available online at <http://www.balancemasters.com/reviews.html>, consulted on 14 August 2016.

[77] Ibid.

Table 17. Products for Rotational Balancing Applications

Application (number of products)	Actual or estimated Hg content (oz.)	Actual or estimated Hg content (g)
Hummer (1)	28 oz. per wheel	790 g
flywheel (1)	est. 4 oz.	112 g
sprinter (1)	28 oz. per wheel	790 g
aircraft (8)	4 oz.	112 g
trucks, buses, vans & motor homes (51) • wheels 16 & 16.5 (12) • wheels 16 & 17.5 (5) • wheels 19.5 & 22.5 (15) • wheels 22.5 & 24.5 (14) • wheels SPOKE (5)	28 oz. per wheel	790 g
motorcycles (31) • belt drives front pulley (8) • compensators (7) • Sportster clutch assembly (3) • sprocket (3) • big twin clutch assembly (10)	est. 4 oz.	112 g
drive shafts (15)	est. 4 oz.	112 g

Source: Sun-Tech Balance Masters® website, www.balancemasters.com. Additional consultant estimates based on personal communications with representatives from the Minnesota Pollution Control Agency and the California Environmental Protection Agency, June 2016.

A2.1 Relevant regulations

A number of US states have regulations aimed at mercury-containing wheel balancers and wheel weights, although truckers and others can easily get around the regulations by purchasing such products in a neighboring state:

- the states of Connecticut, Louisiana and Rhode Island ban these products based on legislation regarding mercury content.
- Maine, New York and possibly some other states ban them as wheel-balancing products or equipment.

- Minnesota and Illinois have legislation prohibiting the sale of these products as rotational balancers or the like, in addition to prohibiting their sale as wheel balancing products/equipment.

As confirmed in communications with IMERC[78] for this report, Sun-Tech has indicated that it does not market its products in any of the IMERC notification states—Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont—and therefore is not legally obliged to report to IMERC.

Canada's Products Containing Mercury Regulations, in force since November 2015, prohibit the manufacture and import of products containing mercury, including wheel balancers and wheel weights.

[78] Personal communication with Rachel Smith and Terri Goldberg from IMERC, 20 June 2016.

Appendix 3: Mercury trade in North America

As mentioned in the body of the report, the trade data presented in this appendix were accessed from databases and other sources prior to October 2016, unless otherwise indicated. As such, they present the data available at that time, and do not reflect revisions and updates to the data that may have occurred since that time. Before citing or using information in this report, therefore, readers are cautioned to consider the temporal nature of the source data, as well as findings based on those data, which in some cases may no longer be valid.

A3.1 Elemental mercury

Table 18. North American trade-elemental mercury

HS 2805.40: Mercury Databases: see notes				Canada CIMTD	Canada CIMTD	Mexico SIAVI	Mexico SIAVI	USA USITC	USA USITC	UNSD COMTRADE	UNSD COMTRADE
Year	Reporter	Trade Flow	Partner	(Kg)	(US$)	(Kg)	(US$)	(Kg)	(US$)	(Kg)	(US$)
2010	Canada	Import from	Mexico	0	0					0	0
2010	Canada	Export to	Mexico	0	0					0	0
2010	Canada	Import from	USA	4,107	41,964					4,107	41,964
2010	Canada	Export to	USA	4,170	17,594					4,170	17,594
2010	Mexico	Import from	Canada			0	0			0	0
2010	Mexico	Export to	Canada			0	0			0	0
2010	Mexico	Import from	USA			14,541	271,250			14,565	271,250
2010	Mexico	Export to	USA			1,329	132			1,329	132
2010	USA	Import from	Canada					4,170	16,773	4,170	17,526
2010	USA	Export to	Canada					5,863	61,076	5,863	61,076
2010	USA	Re-export to	Canada					2,434	25,543	2,434	25,543
2010	USA	Import from	Mexico					0	0	0	0
2010	USA	Export to	Mexico					0	0	0	0
2014	Canada	Import from	Mexico	1,147	10,891					1,147	10,891
2014	Canada	Export to	Mexico	0	0					0	0
2014	Canada	Import from	USA	665	6,430					665	6,430
2014	Canada	Export to	USA	4,065	91,232					4,065	91,232
2014	Mexico	Import from	Canada			0	0			0	0
2014	Mexico	Export to	Canada			276	22,399			276	22,399
2014	Mexico	Import from	USA			28	5,368			28	5,368
2014	Mexico	Export to	USA			0	0			0	0
2014	USA	Import from	Canada					4,065	89,610	4,065	89,668
2014	USA	Export to	Canada					0	0	0	0
2014	USA	Import from	Mexico					0	0	0	0
2014	USA	Export to	Mexico					0	0	0	0

Notes: A single color in a given year marks a discrepancy in the data reported by two different countries.
Trade data are subject to revisions. In general, any monthly data for the current year may be revised until the release of the December data; any annual data for the three preceding years may be revised.
Sources: CIMT (2016), SIAVI (2016), USITC (2016), Comtrade (2016).

A3.2 Mercury compounds

Table 19. North American trade-mercury compounds

HS 2852: Inorganic or organic compounds of mercury, whether or not chemically defined, excluding amalgams (combines sub-categories 2852.10 and 2852.90)
Databases: see notes

Year	Reporter	Trade Flow	Partner	Canada CIMTD Kg	Canada CIMTD US$	Mexico SIAVI Kg	Mexico SIAVI US$	USA USITC Kg	USA USITC US$	UNSD COMTRADE Kg	UNSD COMTRADE US$
2010	**Canada**	Import from	Mexico	89	159					89	159
2010	**Canada**	Export to	Mexico	0	0					0	0
2010	**Canada**	Import from	USA	66,891	204,951					66,896	204,951
2010	**Canada**	Export to	USA	147,714	47,555					151,675	58,912
2010	**Canada**	Re-export to	USA	3,961	11,357					3,961	11,357
2010	**Mexico**	Import from	Canada			2	491			2	491
2010	**Mexico**	Export to	Canada			0	0			0	0
2010	**Mexico**	Import from	USA			13,880	185,079			13,884	185,079
2010	**Mexico**	Export to	USA			8,409	65,569			8,410	65,569
2010	**USA**	Import from	Canada					147,714	45,793	147,714	47,318
2010	**USA**	Export to	Canada					106,046	269,346	106,046	269,346
2010	**USA**	Re-export to	Canada					42,896	85,810	42,896	85,810
2010	**USA**	Import from	Mexico					16,672	67,452	16,672	68,031
2010	**USA**	Export to	Mexico					176,955	717,011	176,955	717,011
2010	**USA**	Re-export to	Mexico					14	3,279	14	3,279
2014	**Canada**	Import from	Mexico	87,425	22,138,983					87,425	22,138,983
2014	**Canada**	Export to	Mexico	0	0					0	0
2014	**Canada**	Import from	USA	205,017	971,066					205,017	971,066
2014	**Canada**	Export to	USA	48,516	594,504					48,527	594,504
2014	**Canada**	Re-import from	Canada	1,270	592,669					1,270	592,669
2014	**Mexico**	Import from	Canada			0	0			0	0
2014	**Mexico**	Export to	Canada			0	0			0	0
2014	**Mexico**	Import from	USA			135	7,503			128	7,513
2014	**Mexico**	Export to	USA			0	0			0	0
2014	**USA**	Import from	Canada					48,516	581,613	48,516	582,405
2014	**USA**	Export to	Canada					248,025	1,861,690	248,025	1,861,690
2014	**USA**	Re-export to	Canada					30,874	769,662	30,874	769,671
2014	**USA**	Import from	Mexico					0	0	0	0
2014	**USA**	Export to	Mexico					167	22,851	167	22,851
2014	**USA**	Re-export to	Mexico					157	19,169	157	19,169

Notes: A single color in a given year marks a discrepancy in the data reported by two different countries.
Trade data are subject to revisions. In general, any monthly data for the current year may be revised until the release of the December data; any annual data for the three preceding years may be revised.
Sources: CIMT (2016), SIAVI (2016), USITC (2016), Comtrade (2016).

Table 20. North American trade-mercury compounds (chemically defined)

HS 2852.10: Mercury compounds, inorganic or organic, chemically defined, excluding amalgams Databases: see notes											
Year	Reporter	Trade Flow	Partner	Canada CIMTD Kg	Canada CIMTD US$	Mexico SIAVI Kg	Mexico SIAVI US$	USA USITC Kg	USA USITC US$	UNSD COMTRADE Kg	UNSD COMTRADE US$
2010	**Canada**	Import from	Mexico	n.d.a.	n.d.a.					n.d.a.	n.d.a.
2010	**Canada**	Export to	Mexico	n.d.a.	n.d.a.					n.d.a.	n.d.a.
2010	**Canada**	Import from	USA	n.d.a.	n.d.a.					n.d.a.	n.d.a.
2010	**Canada**	Export to	USA	n.d.a.	n.d.a.					n.d.a.	n.d.a.
2010	**Mexico**	Import from	Canada			n.d.a.	n.d.a.			n.d.a.	n.d.a.
2010	**Mexico**	Export to	Canada			n.d.a.	n.d.a.			n.d.a.	n.d.a.
2010	**Mexico**	Import from	USA			n.d.a.	n.d.a.			n.d.a.	n.d.a.
2010	**Mexico**	Export to	USA			n.d.a.	n.d.a.			n.d.a.	n.d.a.
2010	**USA**	Import from	Canada					n.d.a.	n.d.a.	n.d.a.	n.d.a.
2010	**USA**	Export to	Canada					n.d.a.	n.d.a.	n.d.a.	n.d.a.
2010	**USA**	Import from	Mexico					n.d.a.	n.d.a.	n.d.a.	n.d.a.
2010	**USA**	Export to	Mexico					n.d.a.	n.d.a.	n.d.a.	n.d.a.
2014	**Canada**	Import from	Mexico	0	0					0	0
2014	**Canada**	Export to	Mexico	0	0					0	0
2014	**Canada**	Import from	USA	48,254	126,953					48,254	126,953
2014	**Canada**	Export to	USA	30,365	546,257					30,365	546,257
2014	**Mexico**	Import from	Canada			0	0			0	0
2014	**Mexico**	Export to	Canada			0	0			0	0
2014	**Mexico**	Import from	USA			79	5,149			72	5,149
2014	**Mexico**	Export to	USA			0	0			0	0
2014	**USA**	Import from	Canada					30,365	535,552	30,365	535,794
2014	**USA**	Export to	Canada					67,054	208,642	67,054	208,642
2014	**USA**	Re-export to	Canada					18,949	68,482	18,949	68,482
2014	**USA**	Import from	Mexico					0	0	0	0
2014	**USA**	Export to	Mexico					76	17,776	76	17,776
2014	**USA**	Re-export to	Mexico					66	14,094	66	14,094

Notes: n.d.a. = no data available.

Trade data are subject to revisions. In general, any monthly data for the current year may be revised until the release of the December data; any annual data for the three preceding years may be revised.

Sources: CIMT (2016), SIAVI (2016), USITC (2016), Comtrade (2016).

Table 21. North American trade-mercury compounds (not chemically defined)

HS 2852.90: mercury compounds, inorganic or organic, not chemically defined, excluding amalgams Databases: see notes											
Year	Reporter	Trade Flow	Partner	Canada CIMTD Kg	Canada CIMTD US$	Mexico SIAVI Kg	Mexico SIAVI US$	USA USITC Kg	USA USITC US$	UNSD COMTRADE Kg	UNSD COMTRADE US$
2010	**Canada**	Import from	Mexico	n.d.a.	n.d.a.					n.d.a.	n.d.a.
2010	**Canada**	Export to	Mexico	n.d.a.	n.d.a.					n.d.a.	n.d.a.
2010	**Canada**	Import from	USA	n.d.a.	n.d.a.					n.d.a.	n.d.a.
2010	**Canada**	Export to	USA	n.d.a.	n.d.a.					n.d.a.	n.d.a.
2010	**Mexico**	Import from	Canada			n.d.a.	n.d.a.			n.d.a.	n.d.a.
2010	**Mexico**	Export to	Canada			n.d.a.	n.d.a.			n.d.a.	n.d.a.
2010	**Mexico**	Import from	USA			n.d.a.	n.d.a.			n.d.a.	n.d.a.
2010	**Mexico**	Export to	USA			n.d.a.	n.d.a.			n.d.a.	n.d.a.
2010	**USA**	Import from	Canada					n.d.a.	n.d.a.	n.d.a.	n.d.a.
2010	**USA**	Export to	Canada					n.d.a.	n.d.a.	n.d.a.	n.d.a.
2010	**USA**	Import from	Mexico					n.d.a.	n.d.a.	n.d.a.	n.d.a.
2010	**USA**	Export to	Mexico					n.d.a.	n.d.a.	n.d.a.	n.d.a.
2014	**Canada**	Import from	Mexico	87,425	22,138,983					87,425	22,138,983
2014	**Canada**	Export to	Mexico	0	0					0	0
2014	**Canada**	Import from	USA	156,763	844,113					156,763	844,113
2014	**Canada**	Export to	USA	18,151	48,247					18,162	48,247
2014	**Canada**	Re-import from	Canada	1,270	592,669					1,270	592,669
2014	**Mexico**	Import from	Canada			0	0			0	0
2014	**Mexico**	Export to	Canada			0	0			0	0
2014	**Mexico**	Import from	USA			56	2,354			56	2,364
2014	**Mexico**	Export to	USA			0	0			0	0
2014	**USA**	Import from	Canada					18,151	46,061	18,151	46,611
2014	**USA**	Export to	Canada					180,971	1,653,048	180,971	1,653,048
2014	**USA**	Re-export to	Canada					11,925	701,180	11,925	701,189
2014	**USA**	Import from	Mexico					0	0	0	0
2014	**USA**	Export to	Mexico					91	5,075	91	5,075
2014	**USA**	Re-export to	Mexico					91	5,075	91	5,075

Notes: n.d.a. = no data available.

Trade data are subject to revisions. In general, any monthly data for the current year may be revised until the release of the December data; any annual data for the three preceding years may be revised.

Sources: CIMT (2016), SIAVI (2016), USITC (2016), Comtrade (2016).

A3.3 Batteries

Table 22. North American trade-manganese dioxide batteries

Commodity code HS 8506.10
Manganese dioxide primary cells and primary batteries, and parts thereof
Showing only trade flow of quantities greater than 1 million items per year
Database: Comtrade (http://comtrade.un.org/data/), accessed 21 July 2016

Year	Reporter	Trade Flow	Partner	Trade value (US$)	Net weight (kg)	Quantity
2010	Canada	Import from	Mexico	$0	0	0
2010	Canada	Export to	Mexico	$0	0	0
2010	Canada	Import from	USA	$125,998,495	17,688,340	291,192,738
2010	Canada	Export to	USA	$0	0	0
2010	Mexico	Import from	Canada	$0	0	0
2010	Mexico	Export to	Canada	$0	0	0
2010	Mexico	Import from	USA	$26,292,438	3,807,851	91,700,590
2010	Mexico	Export to	USA	$1,061,466	365,641	3,328,869
2010	USA	Import from	Canada	$0	0	0
2010	USA	Export to	Canada	$139,587,778	n.d.a.	376,354,915
2010	USA	Re-export to	Canada	$9,614,804	n.d.a.	35,391,886
2010	USA	Import from	Mexico	$0	0	0
2010	USA	Export to	Mexico	$35,599,092	n.d.a.	124,211,753
2010	USA	Re-export to	Mexico	$7,487,011	n.d.a.	21,493,028
2014	Canada	Import from	Mexico	$0	0	0
2014	Canada	Export to	Mexico	$0	0	0
2014	Canada	Import from	USA	$112,073,144	13,905,595	132,332,688
2014	Canada	Export to	USA	$420,246	48,050	1,428,210
2014	Mexico	Import from	Canada	$0	0	0
2014	Mexico	Export to	Canada	$0	0	0
2014	Mexico	Import from	USA	$21,207,896	3,994,272	n.d.a.
2014	Mexico	Export to	USA	$2,156,245	812,116	4,827,466
2014	USA	Import from	Canada	$0	0	0
2014	USA	Export to	Canada	$131,801,344	15,069,954	295,080,809
2014	USA	Re-export to	Canada	$16,016,889	1,831,345	35,859,092
2014	USA	Import from	Mexico	$714,069	88,599	n.d.a.
2014	USA	Export to	Mexico	$30,294,996	3,463,881	67,825,347
2014	USA	Re-export to	Mexico	$8,625,517	986,228	19,311,067

n.d.a.= no data available

Notes: As discussed in the text, these data do not differentiate between mercury-added and mercury-free batteries. Moreover, they may include larger batteries in addition to button cells.
Trade data are subject to revisions. In general, any monthly data for the current year may be revised until the release of the December data; any annual data for the three preceding years may be revised.

Table 23. North American trade-silver oxide batteries

Commodity code HS 8506.40
Silver oxide primary cells and primary batteries, and parts thereof
Database: Comtrade (http://comtrade.un.org/data/), accessed 21 July 2016

Year	Reporter	Trade Flow	Partner	Trade value (US$)	Net weight (kg)	Quantity
2010	Canada	Import from	Mexico	$0	0	0
2010	Canada	Export to	Mexico	$0	0	0
2010	Canada	Import from	USA	$611,034	4,050	1,639,952
2010	Canada	Export to	USA	$0	0	0
2010	Mexico	Import from	Canada	$0	0	0
2010	Mexico	Export to	Canada	$0	0	0
2010	Mexico	Import from	USA	$0	0	0
2010	Mexico	Export to	USA	$0	0	0
2010	USA	Import from	Canada	$0	0	0
2010	USA	Export to	Canada	$2,325,849	9,011	8,655,268
2010	USA	Re-export to	Canada	$1,473,442	5,709	5,945,371
2010	USA	Import from	Mexico	$0	0	0
2010	USA	Export to	Mexico	$560,412	2,171	1,195,863
2010	USA	Re-export to	Mexico	$0	0	0
2014	Canada	Import from	Mexico	$0	0	0
2014	Canada	Export to	Mexico	$0	0	0
2014	Canada	Import from	USA	$769,398	4,304	1,469,252
2014	Canada	Export to	USA	$0	0	0
2014	Mexico	Import from	Canada	$0	0	0
2014	Mexico	Export to	Canada	$0	0	0
2014	Mexico	Import from	USA	$91,632	2,890	298,368
2014	Mexico	Export to	USA	$0	0	0
2014	USA	Import from	Canada	$0	0	0
2014	USA	Export to	Canada	$1,721,648	5,486	n.d.a.
2014	USA	Re-export to	Canada	$628,833	2,004	n.d.a.
2014	USA	Import from	Mexico	$0	0	0
2014	USA	Export to	Mexico	$0	0	0
2014	USA	Re-export to	Mexico	$0	0	0

n.d.a.= no data available

Notes: As discussed in the text, these data do not differentiate between mercury-added and mercury-free batteries. Moreover, they may include larger batteries in addition to button cells.
Trade data are subject to revisions. In general, any monthly data for the current year may be revised until the release of the December data; any annual data for the three preceding years may be revised.

Table 24. North American trade-air-zinc batteries

Commodity code HS 8506.60
Air-zinc primary cells and primary batteries, and parts thereof
Database: Comtrade (http://comtrade.un.org/data/), accessed 21 July 2016

Year	Reporter	Trade Flow	Partner	Trade value (US$)	Net weight (kg)	Quantity
2010	Canada	Import from	Mexico	$0	0	0
2010	Canada	Export to	Mexico	$0	0	0
2010	Canada	Import from	USA	$3,693,611	n.d.a.	3,693,001
2010	Canada	Export to	USA	$0	0	0
2010	Mexico	Import from	Canada	$0	0	0
2010	Mexico	Export to	Canada	$0	0	0
2010	Mexico	Import from	USA	$692,676	13,309	n.d.a.
2010	Mexico	Export to	USA	$0	0	0
2010	USA	Import from	Canada	$0	0	0
2010	USA	Export to	Canada	$6,432,189	54,918	5,708,135
2010	USA	Re-export to	Canada	$2,562,340	21,877	1,806,446
2010	USA	Import from	Mexico	$0	0	0
2010	USA	Export to	Mexico	$1,321,480	11,283	3,262,748
2010	USA	Re-export to	Mexico	$659,006	5,627	1,620,289
2014	Canada	Import from	Mexico	$0	0	0
2014	Canada	Export to	Mexico	$0	0	0
2014	Canada	Import from	USA	$4,437,167	56,782	4,846,338
2014	Canada	Export to	USA	$0	0	0
2014	Mexico	Import from	Canada	$0	0	0
2014	Mexico	Export to	Canada	$0	0	0
2014	Mexico	Import from	USA	$843,810	24,449	n.d.a.
2014	Mexico	Export to	USA	$141,559	94,299	430,796
2014	USA	Import from	Canada	$0	0	0
2014	USA	Export to	Canada	$9,577,104	86,951	29,145,257
2014	USA	Re-export to	Canada	$4,794,936	43,533	14,592,056
2014	USA	Import from	Mexico	$0	0	0
2014	USA	Export to	Mexico	$853,098	7,745	2,596,167
2014	USA	Re-export to	Mexico	$0	0	0

n.d.a.= no data available

Notes: As discussed in the text, these data do not differentiate between mercury-added and mercury-free batteries. Moreover, they may include larger batteries in addition to button cells.
Trade data are subject to revisions. In general, any monthly data for the current year may be revised until the release of the December data; any annual data for the three preceding years may be revised.

Table 25. North American trade-mercuric oxide batteries

Commodity code HS 8506.30
Mercuric oxide primary cells and primary batteries, and parts thereof
Database: Comtrade (http://comtrade.un.org/data/), accessed 21 July 2016

Year	Reporter	Trade Flow	Partner	Trade value (US$)	Net weight (kg)	Quantity
2010	Canada	Import from	Mexico	$0	0	0
2010	Canada	Export to	Mexico	$0	0	0
2010	Canada	Import from	USA	$25,411	n.d.a.	24,511
2010	Canada	Export to	USA	$0	0	0
2010	Mexico	Import from	Canada	$15	1	n.d.a.
2010	Mexico	Export to	Canada	$0	0	0
2010	Mexico	Import from	USA	$662,078	119,886	n.d.a.
2010	Mexico	Export to	USA	$2,201	26	n.d.a.
2010	USA	Import from	Canada	$0	0	0
2010	USA	Export to	Canada	$48,131	n.d.a.	80,011
2010	USA	Re-Export	Canada	$31,041	n.d.a.	62,163
2010	USA	Import from	Mexico	$5,801	n.d.a.	5,030
2010	USA	Export to	Mexico	$745,024	n.d.a.	798,453
2010	USA	Re-Export	Mexico	$9,478	n.d.a.	29,712
2014	Canada	Import from	Mexico	$111	38	73
2014	Canada	Export to	Mexico	$0	0	0
2014	Canada	Import from	USA	$10,305	3,484	207
2014	Canada	Export to	USA	$4,545	n.d.a.	70
2014	Mexico	Import from	Canada	$4	1	n.d.a.
2014	Mexico	Export to	Canada	$0	0	0
2014	Mexico	Import from	USA	$5,171	339	n.d.a.
2014	Mexico	Export to	USA	$258	4	n.d.a.
2014	USA	Import from	Canada	$4,652	1,573	n.d.a.
2014	USA	Export to	Canada	$13,782	n.d.a.	n.d.a.
2014	USA	Re-Export	Canada	$4,287	n.d.a.	n.d.a.
2014	USA	Import from	Mexico	$0	0	0
2014	USA	Export to	Mexico	$262,957	n.d.a.	n.d.a.
2014	USA	Re-Export	Mexico	$36,886	n.d.a.	n.d.a.
2015	Canada	Import	World	$80,649	n.d.a.	9,651
2015	Canada	Export	World	$2,208	n.d.a.	185
2015	Mexico	Import	World	$146,596	77,526	n.d.a.
2015	Mexico	Export	World	n.d.a.	n.d.a.	n.d.a.
2015	USA	Import	World	$624,512	n.d.a.	936,524
2015	USA	Export	World	$1,866,392	n.d.a.	314,254

n.d.a.= no data available

Notes: The data suggest that most of the reported trade in mercuric oxide batteries involves larger batteries than button cells.
Trade data are subject to revisions. In general, any monthly data for the current year may be revised until the release of the December data; any annual data for the three preceding years may be revised.

A3.4 Mercury-added lamps

Table 26. North American trade-discharge lamps, other than ultraviolet

Commodity Sub-heading 8539.31 -
Discharge lamps, other than ultraviolet lamps: Fluorescent, hot cathode
Database: Comtrade (http://comtrade.un.org/data/), accessed 22 July 2016

Year	Reporter	Trade Flow	Partner	Quantity	Trade value (US$)
2010	Canada	Import from	Mexico	399,974	1,034,858
2010	Canada	Export to	Mexico	176	5,191
2010	Canada	Re-export to	Mexico	137	3,657
2010	Canada	Import from	USA	35,362,562	43,119,744
2010	Canada	Export to	USA	43,609,749	61,375,372
2010	Canada	Re-export to	USA	857,341	857,341
2010	Canada	Re-import from	Canada	788,912	1,322,562
2010	Mexico	Import from	Canada	919,780	1,581,996
2010	Mexico	Export to	Canada	133,902	407,220
2010	Mexico	Import from	USA	23,047,205	23,808,522
2010	Mexico	Export to	USA	7,557,259	15,229,634
2010	USA	Import from	Canada	42,782,350	58,158,615
2010	USA	Export to	Canada	42,430,856	73,931,771
2010	USA	Re-export to	Canada	9,053,123	24,034,423
2010	USA	Import from	Mexico	3,742,053	4,961,166
2010	USA	Export to	Mexico	12,730,599	24,332,052
2010	USA	Re-export to	Mexico	923,871	1,868,611
2014	Canada	Import from	Mexico	315,562	1,082,135
2014	Canada	Export to	Mexico	18	149
2014	Canada	Re-export to	Mexico	0	0
2014	Canada	Import from	USA	25,309,228	43,010,719
2014	Canada	Export to	USA	23,487,112	36,448,483
2014	Canada	Re-export to	USA	0	0
2014	Canada	Re-import from	Canada	1,414,889	2,462,836
2014	Mexico	Import from	Canada	325,826	788,078
2014	Mexico	Export to	Canada	96,020	405,563
2014	Mexico	Import from	USA	23,892,207	36,443,511
2014	Mexico	Export to	USA	3,318,200	10,191,359
2014	USA	Import from	Canada	21,068,229	32,968,379
2014	USA	Export to	Canada	45,587,677	73,628,711
2014	USA	Re-export to	Canada	14,088,911	22,755,016
2014	USA	Import from	Mexico	6,092,493	9,533,768
2014	USA	Export to	Mexico	28,951,883	46,760,220
2014	USA	Re-export to	Mexico	3,485,995	5,630,234

Note: Trade data are subject to revisions. In general, any monthly data for the current year may be revised until the release of the December data; any annual data for the three preceding years may be revised.

Table 27. North American trade-mercury or sodium vapor lamps; metal halide lamps

Commodity Sub-heading 8539.32 - Mercury- or sodium-vapor lamps; metal halide lamps Database: Comtrade (http://comtrade.un.org/data/), accessed 22 July 2016					
Year	**Reporter**	**Trade Flow**	**Partner**	**Quantity**	**Trade value (US$)**
2010	Canada	Import from	Mexico	401,042	4,653,668
2010	Canada	Export to	Mexico	36	7,167
2010	Canada	Re-export to	Mexico	0	0
2010	Canada	Import from	USA	2,559,706	26,198,561
2010	Canada	Export to	USA	115,673	2,687,867
2010	Canada	Re-export to	USA	0	0
2010	Canada	Re-import from	Canada	428	6,516
2010	Mexico	Import from	Canada	1,682	22,915
2010	Mexico	Export to	Canada	33,230	766,121
2010	Mexico	Import from	USA	2,904,390	13,278,808
2010	Mexico	Export to	USA	610,726	11,052,120
2010	USA	Import from	Canada	17,396	440,676
2010	USA	Export to	Canada	3,874,649	42,620,464
2010	USA	Re-export to	Canada	1,275,647	14,267,697
2010	USA	Import from	Mexico	3,402,598	23,941,597
2010	USA	Export to	Mexico	801,827	9,398,490
2010	USA	Re-export to	Mexico	308,225	10,338,619
2014	Canada	Import from	Mexico	425,125	3,477,148
2014	Canada	Export to	Mexico	0	9
2014	Canada	Re-export to	Mexico	0	0
2014	Canada	Import from	USA	842,306	8,471,590
2014	Canada	Export to	USA	116,563	5,049,553
2014	Canada	Re-export to	USA	0	0
2014	Canada	Re-import from	Canada	170	6,531
2014	Mexico	Import from	Canada	1,201	15,661
2014	Mexico	Export to	Canada	11,271	299,011
2014	Mexico	Import from	USA	442,392	4,719,291
2014	Mexico	Export to	USA	229,334	4,363,308
2014	USA	Import from	Canada	10,470	123,619
2014	USA	Export to	Canada	2,821,371	26,422,868
2014	USA	Re-export to	Canada	1,493,232	13,984,510
2014	USA	Import from	Mexico	2,661,301	31,421,262
2014	USA	Export to	Mexico	1,230,385	11,522,877
2014	USA	Re-export to	Mexico	848,442	7,945,880

Note: Trade data are subject to revisions. In general, any monthly data for the current year may be revised until the release of the December data; any annual data for the three preceding years may be revised.

Appendix 4: North American mercury trade with the world

A4.1 Elemental mercury

Table 28. Mercury-North American trade with the rest of the world

North American mercury trade									HS tariff code: 280540 mercury
Canada, Mexico, U.S. trade with each other and the rest of the world									Weight: kilograms
Quantities (kg) less than approx. 4,000kg/yr omitted from the table									Years: 2010, 2014
Database: Comtrade (http://comtrade.un.org/data/), accessed 27 April 2016									Trade value: US dollars
		Canada		**Canada**		**Canada**		**Canada**	
		As reported by partner		As reported by Canada		As reported by partner		As reported by Canada	
Partner		2010 US$	2010 kg	2010 US$	2010 kg	2014 US$	2014 kg	2014 US$	2014 kg
USA	exports to	$61,076	5,863	$41,964	4,107				
USA	re-exports to	$25,543	2,434						
Singapore	exports to					$415,397	6,038		
Malaysia	exports to							$1,350,129	142,184
Cuba	imports from							$1,596,048	174,707
USA	imports from	$17,526	4,170	$17,594	4,170	$89,668	4,065	$91,232	4,065
		Mexico		**Mexico**		**Mexico**		**Mexico**	
		As reported by partner		As reported by Mexico		As reported by partner		As reported by Mexico	
Partner		2010 US$	2010 kg	2010 US$	2010 kg	2014 US$	2014 kg	2014 US$	2014 kg
USA	exports to			$271,250	14,565				
Colombia	imports from	$188,184	5,003	$431,050	8,522	$6,092,232	116,817	$6,143,276	124,124
Nicaragua	imports from	$127,471	4,939	$122,646	3,745				
Bolivia	imports from					$522,910	12,102	$1,561,279	23,978
Paraguay	imports from					$87,421	4,689		
Peru	imports from			$328,513	9,373	$6,333,369	91,992	$6,027,104	94,288
India	imports from					$249,498	3,954		
Singapore	imports from					$561,080	6,900	$1,269,698	17,250
Myanmar	imports from							$1,200,000	20,700

Table 28 (continued). Mercury- North America trade with the rest of the world

North American mercury trade						HS tariff code: 280540 mercury			
Canada, Mexico, U.S. trade with each other and the rest of the world						Weight: kilograms			
Quantities (kg) less than approx. 4,000kg/yr omitted from the table						Years: 2010, 2014			
Database: Comtrade (http://comtrade.un.org/data/), accessed 27 April 2016						Trade value: US dollars			
		USA		**USA**		**USA**		**USA**	
		As reported by partner		As reported by USA		As reported by partner		As reported by USA	
Partner		2010 US$	2010 kg	2010 US$	2010 kg	2014 US$	2014 kg	2014 US$	2014 kg
Canada	exports to	$17,594	4,170	$17,526	4,170	$91,232	4,065	$89,668	4,065
Chile	exports to	$324,109	147,001	$426,621	176,377				
Germany	exports to	$1,146,139	14,200	$817,640	11,334	$656,485	4,600	$1,133,825	37,979
Peru	exports to	$95,886	152,585	$121,949	101,728				
Netherlands	exports to							$75,057	7,430
Australia	imports from	$427,663	27,801	$515,000	31,044	$1,113,665	20,086		
Canada	imports from	$41,964	4,107	$61,076	5,863				
Germany	imports from	$442,503	11,000						
Guyana	imports from	$235,046	18,369	$326,000	16,139				
Netherlands	imports from			$4,080,000	295,020				
Nigeria	imports from			$15,000	13,961				
Peru	imports from	$1,034,223	41,194	$817,680	38,432				
India	imports from	$1,656,806	67,971	$229,090	13,799	$1,316,586	12,277		
Viet Nam	imports from			$615,394	36,380				
Spain	imports from	$702,365	29,514	$175,000	10,351				
Philippines	imports from	$52,155	4,845						
Colombia	imports from	$240,470	6,913						
Mexico	imports from	$271,250	14,565						
Singapore	imports from	$123,569	22,521			$4,233,580	65,287		
Brazil	imports from					$942,790	7,970		
Pakistan	imports from					$96,194	18,555		
South Africa	imports from					$956,600	12,862		

A4.2 Mercury compounds

Table 29. Mercury compounds-North American trade with the rest of the world

Commodity code 2852 - Inorganic or organic compounds of mercury, whether or not chemically defined, excluding amalgams
Canada, Mexico, US trade with each other and the rest of the world (2010, 2014)
Database: Comtrade (http://comtrade.un.org/data/), accessed 20 June 2016

Year	Reporter	Trade Flow	Trade Value (US$)	Net weight (kg)
2010	Canada	Import	$356,419	135,141
2010	Canada	Export	$58,912	151,675
2010	Canada	Re-Export	$11,357	3,961
2010	Mexico	Import	$433,571	14,339
2010	Mexico	Export	$2,344,531	47,229
2010	USA	Import	$783,085	243,003
2010	USA	Export	$4,265,103	331,750
2010	USA	Re-Export	$116,922	43,088
2014	Canada	Import	$42,933,333	771,507
2014	Canada	Export	$705,355	52,769
2014	Canada	Re-Import	$592,669	1,270
2014	Mexico	Import	$158,125	423
2014	Mexico	Export	$39,895	111
2014	USA	Import	$3,405,443	349,139
2014	USA	Export	$2,814,516	280,596
2014	USA	Re-Export	$1,188,039	47,265

Appendix 5: Common trade-related definitions and concepts

Table 30. Trade definitions and concepts

Canada	Mexico	United States
Sources: Canada Border Services Agency as presented in: <http://www5.statcan.gc.ca/cimt-cicm/page-page?lang=eng&mode=concepts> CIMT database guidance: <http://www5.statcan.gc.ca/cimt-cicm/page-page?lang=eng&mode=concepts>	**Sources:** Anexos 22, 23, 24, 25, 26, 27, 28 y 29 de las *Reglas de Carácter General en Materia de Comercio Exterior* (Annexes to the General Rules on Foreign Trade) para 2007, publicadas el 27 de abril de 2007. Available at: <http://www.sat.gob.mx/informacion_fiscal/normatividad/Paginas/reglas_comercioexterior_2007_2008.aspx> *Ley aduanera*, texto vigente. Última reforma publicada DOF 09-12-2013. Available at: <www.sat.gob.mx/informacion_fiscal/normatividad/Documents/LA.doc> *Glosario de Definiciones y Acrónimos* (Glossary of Definitions and Acronyms), Anexo de las Reglas Generales de Comercio Exterior para 2016. Available at: <http://www.dof.gob.mx/nota_to_doc.php?codnota=5389052> *Reglas de Carácter General en Materia de Comercio Exterior* para 2014 y sus anexos 10 y 21. Available at: <https://mx.search.yahoo.com/search?p=www.sat.gob.mx%2F...%2Freglasc_comercioexterior_2014_an10y21_29082014.+doc&fr=yfp-t-726>	**Sources:** US International Trade Commission: <https://dataweb.usitc.gov/scripts/dataweb faq.asp> <https://www.usitc.gov/publications/research/tradestatsnote.pdf> Census Bureau: <https://www.census.gov/foreign-trade/www/sec2.html> <http://www.census.gov/foreign-trade/reference/definitions/>
Country of export		
The country from which the goods were exported into Canada. For US goods, state of origin is used for statistical purposes. In most—but not		

Canada	Mexico	United States
all—cases, the country of exit is the same as the country of origin		
Country of final destination		
Export statistics are attributed to the country that is the last known destination of the goods at the time of export. Exports to the United States are attributed to the state of destination.	The country of destination is the country to which the goods are exported according to Appendix 4 of Annex 22 (*Reglas de Carácter General en Materia de Comercio Exterior*)	The country of destination for exports is the country where the goods are to be consumed, further processed, or manufactured, as known to the shipper at the time of exportation. If the shipper does not know the country of ultimate destination, the shipment is credited to the last country to which the shipper knows that the merchandise will be shipped in the same form as when exported.
State of destination		
Canadian exports to the United States are attributed to the state of destination.		
Domestic exports		
Domestic exports include goods grown, produced, extracted or manufactured in Canada, including goods of foreign origin that have been materially transformed in Canada.		Domestic exports comprise commodities that are grown, produced or manufactured in the United States, and commodities of foreign origin that have been changed in the United States, including US Foreign Trade Zones, from the form in which they were imported, or that have been enhanced in value by further processing or manufacturing in the United States.
Exports		
Exports are defined as all goods leaving the country (through customs) for a foreign destination. Total exports are the sum of domestic exports and re-exports.	Definitive exports are goods that are leaving the national territory and intended to stay in a foreign destination indefinitely. (*Ley aduanera,* Customs Law)	Total exports include the total physical movement of goods out of the United States to foreign countries, whether such goods are exported from within the US customs territory, or from a Customs and Border Protection (Customs) bonded warehouse, or from a US Foreign Trade Zone (FTZ). Total exports are the sum of domestic exports plus re-exports (also known as foreign exports).
Canadian exports to the United States and US exports to Canada		
Data on exports to the United States are recorded and compiled by the		The use of Canada's import data to generate US export data requires some adjustments to make the two comparable.

Canada	Mexico	United States
United States as import data from Canada, converted to Canadian dollars using an average monthly rate provided by the Bank of Canada, and sent to Canada for dissemination as Canadian exports.		US exports are valued at the US seaport, airport or border port of export in the United States and include inland freight charges. Canadian imports are valued at the point of origin in the United States and do not include inland freight to the US port of exit. To compensate, Canada adds an estimated 4.5 percent of the value to each transaction to cover inland freight (except for shipments where freight is not a consideration, e.g., large aircraft, vessels and drilling platforms.)
Exports to countries other than the United States		
Exports to countries other than the United States are recorded in Canadian dollars at the values declared on export documents. These values usually reflect an item's transaction value, i.e., the actual selling price used for company accounting purposes. Canadian exports to overseas countries are valued at Free on board (FOB), port of exit, including domestic freight charges to that point but excluding discounts and allowances.		
Re-exports		
Re-exports are goods, materials or articles originally imported into Canada that are exported, either in the same condition in which they were imported or after some minor operations (e.g., blending, packaging, bottling, cleaning or sorting) that leave them essentially unchanged.	Re-exports are the return abroad of goods that are temporarily imported under cover of an ATA ("temporary admission") carnet. This universally accepted carnet identifies the goods and provides an international warranty to cover any duties and taxes in case the goods are not re-exported. (Annex to the General Rules of foreign trade for 2016, Glossary of terms in customs matters, *Glosario de Definiciones y Acrónimos*)	Re-exports are foreign-origin goods that have previously entered the US customs territory, a customs bonded warehouse, or a US FTZ, and, at the time of export have undergone no change in form or condition or enhancement in value by further manufacturing in the US customs territory, customs bonded warehouse or US FTZ.
Free on board (FOB)		
The value of goods		

Canada	Mexico	United States
measured on a free on board (FOB) basis includes all production and other costs incurred up until the moment that goods are placed on board an international carrier for export. FOB values exclude international insurance and transport costs.		
FAS Export Value (excluding exports to Canada)		
		The F.A.S. (free alongside ship) export value is the value of exports at the US seaport, airport, or border port of export, based on the transaction price, including inland freight, insurance, and other charges incurred in placing the merchandise alongside the carrier at the US port of export. The value excludes the cost of loading the merchandise aboard the exporting carrier and also excludes freight, insurance and any charges or transportation costs beyond the port of export.
Imports		
Imports are goods that have entered the country by crossing the territorial (customs) boundary, whether for immediate domestic consumption (following the payment of any duty) or for storage in customs (bonded) warehouses. Duty is not paid at that time.	Definitive import is the formal entrance of goods of foreign origin to stay in the national territory for an indefinite period. (*Ley aduanera*, Customs Law) Temporary import is the entrance of goods to remain in the country for a limited time and for a particular purpose, provided that they return abroad in the same state, by specific deadlines (*Ley aduanera*, Customs Law)	General imports measure the total physical arrivals of merchandise from foreign countries, whether such merchandise enters the US customs territory immediately, or is entered into bonded warehouses or FTZs under customs custody. Imports of merchandise include commodities of foreign origin as well as goods of domestic origin returned to the United States with no change in condition, or after having been processed and/or assembled in other countries. For statistical purposes, imports are classified by the type of transaction. Merchandise entered for immediate consumption. (“duty free” merchandise and merchandise on which duty is paid on arrival). Merchandise withdrawn for consumption from customs bonded warehouses, and

Canada	Mexico	United States
		US Foreign Trade Zones. Merchandise entered into customs bonded warehouses and US Foreign Trade Zones from foreign countries.
Re-imports		
Re-imports are included in Canadian trade data. These are goods, materials or articles that are imported in either the same condition in which they were exported or after undergoing repair or minor alterations (e.g., blending, packaging, bottling, cleaning or sorting) that leave them essentially unchanged.	Re-import is the return to the national territory of goods temporarily exported under cover of an ATA ("temporary admission") carnet. This carnet identifies the goods and provides an international warranty to cover any duties and taxes in case the goods are not re-imported. (Glossary of terms in customs matters, *Glosario de Definiciones y Acrónimos*)	
Domestic re-imports		
Domestic re-imports are goods of Canadian origin, whether grown, extracted, or manufactured in Canada, that are exported to another country and then returned to Canada in 'the same state' as they were sent out. They are classified under HS 98.13 showing the country of origin as Canada.		
Imports for consumption		
		Imports for consumption measure the total merchandise that has physically cleared through customs immediately or after withdrawal for consumption from bonded warehouses or FTZs under customs custody. Many countries use the term "special imports" to designate statistics compiled on this basis. US imports for consumption include only goods that have been cleared through customs. General imports (see above), on the other hand, include all goods that physically arrive into a US port or customs district for processing.
Import valuation		
Import data to all countries	The Customs Value of Goods is	The General CIF (cost, insurance and

Canada	Mexico	United States
are recorded in Canadian dollars. Canadian imports are valued FOB at the place of direct shipment to Canada. The import valuation therefore excludes costs of freight and insurance in bringing the goods to Canada from the point of direct shipment.	the declaration of value that the importer provides to the customs agent, or that is determined by a customs agent at the time of clearance of the goods. (Rules of general nature in the field of foreign trade for 2014, *Reglas de Carácter General en Materia de Comercio Exterior* para 2014)	freight) value represents the landed value of the merchandise at the first port of arrival in the United States. It is computed by adding "Import Charges" to the "Customs Value" and therefore excludes US import duties. The Import Charges represent the aggregate cost of all freight, insurance, and other charges (excluding US import duties) incurred in bringing the merchandise from alongside the carrier at the port of export in the country of export and placing it alongside the carrier at the first port of entry in the United States. In the case of overland shipments originating in Canada or Mexico, such costs include freight, insurance, and all other charges, costs and expenses incurred in bringing the merchandise from the point of origin (where the merchandise begins its journey to the United States) in Canada or Mexico to the first port of entry The General Customs (import) Value is the general value of imports as appraised by the US Customs Service. This value is defined as the price actually paid or payable for merchandise when sold for export to the United States, excluding US import duties, freight, insurance, and other charges incurred in bringing the merchandise to the United States. The Dutiable Customs Value represents, in general, the customs value of foreign merchandise imported into the United States which is subject to duty. Landed Duty-Paid Value is the sum of the CIF value plus calculated duties.
Calculated Duty		
		The calculated duty represents the estimated import duties collected. Estimated duties are calculated based on the applicable rate(s) of duty as shown in the Harmonized Tariff Schedule.
Province of clearance		
The Province of clearance is the Canadian province through which the goods arrived in Canada and		

Canada	Mexico	United States
where the goods were cleared at customs, either for immediate consumption or for entry into a bonded customs warehouse. This may not necessarily be the province in which the goods are consumed.		
Province of origin		
The Province of origin is the Province (or territory) where the goods are grown, extracted or manufactured. This may not always be the province where the goods were cleared at customs. In the case of re-exports, province of origin is the one from which the goods were shipped.		
Quantity and units of quantity		
The quantity associated with a commodity is determined based on the unit of measure used to declare the goods. The number of units refers to complete (or substantially complete) units exported or imported, excluding parts. Weight and volume measures generally exclude packaging used for shipment.	The amount or quantity is the number of goods in commercial units, consistent with the invoice (rules of a general nature in the field of foreign trade for 2014, *Reglas de Carácter General en Materia de Comercio Exterior* para 2014). The units of quantity should be in agreement with the Tariff of the General Import and Export Taxation Law (TIGIE) or with the commercial section of customs. Once an option is selected, it should be used during the entire period of temporary importation. (Rules of a general nature in the field of foreign trade for 2014, *Reglas de Carácter General en Materia de Comercio Exterior* para 2014)	Units of quantity shown are published in terms of the units specified in the HTSUSA for each HS classification.
Rules of origin		
For imports and import clearances, the country of	See Appendix 4 of Annex 22 (Reglas de Carácter General en	The country of origin for imports is the country where the merchandise was

Canada	Mexico	United States
origin is the country of production or the country in which the final stage of production or manufacture occurs. For US goods, the state of origin is used for statistical purposes.	Materia de Comercio Exterior) The specific rules of origin (NAFTA) are applied to determine where goods originated, under the terms of the NAFTA agreement, and if a preferential tariff is adequate. Article 401 (NAFTA)	grown, mined, or manufactured, in accordance with US Customs Regulations. In instances where the country of origin cannot be determined, transactions are credited to the country of shipment.
Foreign Trade Zone; Designated customs area		
		Foreign Trade Zones are enclosed areas, operated as public utilities, under control of US Customs with facilities for handling, storing, manipulating, manufacturing, and exhibiting goods. The merchandise may be exported, destroyed, or sent into customs territory from the zone, in the original package or otherwise. It is subject to customs duties if sent into customs territory, but not if reshipped to foreign points.
Transshipment		
	Internal transit of goods is when the transit takes place under one of the following conditions: I. The office of entry sends the goods of foreign origin to the customs office responsible for the import. II. The customs office releases the domestic or nationalized goods to the customs office of exit, for export. III. The customs office sends the goods temporarily imported into *maquila* programs or to the customs office for export abroad. (*Ley aduanera*, Customs Law)	
Bonded and customs warehousing		
		A bonded warehouse is authorized by US Customs for storage or manufacturing of goods on which payment of duties is deferred until the goods are removed into Customs Territory. These goods are not subject to duties if reshipped to foreign points.

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