



# The State of Mercury in Macedonia



**T**he 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 and entered into force on August 16, 2017, the Convention seeks to address issues related to the use and release of mercury in trade and in industrial processes. The treaty also addresses major sources of atmospheric emissions and releases of mercury into the environment, as well as long-term 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 Macedonia conducted a Minamata Initial Assessment

(MIA). The primary activities of the MIA in Macedonia 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 existing 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 and was implemented in collaboration with United Nations Environment. This brochure summarizes the major findings of the MIA in Macedonia.



# Findings from the Minamata Initial Assessment

## What are the Sources of Mercury?

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

- Coal combustion in power plants (292 kg Hg/yr)
- Mercury added products (508 kg Hg/yr)
- Production of recycled ferrous metals (iron and steel; 300 kg Hg/yr)
- Waste management, including waste incineration, waste deposition/landfilling, and waste water treatment (1,028 kg Hg/yr)



As a result of the MIA process, the magnitude and distribution of these anthropogenic releases into air, water, and land are now quantified for Macedonia. Based on the MIA findings, disposal of mercury-added products through burning, landfilling, and waste water treatment produce significant releases into the environment. Additionally, the extraction and use of fuels, primarily coal combustion, and production of recycled ferrous metals are major sources of mercury emissions in the country. The total calculated mercury input to society in Macedonia is 2,451 kg/year.

## How are People Exposed to Mercury?

Elemental mercury, which is found in 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. A neurotoxin, methylmercury can cause physiological harm and behavioral disorders in people.

Fish and other animals from the sea or freshwater systems can be a major source of methylmercury. 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.

Many of the fish available in Macedonia are safe to eat, although more information is needed about the mercury concentrations to better characterize how mercury is distributed in different species of fish in the waterscape of Macedonia.

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

- Carp, chub, herring, mullet, oysters\*, salmon\*, shrimp, snapper\*, tilapia\*, trout

**Seafood with higher mercury levels**

(>0.22 ppm, ww; *riskier choices*):

- King mackerel\*, many tuna species\*, swordfish\*

\*Market fish and shellfish



## 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 rivers and lakes, or that forage in a food web associated with these habitats

(e.g., beaches or forests), 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, lakes, reservoirs, rivers, and aquatic habitats near contaminated sites

### Wildlife at Greatest Risk:

- Black Stork, Dalmatian Pelican, Glossy Ibis, Great Cormorant, Great Crested Grebe, Grey Heron, Eurasian Kingfisher, White Stork



*Dalmatian Pelican*



*Rivers and Streams*



*Wetlands*



*Lakes and Reservoirs*

## What is the State of Mercury in Macedonia?

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 Macedonia indicate 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 represents a major challenge for Macedonia, particularly the proper disposal of products at the end of their use. 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 Macedonia.

### WHAT CAN YOU DO TO HELP?

- 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.
- Choose healthier fish options (those with lower mercury levels) as part of your diet.
- Support legislation that helps reduce the impacts of mercury on the environment.

## Recommendations from the Macedonia Mercury Team

Representatives from many sectors including government, business and industry, the general public, and international organizations actively participated in the process of MIA development, and defined the following general steps and recommendations to be further developed and considered in future national actions for mercury management:

- The Government to mobilize and allocate funds for further improvements towards reduction and elimination of emissions and releases;
- The Government to make efforts to establish an inventory system and to develop a detailed inventory after the Ratification;
- To improve the capacities of monitoring and reporting of mercury in different media including biota;
- To improve interministerial coordination to control the import of mercury products;
- To build the capacities and strengthen the institutions for sound management of waste, which is the major source category according to the results of the National Inventory of Mercury Releases; and
- To develop a plan for involving the stakeholders, including the general population.

### BRI's Mercury Work in Macedonia



Biodiversity Research Institute (BRI) collaborates with its partners in Macedonia to help identify and estimate any major mercury sources in the region. An international advisor on mercury, BRI serves as co-lead of the UN Environment's Mercury Air Transport and Fate Research Partnership Area to assist with the development of a global mercury monitoring and observation system. In addition, BRI serves as an International Technical Expert with the United Nations Development Programme (UNDP) and with UN Environment, and as an Executing Agency for the United Nations Industrial Development Organization (UNIDO).

### United Nations Environment Programme



The United Nations Environment Programme (UN Environment) is the leading global environmental authority that sets the global environmental agenda, promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system, and serves as an authoritative advocate for the global environment. Learn more at [www.unenvironment.org](http://www.unenvironment.org).

### Useful Links

- BRI mercury publications: [www.briloon.org/hgpubs](http://www.briloon.org/hgpubs)
- Minamata Convention: [www.mercuryconvention.org](http://www.mercuryconvention.org)
- Ministry of Environment and Physical Planning, Persistent Organic Pollutants Unit: [www.pops.org.mk](http://www.pops.org.mk)

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

Milligrams of Omega-3 Fatty Acids/4 Ounces of Cooked Fish →				
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	<b>Healthier Choices</b> Atlantic Salmon, Sardines, Shad
1-2 meals per week (0.05-0.22 µg/g)	Atlantic and Pacific Cod, Flounder, Grenadier, Hake, Lobster,* Scad, Seabream, 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, 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: <a href="http://www.briloon.org/hgcenter">www.briloon.org/hgcenter</a>
No consumption (> 0.95 µg/g)	King Mackerel <b>Riskier Choices</b>	Marlin, 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

### For More Information:

Ministry of Environment and Physical Planning  
Persistent Organic Pollutants Unit

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## MIA Stakeholders

- Ministry of Environment and Physical Planning
- Ministry of Health
- Ministry of Agriculture, Forestry and Water Economy
- Ministry of Economy
- Ministry of Finance
- Ministry of Labour and Social Policy
- Customs Administration
- State Statistical Office
- State Environmental Inspectorate
- Energy Agency of Macedonia
- Drug Agency
- Mining Institute
- Industrial capacities: Mines and Metal Production Plants, Thermo Power Plants, Cement Production Plant, Central Heating Plants, Recycled Ferrous Metals Plants
- Pharmaceutical Chamber of Macedonia
- Healthcare Clinics
- Standardization Institute of Macedonia
- Dental Chamber of Macedonia
- Dental Clinical Centre
- Waste Collectors and Recyclers
- Sanitary Waste Landfill and Medical Waste Incineration Plant
- Waste Water Treatment Plants
- Chamber of Commerce of Macedonia
- Academic Institutions and Research Facilities
- Local Communities
- Importers of mercury-added products
- UN Environment
- Biodiversity Research Institute

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