OCCASION

This publication has been made available to the public on the occasion of the 50th anniversary of the United Nations Industrial Development Organisation.

DISCLAIMER

FAIR USE POLICY

CONTACT

Please contact publications@unido.org for further information concerning UNIDO publications.

For more information about UNIDO, please visit us at www.unido.org

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION
Vienna International Centre, P.O. Box 300, 1400 Vienna, Austria
Tel: (+43-1) 26026-0 · www.unido.org · unido@unido.org

Overview of

Mercury situation

and way forward

in Vietnam

Unido Viet Nam Country Office

July 2015

ACKNOWLEDGEMENTS

This paper has been drawn up by Clément Morel, UNIDO Country Office in Hanoi, under the overall guidance and direction of Patrick J. Gilabert, UNIDO Representative in Viet Nam.

It consists of an overall analysis of mercury emissions, regulations and policies worldwide, in Viet Nam and in some countries belonging to the Southern East Asian Region.

More information can be obtained at office.vietnam@unido.org

DISCLAIMER

Table of Content

I. List of Figures

II. List of Tables

III. List of Acronyms

AMAP	Arctic Monitoring and Assessment Program
AGSM	Artisanal and Small-scale Gold Mining
ASEAN	Association of South-East Nations
BAT	Best Available Techniques
CCO	Chemical Control Order
EU	European Union
HCWH	Health Care Without Harm
LGU	Local Government Unit
MC	Minamata Convention
MONRE	Ministry of Natural Resources and Environment
UNEP	United Nations for Environmental Protection
ZMWG	Zero-Mercury Working Group

1. Introduction

Mercury is a heavy elemental metal that exists in a liquid form at ambient temperature. In nature, mercury rarely exists in its pure form and must be extracted from cinnabar ore. The existence of mercury has been known since antiquity, with the ancient Indians and Chinese being credited with its discovery. Throughout history mercury has been utilized as medicine, cosmetic, and to create pigments for clothes and paint. However, mercury and its vapor are now known to be highly toxic to humans.

Mercury is released to the environment from natural sources and processes and as a result of human activities. Once it has entered the environment, mercury cycles between air, land, and water until it is eventually removed from the system through burial in deep ocean sediments or lake sediments and through entrapment in stable mineral compounds. Methylmercury, the most toxic and bio-accumulative form of mercury, which presents the greatest health risk to humans and wildlife, is mainly formed in aquatic environments through natural microbial processes.

Elemental and methylmercury are toxic to the central and peripheral nervous systems. The inhalation of mercury vapor can produce harmful effects on the nervous, digestive and immune systems, lungs and kidneys, and may be fatal. The inorganic salts of mercury are corrosive to the skin, eyes and gastrointestinal tract, and may induce kidney toxicity if ingested. In spite of the hazard, mercury continues to have irreplaceable uses in society. However, there is a growing international concern about mercury issues as shown by the signature of international conventions such as the Minamata convention by many countries.

In order to better understand main challenges related to mercury, this report will firstly describe anthropogenic mercury emissions, sources and localization of emissions before reviewing main international and regional regulations related to mercury. It will then focus on mercury issues and regulations in ASEAN community before moving to specific situation of Vietnam.

2. Anthropogenic mercury at global scale

According to UNEP (*Global Mercury Assessment, 2013*) anthropogenic sources of mercury emissions account for about 30% of the total amount of mercury entering the atmosphere each year. Another 10% comes from natural geological sources, and the rest (60%) is from re-emissions of previously released mercury that has built up over decades and centuries in surface soils and oceans. There are various sources of mercury emissions due to anthropogenic activities, the most important are as follows.

Mining ores such as gold, zinc, lead, and copper can generate significant quantities of by-product mercury during smelting and refining activities. For example, during the 19th century the activities associated with the American gold and silver rush released up to 1500 t/y of mercury into the global atmosphere. This declined during the wars and depression of the early 20th century to under 1000 t/y (Streets and others, 2012).

Significant quantities of mercury are also generated from collection, recycling and reprocessing of mercury-containing products, and industrial wastes, particularly in the developed world. Reprocessed mercury is a growing source of mercury supply as environmental regulations divert mercury during waste management for safety and environmental reasons.

Particularly large quantities of mercury become available when mercury cell chlor-alkali plants close or convert to non-mercury processes. Capturing and storing mercury from these decommissioning chlor-alkali facilities is an efficient and cost effective way to reduce the global mercury supply because large quantities are already aggregated at one location.

Energy production through coal burning is another major source of mercury emissions. Oil and gas burning also release mercury in the atmosphere. Some other anthropogenic activities such as cement production, oil refining and cremation are other activities which release mercury during the process.

2.1. Localization and sources of emissions

According to UNEP's data, emissions of mercury to the atmosphere at global level due to anthropogenic activities were around 1,960 tons in 2010. As shown in the following graph, main sources of mercury emissions are ASGM (37%), coal burning (24%), mining and production of non-ferrous metals (10%) and industrial processes from raw material to produce cements (9%).

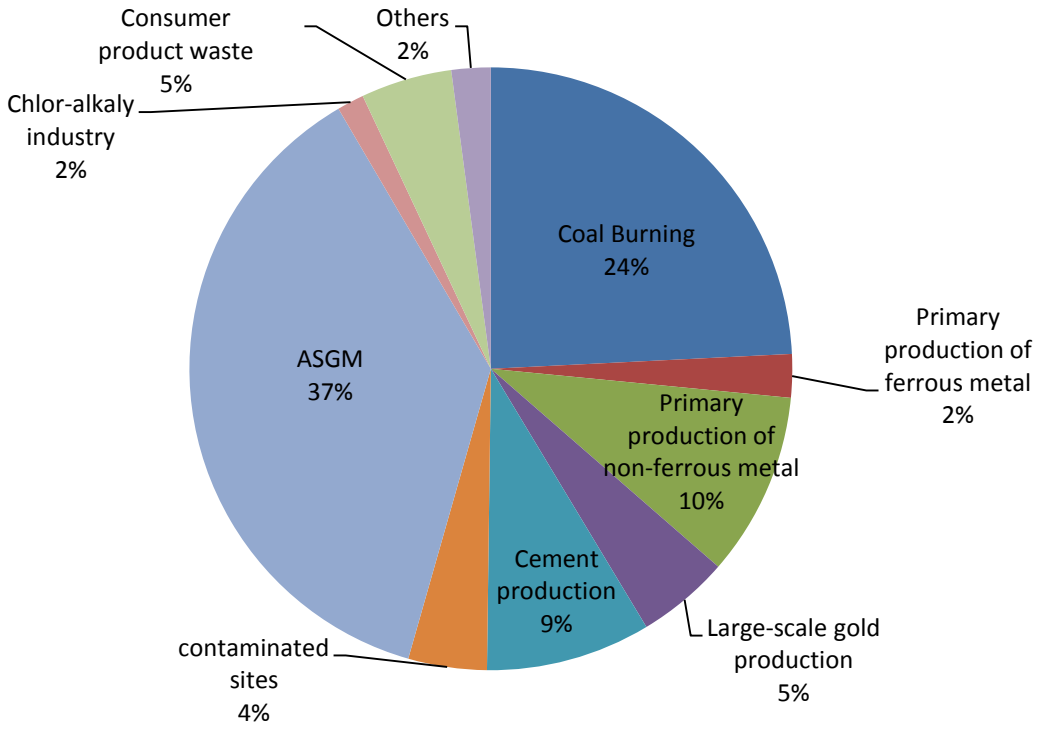


Figure 1: Sources of mercury emissions at global level

It's interesting to notice that almost half of emissions are due to intentional use of mercury in the process (ASGM, Chlor-alkaly industry, consumer product waste and cremation for dental amalgam) while mercury is a by-product or used unintentionally for other activities.

There are big geographic disparities concerning amounts and sources of mercury emissions. As shown in *Figure 2: Global distribution of anthropogenic mercury emissions to air in 2010*, the greatest proportion of anthropogenic mercury emissions to the atmosphere comes from Asia, which contributes about 50% of the global emissions. Most of emissions in Asia are located in from East and Southeast Asia. Indeed, China accounts for three-quarters of East and Southeast Asian emissions, or about one third of the global total. Case of Southeast Asia and especially ASEAN countries will be further developed in a next section.

Sub-Saharan Africa is the second largest most emitter region, accounting for 16.1% of emissions followed by South America which accounts for 12.5% of emissions. Emissions in those regions are mostly due to Artisanal and Small-scale Gold Mining. To the contrary, Europe and North America contribute to mercury emissions to a lesser extent with emissions which are mostly due to stationary coal combustion.

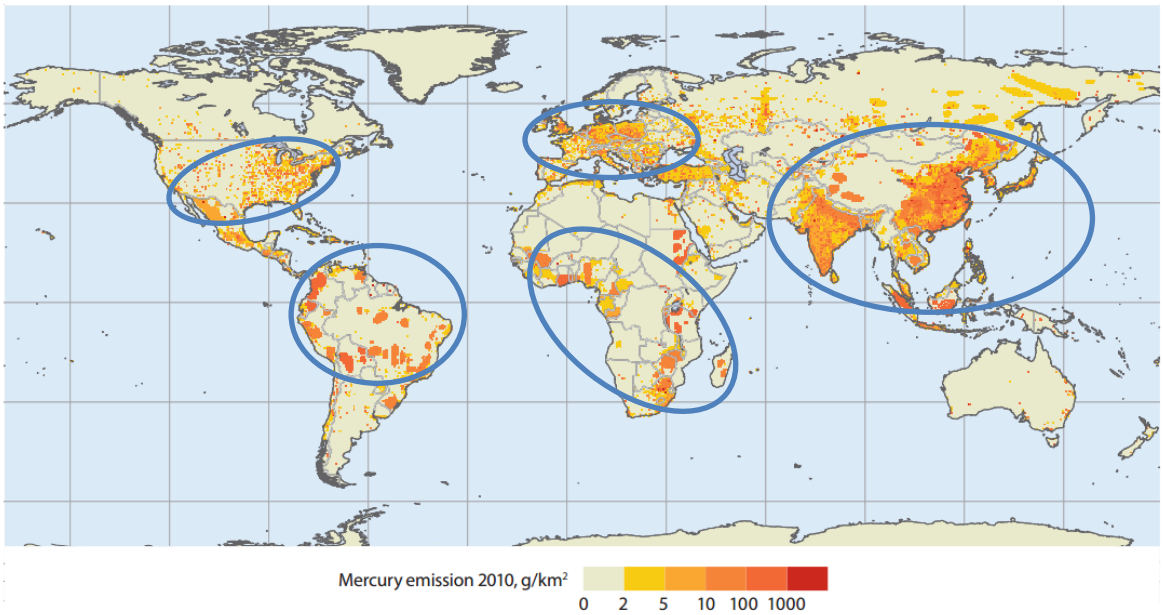


Figure 2: Global distribution of anthropogenic mercury emissions to air in 2010

Source: UNEP, 2013

2.2. *International and regional mercury trade regulations*

2.2.1. *International regulations*

Mercury can travel easily from one part of the world to another through transcontinental transport of mercury. This underscores the necessity of an international approach to negotiate reduction of mercury in all parts of the world.

There are currently 3 main conventions which control mercury trade at an international level. The first one is the **Basel Convention** which came in force in May 1992 and gathers more than 183 parties. This convention aims to protect human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous wastes by ensuring that the generation of hazardous waste is reduced. Hazardous wastes are disposed in an environmentally sound manner within the country of their generation and by enhancing controls on export and import of hazardous waste, amongst others (*Satya P. Mohapatra and Anne Mitchell, 2009*)

Another international regulation is the **Rotterdam Convention** which entered in force on 24 February 2004. It is a convention on the prior informed consent procedure for certain chemicals and pesticides in international trade which aims to limit or control the trade in hazardous chemicals. This convention is a legally binding procedure that requires exporters trading in a list of hazardous substances including mercury and mercury compounds to obtain the prior informed consent of importers before proceeding with the trade. Rotterdam Convention gathered more than 154 parties.

The last one and the first one specific to mercury is the **Minamata convention** which was signed in 2013. Indeed this global treaty aims to protect human health and the environment against the adverse effects of mercury. The major highlights of the Minamata Convention on Mercury include a ban on new mercury mines, the phase-out of existing ones, control measures on air emissions, and the international regulation of the informal sector for artisanal and small-scale gold mining (*UNEP, 2013*). As of today, 128 countries already signed the convention.

2.2.2. Main regional regulation about mercury trade

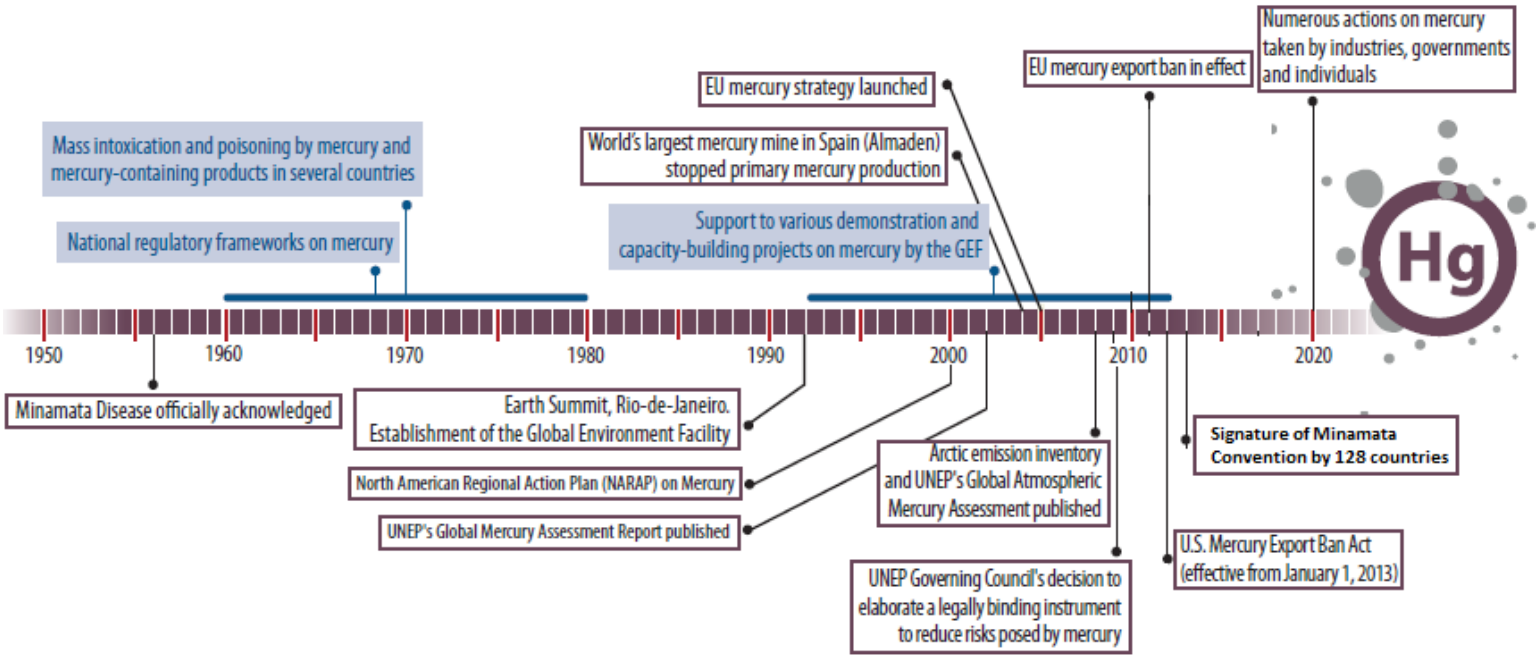
In parallel with international conventions and regulations, some countries and regional organizations have been further into mercury trade regulation. For example, the EU adopted a **ban on the export of mercury from the EU** which was one of the world's biggest mercury exporters. This ban also aims at ensuring its safe storage. This regulation requires the storage of mercury either in salt mines, in deep, underground, hard rock formations, or in above-ground facilities. The ban began in March 2011 and covers other compounds in addition to metallic mercury, such as cinnabar ore, mercury chloride and oxide.

The main other national regulation is the **US Mercury Export Ban Act** which was signed into law on October 2008 and began January 1, 2013. The act includes provisions on both mercury export and long-term management and storage. As the EU, the USA was one of the world's top exporters of mercury and implementation of the act was expected to remove a significant amount of global mercury from the global market. Moreover, mercury from the USA was exported to countries where it had various use, including use in AGSM, which is a major cause of global mercury pollution.

Following figure sums up and shows the establishment of different projects, regulations and events related to mercury pollution through time since the 50s.

Figure 3: Global mercury events timeline

(Adapted from presentation from Fernando Lugris and UNEP - Time to Act now)



2.2.3. Expected effect of Minamata Convention and challenges of an international mercury treaty

Last international and ambitious treaty related to mercury pollution is Minamata Convention. This treaty addresses almost all mercury sources worldwide. But the actions required differ depending on the source of emissions, which include chemical and industrial processes such as the burning of fossil fuels, cement production, waste incineration and gold mining.

For example, one provision of the treaty requires countries to devise national action plans to help limit and control artisanal and small-scale gold mining. AGSM is one of the largest sources of mercury pollution accounting for about 37 percent of emissions making such requirements really encouraging.

Only 3 categories of sources of mercury emissions are not covered by the Minamata Convention. Those sources are oil and natural gas burning, primary production of ferrous metal and oil refining which account for less than 4% of total mercury emissions.

For most of the categories covered, the Minamata Convention requires implementation of the Best Available Techniques (BAT) after 5 to 10 years. BAT means techniques that are '*the most effective to prevent and, where that is not practicable, to reduce emissions and releases of mercury to air, water and land and the impact of such emissions and releases on the environment as a whole, taking into account economic and technical considerations for a given Party or a given facility within the territory of that Party*'. This definition provided by the Convention does not set quantified objectives for mercury emissions which makes difficult to evaluate expected impacts. Table below sums up convention requirements for different sources of mercury emissions:

Category[a]	Total budget in megagrams (uncertainty range)	Covered by Minamata Convention	Convention requirements
Byproduct or unintentional emission			
Coal burning (all uses)	474 (304–678)	Yes	BAT approach after 5–10 yr
Oil and natural gas burning	9.9 (4.5–16.3)	No	
Primary production of ferrous metals	45.5 (20.5–241)	No	
Primary production of nonferrous metals (Al, Cu, Pb, Zn)	193 (82–660)	Yes (97%), except for Al	BAT approach after 5–10 yr
Large-scale gold production	97.3 (0.7–247)	Yes	BAT approach after 5–10 yr
Cement production	173 (65.5–646)	Yes	BAT approach after 5–10 yr
Mine production of mercury	11.7 (6.9–17.8)	Yes	Bans primary mining after 15 yr
Oil refining	16 (7.3–26.4)	No	
Contaminated sites	82.5 (70–95)	Yes	Endeavor to develop strategies to identify, assess; cooperation
Intentional uses			
Artisanal and small-scale gold mining	727 (410–1040)	Yes	Implement national plan
Chlor-alkali industry	28.4 (10.2–54.7)	Yes	Phase-out by 2025
Consumer product waste	95.6 (23.7–330)	Yes	Articles on products, wastes; incineration covered under point sources
Cremation (dental amalgam)	3.6 (0.9–11.9)	Yes	Phase-down
Total emission	1960 (1010–4070)	1880 (96%)	

Figure 4: Mercury categories covered by Minamata Convention and actions required

Source: Selin, 2014

Some researchers from the MIT tried to evaluate the impact of the Minamata Convention in a paper named *global change and mercury cycling: challenges for implementing a global mercury treaty* (Selin, 2014). This paper shows that once the treaty is fully implemented, emissions will decrease slightly or stay at about today's levels. Because mercury takes decades to centuries to cycle through the environment, it will take a while before changes come into effect on a global scale. That explains why the projections through 2050 show only a small decrease in environmental mercury levels, about 1-2 percent year.

By helping to prevent emissions in a near future, Minamata Convention will have an impact on mercury levels in the future even if it takes time to decrease. This effect is real but is however limited. Indeed,

some challenges remain. The greatest challenges this treaty poses are for regions with high mercury emissions because of mining activity in particular, Sub-Saharan Africa and Latin America. Reducing emissions will be especially difficult in these areas due to limited government monitoring capacities and a lack of alternative occupation for gold miners. Whether the major anthropogenic sources of mercury emissions in these countries can be reduced will depend crucially on the level of funding for the planned mechanisms and how effectively the funded programs focus on achieving their designated targets. It will only become possible to predict the long-term effect of the convention with a measure of accuracy after 2020.

2.3. Global mercury trade

Considering primary production of mercury from mines, there is currently only one country, namely Kirghizstan, which continues to export mercury whereas production from other countries with mercury mines such as China is intended for national consumption. About international mercury trade, EU and the US mercury export bans have dramatically changed the landscape of global mercury trade over the last few years. Following graph represents main exporters of mercury over the last few years showing the effect of the two regional export bans.

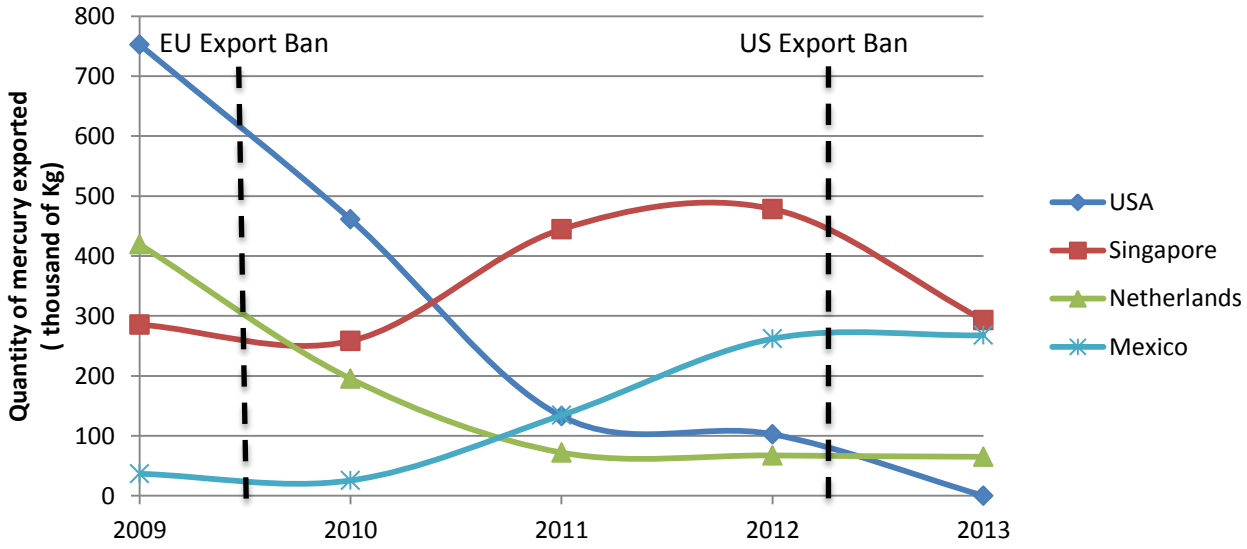


Figure 5: Main exporters of mercury from 2009 to 2013

Source: Own design with data from UN COMTRADE

The EU Export Ban had the effect to reduce dramatically the role of hubs of some European countries such as Netherlands. Before 2009, Rotterdam was indeed one of the most important ports for mercury trade and its importance decreased after implementation of the ban. Exportations from Rotterdam are now exclusively to destination of EU countries. Similarly, Spain which is not represented on the graph is nowadays the biggest mercury exporter in the world but allocates 99.8% of its exportations to the EU market.

Similarly, exportation of mercury from the USA decreased over the last few years announcing the establishment of the US mercury Export Ban which became effective in 2013. It's interesting to notice that UN COMTRADE data are not in line with data from US Trade Online and it is difficult to have a clear overview of US exportations after 2013. Indeed, UN COMTRADE data indicates that US exported 358 tons of mercury with a large part directly to Indonesia whereas US Trade online affirms that no mercury was exported after 2013. Data used for US exportations in the previous graph are those provided by US Trade Online after confirmation of US Embassy in Jakarta, Indonesia. However, this example highlights the difficulty to get credible and reliable data. Indeed, mercury is sometimes exported legally from one country but illegally imported in the receiving country explaining such discrepancies when looking whether at the exportations or whether at the importations.

As a result of the decreasing importance of the two historic mercury hubs after establishment of the two export bans, some countries increased their mercury exportations dramatically. This is the case of Mexico whose exportations increased continually since 2009. As well, Singapore, which was already an important hub for mercury trade, has seen an increase of its mercury exportations which however decreased a bit in 2013. Singapore is a major exporter but situation is still not stabilized and it is difficult to rule on possible trends in the future. It's also interesting to notice that in 2013, majority of the exportations of Singapore were directly exported to countries engaged in AGSM, with Indonesia and Malaysia receiving big quantities. However, such data at national level are difficult to interpret as mercury for AGSM is often illegally exported meaning that mercury leaves the country legally but enters the new country illegally. This is typically the example of Singapore who exports legally to Indonesia but importations are not reported in UN COMTRADE data meaning this is most of the time illegal.

2.4. Position of different stakeholders

Many stakeholders are involved in many projects worldwide to reduce risks related to mercury use. This is the example of the United Nations Environment Program (UNEP) Global Mercury Partnership Exit which engages countries and stakeholders to reduce mercury use and releases of mercury to the environment. This partnership gathers more than 132 partners including governments, intergovernmental Organizations and Non-Governmental Organizations as well as industrials and scientific communities.

Being part of those members, one is really active: The Zero Mercury Working Group (ZMWG) is an international coalition of over 95 public interest environmental and health non-governmental organizations from more than 50 countries from around the world formed in 2005 by the European Environmental Bureau and the Mercury Policy Project. ZMWG strives for zero supply, demand, and emissions of mercury from all anthropogenic sources, with the goal of reducing mercury in the global environment to a minimum. Their mission is to advocate and support the adoption and implementation of a legally binding instrument which contains mandatory obligations to eliminate where feasible, and otherwise minimize the global supply and trade of mercury, the global demand for mercury, anthropogenic releases of mercury to the environment, and human and wildlife exposure to mercury.

About data generation, global inventories for mercury emissions to air from human sources have been produced at approximately 5-year intervals since 1990 by scientific groups. UNEP produced its first Global Mercury Assessment in 2002. Last report is the Global Mercury Assessment 2013. This update provides the most recent information available for the worldwide emissions, releases, and transport of mercury in atmospheric and aquatic environments.

UNEP also developed the "Toolkit for identification and quantification of mercury releases". This toolkit is intended to assist countries to develop a national mercury releases inventory. It provides a standardized methodology and accompanying database enabling the development of consistent national and regional mercury inventories.

3. Mercury challenges in ASEAN

This section aims at giving an overview of general issues related to mercury in ASEAN community. Regional challenges will be developed before focusing on the main countries which face mercury pollution by looking at their national regulation, main sources and projects.

3.1. Mercury emissions in ASEAN Community

It has been well established that Asia represents not only the region contributing to greatest current mercury emissions but also the region with the fastest growth rate. Despite this, emissions from human activities in most countries in this region are not well characterized.

As seen previously, South East Asia is one of the regions of the world which releases the most mercury in the environment and especially in the atmosphere. Due to their size, big population and industrial infrastructures China and India are the biggest mercury polluters in South East Asia while ASEAN's countries release mercury to a lesser extent.

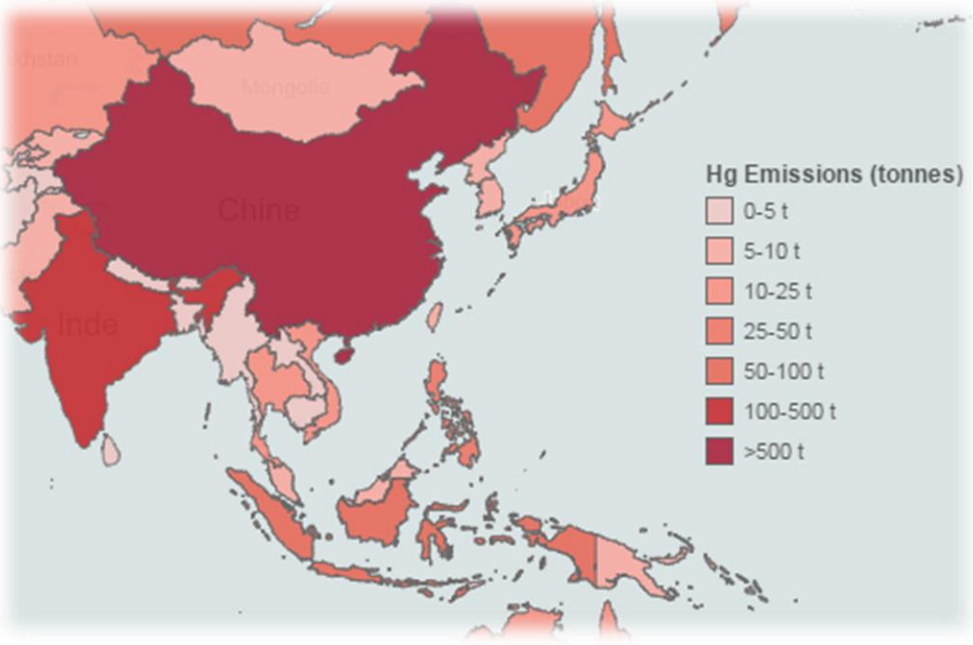


Figure 6: Map of mercury Emissions in South East Asia

Design : Kenneth Davis | Data: AMAP

Indonesia and Philippines are the two main emitters accounting for 74% of mercury emissions in ASEAN Community. They are followed by Thailand, Vietnam and Malaysia which release mercury to a lesser extent. As seen in figure below, main mercury emissions are due to ASGM, coal burning, non-ferrous metal and cement production:

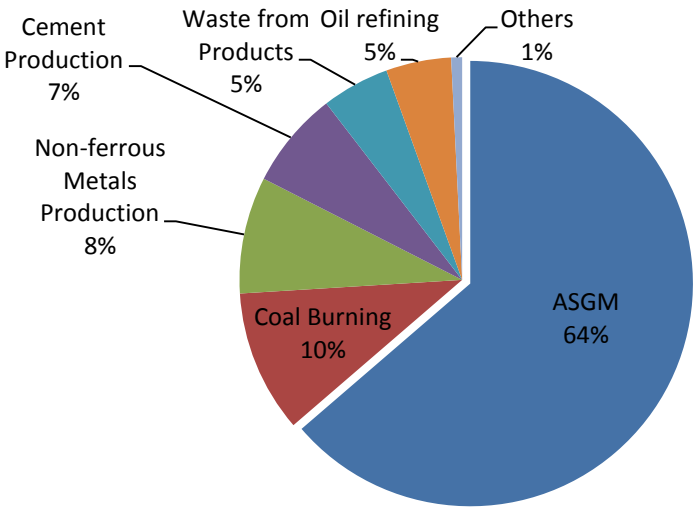


Figure 7: Sources of mercury emissions in ASEAN

Source: Own design| Data: UNEP, 2013

Mercury emissions in Asia are dominated by emissions from ASGM. This can be explained by the predominance of this source in the main polluter's countries such as Indonesia and Philippines. However, this fact conceals major disparities in the source of emissions at national level. Indeed, we can distinguish three main types of countries in ASEAN community:

- **Countries with emissions dominated by AGSM**: This is the case of Philippines, Indonesia, Cambodia and Lao PDR where ASGM account for more than 70% of mercury emissions. Those countries all face similar issues due to ASGM.
- **Countries with emissions dominated by waste from products**: This concerns Singapore and Brunei (and Myanmar to a lesser extent). Singapore and Brunei only emit a small quantity of mercury, probably because of their small size.

- Another category of countries may cover countries like Vietnam and Malaysia which emit **mercury through different sources** without one dominating the others. Three main sources in those two countries are ASGM, coal burning and cement production.

Two countries facing specific issues do not fall into any of these categories. First country is Myanmar whose emissions are partly due to Chlor-alkaly production while no other countries in ASEAN continue to produce Chlor-alkaly. Second country is Thailand whose emissions are largely due to oil refining, which, as a reminder, is not covered by Minamata Convention.

Country	ASGM	Coal Burning	Non-ferrous Metals	Cement Production	Waste from Products	Oil refining	Oil and Gas burning	Waste incineration	Cremation	Cloroalkyl Production
Cambodia	95,3	0	0	1,5	2,6	0	0,2	0	0,4	0
Philippines	79,0	3,6	11	3,1	2,5	0,1	0,2	0,1	0,3	0,2
Indonesia	74,7	8,2	10,1	3,6	2,9	0,2	0,2	0,1	0	0
Lao PDR	74,2	0	18,8	2,3	4,1	0	0	0	0,5	/
Singapore	0	0	0	1,3	71,4	16,5	8,3	2,1	0,5	0
Brunei	0	0	0	24,5	68,7	0,3	4,2	2	0,3	0
Myanmar	0	7,5	1,1	10,3	45,9	0,5	0,8	0,1	9,2	24,6
Thailand	7,6	20,9	4,9	12,6	8,8	44,3	0,4	0	0,5	0
Vietnam	32,3	24,7	1,9	31,4	8,2	0,2	0,4	0	0,8	0
Malaysia	28,5	31,6	1,2	18,1	15,1	3,9	0,8	0,4	0,2	0
Total	63,7	10,3	8,5	7,1	4,9	4,7	0,3	0,1	0,3	0,1

Table 1: Sources of mercury emissions (in percentage) in ASEAN countries

Source: Own design| Data: UNEP, 2013

3.2. Case study in ASEAN

This section will firstly develop the case of the Philippines whose documentation about mercury regulations is the most available before moving to specific regulations related to main sources of mercury emissions in ASEAN Community. These case studies will allow getting an overview of the main national regulations and projects related to mercury in those countries in order to benchmark those cases with Vietnamese regulation and issues.

3.2.1. Philippines

On 10 October 2013, Philippines signed the Minamata Convention on Mercury, along with 86 countries, in a global effort to reduce mercury pollution from anthropogenic sources in the world. Over the last few years, Philippines already adopted several policies related to mercury use and trade regulation. Main regulation is the Chemical Control Order for mercury and mercury compounds. It 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.

Under this law, 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 Environmental Management Bureau, 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. 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

The CCO also 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. The Philippines also promulgated a law 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 this law 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. List of all laws related to mercury in the Philippines can be found in appendix.

In 2008, the Philippine Department of Health's Administrative Order 21 (AO 2008-21) took effect, regulating the Gradual Phase-Out of Mercury in Philippine Healthcare Facilities and Institutions. Similarly, the Philippine Department of Interior and Local Government (DILG) released Memorandum Circular 2010-140 on Mercury Reduction Program for Healthcare Facilities, which is implemented by the local government units (LGUs). The country's phase-out of mercury-containing devices has resulted in a significant number of hospitals replacing mercury-containing devices with safer alternatives (984 out of 1,851 hospitals) within the same year that the law took effect

To tackle issues caused by mercury, government of Philippines with the help of Donors such as ADB and UNIDO implemented several projects as follows:

- Development of Minamata Initial Assessment in the Philippines (on-going)
- Project on the Ratification and Early Implementation of the MC on Mercury in the Philippines
- Improve the health and environment and ASGM communities in the Philippines by reducing mercury emissions
- Management of Mercury and Mercury-Containing Wastes
- Artisanal and Small Scale Gold Mining (ASGM)
- Mercury Assessment for the Philippines Using the UNEP Mercury Toolkit (2008)
- Philippine Energy Efficiency Project (PEEP)
- Philippine Efficient Lighting Market Transformation Project (PELMATP)

3.2.2. Other regulations and situation in ASEAN

A survey about AGSM, which is the first source of mercury emissions in ASEAN, was conducted by UNEP in 2013 in four countries of ASEAN Community which are namely Indonesia, Philippines, Vietnam and Cambodia. Results are summed up in following table:

	Number of people engaged in AGSM	Knowledge of miners about alternatives to mercury	Legal /regulatory status of small scale mining	Legal status of mercury use
Indonesia	1 Million directly	N/A	Illegal	Legal
Philippines	325,000	Low	Legal	Illegal
Vietnam	5,500	Low	Illegal	Illegal
Cambodia	3,500	Low	Legal	Illegal

Table 2: Results of Second Global Forum on Artisanal and Small Scale Gold Mining by UNEP

Source: Own design

Indonesia is the country the most affected by AGSM even if it is illegal. Illegal mercury imported in Indonesia in 2012 had at minimum a value of US$ 31.5 million. The mercury was traded illegally in 850 hotspots spread out all over Indonesia. Philippines are facing similar problems due to illegal mercury importations. There are laws about AGSM in 4 countries where the survey was conducted, 2 stating AGSM is legal and 2 it is not. However, even when AGSM is illegal, countries do not really enforce policies for several reasons.

This study also highlights the fact that knowledge of local miners about alternatives to mercury in AGSM is low in all country where the survey was conducted. However, those countries assure that programs or trainings are available regarding alternatives. Such programs should be further developed to be more effective and increase the knowledge of miners.

4. Case of Vietnam

Following section presents the specific situation of Vietnam, the sources of emissions, the legal documents on mercury management as well as main challenges and recommendations based on benchmarking in other countries in ASEAN Community.

4.1. Sources of emissions and legal documents on mercury management

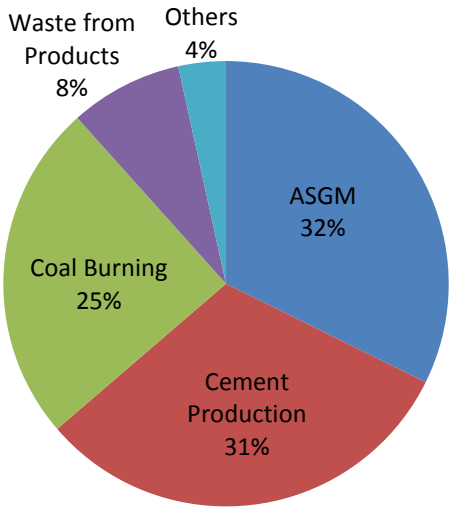


Figure 8: Sources of mercury emissions in Vietnam

Sources: Own design

Vietnam released in 2012 more than 11 tons of mercury in the atmosphere, accounting for 8% of ASEAN countries emissions. As described before, Vietnam's main sources of mercury are coal burning, cement production and ASGM. Vietnam produced around 46 Mt coal in 2012 but used only 26 Mt according to data from United States Energy Information Administration.

About cement production, Vietnam has experienced a surplus of cement since 2009, and the situation has become more serious since 2011. Yet, the Master Plan developed in 2011 was meant to increase the number of cement plants from now until 2020.

Finally, according to governmental data (UNEP, 2013) 3,000 to 4,000 persons were concerned by AGSM in Vietnam for an annual production of 1.3 tons of gold. Indeed, AGSM is legal in Vietnam and occurs in North East, North West, North Central, South Central and Central Highland. However, the use of mercury is illegal but it is reported that miners can buy it from authorized shops trading in chemicals for a price which estimated at 160 USD/liter in 2013. MONRE is the central entity tasked with organizing the mining and exportation of minerals, as well as controlling and revoking mining licenses, especially those relating to acreage, duration, processing, production, safety, and environmental protection. Each province has a

local satellite office called the Department of Natural Resources and Environment ("DONRE"), which is responsible for mineral resource management.

In 2010, Vietnam had 11,834 health care facilities. Some mercury-base medical devices are in use such as thermometers, sphygmomanometers, dental amalgam, laboratory chemical and cleaning products. According to a study conducted by UNDP, the estimated total annual mercury released from broken thermometers and sphygmomanometers per 196,311 beds were 550 kg in 2007 (Nguyen T. L. H. 2011).

Moreover, Vietnam has no completed legal documents on mercury management. Pollution caused by mercury in the gold mining, fertilizers, bulbs, coal, cement, thermal power has not been completely addressed. Main regulations that relate to mercury management are as follows:

- Circular 30/2011/TT-BCT dated August 10, 2011 on the temporary regulations on the allowable concentration limits of certain hazardous substances in electrical and electronic products.
- National technical regulation on a number of toxic chemicals in the air around (QCVN06: 2009 BTNM)
- Decision 3733/2002/QD-BTY on air quality in working area.
- National Technical Regulation on hazardous waste threshold (QCVN 07:2009 / MONRE)
- Surface water quality standards Vietnam's aquatic life protection (TCVN 6774:2000)
- National technical regulations on industrial wastewater (QCVN 40:2009 / MONRE)

Like the Philippines, Vietnam planned to phase-out with mercury in health care facilities. Policies participating to these objectives are the following:

- Law on Environmental Protection, 2005.
- Decrees, decisions that further regulate treatment of liquid and solid waste from production and trade facilities, hospitals, hotels and restaurants.
- VN ratified the Stockholm Convention on 22 July 2002.
- Documents issued by the Ministry of Health
    - Hospital Regulations (1997) including Waste Treatment Regulations.
    - Health-Care Waste Management Regulations

4.2. Potential risks and challenges

Considering those sources of emissions, Vietnam may face several risks and challenges. Indeed, Vietnam has a long coastline of 3,260 km from the northern to the southern part of the country and the residents living in the southern coastal region are significant consumers of shellfish. Unfortunately, shellfish have the capacity to accumulate heavy metals. It might be possible that Vietnamese could be contaminated by mercury because of their diet. One study was conducted in 2014. It appears that shellfish are more contaminated during the rainy season. This could be due to runoff of heavy metals after heavy rains. The Food and Agriculture Organization identified several hazards induced by increase of rains due to climate change. An increase of runoff of heavy metals induced by storms and an increase of shellfish contamination by heavy metals in coastal zones are mentioned as two of these hazards. This study (Nguyen, T. A., 2014) determined the mercury concentrations in shellfish consumed popularly and evaluated exposure of Vietnamese consumers to these contaminants in shellfish consumed popularly. Results of this study confirm that the concentrations of mercury in shellfish are lower than the limits fixed by the Vietnamese and international regulations meaning mercury is not a threat for shellfish consumers, at least for the moment.

Another challenge is the increase of energy demand. Indeed, Vietnam will potentially see at least a doubling in coal use within the next decade, although the predictions for the energy future of Vietnam are subject to significant uncertainty due to the current economic and political climate. However, this will be a significant challenge as mercury emissions from coal burning are already a major source for Vietnam and will probably increase in the future.

Within the ASEAN community, Vietnam is one of the countries with the least country-specific data on mercury emissions. No national inventory has been prepared by anyone other than AMAP/UNEP. This makes difficult to get a clear overview of the situation and real challenge and issues caused by mercury.

Similarly, it seems that to the contrary of countries such as Indonesia and the Philippines which have respectively Balifokus and Ban Toxics, there are no influential and mediatized local NGOs that could help local government to address issues related to mercury use.

The last weakness of Vietnam concerning mercury management is the lack of regulation that directly relates to mercury. Even if Vietnamese government showed willingness to tackle issues caused by mercury by signing Minamata convention, there is currently no legislative framework that addresses the

whole question of mercury management. Moreover policies already in place addressing this problem are not always effective. For example, Vietnam has regulations banning the use of mercury in AGSM but in reality, South East Asian countries like Malaysia, Indonesia and Vietnam that have regulations do not enforce them. This is largely due to avoid tension with the miners representing the poorest sections of the population, whose livelihood strongly depends on AGSM.

4.3. Recommendations

Vietnam should strengthen its regulation related to mercury adopting a plan addressing all the sources of emissions or at least the three main sources:

- AGSM: Implementation of existing policies is a serious issue as explained before. Social programs to provide alternative livelihoods to miners, which are most of the time poor people strongly relying on AGSM to survive, would help fighting illegal AGSM. If stopping AGSM might be ambitious, awareness campaign to AGSM miners should at least be implemented in order to reduce the amount of mercury used in AGSM and promote alternatives to mercury use. Finally it seems that miners buy mercury legally even if the use of this substance is illegal. Local authorities could limit access to mercury in shops in provinces concerned by ASGM. The Ministry of Natural Resources and Environment (MONRE) might be the ministry the most capable to implement such reforms.

- Concerning coal burning, there are already plans and national policies such as the Green Growth Strategy that set objectives to increase the part of renewable energy in national energy supply. However, energy production from coal burning might increase in the next few years and specific objectives should be set in order control emissions of mercury due to coal burning.

- About cement production, government or development agencies should promote investment in adapted technology to reduce mercury emissions from factories.

To tackle the lack of data on mercury, a national assessment should be conducted. Priority should be given to analysis of mercury in ASGM as the data are not really accurate. Similarly, such an assessment should focus on analysis of mercury in coals fired in Vietnam and stack monitoring in order to establish country-specific data as soon as possible.

Emissions from health facilities are not the main source emissions and some policies are already in place. However, while attempting to substitute mercury-containing sphygmomanometers, several hospitals in developing countries need to avoid digital devices of poor quality. As an attempt to overcome this challenge, Health Care Without Harm-Asia (HCWH) provides information on how to spot devices that meet the criteria of professional organizations and could help local authorities to phase out mercury in health care facilities without decreasing quality of health services provided to customers.

References

Mohapatra, S. P., & Mitchell A. (2009). MERCURY TRADE IN A GLOBALIZING WORLD.

Nguyen, T. A., Roudot, A. C., & Massin, D. P. (2014). Risk Assessment of Heavy Metals in Shellfish for the Population in Nha Trang City, Vietnam.*Mercury*, *106*, 12.

Nguyen T. L. H. (2011). Situation of Mercury-free health care in Vietnam, Vietnam Health Environment Management Agency, MOH

Selin, N. E. (2014). Global change and mercury cycling: challenges for implementing a global mercury treaty. Environmental toxicology and chemistry, 33(6), 1202-1210.

Sloss L. (2012). Mercury emissions from India and South East Asia

Streets D G, Devane M K, Lu Z, Bond T C, Sunderland E M, Jacob D J (2012). All-time releases of mercury to the atmosphere from human activities. Environmental Science and Technology, IN PRESS

UNEP (2013). Second Global Forum on Artisanal and Small Scale Gold Mining 3 – 5 September 2013 Lima, Peru

UNEP (2013). Global mercury assessment 2013

Vinachemia (2013). Management of Mercury in Vietnam Sixth Chemical Management Region Forum Vientiane

List of Appendix

Appendix

Regulation	Purpose
Republic Act (RA) 6969: Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990	mandates the control and regulation of the import, manufacture, processing, handling, storage, transport, sale, distribution, use, and disposal of chemical substances
DENR AO 1997-38: CCO for Mercury and Mercury Compounds	control the use and dispersion of mercury into the environment, thereby avoiding its adverse effects to human health and the ecosystem
Department of Health (DOH) AO 2008-21: Gradual Phase-Out of Mercury in all Philippine Health Care Facilities and Institutions	provides the policies and guidelines for a two-year phase-out on the use of mercury in all healthcare facilities
Joint DENR-DOH AO 2005-02: Policies and Guidelines on Effective and Proper Handling, Collection, Transport, Treatment, Storage, and Disposal of Health Care Wastes	provides the guidelines for the management of biological and hazardous wastes generated from health care facilities
Department of Education (DepEd) AO 2006-48: Observance of Safety Measures in Science Laboratories	ensure the safety of students and faculty in science laboratories
Joint DENR-Department of Energy (DOE) AO 2013-09-0001: Lighting Industry Waste Management Guidelines	regulate the EOL disposal of lighting products that contain mercury
RA 8749: Philippine Clean Air Act of 1999 and DENR AO 2000-81: IRR of RA 8749	Control the release of toxic and hazardous pollutants into the atmosphere, including mercury emissions from stationary sources and non-burn technologies
RA 9003: Ecological Solid Waste Management Act of 2000 and DENR AO 2001-34: IRR of RA 9003	address the growing concerns on the management of solid wastes in the country, particularly those from the household and commercial sectors
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	management of toxic and hazardous pollutants in water bodies

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	Provides the safety precautions and measures that operators of small-scale mines must undertake to ensure safe and accident-free operation.

Appendix 1: List of regulations related to mercury in the Philippines

Regulation
Law No. 32 year 2009 regarding Environmental Management and Protection
Ministry of Health Decree No. 1204 year 2004 regarding Requirement of Hospital Environmental Health
Law No. 36 year 2009 regarding Health
Government Regulation No. 18 year 1999 jo No. 85 year 1999 regarding Hazardous Waste Management
Government Regulation No. 74 year 2001 regarding Hazardous Substances Management

Appendix 2: List of regulations related to mercury in Indonesia

UNIDO VIET NAM

Address: Green One UN House (GOUNH) - 304 Kim Ma, Hanoi, Viet Nam
Telephone: +84 4 3822 4490 - Fax: +84 4 3942 2484
Email: office.vietnam@unido.org
Web: www.unido.org – www.un.org.vn