

Mercury Overview: Sources and Impacts



David Schmeltz
US EPA Office of Atmospheric Programs
Washington, D.C.

September 10, 2014

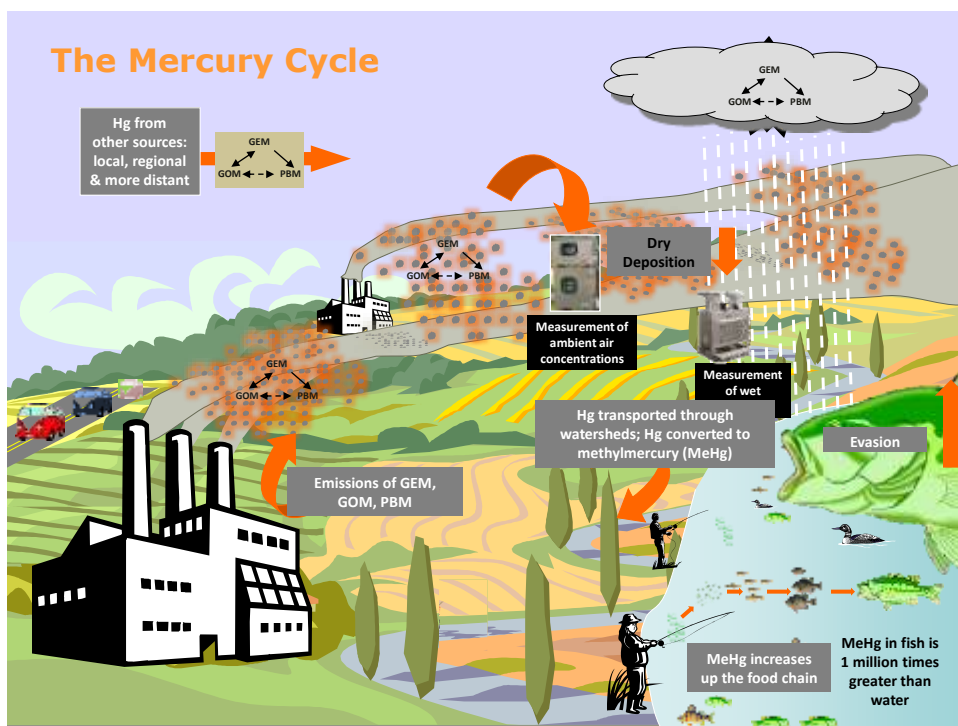


Topics

- Health effects of mercury
- How mercury moves through the environment
- The sources of mercury
- What are we doing about the global mercury problem?
 - Minamata Convention in later talk

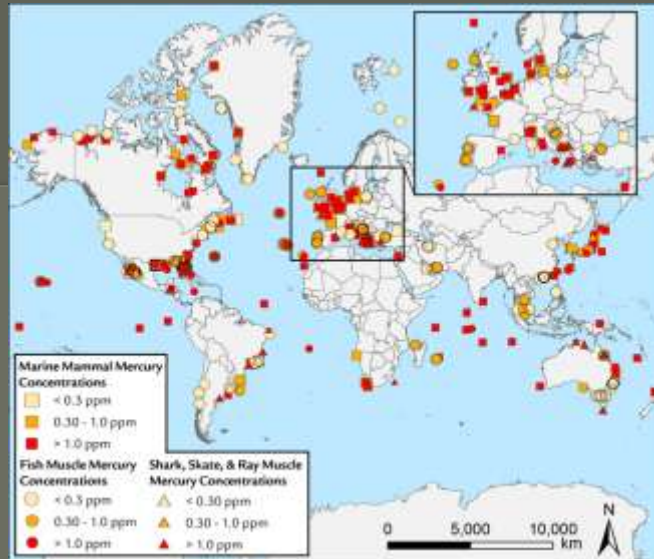
Why do we care about mercury?

- Persistent bioaccumulative neurotoxin – harmful to humans and wildlife
- Fetuses, infants, and children particularly susceptible as methylmercury (MeHg) interferes with brain and nervous system growth and development
 - Impacts on cognitive thinking, memory, attention, language, and fine motor and visual spatial skills observed in children who were exposed to MeHg *in utero*
 - Prenatal and infant exposures to high MeHg doses (less frequent) can cause mental retardation, cerebral palsy, deafness and blindness
- Memory and vision loss, tremors and numbness in fingers and toes in adults
- Other mercury-related disorders:
 - Immunologic
 - Endocrine
 - Metabolic
 - Cardiovascular
 - Digestive
 - Epigenome



Mercury in fish and marine mammals

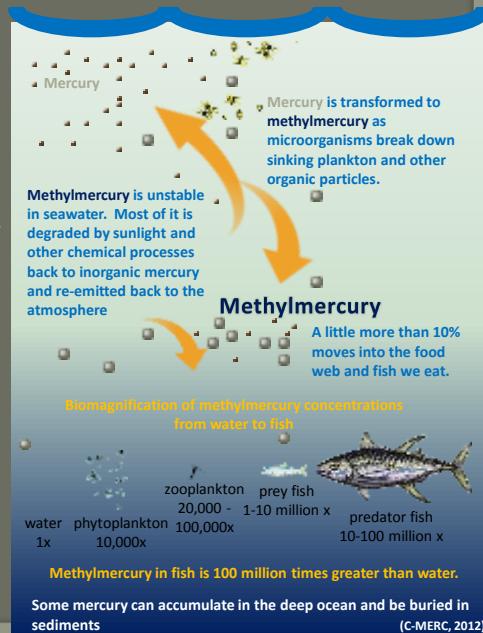
The global distribution of fish, including shark, and marine mammal mercury concentrations. The mercury concentration is presented in parts per million (ppm) on a wet weight (ww) basis.



BioDiversity Research Institute, 2012

The problem is MeHg exposure through eating contaminated fish, and/or seafood

- Eating fish, shellfish, and marine mammals is the single most important source of human exposure to MeHg for individuals around the world, accounting for approximately 75% of total MeHg exposure.
- In the US, marine fish and shellfish consumption are estimated to account for over 90% of human mercury exposure; tuna harvested in the Pacific Ocean account for 40% of this total exposure.
- In East/Southeast Asia and other regions fish represent the main source of animal protein
- Depending upon the species of fish consumed, people who rely on subsistence fishing can experience a disproportionately higher risk of MeHg exposure through the diet.



Asian fish consumption is high and growing

TABLE 15
Per capita fish consumption (kg/person/year) in Asia and Europe

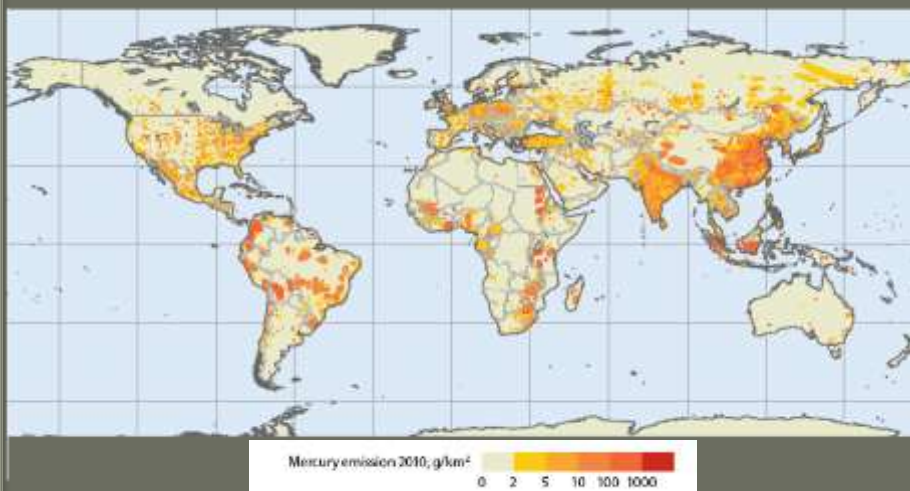
Country	1985	1990	1995	2000	2003	Average growth (%)
Bangladesh	7.0 (6.0)	7.0 (6.0)	8.0 (7.0)	11.0 (10.0)	11.0 (9.0)	57 (83)
China	7.0 (2.0)	11.0 (4.0)	20.0 (7.0)	25.0 (10.0)	25.0 (10.0)	257 (400)
India	3.0 (1.0)	3.0 (1.0)	4.0 (2.0)	4.0 (2.0)	4.0 (2.0)	33 (100)
Indonesia	13.0 (3.0)	14.0 (3.0)	17.0 (4.0)	20.0 (4.0)	20.0 (4.0)	54 (33)
Japan	69.0 (4.0)	71.0 (5.0)	71.0 (5.0)	67.0 (5.0)	66.0 (5.0)	-4 (25)
Myanmar	14.0 (1.0)	15.0 (1.0)	14.0 (2.0)	18.0 (2.0)	18.0 (3.0)	29 (200)
Philippines	33.0 (5.0)	36.0 (5.0)	32.0 (4.0)	29.0 (4.0)	28.0 (5.0)	-15 (0)
Thailand	20.0 (3.0)	20.0 (4.0)	33.0 (6.0)	30.0 (7.0)	30.0 (7.0)	50 (133)
Viet Nam	12.0 (3.0)	13.0 (3.0)	16.0 (5.0)	19.0 (7.0)	17.0 (6.0)	42 (100)
Asia	10.0 (2.0)	12.0 (3.0)	16.0 (4.0)	17.0 (6.0)	17.0 (6.0)	70 (200)
South Asia	3.0 (1.0)	4.0 (2.0)	4.0 (2.0)	5.0 (3.0)	5.0 (3.0)	67 (200)
East and Southeast Asia	21.0 (3.0)	22.0 (3.0)	24.0 (4.0)	25.0 (4.0)	25.0 (5.0)	19 (67)
Europe	18.0 (1.0)	20.0 (1.0)	19.0 (2.0)	19.0 (2.0)	20.0 (2.0)	11 (100)
Western Europe	21.0 (1.0)	24.0 (1.0)	25.0 (2.0)	25.0 (2.0)	26.0 (2.0)	24 (100)
Eastern Europe	8.0 (1.0)	6.0 (1.0)	6.0 (1.0)	7.0 (1.0)	8.0 (1.0)	0 (0)
World	12.0 (2.0)	13.0 (2.0)	15.0 (3.0)	16.0 (4.0)	16.0 (4.0)	33 (100)

The number in parenthesis within the table denote freshwater fish consumption.

Source: Adapted from Laurenti (2007).

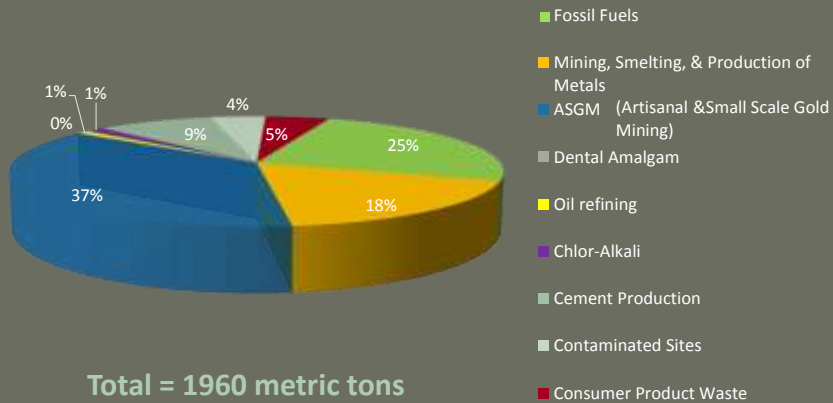
Where does the mercury come from?

Global emissions of mercury from anthropogenic sources, 2010



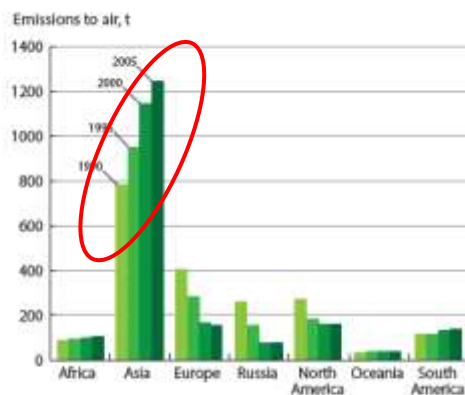
Source: United Nations Environment Programme (UNEP)
The Global Atmospheric Mercury Assessment: Sources, Emissions and Environmental Transport, 2013

Estimated proportion of global anthropogenic mercury emissions by sector, 2010



Source: United Nations Environment Programme (UNEP)
The Global Atmospheric Mercury Assessment: Sources, Emissions and Environmental Transport, 2013

Regional Mercury Emissions Trends



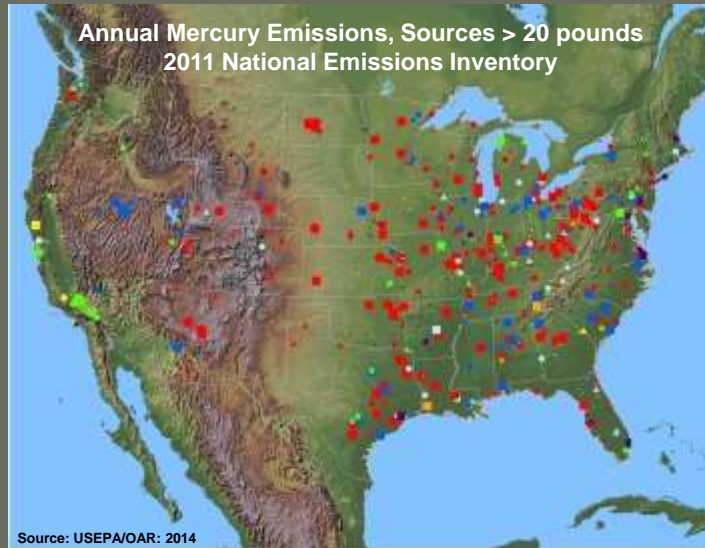
Asian emissions are large and continue to grow!

Estimates of annual anthropogenic mercury emissions from different continents/regions, 1990-2005.

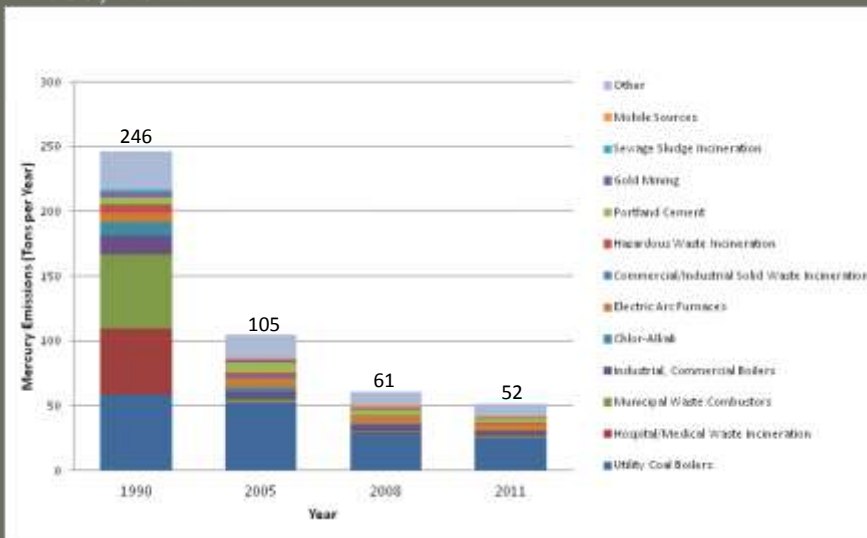
16

Source: United Nations Environment Programme (UNEP)
The Global Atmospheric Mercury Assessment: Sources, Emissions and Environmental Transport, 2013

Having good emissions inventories is important



U.S. mercury emissions, major sources 1990, 2005, 2008, 2011



NEI, 2011 version 1 2014

Thanks!

