Mercury Pollution in the Amazon Basin

Scientific research and related control policies

Norbert Fenzl, PhD (GEF-Amazon Project ACTO/UNEP, Brazil)
Fernanda Nascimento, PhD (GEF-Amazon Project consultant, UFOPA, Brazil)

Abstract

Since Mercury pollution has been considered as a worldwide concern, anthropogenic emissions decreased about 70% . As a result of effective policies, Hg fungicides and organic Hg compounds used in industries and agriculture disappeared in many countries, including Brazil. At the same time the use of Hg in Amazonian gold mining increased drastically since the gold rush of the 80`s. The present poster shows how Mercury Pollution has been object of scientific research and influenced public awareness and policies intending to control the use of Hg and the resulting contamination of the regional population through fish consumption.

Major Amazonian Rivers

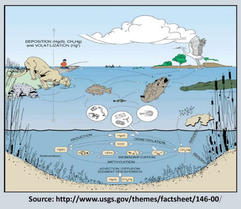
Mercury use and contamination in the Amazon Basin

Artisanal Small Gold Mines in the Amazon Basin

Mercury use and contamination in the Amazon Basin

Methylmercury, the toxic organic compound of Mercury, is responsible for harmful human intoxication and environmental contamination, by bioaccumulation through food chain, and exposing Amazonian communities used to a diet rich in fish. Knowledge originated by scientific research and monitoring will better assist in the development of prevention strategies and government actions targeting the mercury contamination of Amazonian environment.

Behaviour of Mercury in the enviroment



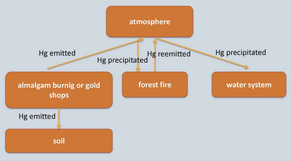
Source: http://www.usgs.gov/themes/factsheet/146-00/

Gold mining and deforestation

For long time, high mercury levels in the blood of fish-eating people in the Amazon have been attributed basically to gold mining activities conducted by informal miners. However, the high deforestation rate in the region has not been recognized as contributing to this environmental problem. Actually scientific data show that about 90 tons of organic mercury from the biomass are estimated to be emitted annually to the atmosphere and precipitated in the aquatic systems for rapid transformation into methylated forms. This is a conservative assessment and may be more than 6 times this rate.

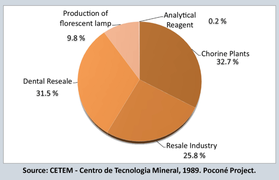
http://www.mining.ubc.ca/faculty/meech/fire4nat.htm

Hg emission by amalgam burning and forest fires



Source: Veiga et al. (1999)

The use of Mercury in Brazil



Source: CETEM - Centro de Tecnologia Mineral, 1989. Poconé Project.

Distribution of Mercury Losses in Brazilian Amazon Basin

Activity	Losses (% of Hg)
Volatilization during amalgam distillation	70
Dragged with the amalgamation tailings	20
Volatilization in the gold shops when gold is melted	10

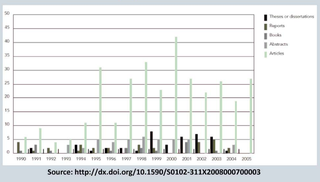
Source: CETEM - Centro de Tecnologia Mineral, 1989. Poconé Project

Emission of Mercury in Brazilian Amazon Basin

Source of Hg	Emission (Ton of Hg)	Concentration ($\mu g/m^3$)	Author
Amalgam burning	30 -70		Pfeiffer et al. (1993)
Gold dealer shops		5.50 to 292	Pfeiffer et al. (1993)
Deforestation	8-80		Veiga et al. (1994)
Different Sources Brazilian Amazon allone	50-80		Veiga et al. (1999)

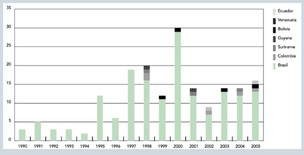
Mercury Research

Number and type of publications per year 1990-2005



Source: http://dx.doi.org/10.1590/S0102-311X2008000700003

Scientific articles published by Amazonian research institutions 1990-2005



Source: http://dx.doi.org/10.1590/S0102-311X2008000700003

Principal Hg research sites according to the mentioned publication year

Source: http://dx.doi.org/10.1590/S0102-311X2008000700003

Important Publications

Mercury contamination in the Brazilian Amazon. Environmental and occupational aspects
http://springerlink3.metapress.com/content/0049-6979/80/1-4/
Hair mercury levels in Amazonian populations: spatial distribution and trends
http://www.ij-healthgeographics.com/content/8/1/71
Mercury Contamination in the Madeira River, Amazon-Hg Inputs to the Environment
http://www.jstor.org/stable/2388449
Mercury Pollution from Deforestation
http://www.mining.ubc.ca/faculty/meech/fire4nat.htm

Control Policies

International activities for control policies (1) Global Mercury Treaty

The fourth session of the Intergovernmental Negotiating Committee to Prepare a Global Legally Binding Instrument on Mercury (INC4) met from 27.06 to 2.07 2012, in Punta del Este, Uruguay, to negotiate the text of a global treaty to regulate mercury use. More than 500 participants, including government representatives, representatives of inter-governmental organizations, NGOs, medical and industry organizations discussed a draft and several country specific proposals.

International activities for control policies (2)

Global Mercury Project (GEF, UNEP, UNIDO)
Policy and Governance Initiative. Enhancing Multi-Stakeholder Approaches to Address Mercury, Small-Scale Gold Mining and the Institutional Dynamics of Change

1. **International Guidelines** on Mercury Management Development of UN International Guidelines on Mercury Management in Artisanal and Small Scale Mining
2. **Capacity-Building** and Institutional Strengthening Strengthening of Multi-Sector Cooperation with Government Agencies and other Organizations in Support of Capacity-Building, Training, Technology, Education, and Mobilization of Resources to Facilitate and Assist in Fulfilling the Aims of the GMP
3. **Policies** on Mercury and Artisanal and Small-Scale Gold Mining
4. **Global Partnerships** for Development Strengthening and Expansion of Global Partnerships for Development - Joint Activities.

International activities for control policies (3)

UNEP Global Mercury Partnership
The overall goal: protect human health and the global environment from the release of mercury and its compounds by minimizing and, where feasible, ultimately eliminating global, anthropogenic mercury releases to air, water and land.
The Partnership currently has seven identified Priorities for Action (or partnership areas) that are reflective of the major source categories.
To become a partner, interested entities or individuals should submit a letter to UNEP signifying their support for the UNEP Global Mercury Partnership and their commitment to achieving its goal, and specifying how they will contribute to meeting the goal of the UNEP Global Mercury Partnership.

Legal disposition for the use of Mercury in Amazonian Countries (1)

Brazil. Law Nr. 9976 (2000). The Instruction IBAMA n º 31/2009 regulates the necessary federal registration for the transport of hazardous material, classifies the metallurgical use of mercury, including gold mining, with a high degree of pollution potential. In the case of small-scale gold mining, the regulation 97.507/1989 of 13/02/1989 bans the use of mercury in gold mining activities, unless it is licensed by the competent environmental agency. The updated Brazilian laws Norm 434 – Aug 9/89 and Norm 14 – Jan 15/90 intend to control on Hg imports.
Ecuador. Both projects Minimization of Mercury Emissions by Small Gold Mines in Southern Ecuador, an SDC project and Mining Development and Environmental Control Technical Assistance Project (PRODAMINCA project) deal with regulations for mercury use in ASGM.

Legal disposition for the use of Mercury in Amazonian Countries (2)

Venezuela. Law Nr. 1740 (1991(b)) regulates the necessary federal permission for the use of mercury.
Bolivia. Law RAAM - Environment Regulation on Mining Activities (31/07/1997) states the use of mercury in mineral concentration process is only allowed when installing mercury recovery equipment to process the output
Colombia. Law Nr. 038 (2010) establishes provisions for the use of mercury and other toxic substances in industrial processes.
Peru. The Law regulating the marketing and use of mercury in mining is nowdays in discussion.

Conclusions

Worldwide recognized danger of widespread Mercury pollution of Amazon Rivers and an important scientific production concerning Mercury related issues did not lead to consistent and effective control policies. The main reasons for the difficulties to apply regulations are basically geographical (the immensity of the region) and socioeconomic, due to massive unemployment and the high international gold prices.
Despite the great difficulties to apply effective regulations there is a significant improvement of international efforts to control the impacts on public health of Mercury contamination in the Amazon region.