Phasing Out/Phasing Down mercury-added products

What to Know about Consumer and Commercial Products Outlined in the Minamata Convention

November 2018

bri

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GLOBAL MERCURY PARTNERSHIP

This publication is a contribution to the UN Environment Global Mercury Partnership's Mercury Reduction in Products Area.

About Biodiversity Research Institute

Biodiversity Research Institute (BRI), headquartered in Portland, Maine, USA, is a nonprofit ecological research group whose mission is to assess emerging threats to wildlife and ecosystems through collaborative research, and to use scientific findings to advance environmental awareness and inform decision makers.

About BRI's Center for Mercury Studies

BRI staff have worked on the topic of mercury in the environment for the past 28 years and endeavor to collect original field data, interpret their results in scientific outlets, and relay information to decision makers in an understandable format. For more information visit: www.briloon.org/hgcenter.

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What are Mercury-added Products?

The **Minamata Convention on Mercury** defines a mercury-added product as a "product or product component that contains mercury or a mercury compound that was intentionally added."

What Do You Need to Know about Mercury-added Products?

Article 4 of the Convention prohibits the manufacture, import, or export of specific mercury-added products after 2020. The Convention also requires a phase down of the use of mercury in dental amalgam. This booklet features some of those products, and offers insights and references for further discussion. In addition, we relate the importance of **Article 11**, which addresses mercury wastes.

For each product category represented in this publication, we note: Minamata Convention requirements; examples of countries that may have significant concern regarding such products or are finding innovative ways to address mercury issues; and mercury-free options where applicable. We also mention ongoing projects that help reduce the risk of mercury from these products, including potential options for "end-of-life" management for some of these products.

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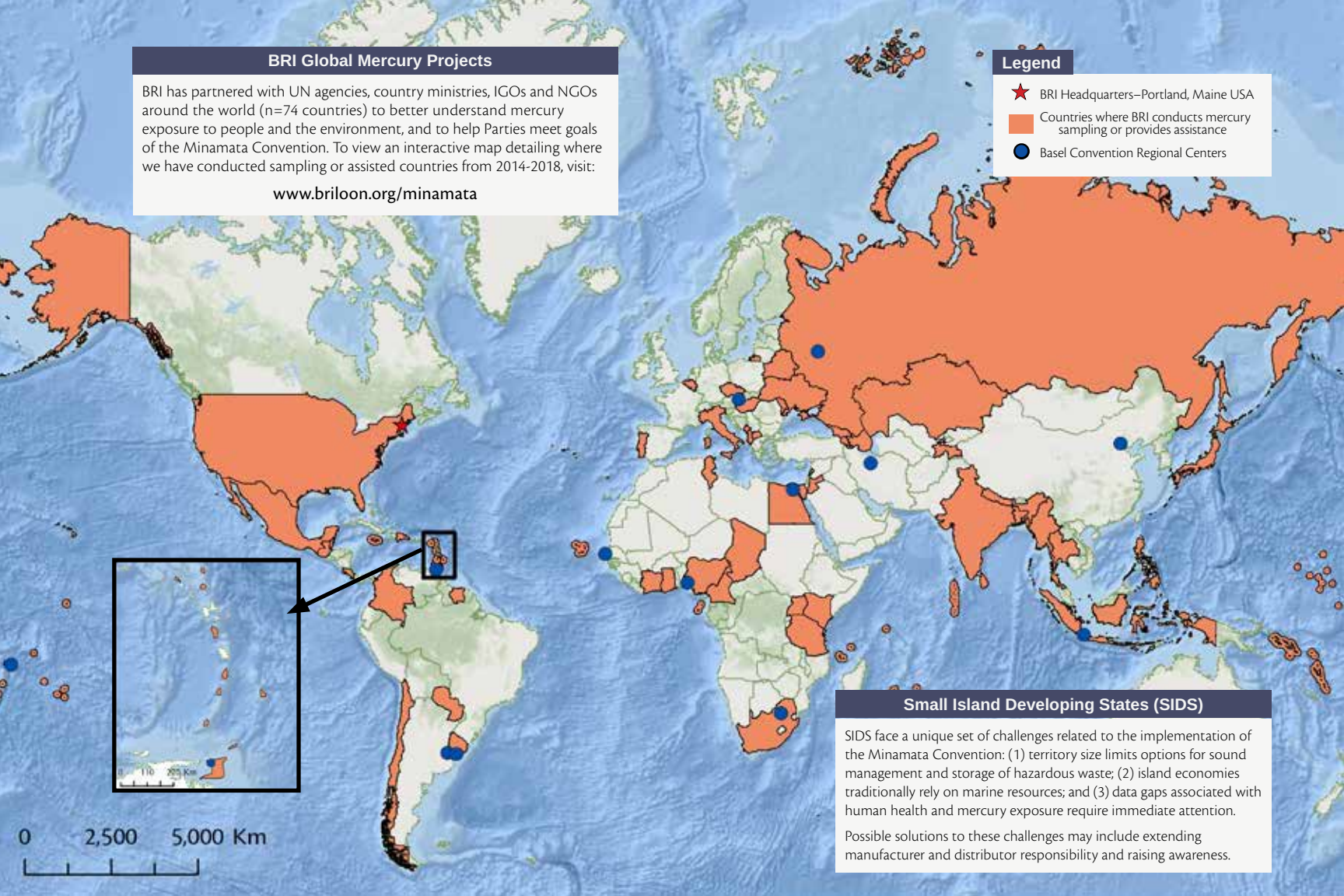
BRI Global Mercury Projects
BRI has partnered with UN agencies, country ministries, IGOs and NGOs around the world (n=74 countries) to better understand mercury exposure to people and the environment, and to help Parties meet goals of the Minamata Convention. To view an interactive map detailing where we have conducted sampling or assisted countries from 2014-2018, visit:
www.briloon.org/minamata
Legend
BRI Headquarters–Portland, Maine USA
Countries where BRI conducts mercury sampling or provides assistance
Basel Convention Regional Centers
Small Island Developing States (SIDS)
SIDS face a unique set of challenges related to the implementation of the Minamata Convention: (1) territory size limits options for sound management and storage of hazardous waste; (2) island economies traditionally rely on marine resources; and (3) data gaps associated with human health and mercury exposure require immediate attention.
Possible solutions to these challenges may include extending manufacturer and distributor responsibility and raising awareness.
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Mercury: A Metal of Antiquity and a Pollutant of Global Importance

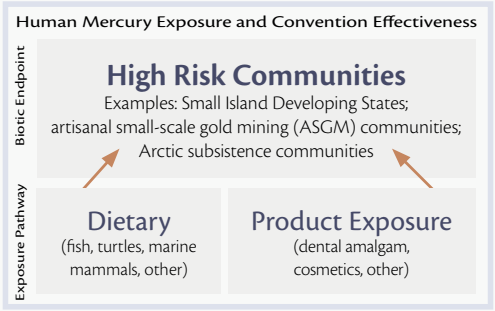
In his seminal work *Meteorology*, Aristotle coined the term "quicksilver" to describe mercury. Since antiquity, humans have exploited this liquid metal for its unique characteristics—it is a good conductor of electricity, forms alloys with other metals, is sensitive to heat and pressure, and acts as a preservative. One of the seven metals of antiquity,* mercury has historically been used in many consumer and industrial products, some of which are highlighted in this publication.

A Global Issue

Mercury's use in consumer products (and in many industrial processes) has amplified its recognition as a pollutant of global importance, affecting the environment and human health through both dietary and occupational routes of exposure (depicted in graphic).

The **Minamata Convention on Mercury** draws worldwide attention to the effects of exposure and widespread use of mercury in consumer products and commercial applications and seeks to address "the harmful effects of mercury pollution." Under the Minamata Convention,

**The seven metals of antiquity, which helped forge civilizations, include gold, silver, copper, tin, lead, iron, and mercury.*



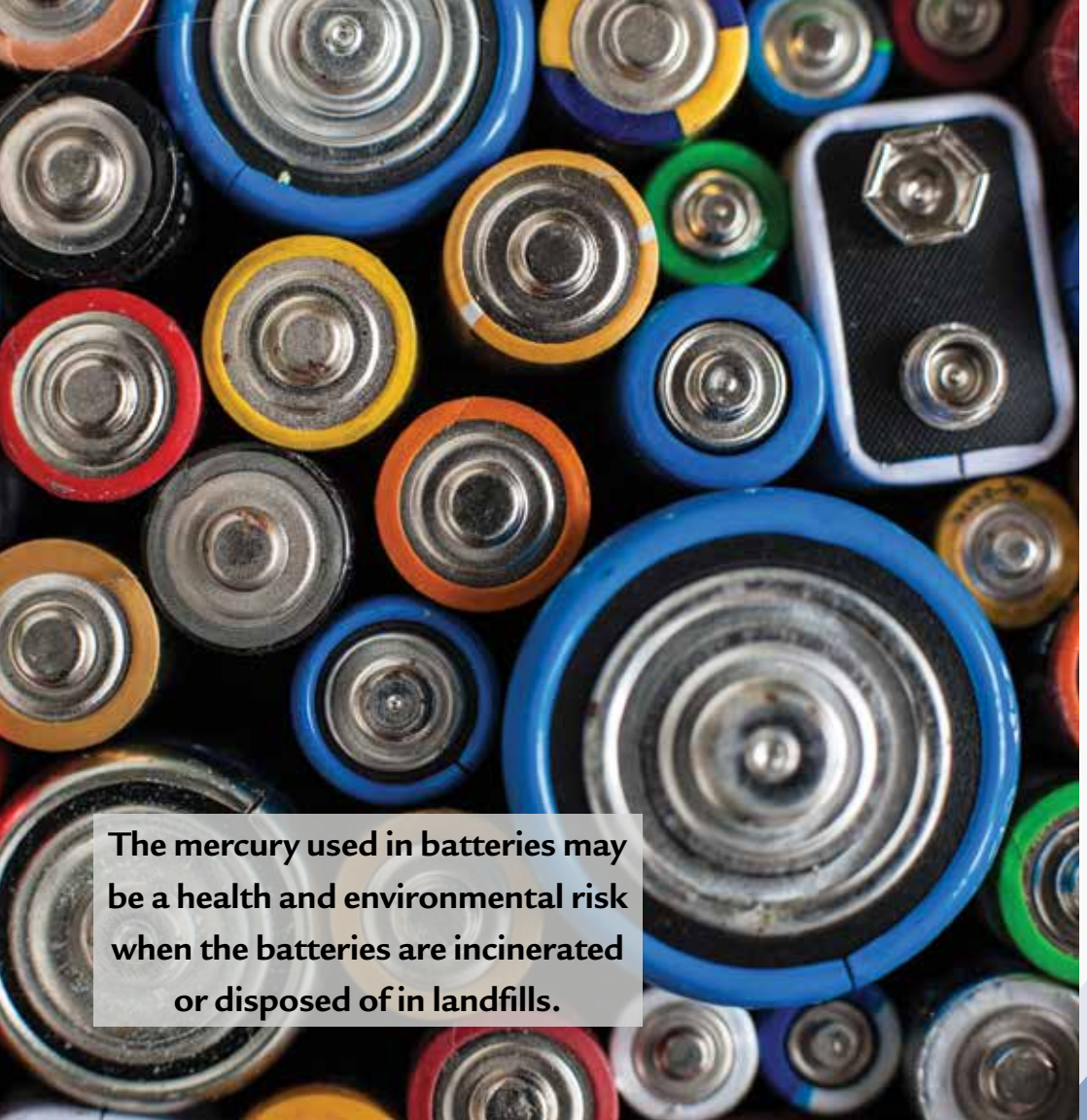
which entered into force on August 16, 2017, individual countries that become Parties are charged with protecting human health and the environment from the risks of mercury exposure. Article 4: *Mercury-added products* requires that certain products may not be manufactured, imported, or exported after 2020 (see Annex A, Part 1; exemptions are listed in Article 6).

Storage and Disposal of Mercury

In general, the use of intact mercury-added products, such as light bulbs, may not in itself pose a risk—except during breakage or puncture. However, disposal of these products may pose risks. Once in a landfill, mercury can leach or vaporize into the environment, where it may eventually enter the food web. Mercury vapor released through incineration can travel long distances. Storage and disposal of mercury-added products (end-of-life management) is a complex issue and represents a significant challenge for many countries, particularly SIDS and economies in transition (see sidebar opposite).

From Basel to Minamata

Article 11: *Mercury wastes* of the Minamata Convention is linked with the Basel Convention, an international treaty in force since May 1992 that focuses on preventing the movement of hazardous wastes between countries. The Basel Convention can provide guidance on environmentally sound management, interim storage, and transboundary movement of mercury and mercury-containing compounds. These two conventions together can help Parties develop and maintain the capacity needed to manage mercury-containing waste.



The mercury used in batteries may be a health and environmental risk when the batteries are incinerated or disposed of in landfills.

Quick Notes

- **Minamata Convention requirements:** Phase out by 2020 (with exceptions)
- **Countries with significant concern:** Those with major battery manufacturing operations; those that import batteries
- **Countries leading in mercury-free solutions:** China, European Union (EU) countries, Japan, and USA
- **Mercury-free alternatives:** Listed in UN publication (see sidebar)
-  **Policy in action:** In anticipation of the signing of the Minamata Convention, the battery manufacturer Rayovac initiated a mercury-free policy in September 2013 for all cylindrical cell batteries produced in its primary Central American factory, which is located in **Guatemala**. This example of corporate responsibility has immediate impacts on potential mercury releases in Guatemala and across the region where these batteries are distributed.

Batteries, Electrical Switches, and Relays

Why is Mercury Used in Batteries?

Since the mercury dry-cell battery was invented for use during World War II, mercury has been widely used in many types of batteries.

Mercury inhibits corrosion, thereby increasing the shelf life of the battery. Mercury-added batteries also provide a steady voltage output. These properties are especially important in applications where portable electronic devices are critical such as in emergency medical situations or for military applications.

Phasing Out Mercury in Batteries

The global manufacture of mercury batteries has declined substantially over the past three decades. In 1996, the US enacted the Mercury-containing and Rechargeable Battery Management Act, which phased out the use of mercury in certain batteries.

Other countries have been phasing out the use of mercury in batteries since the 1990s. Japan, for instance, stopped mercury-added battery production in 1995 and began a robust recycling campaign that continues today. The EU Battery Directive is another example of a mercury-reduction policy.

The majority of the mercury used in this sector is for button-cell batteries, the small, thin, nonrechargeable cells used in watches, hearing aids, and small, portable electronic devices. Button cells containing mercury that are still manufactured in large quantities include zinc air, silver oxide, and alkaline manganese oxide batteries. Use is declining, however, as countries impose restrictions and manufacturers develop mercury-free options.

Phasing Out Mercury-added Switches and Relays

Due to its density and sensitivity to pressure, mercury is used in switches and relays for a variety of consumer, commercial, and industrial products, including auto control systems, appliances, security systems, leveling devices, and pumps. However, there are now numerous effective alternatives on the market and the use of mercury-added switches and relays is declining.

Minamata Convention Requirements

Under Article 4, countries are required to phase out the production, import, and export of mercury in all types of batteries by 2020, with the exception of zinc air cells (used for hearing devices) and silver oxide cells (used for cameras or watches) that contain less than two percent mercury. The production of most switches and relays is to be phased out by 2020 (exceptions apply).

Alternatives to Mercury-added Products

UN Environment developed a publication* that lists manufacturers and their mercury-free products. For example:

Mercury-free Batteries:

1. **button cells:** silver oxide; zinc air; alkaline manganese
2. **cylindrical cells:** primary carbon zinc-silver; primary lithium

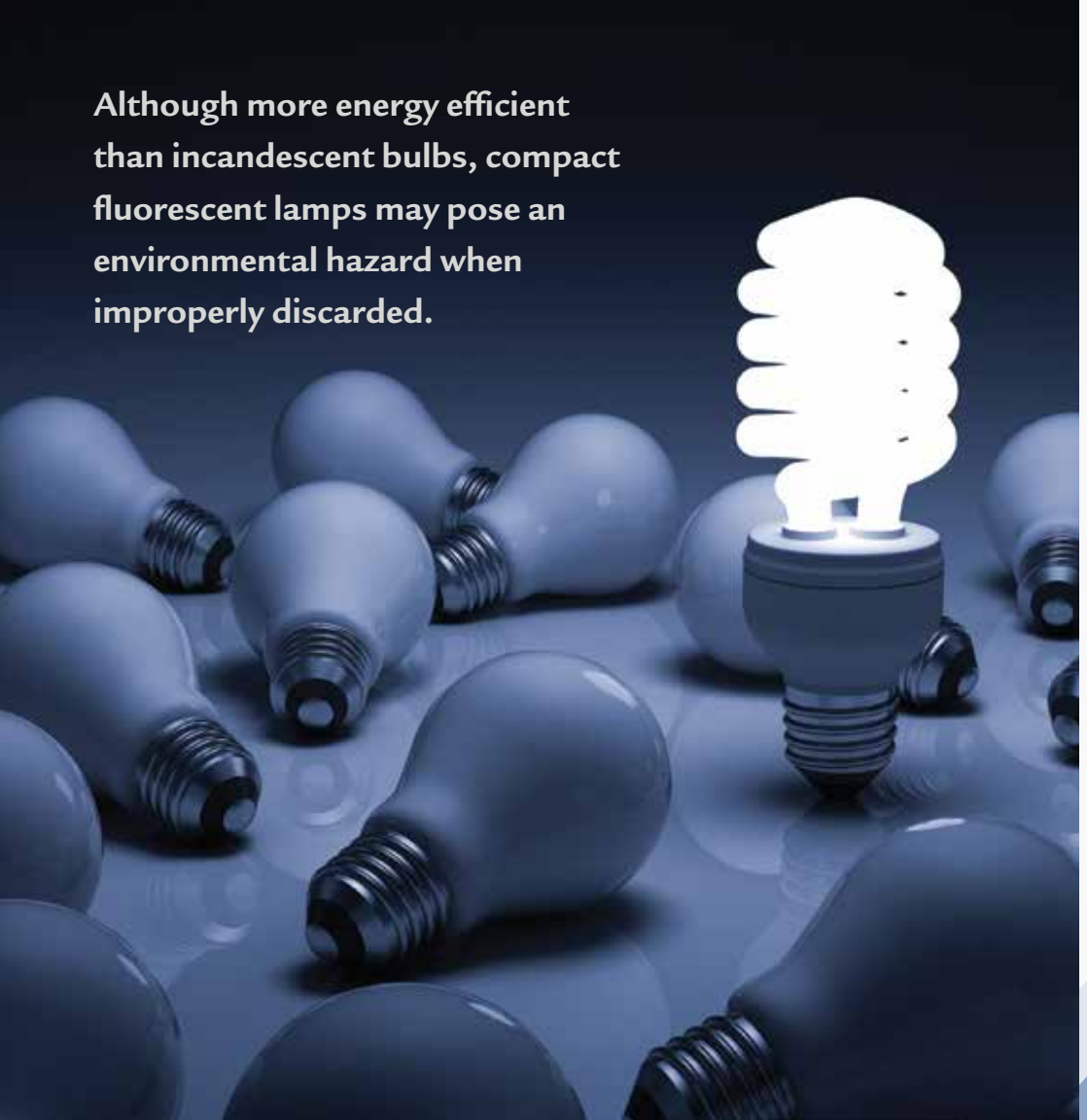
Mercury-free Switches:

1. **float:** mechanical; magnetic dry reed; optical; conductivity; sonic/ultrasonic; capacitance
2. **tilt:** metallic ball; electrolytic; potentiometer; mechanical; solid-state; capacitive
3. **pressure:** mechanical; solid-state
4. **temperature sensitive:** mechanical; solid-state

Mercury-free Relays:

1. dry magnetic reed; electro-mechanical; hybrids

*See References, page 15



Although more energy efficient than incandescent bulbs, compact fluorescent lamps may pose an environmental hazard when improperly discarded.

Quick Notes

- **Minamata Convention requirements:** CFLs ≤ 30 watts not to exceed 5 mg of mercury. LFLs: triband ≤ 60 watts not to exceed 5 mg; halophosphate ≤ 40 watts not to exceed 10 mg of mercury
- **Some countries with significant concern:** Least Developed Countries; Small Island Developing States
- **Some countries leading in mercury-free solutions:** EU countries, India, Japan, Mauritius, Sri Lanka, and USA
- **Mercury-free alternatives:** LED lights
- **Policy in action:**

The **Caribbean Community**, a group of 20 countries, stretching from The Bahamas to Suriname and Guyana in South America, works toward economic integration; foreign policy coordination; human and social development; and security for these countries, most of which are island states. The *Caribbean Energy Efficiency Lighting Project*, is one initiative that assists member countries to improve energy efficiency.

Fluorescent Lamps

Why is Mercury Used in these Lamps?

Thomas Edison's first incandescent lamp (circa 1891) contained mercury; since that historic invention, mercury has been used in light bulbs. Today, mercury is used in fluorescent lamps, which consist of a sealed glass tube coated with phosphor powder.

The lamp works by ionizing mercury vapor inside the tube; this causes electrons in the gas to emit photons at ultraviolet (UV) frequencies. The UV light is absorbed by the phosphor coating causing it to glow, or "fluoresce," and produce visible light.

How Much Mercury is in Each Lamp?

Compact fluorescent lamps (CFLs) are small bulbs often used in residential settings; linear fluorescent lamps (LFLs) are frequently found in commercial and industrial buildings. CFLs use an average of <5 mg of mercury per bulb.

Commercial fluorescent lamps use up to 100 mg of mercury, depending on the size of the bulb and the type of phosphor inside the tubes. The Minamata Convention requires a phase out of the manufacture, import, or export of bulbs that exceed specified limits for each type of lamp.

CFLs Result in Less Mercury Use

The use of CFLs reduces the demand for electricity, which in turn reduces the amount of mercury emitted into the environment from energy sources such as coal-fired power plants.

What are the Risks of Exposure?

However, the risk of mercury exposure in a CFL bulb becomes an issue if the bulb breaks, or ends up incinerated or in a landfill. Recycling is encouraged as part of a comprehensive program for life cycle management of mercury, which also includes sorting at the source, waste management, and disposal.

Outreach programs to raise consumer awareness are also important. In the US, EU, and some Asian countries, retailers place recycling centers in their stores for safe, convenient disposal of fluorescent bulbs. It is impossible to produce mercury-free CFLs. However, energy efficiency of the lamps combined with increased recycling may provide benefits that could outweigh the risk.

Alternatives to Mercury-added Products

UN Environment developed a publication* that lists manufacturers and their mercury-free products. For example:

Alternatives to compact fluorescent lamps

1. Light Emitting Diodes (LED) lamps
2. LED downlight lamps

Alternatives to linear fluorescent lamps

1. Linear LED lamps

Alternatives to high pressure mercury vapour lamps

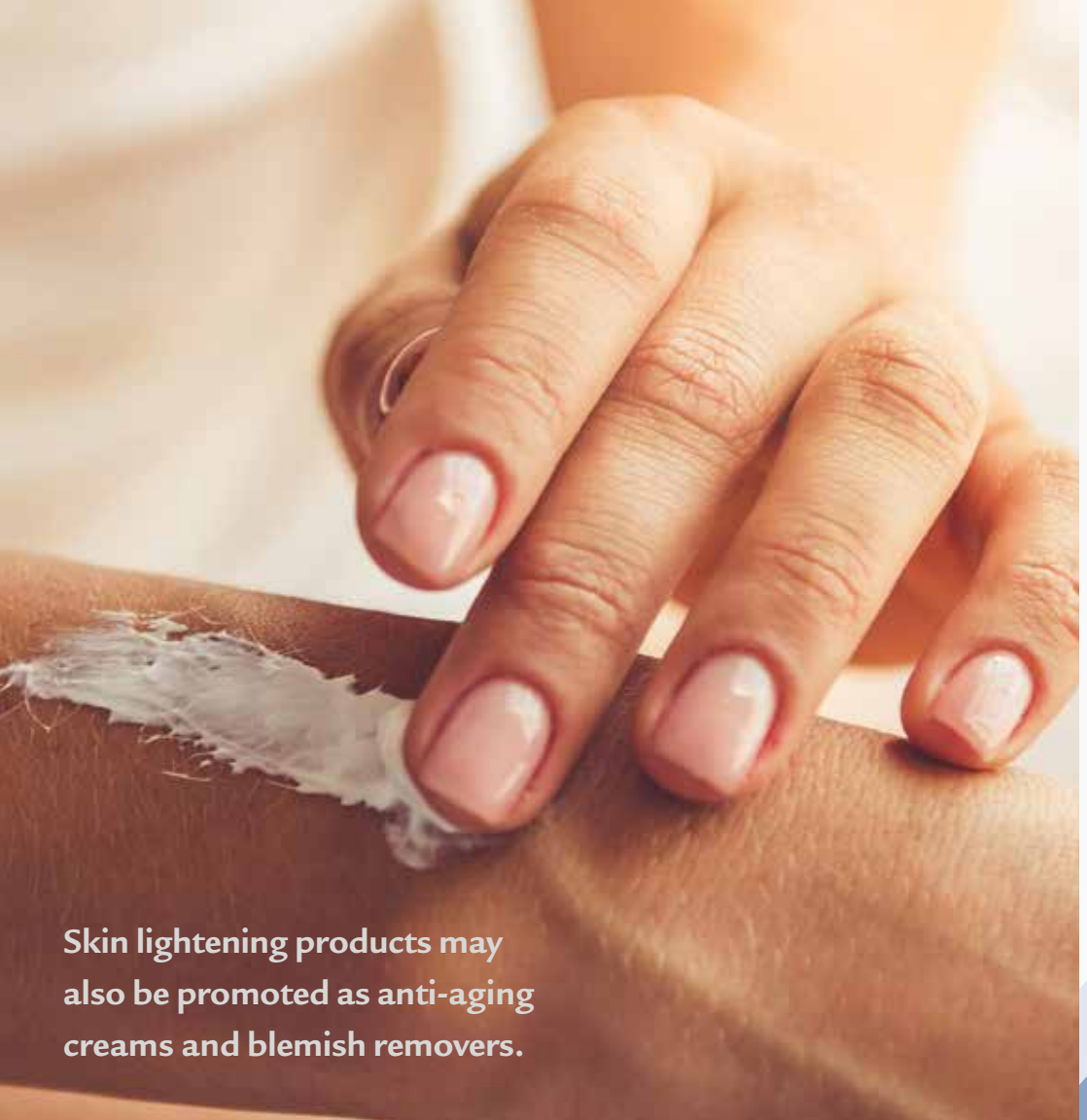
1. LED industrial lighting
2. LED outdoor lighting

Alternatives to cold-cathode fluorescent lamps—used to illuminate most liquid crystal displays (LCDs) used in televisions and computer monitors

1. LCD displays with LED backlight units
2. LED backlight units

*See References, page 15

Bulb crushers are installed at recycling centers in some countries. Next steps include waste management and disposal.



Skin lightening products may also be promoted as anti-aging creams and blemish removers.

Quick Notes

- **Minamata Convention requirements:** Items over 1 ppm banned
- **Some countries with significant concern:** Mostly developing countries in the tropics
- **Some countries leading in mercury-free solutions:** EU countries and USA
- **Mercury-free alternatives:** Listed in UN publication (see sidebar)
- **Research collabortions:** In partnership with Zero Mercury Working Group and BCRC-Caribbean, BRI has analyzed 300+ skin lightening creams from 21 countries; some products do contain >1 ppm
- **Policy in action:**

The Pharmacy Division of the Ministry of Health and Quality of Life in **Mauritius** is responding to results from its country's National Mercury Inventory regarding mercury concentrations in cosmetics, particularly skin lightening creams, and is updating the country's Pharmacy Act to include new regulatory requirements on mercury concentrations in these products.

Skin Lightening Products and Cosmetics

Why is Mercury Added to Cosmetics?

Mercury is a common ingredient used in skin lightening or anti-aging soaps and creams because mercury salts inhibit the formation of melanin, the pigment that gives human skin, hair, and eyes their color. Skin lightening products are used throughout the world among dark-skinned populations, but they are also promoted as treatments to remove age spots, freckles, and blemishes.

Because of its properties as a preservative, trace amounts of mercury are also legally added to some cosmetics, such as mascara, to prevent the growth of bacteria and fungi.

Regulations on Mercury in Cosmetics

The US Food and Drug Administration (FDA) banned mercury in most cosmetics in 1974. The FDA has set a maximum allowable limit for mercury in cosmetic products in trace amounts only (generally no more than 1 ppm). The distribution of mercury-added creams and soaps is bannned in the EU and in some African countries. However, many other countries are not bound by these standards and may still use mercury as an ingredient in these skin care products, which can be easily obtained online.

Check the Ingredients

Although some countries require clear and accurate ingredient labeling for skincare products and cosmetics, products that are manufactured in other countries may omit the list of ingredients or, if a list is included, the list may be misleading. If the ingredient list includes any of the following, the product most likely contains mercury:

- Mercurous chloride
- Calomel
- Mercuric
- Mercurio

Any cosmetics that do not list ingredients should be regarded with suspicion. In the US and in the EU, laws require such labeling. In 2017-18, BRI researchers tested more than 300 products and 15 contained mercury levels above 4 ppm*; of these, only one product listed mercury as an ingredient.

**some were as high as 19000 ppm*

Risks to Human Health and the Environment

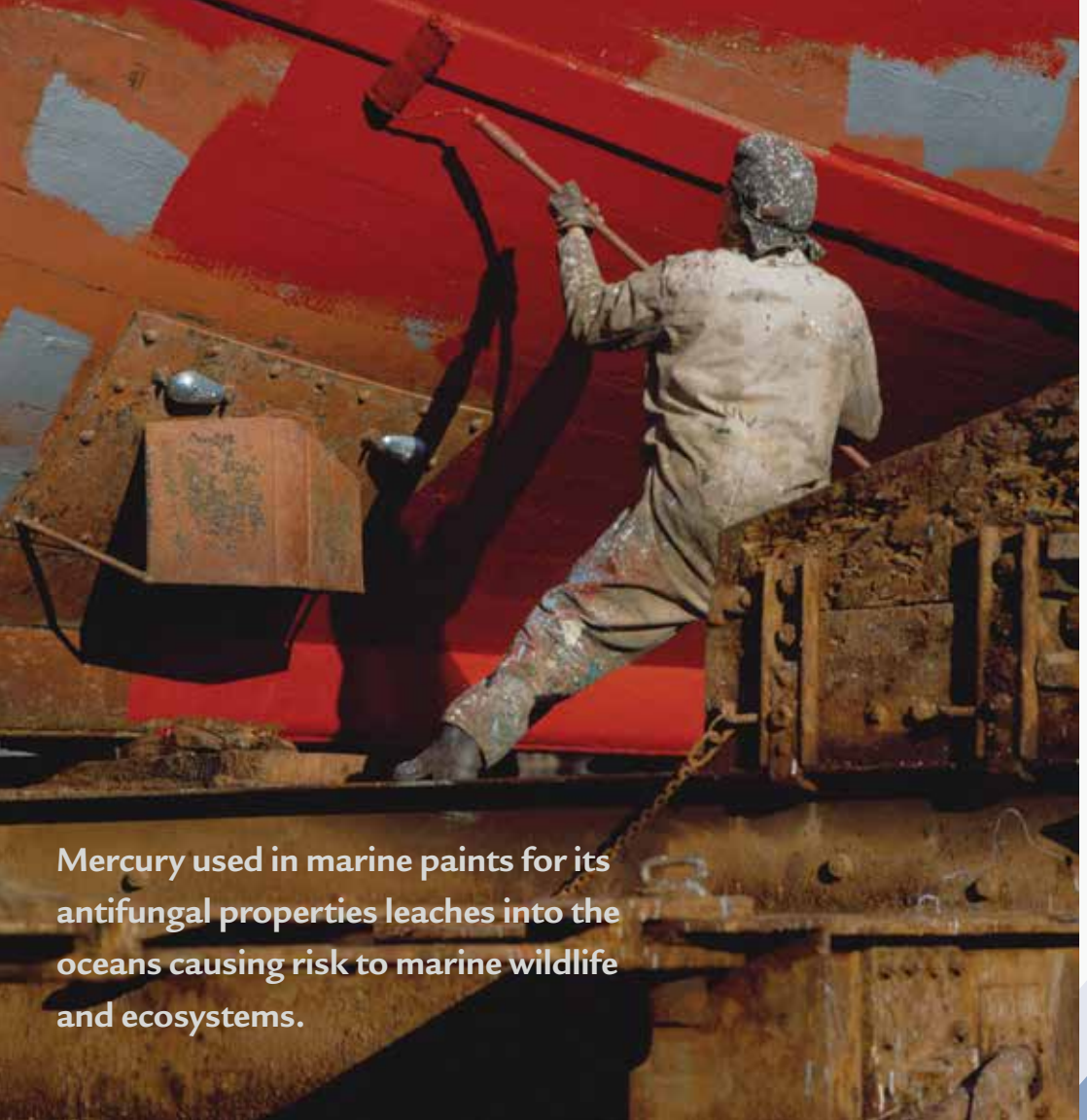
According to the World Health Organization (WHO), the main health risk to those who use skin lightening products that contain mercury is kidney damage, but the use of these products can also result in allergic reactions, skin irritation, or neurotoxicity.

In addition to human health, the environment is also at risk. Mercury in these products is eventually released into wastewater where it enters the environment and, under certain conditions, can be converted to methylmercury and be absorbed into the food web contaminating our food.

Alternatives to Mercury-added Products

UN Environment has developed a list of manufacturers of mercury-free cosmetics on a worldwide basis. This publication highlights manufacturers of mercury-free skin lightening products (soaps and creams).

**See References, page 15*



Mercury used in marine paints for its antifungal properties leaches into the oceans causing risk to marine wildlife and ecosystems.

Quick Notes

- **Minamata Convention requirements:** Phase out by 2020
- **Some countries with significant concern:** Small Island Developing States and other countries with marine-based economies
- **Some countries leading in mercury-free solutions:** EU countries and USA
- **Policy in action:**

In **Sri Lanka**, there is concern that ocean-going ships painted with mercury-based biocides are leaving mercury-laden paint chips in the harbors and potentially creating contaminated waters. There is now a wide range of biocides on the market that do not contain mercury. Sri Lanka hopes that such alternatives can be used to replace mercury-based biocides in paints.

Biocides and Pesticides

Why is Mercury Added to Paints?

Ancient Romans mined cinnabar, a naturally occurring mercury-sulfide ore, for its deep red pigment (called vermilion), which they used to decorate pottery and other items. During the time of wooden sailing ships, barnacles and fungal growth on the hull would impede the ship's performance (known as "fouling"). Mercury's properties as a fungicide make it useful as an antifouling additive in marine paints.

In more recent history, paint manufacturers added inorganic mercury compounds to water-based paint products to control bacterial fermentation in the can (acting as a biocide), which extends shelf life.

Regulations for Mercury in Paint

In 1991, the US began phasing out the use of mercury in paint. When it was discovered that these products posed a human health threat, many other countries followed suit, including the EU with its Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) Regulation that went into force in 2007. These initiatives substantially reduced the use of paints containing mercury, especially in ocean ports near fishing areas that supply seafood to local communities.

Why is Mercury Added to Pesticides?

Historically, mercury compounds were commonly used as agricultural biocides (killing or controlling the growth of living organisms) to protect the seeds of grain crops from disease. This practice has been widely banned or discontinued around the world.

Other mercury compounds are still used in crop pesticides in Eastern European nations and Australia; although production has ceased, stockpiles may still be in use. Many countries do have restrictions in place regarding the production of mercury-added pesticides,

Mercury use in pesticides is waning around the world.

Alternatives to Mercury-added Products

UN Environment has developed a publication* that lists manufacturers of mercury-free pesticides and biocides.

*See References, page 15

however, the restrictions may not include import/export of these products. Parties should ensure that mercury-added paints and pesticides manufactured elsewhere are not imported or exported.

Hazards of Biocides and Pesticides to Human Health and the Environment

Mercury in marine paint can leach into the oceans causing risk to sea life. Mercury from pesticides can leach into wetlands where it can be converted to its more toxic organic form, methylmercury, and enter the food web.

Minamata Convention Requirements

The Minamata Convention requires a phase out by 2020 of the manufacture, import, or export of biocides and pesticides containing mercury. The Convention addresses large stocks of mercury and mercury compounds (>50 metric tonnes) in Article 3: *Mercury supply sources and trade*.

Waste from broken equipment often ends up in landfills or in trash incinerators, causing risk to human health and the environment.

Quick Notes

- **Minamata Convention requirements:** Phase out by 2020
- **Some countries with significant concern:** Least Developed Countries and economies in transition
- **Some countries leading in mercury-free solutions:** EU countries, Japan, and Norway
- **Realistic mercury-free alternatives:** Listed in UN publication (see sidebar)
- **Policy in action:**

In response to the recently completed Minamata Initial Assessment Report,* **Montenegro** has identified medical measuring devices with mercury, such as thermometers and various manometers, as priority mercury-added products to be phased out. While such devices remain as a useful and cost-effective approach for Montenegro, dedicated efforts will now be made to switch to digital and mercury-free alternatives.

*see page 14

Measuring Devices

Why is Mercury Used in Measuring Devices?

Mercury's low vapor pressure makes it highly sensitive to changes in atmospheric pressure, a fact Italian physicist Evangelista Torricelli discovered in 1643 when he invented the barometer, the first known use of mercury in scientific equipment.

Thirteen times denser than water, elemental mercury is highly sensitive to slight changes in pressure. In 1714, Daniel Fahrenheit found this unique property to be invaluable in his new invention—the mercury thermometer.

While the use of mercury in thermometers has declined over the last few decades, mercury continues to be used in barometers as well as in many other common measuring devices including: sphygmomanometers (blood pressure cuffs); hygrometers (humidity gauges); and manometers (gas pressure gauges). Reliable and cost effective alternatives are becoming more available.

An Occupational Hazard

If scientific and medical equipment and other measuring devices should break during use or disposal, the mercury contained in them poses a hazard to technicians who use these instruments in their daily work.

An Environmental Hazard

Medical waste often ends up in landfills or in trash incinerators, which puts the environment and human health at risk.

Phasing Out Mercury in Measuring Devices

Consumer awareness has affected the use of these instruments in the health care industry. The Minamata Convention requires a phase out of the manufacture, import, and export of mercury in scientific measuring devices by 2020. Mercury-free options are available (see sidebar).

Mercury-added Products Exempted in Minamata Convention: Vaccines

Thimerosal is used as a preservative in some vaccines. The Global Advisory Committee on Vaccine Safety and the WHO immunization policy do not recommend changing this status.

Alternatives to Mercury-added Products

UN Environment has developed a publication* that lists manufacturers and their mercury-free products. For example:

Mercury-free barometers
1. aneroid barometers
2. digital barometers

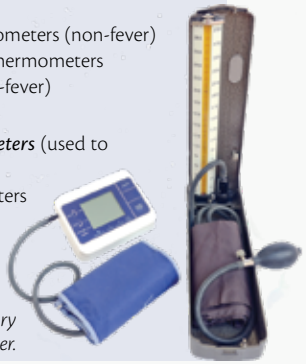
Mercury-free hygrometers/psychrometers (used to measure moisture content of air or any gas)
1. spirit-filled hygrometers/psychrometers
2. digital hygrometers/psychrometers

Mercury-free manometers (used to measure air, gas, and water pressure)
1. needle/bourdon gauge
2. aneroid manometers
3. digital manometers

Mercury-free thermometers
1. mercury-free liquid thermometers (non-fever)
2. mercury-free liquid fever thermometers
3. digital thermometers (non-fever)
4. digital fever thermometers

Mercury-free sphygmomanometers (used to measure blood pressure)
1. aneroid sphygmomanometers
2. electronic sphygmomanometers

*See References, page 15



Right: Mercury sphygmomomanometer.

The preparation of dental amalgam that contains mercury poses an occupational hazard to dental technicians.

Quick Notes

- **Minamata Convention requirements:** Phase down of use; provisions, such as promoting alternatives and best practices, are listed in Annex A; Part II
- **Some countries with significant concern:** All developing regions of the world (Africa, Asia, Central and Eastern Europe, Latin America)
- **Some countries leading in mercury-free solutions:** EU countries, Japan, Norway, and USA
- **Mercury-free alternatives:** Listed in UN publication (see sidebar)
- **Policy in action:**

The **Jordanian** Ministry of Environment and Ministry of Health are working together to issue a directive on dental amalgam to take the necessary measure to eliminate or reduce the use of mercury in dental amalgam; this was initiated during the legal assessment that was conducted within the implementation of the Mercury Initial Assessment project and they expect that this action will contribute in complying with the Minimata Convention provisions.

Dental Amalgam

Why Use Mercury in Dental Amalgam?

Liquid mercury mixed with an alloy powder creates an amalgam (50 percent mercury; 50 percent alloy) pliable enough to press into the tooth. The filling hardens quickly and is strong enough to withstand the forces of biting and chewing.

Mercury Exposure through Amalgam

However, mercury in dental amalgam can cause risk on three fronts: (1) the individual is exposed to mercury in the body; (2) dental technicians working with liquid mercury are at risk; and (3) mercury from dental amalgam can be released into the environment.

The level of exposure to patients is highest during placement or removal of fillings that contain mercury. Exposure to mercury from fillings that are in place is dependent on a number of factors such as age (young children may be more sensitive), number and size of fillings, chewing habits, and teeth grinding.

An Occupational Hazard

Despite improvements in techniques and precautionary measures, dental technicians who prepare the amalgam may breathe in mercury vapors. Exposure can also occur during placement and removal of the fillings. According to the US Environmental Protection Agency (US EPA), dental technicians have greater exposure to mercury than the general public.

An Environmental Hazard

According to the WHO, the amount of dental mercury entering the environment is significant either as a result of improper waste management practices, cremation, dental clinic emissions, human waste, or lost fillings. According to the European Commission, dental amalgam represents the second largest use of mercury in the EU (the chlor-alkali industry is the largest).

Also, the US EPA reports that dental offices are the single largest source of mercury at sewage treatment plants in the US, although most dental offices in the US currently use filtration systems. Amalgam becomes part of sewage sludge, which may then be disposed: (1) in landfills where mercury may be released into ground water or air; (2) during incineration when mercury is released into the air; and (3) as an additive to fertilizer. Due to these concerns, the use of alternative materials is growing more popular.

Minamata Convention Requirements

Nine provisions in the Convention offer guidance on phasing down the use of mercury in dental amalgam. Countries are required to adopt two or more provisions, (e.g., promote use of mercury-free alternatives, or train dentists on mercury-free amalgam).

Alternatives to Mercury-added Products

UN Environment has developed a publication* that lists manufacturers and their mercury-free products including mercury-free dental fillings such as:

1. composite resin fillings
2. glass ionomer cement fillings and/or ionomer resins
3. dental compomers
4. zinc oxide eugenol (ZOE) fillings
5. zinc phosphate cement
6. zinc polycarboxylate cement
7. ceramic, porcelain, gold inlays

See References, page 15

BRI's Contributions to the Minamata Convention on Mercury

Scientific Research Informs Policy

BRI participated in Intergovernmental Negotiating Committee meetings that preceded the adoption of the Minamata Convention and is an active participant in the Conference of the Parties that began when the Convention went into force.

As co-lead of UN Environment's Mercury Air Transport and Fate Research Partnership Area, BRI is assisting with the development of a globally coordinated mercury monitoring and observation system in association with leading a team to develop a chapter in the 2018 Global Mercury Assessment. BRI is also a partner organization in the Artisanal and Small-scale Gold Mining Partnership Area.

Helping Countries Prepare for Ratification

The Global Environmental Facility has developed a series of pre-ratification activities, called Minamata Initial Assessments (MIAs), that are designed to prepare countries for ratification and early implementation of the Convention. BRI currently serves as an executing agency for and/or provides technical expertise to more than 30 countries as part of the Convention's MIA activities.

Collaboration with UN Agencies

BRI is assisting three UN agencies to implement MIA activities around the world as: (1) an Executing Agency with the UN Industrial Development Organization; (2) an International Technical Expert with the UN Development Programme; and (3) an International Technical Expert with UN Environment.

In addition to assisting these UN agencies with MIAs, BRI is helping with the implementation of the Minamata Convention by identifying goals for countries through targeted metrics and associated time periods (Table 1).

Table 1. Potential metrics over three time periods to meet Minamata Convention requirements for Article 4.[1]

Potential Metrics	Relevant Time Period		
	Short term (<6 years)	Medium term (6-12 years)	Long term (>12 years)
1. Amount of mercury used in manufacturing of Annex A products (relative to baseline numbers): • in countries with 2020 deadline • in countries with time exemptions • for any new products added to Annex A, due to COP review	✓	✓ ✓ ✓	✓ ✓ ✓
2. Reduction in amount of mercury trade reported for manufacturing of Annex A products, per Article 3	✓	✓	✓
3. Occupational monitoring data at product manufacturing sites	✓	✓	✓
4. Amount of remaining product inventory of Annex A products			✓
5. Emissions from product waste incineration (per Article 8)			✓

[1] Evers D., Keane S., Basu N., Buck D. (2016) Evaluating the effectiveness of the Minamata Convention on Mercury: Principles and recommendations for next steps. Science of the Total Environment. 569-570:888-903. The full text can be found at: www.unep.org/chemicalsandwaste/global-mercury-partnership/mercury-air-transport-and-fate-research/reports-and-publications

Resources and References

BRI Science Communications — Translating Science for Policymakers, Resource Managers, and the General Public

Mercury in the Global Environment: Understanding Spatial Patterns for Biomonitoring Needs of the Minamata Convention on Mercury. 2018

Mercury in the Global Environment: Marine Mammals highlights the impacts of methylmercury on marine mammals. 2017

Local, Regional, and Global Biomonitoring: Understanding Mercury Exposure through Monitoring At-risk Species. 2018

Center for Mercury Studies highlights BRI's mercury research projects around the world. 2018

BRI's publications are available at: www.briloon.org/hgpubs

Global Mercury Hotspots: New Evidence Reveals Mercury Contamination Regularly Exceeds Health Advisory Levels in Humans and Fish Worldwide. 2014

Great Lakes Mercury Connections: The Extent and Effects of Mercury Pollution in the Great Lakes Region, USA. 2011

References and Other Publications Related to the Minamata Convention

AMAP/UN Environment (2013) Technical Background Report for the Global Mercury Assessment 2013. Arctic Monitoring and Assessment Programme, Oslo, Norway/UN Environment Chemicals Branch, Geneva, Switzerland. pp 263.

BCCC/SCRC (2014) [Brochure] Implementation of the Minamata Convention in the Latin America and Caribbean Region. Basel Convention Coordinating Centre/Stockholm Convention Regional Centre, Uruguay. pp 12.

Santana V, Medina G, Torre A (2014) [Report] Implementation of the Minamata Convention in the Latin America and Caribbean region. Basel Convention Coordinating Centre/Stockholm Convention Regional Centre, Uruguay. pp 43.

United Nations Development Program (2017). Minamata Initial Assessment Report Suggested Structure and Contents. New York, New York. pp 26..

UN Environment (2013) Global Mercury Assessment 2013: Sources, Emissions, Releases and Environmental Transport. UN Environment Chemicals Branch, Geneva, Switzerland. pp 32.

UN Environment (2015) Practical Sourcebook on Mercury Waste Storage and Disposal. ISBN: 978-92-807-3482-9. pp 88.

UN Environment (2016) Lessons from countries phasing down dental amalgam use. UN Environment Chemicals and Waste Branch, Geneva, Switzerland. pp. 27.

UN Environment (2018-19) Alternatives to and Manufacturers of Mercury-added Products (In Draft – Scheduled to be published 2018-19). pp 73.

World Health Organization (2011) Future Use of Materials for Dental Restoration. pp. 57.

World Health Organization (2011) Replacement of mercury thermometers and sphygmomanometers in health care. Technical guidance.

Related Web Links

Basel Convention Regional Centre: www.bcrc-caribbean.org
BRI's Center for Mercury Studies www.briloon.org/hgcenter
IPEN: www.ipen.org
Minamata Convention on Mercury www.mercuryconvention.org
The Caribbean Energy Efficiency Lighting Project https://sustainabledevelopment.un.org
United Nations Development Programme www.undp.org
United Nations Environment www.unep.org/chemicalsandwaste
United Nations Industrial Development Organization www.unido.org
World Health Organization: www.who.int
Zero Mercury Working Group: www.zeromercury.org

The symbol Hg is derived from the Latin *hydrargyrum* (meaning watery silver).

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