The State of Mercury in Guatemala

The Minamata Convention on Mercury is the first global agreement specifically designed to address contamination from a heavy metal. Opened for signature on October 10, 2013 (128 Signatories) and entered into force on August 16, 2017 (as of June 2018 is into force for 93 Parties). The Convention seeks to address issues related to the use and release of mercury in trade and in industrial processes. The Convention also addresses major sources of emissions to the atmosphere and releases to land and water, as well as environmentally sound interim storage and disposal of mercury and mercury compounds.

Under the Minamata Convention, individual countries are charged with protecting human health and the environment from the risks of mercury exposure by systematically controlling mercury emissions and releases, including phasing out the use of mercury in certain products and processes.

In order to assist with preparations for the ratification and implementation of the Convention, the government of Guatemala conducted a Minamata Initial Assessment (MIA). The primary activities of the MIA in Guatemala included:

- A review of institutional and capacity needs for implementation of the Convention;
- An assessment of national regulations, policies, and legislation to assist with preparations for compliance with the obligations of the Convention; and
- An identification of the primary sources of mercury emissions and releases as part of a detailed National Mercury Profile.

The MIA was conducted with financial assistance from the Global Environment Facility (GEF) and was implemented in collaboration with the United Nations Industrial Development Organization (UNIDO). This brochure summarizes the major findings of the MIA in Guatemala.

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Findings from the Minamata Initial Assessment

What are the Sources of Mercury?

The origin of mercury can be natural (e.g., volcanoes) or anthropogenic (human-caused releases). The major sources of mercury in Guatemala, based on the mercury inventory conducted for the MIA, include the following:

- Use and disposal of mercury-added products such as switches, fluorescent lamps, high pressure mercury and sodium lamps, thermometers, sphygmomanometers, dental amalgam, batteries, etc. (827 kg Hg/yr).
- Informal waste incineration (1,120), informal dumpling (448), controlled landfills (358), incineration of medical waste (117) and industrial (55).
- Potential emissions to the atmosphere from point sources: coal-fired power plants and industrial boilers (122) + (66 of biomass); cement clinker production (162); waste incineration facilities (119); and production of non-ferrous metals (26).

As a result of the MIA process, the approximate magnitude and distribution of these anthropogenic releases into air, water, and land are now quantified for Guatemala. Based on the MIA findings, the use and disposal of mercury-added products accounts for 19% of total emissions, with electrical devices, lamps, and dental amalgam being the most relevant. Informal waste burning (26%), informal dumpling (10%) and controlled landfills (8%) are the ways of waste disposal with higher levels of mercury nationwide. Cement clinker production and coal-fired and biomass-fired power generation have a potential mercury emissions of 6% and 4%, respectively. The total calculated mercury input to society in Guatemala is 4,192 kg Hg/yr.

How are People Exposed to Mercury?

Elemental mercury, which is found in some manufactured products, is not necessarily toxic to humans. Exceptions may include dental amalgam and cosmetics, but these products are still under scientific investigation, so their potential harm is not yet fully characterized.

Methylmercury, the organic form of mercury, is toxic to humans because it can biomagnify in food webs and bioaccumulate over time in organisms that may be frequently consumed. A neurotoxin, methylmercury can cause physiological harm and behavioral disorders in people.

Fish from the sea or freshwater systems can be a major source of methylmercury exposure to humans. In general, fish species that are small, short-lived, and forage low in the food web contain less methylmercury, while predatory species that are long-lived and grow larger can contain higher levels of methylmercury.

Published mercury concentrations from tissues in fish and marine mammals in the Caribbean Sea indicate regular exceedance of various thresholds used by American and International entities (e.g., 0.22 ppm, ww by the Great Lakes Consortium for the U.S. and Canada; 0.30 ppm, ww by the U.S. Environmental Protection Agency; 0.50 ppm, ww by the European Commission and World Health Organization, which includes an exemption for large predatory fish species of 1.0 ppm, ww). See the list of healthier and riskier seafood choices below:

Seafood with lower mercury levels (<0.22 ppm, ww; *healthier choices*):

- Small grouper, snapper, shrimp, tilapia, oysters, mahi mahi, salmon

Seafood with higher mercury levels (>0.22 ppm, ww; *riskier choices*):

- Many tuna species, Atlantic blue marlin, barracuda, large grouper, king mackerel, swordfish, wahoo (peto)

Red Snapper

How Does Mercury Affect Ecological Health?

The process of methylation, the conversion of mercury to methylmercury, varies widely on the landscape and within the waterscape. Areas that are particularly sensitive to mercury deposition—where methylation rates are highest and biomagnification in the food web is greatest, and where animals experience significant reproductive harm—are called biological mercury hotspots. These areas generally represent aquatic ecosystems or have an aquatic connection within the food web.

Generally, aquatic ecosystems connected to wetlands, either marine (e.g., estuaries) or freshwater (e.g., lakes), are prime areas for high methylation rates. Fish and wildlife predators that live in estuaries and lakes, or that forage in a food web associated with these habitats (e.g., mangroves), often contain elevated mercury levels. The combination of high methylation rates and longer-lived animals higher in the food web creates the greatest risk.

Habitats at Greatest Risk:

- Wetlands, mangroves, aquatic habitats near contaminated sites

Wildlife at Greatest Risk:

- Brown Pelican, Magnificent Frigatebird, Masked and Red-footed Booby, White-tailed Tropicbird, Black-capped Petrel, Audubon's Shearwater, Bridled Tern, Sooty Tern

Brown Pelican

Coastal Habitat

Freshwater Lakes

Rivers and Tropical Forests

What is the State of Mercury in Guatemala?

The impacts of mercury pollution can be challenging to identify and reverse. However, strategies to reduce mercury contamination are important because mercury can cause significant adverse effects to human and ecological health.

Findings from the MIA in Guatemala indicate that the input of mercury into ecosystems may be elevated in some areas but with effort by the government, key stakeholders, and the general public, those inputs can be further identified and reduced.

Lifecycle management of mercury-added products also presents a challenge for Guatemala. The adoption of legislation that limits and restricts the importation of such products will be an important first step towards the successful implementation of the Minamata Convention, which will help to reduce overall mercury releases in the country.

What Can You Do to Help?

- Choose healthier fish options (those with lower mercury levels) as part of your diet.
- Use your buying power—purchase no- or low-mercury product replacements when possible (See Useful Links on back page for more information).
- Be aware of and support current and new recycling programs for mercury-added products.
- Support legislation that helps reduce the impacts of mercury on the environment.

Recommendations from the Guatemala Mercury Team

- Create legislation that can help facilitate a framework to comply with the Minamata Convention.
- Reduce the import and use of products that contain mercury by selecting no- or low-mercury product replacements:
  - Replace compact and linear fluorescent lights with LED bulbs;
  - Replace outdated medical/measuring devices containing mercury with digital alternatives;
  - Choose brands of batteries that do not contain mercury; and
  - Check the ingredients in skin lightening creams and lotions to avoid products that contain mercury.
- Properly store waste products with mercury and avoid using landfills by creating proper storage facilities for hazardous waste.
- Generate greater awareness and education through existing outreach programs; oversee the development and distribution of information on mercury to the public, including importers of manufactured products.
- Participate in global mercury database and monitoring programs and coordinate existing data with global and regional sampling efforts organized by UN agencies, including:
  - Hair samples for people;
  - Muscle samples for fish;
  - Blood, feather, and egg samples for birds;
  - Sampling of cosmetic skin lightening creams; and
  - Air sampling with passive devices.

BRI's Mercury Work in Guatemala

Biodiversity Research Institute (BRI) has collaborated with its partners in Guatemala to help identify and estimate major mercury sources in the region. As an International Technical Expert, BRI provided training on the UN Environment's *Toolkit for Identification and Quantification of Mercury Releases* and assisted with the review of primary reports and products developed as part of the MIA.

United Nations Industrial Development Organization

UNIDO is the specialized agency of the United Nations that promotes industrial development for poverty reduction, inclusive globalization and environmental sustainability. The mission of the United Nations Industrial Development Organization (UNIDO) is to promote and accelerate inclusive and sustainable industrial development (ISID) in Member States.

Useful Links

Minamata Convention: **www.mercuryconvention.org**
BRI publications: **www.briloon.org/hgpubs**
Ministry of Environment and Natural Resources: **www.marn.gob.gt**
World Health Organization: **www.who.int/ipcs/assessment/public_health/mercury/en/**

Global Health Trade-Off for Mercury and Omega-3 in Seafood

Milligrams of Omega-3 Fatty Acids/4 Ounces of Cooked Fish →

Total Mercury in Muscle Tissue µg/g (ww) ↓

Meal Frequency Recommendations	<500 mg	500-1,000 mg	1,000-2,000 mg	> 2,000 mg
Unrestricted meals (< 0.05 µg/g)	Catfish, Clams, Crab* (most species), Croaker, Haddock, Scallops, Shrimp, Tilapia*	Blue Mussels,* Pink Salmon, Sockeye Salmon	Chinook Salmon,* Coho Salmon, Oysters	Healthier Choices: Atlantic Salmon, Sardines, Shad
1-2 meals per week (0.05–0.22 µg/g)	Atlantic and Pacific Cod, Flounder, Grenadier, Hake, Lobster,* Sole	Atlantic Pollock, Mahi Mahi, Mullet, Scad, Squid, Skipjack Tuna, any canned tuna	Atlantic Horse Mackerel, European Sea Bass, Rays, Skates, Trout	Anchovies,* Herring
1 meal per month (0.22–0.95 µg/g)	Grouper, Orange Roughy, Snapper	Amberjack, Barracuda, Bigeye Tuna, Bluefish, Halibut, Jack, Trevally, Wahoo (Peto), Yellowfin Tuna	Atlantic and Pacific Mackerel, Albacore Tuna,* Atlantic Bluefin Tuna, Chilean Sea Bass	Mercury concentrations vary widely across shark species. To learn more, visit: www.briloon.org/hgcenter
No consumption (> 0.95 µg/g)	King Mackerel — Riskier Choices	Atlantic Blue Marlin, Atlantic Sailfish, Tilefish	Dogfish, Ground, and Mackerel Sharks; Pacific Bluefin Tuna, Swordfish*	

Data Sources: BRI's Global Biotic Mercury Synthesis (GBMS) Database; U.S. Environmental Protection Agency; U.S. Food and Drug Administration; Great Lakes Consortium for the U.S. and Canada

*Pictured species; Underlined – species found in the Caribbean Sea.

MIA Stakeholders

- Ministry of Environment and Natural Resources
- Ministry of Public Health and Social Assistance
- Ministry of Energy and Mines
- Ministry of Economy
- Ministry of Agriculture, Livestock, and Food
- Ministry of Foreign Affairs
- Superintendence of Tax Administration
- Coordinating Committee of Agricultural, Commercial, Industrial and Financial Associations

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