

**附属資料 2**

**セミナー/ミーティング 発表資料**



# Ratification and Early Implementation of the Minamata Convention on Mercury in the Philippines



Environmental Management Bureau  
Department of Environment and Natural Resources

**DISCLAIMER**

This Ratification Dossier is for informational and educational purposes only. It is not intended as a legal document, nor does it constitute legal advice.



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**ACRONYMS AND ABBREVIATIONS**

AO	Administrative Order
ASGM	Artisanal and Small-scale Gold Mining
ASGMP	Artisanal and Small-scale Gold Mining and Processing
BAT	Best Available Techniques
BEP	Best Environmental Practices
CCO	Chemical Control Order
DENR	Department of Environment and Natural Resources
DepEd	Department of Education
DOE	Department of Energy
DOH	Department of Health
EMB	Environmental Management Bureau
EPR	Extended Producers Responsibility
GES	General Effluent Standards
HazMat	Hazardous Material Unit
IEC	Information, Education, and Communication
MC	Memorandum Circular
MT	metric ton
mg/L	milligrams per liter
mg/Nm <sup>3</sup>	milligrams per normal cubic meter
NAAQGV	National Ambient Air Quality Guideline Values
ng/mL	nanograms per milliliter
NGO	Non-Government Organization
NWQSR	National Water Quality Status Report
PhP	Philippine Peso
PNSDW	Philippine National Standards for Drinking Water
ppm	parts per million
RA	Republic Act
UNEP	United Nations Environmental Programme
UP-NPMCC	University of the Philippines – Manila National Poison Management and Control Center
US	United States
WQG	Water Quality Guidelines

## 1.0 INTRODUCTION

On 10 October 2013, during the Diplomatic Conference of the Plenipotentiaries in Kumamoto, Japan, Department of Environment and Natural Resources (DENR) Secretary Ramon J. P. Paje, on behalf of the Philippine Government, signed the Minamata Convention on Mercury (hereafter referred to as the Convention), along with 86 countries, in a global effort to reduce mercury pollution from anthropogenic sources in the world. Although not yet into force, the provisions and obligations under the Convention would require thorough assessment and preparatory work to ensure the country’s readiness to comply once the Convention enters into force.

In view thereof, this Ratification Dossier on the Minamata Convention on Mercury is prepared as reference for assessing the country’s capability in adopting the Convention and deliberating on its ratification. It provides an overview of the state of the Philippines with regards to mercury pollution; the existing laws, policies, and regulations for managing mercury during its complete life-cycle, including mercury wastes; and the social, economic, and environmental impacts of the Convention. Lastly, it presents the initial national action plans and strategies for complying with the Convention’s requirements.

### 1.1 OVERVIEW OF MERCURY, ITS USES, AND IMPACTS TO HUMAN HEALTH AND THE ENVIRONMENT

Mercury is a naturally occurring element that exists in three states, namely: elemental mercury ( $Hg^0$ ), mercurous mercury ( $Hg_2^{2+}$ ), and mercuric mercury ( $Hg^{2+}$ ). At room temperature, elemental mercury vaporizes to form mercury vapor, which is a colorless and odorless fume.<sup>[56]</sup>

The earliest use of mercury dates back to 2700 B.C., where it was primarily used for mining in Spain. Its use for gold extraction through amalgamation was then popularized during the 1860s. Through the ages, other applications of mercury have been developed in various fields of medicine as well as in science and technology.<sup>[6]</sup> Some of these applications are enumerated in Table 1.

*Vapor pressure is a function of temperature – the warmer the environment, the more mercury vapors are formed. Thus, tropical countries like the Philippines have higher risk of exposure to mercury vapor through inhalation.*

**Table 1. Sample Applications of Mercury and its Compounds** <sup>[29]</sup>

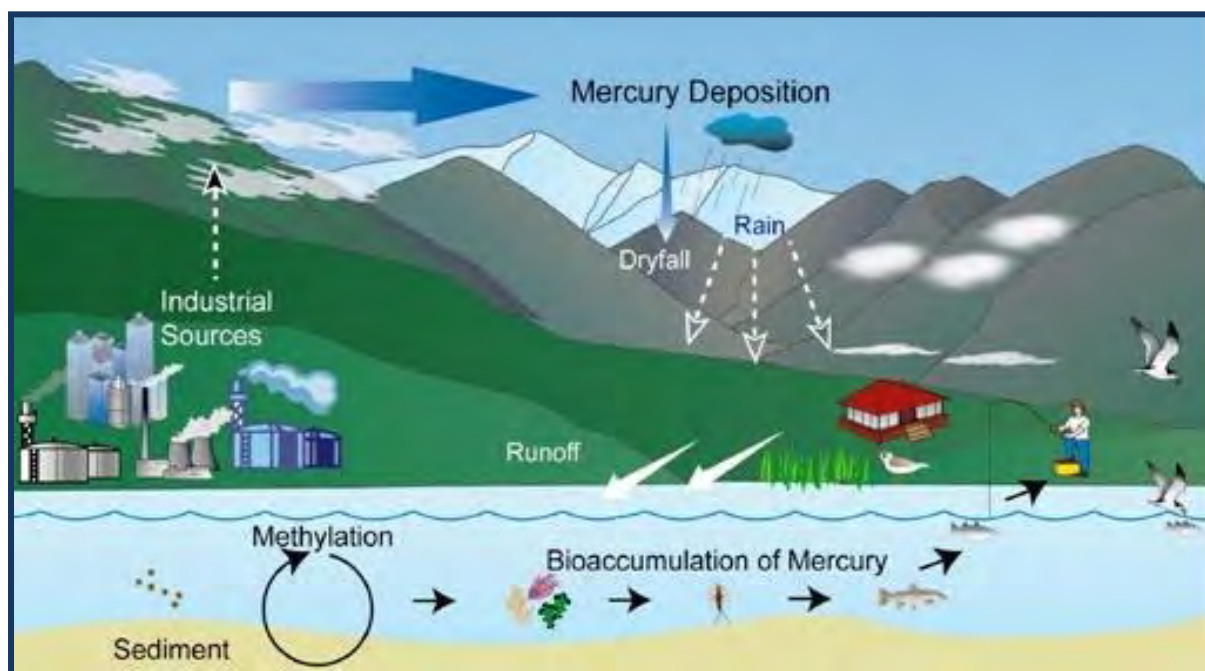
Mercury Used as Metal	Mercury Used as Chemical Compound
<ul style="list-style-type: none"> <li>❖ Extraction of gold and silver</li> <li>❖ Catalyst for chlor-alkali production</li> <li>❖ Manometers for measuring and controlling pressure</li> <li>❖ Thermometers</li> <li>❖ Electrical and electronic switches</li> <li>❖ Fluorescent lamps</li> <li>❖ Dental amalgam fillings</li> </ul>	<ul style="list-style-type: none"> <li>❖ Batteries (as a dioxide)</li> <li>❖ Biocides in paper industry, paints, and on seed grain</li> <li>❖ Antiseptics in pharmaceuticals</li> <li>❖ Laboratory analyses reactants</li> <li>❖ Catalysts</li> <li>❖ Pigments and dyes</li> <li>❖ Detergents</li> <li>❖ Explosives</li> </ul>

Although mercury is widely used in many applications, it is considered as highly toxic upon exposure. Even in low doses, exposure to mercury through inhalation of mercury vapors, consumption of contaminated food or water, and/or dermal contact with mercury-containing substances can still pose a threat to one's health. In fact, studies have shown that the adverse effects of mercury in human health particularly affect the nervous system (e.g., memory loss, hypoesthesia), the motor system (e.g., disruption of fine motor functions), the immune system, the kidneys, and the development of fetuses.<sup>[57],[64]</sup> On the other hand, minor effects can be seen in the respiratory, cardiovascular, gastrointestinal, hematologic, immune, and/or reproductive systems.

Effects on the nervous system can be observed in tremors, starting from the hands then spread throughout other parts of the body. Muscle weakness and atrophy, along with headaches and polyneuropathy, have also been associated with elemental mercury poisoning. However, the most significant adverse effect of inorganic mercury in the body is the formation of mercuric mercury-induced autoimmune glomerulonephritis, which is characterized by the inflammation of the kidneys and damages its ability to remove waste and excess fluids from the body. In addition, toxicity effects of methylmercury can be observed on the offspring born of women exposed to methylmercury during pregnancy. The offspring may exhibit delayed onset of walking and talking, cerebral palsy, altered muscle tone, and/or reduced neurological test scores.<sup>[57]</sup>

Aside from its toxic effects to humans, mercury also poses a great threat to the environment and ecosystem as it can enter the environment through emissions to air or releases to land and water (Figure 1). Mercury in air can fall to the ground in a process known as air deposition. After the mercury falls to the ground, it ends up in streams, lakes, or estuaries, where it will be converted into methylmercury through microbial activity. Methylmercury can bio-accumulate in fishes, thus causing greater harm to other species up along the food chain. This exposure to methylmercury in wildlife can cause death, reduced fertility, slower growth and development, and/or abnormal behavior that affect their survival.<sup>[61]</sup> Due to the long-range transport of mercury, mercury contamination can be found not only near the point sources, but also in the Arctic Region.



**Figure 1. Sources and Paths of Mercury in the Environment** [36]

With these impacts to the human health and the environment, there is an urgent need to address the management of mercury, mercury compounds, mercury-added products, and their corresponding wastes in the Philippines.

## 1.2 OVERVIEW OF THE MINAMATA CONVENTION ON MERCURY

The Minamata Convention on Mercury is an international instrument designed to protect human health and the environment from the adverse effects of mercury. It was named in honor of the city of Minamata in Japan, whose residents have greatly suffered from the effects of mercury poisoning since the early 1950s.

Between 1932 and 1968, an acetaldehyde factory owned by the Chisso Corporation, discharged wastewater containing methylmercury (one of the most toxic forms of mercury) into the Minamata Bay. At that time, local fishermen were unaware of the dangers of mercury and continued with their daily activities in the contaminated water for almost two decades. It was not until 1956 when residents began noticing a mysterious disease spreading throughout the city, as people would stumble while walking and tremble uncontrollably without warning. Reports of neurological problems and births of severely impaired children also began surfacing along coastal areas and nearby villages, and an investigation was launched.

By the end of 1956, epidemiological and medical researchers identified the disease as the “Minamata Disease” caused by the intake of mercury-contaminated fish and shellfish. As a result, more than 900 people died and 2,265 people were certified as having suffered from the disease, while thousands more were diagnosed with mercury poisoning.<sup>[5],[54]</sup>

Three years later, direct evidence on the mercury coming from the acetaldehyde plant was discovered; and in 1970, the Chisso Corporation was ordered by the district court to pay US\$ 3.2 million as compensation for the victims and their

families. To this day, the factory still operates in Minamata, where fishing has been prohibited in mercury-contaminated sections of the bay.<sup>[2]</sup>

The incident in Minamata led to the inception of an international effort to reduce mercury and mercury-containing wastes in the global market. In 2007, the United Nations Environmental Programme (UNEP) Governing Council initiated negotiations to develop a globally legal-binding instrument to regulate the importation, use, storage, and disposal of mercury. In October 2013, the text of the Minamata Convention on Mercury was finalized and opened for signature at the Diplomatic Conference of the Plenipotentiaries in Kumamoto, Japan.

### 1.2.1 Legal Obligations Imposed by the Minamata Convention on Mercury

The Convention, under Article 2, defines “mercury” as elemental mercury [Hg<sup>(0)</sup>, CAS No. 7439-97-6]; “mercury compound” as any substance consisting of atoms of mercury and one or more atoms of other chemical elements that can be separated into different components only by chemical reactions; and “mercury-added product” as a product or product component that contains mercury or a mercury compound that was intentionally added. Upon the date of entry into force of the Convention, a Party is required to abide by the provisions of the Convention stated in Table 2.

**Table 2. Summary of Provisions and Legal Obligations of the Convention**

Article	Provisions and Legal Obligations
Mercury Supply Sources and Trade (Article 3)	<ul style="list-style-type: none"> <li>❖ Prohibit new primary mercury mining</li> <li>❖ Proscribe the operation of existing primary mercury mining after a period of 15 years from the date of entry into force of the Convention</li> <li>❖ Identify individual stocks of mercury and mercury compounds exceeding 50 metric tons (MT), as well as mercury supply-generating stocks exceeding 10 MT per year that are located within the Party’s territory</li> <li>❖ Dispose excess mercury from decommissioning of chlor-alkali facilities in accordance with the guidelines for environmentally sound management under Article 11 of the Convention</li> <li>❖ Prohibit the export of mercury, except to a:               <ul style="list-style-type: none"> <li>• Party that has provided its written consent for the purpose of either a use allowed by the Convention or for environmentally sound interim storage under Article 10</li> <li>• Non-Party that has met the same requirements for a Party in addition to providing certification, demonstrating the non-Party’s capability to protect human health and the environment as well as to comply with Articles 10 and 11 of the Convention</li> </ul> </li> <li>❖ Prohibit the import of mercury from a non-Party unless it provides certification that the mercury is from sources allowed by the Convention</li> </ul>
Mercury-added Products (Article 4)	<ul style="list-style-type: none"> <li>❖ Prohibit the manufacture, import, and export of mercury-added products listed under Annex A: Part I of the Convention by 2020 (unless the Party has registered for an exemption to the phase-out date pursuant to Article 6)</li> <li>❖ Alternative to the above provision, indicate the time of ratification of an amendment under Annex A: Part I in which the Party will implement different measures to address the products listed</li> </ul>

Article	Provisions and Legal Obligations
	<p>under Annex A: Part I, provided that it has reduced the manufacture, import, and export of these products to a de minimis level</p> <ul style="list-style-type: none"> <li>❖ Implement measures for dental amalgam under Annex A: Part II of the Convention</li> <li>❖ Prevent the incorporation of mercury-added products, whose manufacture, import, and export is prohibited under this Convention, into assembled products</li> <li>❖ Discourage the manufacture and distribution in commerce of mercury-added products that are not covered by any known use of these products prior to the date of entry into force of the Convention, unless an assessment of the risks and benefits of the products has environmental or human health benefits</li> </ul>
<p>Manufacturing Processes in which Mercury or Mercury Compounds are Used (Article 5)</p>	<ul style="list-style-type: none"> <li>❖ Prohibit the use of mercury or mercury compounds in acetaldehyde production (as catalyst) by 2018 and chlor-alkali production by 2025 unless the Party has registered for an exemption</li> <li>❖ Restrict the use of mercury or mercury compounds in the manufacturing processes listed under Annex B: Part I of the Convention, namely: the production of vinyl chloride monomer; sodium or potassium methylate/ethylate; and polyurethane (as catalyst) in accordance with the provisions set out in Annex B: Part II of the Convention</li> <li>❖ For facilities that use mercury or mercury compounds in manufacturing processes listed in Annex B: <ul style="list-style-type: none"> <li>• Address the emissions and releases of mercury or mercury compounds from these facilities</li> <li>• Submit a report, including information on the measures taken</li> <li>• Identify facilities within its territory that use mercury or mercury compounds for these processes and submit it within three years after the date of entry into force of the Convention</li> </ul> </li> <li>❖ Prohibit the use of mercury or mercury compounds for manufacturing process under Annex B in new facilities (i.e., did not exist prior to the date of entry into force of the Convention)</li> <li>❖ Discourage the development of any facility conducting mercury-using process that did not exist prior to the date of entry into force of the Convention, unless the Party can demonstrate that these process provides significant environmental and health benefits, and that there are no technically or economically feasible mercury-free alternatives available for providing such benefits</li> <li>❖ Exchange information on new technologies, economically and technically feasible mercury-free alternatives, and techniques to reduce or eliminate the use and release of mercury or mercury compounds from manufacturing processes under Annex B</li> </ul>
<p>Exemptions Available to the Party upon Request (Article 6)</p>	<p>Option to register for one or more exemptions or amendments to the phase-out dates listed in Annex A of Article 4 and Annex B of Article 5 upon notification of the Secretariat, accompanied by a statement explaining the Party's need for the exemption</p>
<p>Artisanal and Small-scale Gold Mining (Article 7)</p>	<ul style="list-style-type: none"> <li>❖ Reduce or eliminate, where feasible, the use and release of mercury and mercury compounds in artisanal and small-scale gold mining and processing (ASGMP)</li> <li>❖ In case that ASGMP is determined to be more than insignificant by the Party: <ul style="list-style-type: none"> <li>• Develop and implement a national action plan in accordance with Annex C of the Convention</li> </ul> </li> </ul>

Article	Provisions and Legal Obligations
	<ul style="list-style-type: none"> <li>• Submit this plan to the Secretariat within three years after the entry into force of the Convention</li> <li>• Provide a progress review of the plan every three years</li> </ul>
Emissions (Article 8)	<ul style="list-style-type: none"> <li>❖ For relevant sources listed under Annex D of the Convention, prepare and implement a national plan to control emissions, and submit it to the Conference of Parties within four years of the date of entry into force of the Convention</li> <li>❖ For new sources, use Best Available Techniques (BAT) and Best Environmental Practices (BEP) to control and, where feasible, reduce emissions within five years after the entry into force of the Convention</li> <li>❖ For existing sources, implement one or more of the measures under Paragraph 5 of this Article in no more than 10 years after the entry into force of the Convention</li> <li>❖ Establish and maintain an inventory of emissions from relevant sources within five years after the entry into force of the Convention</li> </ul>
Releases (Article 9)	<ul style="list-style-type: none"> <li>❖ Identify relevant point source categories no later than three years after the entry into force of the Convention</li> <li>❖ Prepare a national plan to implement measures to control the releases from the identified relevant sources, and submit this plan within four years of the date of entry into force of the Convention</li> <li>❖ Establish, and maintain thereafter, an inventory of releases from relevant sources within a time period of five years after the date of entry into force of the Convention</li> </ul>
Environmentally Sound Interim Storage of Mercury, other than Waste Mercury (Article 10)	<ul style="list-style-type: none"> <li>❖ Adopt guidelines on the environmentally sound interim storage of mercury and mercury compounds (excluding mercury waste covered under Article 11) in accordance to the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal</li> <li>❖ Cooperate with other Parties and relevant intergovernmental organizations to enhance capacity-building on environmentally sound interim storage of mercury or mercury compounds</li> </ul>
Mercury Wastes (Article 11)	<ul style="list-style-type: none"> <li>❖ Manage mercury wastes as defined in this Article in an environmentally sound manner, taking into account the guidelines developed under the Basel Convention and in accordance with amendments or additional annexes under Article 27</li> <li>❖ Recover, recycle, reclaim or directly re-use mercury wastes either for a use allowed to the Party under this Convention or for environmentally sound disposal pursuant to the Basel Convention and in accordance with amendments or additional annexes under Article 27</li> <li>❖ For a Party to the Basel Convention, prohibit the transport of mercury wastes across international boundaries, except for the purpose of environmentally sound disposal</li> <li>❖ For a non-Party to the Basel Convention, permit the transport of mercury wastes across international boundaries, taking into account the relevant international rules, standards, and guidelines</li> </ul>
Contaminated Sites (Article 12)	<ul style="list-style-type: none"> <li>❖ Develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds</li> <li>❖ Perform actions that reduce risks posed by such sites in an environmentally sound manner and in consideration of the risks to human health and the environment</li> <li>❖ Option to cooperate in developing strategies and implementing activities for identifying, assessing, prioritizing, managing, and as</li> </ul>

Article	Provisions and Legal Obligations
	appropriate, remediating contaminated sites
Financial Resources and Mechanisms (Article 13)	Undertake to provide, within its capabilities, resources in respect of those national activities intended to implement the Convention, in accordance with national policies, priorities, plans, and programs.
Health Aspects (Article 16)	<ul style="list-style-type: none"> <li>❖ Promote the development and implementation of programs to identify and protect vulnerable populations</li> <li>❖ Promote the development and implementation of science-based educational and preventive programs on occupational exposure to mercury and mercury compounds</li> <li>❖ Promote health-care services for the prevention, treatment, and care for populations affected by mercury exposure</li> <li>❖ Establish and strengthen institutional and health professional capacities for the prevention, diagnosis, treatment, and monitoring of health risks related to the exposure to mercury and mercury compounds</li> </ul>
Information Exchange (Article 17)	Facilitate the exchange of scientific, technical, economic, and legal information concerning mercury and mercury compounds; the reduction or elimination of their production, use, trade, emissions, and releases; health impacts associated with mercury exposure (in close cooperation with the World Health Organization and other relevant organizations); as well as alternatives to mercury-added products, mercury-using manufacturing processes, and processes that emit or release mercury or mercury compounds
Public Information, Awareness, and Education (Article 18)	<ul style="list-style-type: none"> <li>❖ In collaboration with relevant intergovernmental and non-government organizations (NGOs) and vulnerable populations, promote to the public, the health and environmental effects of exposure to mercury and mercury compounds; their alternatives; their results from research, development, and monitoring activities (under Article 19) in addition to those topics provided under Article 17; and the activities to meet its obligations under this Convention</li> <li>❖ Use or develop mechanisms, such as pollutant release and transfer registers, to collect and disseminate information on estimates of annual quantities of mercury and mercury compounds that are emitted, released, or disposed of through human activities</li> </ul>
Research, Development and Monitoring (Article 19)	<ul style="list-style-type: none"> <li>❖ Prepare an inventory of the use, consumption, and anthropogenic emissions and releases of mercury and mercury compounds to the environment</li> <li>❖ Develop and improve the modeling and geographically representative monitoring of levels of mercury and mercury compounds in vulnerable populations and in environmental media</li> <li>❖ Assess the impact of mercury and mercury compounds on human health and the environment, in addition to social, economic, and cultural impacts in vulnerable populations</li> <li>❖ Research information on the environmental cycle, transport, transformation, and fate of mercury and mercury compounds in various ecosystems, as well as in commerce and trade</li> <li>❖ Research on the technical and economic availability of mercury-free products and processes; and on BAT and BEP to reduce and monitor emissions and releases of mercury and its compounds</li> </ul>
Implementation Plans (Article 20)	Option to develop, review, update, and execute an implementation plan to meet the obligations under the Convention, while consulting and coordinating with national stakeholders to facilitate the development, implementation, review, and updating of this plan



Article	Provisions and Legal Obligations
Reporting (Article 21)	Report measures taken to implement the provisions of the Convention, their effectiveness, and possible challenges, including information called for in Articles 3, 5, 7, 8, and 9 of this Convention

**1.2.2 Countries that Adopted the Minamata Convention on Mercury**

In accordance with Article 31, the Convention shall enter into force 90 days after the 50th instrument of ratification, acceptance, approval, or accession. Depending on a State’s Constitution or national law, there are ways to become a Party to the Convention<sup>[34]</sup>. These are:

- ❖ *Ratification.* A State’s Constitution or national law will specify a national ratification process that needs to be complied with before the final instrument can be deposited with the Secretary-General. For example, a State’s national law may require that the treaty be reviewed and/or approved by a legislative body before the instrument of ratification can be prepared, signed, and deposited.
- ❖ *Acceptance or Approval.* Acceptance and approval of a treaty have the same legal effect as ratification and have been used when constitutional law does not require the treaty to be ratified by the head of state.
- ❖ *Accession.* A country that has not signed the Convention by 09 October 2014 can become a Party to the Convention by depositing an instrument of accession, which has the same legal effect as ratification.

As of February 2015, only 10 out of the 128 signatories have ratified, accepted, or accessed the Convention in their respective countries.<sup>[52]</sup> Table 3 presents the list of countries and their date of ratification, acceptance, approval, or accession of the Convention.

**Table 3. Countries that Adopted the Minamata Convention <sup>[52]</sup>**

Countries	Date of Ratification, Acceptance, Approval or Accession
<b>AFRICA</b>	
Djibouti	September 23, 2014
Gabon	September 24, 2014 (Acceptance)
Guinea	October 21, 2014
Lesotho	November 12, 2014 (Accession)
Seychelles	January 13, 2015
<b>EUROPE</b>	
Monaco	September 24, 2014
<b>NORTH AMERICA</b>	
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## **2.0 MERCURY AND ITS MANAGEMENT IN THE PHILIPPINES**

This section provides an overview of the management of mercury in the Philippines. It includes an inventory of mercury and mercury-containing wastes as well as an assessment of the monitoring programs pertaining to mercury in different environmental media and in humans. It also provides a summary of mercury-related incidents reported in the Philippines. Lastly, a brief description is provided on the existing national laws and regulations being implemented to regulate the entry and release of mercury within the country.

### **2.1 INVENTORY OF MERCURY AND MERCURY WASTES**

To address the management of mercury and mercury-containing wastes, it is important to first identify the sources and quantities of mercury supply and emissions. This information serves as a baseline for assessing current waste management policies and programs, and in developing strategic action plans and control measures for future implementation.

#### **2.1.1 Sources of Mercury**

Mercury in the international market is obtained from four major sources:

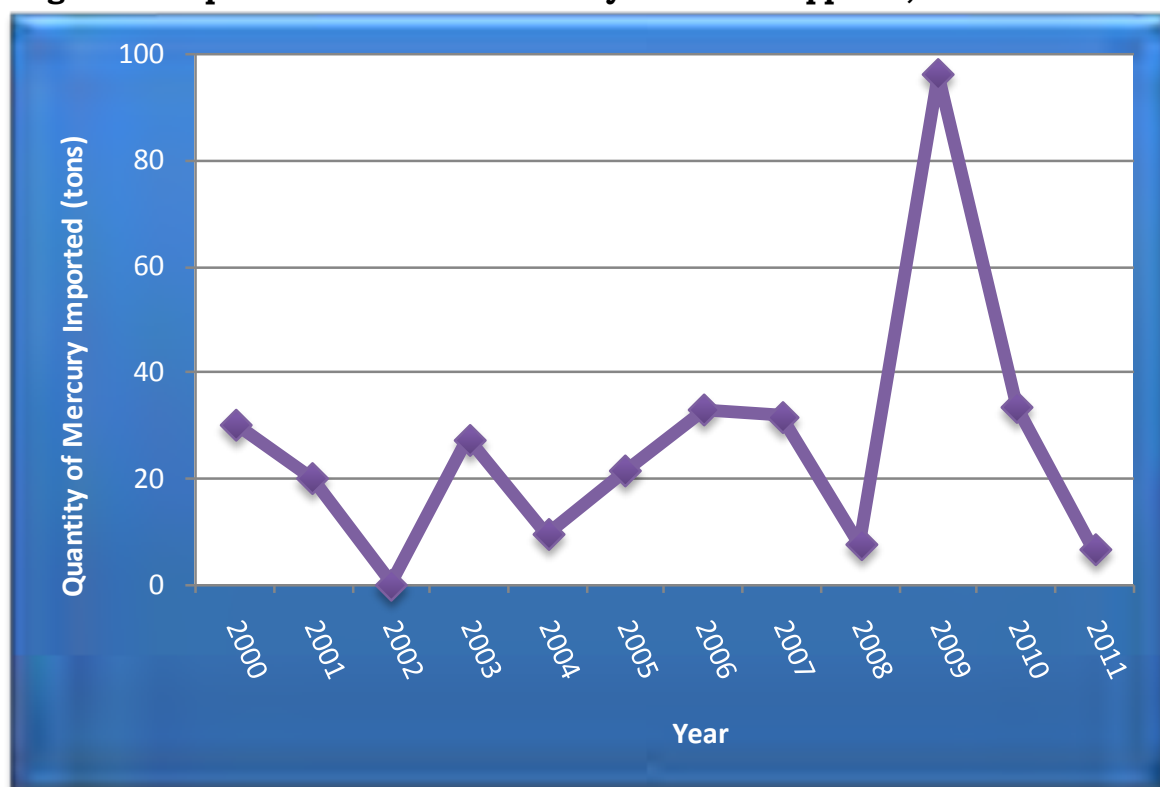
- ❖ Primary mercury from mercury mines
- ❖ Residual mercury from decommissioned chlor-alkali facilities
- ❖ Recycled or recovered mercury from mercury-containing products and wastes
- ❖ By-product mercury from other resource extraction operations



Majority of the global mercury demand is supplied by active mercury mines in Algeria, China, and Kyrgyzstan, and from leftover stock from closed mines in Spain and the United States (US). Mercury exported by the US is also extracted as by-product from gold mining operations and from decommissioned chlor-alkali plants.

In the Philippines, primary mercury was extracted from mines in the island province of Palawan from 1955 to 1976, with an annual estimated production of 140 tons. However, since its shutdown, the country’s mercury supply now relies heavily on imports from the US, Spain, China, and Germany. According to the data from the United Nations Statistical Division – Commercial Trade, the Philippines has imported over 300 tons of elemental mercury from 2000 to 2011, amounting to a total trade value of US\$ 4 million.<sup>[6]</sup> Figure 2 presents the annual breakdown of elemental mercury imports in the Philippines.

**Figure 2. Imports of Elemental Mercury in the Philippines, 2000 to 2011** <sup>[6]</sup>



A significant decline in mercury imports from 2009 to 2011 can be noted. This could be attributed to the enforcement of the export ban of mercury from the European Union in 2011. However, excluded from the data are imports from illegal mercury trade, which is still unaccounted. Field investigations revealed that most of the mercury in mining operators have untraceable sources, even more so with local miners being reluctant to disclose any information on the origins of their imported mercury. According to reports, countries that import greater quantities of mercury than what is needed for legal uses sell the excess amounts to miners through the black market. <sup>[6],[30]</sup> Tracking of mercury trade and supply thus becomes challenging.

Aside from elemental mercury, mercury legally imported as amalgam for dental applications has become a secondary source of mercury in the country, specifically for artisanal and small-scale gold mining (ASGM). Composed of fifty percent (50%) mercury, dental amalgam is one of the major applications of mercury that is exempted from the obligations and restrictions of DENR Administrative Order (AO) 1997-38, otherwise known as the Chemical Control Order (CCO) for Mercury and Mercury Compounds.

Other substantial sources of mercury in the Philippines come from impurities in the raw material used in power generation; cement and lime production; chlor-alkali decommissioning; and by-product mercury from the refining or processing of ferrous and non-ferrous metals.

*According to UNEP, mercury used in dental amalgam constitutes 10 percent of the global mercury consumption, making it the leading consumer use of mercury in the world. It is estimated that 300 to 400 MT of mercury is consumed per year from dental amalgam.<sup>[48]</sup>*

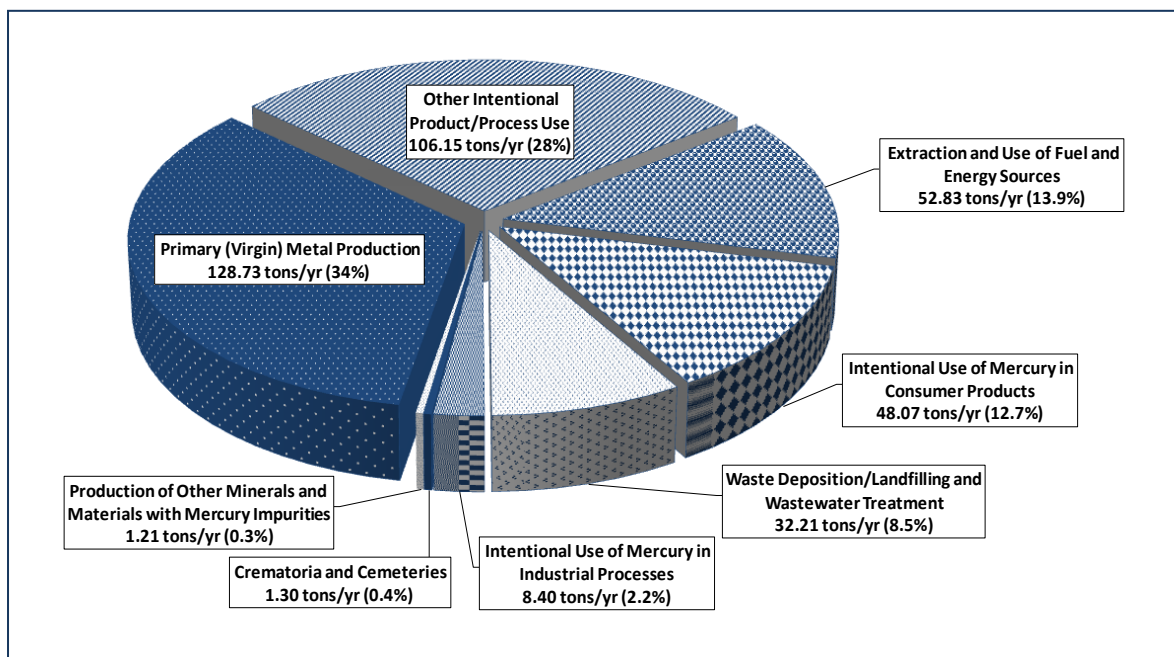
*In 2010, a study on the use of mercury in ASGM in the Philippines<sup>[4]</sup> found that, in some mining areas, mercury is sold in retail stores for PhP 4 to PhP 10 per gram. However, interviews with local miners revealed that mercury is mostly purchased from dental clinics, which aside from supplying the metal, also operate as gold buyers. The study further revealed that the exemption of dental amalgam to the requirements of DENR AO 1997-38 has resulted in the proliferation of dental clinics that supply mercury for gold mining.*

### **2.1.2 Sources of Mercury and Mercury-Containing Wastes and their Release into the Environment**

In 2008, the Environmental Management Bureau (EMB) of DENR conducted an inventory assessment for the identification and quantification of mercury releases in the country.<sup>[28]</sup> The report includes a list of the main and sub-category sources of mercury in the Philippines and the estimated annual releases from each source. Using the UNEP Inventory Toolkit, an input factor is used to calculate for the estimated amount of mercury emissions to the environment.

The inventory revealed that approximately 378.89 tons of mercury and mercury-containing wastes are released annually into various environmental media. Eight (8) main sources, comprising twenty-three (23) sub-categories, of mercury and mercury-containing wastes were identified and their individual contributions are presented in Figure 3.

**Figure 3. Main Sources of Mercury and Mercury-Containing Wastes in the Philippines [28]**



Based on the data, the most significant anthropogenic sources of mercury come from the mining and energy sectors. Emissions from primary (virgin) metal production accounts for 128.73 tons or thirty-four percent (34%) of the total amount of mercury released per year. This is followed by intentional uses of products or processes, which disposes 106.15 tons or 28 percent of the total mercury waste annually; and the extraction and use of fuel and energy sources, which produces almost fourteen percent (14%) or 52.83 tons of mercury waste annually.

The twenty-three (23) sub-categories of the eight (8) main sources of mercury and mercury-containing wastes, are presented in Table 4, together with their calculated estimated emissions to the environment. Specifically, the primary contributors to mercury and mercury-containing wastes in the country are from unintentional releases in artisanal gold and silver mining with 113.49 tons per year, end-of-life (EOL) of laboratory chemicals and equipment containing mercury with 65.50 tons per year, and geothermal power generation with 46.37 tons per year. Other sources of mercury waste include intentional uses of industrial processes and consumer products (e.g., chlor-alkali production, thermometers, and fluorescent lamps); landfilling and wastewater treatment; crematoria and cemeteries; and production of other minerals and materials with mercury impurities.

**Table 4. Main and Sub-category Sources of Mercury and Mercury-Containing Wastes in the Philippines [28]**

Category Source	Subcategory Source	Mercury Emitted/Released (tons/year)
Extraction and Use of Fuels/Energy Sources	Coal combustion	5.39
	Extraction, refining, and use of mineral oil	0.22
	Use of natural gas	0.85
	Geothermal power production	46.37
Primary (Virgin) Metal Production	Gold and silver production	113.49
	Copper extraction and initial processing	0.248
	Lead extraction and initial processing	15.00
Production of Other Minerals and Materials with Mercury Impurities	Cement production	1.20
	Pulp and paper production	0.006
	Lime production	0.003
Intentional Use of Mercury in Industrial Processes	Chlor-alkali production	8.40
Intentional Use of Mercury in Consumer Products	Thermometers	0.20
	Electrical switches	0.22
	Double end fluorescent tubes	23.50
	Compact fluorescent lamps (CFL)	2.20
Other Intentional Product/Process Use	Dental mercury-amalgam fillings	17.74
	Manometers and gauges with mercury	0.10
	Laboratory chemicals and equipment with mercury	65.50
	Miscellaneous product uses, mercury metal uses, and other sources (lighthouses)	22.80
Waste Deposition/Landfilling and Wastewater Treatment	Controlled landfills	4.50
	Informal local disposal	8.09
	Wastewater treatment	19.62
Crematoria and Cemeteries	Burial	1.30

Of the total amount of mercury emitted from these sources, almost half is distributed into the air, followed by land and water resources. On the other hand, the remaining mercury and mercury-containing wastes are released either as impurities in products or through sector-specific treatment or disposal.

The initial inventory conducted using the UNEP Inventory Toolkit is a useful exercise for establishing the life cycle of mercury and its wastes in the country. However, while the initial inventory provided the major sources as well as an estimate on the levels of mercury released; the amount and type of wastes generated from the identified processes, products, and uses of such products were not available. Other potential sources of mercury were also not included in the inventory. The issues and drawbacks to the inventory are expounded in the *National Action Plan on Mercury and Mercury-containing Wastes Management* <sup>[21]</sup> and the *Associated Mercury Action Plan for the Philippines*.<sup>[27]</sup>

In addition, there have been several interventions since the conduct of the inventory, including the conduct of independent studies by NGOs such as that presented in Annex 1. Thus, there is a need to re-evaluate and update the inventory assessment to develop an accurate representation of the mercury releases in the Philippines.

## 2.2 MERCURY MONITORING IN THE PHILIPPINES

The release of mercury into the atmosphere, water supply, and soil is a growing concern among government agencies and civil society as mercury is known to be highly persistent in different environmental media. To evaluate the extent of mercury pollution, monitoring programs for mercury and its wastes are required by national laws and regulations in an effort not only to quantify the actual amount of mercury being released into the environment, but also to identify critical areas that could be targeted for control measures. The succeeding subsections present the current monitoring programs being implemented pertaining to mercury.

### 2.2.1 Environmental Monitoring

This subsection provides an assessment of the monitoring of mercury in the environment. Specifically, it presents the current state of mercury pollution based on the results of monitoring and the limitations to the current framework in effectively monitoring the impacts of mercury and mercury-containing wastes.

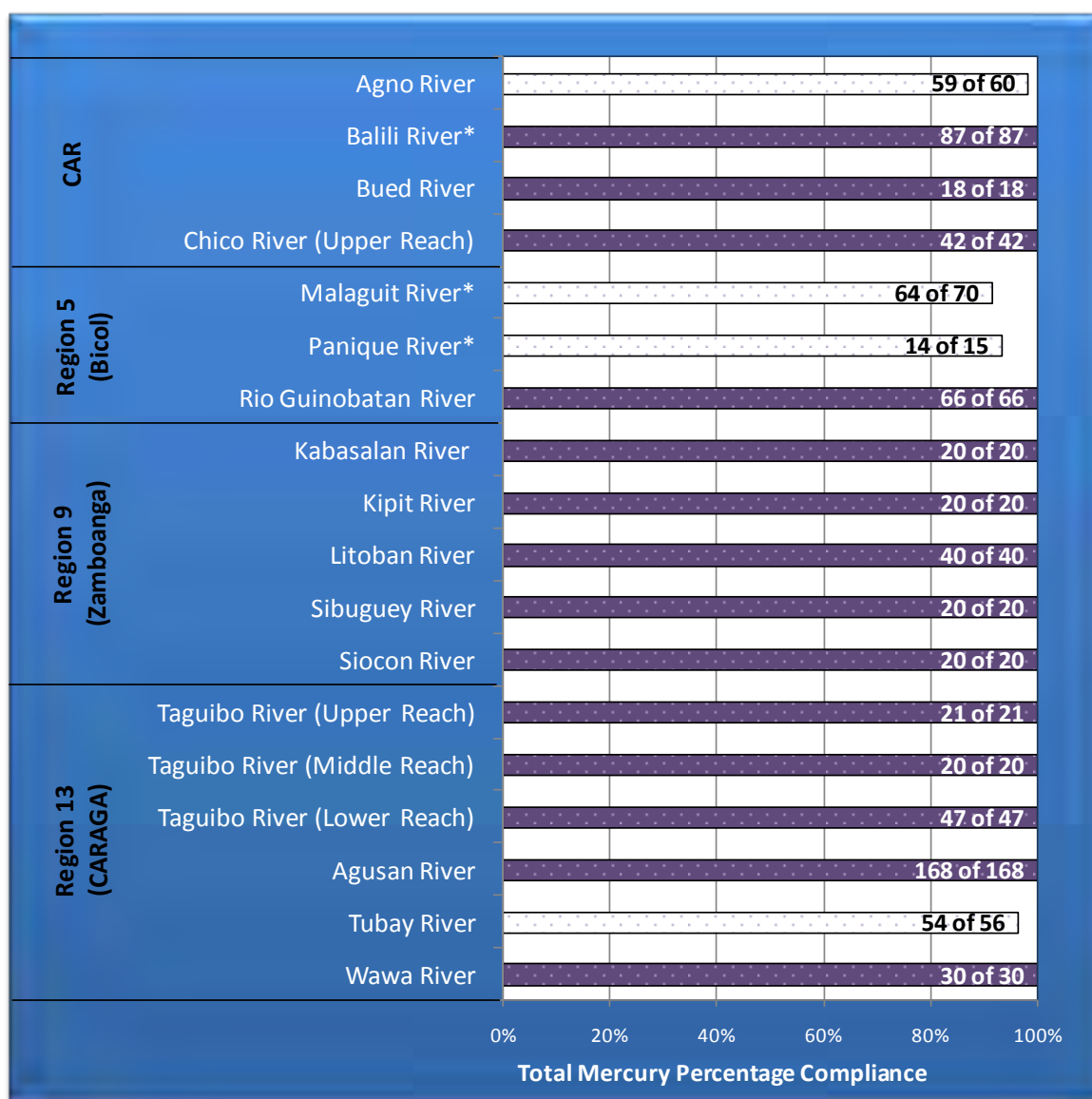
#### ***Water Quality Monitoring***

As reported in the National Water Quality Status Report (NWQSR) (2006 to 2013),<sup>[31]</sup> EMB and its Regional Offices monitored selected water bodies in the country for their mercury content due to their close proximity to mining, electroplating, tanning, and other similar activities. For the eight-year period, sixteen (16) inland surface water bodies were monitored for Total Mercury, which includes both elemental mercury and mercuric salts. Results were then compared to the water quality criterion of 0.002 milligrams per liter (mg/L) established under DENR AO 1990-34, otherwise known as Revised Water Usage and Classification.

The report showed that all monitored water bodies already exhibited traces of mercury. Based on Figure 4, four (4) of the monitored water bodies had less than 100 percent rating or with mercury levels that exceeded the allowable limit, namely: Agno River (98%) in the Cordillera Administrative Region (CAR); Malaguit River (91%) and Panique River (93%) in Region 5; and Tubay River (96%) in Region 13.

Ironically, Agno River and Tubay River are widely used as sources of potable water, whereas Malaguit River and Panique River are classified as priority rivers under the *Sagip Ilog* Program of EMB and are mostly used for fisheries. These results highlighted that mercury is being discharged into the country’s water resources in levels that are deemed detrimental to the environment and to human health.

**Figure 4. Total Mercury Percentage Compliance Rating of Monitored Water Bodies in the Philippines, 2006 to 2013** [31]



Note: The figure presents the number of sampling events that met the water quality criterion (i.e., less than 0.002 mg/L) out of the total number of sampling events conducted.



Aside from EMB, the Department of Health (DOH) has also allocated a substantial amount of funding for the environmental monitoring (air, water, soil, and fish) of mercury, particularly in miners and ASGM communities. In a study, entitled “*Environmental Contamination of Mercury in the Philippines: Its Impact to the Health and the Environment*”<sup>[9]</sup>, DOH studied three major sources of mercury contamination, namely: small-scale gold mining activities utilizing mercury, pollution brought about by mine tailings in a former mercury mine, and a coal-fired power plant. Table 5 presents the mercury levels in drinking water near these sources.

**Table 5. Mercury Levels in Drinking Water <sup>[9]</sup>**

Activity	Total Mercury Concentration (ng/mL)
Small-scale Gold Mining	
Ballmilling/Refining (Sibutad, 2001)	0.009
Mining/Processing (Tagum, 2004)	1.5 – 1.8
Coal-fired Power Plant (Batangas, 2003)	0.001
Coal-fired Power Plant (Batangas, 2004)	1.892
Abandoned Mercury Mines (Palawan, 2004)	0.002 – 0.305
<b>Philippine National Standards for Drinking Water (PNSDW)</b>	<b>1.0</b>

Mercury levels from the mining/processing activities in Tagum have exceeded the PNSDW level for safe drinking water. In addition, within a span of one year, the mercury level in the drinking water of a coal-fired power plant in Batangas rose significantly to ninety percent (90%) greater than the acceptable limit.

Analysis of fish samples collected from these areas have also revealed levels of organic mercury (i.e., methylmercury), the most toxic form of mercury, that have exceeded the recommended limit of 0.3 ppm in the abandoned mercury mines, small-scale gold mining areas, and coal-fired power plant operations. These results, summarized in Table 6, suggested the bioaccumulation of mercury in these waters, which could put nearby communities at risk of exposure to toxic levels of mercury, especially those whose diet included consumption of marine/aquatic products.

**Table 6. Mercury Levels in Fish <sup>[9]</sup>**

Activity	Methylmercury Concentration (ppm)
Small-scale Gold Mining	
Mining/Processing (Tagum, 2000)	0.0071 – 0.378
Mining/Processing (Sibutad, 2001)	0.0038 – 0.036
Ballmilling/Processing (Tagum, 2005)	0.002 – 0.58
Coal-fired Power Plant (Batangas, 2005)	0.003 – 0.0036
Abandoned Mercury Mines (Palawan, 2004)	0.0013 – 0.932
<b>Standard (Japan)</b>	<b>0.3</b>



### ***Air Quality Monitoring***

Aside from the NWQSR, a National Air Quality Status Report is also being prepared on a regular basis to monitor the level of pollutants in the atmosphere. The scope of the report, however, is limited to emissions of particulate matter, sulphur and nitrogen oxides, carbon monoxide, and volatile organic compounds, none of which include mercury. Monitoring data are also based solely on emissions from point sources rather than in the ambient air. This could be due to the fact that there is no standard for mercury emissions in ambient air, while an emission standard for mercury from point sources has already been established at five (5) milligrams per normal cubic meter (mg/Nm<sup>3</sup>) under Republic Act (RA) 8749 or the Philippine Clean Air Act of 1999.

The Occupational Safety and Health Standards (OSHS) of the Department of Labor and Employment (DOLE) prescribes the Threshold Limit Value of 0.01 mg/m<sup>3</sup> for mercury alkyl compounds – Skin and 0.05 mg/m<sup>3</sup> for all forms of mercury except alkyl. Rule 1072 of the OSHS states that to achieve compliance, administrative and engineering controls must first be determined and implemented whenever feasible. When such controls are not feasible to achieve full compliance, protective equipment and other appropriate measures shall be used to keep the exposure of employees to air contaminants within the limit prescribed.

Given that majority of the total volume of mercury in the Philippines is released into the air, priority should be given to the monitoring of mercury levels in the atmosphere since mercury vapors are odorless and colorless, making their dispersion in the environment and in nearby communities less noticeable. A study on monitoring the levels of mercury emissions in various sites across the Philippines is presented in Annex 2.

### ***Soil Quality Monitoring***

Due to the lack of a legal framework, there is no centralized program for soil quality monitoring in the Philippines. Initiatives to monitor the presence of pollutants in soil have mainly been on an *ad hoc* basis or through independent activities carried out by the private sector. Thus, there is a need to enhance the legal infrastructure for soil quality monitoring, beginning with the research and development of soil quality standards.

#### **2.2.2 Public Health Monitoring**

In the same study conducted by DOH<sup>[9]</sup>, the impact of mercury contamination to the health of miners and ASGM communities were monitored. Biological testing of community members within ten (10) kilometres of mercury mines showed that majority of the residents (including adults and children) had elevated mercury levels in their blood that required detoxification and that correlated to mercury levels found in their hair.

Gingival mercury deposits were also found in miners, who were reported to experience impaired breathing and abnormal gait/loss of balance. On the other hand, residents (including workers) were described to exhibit classic symptoms of mercury intoxication, such as fatigue, memory problems, loss of weight, bluish discoloration of the skin, metallic taste, and tremors of the eyelids, lips, and fingers. Other findings of the study are summarized below:

- ❖ Significant positive association between blood mercury levels and the duration of work
- ❖ Blood mercury levels were higher during the initial assessment of residents in abandoned mercury mines since most of those examined were workers in former mercury mining operations
- ❖ Occupationally-burdened populations suffer from chronic mercury intoxication, wherein mercury storage at home may be a risk factor

While similar health studies have been conducted to investigate the effects of mercury pollution due to ASGM, majority of these, however, are shouldered by non-government agencies and the scientific community. These are also limited to communities residing in mining areas, such as in Mt. Diwalwal, where residents were found to have dangerous levels of mercury in their bodies and already showed symptoms of mercury poisoning.<sup>[24],[38],[39]</sup> As such, a nationwide surveillance on the impacts of mercury contamination from the major sources, such as those identified in Section 2.1.2, to public health has yet to be conducted.

Likewise, the health impacts of mercury releases from other source locations, such as hospitals, educational institutions, and industrial plants, are not included, but vulnerable populations in these areas are also at risk of high levels of mercury exposure. In line with this, a framework providing for the nationwide monitoring of public health in terms of mercury exposure is needed.

### **2.3 MERCURY INCIDENTS IN THE PHILIPPINES**

This subsection presents some of the reported incidents arising from the domestic release of mercury. These have helped shed light on the toxic effects of mercury to the public and reinforced the need to address the proper management of mercury and mercury wastes nationwide.

#### ***St. Andrew's School Incident***

On the morning of 16 February 2006, an estimated fifty (50) grams of elemental mercury accidentally spilled during a science class experiment in St. Andrew's School in Parañaque City.<sup>[1],[7],[35]</sup> Eighty students and their science teacher were directly exposed to the toxic substance. However, relevant school authorities were not notified of the incident and no immediate cleanup and decontamination was conducted. It was only during the evening when the University of the Philippines – Manila National Poison Management and Control Center (UP-NPMCC) received a phone call from a 14-year old student complaining of extreme numbness, redness, and pain, and recognized the symptoms of acute mercury exposure, that appropriate actions were taken.

Four (4) days after the incident, 106 students and teachers feared to have been exposed to mercury were brought in for screening by UP-NPMCC. Among those screened, ten (10) students, mostly aged 13, were admitted at the Philippine General Hospital for close monitoring after detectable levels of mercury were found in their blood. These students exhibited symptoms such as fever, skin rashes, respiratory difficulties, chest pains, headaches, and body malaise. Out of the ten (10) students that were hospitalized, one student succumbed to the adverse effects of mercury poisoning and was diagnosed with symptoms similar to Parkinson's disease, high-grade fever, and tremors.<sup>[5],[37],[59]</sup>

Local agencies, including DOH and EMB, contracted international experts from the US Environmental Protection Agency to assist in the assessment and cleanup of the mercury spill and the decontamination of the students and faculty. Meanwhile, the school was temporarily closed until its grounds were deemed safe for use and was reopened months later in June 2006.<sup>[1],[35]</sup> OSHS-DOLE responded to the incident by monitoring the mercury levels in air in the contaminated classrooms and affected areas after the mercury spill and after the post clean up done by a third party.

Though unfortunate, the incident at the St. Andrew’s School helped raised public awareness on the hazards of mercury to public health and the environment. Following the incident, Parañaque Representative Eduardo Zialcita filed a bill proposing the total ban on mercury in public and private schools under the “Safe Schools Mercury Reduction of 2006”, which aims to prohibit the use, purchase, and storage of mercury substances and instruments in all private and public schools and institutions. In November 2006, Department of Education (DepEd) AO 2006-48 was issued to ensure the observance of safety measures in science laboratories in educational institutions.

***Dr. Jose Fabella Hospital Incident***

Another mercury spill was reported on 08 August 2014 at the Dr. Jose Fabella Memorial Hospital (Fabella Hospital) where eighteen (18) vials containing mercury dental amalgam broke inside a storage room adjacent to a pediatric ward. Compared to the St. Andrew’s School incident, the response in the Fabella Hospital was quicker as forty (40) patients were immediately transferred from the ward, thus eluding exposure.<sup>[41],[51],[63]</sup>

Health Assistant Secretary Eric Tayag explained that the large amount of mercury amalgam was still stored in the supply room of the hospital since its disposal required the supervision of DENR. In response, Health Secretary Enrique Ona ordered “a review of the proper and safe storage and disposal of harmful chemicals, particularly, mercury, in hospitals”.<sup>[51]</sup>

According to DOH, 80 hospital personnel and members of the Hazardous Material Unit (HazMat) of the Bureau of Fire Protection underwent blood tests for mercury contamination “as part of the standard operating procedure during a chemical spill”, though results were unavailable. On the other hand, all patient areas monitored for ambient mercury after the cleanup yielded negative results. Within five days, the HazMat team completed the cleanup and recovery of the spilled mercury; but as a safety precaution, the area is temporarily closed for occupancy until declared mercury-free.<sup>[63]</sup>

While there are many other cases of mercury spills in the country, the lessons learned from the events at the St. Andrew’s School and Fabella Hospital have made a profound impact in raising society’s awareness on mercury, whose adverse effects have resonated throughout the country. Since then, inter-agency response to manage mercury and its wastes has steadily increased to prevent similar incidents from occurring.

**2.4 LEGAL AND REGULATORY REQUIREMENTS ON THE MANAGEMENT OF MERCURY AND MERCURY WASTES**

Under Article II, Sections 15 and 16 of the 1987 Philippine Constitution, the government is mandated to protect and preserve the right to health of Filipinos, and the right of the people to a balanced and healthful ecology. This basic policy brought forth a number of environmental issuances geared toward the management of toxic and hazardous substances, including mercury and mercury-containing wastes. These legal policies and regulations relevant to the management of mercury and mercury-containing wastes are discussed hereafter.

**2.4.1 RA 6969: Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990 and DENR AO 1992-29: Implementing Rules and Regulations (IRR) of RA 6969**

RA 6969 is the governing legislation on the management of toxic substances and hazardous and nuclear wastes in the Philippines. It mandates the control and regulation of the import, manufacture, processing, handling, storage, transport, sale, distribution, use, and disposal of chemical substances and mixtures that present unreasonable risk and/or injury to health or the environment, as well as the storage, treatment, and disposal of hazardous and nuclear wastes in the country. It also defines the general requirements on pre-manufacturing and pre-importation, testing of chemicals, exemptions, prohibited acts, and their corresponding fines and penalties.

*A pending Senate Bill – Philippine Hazardous and Radioactive Wastes Management Act intends to amend the hazardous waste component of RA 6969. The Bill aims to strengthen hazardous and radioactive waste management in the Philippines, including wastes from mercury-containing products, through the use of BAT and BEP, and the implementation of market-based instruments, extended producer responsibility (EPR), responsible care, products stewardship programs that shall promote cleaner production, waste minimization and resource recovery.*

To facilitate the implementation of RA 6969, DENR AO 1992-29 was promulgated to provide for the detailed rules and requirements to ensure the proper management of hazardous wastes within the country from importation/generation to treatment and disposal. One of the key provisions of DENR AO 1992-29 is the categorization of hazardous wastes, in which mercury and mercury compounds are clearly defined as hazardous wastes under the category “inorganic chemical wastes”. Thus, facilities and entities with these substances are considered as “hazardous waste generators” and are subject to requirements, such as:

- ❖ Regular reporting of the type and quantity of hazardous wastes generated in the facility
- ❖ Submission of comprehensive emergency contingency plans to mitigate and combat spills and accidents involving chemical substances and/or hazardous wastes
- ❖ Ensuring proper training of personnel and staff on the implementation of the emergency plan as well as the hazard posed by the improper handling, storage, transport, and use of chemical substances and their containers

- ❖ Responsible management of hazardous waste generated in the facility until certified by a DENR-registered waste treater as properly treated, recycled, reprocessed, and/or disposed

DENR AO 1992-29 also prescribes the standards for proper waste storage and labelling, and requires the use of a manifest system during the transport of hazardous wastes.

**2.4.2 DENR AO 1997-38: CCO for Mercury and Mercury Compounds**

DENR AO 1997-38 was issued to control the use and dispersion of mercury into the environment, thereby avoiding its adverse effects to human health and the ecosystem. It applies to the importation, manufacture, processing, use, and distribution of mercury and mercury compounds, as well as to the treatment, storage, and disposal of mercury-bearing or mercury-contaminated wastes in the country.

The issuance of the CCO for Mercury and Mercury Compounds provides more specific requirements for the management of mercury and mercury-containing wastes in addition to the general requirements and procedures stipulated in DENR AO 1992-29. Under DENR AO 1997-38, facilities or entities with mercury and mercury wastes must submit a Mercury Management Plan as part of the CCO registration process. Those that use or purchase mercury for industrial purposes are also required to secure a license from DENR-EMB, while importers of mercury are required to secure an Importation Clearance.

Limitations and restrictions on the usage and disposal of mercury and mercury compounds are also provided in DENR AO 1997-38. Under Section 7, the use of mercury and mercury compounds is strictly limited to the following end-users:

- ❖ Chlor-alkali plants
- ❖ Mining and metallurgical industries
- ❖ Electrical apparatus (lamps, arc rectifiers, battery cells, and others)
- ❖ Industrial and control instruments
- ❖ Pharmaceutical
- ❖ Paint manufacturing
- ❖ Pulp and paper manufacturing
- ❖ Dental amalgam
- ❖ Industrial catalyst
- ❖ Pesticides (fungicide) production or formulation

*There is a need to review and revise this CCO considering the global trend in mercury elimination in consumer products and the more proactive approach in their EOL management.*

Furthermore, DENR AO 1997-38 requires quarterly submission of reports and record-keeping of all transactions with details on the quantity of product supplied and wastes generated. Lastly, it presents provisions on the information, education, and communication (IEC) as well as training requirements. The CCO specifies the collaborative effort among government agencies, industry associations, NGOs, professional organizations, and the academe for the promotion of public awareness on the beneficial use of mercury and mercury compounds along with the accompanying hazards and risks involved in the use of the chemical.



### **2.4.3 DOH AO 2008-21: Gradual Phase-Out of Mercury in all Philippine Health Care Facilities and Institutions**

DOH AO 2008-21 provides the policies and guidelines for a two-year phase-out on the use of mercury in all healthcare facilities pursuant to the provisions of RA 6969, DENR AO 1992-29, DENR AO 1997-38, RA 9275 (Philippine Clean Water Act of 2004), and other relevant laws and regulations. It applies to all health care facilities and institutions, including hospitals, infirmaries, birthing homes, and clinics.

Recognizing the risks posed by the continued use of mercury-containing products, DOH AO 2008-21 sets forth the immediate discontinuation of the distribution of mercury thermometers to patients as part of the hospitals admission/discharge kits. It also requires all hospitals to follow the guidelines for the gradual phase-out of mercury in health care facilities.

For new health care facilities, DOH AO 2008-21 requires the submission of an inventory of all mercury-containing devices to be used and a corresponding mercury elimination program. All health care facilities other than hospitals are also required to make a Mercury Minimization Program based on a set of guidelines set by the Order.

Furthermore, DOH AO 2008-21 requires the designation of the Mercury Management Team under the Hospital Waste Management Committee in all health care facilities. The Mercury Management Team in each health care facility shall have accomplished the following for the first six months of their inception:

- ❖ Conduct of a Mercury Audit of their facility, including assessment of costs of switching to alternative devices
- ❖ Development and management of a Mercury Minimization Program
- ❖ Drafting and implementation of a purchasing policy requiring vendors to sign a mercury-content disclosure agreement that covers products intended for purchase and communicate to suppliers the eventual mercury-free purchasing policy
- ❖ Conduct of a facility-wide information campaign and employee education on the consequences of mercury-use as well as the accomplishment of personnel training on preventing and proper handling of mercury spills
- ❖ Identification and removal of unnecessary practices that promote the use and distribution of mercury-containing medical devices

Lastly, DOH AO 2008-21 sets a clear timeline on the implementation of the phase-out program. It states that, within 24 months from its effectivity, all hospitals should have accomplished the following:

- ❖ Full implementation of the Mercury Minimization Program
- ❖ Switch from mercury-containing devices to alternatives
- ❖ Development and implementation of waste segregation and recycling program to further reduce mercury waste stream for cases where no alternative products exist (e.g. mercury-containing batteries and fluorescent light bulbs)
- ❖ Identification of a mercury collection area within the facility
- ❖ Development of proper temporary mercury storage room in the facility that is not accessible to the public

- ❖ Incorporation of mercury management module in the training program for new personnel
- ❖ Display of information materials on mercury for the benefit of the patients and the general program

**2.4.4 Joint DENR-DOH AO 2005-02: Policies and Guidelines on Effective and Proper Handling, Collection, Transport, Treatment, Storage, and Disposal of Health Care Wastes**

Joint DENR-DOH AO 2005-02 provides the guidelines for the management of biological and hazardous wastes generated from health care facilities. It clarifies the jurisdiction, authority, and responsibilities between DENR and DOH with the aim of harmonizing the efforts of DENR and DOH on proper health care waste management. Handling, collection, storage, and treatment of mercury-containing health care wastes are in accordance with the requirements of RA 6969, RA 8749 (Philippine Clean Air Act of 1999), RA 9003 (Ecological Solid Waste Management Act of 2000), and the revised DOH Health Care Waste Management Manual.

**2.4.5 DepEd AO 2006-48: Observance of Safety Measures in Science Laboratories**

To ensure the safety of students and faculty in science laboratories, DepEd AO 2006-48 requires the strict implementation of the guidelines provided in the laboratory manuals issued by DepEd on the management of hazards and observance of safety measures in the performance of laboratory activities and handling of tools, equipment, and chemicals. In line with this, school officials in all public and private elementary and secondary schools should observe the following:

- ❖ Education and training of the students on the hazards and safe handling and use of equipment and chemicals
- ❖ Implementation of stringent security and safety measures in the use of science laboratories, including the assignment of a full-time laboratory technician or science teacher in charge of the science laboratories
- ❖ Provision of immediate and proper treatment, if needed
- ❖ Reporting of all accidents, regardless of whether or not they result to an injury, to the proper authorities, such as DENR, DOH, Department of Science and Technology, for the expert management of any emergency situation

**2.4.6 DepEd Memorandum Circular (MC) 2010-160: Dissemination of DOH AO 2008-21**

DepEd MC 2010-160 restates the requirements of DOH AO 2008-21 and provides for its immediate dissemination in all public and private elementary and secondary institutions. It particularly highlights the phase-out on distribution and use of mercury thermometers and sphygmomanometers, and mercury-containing batteries and fluorescent light bulbs. Lastly, it calls for the review and/or amendment of DepEd AO 2006-48 to ensure the exclusion of mercury among commonly used chemicals in school science laboratories.



#### 2.4.7 Joint DENR-Department of Energy (DOE) AO 2013-09-0001: Lighting Industry Waste Management Guidelines

Joint DENR-DOE AO 2013-09-0001 was promulgated to regulate the EOL disposal of lighting products that contain mercury, arsenic, and other toxic compounds in accordance with the requirements of RA 6969, RA 9003, and RA 7638 (Department of Energy Act of 1992). It defines the responsibilities for lamp waste producers, importers, distributors, and sellers, as well as the role of the local government in the overall management of lamp wastes. It is the first environmental regulation that anchored on the principle of Extended Producer Responsibility (EPR).

Under Section 4, producers and importers are required to set-up and register with a Lamp Waste Management System Operator as defined by the Order. The Lamp Waste Management System Operator is assigned with the responsibility of preparing, implementing, reviewing, and monitoring the Lamp Waste Management Plan and submitting a database of registered producers as part of the Plan.

In line with this, the Joint AO requires distributors and sellers to limit their purchases of lighting products to registered producers. It also specifies the collaboration among local government units, sellers, and the Lamp Waste Management System Operator in establishing a collection point or consolidation center for lamp wastes in compliance with the requirements of RA 6969 and its IRR.

#### 2.4.8 DENR AO 2013-22: Revised Procedures and Standards for the Management of Hazardous Wastes

DENR AO 2013-22 strengthens the enforcement of hazardous waste management of RA 6969. It expands the classification of hazardous wastes and clearly designates waste electrical and electronic equipment (WEEE) as hazardous wastes (M506). Similarly, “special wastes” (M507) is expanded to include busted lamps from domestic sources; and “mercury and mercury compounds” (D407) is expanded to include wastes with a total mercury concentration above 0.1 mg/L based on the analysis of extract, as well as organomercury compounds.

The DENR AO 2013-22 also provided the regulatory framework for a more transparent implementation of the hazardous waste manifest system through the use of an online database, which allows real-time tracking of hazardous wastes from generator to transporter and treatment, storage, and disposal facilities.

*The Asian Development Bank, through the Philippine Energy Efficiency Project, provided assistance to initiate the implementation of EPR for lighting products; which included setting up of the EPR system, facilitating the formulation and approval of Joint DENR-DOH AO 2013-09-0001, as well as the procurement and pilot testing of a lamp waste recycling facility. Unfortunately, operationalization of the EPR as envisioned by this Order is yet to be realized and is pending compliance by the lighting product producers.*

**2.4.9 DOLE Rule 1070: Occupational Health and Environmental Control and Department Order 136: Guidelines for the Implementation of Globally Harmonized System (GHS) in Chemical Safety Program in the Workplace**

The DOLE Occupational Safety and Health Standards shall apply to all places of employment. Rule 1070 establishes the threshold limit values of mercury. The Department Order 136 requires all chemical-using industries to develop a chemical safety program and labeling in accordance to Globally Harmonized System (GHS) to protect workers and properties from the hazards of chemicals including mercury.

**2.4.10 RA 8749: Philippine Clean Air Act of 1999 and DENR AO 2000-81: IRR of RA 8749**

RA 8749 was enacted to control the release of toxic and hazardous pollutants into the atmosphere, including mercury emissions from stationary sources and non-burn technologies. It includes provisions on the air quality standards for criteria pollutants, as well as the requirements for industrial sources of air pollution.

The National Emission Standards for Source-Specific Air Pollutants establishes the criteria for air pollutants emitted from stationary sources, such as industrial plants and fuel-burning equipment. Under Article 3, an emission standard from stationary sources was set at a maximum allowable limit of 5 mg/Nm<sup>3</sup> for mercury existing as elemental mercury in each identified stationary source.

On the other hand, standards for pollutants in the ambient air are provided under the National Ambient Air Quality Guideline Values (NAAQGV). These values are used for air quality management purposes, such as determining time trends and evaluating stages of deterioration or enhancement of air quality, which in turn, are used as basis for taking positive action in preventing, controlling, or abating air pollution. The current NAAQGV does not have specific guideline values for mercury, but list the values for other criteria pollutants, including suspended particulate matter, sulfur and nitrogen dioxide, photochemical oxidants as ozone, carbon monoxide, and in DENR AO 2000-81, lead.

In addition to setting the air quality standards, RA 8749 encourages the use of non-burn technologies for the disposal of solid wastes in lieu of incineration practices. One way to encourage this is to mandate local government units to promote and implement a comprehensive ecological waste management scheme that includes waste segregation, recycling, and composting. The requirements for non-burn treatment practices are provided in DENR AO 2000-81, wherein 0.05 mg/Nm<sup>3</sup> was set as the maximum allowable limit for mercury compounds emitted from non-burn technologies.

**2.4.11 RA 9003: Ecological Solid Waste Management Act of 2000 and DENR AO 2001-34: IRR of RA 9003**

RA 9003 was promulgated to address the growing concerns on the management of solid wastes in the country, particularly those from the household and commercial sectors. One of the main provisions of this Act is the requirement on the management of household hazardous wastes or “special wastes”. These include wastes from residential and commercial sources that comprise of bulky wastes,

consumer electronics, white goods, yard wastes that are collected separately, batteries, oil, and tires. Examples are paints, thinners, household batteries, lead-acid batteries, and spray canisters.

Since special wastes are possible sources of mercury, these are usually handled separately from other residential and commercial wastes. Hence, local government units are mandated to include the handling and disposal of special wastes in their Solid Waste Management Plan according to the details in RA 9003.

RA 9003 also defines the standards and requirements for solid waste disposal facilities, including material recovery facilities, composting sites, recyclable material facilities, controlled dumps, and sanitary landfills. Moreover, it requires the collaborative effort of local government units and private sectors to undertake the following responsibilities, among others:

- Accurate characterization of wastes and determination of their compatibility with containment features and other wastes
- Proper segregation, storage, and collection of solid wastes
- Inventory of existing markets for recyclable materials, composts, and waste disposal facilities

**2.4.12 RA 9275: Philippine Clean Water Act of 2004, DENR AO 2005-10: IRR of RA 9275, DENR AO 1990-34: Revised Water Usage and Classification, and DENR AO 1990-35: Revised Effluent Regulations of 1990**

The management of toxic and hazardous pollutants in water bodies is covered by the provisions of RA 9275 and its IRR, such as DENR AO 2005-10, DENR AO 1990-34, and DENR AO 1990-35. DENR AO 2005-10 provides for the detailed implementation of RA 9275, while both DENR AO 1990-34 and DENR AO 1990-35 are interim regulations until the revised Water Quality Guidelines (WQG) and General Effluent Standards (GES) are promulgated. Table 7 presents the current criteria and standards for mercury in DENR AO 1990-34 and DENR AO 1990-35, and the proposed values in the revised WQG and GES.

**Table 7. Water Quality Guidelines and General Effluent Standards for Mercury**

Class	DENR AO 1990-34 (mg/L)	Revised WQG (mg/L)	DENR AO 1990-35 (mg/L)	Revised GES (mg/L)	
<b>Inland Water</b>					
<b>AA</b>	0.002	0.001	NDA	NDA	
<b>A</b>	0.002	0.001	0.005	0.002	
<b>B</b>	0.002	0.001	0.005	0.002	
<b>C</b>	0.002	0.002	0.005	0.004	
<b>D</b>	0.002	0.004	NC	0.008	
<b>Marine Water</b>					
<b>SA</b>	0.002	0.001	NDA	NDA	
<b>SB</b>	0.002	0.001	0.005	0.002	
<b>SC</b>	0.002	0.002	0.005	0.004	
<b>SD</b>	NC	0.004	0.01	0.008	

Notes: Values refer to mercury as Total Mercury, which include elemental mercury and mercuric salts  
 NC - No criteria

*NDA – No discharge allowed*

In the revised WQG, the maximum allowable limits for mercury were redefined based on the PNSDW 2007 or DOH AO 2007-12 as well as on new studies on the health and environmental impacts of mercury. In addition, the classification and beneficial uses for some water bodies were changed. On the other hand, the revised GES identified significant effluent quality parameters for each industry. Based on this, sectors that are required to comply with the revised GES for mercury include:

- Gold ore mining
- Coal and lignite mining
- Silver ore mining
- Platinum ore mining
- Copper ore mining
- Chromite ore mining
- Paper and paperboard milling
- Extraction of crude petroleum and natural gas, and support activities
- Manufacture of industrial (compressed/liquefied) gases
- Manufacture of paints, ink, varnishes, and similar coating materials
- Manufacture of synthetic glues and adhesives
- Manufacture of iron and steel
- Manufacture of precious metals
- Non-ferrous smelting and refining, except precious metals
- Non-ferrous rolling, drawing, and extrusion mills
- Manufacture of pipe fittings of non-ferrous metal
- Manufacture of basic precious and non-ferrous metal, not elsewhere classified
- Casting of non-ferrous metal such as aluminum, copper, and zinc alloys
- Manufacture of batteries and accumulators
- Coal power generation
- Geothermal power generation
- Manufacture of gas and distribution of gaseous fuels through mains
- Maintenance and repair of vehicles, their parts and components (excluding vulcanizing/tire-related preparations)
- Scrubbing of flue gases from firing systems

**2.4.13 RA 7076: People’s Small-Scale Mining Act of 1991, DENR AO 2015-03: Revised IRR of RA 7076, and DENR AO 1997-30: Small-Scale Mine Safety Rules and Regulations**

RA 7076 was promulgated to promote, develop, protect, and rationalize viable small-scale mining activities to generate more employment opportunities and provide equitable sharing of the nation’s wealth and natural resources. Small-scale mining is one of the leading sources of mercury emissions and discharges. Although RA 7076 does not have provisions to address mercury releases produced from the mining process, the law requires the registration of small-scale miners and the designation of mining areas that can be utilized.

In line with this, DAO 2015-03 was issued to declare and set aside mineralized areas onshore that are suitable for small-scale mining as the People’s Small-Scale Mining Area or the *Minahang Bayan*. As such, no small-scale mining shall be

undertaken outside a *Minahang Bayan* and without securing a small-scale mining contract or permit. In relation to mercury, DAO 2015-03 prohibits the use of mercury in any phase of small-scale mining.

On the other hand, DENR AO 1997-30 provides the safety precautions and measures that operators of small-scale mines must undertake to ensure safe and accident-free operation. It requires the reporting and record-keeping of accidents, including exposure to toxic substances. DENR AO 1997-30 also sets 0.10 milligrams per cubic meter as the maximum allowable limit of mercury in dusts.

### 3.0 IMPLICATIONS OF ADOPTING THE MINAMATA CONVENTION ON MERCURY AND THEIR ADVANTAGES AND DISADVANTAGES

This section presents an assessment of the advantages and disadvantages of adopting the Convention in the country, and their impacts to the Philippine environment, economy, society, and culture.

#### 3.1 ENVIRONMENTAL

In the Philippines, an annual estimate of 300 tons of mercury is released to the environment. By implementing restrictions on the importation and use of mercury and mercury-containing products, the Convention will reduce the amount of mercury consumption in the country, and therefore, minimize their subsequent release and adverse effects to the environment. Current levels of mercury contamination in water bodies and in the ambient air as highlighted in Section 2.2.1 *Environmental Monitoring of Mercury in the Philippines* will also be addressed through the development of reduction programs required by the Convention.

Moreover, significant sources of mercury and mercury-containing wastes that are not covered by the requirements of existing national laws and regulations (i.e., dental amalgam, mercury emissions in the ambient air) will be regulated by the provisions of the Convention, thus the government capacity to control the anthropogenic mercury emissions and releases over their complete life-cycle will be improved in the Philippines.

*According to the 2013 UNEP Global Mercury Assessment,<sup>[53]</sup> anthropogenic sources account for thirty percent (30%) of the total mercury emitted worldwide. Of these, forty percent (40%) comes from East and Southeast Asia.*

*Among these anthropogenic sources, ASGM and coal-burning are the largest contributors of mercury emissions globally, releasing 727 tonnes and 474 tonnes of mercury into the atmosphere per year.*

*These emissions (as well as releases) into the environment have increased over time. As such, a time lag spanning years or decades is expected before the effects of reductions in mercury emissions become apparent.*

#### 3.2 ECONOMIC

The adoption of the Convention will have several implications on the Philippine economy. Since majority of the country's mercury supply is imported from primary mines abroad, prohibitions placed on new and existing primary mercury mining would eventually limit the global supply of mercury available for importation, resulting to an increase in the price of imported mercury. Stricter importer-exporter requirements and procedures may also incur additional costs for securing of written consents and certifications, especially if either exporting country or the Philippines is not a Party to the Convention.

Another provision for consideration is the impending phase-out of mercury-added products by 2020, manufacturing processes using mercury and mercury compounds listed under the Convention by 2025, phase-down of dental amalgam,



as well as the restrictions imposed on mercury-using processes. Phasing-out or phasing-down of these products and shifting to mercury-free alternatives will require extensive planning and capital cost.

Moreover, there is a need to address the provisions in the Convention on ASGM and point sources of mercury emissions. Imposing restrictions in accordance with the Convention may, in some degree, affect the activities and growth of the economy and incur additional costs to the affected sectors during the transition phase.

On the other hand, the long-term investments on a mercury-free environment may eventually offset the capital expenses in terms of savings from cleanup and decontamination costs. For the latter, although an accounting of cleanup costs in the Philippines is not available, the Philippine News Agency reported that the damages incurred by the mercury spill in the Fabella Hospital storage room alone was estimated to cost about PhP 1 million.<sup>[41]</sup> As for the St. Andrew's School, a similar incident that occurred at the Ballou High School in Washington, D.C. amounted to a total of US\$ 1.5 million in cleanup costs.<sup>[59]</sup>

In terms of decontamination, the only available treatment for mercury exposure is through chelation therapy. This involves the use of chelating agents to remove heavy metals from the body and usually costs around US\$ 3,750 per patient.<sup>[47]</sup> Patients that exhibit tremors and twitches related to the nervous system, such as in the case of the students of St. Andrew's School, are most likely to spend around US\$ 6,000 per year per patient.<sup>[49]</sup> Such expenditures could be avoided with the reduction and eventual phase-out of mercury in the country.

In addition, the ratification of the Convention would provide access to financial support from the international community, such as the Global Environment Facility Fund, in meeting the obligations of the Convention. The country can also benefit from the provision of resources under Article 13 and the information exchange with other member countries under Article 17 on the use of technically and economically viable alternatives to mercury.

*The costs associated with the mismanagement of mercury not only result to financial strain, but also have long-term, and sometimes irreversible, consequences to the lives of the victims and their families.*

*Four years after the mercury spill at St. Andrew's School, one of the students, who succumbed to the severe effects of mercury exposure, filed a case against his science teacher and school officials for negligence and is seeking more than PhP 6 million in damages. Since the incident, he is still suffering from symptoms related to Parkinson's disease and regularly experiences high-grade fever, which causes prolonged episodes of tremors. At first year college, he has reportedly found it difficult to function normally in society and has missed a lot of classes due to his condition.<sup>[3]</sup>*

### 3.3 SOCIO-CULTURAL

ASGM is one of the highest anthropogenic sources of mercury pollution in the country. The preference towards mercury for gold mining is due to its low-cost, quick, and easy process that does not require much qualification among workers.

Thus, operators of gold mining activities and nearby communities are usually unaware of the environmental and health risks associated with mercury exposure and are most prone to contracting mercury-related diseases.

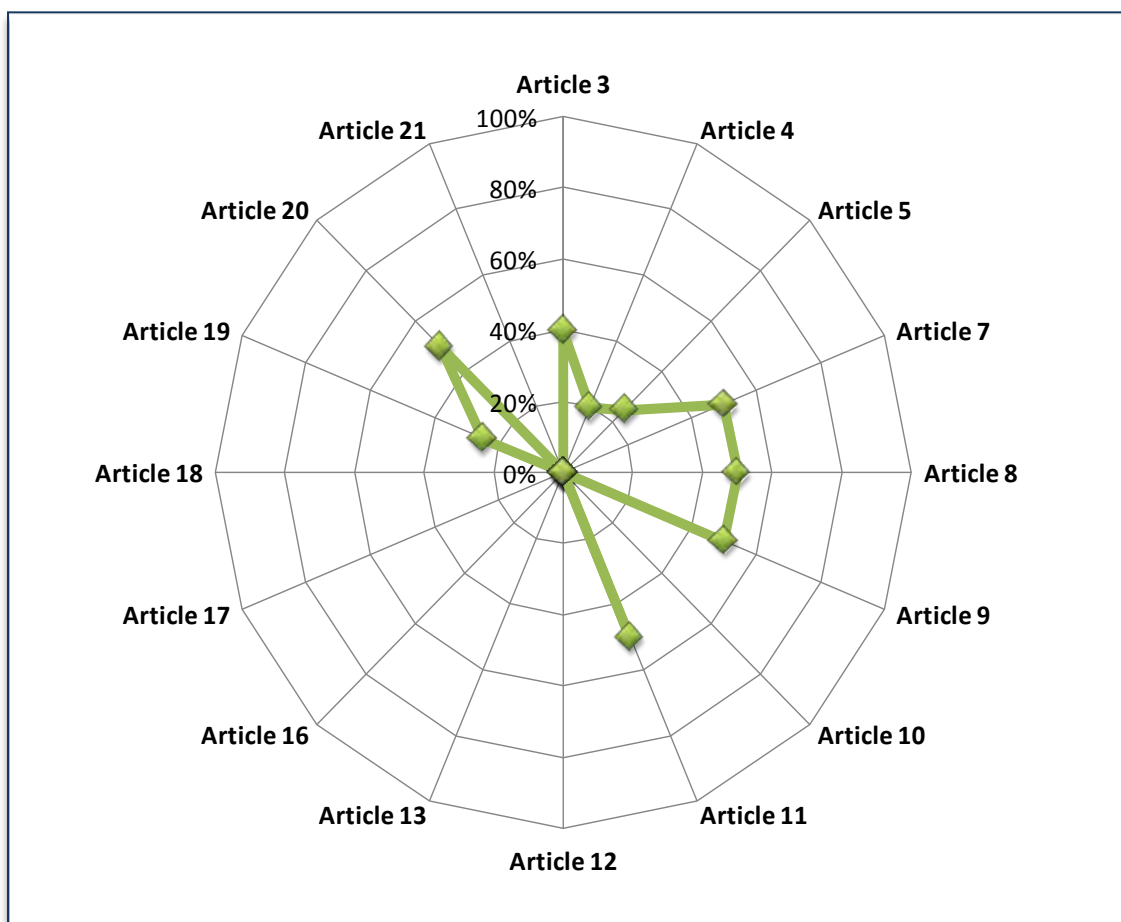
Through education and training, the Convention will therefore increase public awareness on the effects of mercury exposure to human health and the environment, as well as on economically-viable alternatives to mercury and mercury compounds. While public education and awareness is already provided for by existing national policies such as DENR AO 1997-38, the promotion of mercury-free mining has yet to be clearly specified in any national policy. This legal obligation would provide ground to foster a culture of environmental consciousness and facilitate the conversion from mercury-intensive mining to one that will reduce health risks and promote good environment and public well-being.

#### **4.0 OVERALL ASSESSMENT ON THE ADVANTAGES AND DISADVANTAGES OF ADOPTING THE MINAMATA CONVENTION ON MERCURY IN THE PHILIPPINES**

The growing concern over mercury pollution and its hazards to the environment and public health has become a global issue, resulting from the local experiences of affected countries. This was recognized by the Philippines when DENR Secretary Paje signed the Convention last 2013 in the hopes of strengthening actions towards the environmentally sound management of mercury and its wastes.

Currently, the overall readiness of the country in meeting the provisions and legal obligations to the Convention is summarized in Figure 5.

**Figure 5. Overall Assessment of the Readiness of the Philippines in Adopting the Minamata Convention on Mercury**



The existing policies, programs, and regulations have, to some degree, prepared the Philippines in terms of fulfilling the requirements of the Convention. These include the following, among others:

- ❖ Ban on new primary mercury mining and shutdown of existing primary mercury mines (Article 3)
- ❖ Development of a national plan to manage the use of mercury in ASGM (Article 7)
- ❖ Development and implementation of a plan to reduce or control mercury emissions and releases (Article 8)
- ❖ Conduct of an initial inventory on the use, consumption, emissions, and releases of mercury and mercury compounds to the environment (Articles 8, 9, and 19)
- ❖ Legal framework on the environmentally sound management of mercury wastes in accordance to the Basel Convention (Article 11)
- ❖ Development of an implementation plan to meet the obligations under the Convention (Article 20)

Notably, the fulfilment of other requirements of the Convention is dependent on the amendment of DENR AO 1997-38 or the CCO for Mercury and Mercury Compounds. This is particularly the case for the following provisions:

- ❖ Phase-down of dental amalgam (Article 4)
- ❖ Development of guidelines for the environmentally sound interim storage of mercury (Article 10)
- ❖ Identification and assessment of contaminated sites (Article 12) and vulnerable populations (Article 16)
- ❖ Use of BAT and BEP to control mercury emissions and releases (Articles 8, 9, and 19)
- ❖ Development of soil and ambient air quality standards for mercury to expand the monitoring framework and update the initial inventory (Articles 8, 9, and 19)

A more detailed assessment of the legal obligations under each Article in terms of the country's readiness to adopt the Convention is presented in Annex 3.

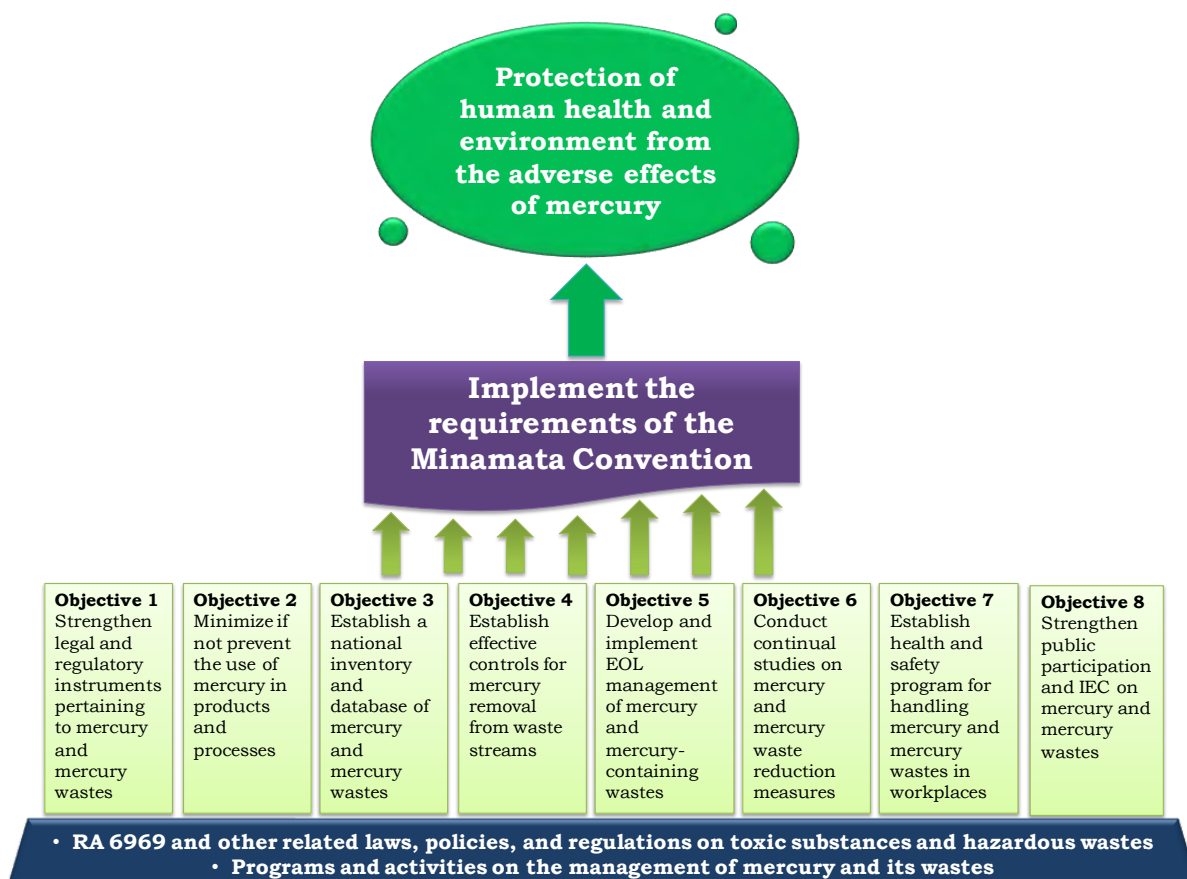
Despite the economic cost to comply with the provisions of the Convention, the long-term benefits of becoming a Party far outweigh the disadvantages. As a country dependent on foreign exchange, being a Party to the Convention and abiding to the international rules associated with mercury management would enable the Philippines to retain its connections with international markets in compliance with the regulations of the World Trade Organization.

Likewise, the Convention is consistent with the country's basic policy to protect and preserve the right to health of Filipinos, and the right of the people to a balanced and healthful ecology. It is also well-aligned with existing regulations and programs on mercury management, reinforcing their implementation as well as addressing gaps or loopholes in their execution. This is especially evident in the alignment of the *National Strategic Plan for the Phase-out of Mercury in Artisanal and Small-Scale Gold Mining in the Philippines* with Article 7 (Annex C) of the Convention, and the provision of the Convention to regulate the use of mercury in dental facilities, academic institutions, and other users that are not covered by the current CCO for Mercury and Mercury Compounds. With the aid of the Convention, the ever-increasing threat of mercury pollution to public health and environment could be minimized or eliminated.

### 5.0 MEASURES IN IMPLEMENTING THE MINAMATA CONVENTION ON MERCURY IN THE PHILIPPINES

Adopting the Convention to the Philippine setting requires strong inter-agency and multi-sectoral collaborations. It entails the cooperation and active participation of government agencies, institutions, industry sectors, NGOs, the academe, and the Filipino public. Formulation of measures to implement the Minamata Convention is anchored on the framework illustrated in Figure 6.

**Figure 6. Framework on the Measures to Implement the Requirements of the Minamata Convention on Mercury**



As indicated, these measures are based on existing legal and regulatory instruments being enforced as well as programs and activities implemented to manage mercury and its wastes. These measures expressed in action plans and strategies were formulated through previously implemented projects of various agencies led by DENR-EMB such as the *National Action Plan on Mercury and Mercury-containing Wastes Management*, *National Strategic Plan for the Phase-out of Mercury in Artisanal and Small-Scale Gold Mining in the Philippines*, and the *National Implementation Plan to Operationalize EPR for Lighting Products in the Philippines*.

The output is a 10-year management plan that will facilitate the integration and implementation of the provisions of the Convention alongside existing national policies amounting to approximately US\$8.9 million. Table 8 presents the summary of the objectives and key actions of the management plan, including the estimated project cost of the listed activities, while the details are presented in Annex 4.

**Table 8. Objectives, Key Actions, and Project Cost on the Management of Mercury and Mercury-Containing Wastes**

Objective and Key Action	Project Cost (US\$ 1,000)
<b>Objective 1</b> – Strengthen legal and regulatory instruments pertaining to mercury and mercury-containing wastes (including mercury-contaminated materials/sites)	1,556
<b>Objective 2</b> – Minimize if not prevent the use of mercury in products and processes	815
<b>Objective 3</b> – Establish a national inventory and database of mercury and mercury-containing wastes (including mercury-contaminated sites)	400
<b>Objective 4</b> – Establish effective controls for mercury removal from waste streams (air, water, sludge, soil)	710
<b>Objective 5</b> – Develop and implement EOL management of mercury and mercury-containing wastes	2,510
<b>Objective 6</b> – Conduct continual studies on mercury and mercury waste reduction measures	742
<b>Objective 7</b> – Establish health and safety program for handling mercury and mercury-containing wastes in workplaces	280
<b>Objective 8</b> – Strengthen public participation and IEC on mercury and mercury-containing wastes	1,982
<b>TOTAL</b>	<b>8,995</b>



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**ANNEX 1  
BEAUTY AND THE RISK:  
A STUDY ON MERCURY CONTAMINATED COSMETICS**

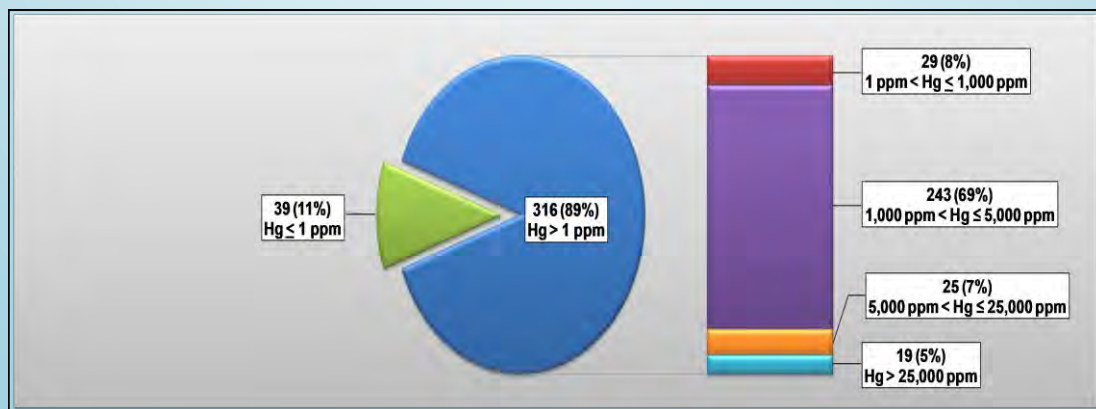
A report recently published by the EcoWaste Coalition in February 2015 assessed the availability and level of mercury found in beauty products being sold in the Philippines without the approval of the Food and Drugs Administration (FDA). Funded by the International Persistent Organic Pollutants Elimination Network, the study appropriately titled, “Beauty and the Risk”, aimed to support the government’s effort to stop the illegal traffic and trade of mercury-added cosmetics in the market in the Philippines and the Association of Southeast Asian Nations to protect public health and the environment in line with the Minamata Convention on Mercury.

Due to limitations of the study, the following products were excluded in the investigation:

- ❖ Products containing other toxic metals or melanin-suppressive ingredients
- ❖ Skin whitening products sold in legitimate business establishments that are authentic and approved by the FDA
- ❖ Skin whitening products sold online

A total of 355 samples procured from November 9, 2014 to February 2, 2015 from various retail outlets (i.e., Chinese drug stores, herbal supplement stalls, beauty product stores, general merchandise shops, and sidewalk or market vendors) in 50 cities were tested for mercury using an Olympus Innov-X Delta handheld X-Ray Fluorescent Spectrometer.

Based on the study, 89 percent or 316 samples contained mercury above the allowable limit of 1 part per million (ppm) set by the FDA. Of these, 243 samples had mercury above 1,000 ppm, 25 samples above 5,000 ppm, and 19 samples above 25,000 ppm. These results are summarized in the figure below.



The report also released the “Dirty Dozen”, a list of the sample products with the highest mercury content, with one product containing an average concentration of 96,000 ppm. Alarming, 41 brands out of 116 skin whitening creams that are banned by the FDA are still being sold in the market, while 26 mercury-laden whitening creams have yet to be banned by the FDA. In addition, the investigation identified cities such as Manila, Baguio, Biñan, Imus, Cebu, Cagayan de Oro, General Santos, and Zamboanga as major trading hubs of mercury-added skin whitening cosmetics that are illegal in the country. The list of the “Dirty Dozen” and the other brands containing mercury is presented below.



Product		Mercury Concentration (ppm)
<b>“Dirty Dozen”</b>		
1	Xuefujaolan Herbal Whitening and Embellish Classic Set (3 small jars)	96,100
2	Beauty Girl 10 Days Double Whitening Speckles Removed Essence	76,800
3	Yu Dan Tang Ginseng and Green Cucumber 10 Days Whitening Speckles Removed Essence	63,100
4	BG Ginseng & Ganoderma Lucidum 6 Days Specific Eliminating Freckle Whitening Sun Block Cream	59,500
5	BG Sea Pearl & Papaya Natural Essence 6 Days Specific Eliminating Freckle Whitening Sun Block Cream	56,000
6	Beauty Girl Egg White and Tomato 6 Days Specific Eliminating Freckle Whitening Cream	48,700
7	Yu Dan Tang Green Cucumber and Ginseng 6-Day Specific Eliminating Freckle Whitening Cream	47,200
8	Feique Herbal Extract Chinese Formula Whitening Anti-Freckle Set	32,000
9	Feique Cucumber Anti-Wrinkle Whitening Set	25,800
10	Feique Rose Refining Nourishing Set	19,500
11	Beauty Excellent Lamb Placenta Whitening and Anti-Aging	12,900
12	Erna Whitening Cream	11,900
<b>Other Beauty Product Brands</b>		
13	BG Sea Pearl and Papaya Natural Essence 6 Days Specific Eliminating Freckle Whitening Sun Block Cream	51,000
14	BG Ginseng and Ganoderma Lucidum 6 Days Specific Eliminating Freckle Whitening Sun Block Cream	46,800
15	Yu Dan Tang Ginseng and Green Cucumber 10 Days Whitening Speckles Removed Essence	43,500
16	Feique Herbal Extract Whitening Anti-Freckle Set	28,800
17	Erna Whitening Cream	8,284
18	Yinni Green Tea Quick-acting Whitener and Speckle Remover Package	6,554
19	Jiaoli Miraculous Cream	4,740
20	S'zitang	4,565

**ANNEX 2  
CHASING MERCURY: MEASURING MERCURY LEVELS IN THE AIR**

In a study conducted by BAN Toxics, mercury emissions in selected areas of the country were monitored using a Lumex RA-915+ Mercury Vapor Analyzer, which can trace mercury in air up to 2 nanograms per cubic meter accuracy (ng/m<sup>3</sup>). Sampling sites were classified according to the following source categories, among others: coal ash, mining, schools, hospitals, dumpsites, government offices, and communities near industrial parks.




Over a six-month period (June 2010 to January 2011), monitoring results of the ambient air revealed traces of mercury in the ambient air, even in areas with no known or alleged mercury use. As presented in the table below, the highest concentrations of mercury were recorded in mining sites, with the mining area in Camariñes Norte having the highest average reading (14,275.3 ng/m<sup>3</sup>). Traces of mercury were also found in educational institutions (mainly from laboratories) and in public hospitals, despite the issuance of Department of Health (DOH) AO 2008-21, which mandates the phase-out of mercury in all health care facilities, and Department of Education (DepEd) Memorandum 2010-160, which reiterates the provisions of DOH AO 2008-21 in educational institutions.











**Average Mercury Vapor Levels in Selected Areas in the Philippines**

Sources	Number of Areas Sampled	Average Reading (ng/m <sup>3</sup> )	
		Minimum	Maximum
<b>Coal-Fired Power Plant</b>	4	12.7	982.4
<b>Mining Areas</b>			
<i>Benguet</i>	9	3.4	3,751.8
<i>Camarines Norte</i>	8	9.0	14,275.3
<i>Romblon</i>	27	5.2	10,196.2
<i>Palawan</i>	9	4.1	299.7
<b>Educational Institutions</b>	8	0.4	9,956.6
<b>Public Hospital</b>	25	4.5	2,442.2
<b>Dumpsites/Landfills</b>	7	12.3	3,137.2
<b>Other Areas</b>			
<i>Government Offices</i>	3	2.6	5.3
<i>Community Near Hazardous Waste Treatment Facility</i>	7	2.7	13.5
<i>Parks and Malls</i>	5	0.2	18.0

**ANNEX 3  
ASSESSMENT OF READINESS OF THE PHILIPPINES IN ADOPTING THE  
MINAMATA CONVENTION ON MERCURY**

**LEGEND:**

-  Legal obligations met
-  On-going initiatives
-  No action taken yet
- N/A Not applicable

Article	Provisions and Legal Obligations	Status
Mercury Supply Sources and Trade (Article 3)	Ban new primary mercury mining	
	Close existing primary mercury mining after a period of 15 years from the date of entry into force of the Convention	
	Conduct inventory of individual stocks: ❖ Mercury and mercury compounds (>50 MT/year) ❖ Mercury supply-generating stocks (>10 MT/year)	
	Environmentally sound disposal of excess mercury from decommissioning of chlor-alkali facilities	
	Ban export of mercury, except to: ❖ Party with written consent for the purpose of either a use allowed by the Convention or for environmentally sound interim storage ❖ Non-Party that with same requirements for a Party, including certification demonstrating the non-Party's capability to protect human health and the environment as well as to comply with Articles 10 and 11	
	Ban import of mercury from a non-Party without certification that the mercury is from sources allowed by the Convention	N/A
Mercury-added Products (Article 4)	Phase-out on the manufacture, import, and export of mercury-added products by 2020 [unless the Party has registered for an exemption under Article 6 (Exemptions Available to a Party upon Request)]	
	<u>Alternative:</u> Indicate the time of ratification of an amendment under Annex A: Part I in which the Party will implement different measures to address its mercury-added products (provided that it has reduced the manufacture, import, and export of these products to a de minimis level)	
	Prevent the incorporation of mercury-added products, whose manufacture, import, and export is prohibited under this Convention, into assembled products	
	Discourage the manufacture and distribution in commerce of mercury-added products that are not covered by any known use of these products prior to the date of entry into force of the Convention (unless an assessment of the risks and benefits of the products has environmental or human health benefits)	
	Implement measures to phase-down the use of dental amalgam, including two or more of the following measures:	



Article	Provisions and Legal Obligations	Status
	<ul style="list-style-type: none"> <li>❖ Set national objectives to prevent dental caries (“tooth decay or cavities”) and promote dental health, thus minimizing the need and use for dental restoration</li> <li>❖ Promote the research and encourage the use of mercury-free alternatives for dental restoration</li> <li>❖ Restrict the use of dental amalgam in its encapsulated form</li> <li>❖ Educate and train dental professionals and students on the use of mercury-free dental restoration alternatives and on promoting best management practices</li> <li>❖ Promote the use of Best Environmental Practices (BEP) in dental facilities to reduce releases of mercury and mercury compounds to water and land</li> </ul>	
Manufacturing Processes in which Mercury or Mercury Compounds are Used (Article 5)	Phase-out the use of mercury or mercury compounds (unless the Party has registered for an exemption): <ul style="list-style-type: none"> <li>❖ Acetaldehyde production (as catalyst) by 2018</li> <li>❖ Chlor-alkali production by 2025</li> </ul>	♦
	Restrict the use of mercury or mercury compounds in the production (Annex B) of: <ul style="list-style-type: none"> <li>❖ Vinyl chloride monomer</li> <li>❖ Sodium or potassium methylate/ethylate</li> <li>❖ Polyurethane (as catalyst)</li> </ul>	♦
	For facilities that use mercury or mercury compounds in manufacturing processes under Annex B: <ul style="list-style-type: none"> <li>❖ Address the emissions and releases of mercury or mercury compounds from these facilities</li> <li>❖ Submit a report, including information on the measures taken</li> <li>❖ Identify facilities within its territory that use mercury or mercury compounds for these processes and submit it within three years after the date of entry into force of the Convention</li> </ul>	♦
	Ban the use of mercury or mercury compounds for manufacturing process under Annex B in new facilities (i.e., did not exist prior to the date of entry into force of the Convention)	▲
	Exchange of information on: <ul style="list-style-type: none"> <li>❖ New technologies / Economically and technically feasible mercury-free alternatives</li> <li>❖ Reduction or elimination techniques for the use and release of mercury or mercury compounds from manufacturing processes under Annex B</li> </ul>	▲
	Discourage the development of any facility conducting mercury-using process that did not exist prior to the date of entry into force of the Convention, unless: <ul style="list-style-type: none"> <li>❖ The process provides significant environmental and health benefits</li> <li>❖ There are no technically or economically feasible mercury-free alternatives available for providing such benefits</li> </ul>	▲
Artisanal and Small-scale Gold Mining (Article 7)	Reduce (or eliminate where feasible) the use and release of mercury and mercury compounds in artisanal and small-scale gold mining and processing (ASGMP)	♦
	If ASGMP is determined to be more than insignificant by	♦

Article	Provisions and Legal Obligations	Status
	the Party: <ul style="list-style-type: none"> <li>❖ Develop and implement a national action plan</li> <li>❖ Submit the plan within three years after the entry into force of the Convention</li> <li>❖ Provide a progress review every three years</li> </ul>	
Emissions (Article 8)	For <u>relevant</u> sources: <ul style="list-style-type: none"> <li>❖ Prepare and implement a national plan to control emissions</li> <li>❖ Submit the plan within four years after entry into force of the Convention</li> </ul>	♦
	For <u>new</u> sources: Use Best Available Techniques (BAT) and BEP to control and, where feasible, reduce emissions within five years after the entry into force of the Convention	♦
	For <u>existing</u> sources: Implement one or more of the following measures in no more than 10 years after the entry into force of the Convention: <ul style="list-style-type: none"> <li>❖ Quantified goal for controlling/reducing emissions</li> <li>❖ Emission limit values for controlling/reducing emissions</li> <li>❖ Use of BAT and BEP to control emissions</li> <li>❖ Multi-pollutant control strategy that would deliver co-benefits for controlled mercury emissions</li> <li>❖ Alternative measures to reduce emissions</li> </ul>	▲
	For <u>all</u> sources: Establish and maintain an inventory of emissions from relevant sources within five years after the entry into force of the Convention	★
Releases (Article 9)	Identify relevant point source categories no later than three years after the entry into force of the Convention	♦
	Prepare a national plan to implement measures to control releases from the identified relevant sources	♦
	Submit the plan within four years of the date of entry into force of the Convention	♦
	Establish and maintain an inventory of releases from relevant sources within five years after the date of entry into force of the Convention	♦
Environmentally Sound Interim Storage of Mercury, other than Waste Mercury (Article 10)	Adopt guidelines on the environmentally sound interim storage of mercury and mercury compounds (excluding mercury waste) in accordance to the Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and their Disposal	▲
	Enhance capacity-building on environmentally sound interim storage of mercury or mercury compounds in coordination with other Parties and relevant intergovernmental organizations	▲
Mercury Waste (Article 11)	Manage mercury waste in accordance to Basel Convention and amendments or additional annexes under Article 27 (Adoption and Amendment of Annexes)	♦
	Recover, recycle, reclaim or directly re-use mercury wastes either for a use allowed to the Party under this Convention or for environmentally sound disposal	♦
	For a Party to the Basel Convention, prohibit the transport	♦



Article	Provisions and Legal Obligations	Status
	of mercury wastes across international boundaries (except for the purpose of environmentally sound disposal)	
	For a non-Party to the Basel Convention, permit the transport of mercury wastes across international boundaries, taking into account the relevant international rules, standards, and guidelines	N/A
Contaminated Sites (Article 12)	Develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds	▲
	Reduce risks posed by contaminated sites in an environmentally sound manner and in consideration of the risks to human health and the environment	▲
	Cooperate in developing strategies and implementing activities for identifying, assessing, prioritizing, managing, and as appropriate, remediating contaminated sites	▲
Financial Resources and Mechanisms (Article 13)	Undertake to provide, within its capabilities, resources in respect of those national activities intended to implement the Convention, in accordance with the Party's national policies, priorities, plans, and programs.	▲
Health Aspects (Article 16)	Promote the development and implementation of the following: <ul style="list-style-type: none"> <li>❖ Programs to identify and protect vulnerable populations</li> <li>❖ Science-based educational and preventive programs on occupational exposure to mercury and mercury compounds</li> <li>❖ Health-care services for the prevention, treatment, and care for populations affected by mercury exposure</li> </ul>	▲
	Establish and strengthen institutional and health professional capacities for the prevention, diagnosis, treatment, and monitoring of health risks related to the exposure to mercury and mercury compounds	▲
Information Exchange (Article 17)	Facilitate the exchange of the following information: <ul style="list-style-type: none"> <li>❖ Scientific, technical, economic, and legal information concerning mercury and mercury compounds</li> <li>❖ Health impacts associated with mercury exposure</li> <li>❖ Reduction or elimination of production, use, trade, emissions, and releases of mercury and mercury compounds</li> <li>❖ Alternatives to mercury-added products, mercury-using manufacturing processes, and processes that emit or release mercury or mercury compounds</li> </ul>	▲
Public Information, Awareness, and Education (Article 18)	Promote to the public: <ul style="list-style-type: none"> <li>❖ Health and environmental effects of exposure to mercury and mercury compounds</li> <li>❖ Alternatives to mercury and mercury compounds</li> <li>❖ Results from research, development, and monitoring activities (Article 19)</li> <li>❖ Information topics under Article 17</li> <li>❖ Activities to meet the obligations of the Convention</li> </ul>	▲
	Use or develop mechanisms (e.g., pollutant release and transfer registers) to collect and disseminate information on estimates of annual quantities of mercury and mercury compounds that are emitted, released, or disposed of through human activities	▲
Research,	Prepare an inventory of the use, consumption, and	◆

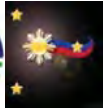
Article	Provisions and Legal Obligations	Status
Development, and Monitoring (Article 19)	anthropogenic emissions and releases of mercury and mercury compounds to the environment	
	Develop and improve the modelling and geographically representative monitoring of levels of mercury and mercury compounds in vulnerable populations and in environmental media	▲
	Assess the impact of mercury and mercury compounds on human health and the environment, including social, economic, and cultural impacts vulnerable populations	▲
	Research information on the following: <ul style="list-style-type: none"> <li>❖ Environmental cycle, transport, transformation, and fate of mercury and mercury compounds in various ecosystems, as well as in commerce and trade</li> <li>❖ Technical and economic viability of mercury-free products and processes</li> <li>❖ BAT and BEP to reduce and monitor emissions and releases of mercury and mercury compounds</li> </ul>	◆
Implementation Plan (Article 20)	Option to develop, review, update, and execute an implementation plan to meet the obligations under the Convention	◆
	Option to consult and coordinate with national stakeholders to facilitate the development, implementation, review, and update the plan	◆
Reporting (Article 21)	Report the following: <ul style="list-style-type: none"> <li>❖ Measures taken to implement the provisions of the Convention, their effectiveness, and possible challenges</li> <li>❖ Information under Articles 3, 5, 7, 8, and 9 of this Convention</li> </ul>	▲



## Mercury Waste Management in the Philippines and Update on the Ratification of the Minamata Convention

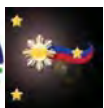


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Chief, Hazardous Waste Management Section  
Environmental Quality Management Division  
Environmental Management Bureau



## Outline of Presentation

- Current Legal and Regulatory Framework
- Projects/Programs/Initiatives
- Update on the Ratification of the Minamata Convention on Mercury in the Philippines

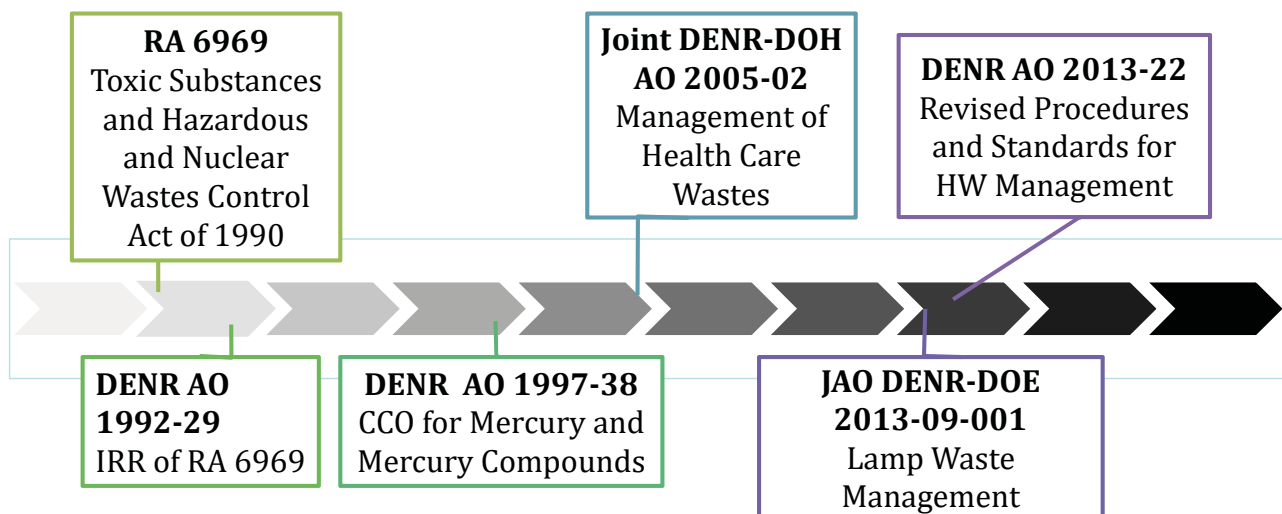




## CURRENT LEGAL AND REGULATORY FRAMEWORK

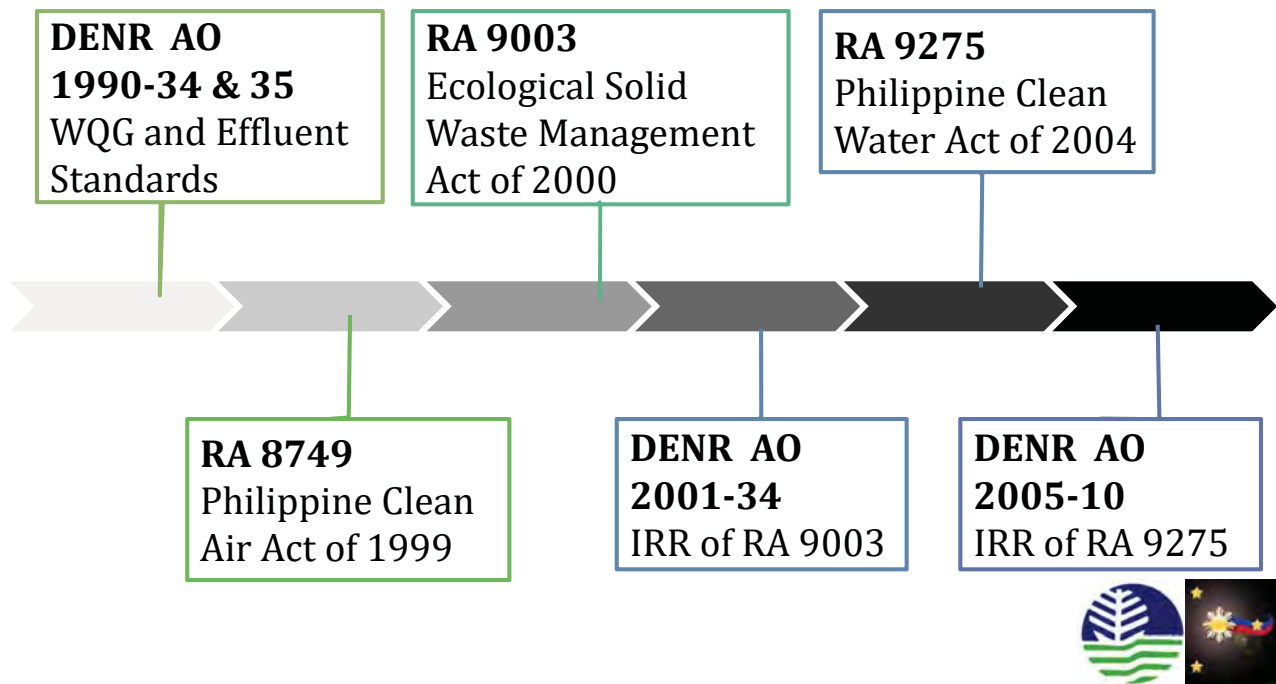


## Legal and Regulatory Framework





## Legal and Regulatory Framework



## Republic Act 6969 Toxic Substances and Hazardous and Nuclear Wastes Control Act

**The Act directs the Department of Environment and Natural Resources (DENR) to establish rules, regulations, and programs for controlling chemical substances and hazardous wastes in the Philippines.**



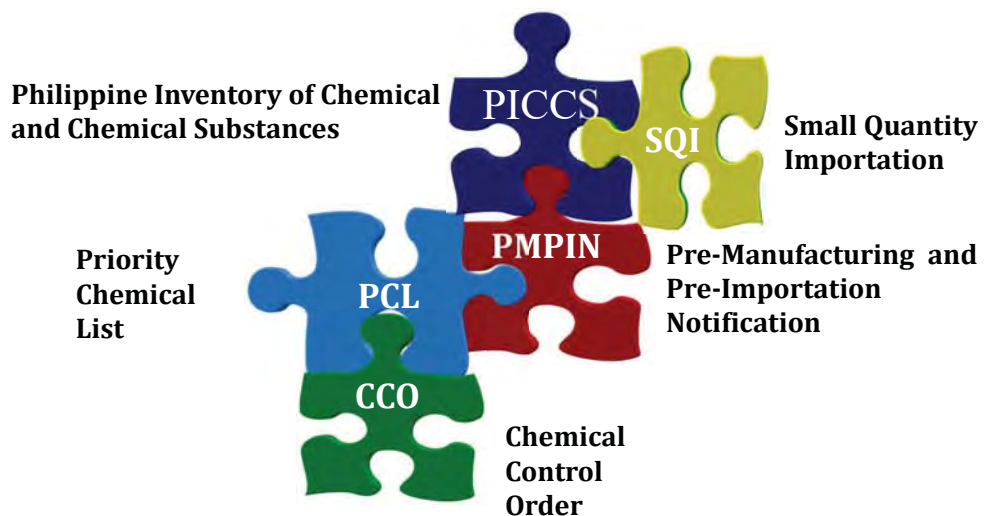


# Department Administrative Order (DAO) 1992-29 (Implementing Rules and Regulations of RA 6969)

- ☀ **Chemical Management (Title II)**
- ☀ **Hazardous Waste Management (Title III)**



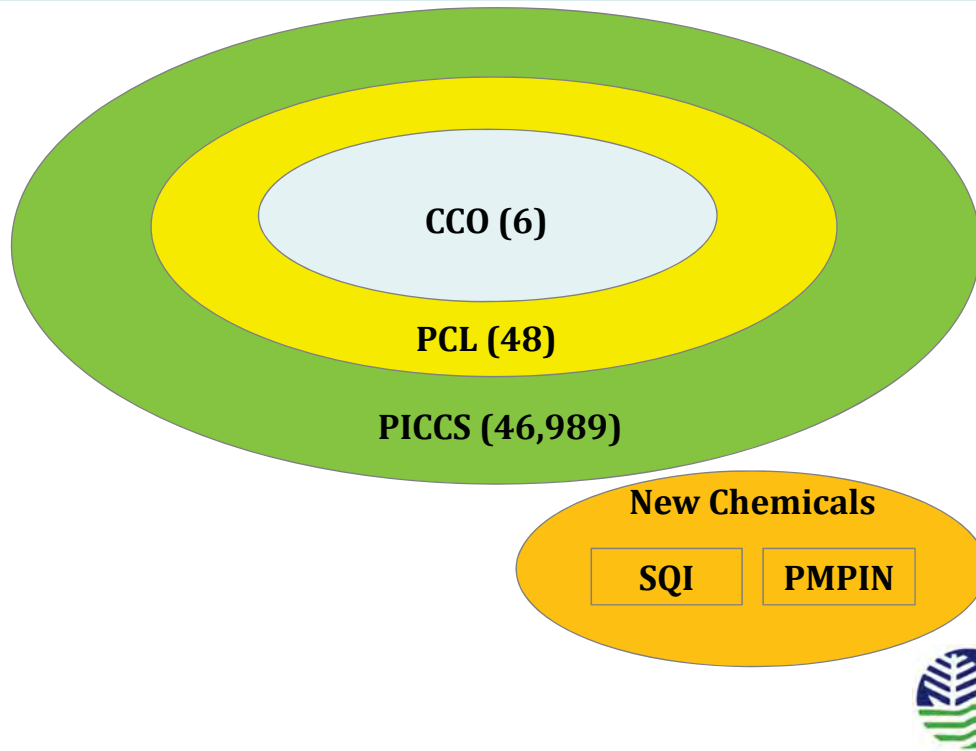
## Title II: Management of Chemicals and Toxic Substances







## Title II: Management of Chemicals and Toxic Substances



## Chemical Control Order (CCO)



- **Mercury & Mercury Compounds (DAO 1997-38)**
- **Cyanide & Cyanide Compounds (DAO 1997-39)**
- **Asbestos (DAO 2000-02)**
- **Ozone Depleting Substances (DAO 2000-18 / DAO 2004-08)**
- **Polychlorinated Biphenyls (DAO 2004-01)**
- **Lead and Lead Compounds (DAO 2013-24)**





## DAO 1997-38

# CCO for Mercury and Mercury Compounds

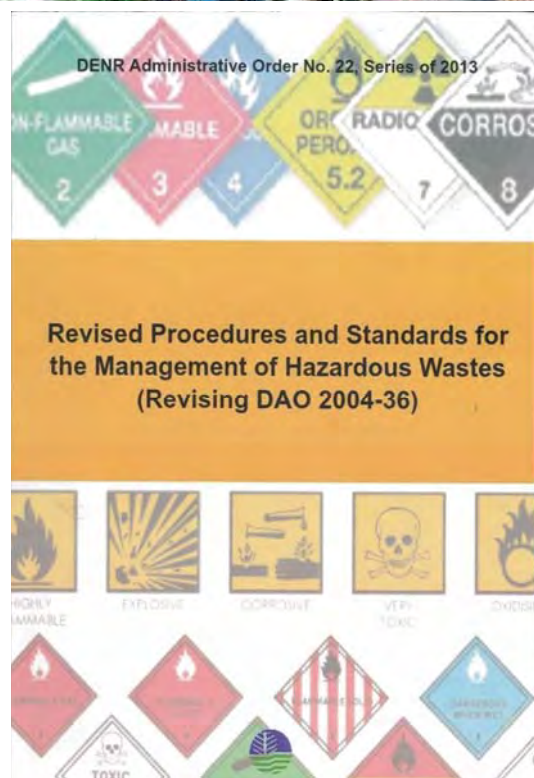
Under Section 7, the use of mercury and mercury compounds is strictly limited to the following end-users:

- ❑ Chlor-alkali plants
- ❑ Mining and metallurgical industries
- ❑ Electrical apparatus (lamps, arc rectifiers, battery cells, and others)
- ❑ Industrial and control instruments
- ❑ Pharmaceutical
- ❑ Paint manufacturing
- ❑ Pulp and paper manufacturing
- ❑ Dental amalgam
- ❑ Industrial catalyst
- ❑ Pesticides (fungicide) production or formulation



## Title III: Hazardous Waste Management

**DAO 2013-22  
REVISED  
PROCEDURES AND  
STANDARDS FOR THE  
MANAGEMENT OF  
HAZARDOUS WASTES**





## Classification of Hazardous Wastes

CLASS	WASTE NUMBER
A. Wastes with cyanide	A101
B. Acid wastes	B201 to B299
C. Alkali wastes	C101 to C399
<b>D. Wastes with Inorganic Chemicals</b>	<b>D401 to D499</b>
E. Reactive Chemical Wastes	E501 to E599
F. Inks/Dyes/Pigments/Paint/Resins/Latex/Adhesives/Organic Sludge	F601 to F699
G. Waste Organic Solvents	G703 to G704
H. Organic Wastes	H802
I. Oil	I101-I104
J. Containers	J201
K. Stabilized Waste	K301 to K303
L. Organic Chemicals	L401 to L404
<b>M. Miscellaneous Wastes</b>	<b>M501 to M507</b>



## Classification of Hazardous Wastes

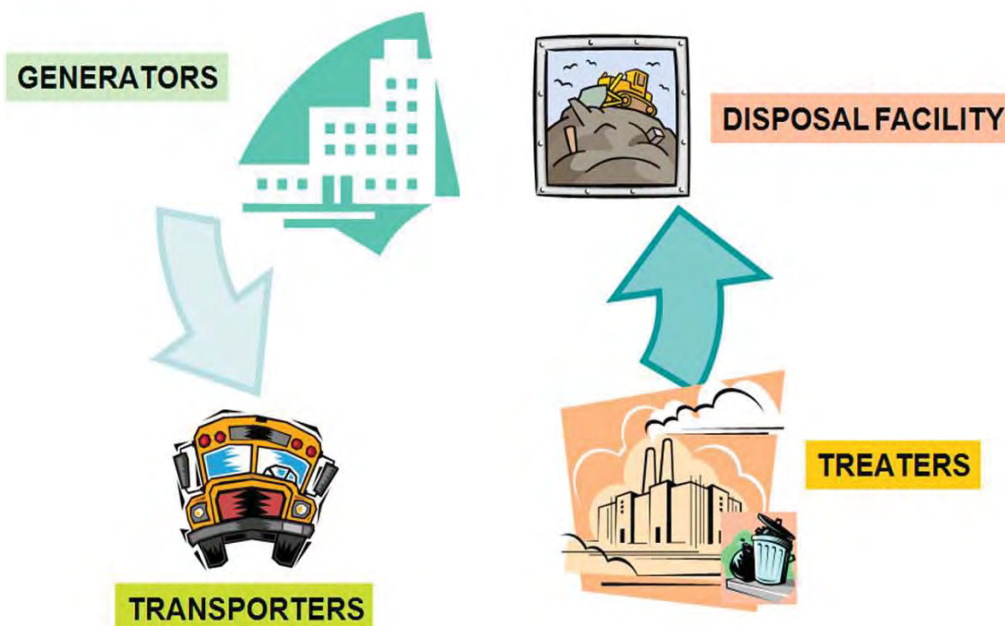
CLASS	DESCRIPTION	WASTE NUMBER
<b>Mercury and mercury compounds</b>	Includes all wastes with a total Hg concentration > 0.1 mg/L based on analysis of an extract. These also includes organomercury compounds. Refer to CCO	<b>D407</b>
<b>Waste electrical and electronic equipment (WEEE)</b>	Include all waste electrical and electronic equipment that contain hazardous components such as lead, cadmium, mercury, hexavalent chromium, polybrominated biphenyls (PBBs) and polybrominated diphenyl ethers (PBDEs) that includes its peripherals i.e., ink cartridges, toners, etc.	<b>M506</b>





## Classification of Hazardous Wastes

CLASS	DESCRIPTION	WASTE NUMBER
<b>Special wastes</b>	<p>Household hazardous wastes such as paints, thinners, household batteries, lead-acid batteries, spray canisters and the like that are consolidated by Material Recovery Facilities (MRFs).</p> <p>These include wastes from residential and commercial sources that comprise of consumer electronics, white goods (i.e. refrigerators, washing machines, air conditioners, etc.) batteries, oil and busted lamps.</p>	<b>M507</b>



## Hazardous Waste Management







## Department of Health Directive

- **DOH Administrative Order No. 2008-0021  
(Gradual Phase-Out of Mercury in all Philippine Healthcare Facilities and Institutions)**
  - Thermometers (December 2009)
  - Sphygmomanometers (December 2010)
  - Guidelines for setting up a proper temporary mercury storage area
  - Specific storage requirements and standards



## Joint Directive of the DENR and the Department of Energy

- **Joint DENR-DOE Administrative Order (JAO 2013-09-0001)  
(Lighting Industry Waste Management Guidelines)**
  - The JAO aims to regulate the end-of-life disposal of lighting products to control the release of mercury and other toxic substances into the environment
  - The implementation of the Extended Producer Responsibility (EPR) for lighting products and the operationalization of a Lamp Waste Management Facility (LWMF) is part of the Philippine Energy Efficiency Project (PEEP) of the DOE





## Executive Order No. 79, s. 2012

- **Institutionalizing and Implementing Reforms in the Philippine Mining Sector Providing Policies and Guidelines to Ensure Environmental Protection and Responsible Mining in the Utilization of Mineral Resources**
  - Section 2: Full enforcement of environmental standards in mining
  - Section 11: Measures to Improve Small-Scale Mining Activities
    - The use of mercury in small-scale mining shall be strictly prohibited.



**PROJECTS/PROGRAMS/INITIATIVES**







## Development of Minamata Initial Assessment (Philippines, Cambodia and Pakistan)

- ❖ **Component 1:** Establishment of Coordination Mechanism and organization of process
- ❖ **Component 2:** Assessment of the national infrastructure and capacity for the management of mercury, including national legislation
- ❖ **Component 3:** Development of a mercury inventory using the UNEP mercury toolkit and strategies to identify and assess mercury contaminated sites
- ❖ **Component 4:** Identification of challenges, needs and opportunities to implement the Minamata Convention on Mercury
- ❖ **Component 5:** Preparation, validation of National MIA report and implementation of awareness raising activities and dissemination of results
- ❖ **Component 6:** Information exchange, capacity building and knowledge generation



## RATIFICATION AND EARLY IMPLEMENTATION OF THE MINAMATA CONVENTION ON MERCURY IN THE PHILIPPINES PROJECT

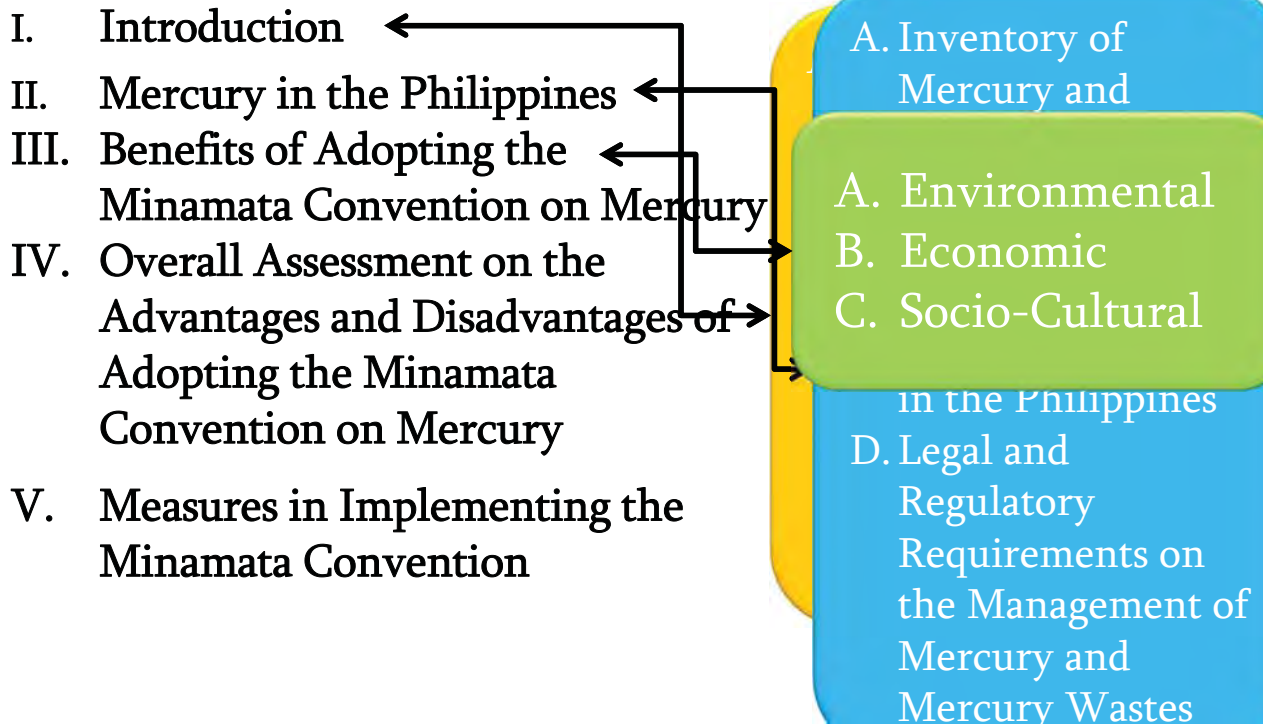
Ratification Dossier comprising of the following:

- a) Legal assessment of the existing legal instruments for mercury in the Philippines
- b) Technical study considering the implications and benefits of ratification
- c) Concise plan of priority areas and actions related to mercury management in the Philippines





## Outline of the Ratification Dossier





## Improve the health and environment and artisanal gold mining communities in the Philippines by reducing mercury emissions

- A formalized ASGM entity to facilitate the reduction of mercury is established.
- Comprehensive health education, techniques, and technology training programs to reduce mercury in ASGM are developed, including mercury surveillance program at the community level to prevent exposure among high risk populations.
- Two replicable pilot projects are implemented with local and national stakeholders. Overall mercury use, emissions, and exposure are reduced at pilot sites.
- Capacity for regional and sub-regional collaboration and coordination to manage and monitor mercury are increased.



## High Risk Practices in ASGM - Philippines



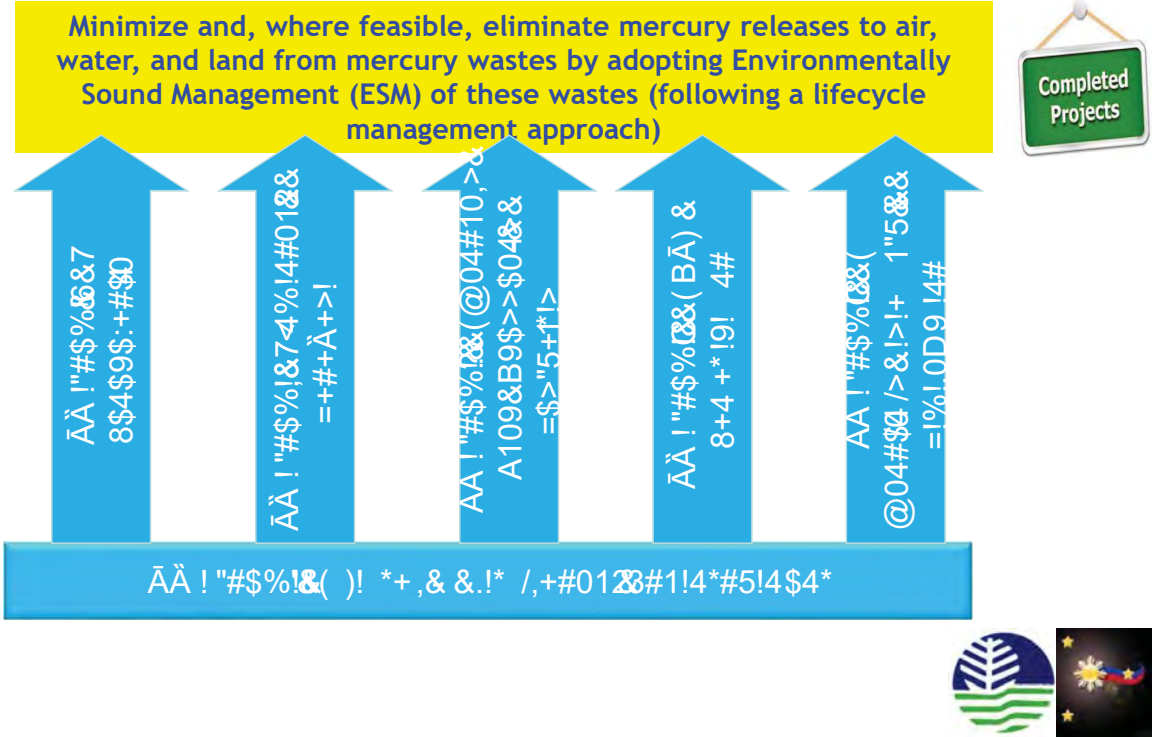
Courtesy of the "Improve the health and environment and artisanal gold mining communities in the Philippines by reducing mercury emissions" Project  
(c/o Ms. Elvira Pausing, Project Coordinator)







## MANAGEMENT OF MERCURY AND MERCURY-CONTAINING WASTES



## National Strategic Plan for the Phase-out of Mercury in ASGM

**Priority Goal, Objectives and Implementation strategies:**

- E Effectively reduce mercury use in the ASGM sector;
- E Develop and implement coherent national policies and regulations;
- E Establish a legal and organized group of ASGM miners with a national constituency and representing the needs of the ASGM sector;
- E Build and strengthen institutional capacity of PMRBs, LGUs and other ASGM support institutions;
- E Enhance cooperation and partnership of all levels among miners, industry sector, NGOs, Church, Academic institutions;
- E Develop and promote the safe handling and long term storage of excess mercury from the ASGM sector.





## Mercury Assessment for the Philippines Using the UNEP Mercury Toolkit

**Top three (3) principal sub-categories releasing mercury in the Philippines are:**



- ❖ Primary Virgin Metal production – 65,927 kg Hg/year (32% of total releases) – ASGM;
- ❖ Extraction and Use of Fuel and Energy Resources – 31,940 kg Hg/year (20% of total releases)
- ❖ Other intentional use – products, e.g. thermometer, etc. – 29,471 kg Hg/year (20% of total releases)

**Over-all mercury emissions are distributed mainly to:**

- ❖ air (45%); land (19%); water (18%); and the rest to general waste and others.



## Philippine Energy Efficiency Project (PEEP)

**Project Components:**



DOE is transforming the lighting industry market by promoting the use of energy-efficient lighting (EELs) products and recognizes that EELs such as fluorescent lamps contain mercury; thus DOE intends to:

- operationalize a Lamp Waste Management Facility (LWMF) that will recovery mercury from lamp wastes
- Implement an Extended Producer Responsibility (EPR) for lighting products

**Collaborative Output:**

Joint DENR-DOE Administrative Order on Lighting Industry Waste Management Guidelines



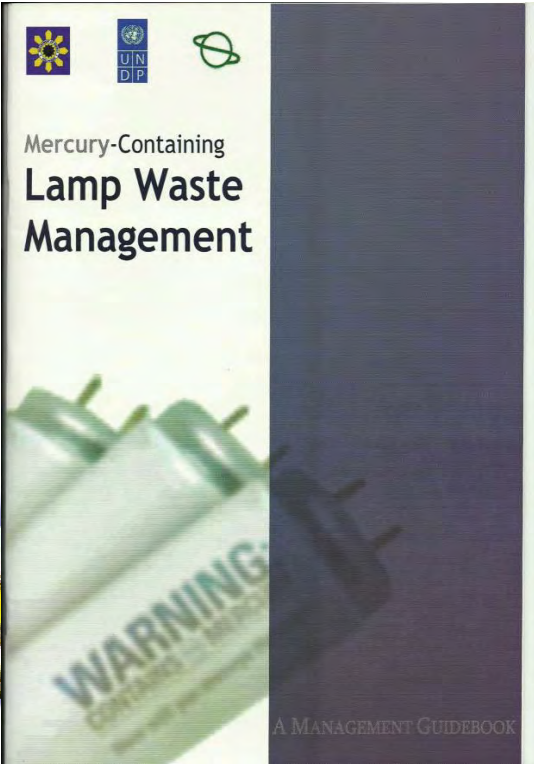


# Philippine Efficient Lighting Market Transformation Project (PELMATP)



### Collaborative Outputs:

- Guidebook on the Management of Mercury-Containing Lamp Wastes
- Poster on the Health and Environmental Effect of Mercury
- Primer on Lamp Waste Management







## Update on the Ratification of the Minamata Convention on Mercury in the Philippines



### Ratification

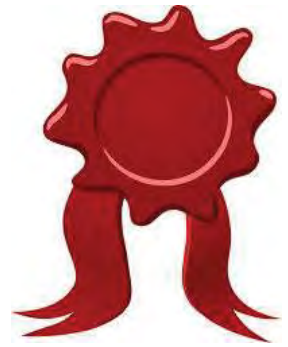
- The ratification process shall follow Executive Order (EO) No. 459, which provides the Guidelines in the Negotiation of International Agreements and its Ratification
- Ratification Dossier and the Certificates of Concurrences will be transmitted to our Department of Foreign Affairs (DFA), which in turn, will submit it to the Senate of the Philippines.





## Status of Submission of Certificates of Concurrence

- |                |   |                    |
|----------------|---|--------------------|
| 1. DOH         | : | March 27, 2015     |
| 2. FPA-OPAFSAM | : | September 1, 2015  |
| 3. DOST        | : | September 24, 2015 |
| 4. DTI         | : | January 12, 2016   |
| 5. OSHC-DOLE   | : | January 22, 2016   |
| 6. DOE         | : | June 14, 2016      |
| 7. BOC-DOF     | : | none yet           |

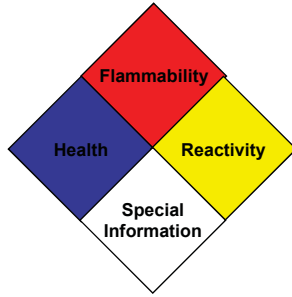


**Let's Save the Future!!!**





# MARAMING SALAMAT PO!!!



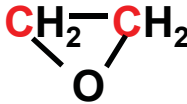
[www.emb.gov.ph](http://www.emb.gov.ph)



Ethylene oxide –  
colorless gas  
(flammable, reactive,  
and explosive)



or







# Health Monitoring Programs on Mercury Exposure

Rodolfo M. Albornoz, MD, MPH  
Medical Officer V, Occupational Diseases Division  
Disease Prevention and Control Bureau



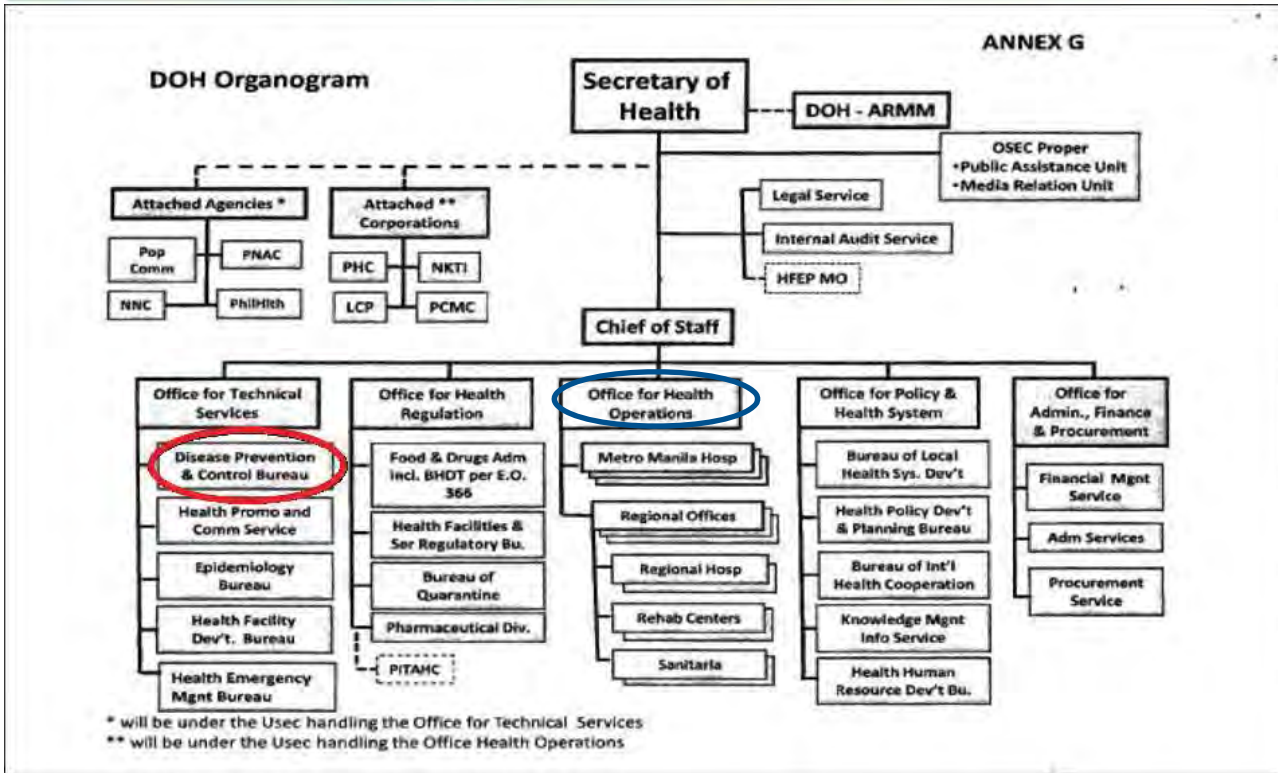
## OUTLINE



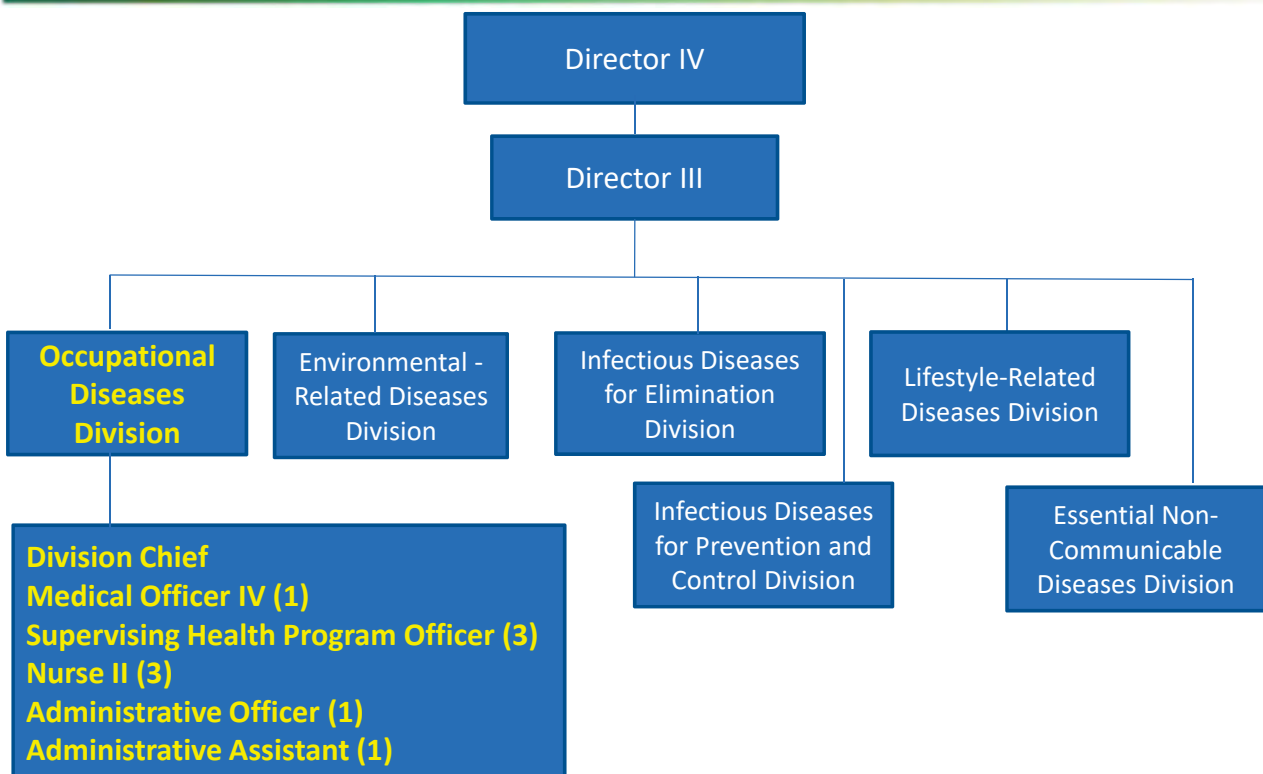
- 1. Department of Health policies/structure**
- 2. Occupational Disease Division  
programs/plans/activities**
- 3. Gaps and Challenges**



# DOH Structure



# Disease Prevention and Control Bureau

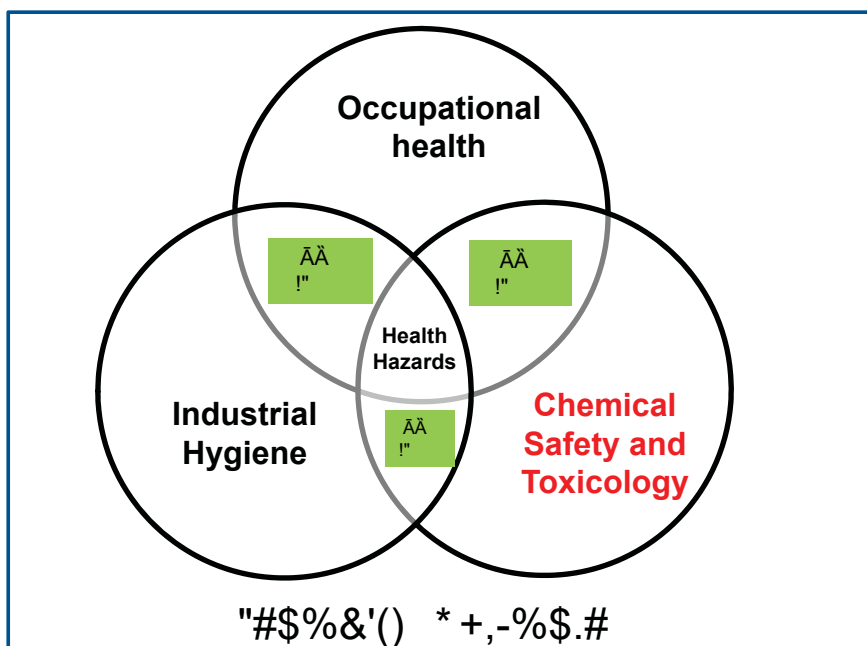




## Functions:

1. Policy/Guidelines Formulation
2. Capacity Building
3. Technical Assistance
4. Research

## Occupational Diseases Division Operational Framework



Legend:  
ISW – Informal Sector Worker  
PHW – Public Health Worker

# Policies/Guidelines Formulation



## Summary of the Ambient Mercury (Hg) Levels in Selected DOH Hospitals in Metro Manila, May, 2007

Mercury Level/Hosp	(A)	(B)	(C)	(D)	(E)	(F)	(G)
< 3 ug/m <sup>3</sup>	2 (5%)	41 (84%)	57 (55%)	82 (65%)	94 (36%)	56 (67%)	37 (45%)
3 - 10	29 (69%)	8 (16%)	29 (28%)	33 (26%)	119 (46%)	28 (33%)	43 (52%)
11-25	11 (26%)	0	5 (5%)	7 (6%)	47 (18%)	0	2
>25	1 (2%)	0	12 (12%)	5 (4%)	1 (0.38%)	0	0
Highest level obtained*	230 ug/m <sup>3</sup> *	8	38	HL**	169	125**	13
Range	<3 – 230	<3 – 8	<3 – 38	<3 - HL**	<3 - 169	<3 - 9	<3 - 13
Total # of sampling sites	43	49	103	127	261	84	82

# Policies/Guidelines Formulation



- / **Administrative Order No. 2008 – 0021** “Gradual Phase-out of Mercury in all Philippine Health Care Facilities and Institutions”
- / **Department Memorandum No. 2011 – 0145** “Guidelines for the Temporary Storage of Mercury Wastes in Healthcare Facilities in Accordance with Administrative Order No. 2008 - 0021 ...”
- / **Department Memorandum No. 2011 – 0149** “Instructions for DOH Healthcare Facilities for the Disposal of Mercury Lamps in Accordance with Administrative Order No. 2008 – 0021 ...”

# General Provisions

- All HCF shall immediately discontinue the distribution of mercury thermometers to patients thru the distribution of hospitals/discharge kits;
- All HCF shall follow the guidelines for the gradual phase-out of mercury in HCF described in this AO in the timeline specified
- All new HCF applying for a license to operate shall submit an inventory of all mercury-containing devices that will be used in their facilities and a corresponding mercury elimination program (MEP)
- All other HCF other than hospital shall make a mercury minimization program based on the guidelines set by this AO.

Inventories of Medical Devices containing Hg including Bulbs (DOH Hospitals at NCR)

	Hospitals	No. of Thermometer *		No. of Bp Apparatus**		Bulbs***	Others
		Intact	Broken	Intact	Broken		
1	Dr. Jose Fabella Memorial Hospital	0	0	15	0	100	5 X 1 kilo bottle, 1/4 lb. bottle X 18
2	Dr. Jose Rodriguez Memorial Hospital	2	0	43	0	280	0
3	Jose R. Reyes Memorial Medical Center	0	0	115	0	0	0
4	Las Pinas General Hospital	0	0	16	0	0	0
5	Lung Center of the Philippines	5	0	51	0	1603	0
6	Naiotnal Center for Mental Health	0	0	30	0	5000	0
7	National Children's Hospital	0	0	25	0	600	0
8	National Kidney and Transplant Institute	0	0	103	0	1365	0
9	Philippine Children's Medical Center	0	0	47	0	5000	0
10	Philippine Heart Center	0	0	209	0	101	0
11	Philippine Orthopedic Center	0	0	26	0	0	0
12	Quirino Memorial Medical Center	0	0	5	0	1500	2 kg
13	San Lazaro Hospital	200	52	59	1	1006	1 small bottle
14	San Lorenzo Ruiz Womens Hospital	5	0	1	0	3	40 ml
15	Tondo Medical Center	0	0	49	0	2000	0
	<b>Total</b>	<b>212</b>	<b>52</b>	<b>794</b>	<b>1</b>	<b>18558</b>	
	<b>Estimated amount of Hg:</b>	<b>636 grams</b>		<b>71,460 grams</b>		<b>222 grams</b>	
	Legend						
	Estimated mercury content/piece:						
	*3 g/unit						

# Policies/Guidelines Formulation



## / **Administrative Order No. 2013 – 0009**

### *“National Chemical Safety Management and Toxicology Policy”*

#### **General Objective**

To formulate an integrated and comprehensive national chemical safety management program that will effectively address the gaps in chemical management in the Philippines

### *“National Chemical Safety Management and Toxicology Policy”*

#### **Specific Objectives**

1. To formulate strategies to minimize the health and environmental risks associated with chemical use, production and trade;
2. To improve the knowledge and awareness of stakeholders on chemical management;
3. To strengthen the governance and coordination of agencies involved in chemical management;
4. To promote capacity-building and technical cooperation among stakeholders;
5. To prevent illegal trafficking of toxic and dangerous chemicals in the country.

# *“National Chemical Safety Management and Toxicology Policy”*

## **STRATEGIC APPROACHES**

- / Capacity Building for Personnel
- / Capacity for Risk Assessment, Reduction, Management and Communication
- / Capacity for Implementation & Enforcement
- / Capacity to Respond to Emergencies
- / Capacity for Rehabilitation of Contaminated Sites
- / Capacity for Surveillance and Treatment of Cases
- / Awareness and Education
- / Research - Evidence-based studies
- / Information Gathering and Dissemination
- / Monitoring & Evaluation

## **Inter-sectoral Partnership**



### **Inter-Agency Committee on Environmental Health (IACEH)**

- / Executive Order No. 489
- Chair: Department of Health
- Vice-Chair: Department of Environment & Natural Resources



# IACEH sectoral partnership



## TOXIC CHEMICALS and HAZARDOUS WASTE SECTOR (Chemical Safety and Health)

**Chair:** Department of Environment & Natural Resources – Environmental and Management Bureau

### Members:

Department of Agriculture (DA) – Fertilizer and Pesticide Authority

DA – Bureau of Fisheries and Aquatic Resources

Department of Finance – Bureau of Customs

DOH – Disease Prevention and Control Bureau

DOH – Food and Drug Administration

Department of Labor & Employment – Occupational Safety & Health Center

Department of Science & Technology (DOST) – Industrial Technology

Development Institute

DOST – Philippine Nuclear Research Institute

# IACEH sectoral partnership



## / Major Sector Programs and Projects:

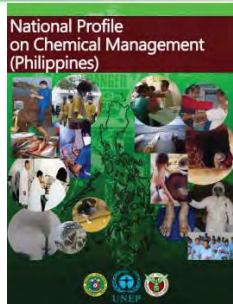
- 0 Research and Development of technology for chemical alternatives/substitutes and treatment of chemical wastes (DOST)
- 0 Conduct of epidemiological studies to estimate the health burden from exposures to chemicals and hazardous wastes (DOH)
- 0 Establishment of guidelines for agency/sector responsibility on overall coordination on reporting chemical incidents, on emergency response among others (DOH)
- 0 Development of guidelines on data management and information dissemination (DENR-DOH)
- 0 Development and/or updating of risk-based standards for chemicals in soil, air, and water resources (DENR)
- 0 Inclusion of Health Impact Assessment in the Environmental Impact Statement requirements (DOH-DENR)



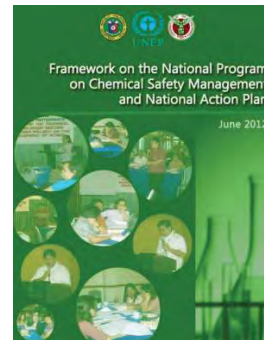
# Policies/Guidelines Formulation



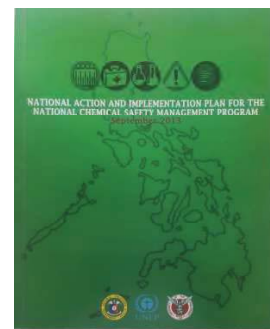
- / National Profile on Chemical Management (2011)



- / Framework on the National Program on Chemical Safety Management and National Action Plan (2012)



- / National Action and Implementation Plan for the National Chemical Safety Management Program (2013)



# Capacity Building

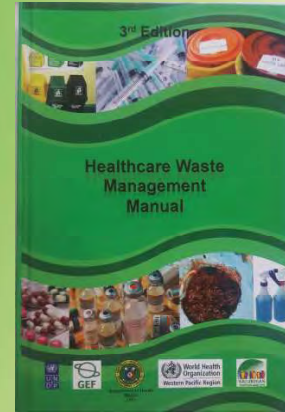


1. Training on Industrial Hygiene
2. Chemical Safety and Toxicology
  - 0 Clinical Toxicology (MDs, nurses, ER personnel)
  - 0 Analytical Toxicology (Medical Technologist)
  - 0 Toxicology Administration (Public Health)
3. Training Course on the Basic Management of Mercury Wastes for Healthcare Workers (2011)

# Basic Management of Mercury (Hg) Wastes for Healthcare Workers

## General Objective

To enable health workers to manage mercury waste in healthcare facilities.



## Specific Learning Objectives:

1. Know the salient points of DOH AO 2008-0021 and other related policies and regulations on the handling and storage of mercury wastes;
2. Recognize the sources of mercury exposure in healthcare facilities;
3. Explain the risks of mercury exposure to health;

# Basic Management of Mercury Wastes for Healthcare Workers

## Specific Learning Objectives:

4. Identify mercury exposure prevention and control measures;
5. Discuss the proper handling and storage of mercury and mercury-containing devices;
6. Discuss & demonstrate the procedures for the following:
  - a. handling and storing *Hg* and *Hg*-containing devices
  - b. managing mercury spills in health facilities
7. Promote the principles of safe hospital practices.



# Information, Education, and Communication (IEC) Materials



## A Guide to the MERCURY PHASE-OUT in HEALTH-CARE FACILITIES



DEPARTMENT OF HEALTH, MANILA, 2010  
(Picture derived from the IOMC Technical Report, May, 2007)



Reprinted by:



Department of Health  
OCCUPATIONAL DISEASE DIVISION  
DISEASE PREVENTION AND CONTROL BUREAU

October 2015

Produced by the Department of Health, Department of  
Agriculture, Department of Science and Technology and  
the Department of Environment and Natural Resources in  
cooperation with the Philippine Information Agency. (1987)

# Technical Assistance



/ Health Assessment during Chemical Emergencies

/ Health Assessment of small-scale miners



# Research



**UNIDO-DOH Project** “Health and Environment of Artisanal Gold Mining Communities in the Philippines by Reducing Emissions”

**Objective:** To determine and compare the levels of mercury in biological and environmental samples collected in small scale gold mining sites before and after transition to an alternative method.

## Expected Outputs:

1. Sociodemographic profile
2. Exposure data
3. Clinical manifestations
4. Levels of biomarkers
5. Environmental monitoring results

**Project Duration:** 3 months

**Project Sites:** (1) Mt. Diwata, Compostela Valley,  
(2) Jose Panganiban, Camarines Norte and  
(3) Pasil, Kalinga Apayao

## Locations of small-scale Gold Mining in the Philippines



# Research



## Monitoring of Blood Hg Levels and Significant Findings\*

Activity	Population	T-Hg (ng/ml)	Me-Hg (ng/ml)	Physical Examination	Findings/remarks
Mining/ processing (Mt. Diwata, 1998)	Workers	0-63	No data	Gingival mercury deposits, thyroid enlargement, impaired breath sounds	Statistical significant positive association of blood Hg levels with the duration of work, eosinophil count, serum glutamic aminotransferase
Mining/ processing (Pantukan, 1999)	30 workers	10 – 120	No data	Poor memory, anosmia and abnormal gait and loss of balance	
Ballmilling/ processing (Tagum, 2000)	162 schoolchildren (5-17 yrs)	0.76 – 56.88	1.36 – 46	Underheight/underweight, gingival discoloration, adenopathy dermatologic abnormalities/neurologic findings	10/163 (6.13%) of the children had elevated T-Hg blood levels. For methyl mercury 1 child exceeded the WHO limit. 5/163 (3.07%) of T-Hg hair levels were elevated while Me-Hg was elevated in 1 child as compared with the WHO criteria

*\*Environmental Contamination of Mercury in the Philippines: Its Impact to the Health and the Environment : Nelia P. Cortes-Maramba, Jose Paciano Reyes, Ana Trinidad Francisco-Rivera, Lynn Panganiban, Carissa Dioquino, Hirokatsu Akagi*

# Research



## Monitoring of Blood Hg Levels and Significant Findings\*

Activity	Population	T-Hg (ng/ml)	Me-Hg (ng/ml)	Physical Examination	Findings/remarks
Mining/ processing (Sibutad, 2001)	38 workers & non-workers 13 children	3.38 – 29.48 2.74 – 14.2	1.63 – 23.11 1.63 – 11.48	Children: frequent cough, dermatological disease, conjunctival pallor Adults: musculoskeletal, headache, abdominal pain and frequent cough	Mercury storage at home may be a risk factor. Elevated hair Me-Hg levels was significantly associated with gastro-intestinal complaints and a trend in association with elevated diastolic pressure
Gold Mining (UNIDO - Mt. Diwalwal, 2001)	150 residents	<0.25 – 107.6	No data	Classic picture of Hg intoxication such as fatigue, tremor, memory problems, loss of weight, restlessness, metallic taste and sleeping disturbance.	More than 70% (73 out of 102) of the occupationally-burdened population suffer from chronic mercury intoxication. In the sub-group of amalgam smelter this percentage is even higher (85.4%) O'Reilly, et.al, 2000)

*Normal Values adopted blood Total Hg for adults (15 ng/g) and children (<7 ng/g)*



# Research



## Monitoring of Blood Hg Levels and Significant Findings\*

Activity	Population	T-Hg (ng/ml)	Me-Hg (ng/ml)	Physical Examination	Findings/remarks
Abandoned Mercury Mines DOH/UP-NPCIS, 1995	12 workers	12.33			Blood THg levels were higher during the initial assessment of residents in the abandoned Hg mines, since most of those examined in the initial study were workers in the former Hg mining operations
British Geological Survey, 2001	168 residents		0 – 39.5		No indication of significant excess exposure as direct consequence of residence on or near the Hg substrate
Abandoned Mercury Mines (Honda Bay, Palawan) DOH/UP-NPCIS, 2004	35 children 35 mothers	1.20 – 52.27 2.58 – 35.37	1.18 – 52.27 2.27 – 28.47	Continuing Hg exposure among residents near the abandoned mine with different exposure pathways	Significantly higher mean biomarkers in the exposed compared with the control. Lower scores in the Denver Development Screening Test II and Screening Behavioral Inventory as early as 6 months of age particularly in fine motor. Low scores in gross motor, personal/social language domains among 1-2 years olds.

# Research



### What is being done?

- / The Department of Environment and Natural Resources (DENR) has formulated environmental regulations to restrict mercury use in the country. The Department of Health (DOH) has regularly conducted health monitoring of the affected community in collaboration with UP-National Poisons Management and Control Center.

### What needs to be done?

- / Exposure to Hg should be minimized by phasing-out certain uses of mercury (e.g. medical, mining, etc)
- / Health and environmental monitoring activities should continuously be undertaken to take into consideration low-dose chronic exposure among the general population and sensitive sub-populations such as pregnant and lactating women including infants and children.

# RESEARCH



## What needs to be done?

- / People should be aware of the toxic effects of mercury to human health even at low doses.
  - / Health advisories should include guidelines on the consumption of fish
  - / Clean and environmental-friendly technology in the extraction of gold from the ore.
  - / Clean-up and remediation should be the primary consideration of mercury contaminated sites. However, it is imperative that preservation and protection of the environment should be the primary objective for developing countries where technology and financial resources are extremely inadequate if not lacking.
- 

## Other on-going activities



- / **Draft Joint Administrative Order regarding Phase-down of Mercury Use in Dental Restoration Procedures**

# Draft Joint Administrative Order regarding Phase-down of Mercury Use in Dental Restoration Procedures

## General Objective

To provide a comprehensive policy direction in the phase-down of Hg-containing dental amalgams in the country.

## Specific Objectives

1. Develop procedural guidelines for the importation, use, handling and disposal of dental amalgam in the country.
2. Provide health and safety guidelines in the handling, use and disposal of Hg-containing dental amalgams among dental workers and students, including patients.
3. Educate and promote awareness among consumers and manufacturers on dental restoration materials.
4. Comply with the provisions promulgated under the Minamata Convention on Mercury on the restrictions in mercury use in dental amalgams.

## Other on-going activities



### / Administrative Order No. 2012-0020

#### *“Guidelines Governing the Occupational Health and Safety of Public Health Workers”*

- 0 Hepatitis B immunization for Public Health Workers (2017)
- 0 Finalization of implementing guidelines on setting-up Occupational Health Programs in Health Facilities

### / Administrative Order No. 2013-0018

#### *“National Occupational Health Policy for the Informal Mining, Transport and Agricultural Sectors”*

- 0 Finalization of implementing guidelines on Occupational Health Services for Informal Sector Workers

# Gaps and Challenges



- / No sustainable monitoring and evaluation of AO 21
- / No Final Disposal and Treatment Facility for Elemental Mercury – c/o DENR
- / Enrollment of small-scale miners to PhilHealth
- / limited data on health of small-scale miners



どうもありがとうございます  
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# Updates on the Small-Scale Mining Act and MGB Efforts Vs the Use of Mercury on SSM Operations

Mines and Geosciences Bureau  
Mining Technology Division



## Presentation Outline

- **What is Small-Scale Mining?**
- **Evolution of SSM Laws and Policies;**
- **Provisions of EO 79 in DAO 2015-03;**
- **Additional Highlights of DAO 2015-03;**
- **Updates on *Minahang Bayan* (MB) proposals filed;**
- **MB Declaration and SSM Legalization Obstacles**
- **MGB Initiatives vs Illegal Mining**
- **MGB Efforts vs the Use of Mercury in SSM Operations**
- **Other MGB Relevant Initiatives vs the Use of Mercury**



## What is Small Scale Mining?

Extraction of minerals that relies heavily on: manual labor using simple implements and methods and does not use explosives or heavy mining equipment

Annual production limit = **50,000 DMT**

Max. Capital = **PhP10 M**

Term of Permit = **2 years**

Total Area = **≤ 20 Has.**



## Evolution of Small Scale Mining Laws and Policies



**PD No. 1150 (June 6, 1977)**

Amending PD No. 581 and **Regulating Panning or Sluicing for Gold Inside Mining Claims or in Public or Private Lands**

**PD 1899 (January 23, 1984)**

**Establishing Small-Scale Mining as a New Dimension in Mineral Development**

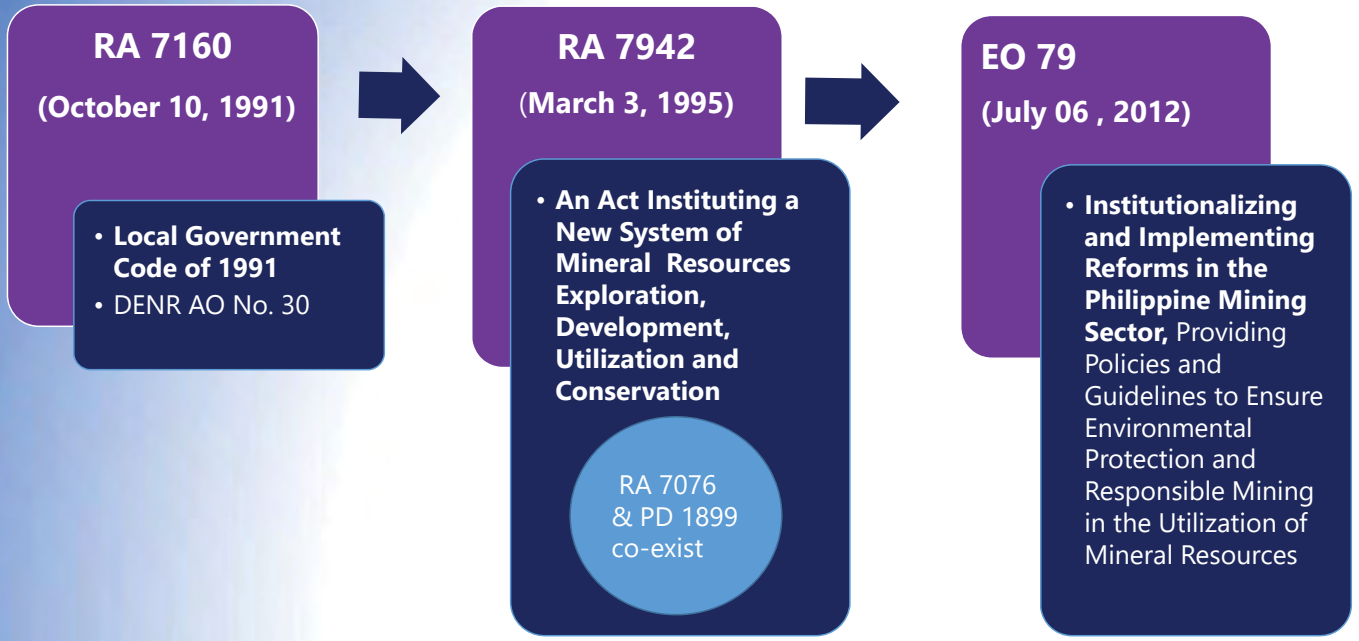
(MRD 41, Series of 1984)

**RA 7076 (June 27, 1991)**

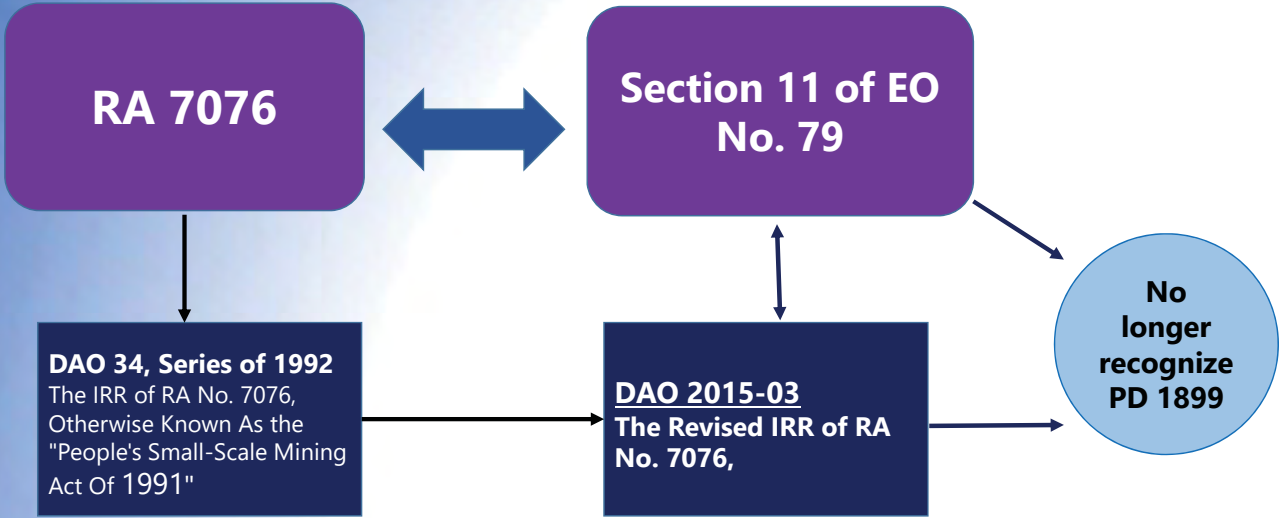
**"The Small-Scale Mining Act"** Creating a People's Small-Scale Mining Program ...

(DAO 34, Series of 1992)

Evolution of ...



Evolution of ...



# Provisions of EO 79 in DAO 2015-03



**I. Small Scale Mining should be confined in Minahang Bayans**

**II. Compliance with RA 7076 and PD 1586 Environmental Impact System (EIS)**

ECC thru and EIS from Environmental Management Bureau

Potential Environmental Impact Report and FMRDP

Community Development Management Program

Envi-Socio Requirements for Small Scale Mining Contract

## Provisions of EO 79 in ...

**III. Creation of P/CMRB where they have not been constituted**

In Provinces and cities where the Board have not been constituted , the said Board will be operationalized

Small-Scale Mining Contracts to be issued by the PMRB





Provisions of EO 79 in ...



**IV. SSM not applicable to metallic minerals except gold, chromite and silver**



Provisions of EO 79 in ...



**V. Hydraulicking and compressor mining methods are prohibited**





Provisions of EO 79 in ...



**VI. The use of mercury in small-scale mining operations is strictly prohibited**



Provisions of EO 79 in ...



**VII. Training and technical assistance to small scale miners**

**VIII. LGU, DENR and MGB shall work together in strictly implementing RA 7076**



[http://i.istockimg.com/file\\_thumbview\\_approve/42584768/3/stock-photo-42584768-tripartite-alliance-three-mixed-hands-linked-in-unity-against-grass.jpg](http://i.istockimg.com/file_thumbview_approve/42584768/3/stock-photo-42584768-tripartite-alliance-three-mixed-hands-linked-in-unity-against-grass.jpg)

## Additional Highlights of DAO 2015-03



**1. Incorporation of the relevant provisions on SSM under Executive Order No. 79**

**2. Making available portions of large-scale mining areas for the declaration of Minahang Bayan**

### DAO 2015-03

**3. Limiting the total term of the SSMC to a maximum period of (6) years.**

**4. Strict imposition of provisions of custom mill(s) in mineral processing zone under a Minahang Bayan.**

## Additional Highlights ...



**5. Imposition of national and local taxes and royalty payment in Mineral Reservations**

**6. Adoption of current regulations on the transport and export of mineral products.**

### DAO 2015-03

**7. Updating the pertinent rates of prescribed fees and charges.**

**8. Adoption of the small scale administrative mechanism with current administrative set up.**



## **PENAL PROVISIONS:**

Violation of any of the provisions of RA No. 7076 or DAO No. 2015-03 shall, after conviction, be penalized with:

- a) **imprisonment of not less than six (6) years; and**
- b) **confiscation and seizure by the Board of the equipment, tools and conveyance**

## Updates on: **MB Proposals Filed**



There are **42 applications** for Minahang Bayan as of 2015.

**Declared Minahang Bayans:**  
**3 Under DAO No. 34**  
**2 Under DAO 2015-03**

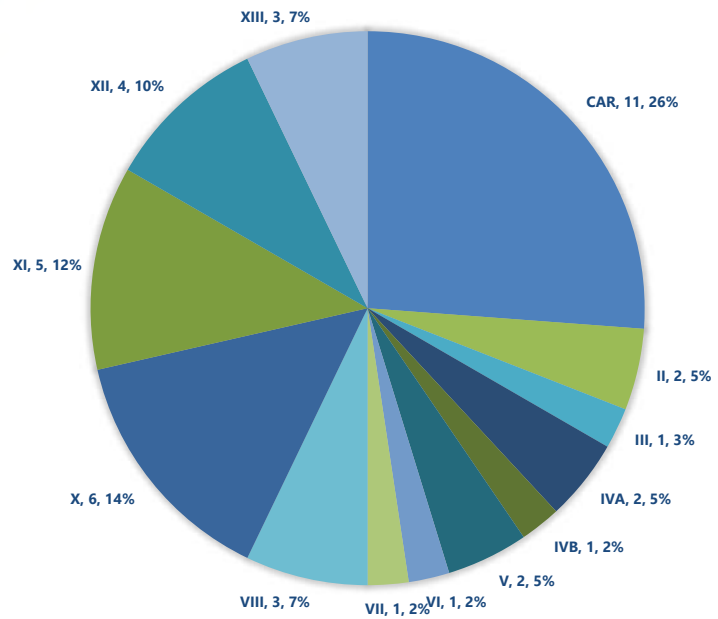
Updates on ...

## Minahang Bayan Applications:

Majority of applications from CAR, Region X and Region XI

11/24/2015

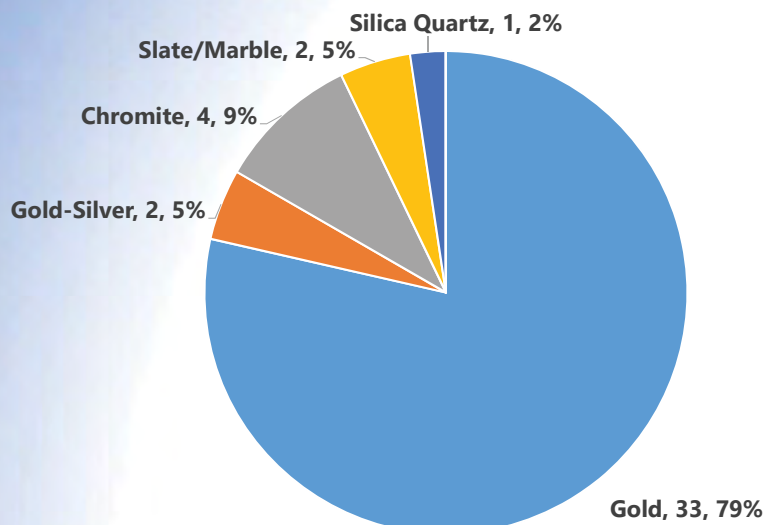
DISTRIBUTION OF MB APPLICATIONS PER REGION



17

Updates on ...

## MB Applications by Commodity



■ Gold ■ Gold-Silver ■ Chromite ■ Slate/Marble ■ Silica Quartz ■ ■ ■ ■



18

## MB Declarations and SSM Regulation Obstacles



1. Existence of known illegal small-scale mining activities in some localities

2. Coddling by some politicians and influential/powerful personalities of illegal SSM operators

3. Many areas of interest to small-scale miners are closed to mining/in No-Go Zone

4. Requirements for the legalization are too many and the processing are tedious and costly

5. The existing mining scheme of some SSM operators could not be legalized under the existing guidelines

## MGB Initiatives vs Illegal Mining



1. Intensification of Campaign vs Illegal SSM







**2. Information Education Campaign on the SSM technologies and new policies**

**3. Fast-tracking of PMRB operationalization/ reconstitution**

**For the promotion of SSM**

**4. Fast-tracking of Processing of Declaration of Minahang Bayan Proposals**

**5. Continuous review, crafting and implementation of new policies vs illegal mining**



**6. Enhancement of collaboration with other governments agencies/task forces, NGO/POs vs illegal mining;**



## MGB Efforts vs the use of Mercury in SSM Operations

MGB Efforts ...

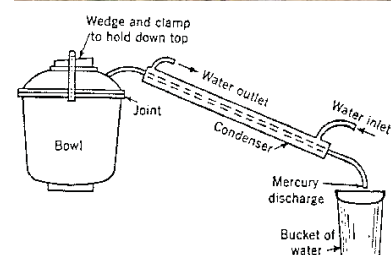
### Introduced Mercury Retort in known ASSGM Sites



The mercury in the amalgam can be captured and recycled using a retort or fume hood. Simple and affordable models can reduce mercury emissions by 75 to 95%. Recycling mercury prevents the need for fresh mercury imports.

Capturing and recycling mercury can be an effective first step in moving towards mercury free processing.

**Mercury Retorts** heat amalgam in one part and cool and condense the mercury vapor back into a liquid in another part of the device. The mercury can then be re-used.





## Initiated the Banning of Mercury on SSM Operations

Section 11, item e, of Executive Order No. 79

DAO 2015-03, IRR of RA No. 7076



Prohibition of the Use of Mercury on Small-Scale Mining



## Promotion of Mercury-Free Gold Recovery Processes

### a. Gravity Separation

A method of separating minerals of different specific gravity and one or more forces ( i.e., resistance to motion offered by a viscous fluid). Pans, jigs, riffled tables, shaking tables, flotation, centrifuge and sluices are commonly used.

Disadvantages include lower than recovery of gold.





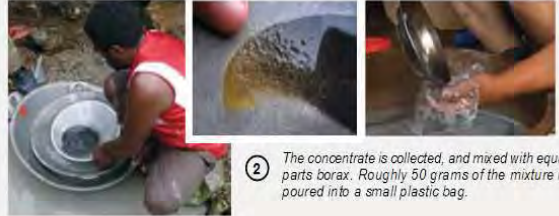


## b. Direct Smelting

A small mass of high grade concentrate is first produced (by panning or by using shaking table for example), then it is melted to separate the gold from other minerals. Sometimes called as "**borax method**", however other reagents can be used.

**Direct smelting** is an alternative processing pathway that does not use mercury. Mercury is commonly applied to large masses of concentrate - for example, 20 kg coming from the carpets of a sluice - whereas direct smelting is performed on small masses of high grade concentrate usually no larger than 100g.

① Concentrate is carefully reduced by panning until it is more than 25% gold. Care is taken so that gold is not lost in the process; this is done using multiple pans (below).



② The concentrate is collected, and mixed with equal parts borax. Roughly 50 grams of the mixture is poured into a small plastic bag.

③ A clay crucible is pre-heated using the blow torch and melting a small amount (5g) of borax in it.

④ The plastic bag is placed in the crucible and heated by burning charcoal and a fan blows to increase the heat for 5-15 minutes. The result is solid gold dore.



"Reducing Mercury Use in Artisanal and Small-Scale Gold Mining", UNEP

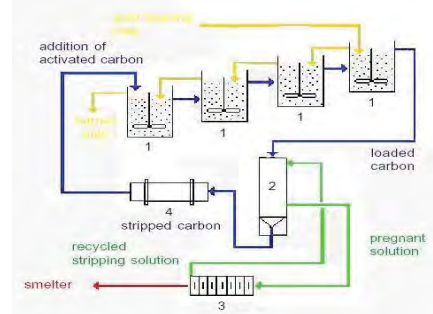


## c. Chemical Leaching/Cyanidation

**Chemical leaching** using cyanide is the method primarily used by large-scale mining companies in the Philippines. It is being adopted by some small-scale miners due to low-cost and high gold recovery.

**Cyanidation** is the process of dissolving metallic gold in an aerated dilute cyanide solution. Gold in cyanide solution are commonly extracted by either zinc cementation or carbon adsorption.

Cyanide is highly toxic however it is biodegradable unlike mercury.



## Other Relevant Initiatives of MGB vs Mercury



### “Mercury-Free Analysis of Total Iron in Lateritic and Iron Ores by Reductometric Titration with Ascorbic Acid”

Ascorbic Acid titration is comparable with that of conventional volumetric titration with Potassium Dichromate ( $K_2Cr_2O_7$ ) using Mercury (II) Chloride. Thus, the Mercury-free analysis can be an alternative method in the determination of total iron, in iron bearing ores, minerals, mineral products and others.

Acid Compared with Potassium Dichromate ( $K_2Cr_2O_7$ ) using Mercury (II) Chloride

Sample Mark	Classification	$K_2Cr_2O_7$ Method 1 (accepted method)	Ascorbic Acid * Method 2	Certified Value	Deviation (Method1- Method 2)	% Relative** Accuracy
15-32 #3	Laterite, submitted sample	14.85	14.82	-	- 0.03	99.80
15-33 #5	-do-	16.25	16.24	-	- 0.01	99.94
15-90 #1	-do-	30.60	30.29	-	-0.31	98.99
15-90 #7	-do-	44.05	43.96	-	-0.09	99.80
15-38 #5	Iron Ore, submitted sample	28.18	28.17	-	- 0.01	99.96
15-38 #1	-do-	36.56	36.54	-	- 0.02	99.94
15-38 #8	-do-	48.75	48.89	-	+0.14	100.29
15-112 #1	-do-	55.61	55.63	-	+0.02	100.04
NIST 27C	CRM, Iron Ore	-	65.02	65.00	-	100.03
NIST 27F	CRM, Iron ore	-	65.96	65.97	-	99.98

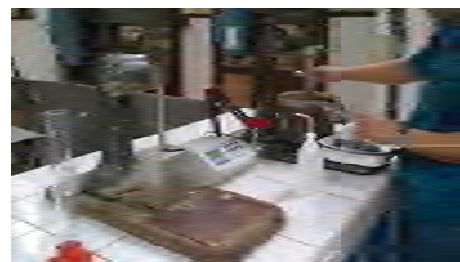


## Other Relevant ...

### “Technical Study on the Recovery of Residual Gold from the Tailings of Small-Scale Operations”

The metallurgical investigation conducted involves wet screening; gravity separation, flotation, roasting of flotation concentrates, and gold leaching (**cyanidation**).

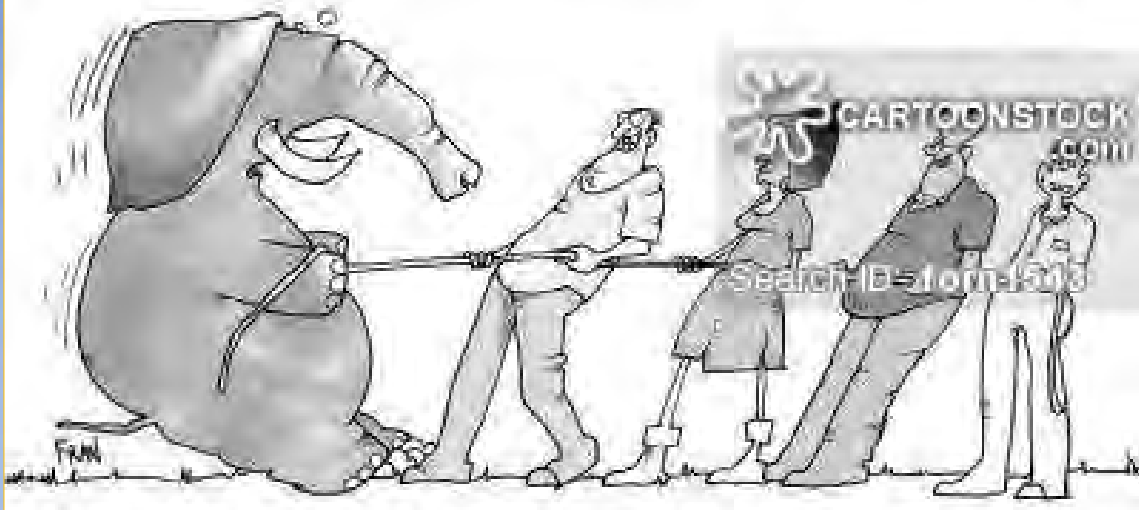
Initial results of metallurgical tests showed a recovery of above 82% with a concentrate yield of above 35%.







We can do ANYTHING if we ALL pull together!



<https://www.cartoonstock.com/directory/c/collaboration.asp>



**END OF PRESENTATION**



## The Journey for Minahang Bayan and Mercury Elimination in ASGM: the LGU-Jose Panganiban Experience

SARAH MARIE PANTE-AVIADO, DPA

August 5, 2016

Marco Polo Ortigas, Ortigas Business District, Pasig City



## Brief Description



Ã This is about the experience, challenges faced and continuous efforts of the Local Government Unit of Jose Panganiban in cooperation and close working relationship with the artisanal and small-scale gold miners in the locality towards the declaration of Minahang Bayan and conversion to Mercury-free mining method.

# Mining Operations

Underground  
Mining: Tunnel



Akawan

Surface  
Mining



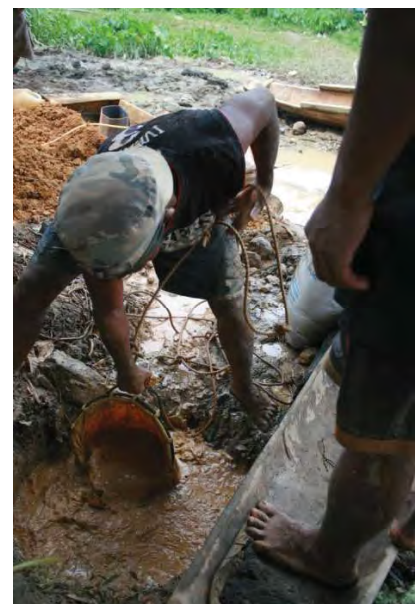
Pagadgad



Placer/ Balat-lupa

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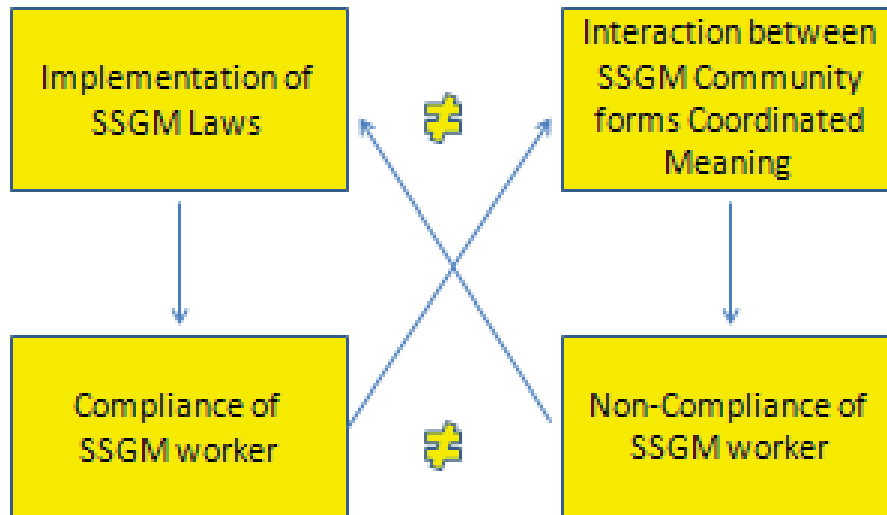
## Underwater Mining: Compressor Mining





Based on Theory of Coordinated Management of Meaning (CMM) developed by Barnett Pearce, Vernon Cronen, and their colleagues.

## Strange Loop



## Minahang Bayan Interventions

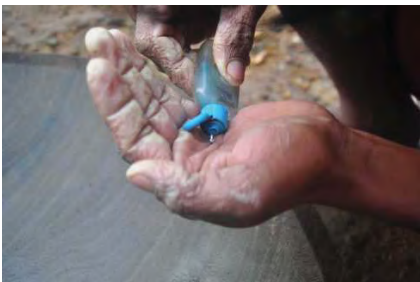
- Ā IEC on Minahang Bayan
- Ā Appeal to MGB: Land-owners and SB Resolution; application for validation and declaration of MB
- Ā Executive Order for Task Force Minahang Bayan
- Ā Organizing: Cooperative; Licensed Miner (MGB/ CDA)
- Ā Miners' Association: 8 barangays, 11 associations, 1 municipal federation
- Ā Claim-owner's consent

# Issues and Concerns on Minahang Bayan

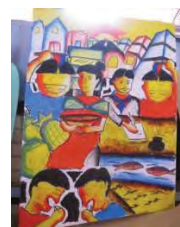


- ̄ Lengthy process and no checklist of requirements per process/stage
- ̄ Prevalence of extortion from authorities and persons of influence due to “illegal” operations
- ̄ Conceived impression of ASGM workers that the government are not fully supportive of the legalization of ASGM, compared to their support given to large-scale.
- ̄ Selective apprehending of miners; the higher your income, the higher the higher the possibility of being apprehended.

## Mercury-Free Mining



- ̄ Widespread Mercury use
- ̄ Children playing with Mercury
- ̄ Mindset that Mercury use is not harmful
- ̄ Real-life victims in the community





# Interventions for Mercury-Free Mining

- ̄ IEC on Mercury Toxicity
- ̄ Batang Bantay Toxics (BT)
- ̄ HCW Training/ referral  
Miner-to-Miner Training
- ̄ Environmental monitoring: air, water, sediments, fish/marine life, rice
- ̄ Bio-monitoring: hair, urine, blood
- ̄ Alternative/ Cleaner Mining Methods:
  - ̄ BT: artisanal
  - ̄ UP-DOST: small
  - ̄ SMM: their own



## Issues and Concerns on Mercury-Free Mining

- ̄ Efficiency of Mercury-free Mining Method
  - ̄ time, labor/ man-power, water
- ̄ Low-conversion rate
- ̄ Cannot go back (have done it before, and have innovated & is now doing better with Mercury, why go back?)
- ̄ Reduction and proper handling
- ̄ Government support: laws and enforcement





# NATIONAL SITUATION ON MERCURY IN VIETNAM

Ha Noi, August 2016

Mr. Viet Thang (Mr.)  
Vietnam Chemicals Agency  
thanglv@moit.gov.vn



## Content

Overview of chemicals management in Vietnam

National situation on mercury (based on the MIA outputs)

Roadmap for Minamata Convention in Vietnam

Mr. Viet Thang (Mr.)  
Vietnam Chemicals Agency  
thanglv@moit.gov.vn



# Overview of Chemicals Management in Vietnam

## State management of chemicals activities by life-circle (Law on Chemicals 2007)

Ministry	Import / Export	Production	Trade	Transport	Use	Disposal
Industry and Trade (MOIT) – Focal Point	ALL	ALL	ALL	-	Industrial	-
Environment and Natural Resource – MONRE	POPs, waste	-	-	POPs, waste		POPs, waste
Agriculture and Rural Development -MARD	Crop Protection; Agrichemicals	Crop Protection; Agrichemicals	Crop Protection; Agrichemicals	-	Crop Protection; Agrichemicals	-
Health - MOH	Pharmaceutical; biocide	Pharmaceutical; biocide	Pharmaceutical; biocide	-	Pharmaceutical; biocide	-
Transportation - MOT	-	-	-	Main	-	-

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 'hanglv@moit.gov.vn



## National Situation on Mercury

### Background about the MIA Project

- Approved in June 2014
- Implemented by UNIDO
- Executed by Vinachemia
- Budget: \$500,000 from the GEF and \$25,000 co-financing from Vinachemia and \$22,000 from UNIDO
- 24 months duration
- Objective: Pre-ratification activities under the Minamata Convention completed to enable policy and strategic decision making and to prioritize areas for future interventions

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# National Situation on Mercury

## Institutional Framework for mercury management by life-circle

No	Issue	MOIT	MONRE	MOH	MARD	MOST	MOLISA	MOT
1	Mercury supply sources and trade	X		O	O			O
2	Mercury added products	X		X	X			
3	Manufacturing processes in which mercury or mercury compounds are used	X		O	O	O		
4	Artisanal and small-scale gold mining	X	O	O				
5	Emissions	O	X			O		
6	Releases	O	X			O		
7	Environmentally sound interim storage of mercury	O	X	O	O			O
8	Mercury wastes	O	X					O
9	Contaminated sites	O	X					
10	Health aspects	O		X			X	

X: Responsible

O: Involve

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# National Situation on Mercury

## Legal Framework for mercury management by life-circle

Minamata Convention		Compliance of Legal framework in Vietnam			
Article	Obligation	Fully	Not completed	Not regulated	Referring legislation
3	Mercury supply sources and trade		X		40/2011/TT-BCT
4	Mercury added products		X		30/2011/TT-BCT
5	Manufacturing processes in which mercury or mercury compounds are used			X	
7	Artisanal and small-scale gold mining			X	
8	Emissions		X		QCVN: 02,22,23,30,41
9	Releases		X		QCVN: 40,43,50,52
10	Environmentally sound interim storage of mercury		X		TCVN 5007:2002
11	Mercury wastes		X		16/2015/QĐ-TTg
12	Contaminated sites			X	
16	Health aspects		X		QCVN: MOH, MARD, MONRE

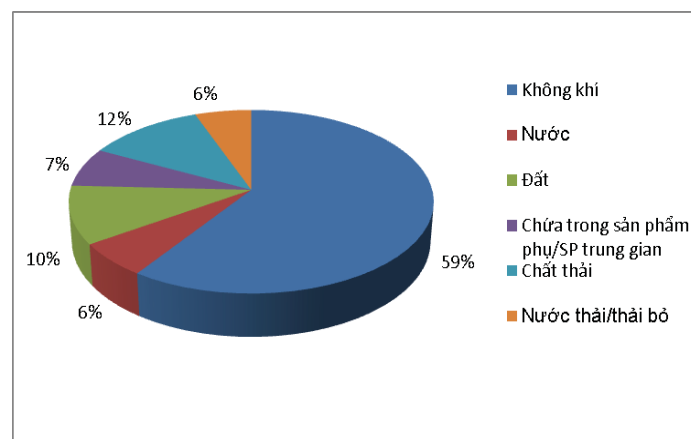
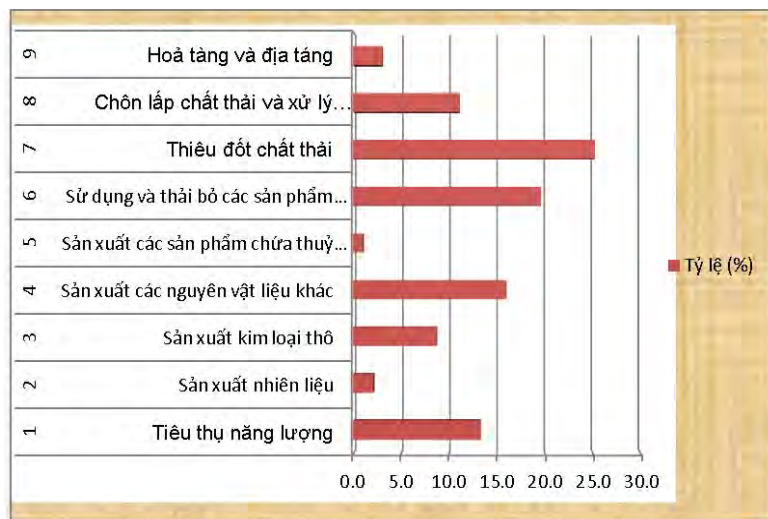
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# National Situation on Mercury

## Summary on National Inventory of Mercury in Vietnam



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## Roadmap for Minamata Convention in Vietnam

No	Item	I-2016	II – 2016	III – 2016	IV – 2016	I – 2017	II – 2017
<b>I RATIFICATION</b>							
1	Minamata Initial Assessment in Vietnam	X	X	X	X		
2	NAP for ASGM in Vietnam			X	X	X	X
3	Submission to Government for Ratification				X		
4	Ratification				X	X	
<b>II EALY IMPLEMENTATION</b>							
1	Issuing Decree and Circulars					X	X
2	National Action Plan					X	X

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**Thank you for the kind attention**



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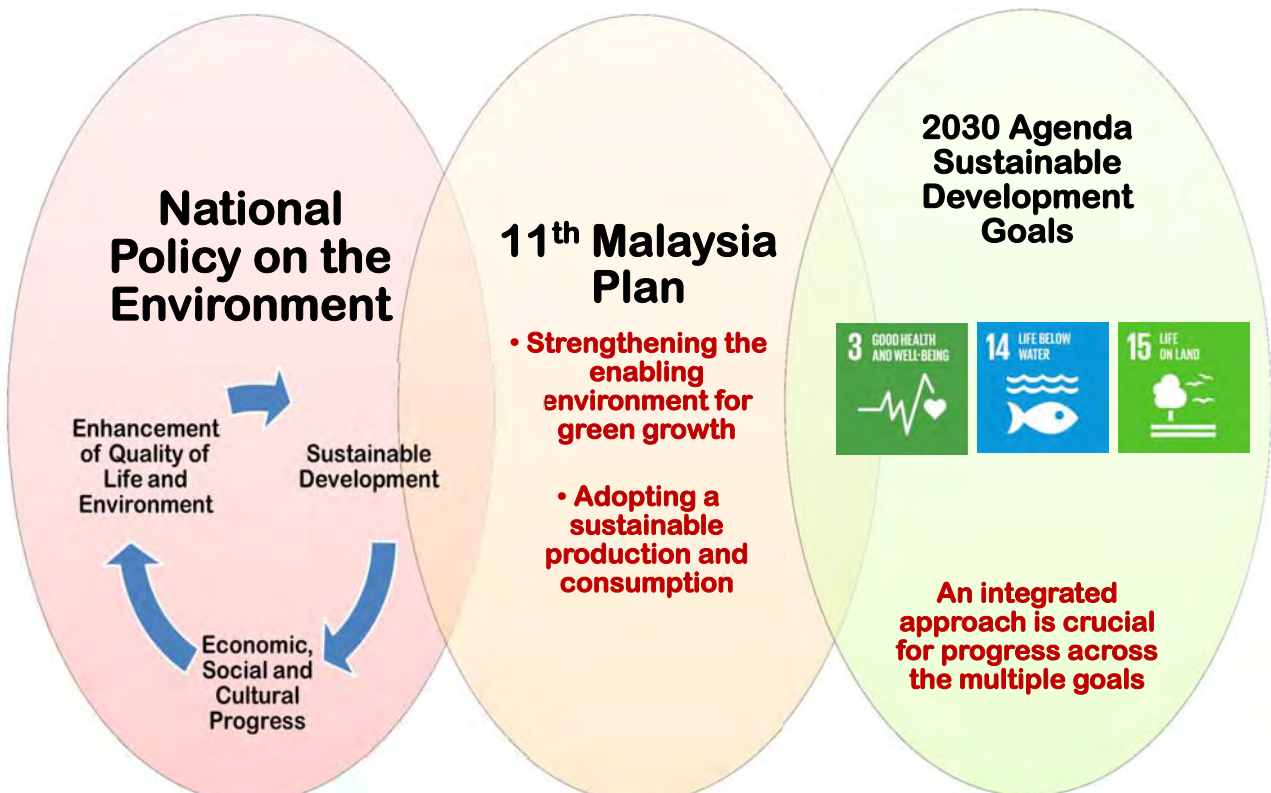


# PROGRESS TOWARDS RATIFICATION OF THE MINAMATA CONVENTION ON MERCURY

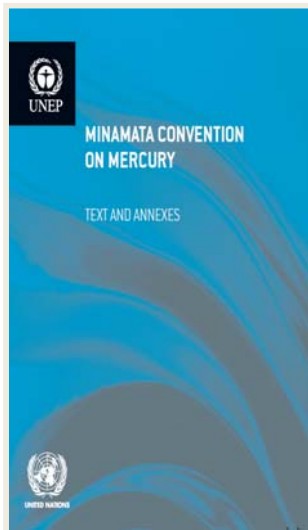
Environmental Management and Climate Change Division  
Ministry of Natural Resources and Environment

25 August 2016 (Thursday)

## BACKGROUND



# MINAMATA CONVENTION ON MERCURY



## Objective:

To protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds

## Current Status:

**Signatories : 128 countries**

**Ratifications: 29 countries**

## Status of Malaysia:

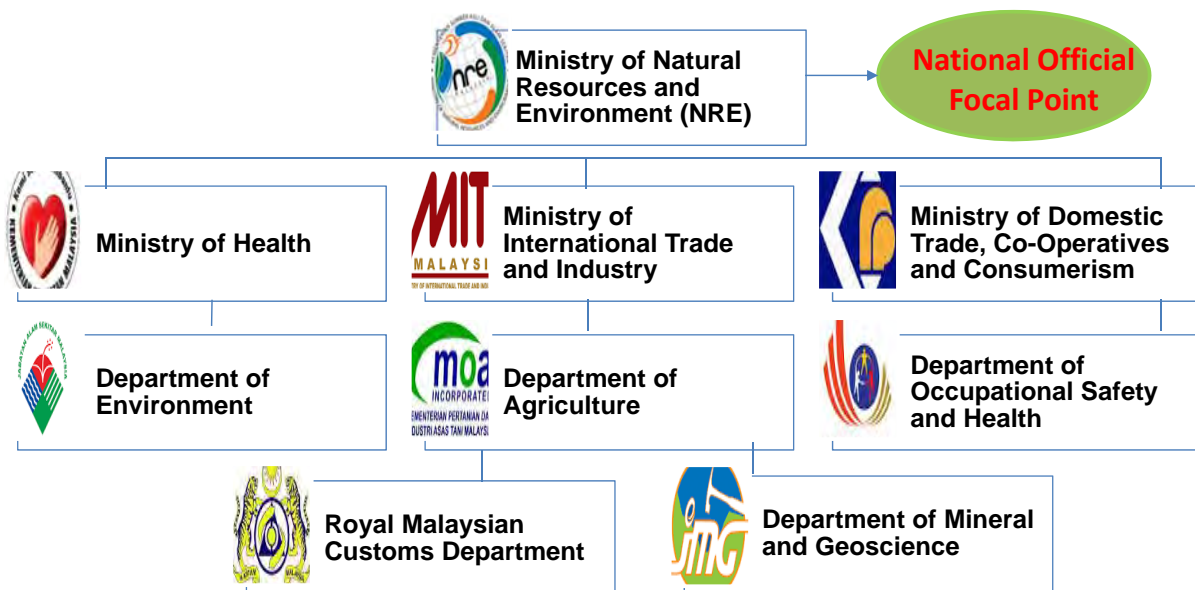
**Signed on 24<sup>th</sup> Sept. 2014** during The High-Level Special Event - “The Minamata Convention on Mercury: Towards its early entry into force and effective implementation” at United Nations, New York.

**Time to Act !**

Effective after ninetieth day after the date of the 50<sup>th</sup> ratification

3

## REGULATORY AGENCIES FOR MERCURY MANAGEMENT IN MALAYSIA



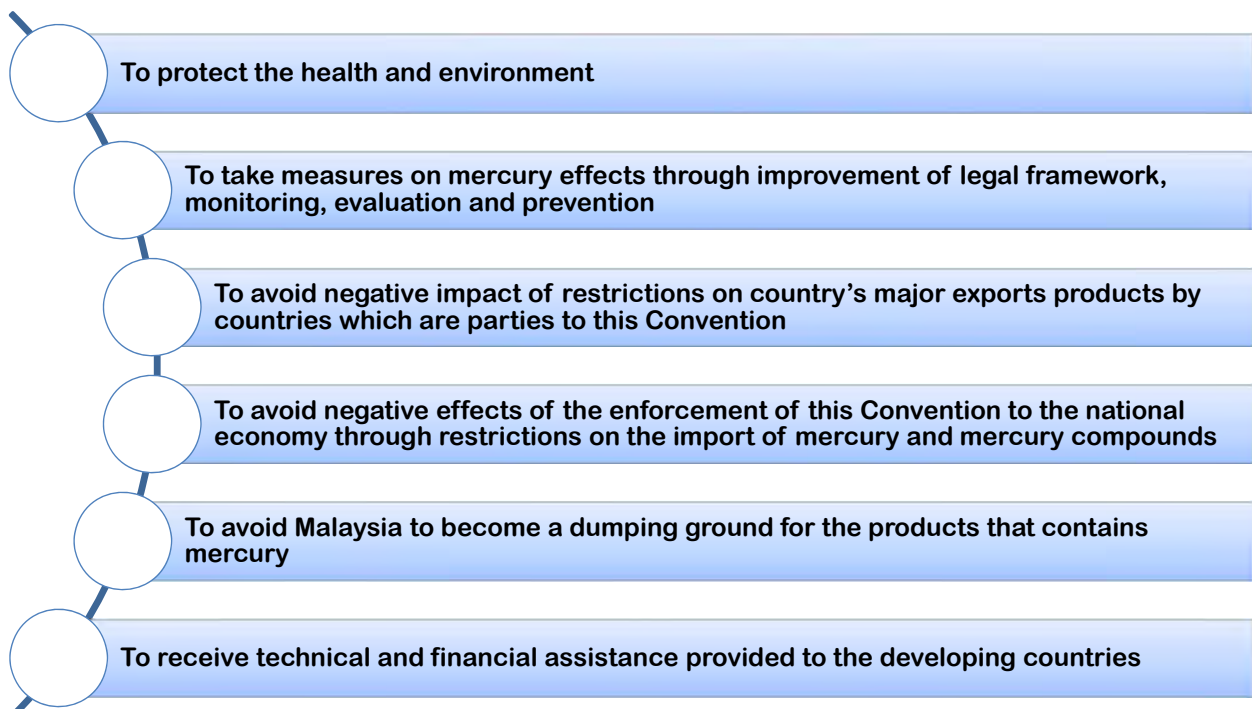


# LEGAL FRAMEWORKS ON MERCURY MANAGEMENT IN MALAYSIA

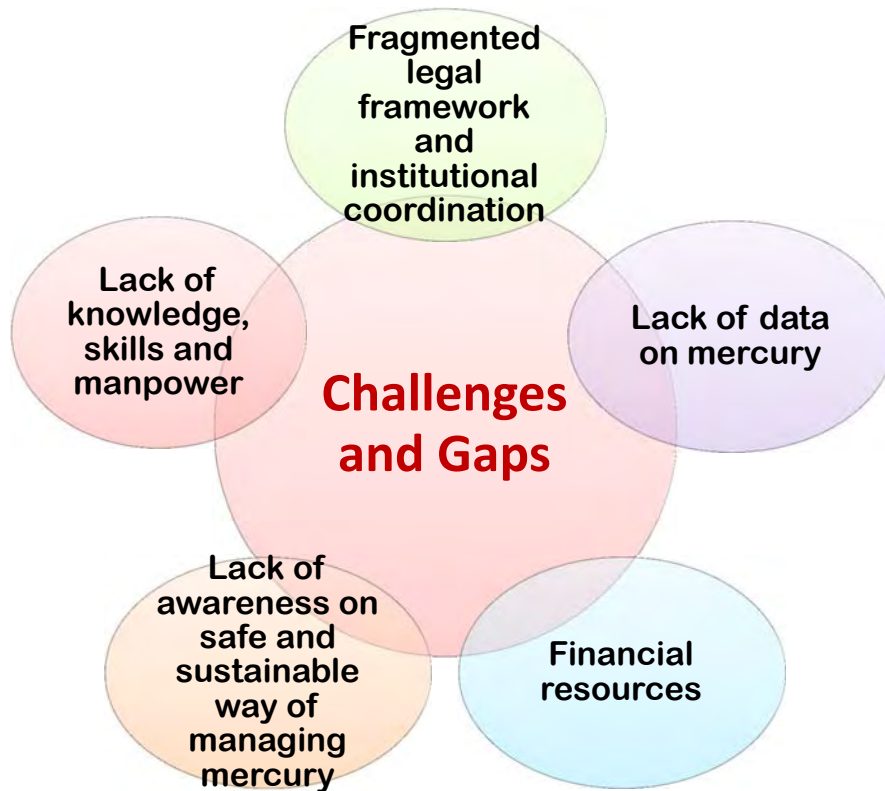
	Environmental Quality Act 1974	- NRE/DOE
	Poisons Act 1952	- MOH
	Industrial Coordination Act 1975	- MITI
	Consumer Protection Act 1999	- KPDNKK
	Pesticide Act 1974	- DOA
	Mineral Development Act 1994	- JMG
	Occupational Safety and Health Act 1994	- DOSH
	Customs Act 1967	- CUSTOMS
	Medical Devices Act 2012	- MOH

5

## NATIONAL'S INTEREST TO RATIFY THE MINAMATA CONVENTION



# CHALLENGES AND GAPS IN MERCURY MANAGEMENT



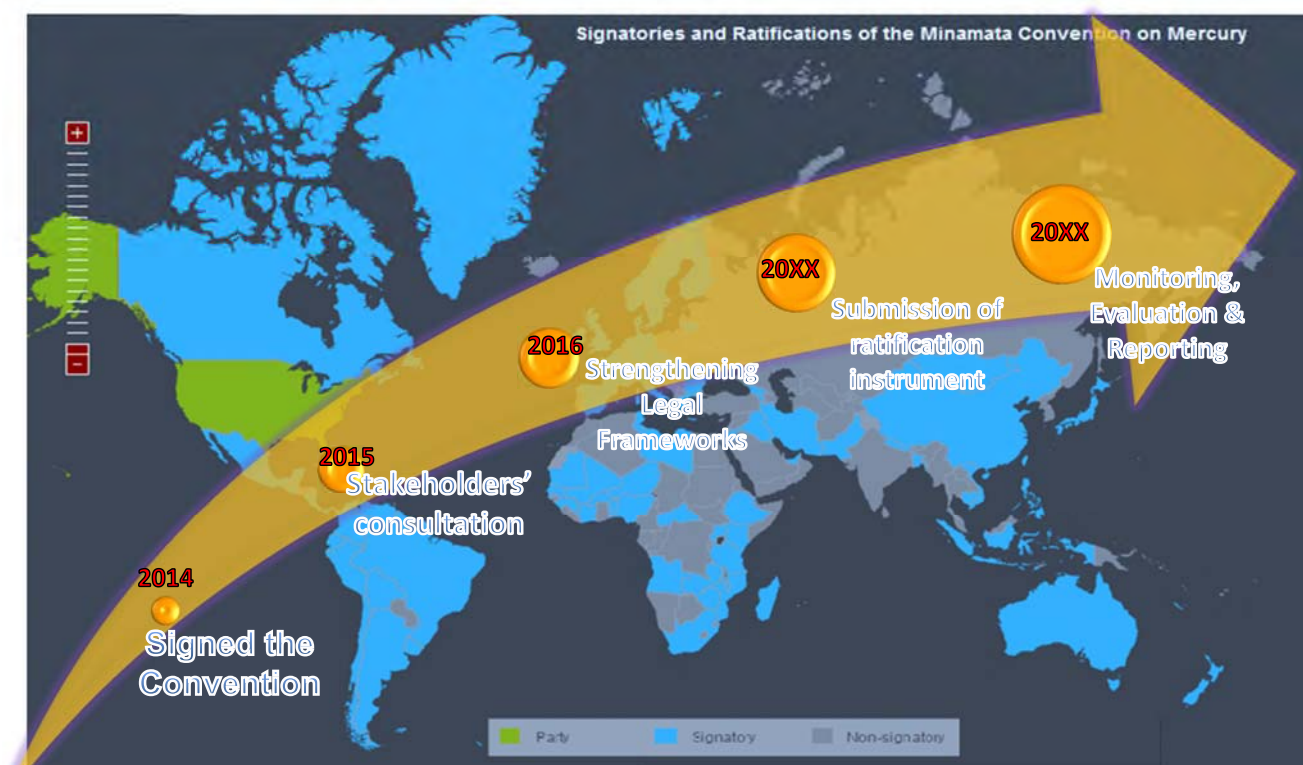
## ACTIONS TOWARDS RATIFICATION OF MINAMATA CONVENTION

<p><b><u>Stakeholders' Consultation</u></b></p> <ul style="list-style-type: none"> <li>-Regulatory agencies</li> <li>-Trade, industrial associations &amp; SME's</li> <li>-Academia</li> <li>-NGOs</li> <li>-AGC</li> </ul>	<p><b><u>Studies</u></b></p> <ul style="list-style-type: none"> <li>-Preliminary Study on Mercury Inventory</li> <li>-Minamata Initial Assessment</li> <li>-Mercury Waste Management</li> </ul>
<p><b><u>National Action Plans</u></b></p> <p>Mercury management in Malaysia</p>	<p><b><u>Awareness &amp; Education</u></b></p> <ul style="list-style-type: none"> <li>- Pamphlets, newspaper, brochure &amp; campaigns</li> <li>- Public engagement</li> <li>- Printed, social and e- media</li> </ul>

# STEPS TOWARDS RATIFICATION OF MINAMATA CONVENTION



# WAY FORWARD TOWARDS RATIFICATION OF MINAMATA CONVENTION



# THANK YOU



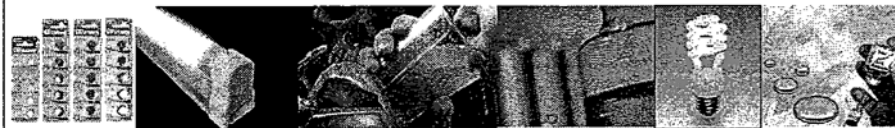
# “Moving towards the ratification of the Minamata Convention on Mercury”

Pollution Control Department (PCD),  
Ministry of Natural Resources and Environment, THAILAND



## The contents :

- Mercury situations in Thailand
- Mercury regulation in Thailand
- Institutional mechanisms
- Preparation for Ratification and implementation of the Minamata Convention on mercury
- Next Steps for Ratification of the Convention



## Mercury situations in Thailand

### Mercury situations in Thailand

- **Primary Mercury mining** – NONE
- **Trade of Mercury** – Importing from Japan and United States. The Most importers are in the field of fluorescence production, dentistry, and lab analysis.
- **Manufacturing processes** – We have already phased out the mercury cell chlor-alkali process, and Acetaldehyde production in which mercury are used as a catalyst.
- **Gold mining**– We Still illegal use of liquid mercury for gold extraction from ore by 100 people at Phi chit province .
- **Emissions\*** – The major of mercury emissions (1) Informal waste burning (2) Mineral oils - extraction, refining and use (3) Incineration of hazardous waste.
- **Releases\*** – The major of mercury releases (1) Waste water system/treatment (2) Mineral oils - extraction, refining and use (3) Natural gas - extraction, refining and use.

\* Preliminary Hg inventory in Thailand (2012) by using UNEP Toolkit (2010)



## Mercury regulations in Thailand

## Mercury regulations in Thailand

- Thailand has realized the harmful effects of mercury to human health and environment. We have put on many efforts to control use of mercury, emissions and releases, and trades including Dental amalgam.
- The regulations & actions for mercury management :
  1. Regulations for Hg import-export
  2. Regulations for Hg Uses
  3. Regulations for Hg emissions and effluent
  4. Regulations for Hg storage
  5. Regulations for Hg waste
  6. Actions for Dental mercury-amalgam fillings .

### 1. Regulations for Hg import-export

- MERCURIC CHLORIDE,
- MERCURIC OXIDE,
- MERCURIC SULFIDE (MERCURIC SULPHIDE),
- MERCUROUS CHROMATE (MERCURY CHROMATE),
- MERCURY (QUICK SILVER; HYDRARGYRUM),
- MERCURY (II) THIOCYANATE

Hazardous Substance type 3  
under the Hazardous Substances Act 1992

- The importation and exportation have to be registered and approved by **Department of Industrial Works** .

### 2. Regulations for Hg Uses

Thailand has taken measures to reduce mercury use in products:

- **Banned Pesticides and Biocides and Mercury added Dry cell batteries containing mercury** under Hazardous Substance Act B.E. 2535 (1992)
- **Limited mercury content in Fluorescent lamps** under Industrial Product Standards Act, B.E. 2511 (1968), including **Cosmetics** under Cosmetics Act B.E. 2535 (1992).
- **Promoted the alternative products** through several tools such as 1) Providing Thai Green Label for Fluorescent lamps and Primary batteries to guarantee green product and 2) Reducing prices for LED.

### 3. Regulations for Hg emissions and effluent

#### Emission STD:

1. Industrial hazardous waste incinerator : not exceed 0.1 mg/m<sup>3</sup>
2. Factory with combustion process : not exceed 3 mg/m<sup>3</sup>
3. Factory without combustion process : not exceed 2.4 mg/m<sup>3</sup>
4. Municipal waste incinerator : not exceed 0.05 mg/m<sup>3</sup>
5. Infection waste incinerator : not exceed 0.05 mg/m<sup>3</sup>
6. Cement plant using wastes as fuel or raw materials : not exceed 0.1 mg/m<sup>3</sup>
7. Gas separation plant : not exceed 0.8 mg/m<sup>3</sup>
8. Petroleum refinery : not exceed 2.4 mg/m<sup>3</sup>

#### Effluent STD:

1. Factory wastewater treatment plant : : not exceed 0.005 mg/l

### 4. Regulations for Hg storage

- Thailand has already developed the Manual for Chemicals and Hazardous Substances including Hg Storage which was published in B.E. 2550 (1998) under the Notification of the Ministry of Industry, dated March 10 B.E. 2551(1999).
- The storage of Hg in factory or having in possession must be proceeded stringently as stated in the Manual or as stated in international guidance approved by the Department of Industrial Works, the Ministry of Industry.

### 5. Regulations for Hg waste

- Thailand has already classified wastes contaminated with mercury at concentration exceed 20 milligrams per kilogram as Hazardous Wastes.
- Storage, transportation, handling, and disposal for Hg waste must follow strict procedure of the Notification of the Ministry of industry, dated December 27 B.E. 2548 (1995), issued under the Factory Act B.E 2535 (1992) such as
  - Waste collector ,transporter and disposer shall be approved from Department of Industrial Works (DIW) .
  - An operation must be in compliance with procedure of DIW such as hazardous waste transportation out of factory shall use HAZ waste manifest form and also report transport of all wastes to DIW.
  - Managing hazardous waste within factory by Incineration shall be approved by DIW.

### 6. Actions for Dental amalgam

- We have realized exposure to mercury vapor and impact on health in the dental personnel. Therefore, we have already developed Clinical Dental Practice Guideline for Mercury safety management by Institute of Dentistry, Department of Medical services.
- Clinical Dental Practice Guideline consists of how to manipulation of dental amalgam safety and the safe removal of dental amalgam fillings. Its training workshops is provided to dental personnel continuously.

## Institutional mechanisms

## Institutional mechanisms

A National Subcommittee on the Minamata Convention has been established under the National Environment Board as an institutional mechanism to support future implementation of the Convention.

**Mandates and Functions:** Supporting the ratification and Proposing recommendation for implementation of the Convention to the National Environment Board for making decision.

**Composition:**

**Chair :** Expert of the National Environment Board

**Committees:** 24 Authorities

(Health, Industry, Environment and Private Sectors)

**Secretariat :** Waste and Hazardous Substances Management Bureau,  
Pollution Control Department

## National Subcommittee on the Minamata Convention



## Preparation for Ratification and implementation of the Minamata Convention on mercury

## 1. The negotiation process of the Minamata Convention

- ❑ We have been working closely with relevant international partners on mercury issues, including attending the INC meetings for the development of the Convention continuously.
- ❑ At the national level, we provided the consultative meetings for the negotiation processes of the Minamata Convention in 2010-2013 as well as the capacity building workshop for the convention continuously.

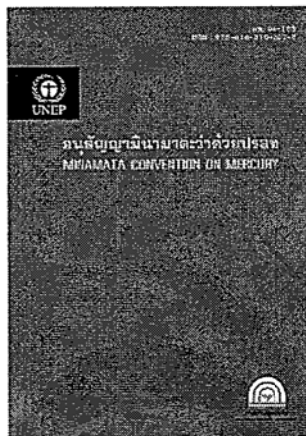


## 2. The preliminary mercury inventory

- ❑ In 2013, we studied the preliminary Hg inventory in Thailand by using the estimation method of UNEP Toolkit for identification and quantification of mercury emissions and releases 2010.
- ❑ The major sources of mercury releases
  1. Waste water system/treatment
  2. Mineral oils - extraction, refining and use
  3. Natural gas - extraction, refining and use
  4. Informal dumping of general waste
- ❑ The major sources of mercury emissions
  1. Informal waste burning
  2. Mineral oils - extraction, refining and use
  3. Incineration of hazardous waste
  4. Informal dumping of general waste

## 3. Translation the Convention

- ❑ In 2014, we translated the text of the Convention to Thai for disseminating its obligation to relevant stakeholders, students and people.



## 4. The feasibility study for ratification and implementation of the Minamata Convention

- ❑ In 2014, we carried on a project on **“the feasibility study for ratification and implementation of the Minamata Convention”**.
- ❑ The aim of the project are
  - (1) to feasibility study for ratification of the Minamata Convention by assessing institutional and legal infrastructure and the implications and benefits of ratification.
  - (2) to prepare the needed infrastructure such as changes in laws and policies for implementation of the Minamata Convention.

#### 4. The feasibility study for ratification and implementation of the Convention (Cont.)

##### Step of the feasibility study

1. Review of Mercury situation and Key Minamata Convention Provisions.
2. Discussion with the relevant authorities and all stakeholders regarding their concerned.
3. Assessment of advantages and disadvantages of the ratification.
4. Review of the existing legal instruments and identifying the legal gaps for the ratification.
5. Recommendation actions needed in ratifying and implementing of the convention
6. Public hearings.

#### 4. The feasibility study for ratification and implementation of the Convention (Cont.)

- The result shown that Thailand should become a Party of the Convention because the benefits to Thailand becoming a Party more than the disadvantages.

##### Advantages:

- Reducing the environmental and human health risks from Mercury.
- Enhancing environmental reputation
- Increasing an opportunity to receive technical and financial support from international environmental organization.
- Driving force for development of domestic policy, law and regulation of mercury management.

##### Disadvantages:

- Increasing the production costs in the earlier stage of the Convention entered into force. However in the long term, the prices of substitute products tend to decrease according to the market mechanism.

#### 4. The feasibility study for ratification and implementation of the Convention (Cont.)

- Public hearings were held in 2014 at Rayong Chiangmai and Nonthaburi province.
- The forums agreed that Thailand should ratify the Minamata Convention.



#### 5. Action plan for ratification and implementation of the Minamata Convention on Mercury

- In 2015, the **Action plan for ratification and implementation of the Minamata Convention on Mercury** had been developed by the working group under National Subcommittee on Mercury Convention for identifying actions needed for ratification and implementation of the Convention, priority areas of action, and duration of action including assigning responsible agencies.



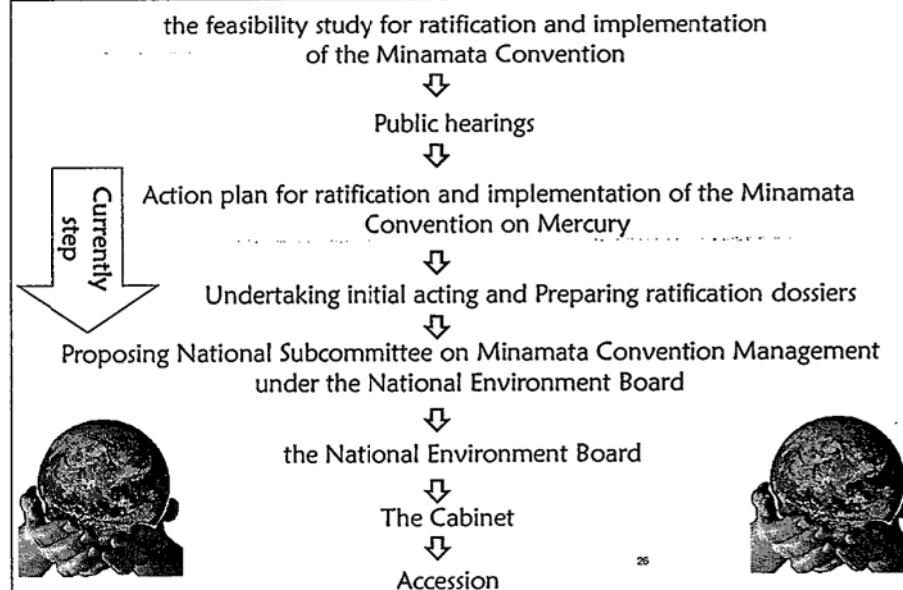


## 5. Action plan for ratification and implementation of the Minamata Convention on Mercury

Actions needed in ratification and implementation are such as ;

- Determining some mercury compounds pursuant to the Minamata Convention as hazardous substances category 3 under the Hazard Substances Act,1992
- Defining regulations of factory permission that are not allowing the use of mercury or mercury compounds in new factories .
- Identifying emission and release sources and reviews emission & release STD.
- Providing awareness raising, knowledge and capacity building for relevant agencies .

## Steps for ratification of the Convention



## Next Steps for Ratification of the Convention

- We are revising the ratification dossiers as per the comments of the National Subcommittee on Minamata Convention on June 2016.
- In August 2016, We will submit it to the National Subcommittee on Minamata Convention again and if it is approved, we will submit it to the National Environment Board and the cabinet, respectively to request their approval for being the Party to the Convention .

## Thank you for your attention

➤ Hazardous Substance Division, Waste and Hazardous Substance Management Bureau,  
Pollution Control Department ,  
Ministry of Natural Resources and Environment  
Email : Chem@pcd.go.th



# Present state of the Minamata Convention on Hg

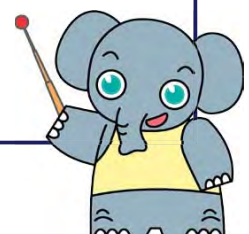


## Approach in Japan toward Ratification & Efforts in the Future

**UTAGAWA, H.**  
JICA Survey Team

## Contents

- 1. Introduction**
- 2. Outline of the Minamata Convention**
- 3. Present State of the Ratification**
- 4. Approach in Japan & Efforts in Future**
- 5. In place of the conclusion**



## Characteristics of Mercury



Earth crust: 0.067-0.05 ppm

Sea water: 0.00014 ppb

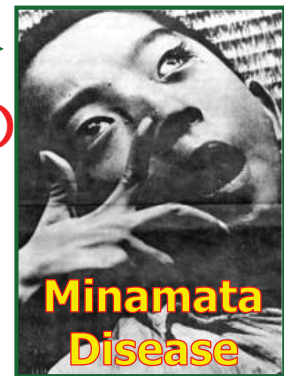
Drinking water .....  
(Guideline value: <math><0.001\text{ mg L}^{-1}</math>)



Health effect:

Neurogenic intoxication (Methyl Hg)

- Bio-accumulative toxicant
- Formed also from inorganic Hg
- Mechanism is still unknown



**Minamata Disease**

## History of Minamata Disease

MeHg

'46

Untreated wastewater was started to discharge to a bay.

'56

Minamata disease was first discovered.

'58

Fishing industry was closed down.

'67

"Basic Act for Env. Pollution Control" was enforced.

'73

Landfill and sludge removal was implemented.

'94

Hg conc. in water of the bay became lower than the STD.

Now

Fishing industry has been restarted from 1997.  
Swimming is also available in Minamata bay.

## Aim and Characteristics

- Aims to protect human health and the environment from the artificial emission of mercury and products containing mercury.
- All mercury that occurs in the life cycle of mercury such as "Production", "Trading", "Use", "Emission", "Release" and "Storage" are subject to restriction under the convention.
- Mercury and products containing mercury (Batteries, Switches, Relays, Skin-lightening Cosmetics, Thermometers, Blood Pressure Monitors and etc.) are subject to a 2020 phase out date.

Article	Main contents
1, 2	Purpose & Definition
3	Hg supply sources & trade
4, 5, 6	Process of Hg-added products & manufacturing
7	Artisanal and small-scale gold mining (ASGM)
8, 9	Hg emissions & releases to air/land/water
10,11,12	Hg storage & wastes, contaminated sites
13,14	Financial resources & technical assistances
15-20-35	Public awareness, education & research etc.

need  
**New Act**

NAP



## Act on Preventing Environmental Pollution on Mercury (Nov. 11, 2015)

### measures

#### ➤ Use of Mercury

- Art. 4: Mercury-added products
- Art. 5: Manufacturing processes
- Art. 7: Artisanal and small-scale gold mining
- Art. 10: Interim storage of mercury

#### ➤ Disposal

- Art. 11: Mercury wastes

#### ➤ Others

- Art. 3: Primary mercury mining
- Art. 20 : Implementation plan



### 3. Present State of the Ratification (1)

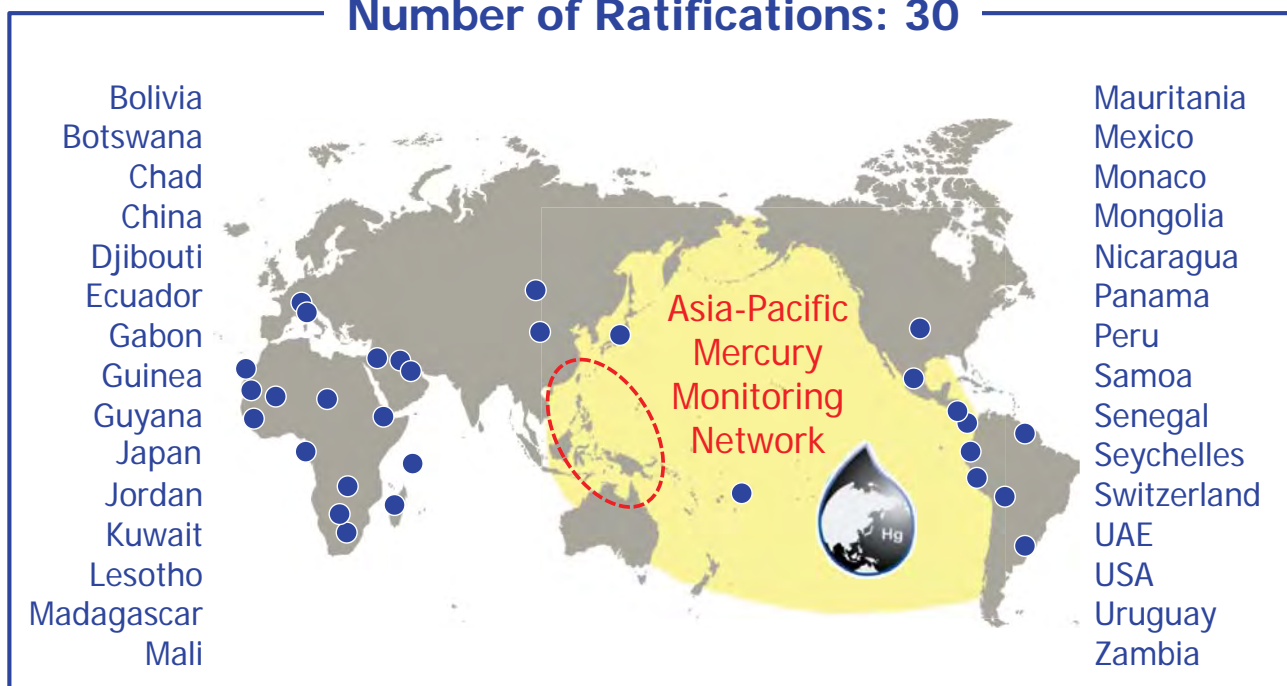
#### Process & Schedule

Time	Event
2013	Agreed in Minamata City
2016-2017	Enter into force 90 days after <b>50 governments ratified.</b>
Before 2020	Arrangement and engagement of the Convention has to be fulfilled.

## List of Ratified Countries (Aug. 2016)

Number of Signatories: 128

Number of Ratifications: 30



## 4. Approach in Japan & Efforts in Future (1)

### Japan's approach

#### Basic Policy

- ✓ Support parties to tackle their environmental challenges
- ✓ Promote "Human Security" focuses on each & every individual
- ✓ Utilize Japanese **technologies** to overcome env. pollution over the past

#### Concrete Measures 1

- ✓ Provide **USD 2 billion of ODA** over the next 3 years (2014-2016) in the **air, soil & water** to support parties in tackling environmental pollution.

#### Concrete Measures 2

- ✓ Launch a capacity building program, specially for Hg pollution.



**Training and Dialogue Programs**

## Future Plans in Japan

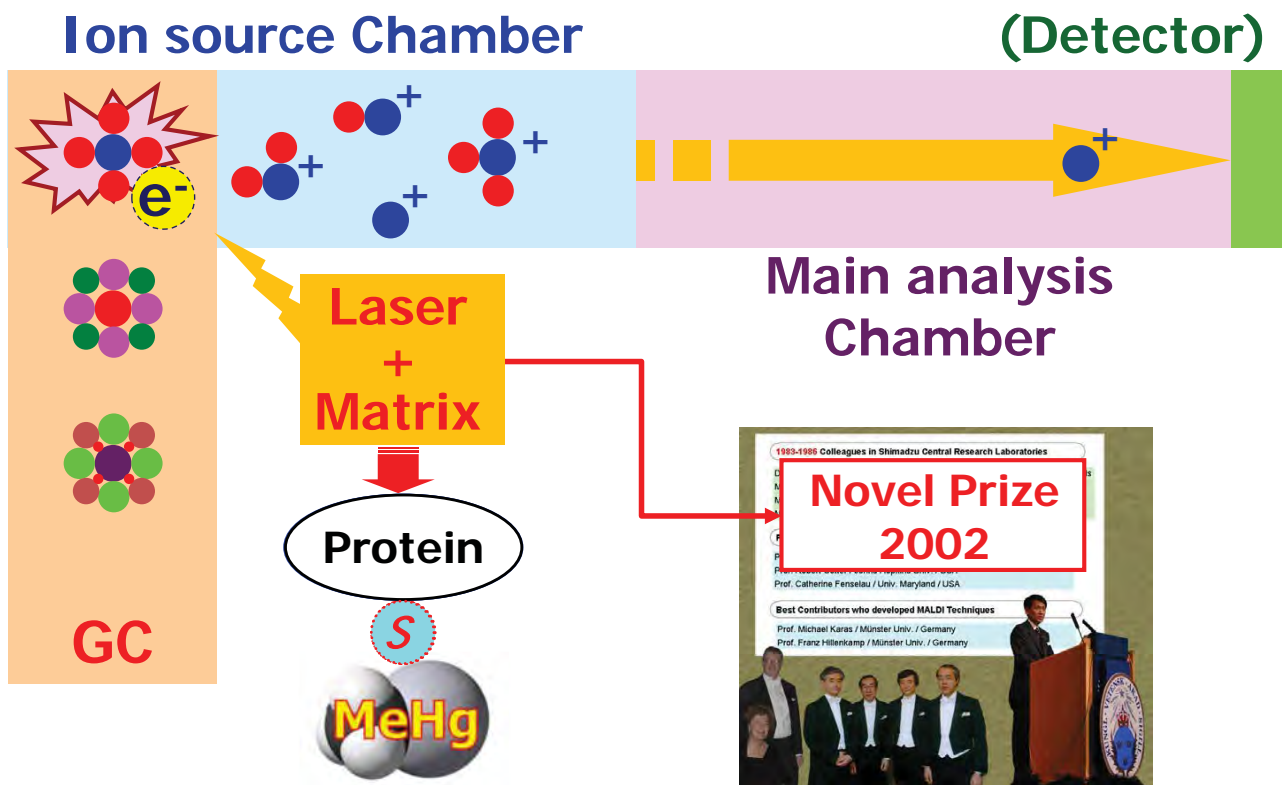
Time	Event
2016	Japan ratified the Minamata Convention on Mercury
From autumn to winter	Develop NIP on preventing of environmental pollution on Hg and submit to the secretariat of the convention.
up to 2017	The convention will go into effect & new act (except some parts) shall enter force in Japan.
	Dissemination of the relevant legislation of Hg to relevant gov. agencies & industries, holding of a briefing session.
Commencement of the regulation on manufacturing, imports and exports to the specified Hg-added products.	
Jan. 1, 2018	(in case that the regulation starts in advance)
Jan. 1, 2021	(in case of that the regulation starts in accordance with the convention)

## 5. In place of the conclusion (1)



**EMC has advanced equipment.**

# Time-of-Flight MS (TOFMS)



Thank you for your kind attention



Terima kasih banyak





# Present State of the Minamata Convention on Mercury

## Approach in Japan toward Ratification and Efforts in Future

August 2016

KENJI FUKUSHIMA

OYO INTERNATIONAL CORPORATION

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### Contents

1. Outline of the Minamata Convention on Mercury
2. Present State of the Ratification
3. Approach in Japan toward the Ratification
4. Efforts in Future

### Original sources

1. <http://www.hg-nic.com/mercury/minamata/index.html>
2. <http://www.mercury-free.jp/convention/>
3. <http://www.unep.org/PDF/PressReleases/GlobalMercuryAssessment2013.pdf>  
[http://www.env.go.jp/chemi/tmms/suigin\\_pamphlet\\_EN.pdf](http://www.env.go.jp/chemi/tmms/suigin_pamphlet_EN.pdf)  
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4. [http://www.mofa.go.jp/mofajgaikopage3\\_000477.html](http://www.mofa.go.jp/mofajgaikopage3_000477.html)  
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<http://www.meti.go.jp/committee/sankoushin/seizou/kagaku/pdf/...>

## 1. Outline of the Minamata Convention on Mercury

### **Aim and Character of the Minamata Convention on Mercury**

The convention aims to protect human health and the environment from the artificial emission of mercury and products containing mercury.

All mercury that occurs in the life cycle of mercury such as **“Production”, “Trading”, “Use”, “Emission”, “Release”, and “Storage”** are subject to restriction under the convention.

Mercury and products containing mercury (Batteries, Switches, Relays, Skin-lightening Cosmetics, Thermometers, Blood Pressure Monitors and etc.) are subject to a 2020 phase out date.

1. *Discontinuation of manufacturing for specified mercury-added products (16 items)*
2. *Strict management on the trading of mercury*
3. *Reduction of air emission (Requirement of air emission control for all plants)*
4. *Management of mercury waste*
5. *Instruction and elimination of artisanal and small-scale gold mining*
6. *Prohibition of the development of new mercury mines and abandonment of existing mercury mines*

3

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## 2. Present State of the Ratification

### **Process & Schedule of the Convention**

<b>Time</b>	<b>Event</b>
<b>2013</b>	<b>Agreed in Minamata City</b>
<b>2016 - 2017</b>	<b>Enter into force 90 days after <b>50 governments ratified.</b></b>
<b>Before 2020</b>	<b>Arrangement and engagement of the Minamata Convention on Mercury has to be fulfilled.</b>

4

## 2. Present State of the Ratification

### List of Ratified Countries as of May 2016

**Number of Signatories: 128**

**Number of Ratifications: 29**

Switzerland

Mali

Botswana

Zambia

Senegal

Bolivia

Japan

Peru

China

Chad

Djibouti

Gabon

Guinea

Guyana

Jordan

Kuwait

Lesotho

Madagascar

Mauritania

Mexico

Monaco

Mongolia

Nicaragua

Panama

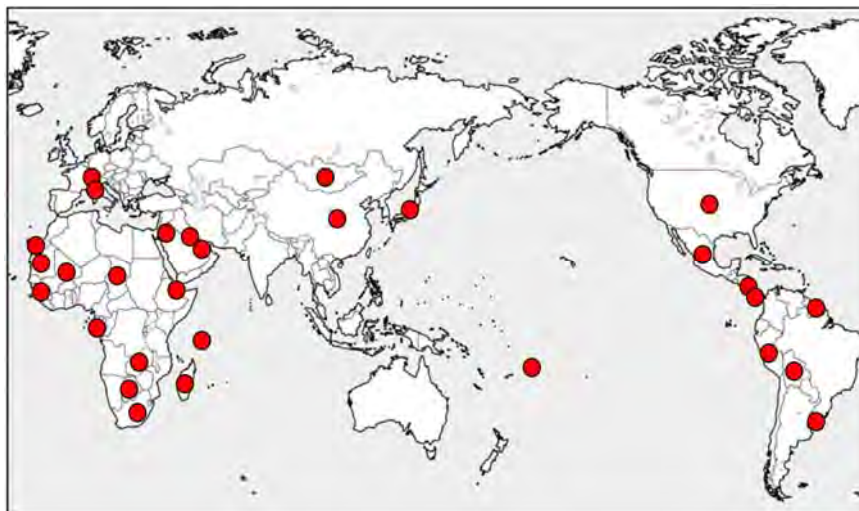
Samoa

Seychelles

United Arab Emirates

United States of America

Uruguay



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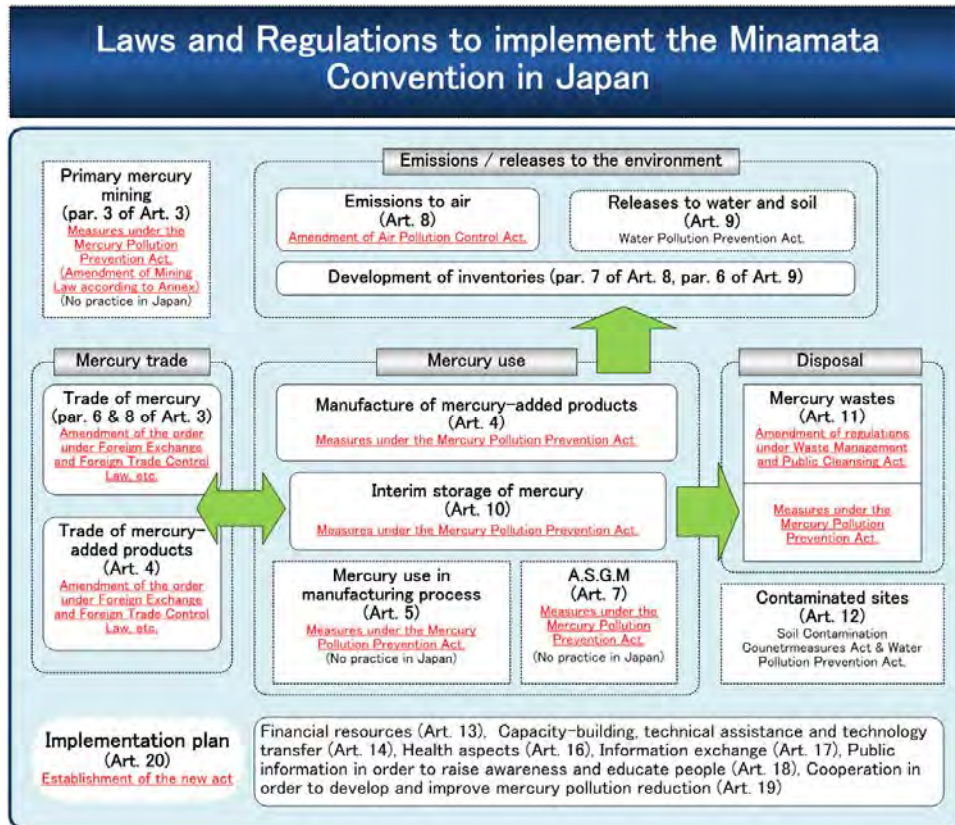
## 3. Approach in Japan toward the Ratification

### Major points of measures to implement the Minamata Convention in Japan

Requirement for the Ratification	Measures in Japan
Development of National Implementation Plan (NIP) for meeting the obligations under the convention (Article 20)	Legislation of the Act on Preventing Environmental Pollution on Mercury (new Act)
Prohibits the mercury mining, the gold mining using mercury, and the use of mercury or mercury compounds in the manufacturing processes. (Article 3, Article 5, Article 7)	
Regulations on manufacturing of mercury-added products prohibits (Article 4)	
Storage of mercury (Article 10)	
Controlling emissions of mercury (Article 8)	Amendment of Air Pollution Control Act
Releases of mercury into land, water (Article 9)	Measures against releases of mercury are already taken based on Water Pollution Control Law
Management of mercury wastes (wastes defined by waste management law) (Article 11)	Amendment of Waste Management Law
Management of mercury wastes (materials not defined by Waste Management Law) (Article 11)	Legislation of the Act on Preventing Environmental Pollution on Mercury (new Act)
Regulation of imports and exports (Article 3)	Amendment of governmental and ministerial ordinance

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### 3. Approach in Japan toward the Ratification



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### 3. Approach in Japan toward the Ratification

Measures in terms of Legislation (Article 3)	
Minamata Convention on Mercury	Measures in terms of Legislation
<p>Article 3</p> <p>Mercury supply sources and trade</p> <ul style="list-style-type: none"> <li>The provisions of this Article do not apply to mercury compounds used for laboratory research, naturally occurring trace quantities of mercury or mercury compounds present, mercury-added products.</li> <li>It prohibits parties to allow mercury mining that was not being conducted prior to country's entrance in the treaty, and it only allows mercury mining that was conducted prior to the treaty up to fifteen years after that date.</li> <li>It encourages countries to identify individual stocks of mercury or mercury compounds exceeding 50 metric tons, and that if found such mercury is disposed of in accordance with the guidelines for environmentally sound management.</li> <li>States are not allowed to export the mercury except for the environmentally sound storage or if it's necessary to ensure protection of human health; same goes for imports.</li> </ul>	<p style="color: blue; font-size: small;">* in the event of a violation, violators are subject to administrative penalties</p> <p>《new Act》</p> <ul style="list-style-type: none"> <li>Mercury mining is not allowed.</li> <li>Duty to report in terms of mercury storage.</li> </ul> <p>《 Amendment of governmental and ministerial ordinance 》</p> <ul style="list-style-type: none"> <li>Export of mercury is prohibited in principle.</li> <li>Import of mercury from supply sources that is not allowed according to the Convention is not approved.</li> </ul> <div style="text-align: center;"> </div>

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### 3. Approach in Japan toward the Ratification

Measures in terms of Legislation (Article 4)	
Minamata Convention on Mercury	Measures in terms of Legislation <i>* in the event of a violation, violators are subject to administrative penalties</i>
<p>Article 4 Mercury-added products</p> <ul style="list-style-type: none"> <li>Each state needs to take appropriate measures to ban the manufacture, import or export of mercury-added products.</li> </ul>	<p>《new Act》</p> <ul style="list-style-type: none"> <li>Manufacturing of specified mercury-added products listed in Annex A of the convention are prohibited.</li> <li>Ban on incorporation specified mercury-added products into assembly products.</li> <li>Restrain manufacturing new use of mercury-added products and their distribution in commerce.</li> </ul> <p>《Measures by Foreign Exchange and Foreign Trade Control Act》</p> <ul style="list-style-type: none"> <li>Regulation of imports and exports to the specified mercury-added products.</li> </ul>

### 3. Approach in Japan toward the Ratification

Measures in terms of Legislation (Article 5)	
Minamata Convention on Mercury	Measures in terms of Legislation <i>* in the event of a violation, violators are subject to administrative penalties</i>
<p>Article 5 Manufacturing processes in which mercury or mercury compounds</p> <ul style="list-style-type: none"> <li>Prohibits the use of mercury or mercury compounds in the manufacturing processes.</li> <li>Each state has to maintain relevant information on processes that use mercury or mercury compounds.</li> <li>The use of mercury or mercury compounds is forbidden in a facility that did not exist before the Convention.</li> </ul>	<p>《new Act》</p> <ul style="list-style-type: none"> <li>Prohibits the use of mercury or mercury compounds in the manufacturing processes shown in the Annex B of the Convention.</li> </ul>



### 3. Approach in Japan toward the Ratification

#### Measures in terms of Legislation (Article 7)

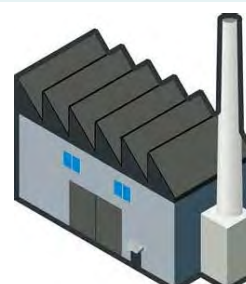
Minamata Convention on Mercury		Measures in terms of Legislation
Article 7 Artisanal and small-scale gold mining	<ul style="list-style-type: none"> <li>Each Party that has small-scale gold mining within its territory needs to reduce the use of mercury and mercury compounds in mining and processing.</li> </ul>	<p>* in the event of a violation, violators are subject to administrative penalties</p> <p>《new Act》</p> <ul style="list-style-type: none"> <li>Prohibits the gold mining using mercury.</li> </ul>



### 3. Approach in Japan toward the Ratification

#### Measures in terms of Legislation (Article 8)



Minamata Convention on Mercury		Measures in terms of Legislation
Article 8 Emissions of mercury	<ul style="list-style-type: none"> <li>It addresses controlling and reducing emissions of mercury and mercury compounds.</li> <li>Each state needs to take measures to control the pollution and set out a national plan to reach the expected target and goals of the mercury emission, using the best available technology.</li> <li>Emission should be reduced no later than five years after the date of entry into the Convention.</li> </ul>	<p>* in the event of a violation, violators are subject to administrative penalties</p> <p>《Amendment of Air Pollution Control Act》</p> <ul style="list-style-type: none"> <li>Notification of establishment of mercury emission facility.</li> <li>Compliance obligation with emission standard</li> <li>Voluntary efforts by establisher of mercury emission suppressing facility</li> </ul> <p>《new Act》</p> <ul style="list-style-type: none"> <li>Defining emission inventory based on the national plan under the new Act.</li> </ul>



### 3. Approach in Japan toward the Ratification


Measures in terms of Legislation (Article 9)	
Minamata Convention on Mercury	Measures in terms of Legislation
<p>Article 9</p> <p>Releases of mercury</p> <ul style="list-style-type: none"> <li>Controlling and reducing releases of mercury and mercury compounds.</li> <li>Each state should within three years after of date of entry into force of the Convention identify the relevant releases of mercury into land, water, and air.</li> <li>If the source exceeds maximum allowable emission, state needs to take measures to control releases and prepare a national plan setting out the plan to reach expected targets, goals and outcomes.</li> <li>National plans to control the release need to be submitted to the Conference of the Parties not later than 4 years after the entry of the state to the convention.</li> </ul>	<p>* in the event of a violation, violators are subject to administrative penalties</p> <p>《Measures against releases of mercury are already taken based on Water Pollution Control Law》</p> <p>《new Act》</p> <ul style="list-style-type: none"> <li>Defining releases inventory based on the national plan under the new Act.</li> </ul> 

### 3. Approach in Japan toward the Ratification


Measures in terms of Legislation (Article 10)	
Minamata Convention on Mercury	Measures in terms of Legislation
<p>Article 10</p> <p>Environmentally sound storage of mercury</p> <ul style="list-style-type: none"> <li>Any disposal of mercury waste should be done environmentally sound manner, taking into account any guidelines, and in accordance with any requirements of the Convention.</li> </ul>	<p>* in the event of a violation, violators are subject to administrative penalties</p> <p>《new Act》</p> <ul style="list-style-type: none"> <li>The government establishes the technical guidelines for environmental pollution control in terms of mercury storage and recommends relevant companies to implement corrective measures if necessary.</li> <li>A person who storage a certain amount of mercury has an obligation of regular report to the government in terms of the state of mercury storage</li> </ul>  

Recovered mercury is being stockpiled at long-term storage sites above- and, as shown here, below ground.

### 3. Approach in Japan toward the Ratification

Measures in terms of Legislation (Article 11)	
Minamata Convention on Mercury	Measures in terms of Legislation
<p>Article 11</p> <p>Relevant definition of mercury wastes, as well as the treatment of waste</p> <ul style="list-style-type: none"> <li>All mercury wastes should be disposed by the provisions of national law or the Convention, excluding overburden, waste rock and tailings from mining.</li> </ul> 	<p><i>* in the event of a violation, violators are subject to administrative penalties</i></p> <p>《Amendment of Waste Management Law》</p> <ul style="list-style-type: none"> <li>The government establishes new disposal method and standard in terms of mercury wastes (amendment of governmental and ministerial ordinance).</li> </ul> <p>《new Act》</p> <ul style="list-style-type: none"> <li>The government establishes the technical guidelines for environmental pollution control in terms of mercury recycling resources management and recommends relevant companies to implement corrective measures if necessary.</li> <li>A person in charge of mercury recycling resources managements has an obligation of regular report to the government in terms of the state of mercury recycling resources management.</li> </ul>

### 3. Approach in Japan toward the Ratification

Measures in terms of Legislation (Article 12)	
Minamata Convention on Mercury	Measures in terms of Legislation
<p>Article 12</p> <p>Treatment of contaminated sites</p> <ul style="list-style-type: none"> <li>Each state needs to develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds in an environmentally sound manner</li> <li>Treatment of contaminated site needs to incorporate an assessment of the risks to human health.</li> </ul>	<p><i>* in the event of a violation, violators are subject to administrative penalties</i></p> <p>《Measures against treatment of contamination sites are already taken based on the Soil Contamination Countermeasures Law and the Water Pollution Control Law》</p> 

### 3. Approach in Japan toward the Ratification

Measures in terms of Legislation (Article 20)	
Minamata Convention on Mercury	Measures in terms of Legislation
<p>Article 20</p> <p>National Implementation Plans</p> <ul style="list-style-type: none"> <li>Each party (signatory nation) may develop and execute a national implementation plan (NIP) for meeting the obligations under the convention.</li> </ul>	<p><i>* in the event of a violation, violators are subject to administrative penalties</i></p> <p>《new Act》</p> <ul style="list-style-type: none"> <li>Hearing the opinions from the Central Environment Council, the government develops “National Implementation Plan on Preventing of Environmental Pollution on Mercury”</li> <li>The overview and future measures against environmental pollution by mercury are comprehensively identified in the plan.</li> </ul>



### 4. Efforts in Future

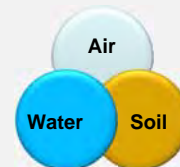
#### Japan's approach to the Minamata Convention on Mercury (1)

##### Basic Policy

- ✓ Support developing countries to tackle their environmental challenges
- ✓ Promote “Human Security”, one of the main agenda of Japanese foreign policy, which focuses on each and every individual
- ✓ Utilize **technologies** which Japan has developed to overcome environmental pollution over the past years

##### Concrete Measures 1

- ✓ Japan will provide **USD 2 billion of ODA** in total over the next 3 years (2014-2016) in the following 3 areas to support developing countries in tackling environmental pollution.



##### Concrete Measures 2

- ✓ Japan will launch a capacity building program, specially designed for mercury pollution prevention (**3 years' JICA Group training course**. Sharing lessons learned from Minamata disease experience, sharing Japan's knowledge to tackle mercury pollution, assisting developing countries in ratifying the Convention.)

## 4. Efforts in Future

### Japan's approach to the Minamata Convention on Mercury (2)

#### Technical Cooperation Project by JICA

##### *✓ Effectively Combining a Variety of Cooperation Tools*

(1) Dispatch of Experts



(2) Acceptance of Training Participants

(3) Technical Cooperation Projects

(4) Technical Cooperation for Development Planning

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## 4. Efforts in Future

### Japan's approach to the Minamata Convention on Mercury (3)

#### (2) Acceptance of Training Participants

##### *JICA Knowledge Co-Creation Program (Group & Region Focus, 10 participants)*

###### a. Capacity Building for **Ratification** of Minamata Convention on Mercury

- ✓ Place: Minamata City, Kyusyu, Japan
- ✓ Period: 20 Nov. 2016 ~ 24 Dec. 2016 (from 2014, yearly program)
- ✓ Contents (lectures and inspections):
  1. Lessons learnt from Minamata Disease in Japan
  2. Summary of environmental management in Japan
  3. Countermeasures for mercury pollution in Japan
  4. Details of Minamata Convention on Mercury
  5. Japan's situation of preparatory for ratification of the Convention

###### b. Capacity Building for **Mercury Monitoring in Multimedia Environment**

- ✓ Place: Minamata City, Kyusyu, Japan
- ✓ Period: End Sep. 2017 ~ Mid Nov. 2017 (from 2017 to 2019, yearly program)
- ✓ Contents (lectures and practice):
  1. Physicochemical and toxicological characteristics of mercury, environmental fate and status of mercury, objective and justification of mercury monitoring
  2. Q.A. and Q.C., regulatory measures of mercury such as environmental standard.
  3. Introduction of analytical chemistry for mercury monitoring, analytical method for environmental and biological media, operational principles of analytical instruments, explanation of handling steps, and exercise of analytical work in multimedia environment.
  4. Case study on fact-finding survey for mercury contamination in the environment
  5. Outline of the plan for the mercury monitoring network in the Asia and Pacific region

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## 4. Efforts in Future

Future Plans in Japan	
Time	Event
2016	Japan ratified the Minamata Convention on Mercury
From autumn to winter	Develop a national implementation plan ( <b>NIP</b> ) on preventing of environmental pollution on mercury and submit to the secretariat of the convention.
- 2017	The convention will go into effect, and new act on preventing environmental pollution on mercury (except some parts) shall enter force in Japan.
	Dissemination of the relevant legislation of mercury to relevant government agencies and industries, holding of a briefing session.
January 1, 2018	Commencement of the regulation on manufacturing, imports and exports to the specified mercury-added products. (in case that the regulation starts in advance)
January 1, 2021	Commencement of the regulation on manufacturing, imports and exports to the specified mercury-added products. (in case of that the regulation starts in accordance with the convention)



Data Collection Survey on the Countermeasure against **Hg pollution**  
in Asia, Central & South America

## Summary of the survey results



**Takako UEDA**  
Sub leader  
JICA Survey Team

## Brief outline

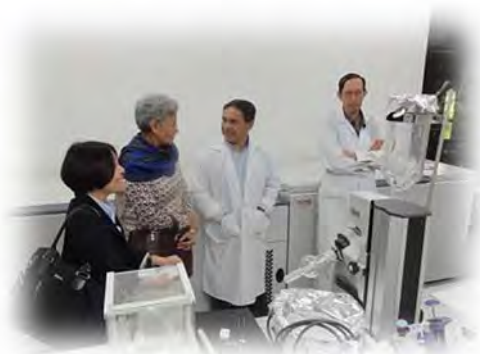
### 1. General considerations

- 1.1. Background of the survey
- 1.2. Countries surveyed & Periods
- 1.3. Current status of Hg analysis system

### 2. Detailed explanation

- 2.1. Latin America
- 2.2. Southeast Asia

### 3. Short summary



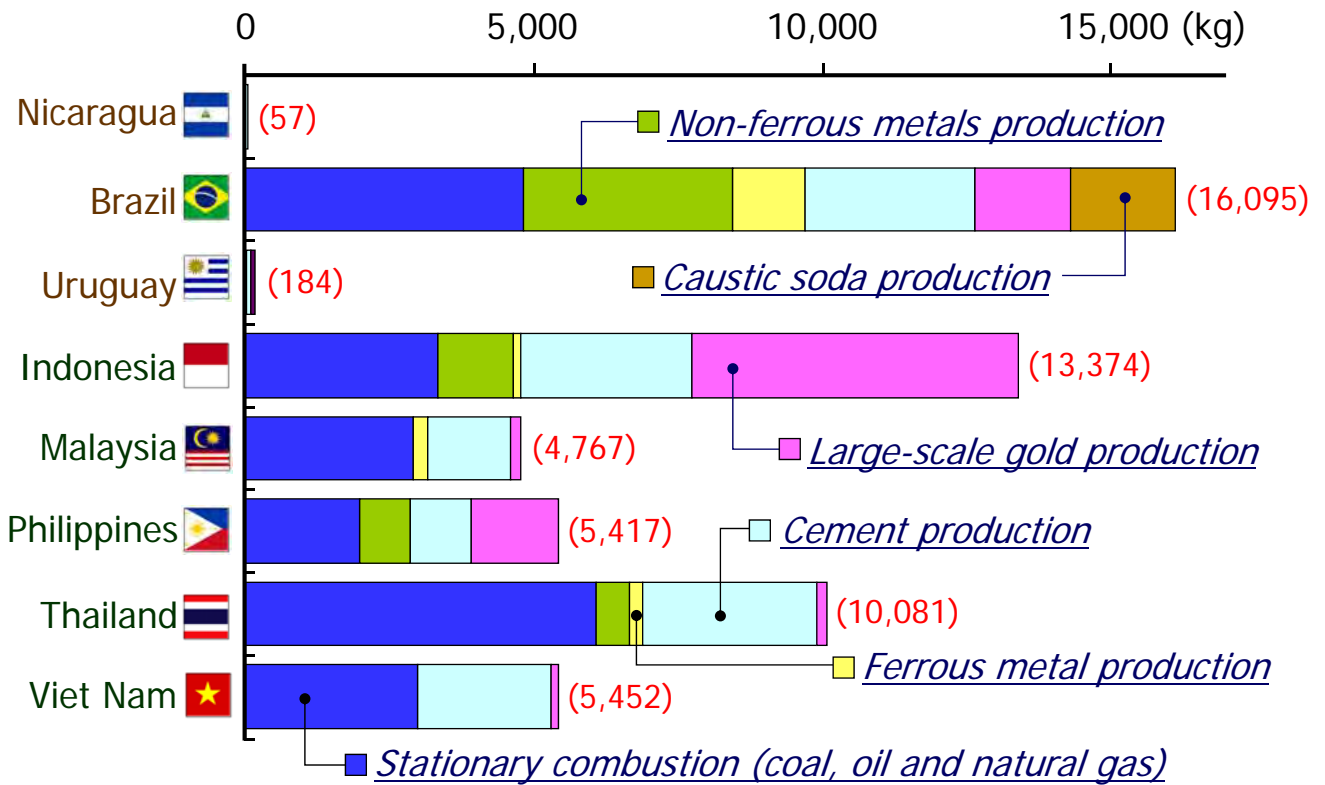
# 1. General considerations



## 1.1. Survey background (1)



## Hg by-product emission (UNEP 2013)



## 2. Countries surveyed & Periods of the 1st survey

### Latin America



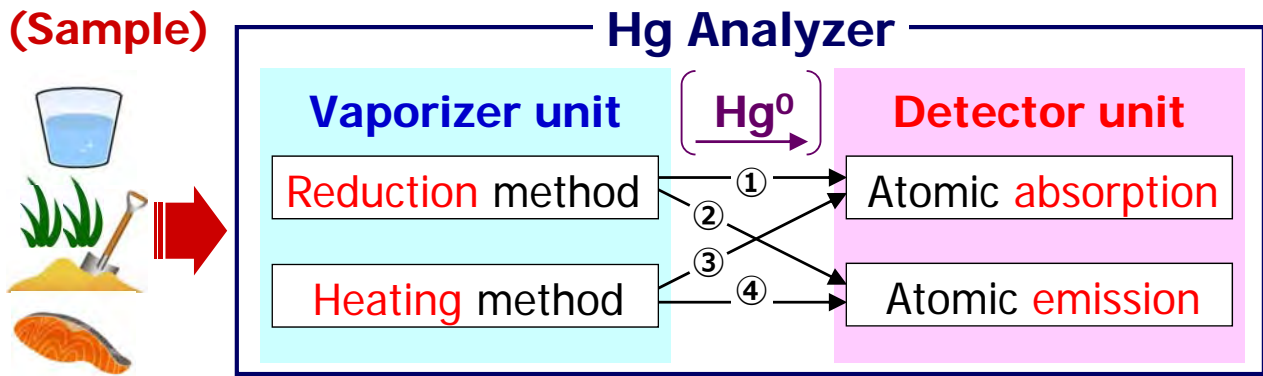
 :21-28 May  
 :29 May-4 Jun.  
 :5-13 Jun.

### Southeast Asia



 :29 May-4 Jun.      :19-25 Jun.  
 :5-11 June      :26 Jun.-2 Jul.  
 :3-9 Jul.





System	Characteristics		Countries adopting
① Red. + AAS	General purpose		
② Red. + AES	Low Hg conc. samples		
③ Heat + AAS	Advant. for solids	Wide range	
④ Heat + AES		Low Hg conc.	(nil)

## 2. Detailed explanation





## Uruguay

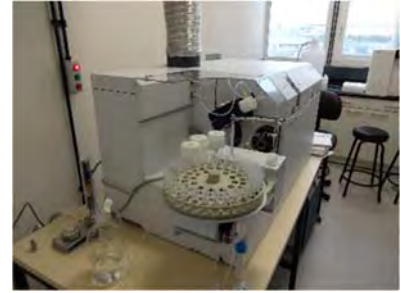
- Minamata Convention: **Ratification (24/09/2014)**
- GEF/UNDP project is on-going.
- MoH is investigating the contamination of T-Hg & **MeHg** in human being.
- Nacional Env. Division is monitoring T-Hg & **MeHg** mainly in the hydrosphere, and planning to analyze fish.



Inside of laboratory  
(DINAMA)



Hg analyzer  
(PerkinElmer FIMS100)



ICP-MS  
(Agilent 7700x)



## **Brazil**

- Minamata Convention: **Signature (10/10/2013)**
- Minamata Initial Assessment (MIA) is on-going.
- MoH (IEC) is monitoring **MeHg** periodically among the 8 target countries.
- Sao Paulo State Env. Agency (CETESB) is investing to analyze **T-Hg & MeHg** to be a regional center of Minamata Convention.



Hg Analysis System  
(FIMS 100)



Gas chromatography  
(Yanaco YX8000-E)



ICP-MS  
(Varian 820)

## Nicaragua

- **Minamata Convention: Ratification (29/10/2014)**
- **A national university (UNAN/CIRA) has already attained to technological level of infinitesimal Hg quantitation (ppt order) including MeHg.**
- **UNAN/CIRA is conducting MeHg analyses in human hair, and plans to analyze on marine products in future.**



Inside of laboratory  
(UNAN/CIRA)



Hg analyzer  
(Milestone DMA-80)



Hg analyzer  
(SANSO HG-201)

## Vietnam

- **Minamata Convention: Signature (11/10/2013)**
- **GEF/UNIDO project is on-going.**
- **Center for Environment Monitoring is conducting environmental monitoring in water & air.**
- **Now IET focuses on As speciation in natural water by following environment policy.**



Inside of laboratory  
(IET)



Atomic Absorption  
(Shimadzu AA-6800)



Gas chromatography  
(Shimadzu GC-2010)



## Roadmap for Minamata Convention in Vietnam

No	Item	I- 2016	II- 2016	III- 2016	IV- 2016	I- 2017	II- 2017
<b>I RATIFICATION</b>							
1	Minamata Initial Assessment in Vietnam	X	X	X	X		
2	NAP for ASGM in Vietnam			X	X	X	X
3	Submission to Government for Ratification				X		
4	Ratification				X	X	
<b>II EALY IMPLEMENTATION</b>							
1	Issuing Decree and Circulars					X	X
2	National Action Plan					X	X

August 2016  
Vietnam Chemicals Agency/ MOIT

## Philippines

- **Minamata Convention: Signature (10/10/2013)**
- **Philippines is so sensitive to Hg pollution due to small-scale gold mining, GEF/UNIDO project was conducted in 2013-2015.**
- **Environmental Management Bureau (EMB) has a responsibility to certify for Hg compound usage.**



Inside of laboratory  
(EMB)



Hg analyzer  
(NIC RA-3)



Certification of Hg  
compaund usage

## Malaysia

- Minamata Convention: **Signature (24/09/2014)**
- 5 Ministries take responsibility for the Convention, 16 Agencies have some relations to Hg issues.
- MOH's Lab is analyzing **MeHg** in the marine products by **LC-ICP-MS** system.
- Toxicological studies on Hg are actively proceeded.



Hg analyzer for solid sample (SIRIM Berhad)



LC-ICP-MS for MeHg (Public Health Lab, MOH)



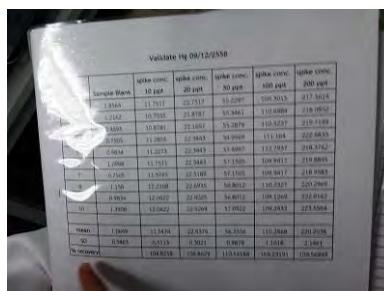
Laboratory staff (←same as on the left)

## Thailand

- Minamata Convention: **(Unsigned)**
- PCD in MNRE has 5 Hg analyzers which are used separately according to sample (e.g. soil, water, etc.).
- ERTC is conducting Hg monitoring **in the atmosphere**.
- JGSEE, a joint graduate school, promotes **international academic exchange** regarding Hg monitoring strongly.



Hg analyzer (milestone general FMA-80, PCD)



Validation record of Hg analyzer (PCD)



Air sample for Hg monitoring (ERTC)



## **Indonesia**

- **Minamata Convention: Signature (10/10/2013)**
- **In 1993, Environmental Management Centre (EMC) was established with 6 laboratories and had kept analysing organic/inorganic substances.**
- **EMC has 3 Hg analyzers, and it is expected that these equipment will be utilized more effectively.**



**Inside of laboratory  
(EMC)**



**Hg analyzer  
(NIC MA-3000)**



**Hg analyzer  
(Milestone DMA-80L)**

## 3. Short Summary



								
<b>Minamata Convention</b>								
Signature	X	X	X		X	X	X	X
Ratification	X		X					
<b>Mercury Analysis</b>								
Water	X	X	X	X	X	X	X	X
Soil	X	X	X	X			X	
Air				(X)			(X)	(X)
Bio media			X	X	X			X
<b>MeHg</b>	X	X	X		X			

**Thank you for your attention.**



**Salamat po / Cám ơn / Terima kasih / ขอบคุณค่ะ**  
**Muchas gracias / Muit Obrigada**

# JICA KNOWLEDGE CO-CREATION PROGRAM: CAPACITY BUILDING FOR RATIFICATION AND IMPLEMENTATION OF THE MINAMATA CONVENTION ON MERCURY

1

Masayuki Takazawa, JICA Study Team

## BACKGROUND OF PROMOTION OF THIS TRAINING COURSE

- Minamata Disease
- The Minamata Convention on Mercury
- Why are we (JICA Study Team) promoting this training course?

## MINAMATA DISEASE: MAJOR POINTS (1)

- Environmental pollution,,,, it is the return for the high-speed economic growth. Japan experienced the “return” in the 1950s, called “Postwar Economic Growth”.
- Minamata Disease was officially recognized in 1956. It is often said to be the first officially-recognized case of environmental pollution.
- This highly toxic chemical was bioaccumulated in shellfish and fish in Minamata Bay and the Shiranui Sea. When the local populace consumed the contaminated shellfish and fish, it resulted in mercury poisoning.

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## MINAMATA DISEASE \_MAJOR POINTS (2)

- Mininamata Disease is a neurological syndrome caused by severe mercury poisoning.
- The symptoms include ataxia, numbness in the hands and feet, general muscle weakness, loss of peripheral vision, and damage to hearing and speech.
- In extreme cases, insanity, paralysis, coma, and death follow within weeks of the onset of symptoms. A congenital form of the disease can also affect fetuses in the womb.
- It was caused by the release of methylmercury in the industrial wastewater from the Chisso Corporation’s chemical factory, which continued from 1932 to 1968.

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## MINAMATA DISEASE: VICTIMS

- As of May 2008, 2,268 victims had been officially recognized as having Minamata disease<sup>1</sup>.
- 1,658 of whom had died.
- But, there is believed to be more than 100,000 victims/deaths throughout Japan<sup>1</sup>.
- Many victims of Minamata disease faced discrimination and ostracism from the local community.

Note 1: <http://www.soshisha.org/jp/>



<http://bougainvillea330.blog.fc2.com/blog-category-16.html>



<http://blog.goo.ne.jp/wag18470/e/cecdb3676b055a539a2df9f09384eec9>



<http://masakosamalove.blog.fc2.com/blog-entry-259.html>

5

## THE MINAMATA CONVENTION ON MERCURY: GENERAL INFORMATION

- Global treaty to protect human health and environment from the adverse effects of mercury.
- Agreed at the fifth session of the Intergovernmental Negotiating Committee on Mercury in Geneva, Switzerland on 19 January 2013
- Adopted 10 October 2013 at a Diplomatic Conference (Conference of Plenipotentiaries) in Kumamoto, Japan.
- Signatory: 90 countries (as of May 2016)
- Ratifier: 28 countries (as of May 2016), Japan ratified on 2 February 2016
- Historical step to prevent mercury pollution was taken through adoption of the treaty.

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## THE MINAMATA CONVENTION ON MERCURY: MAJOR HIGHLIGHTS

- Ban on new mercury mines,
- Phase out and phase down of mercury use in a number of products and processes,
- Control measures on emissions to air and on releases to land and water,
- Regulation of the informal sector of artisanal and small-scale gold mining.
- Also, it addresses the following: interim storage of mercury and its disposal once it becomes waste; sites contaminated by mercury; and health issues

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## WHY ARE WE (JICA STUDY TEAM) PROMOTING THIS TRAINING COURSE?

- “Crisis” on possible mercury pollution in other countries, especially China and some African countries, spurring a momentum of economic growth
- “Japan’s mission” is to convey the tragedy of Minamata Disease to the world and to contribute to increase of ratifiers for UNEP

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## CONTENTS OF CAPACITY BUILDING FOR RATIFICATION AND IMPLEMENTATION OF THE MINAMATA CONVENTION ON MERCURY

- Goal
- Target personnel/ organization
- Learning method
- Outputs (1)-(4)

## GOAL

-The Action Plan designed for promoting ratification of the Minamata Convention on Mercury through this training course is implemented in the participants' countries.

## TARGET PERSONNEL/ ORGANIZATION

- Administrative officers in charge of legislative preparation for ratification and implementation of the Minamata Convention on Mercury.
- Governmental or public agencies engaging in the ratification and implementation of the Minamata Convention.

## LEARNING METHOD

Method	Remarks
Lecture	Delivered by the government officials, Minamata Disease victims, and some private mercury-containing waste management operators
Site visit	Some site visits including Minamata City, Kumamoto Pref. on Kyushu Island
Discussion	Discussion with lecturers, Minamata Disease victims and other country participants
Practical work	Design of an original action plan toward ratification

## OUTPUT (1): TO UNDERSTAND THE MINAMATA CONVENTION ON MERCURY

Major points	Learning Method
<ul style="list-style-type: none"><li>-To learn some basic knowledge: e.g. history of Minamata Disease, use/emission of mercury in Japan, use of Mercury in Artisanal and Small-Scale Gold Mining (ASGM)</li><li>-To learn what the Minamata Convention states and process of negotiation</li><li>-To learn from the Minamata Disease victims</li><li>-To learn from site visits: e.g. Minamata Disease Mitigation Project and “Mercury-Free” Promotion by Kumamoto Prefecture, environmental activities by Minamata City and its citizens, solid waste management facility in Minamata City</li><li>-To identify the key points of the Convention through the above points</li></ul>	<ul style="list-style-type: none"><li>Lecture</li><li>Discussion</li><li>Site Visit</li></ul>

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## OUTPUT (2): TO UNDERSTAND PROCEDURAL STEPS TOWARD RATIFICATION

Major points	Learning Method
<ul style="list-style-type: none"><li>-To learn Japan’s experience of ratification of the Convention</li><li>-To identify necessary works for ratification</li></ul>	<ul style="list-style-type: none"><li>Lecture</li><li>Discussion</li></ul>

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## OUTPUT (3): TO UNDERSTAND THE TECHNOLOGY AND APPLICATION OF THE PREVENTIVE METHODS IN JAPAN

Major points	Learning Method
<ul style="list-style-type: none"><li>-To learn countermeasures for airborne mercury emission and emission inventory</li><li>- To learn the method for pollution prevention of mercury</li><li>- To observe management facility of the fluorescent tubes</li><li>- To learn how to do environmental assessment</li></ul>	Lecture Site Visit Discussion

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## OUTPUT (4):TO DESIGN "ACTION PLAN" TOWARD RATIFICATION

Major points	Learning Method
<ul style="list-style-type: none"><li>-To discuss challenges and possible solutions for ratification</li><li>-To draft the Action Plan based on the discussion by each training participant or country participant group</li><li>-To present and discuss the Action Plan with the lectures and the training course participants</li></ul>	Practical work Discussion

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## RELATION OF OUTPUTS TO GOAL

Output 1

- To understand the Minamata Convention on Mercury

Output 2

- To understand procedural steps toward ratification

Output 3

- To understand the technology and application of the preventive methods in Japan

Output 4

- To design "Action Plan" toward ratification

### Goal

“The Action Plan designed for promoting ratification of the Minamata Convention on Mercury through this training course is implemented in the participants’ countries”

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<http://www.city.minamata.lg.jp/>



チッソ東門排水口

<http://blog.goo.ne.jp/morinoizumi20/e/cdbdaec71180554e7ad4200739e052f3>



<http://www.ozakitamaki.com/cn17/pg106.html>

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THANK YOU VERY MUCH.



# Capacity strengthening for **Multi-Media Mercury Monitoring (4M)** in Asia-Pacific region



**Takako UEDA**

Sub leader,  
JICA Survey Team

1 /22

## Outline

1. Overview of the program
2. Objective & Outcome
3. Propoed curriculum
  - 3.1. Scientific characteristics of Hg
  - 3.2. Quality assurance & Quality control
  - 3.3. Analytical methods in various media
  - 3.4. Case study on Hg contamination survey
  - 3.5. Hg monitoring network in Asia & Pacific region
4. Conditions & expectations

2 /22

## 1. Overview of the program



# Minamata Convention on Mercury

(Request to report)

- Current situation of Hg usage in the country
- Progress of the implemented countermeasures



In the program:

1. To learn practical sampling and analysis techniques
2. To support to carry out the Hg monitoring
3. To develop HR to contribute to the monitoring NW

## 2. Objective & Outcome

### Objective

To understand the necessary initiatives & issues for the development of the Hg monitoring in the country

### Outcome

1. Scientific characteristics of Hg
2. Quality assurance & quality control (QA/QC)
3. Analytical methods for Hg in various media
4. Case study on Hg contamination survey
5. Hg monitoring network in Asia & Pacific region

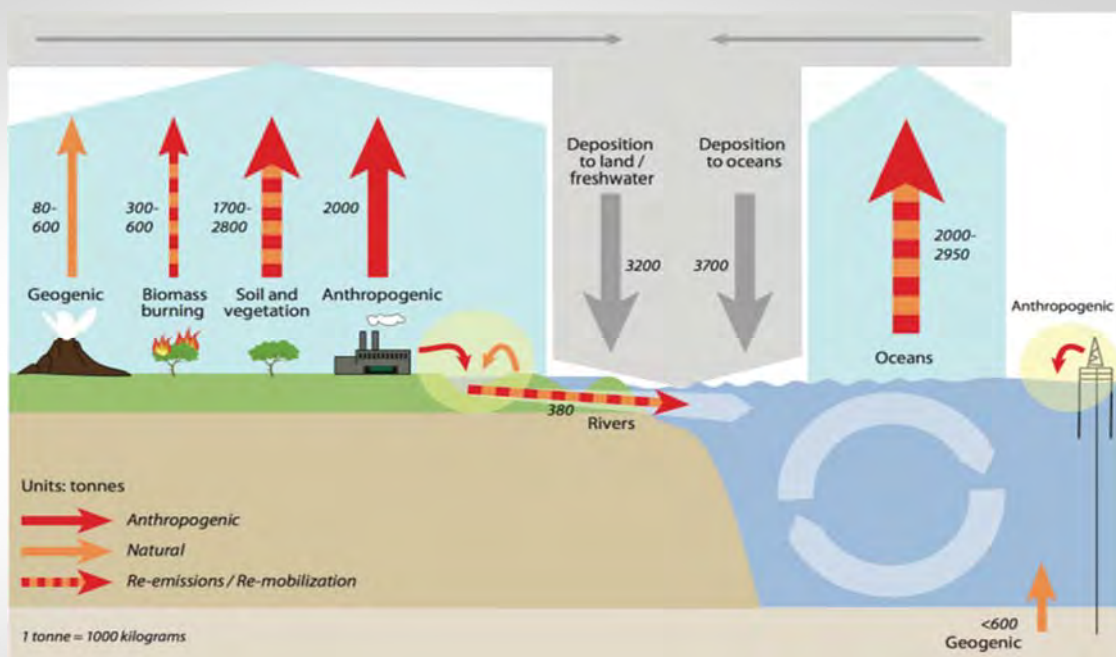
## (1) Scientific characteristics of Hg

Hg is the **ONLY** metallic element, which does not coagulate at room temperature, under normal pressure.

- Hg is easily vaporized.
- Hg does not decompose (/disappear) in nature.

 Hg moves (/circulates) in the whole world.

## Global Hg cycling

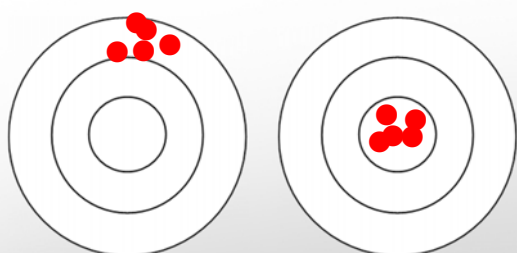




## (2) Quality assurance & Quality control

- Quality assurance and quality control
- Regulatory measures of mercury such as environmental standard

### *Precision & Accuracy*

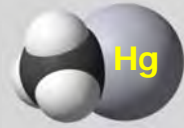


Standard Value (JP)	T-Hg (mg/L)	Alkyl-Hg (mg/L)
Waste water	0.005	Not detectable
Surface water	0.0005	Not detectable
Drinking water	0.0005	Not detectable

## (3) Analytical methods in various media

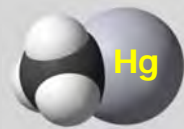
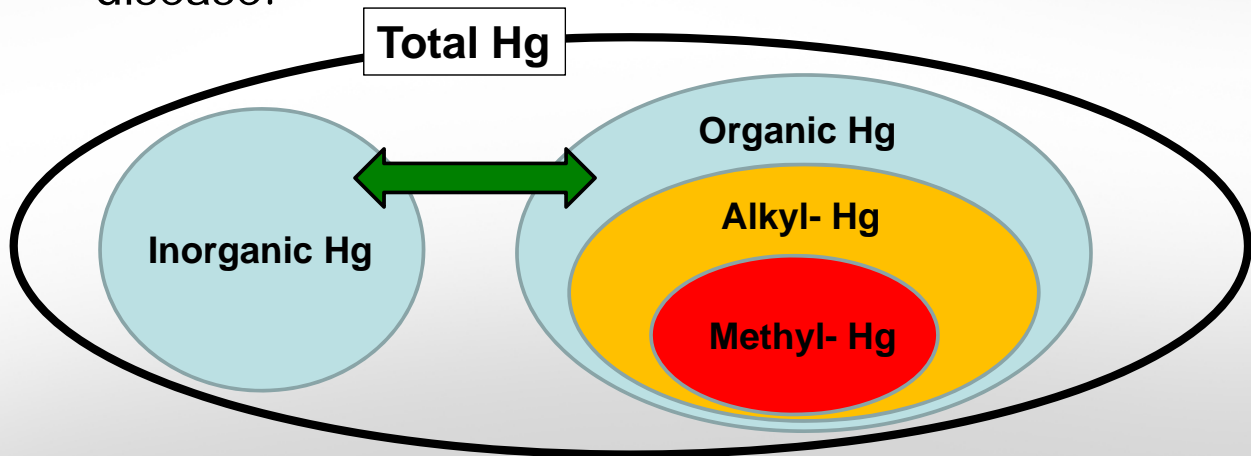
- Analytical chemistry for Hg monitoring
- Analytical method for environmental and biological media
- Operational principles of analytical Instruments, explanation of handling steps
- Exercise of analytical work



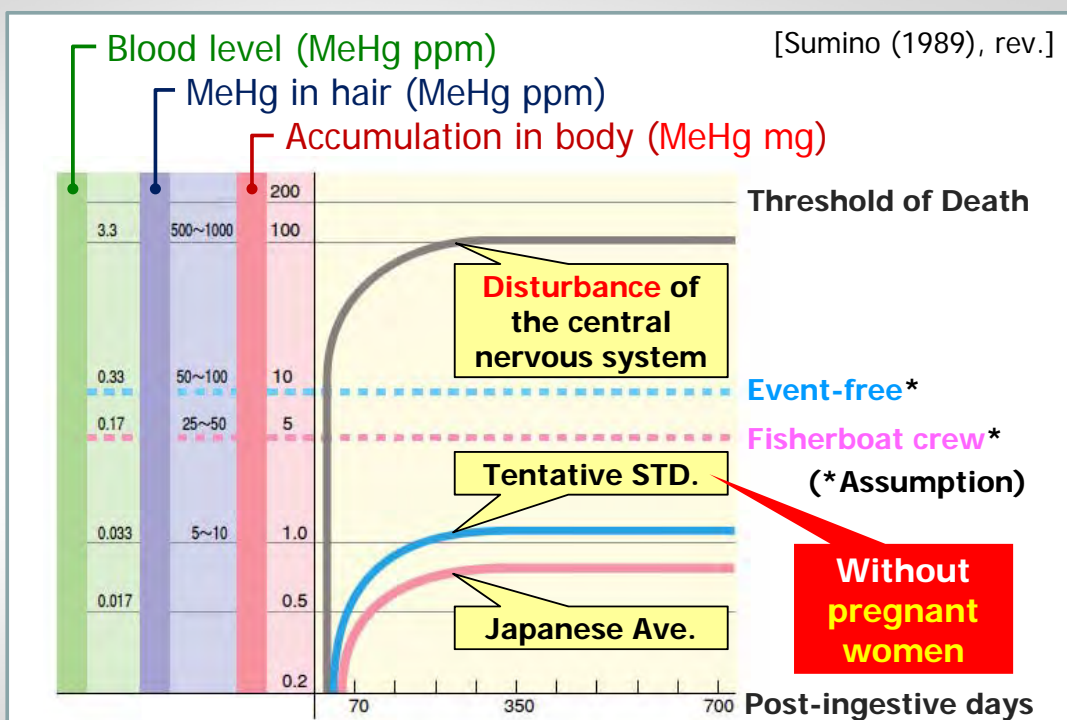


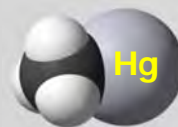
## Practices: Metyl Hg (MeHg) -1

- Methyl Hg is a fat-soluble substance, and easily accumulate in organisms body.
- Methyl Hg is the causative agent of Minamata disease.



## Practices: Metyl Hg (MeHg) -2





## Practices: Metyl Hg (MeHg) -3

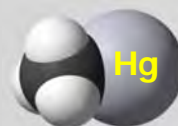
FAO/WHO (JECFA)  
2003



**1.6**  $\mu\text{g}$  MeHg-Hg  
/kg weight/week



**3.3**  $\mu\text{g}$  MeHg-Hg  
/kg weight/week



## Practices: Metyl Hg (MeHg) -4

Fishery product



$$\frac{\text{MeHg}}{\text{Total Hg}} = 0.75 \sim 1$$



$$\frac{\text{MeHg}}{\text{Total Hg}} = \frac{0.542^*}{0.723^*} = 0.75$$

(\* $\mu\text{g/g}$ )

## (4) Case study on Hg survey

- Case study on fact-finding survey for Hg contamination in the environment



Aerosol sampler



Aerosol mass spectrometer

## Monitoring system in Japan

Target	Frequency	No. of Exceeded Reference Value
Air	270 points / month	0
Surface water	3950 points / month	1 (Derived from natural)
Ground water	2886 points / year	1
Soil	---	84

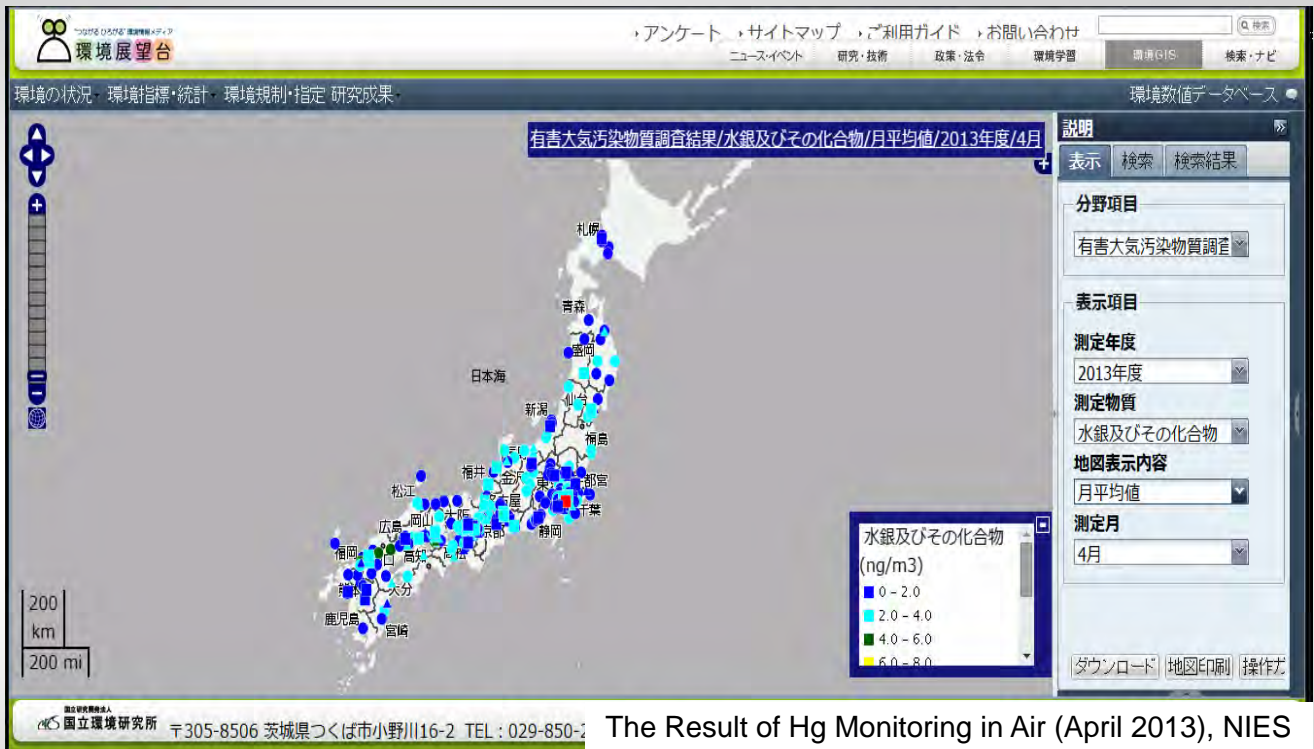
Result of Hg Monitoring in 2014, MOE, Japan

- Inspection ~~≠~~ Monitoring
- Monitoring is conducted by not only MOE but also other agencies (like MLIT, MOH, local govt., etc.)
- The results of Monitoring are stored in a database, and it is opened to the public.



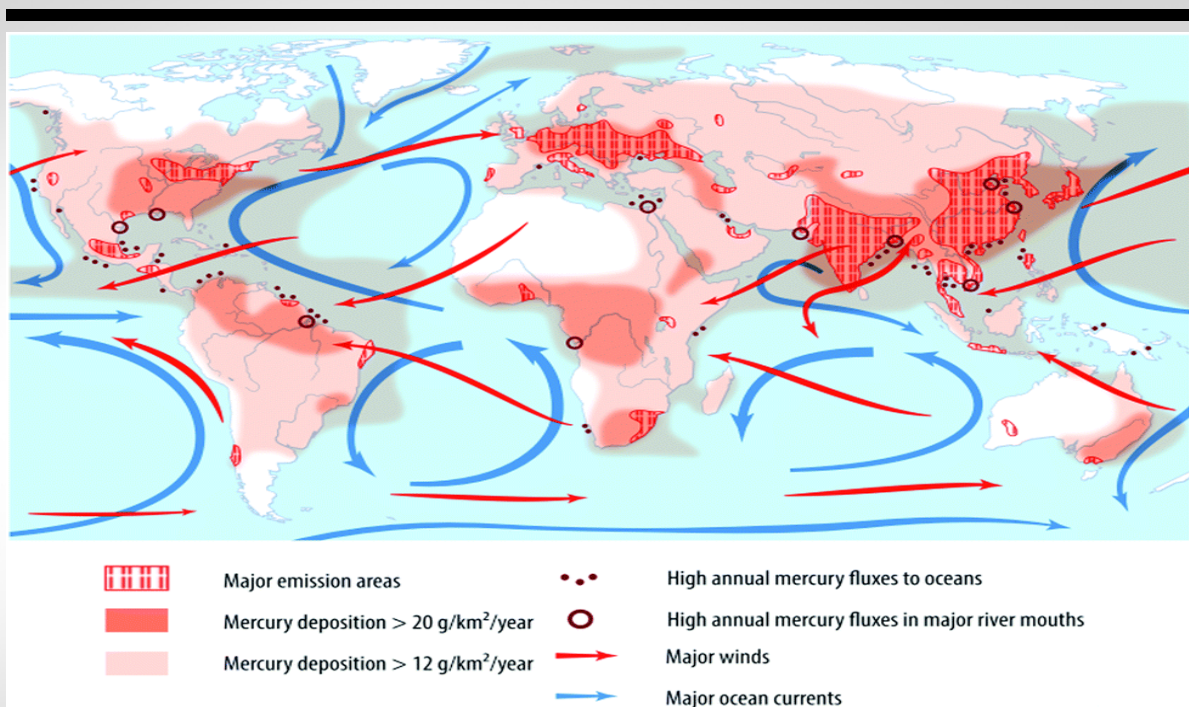
3. Proposed curriculum (5) -2

# Information disclosure in Japan



3. Proposed curriculum (5) -3

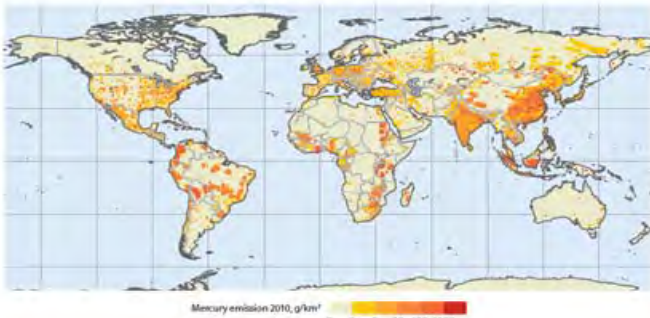
# Global Hg transport





## (5) Hg monitoring network

- Outline of the plan for the Hg monitoring network in the Asia and Pacific Region
- Discussion of the mercury monitoring system in each participant's country



Atmospheric Hg Monitoring Workshop  
in Taiwan, 13-17 June 2016



### Implementation term

- It is planned for 3 years (2017 – 2019)
- From end of Sep. to middle of Nov, 2017

### Target organization

Public institute for chemical/health/hygiene research

### Target persons

- Technical staffs working for the laboratory
- Clinical laboratory technologists

(Upper-limit: 10 persons/year)

# Merit of KCC training



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## Ratification & Implementation of Minamata Convention

1. **Preparation process** for ratification
2. **Necessary modification** of the other conventions, laws and regulations
3. **On-going process** for implementation of Minamata Convention in **Japan**
4. **Discussion & Info exchange** among participants from other countries
5. **Exercise** applying the lesson learnt from the training course ("**Action plan**")

20 /22

# Multi-Media Mercury Monitoring (4M)

- 1. Scientific characteristics** of Hg
- 2. Quality assurance & Quality control** (QA/QC)
- 3. Analytical methods** for Hg in various media
- 4. Case study** on Hg contamination survey
- 5. Hg monitoring network** in Asia & Pacific region

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**Thank you for your attention.**



**Looking forward to your application!**

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# Introduction of Heavy metals

— Health effect & Advanced technology —



**UTAGAWA, H.**  
Team leader  
JICA Survey Team

0. Definition -as substitute for introduction-

2/25

## What are "Heavy Metals" ?

### Today's topics

Concerning **Cr, Cd, Hg, Pb, As**:

- Human health effect
- The latest academic trends & technologies

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57~71 La-Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89~103 Ac-Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn						



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# Outline

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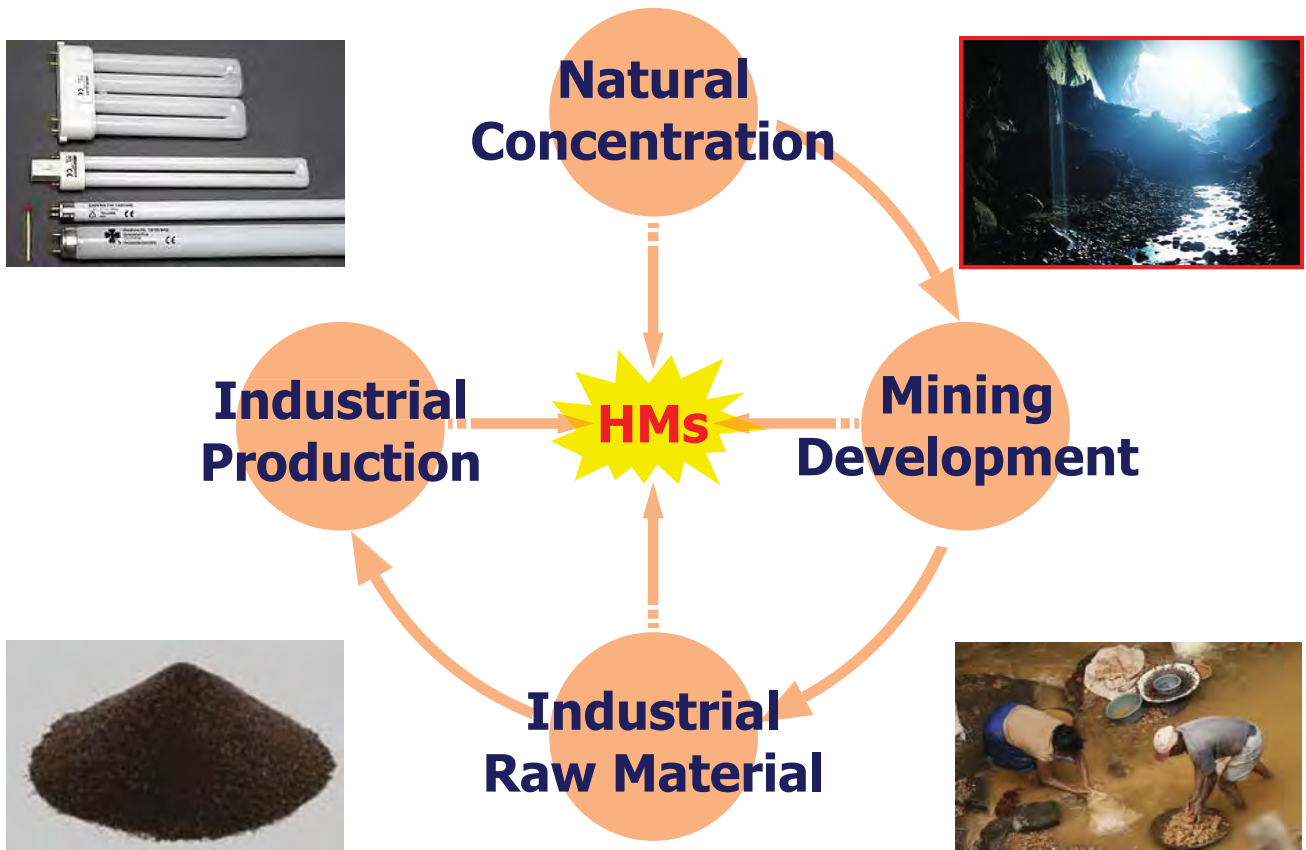
0. Definition of "heavy metals"
1. Env. science on heavy metals
2. Characteristics of 5 heavy metals
3. Some researches in recent years
4. Conclusion (brief remark)



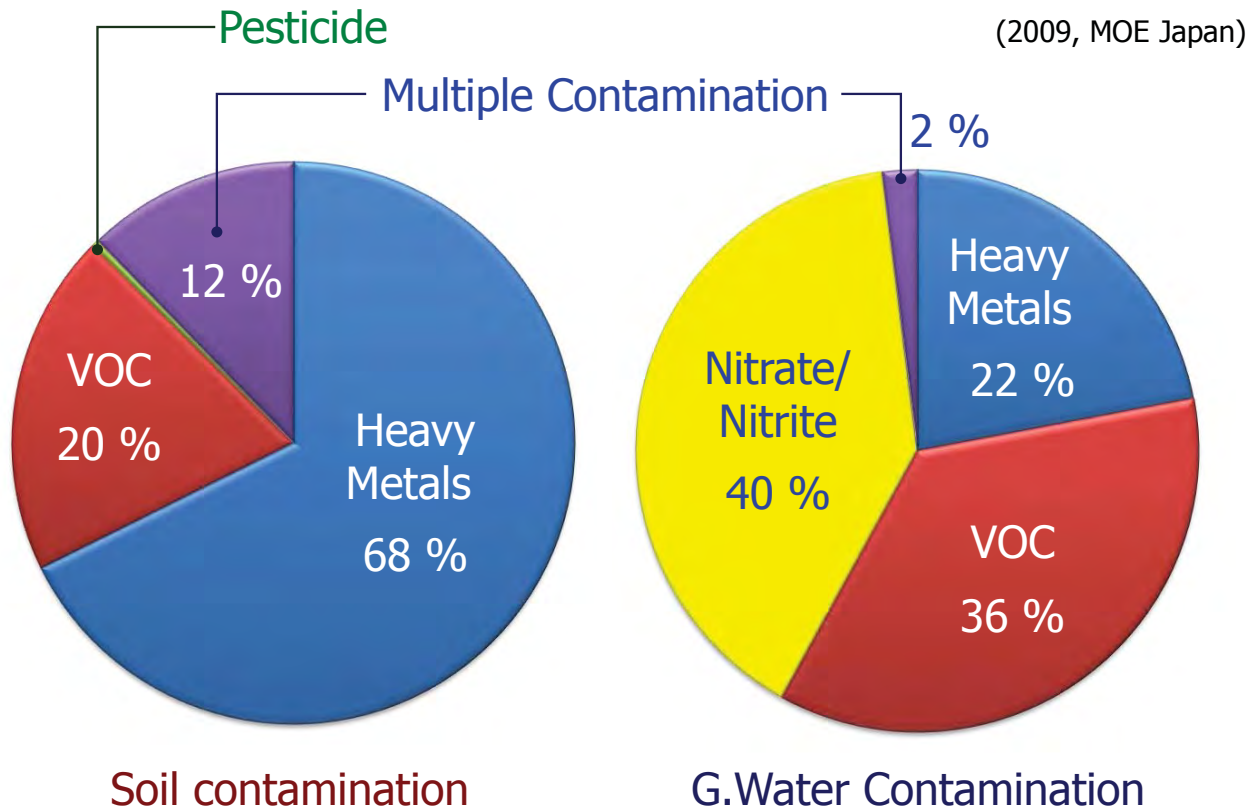
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## 1. Env. Science on Heavy Metals (Basic introduction)

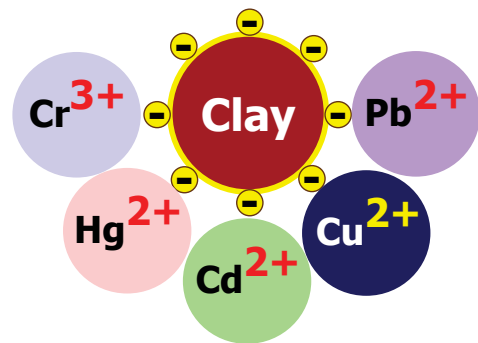




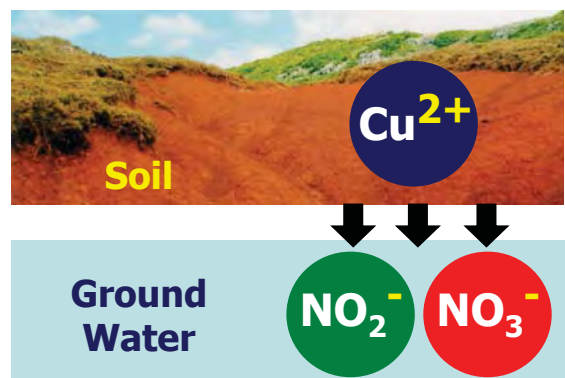
(<http://www.doe.gov.my/portalv1/>)



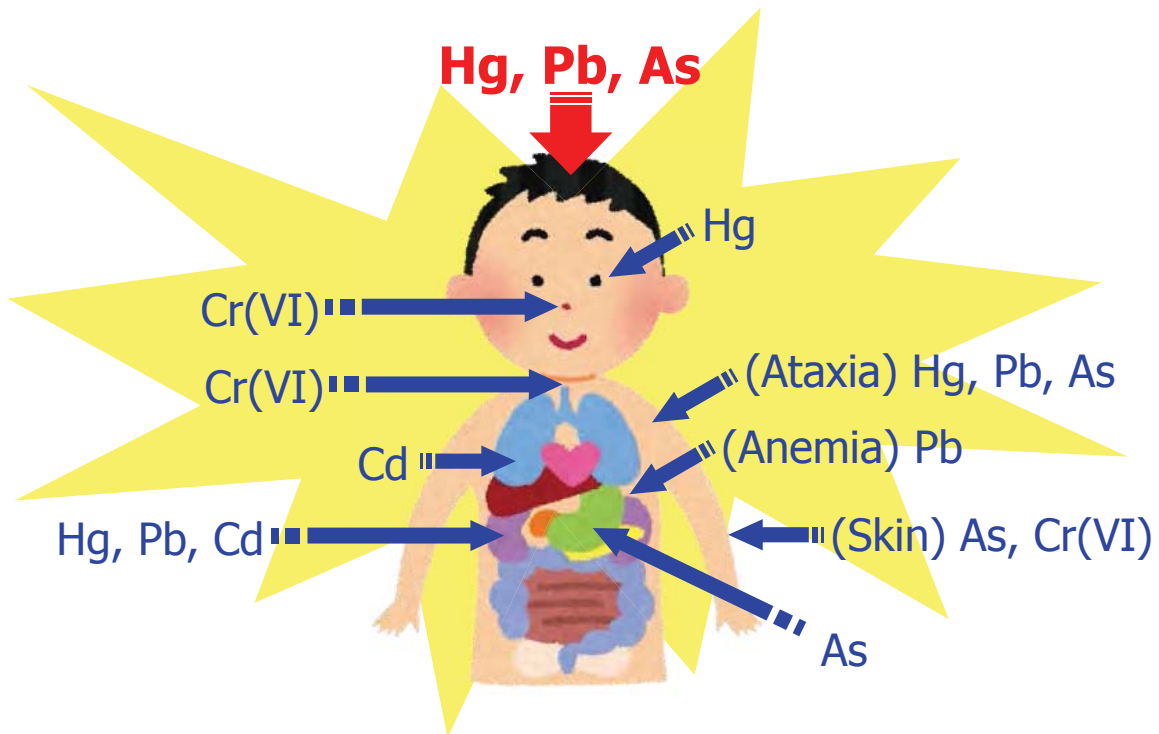
**Soil Particles**



Diameter (mmφ)		
	<b>Sand</b>	<b>0.02-2.0</b>
	<b>Silt</b>	<b>0.002-0.02</b>
	<b>Clay</b>	<b>&lt;0.002</b>

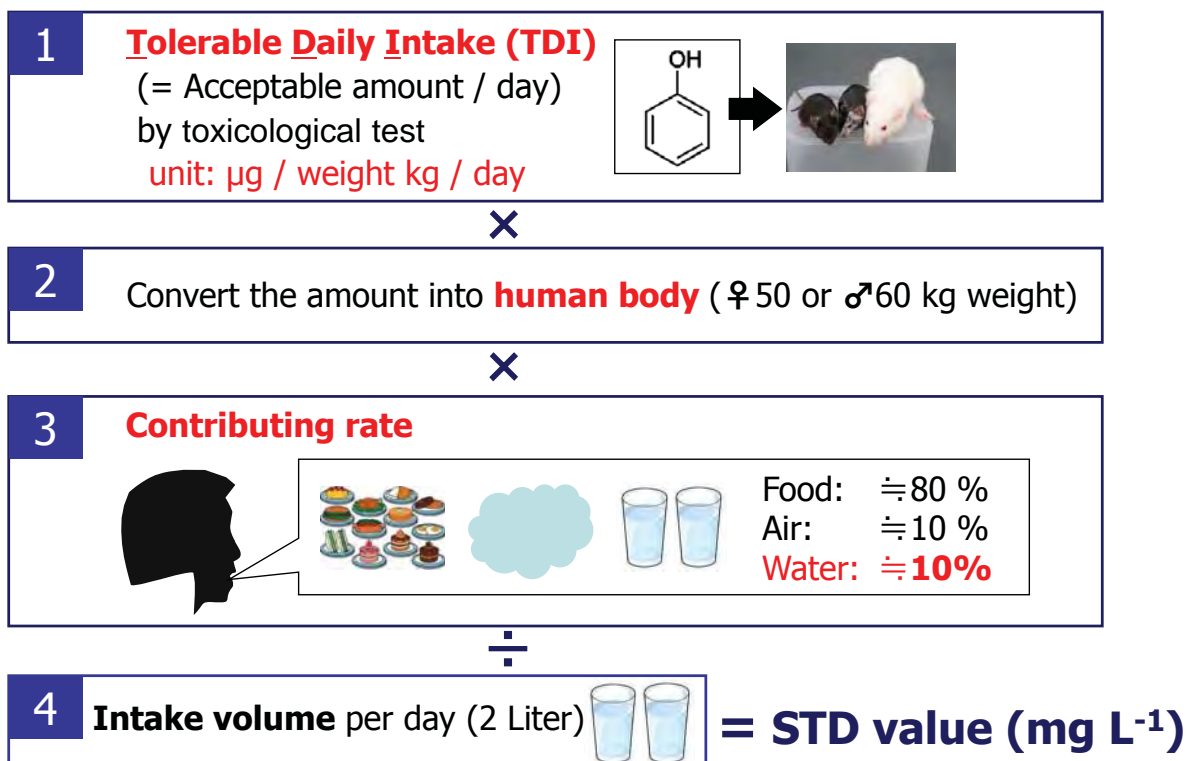


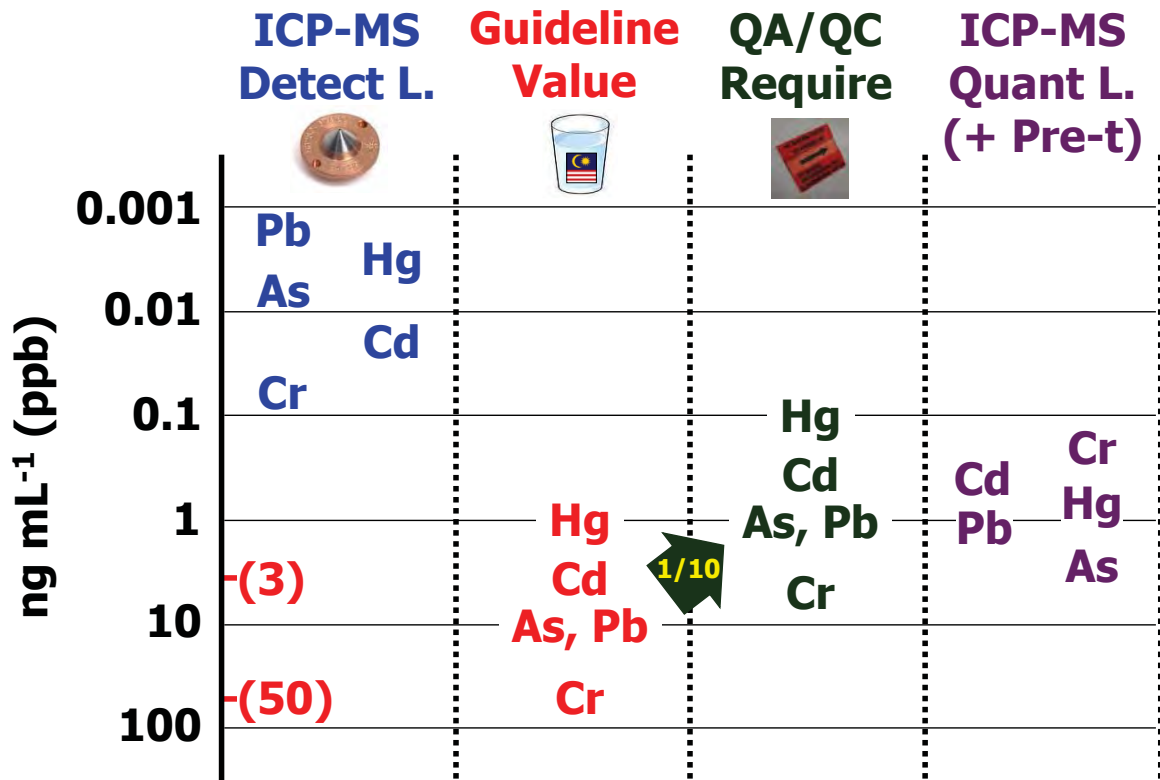
## 2. Characteristics of 5 heavy metals



### 2.1. Introduction

## How to decide "WQ standards"





### Arsenic (As)



Native arsenic

Sea water: about 1.6 ppb  
 Earth's crust: about 1.5 ppm (=0.00015 %)  
 Soil: about 1–10 ppm  
 ↓  
 Natural water: about 1–2 µg L<sup>-1</sup> (≅ppb)

❌ WHO guideline (10 µg L<sup>-1</sup>) is just **PROVISIONAL** one, and it is **NOT** a "Science-based" value.

#### WHO guideline for As

1958: 2 µg L<sup>-1</sup> → 1963: 5 µg L<sup>-1</sup> → 1993-: 10 µg L<sup>-1</sup>

"10 µg L<sup>-1</sup>" is mainly due to **detection limit** of equipment.



### 1. Health effects

As leads to risk of cancer in the skin, lungs, bladder and kidney.



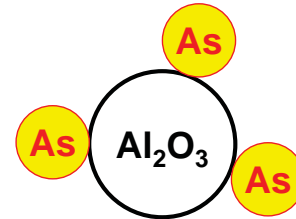
### 2. Exposure route

Drinking water & diets (fish and shellfish)

Bio-accumulative element

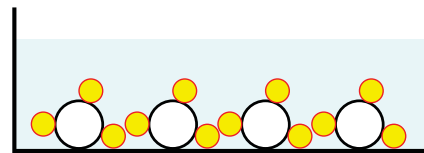
### 3. Water treatment

Activated **alumina** method

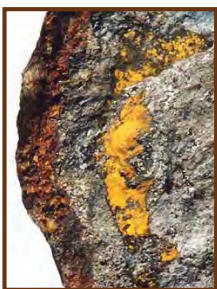


Coprecipitation method

- Poly Aluminum Chloride (PAC)
- Ferric Chloride (FeCl<sub>3</sub>)



## Cadmium (Cd)



**Earth crust: 0.11-0.15 ppm**

**Sea water: 0.07 ppb**

**Drinking water** ← - - - - -

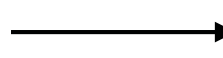
**Guideline: 0.003 mg L<sup>-1</sup>**



### 1. Health effect:



Lead to cancer, osteopathy



### 2. Treatment method (in factories):

- Ion exchange
- Flocculation method



**Lead (Pb)**

Items for large-scale health effects through drinking water

As, F, **Pb**, Se, U



**Earth crust: 10-14 ppm**

**Sea water: 0.0027 ppb**

**Drinking water** ←.....

(Guideline value: 0.01 mg L<sup>-1</sup>)



**1. Health effect:**

Neurogenic intoxication



**2. Treatment method (in factories):**

Ion exchange, flocculation method etc.

**Mercury (Hg)**



**Earth crust: 0.067-0.05 ppm**

**Sea water: 0.00014 ppb**

**Drinking water** ←.....

(Guideline value: 0.001 mg L<sup>-1</sup>)



**1. Health effect:**

Neurogenic intoxication (methyl Hg)



**2. Treatment method (in factories):**

- Adsorption on **activated carbon**
- Reverse osmosis method

**Cromo (Cr)**



**C. terrestre:**  
**100-350 mg kg<sup>-1</sup>**

**Mar : 0.212 µg kg<sup>-1</sup>**



**Guideline: <0.05 mg Cr (total) L<sup>-1</sup>**

**less  
(soluble)**

**Natural  
water**

😊 **Cr (III): Essential for human**

☹️ **Cr (VI)** → **-Lead to cancer  
-Damage to skin**

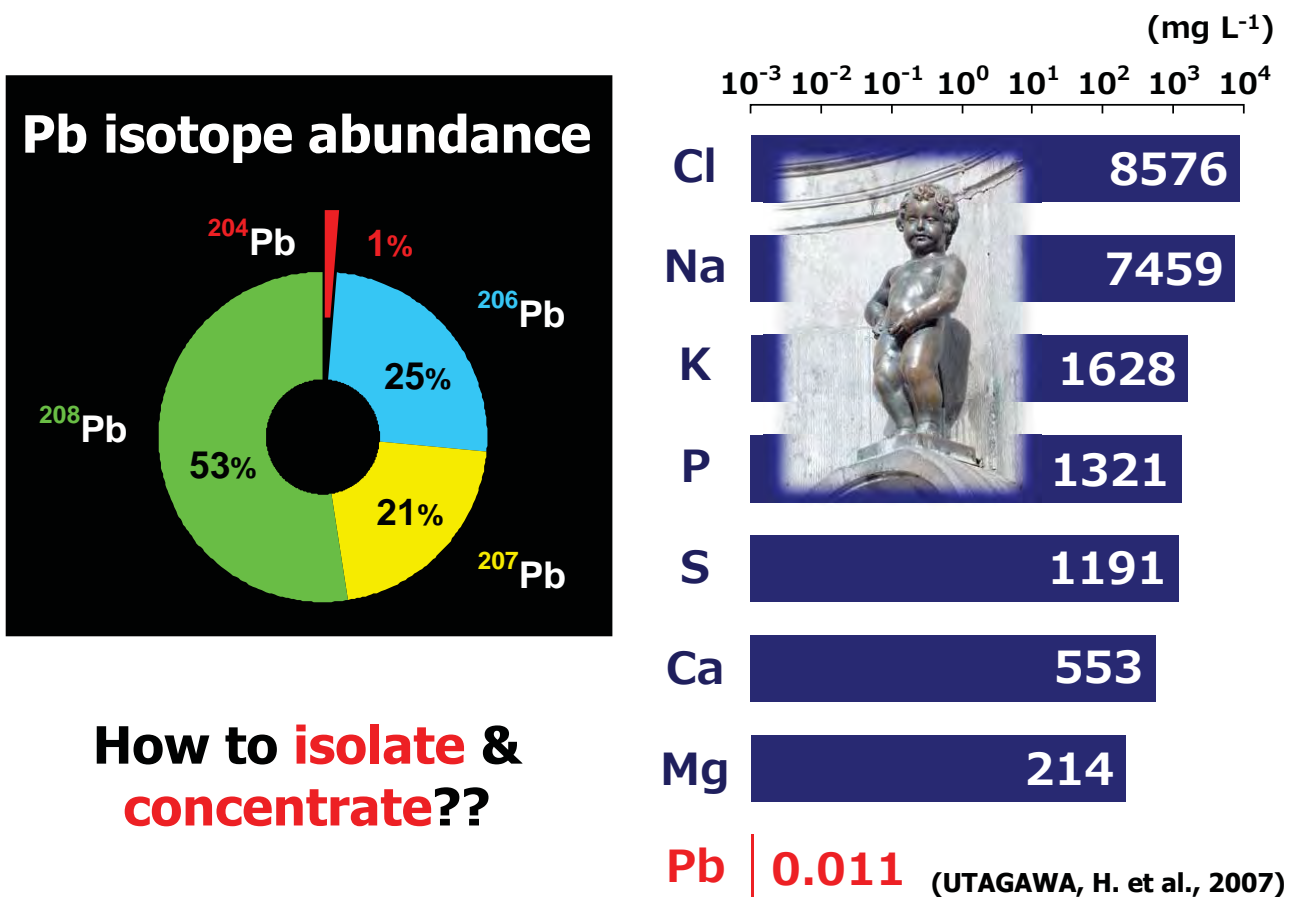
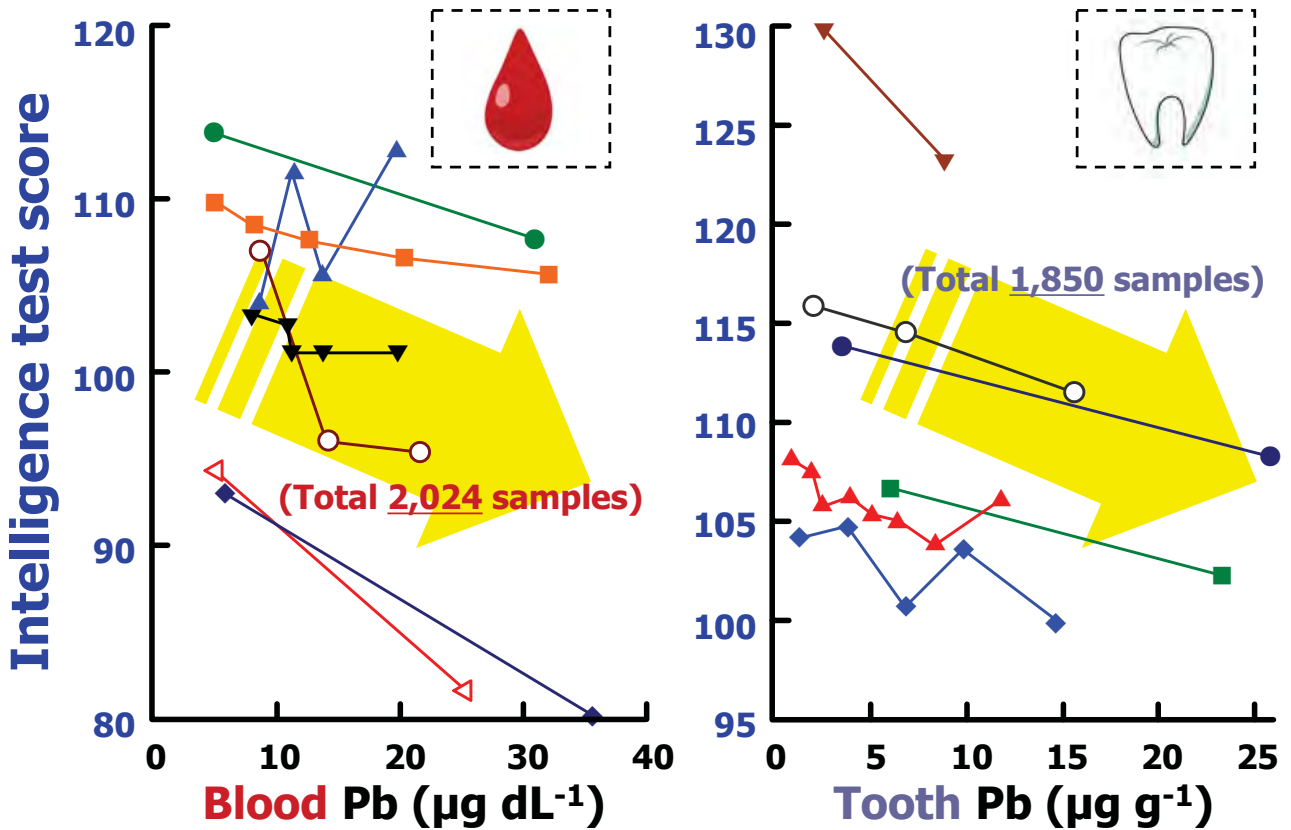
**>0.25 mg Day<sup>-1</sup>**

**Artificially**

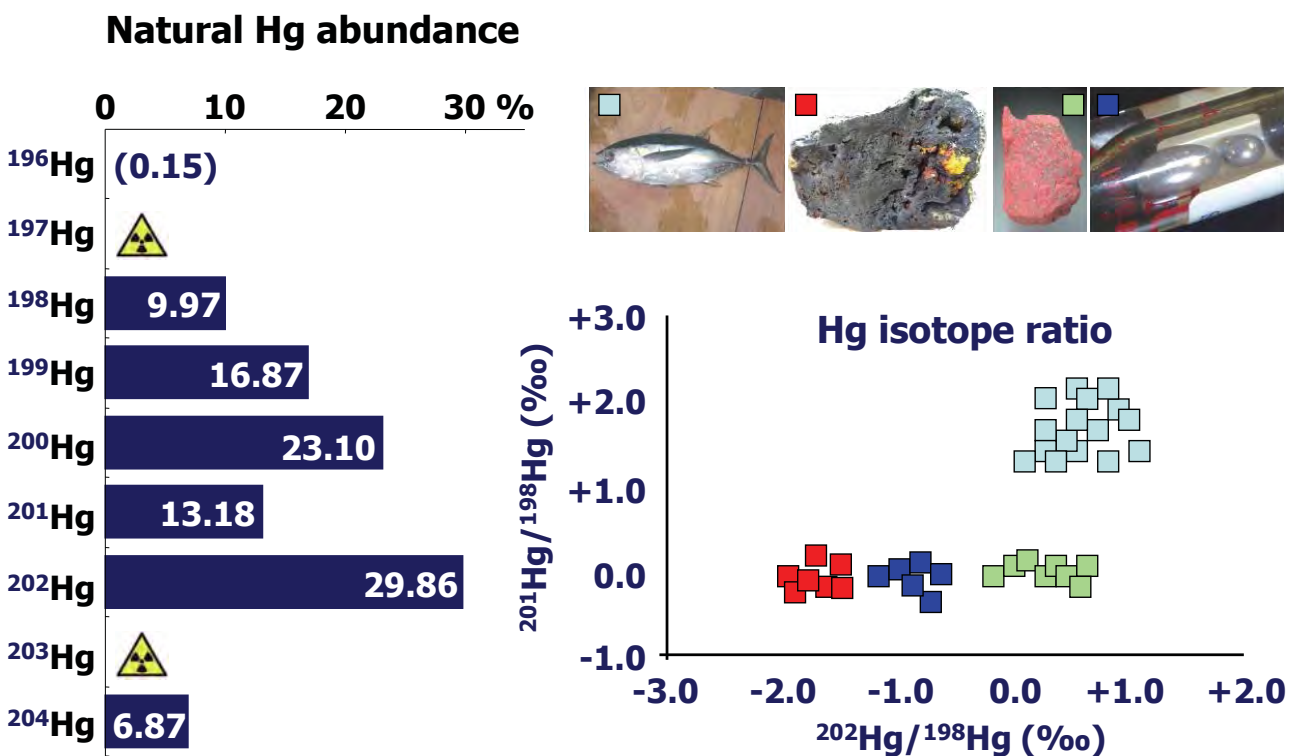
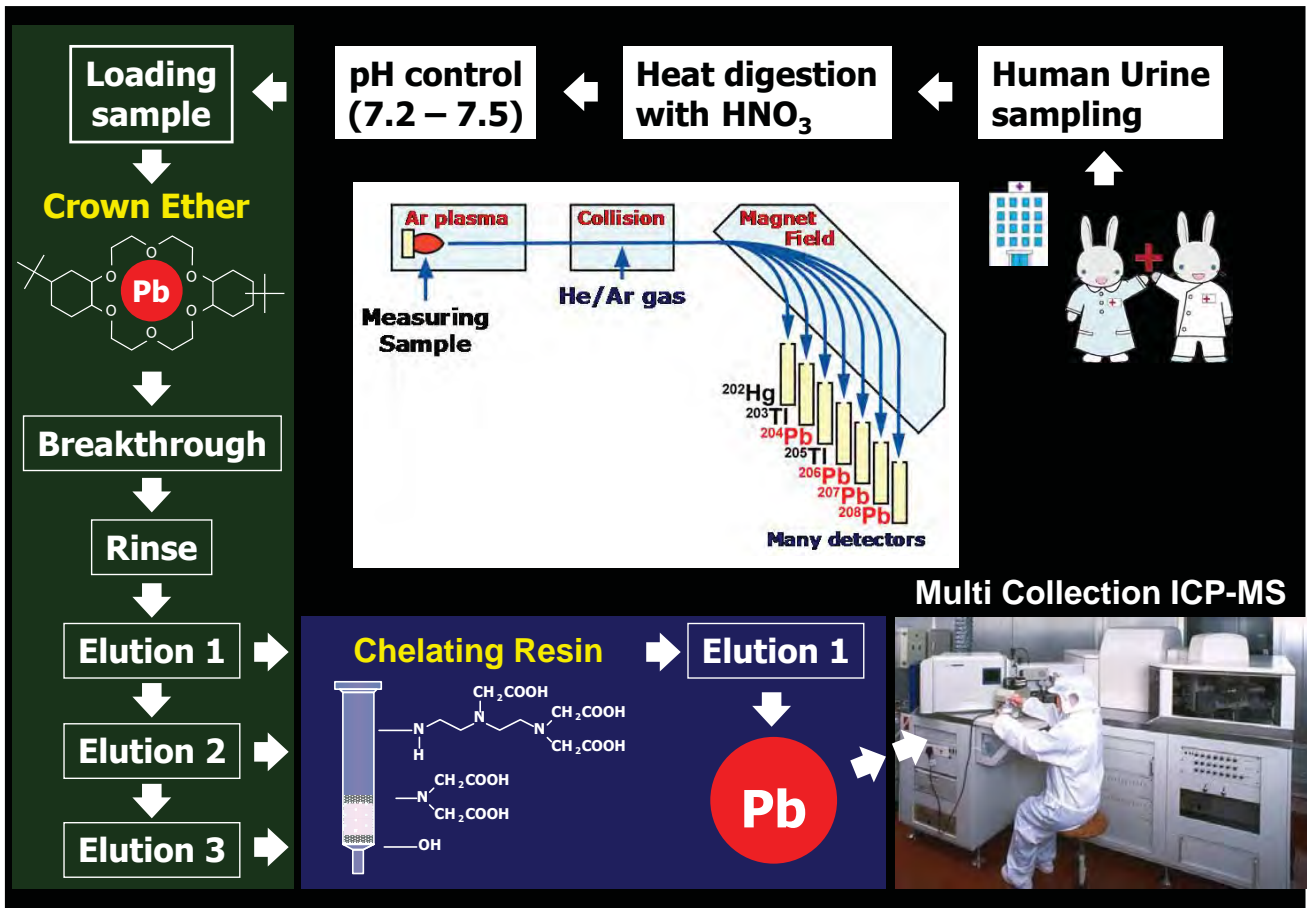


### 3. Some researches in recent years











## 4. Brief conclusion



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### 4. Conclusion

**We can analyze heavy metals.**

**but**

**We have to understand & always confirm:**

- **Characteristics of Heavy Metals**
- **Principle of Analytical Equipment**
- **Securement of Data Quality**

**as Professional Scientists.**

# Terima kasih



**Let's enjoy today's seminar.**

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# Hg contained waste management in Japan

Dr. Yuko Aoki  
Kokusai Kogyo co. Ltd.,

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## Minamata disease

- Since around 1932-1968, Hg contained waste water had been discharged into the river/sea from Chisso cooperation's factory.
- Certified patients: 2,280 (1,879 died)
- Other patients :70,000
- At the moment, 2,100 are claiming to be certified patients and 1,300 are asking for compensation in court.

(Source: Asahi Shinbun, **April 30 2016**)

# Discrimination, prejudice, lack of understanding



At the facility of Patients fetal Minamata disease, June 2007  
[http://www.huffingtonpost.jp/2016/04/30/minamata-desease-sixty-years\\_n\\_9815362.html](http://www.huffingtonpost.jp/2016/04/30/minamata-desease-sixty-years_n_9815362.html)

## Minamata disease is not over yet

## Minamata



Source: [http://www.minamata195651.jp/pdf/qa/qa\\_04.pdf](http://www.minamata195651.jp/pdf/qa/qa_04.pdf)



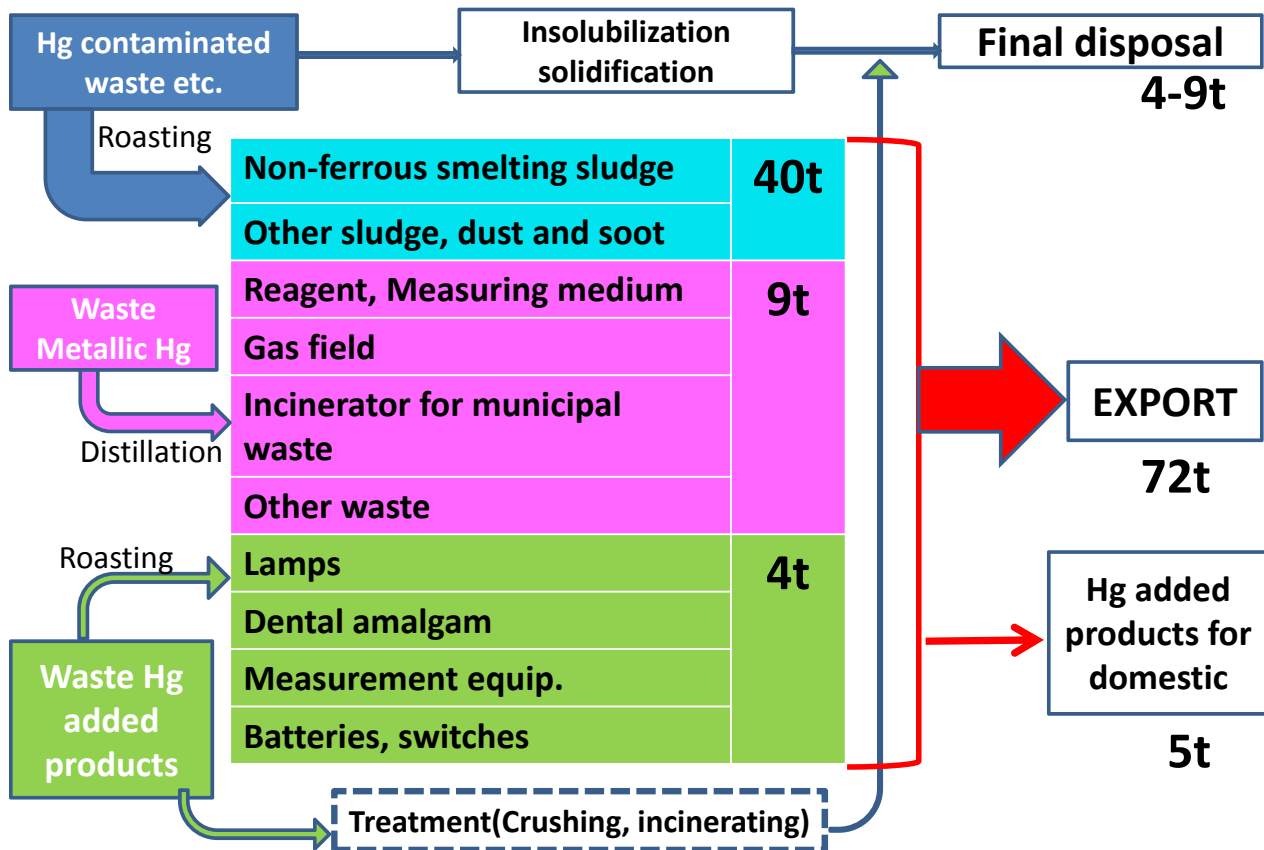
## Management of Hg

- 1. Reduce** the use of Hg
  - 2. Collect** Hg (if use) for recycle  
and /or
  - 3. Stabilize** for safety disposal
- 

## Hg contained waste

1. Byproducts/waste of industry  
and manufacturing
- 2-1. Hg added products
- 2-2. Metallic Hg → **waste**

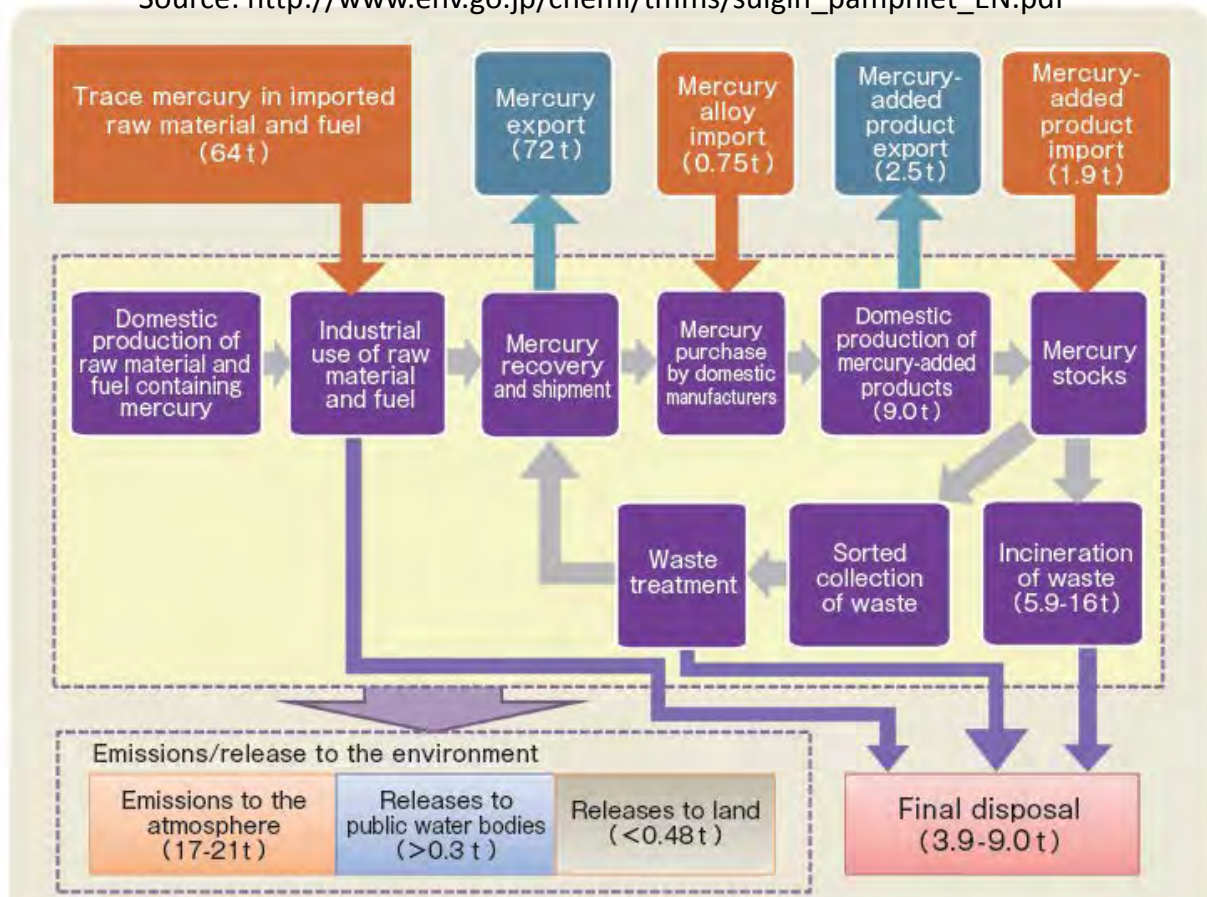
# Material flow of waste Hg in Japan



Source: MOEJ, Updated in 2013 based on 2010 data

## Material flow of mercury in Japan (FY2010 basis; updated in FY2015; simplified version)

Source: [http://www.env.go.jp/chemi/tmms/suigin\\_pamphlet\\_EN.pdf](http://www.env.go.jp/chemi/tmms/suigin_pamphlet_EN.pdf)



## Hg contained waste treatment by Nomura Kohsan

### 27,000 tons of Hg waste / year

- ① 13,000 tons of dry-cell batteries (0.3t)
- ② 8,000 tons of fluorescent lamps (0.3t)
- ③ **6,000 tons of other types of waste (36t)**

i.e. Oil sludge from Non-ferrous smelting  
other sludge, dust and soot.

- Sphygmomanometer, thermometer etc. = 15t/yr (1.5 tons of Hg)
  - (2-2)Metallic Hg = 8t/yr (8 tons of Hg)
- 

### ③ Oil sludge and others

- Waste is heated at a temperature between 600 – 800 C
- Hg evaporates and collected through a cooling process.

## 2-1. Hg added products → Hg waste

- **Lamps**

1. Fluorescent lamps (incl. CFL, office and home)
2. HID lamps (Factory, stadium, highways and street lights etc...)
3. CCFL (Back light of TV panel and PC)

- **Sphygmomanometers, Thermometers , and other measuring equipment**

- **Batteries**

From

**Business/industry OR Households?**

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### Sphygmomanometers, Thermometers

#### **Business/industry**

Through the network of medical association of the cities and prefectures.

#### **Households**

Through the municipalities.



1.2 g Hg /unit = 200 FLs



48g Hg/unit = 8000 FLs



<http://www.union.tokyo23-seisou.lg.jp/kanri/haiki/kumiai/oshirase/documents/tirashi.pdf>

## Battery

### Households

Via initiative of **Battery Association of Japan(BAJ)**  
Or Separate collection by municipalities



Treatment  
facility for  
recycling

### Business/industry

Of their own responsibility  
for appropriate disposal.

Note: All types of Batteries used in Japan are corresponding the requirements of Minamata Convention.

SR △  
PR ○  
LR △



# Lamps



Almost all types of Lamps in Japan are already achieved the standard required in Minamata Convention though,  
**Need to be encouraged collection.**



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## Component of FL

In case of 36W Straight tube type  
by weight (200g/1pc)

- Soda glass 92.5%
- Lead glass 2.7%
- Fluorescent powder 2.0%
- Metal base 1.4%
- Adhesive 0.6%
- **Mercury 0.004%**



# Component of HID Lamps

In case of 400W type  
by weight (280g/1pc)

- Borosilicate glass 67.8%
- Nickel plate , Ceramics, Glass 11.4%
- Iron, Copper, Manganese, Nickel 10.7%
- Quartz glass 8.9%
- Adhesive 0.7%
- Tungsten, Molybdenum 0.3%
- **Mercury 0.02%**



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## CCFL(Cold Cathode Fluorescent Lamp)



LCD monitor, PC  
monitor, fax, scanner  
etc...



**E-waste  
Management Flow**

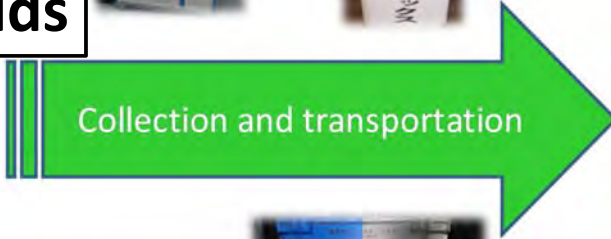
Hg contain : 3-4 mg/ unit

# How to collect FL

Municipalities



Households



Business/industry



Their own responsibility



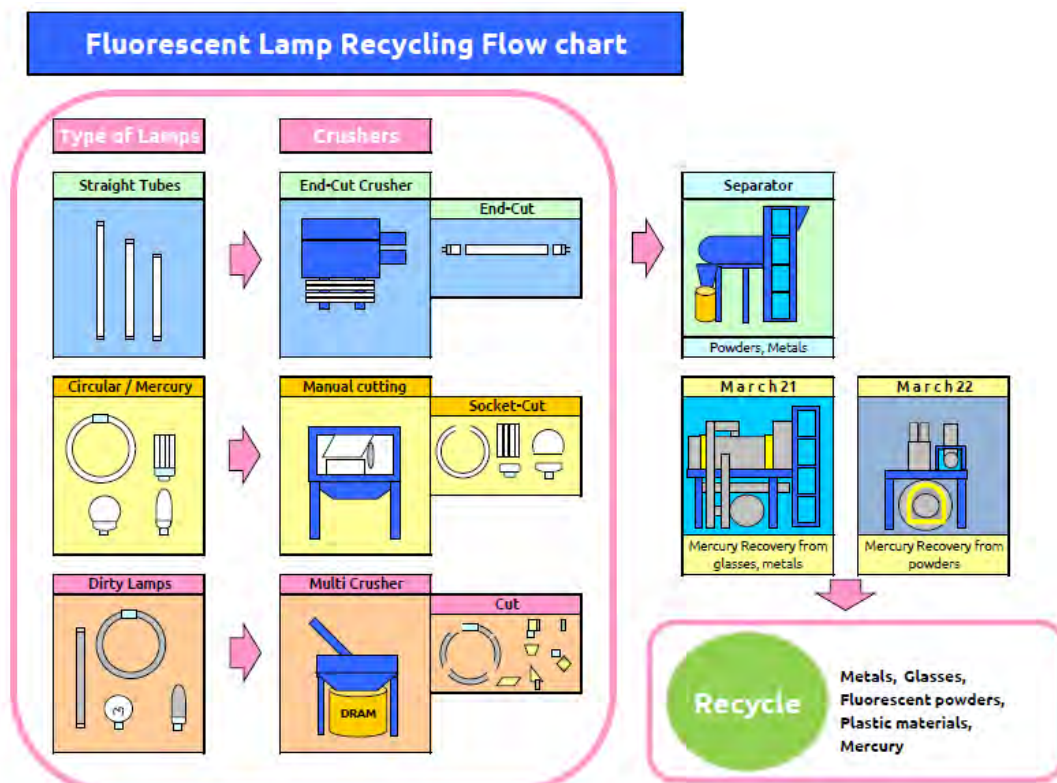
Recycling factory







## Processing of FL



The case of Japan Fluorescent Lamp Recycling Co.,Ltd.

[http://www.eco-jr.co.jp/recycle/english/fluorescent\\_recycling\\_flow\\_chart.html](http://www.eco-jr.co.jp/recycle/english/fluorescent_recycling_flow_chart.html)

# After processing



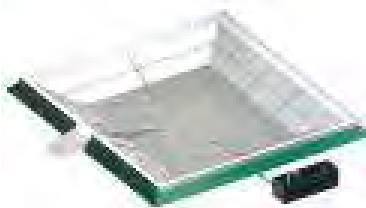
- Glass (**90-92%**) : recyclable  
0.0023mg/L dissolution test
- Metals (**1%**) : recyclable
- Residue (**5-7%**) : non hazardous
- Fluorescent Powder and mercury(**2% + 0.004%**)  
<hazardous waste which is needed cementation solidify to KA in case of Malaysia>

**97 % of reduction**  
as Hazardous Waste.

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## Stabilize for safety disposal

Environmental standard of total Hg (for waste)  
**= 0.005mg/L**



> **Controlled final landfill site**

< **Isolated-type final landfill site**



Ref. Soil < 15mg/kg

Bottom Sediment < 25ppm = mg/kg

Source: For air, water and others,

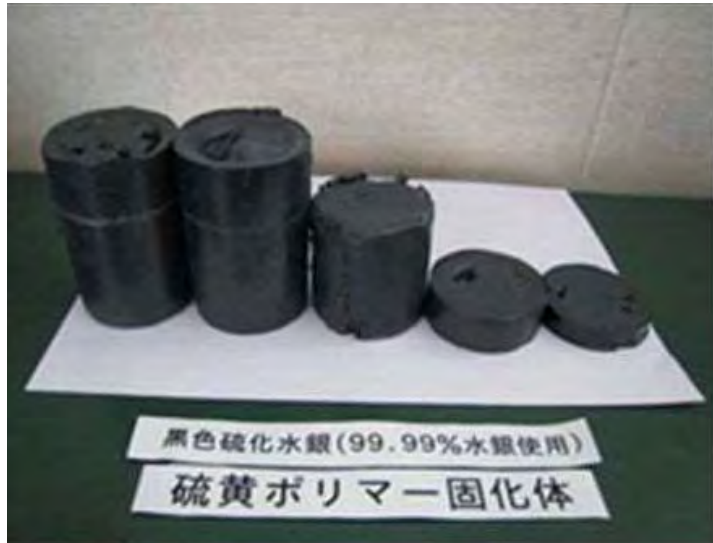
<https://www.env.go.jp/chemi/tmms/lmrm/02/ref02.pdf>



# Stabilization

Still under verification but

Mercury sulfide (HgS) is the way.



Solidified sulfur polymer

Source: <https://www.city.kitakyushu.lg.jp/files/000721739.pdf>

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## Impact of Minamata convention

- (out of the impact?) More use of LED, less use of FL
  - 10% reduction of discharging FL year by year
- Hg added products which meets the standard of Minamata convention is able to be produced and trade.
  - some amount of discharging Hg will be continued.
- It could be increase the volume of “waste Hg” due to the reduction of market needs, and less incentive for collecting Hg for recycling.
  - Encouragement of collection, appropriate treatment, and safety disposal are needed.

# Law and Regulations

- Waste Management Law enforcement ordinance amendment (Enforcement Apr. 2016)
  - Air Pollution Control Law (Amendment) Act (June 2015)
  - Mercury pollution prevention Act (June 2015)
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**Reduce**

**Collect for recycle**

**Stabilize for safety disposal**

# Terima Kasih

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