



## IPEN submission on review of Annex A and B of the Minamata Convention

May 2020

Contact Lee Bell- IPEN Mercury Policy Advisor [leebell@ipen.org](mailto:leebell@ipen.org)

IPEN would like to support the addition of a range of products and processes to Annex A and Annex B respectively of the Minamata Convention. This submission addresses those products and processes that should be prioritised for phase out and other forms of regulation to prevent negative impacts on human health and the environment. In addition IPEN would like to comment on additional matters of significant concern that should be addressed by the convention such as regulation of the Oil and Gas sector (proposed addition to Annex D) and the addition of ASGM to Annex B of the convention.

### Oil and Gas sector

IPEN's comments on the review of Annex A and B are detailed below. However, IPEN believes it is important to also raise the issue of the Oil and Gas sector as a known source of elemental mercury, mercury waste and mercury emissions. While the Oil and Gas sector are not directly referred to in the Convention and at some level are considered to be 'exempt' from the requirements of the convention due to their omission from Annex D, Oil and Gas mercury containing waste falls within the scope of article 11 and releases may be controlled under article 9. Emissions of mercury from the Oil and Gas sector are not addressed by article 8 as refineries, extraction platforms and other forms of oil and gas infrastructure are not included as sources under Annex D. Recent assessments of mercury emissions from the Oil and Gas sector are significant with a minimum of 60 tonne+ released to air annually from gas alone (Maxxson 'Mercury in natural gas' ICMGP 2019) and more from oil refineries. The Oil and Gas sector need to have their mercury pollution regulated comprehensively through the convention but neither a review of Annex A or B afford this opportunity. For this reason, IPEN urges the secretariat to consider a review of Annex D in the near future.

### **Annex A – Mercury-added products**

#### Satellite thruster propellant (mercury)

IPEN believes it is essential that the use of mercury as a satellite thruster propellant product in Hall thrusters or similar devices be added to Annex A and scheduled for immediate phase out (2020). Research has indicated that 75% of mercury emissions from thrusters or around 20 Mg yr<sup>-1</sup> of mercury could potentially be deposited into the Earth's oceans based on an analysis of the rapidly growing satellite industry and its potential mercury use (Dan Fourie et al 2019 Environ. Res. Lett. 14 124021). In terms of global emissions this amount accounts for approximately 1% of current anthropological emissions but the fraction could be even higher as other actions taken by parties under the Minamata Convention to reduce anthropogenic emissions increases the relative contribution by satellite thrusters.

Non-hazardous alternatives are currently available and achieve high performance levels (xenon gas) and have been in commercial use for decades as a propellant for satellite thrusters. The small cost savings to commercial satellite companies in switching from xenon to the mercury propulsion are heavily outweighed by the environmental impacts on aquatic life, the food chain and ultimately human exposure. IPEN supports Norway's submission of a peer reviewed study of the negative implications of mercury use as a propellant in satellite thrusters and supports the addition of

mercury as a thruster propellant to Annex A of the Convention with a phase out date effective immediately (i.e. 2020).

### Dental amalgam

At COP4, the world will be ready to adopt a phase out plan for amalgam, as already exists for the other products. Changes in technology, dental practice, consumer awareness, and government policies since the initial "phase down" language now call for a phase out date – either in usage or in trade or in both. The transition to mercury-free dentistry is already occurring. IPEN anticipates that the Africa Region – which is leapfrogging toward mercury-free dentistry in many of its countries – will again propose an amendment to Annex A Part II seeking to add dental amalgam to Annex A Part I, and will receive broad support from Parties and non-Parties in the other Regions. IPEN is prepared to work with the Parties and non-Parties to build a consensus to end the use of this mercury-based product that is no longer needed in oral care and no longer fitting for 21<sup>st</sup> century dentistry.

Economic and efficient alternatives to mercury based dental amalgam are readily available including composite resin, glass ionomer, porcelain, and gold, among other options. At COP 3 many parties from the African region and other regions supported the amendment of Annex A Part I to include dental amalgam. IPEN supports the proposed amendment and the efforts by those parties to ensure that mercury exposure and mercury waste from this source is eliminated.

IPEN is also concerned that the ongoing allowed use of mercury in dental amalgam is acting as a 'cover' for the illegal trade in mercury destined for ASGM. Reports from our network indicate that large quantities of mercury labelled as dental amalgam are being imported into countries with restrictions on the use of mercury in ASGM. The quantities imported far exceed any possible requirements for the use of dental amalgam in those countries. Policing national borders to prevent illegal mercury imports would be greatly assisted by the phase out of dental amalgam. A number of studies<sup>1</sup> support information from our network that many mercury imports labelled 'dental amalgam' are effectively an illegal conduit for mercury use in ASGM.

### Mascara

Eye cosmetics such as mascara containing mercury should be added to Annex A and should no longer be exempt from the requirement of the convention. Many manufacturers have now moved to formulations that are mercury free demonstrating that alternatives are available and accepted<sup>2</sup> by the cosmetics industry. In addition, research has demonstrated that consumers are willing to accept a modest price differential to ensure that their cosmetics do not have negative health impacts<sup>3</sup>. IPEN supports the EU's conclusion that there is scope to replace the use of thiomersal and similar based mercury preservatives in cosmetic products such as mascara.

IPEN also supports the following additions to Annex A Part I:

---

<sup>1</sup> Tibau, A. V., & Grube, B. D. (2019). Mercury Contamination from Dental Amalgam. *Journal of health & pollution*, 9(22), 190612. <https://doi.org/10.5696/2156-9614-9.22.190612>

UNEP (2006) Summary of supply, trade and demand information on mercury [Internet] Nairobi, Kenya: United Nations Environment Programme; 2006. Nov, p. 95. [cited 2019 Apr 10] p. Available from: <http://mddconsortium.org/wp-content/uploads/2014/11/UN-HgSupplyTradeDemand-Final-Nov2006.pdf>.

<sup>2</sup> COWI, 2008. Options for reducing mercury use in products and applications, and the fate of mercury already circulating in the society. Final Report. Available at: [http://ec.europa.eu/environment/chemicals/mercury/pdf/study\\_report2008.pdf](http://ec.europa.eu/environment/chemicals/mercury/pdf/study_report2008.pdf).

<sup>3</sup> Halla, N. et al., 2018. Cosmetics Preservation: A Review on Present Strategies. Available at: <https://www.mdpi.com/1420-3049/23/7/1571/pdf>.

1. Button batteries with a content >0.0005% of mercury should be phased out as Hg free alternatives are available. Mercury-free silver oxide batteries, mercury-free zinc air batteries, lithium batteries are a commonly available alternative.
2. Melt pressure transducers, transmitters and sensors using mercury in a capillary system should be added to annex A. Hg free alternatives are available.
3. Mercury vacuum pumps. Hg free alternatives are available and are in common use.
4. Mercury catalyst were used in the production of polyurethane elastomers. Alternatives are available.
5. Tensiometers for measuring soil moisture tension. Alternatives are readily available.
6. Mercury containing counter-balancers (tyre weights). Liquid alternatives available.
7. Mercury slip rings for signal transmission between rotors and stators on industrial equipment. Alternatives readily available.
8. Mercury-containing lamps including: compact fluorescent lamps, cold cathode fluorescent lamps and external electrode fluorescent lamps, induction fluorescent lamps and automotive headlamps. LED alternatives are available.

### **Annex B – Manufacturing processes in which mercury or mercury compounds are used.**

#### ASGM

While it is understood that the Convention has mechanisms for addressing ASGM through National Action Plans (NAPs) in those countries where ASGM using mercury is a significant activity, IPEN is of the view that mercury use in ASGM remains a critical and potentially growing source of mercury pollution on a global scale. IPEN has many active participating organisations in ASGM hotspots around the world who provide detailed information to IPEN and their national government about the ongoing use of mercury in gold production and widespread human suffering and mercury intoxication as a result of its use. IPEN has conducted a number of studies sampling the hair of women of childbearing age in ASGM locations revealing extremely high body burden of mercury from the majority of those women participating in the sampling studies. In our view the current mechanisms to reduce the amount of mercury used in ASGM is relatively slow and ineffective. Both legal and illegal trade in mercury is fuelling mercury use in ASGM.

While ASGM continues to remain an 'allowed use' of mercury under the convention it will remain almost impossible to control the flow of mercury into this activity. The current situation also makes it extremely difficult for customs officers to restrict mercury movement when there are 'allowed uses' (such as dental amalgam) and restricted uses. Labelling of mercury shipments based on end use is almost impossible to police.

IPEN is of the view that ASGM should be added to Annex B of the convention as a 'manufacturing process' (the extraction of gold from gold bearing ore) with a phase out date of 2025. This would allow adequate time for the transition to mercury free ASGM activity and give a sense of urgency to the implementation of NAPs that is currently not evident. In combination with adding dental amalgam to Annex A Part I of the convention this would eliminate the bulk of world trade in 'legal' elemental mercury making detection and control of illegal mercury trade a realistic prospect.

#### Gold plating (aka metal plating, fire gilding, ormolu, bronze doré)

IPEN proposes that gold plating using mercury should be added to Annex B of the convention.

The use of mercury to impart gold plate to less valuable metals has been practised for thousands of years. There is evidence that this process continues in some countries. Studies of occupationally

exposed workers in Iran<sup>4</sup> confirm health impacts from gold plating using mercury. In this application of the gold plating workers were using large amounts of elemental mercury mixed with gold to form a paste which was applied to the minarets and other structures of Islamic places of worship. Blow torches are then used to burn away the mercury leaving a gold plating on the base metal. This same technique has been used for centuries to decorate religious statues, artworks, clocks, porcelain and furniture. The practice was made illegal in France in the 1830's to the severe health impacts on artisans using the technique. The Convention is currently silent on this use of mercury.

The large-scale use of this technique in Nepal came to light in 2016 as part of an investigation by a Nepal-based IPEN participating organisation Center for Public Health and Environmental Development (CEPHED). Since then work on the MIA for Nepal has revealed that this practice is the highest source of anthropogenic mercury emissions in the country.

The following section provides details of mercury-based gold plating in Nepal, exposure levels, impacts and emission estimates.

Metal plating (gold plating) is a process in which gold lining/painting is conducted on metal statues (sculptures) in Nepal by mixing mercury and gold together in a hand held mortar and pestle for extended hours thus preparing paste of gold and mercury. The paste is applied over the metal statue and then heated with a blow torch to evaporate mercury with gold plating remaining on the statue. There is a strong belief among processors that gold plating carried out through this process lasts longer and is better quality than gold electroplating- the main industrial alternative. The latter methods does have some limitations with larger statues requiring a large bath and a lot of gold.



In all the processes from making mercury and gold paste, applying this on the statues and heating to evaporate the mercury, workers get a direct high level of exposure and there is high level of environmental (air, water, soil ) burden of mercury pollution that must be monitored. The details of the process can be seen in this video <https://youtu.be/Tk9HZUYQc6s>. The workers were not informed at all about ill effect of mercury. The previous study on bio monitoring of mercury among 20 metal plating workers revealed very high level of mercury exposure average 3.62 ppm to 28.46 ppm. As the level of mercury in air, water and soil has yet unknown, we aimed to generate data on at least soil and water pollution levels of mercury through collecting soil dust and drainage water samples from the workshop area and will prepare reports.

**Gold plating (gold-mercury amalgam)** is one of the traditional works primarily practiced by an ethnic community in Nepal and has a history of many centuries. According to Department of Archaeology (DOArc), a total of 190,212 items of gold plated sculptures having a total

---

<sup>4</sup> Vahabzadeh M, Balali-Mood M. (2016) Occupational metallic mercury poisoning in gilders. Int J. Occup Environ Med 2016: 7-122

weight of 1255.33 MT were exported in the year 2016/17 and this led to an estimation of 12,825 Kg of mercury used in preparing the above sculptures. The gold-plated sculptures are mainly exported to China, India, Sri Lanka, Thailand, Bhutan, including others. It has also been estimated that about 95% of the used mercury is released to atmosphere while blow torching the sculptures with hot flame to remove the mercury; also, 3% of Hg may get into water used to wash the sculptures and only 2% might deposit into the soil in the immediate vicinity of gold plating activities. Gold plating is done partially as well as completely on the sculptures body.

## **Populations engaged in the gold plating business**

Gold plating is an important, traditional and unique practice to manufacture religious sculptures. It is a durable and conventional technology that uses metallic mercury to coat sculptures with gold, and also the roofs and minarets of temples. As mentioned earlier, in Nepal, more than 400 families (with around 10 workers in each family) are involved in this business. Around 4000 people are directly exposed to mercury during gold plating process. *The inventory of Hg also showed that gold plating business is the highest contributor in emitting and releasing mercury into the environment in Nepal.* People involved in this business are directly exposed to the mercury vapor released when mercury is burned off leaving a gold coating on the sculptures. The exposure to workers is metallic vapor inhalation and dermal absorption as they directly handle mercury in the workplace, often without necessary Personal Protective Equipment (PPE). During the MIA project period, an interaction program "Source of Mercury (Hg), its use and safe management" was jointly organized by Ministry of Forests and Environment and Federation of Handicraft Associations of Nepal (FHAN) on 5 July, 2018 at FHAN, Thapathali. Around 40 participants from different businesses related to arts, crafts and gold plating participated in the program

The gold plating business needs immediate action and introduction of sound technology to minimize the adverse effects of Hg. Further, it was also found that the women engaged in gold plating business (often family business) had some health problems at their early age. The hair samples of 20 women of child-bearing age involved in gold plating were tested and the average Hg concentration was found to be 3.62 ppm (Bell, 2017). This finding reveals that populations involved in gold plating business are at high risks of mercury exposure. These populations need urgent attention and their workplace needs immediate improvement to make it safe and free from risks associated with the use of mercury.

About a decade ago, most of these ethnic groups were engaged in this business as their family business. However with increase in the awareness level among them about the toxicity of the mercury, they refrain to engage in the practice themselves and hire or subcontract this harmful business of gold plating to the poor and illiterate workers who don't know about the toxic effects of mercury. It has been seen that the workers of even very young ages (including pre-pubescent female child workers) were engaged in such plating work without using any PPE.

## **Minamata Initial Assessment (MIA) 2019, Nepal**

**The Government of Nepal signed the UN Minamata Convention on Mercury** on 10<sup>th</sup> of October 2013. Soon after signing the Convention, the Nepalese delegation and concerned government agencies started to prepare for the ratification of the Convention. However due to several rounds of discussion among the officials and other government agencies, a study about the status of mercury import, use and handling was prioritised. Thus there was a process of developing required resources for the assessment. With the support of GEF fund and implementing agencies UNITAR and sub-contracting agencies like BRI, The Minamata Initial Assessment (MIA) of Nepal were completed in the year 2018 and finalized as well as submitted to the Minamata Secretariat in early 2019<sup>5</sup>.

The following section summarizes the MIA of Nepal with major highlights related to metal plating works in Nepal.

**Total release of mercury in Nepal for the base year 2016/17 is estimated to be 19615 Kg Hg/y**, which includes 6,790 Kg Hg/y from different source categories identified in UNEP Toolkit spreadsheet and **12825 Kg Hg/y from gold plating**.

**Gold plating could not be included as potential mercury sources in the quantitative inventory as this is not identified in the UNEP toolkit, but it is included under miscellaneous mercury sources. Gold plating (gold-mercury amalgam) is identified as the highest contributor in releasing mercury in Nepal** followed by 2,476 Kg Hg/y from use and disposal of mercury-added products. Waste incineration and open burning, and informal dumping of general waste were also significantly releasing mercury, 998 Kg Hg/y and 931 Kg Hg/y, respectively. Energy consumption contributed 904 Kg Hg/y, while crematoria and cemeteries contributed 512 Kg Hg/y. Mercury releases from other materials production such as cement, pulp and paper production is estimated to be 389 Kg Hg/y. The wastewater system, treatment, application, use and disposal of dental amalgam fillings contributed 368 Kg Hg/y and 114 Kg Hg/y, respectively.

The total estimated mercury emission to air is found to be 3,550 kg Hg/y excluding that from the gold plating. The individual mercury release sub-categories contributing with the highest mercury releases to the atmosphere are:

<b>Mercury Release Source Categories</b>	<b>Total Mercury Release to Atmosphere</b>
Miscellaneous (gold plating in case of Nepal)	12184 Kg
Open fire waste burning	774 Kg
Biomass fired power and heat production	739 Kg
Crematoria	465 Kg
Informal dumping of general waste	466 Kg
Cement Production	288 Kg
Medical blood pressure gauges	246 Kg
Incineration / Burning of medical waste	224 Kg
Thermometers	98 Kg
Source: Nepal, MIA 2019, p xi	

<sup>5</sup> [http://mercuryconvention.org/Portals/11/documents/MIAs/Nepal\\_MIA\\_2019.pdf](http://mercuryconvention.org/Portals/11/documents/MIAs/Nepal_MIA_2019.pdf)

Similarly, the total estimation of mercury release to water was 1,250 Kg Hg/y. The main sources of the mercury release in water are application, use and disposal of dental amalgam fillings, use and disposal of other products, informal dumping and wastewater system/treatment. **The water discharged from gold plating practices is also calculated to release 385 Kg Hg/y.**

Mercury release to land is estimated to be 460 Kg Hg/y. The major sources of mercury release to land are informal dumping of general waste, use and disposal of other products (thermometer), crematoria and cemeteries, production of recycled metals and application, use and disposal of dental amalgam fillings. **Solid residues from gold plating are disposed of on land after extraction of traces of gold and this is calculated to release 257 Kg Hg/y to the land.**

Gold plating is one of the major mercury sources identified in Nepal. Grand total of Hg release accounting 19615 Kg Hg/y including gold plating and a total of 6790 Kg Hg/y without the gold plating. Gold Plating sources in Nepal require more detailed studies and strategic planning for short, medium and long-term objectives to address all associated health and environmental issues.

Gold plating (gold-mercury amalgam) is one of the traditional works in Nepal and has a history of many centuries. This profession is mainly undertaken by the Newar Community and some other communities. According to Federation of Handicraft Association Nepal (FHAN), it is assumed that there are more than 400 families involved in this business. The traditional way of gold plating using mercury generates good income, though it is costlier than the electro gold plating. According to mercury-based gold plating entrepreneurs, the quality of the gold plating using Hg is higher than the electro gold plating and has a good demand and high market value. Information from gold plating entrepreneurs, FHAN and DOArch/GON, suggests about 90 % of the gold-plated sculptures are exported and only 10 % are consumed domestically.

According to the gold plating processors, gold and mercury are mixed at a ratio of 1:15 (on average however this ratio varies in case of gold plating in the temple roofing) for gold plating on the brass and copper statues/sculptures. For this subcategory, the estimation of the mercury input was done based on the information received from gold plating entrepreneurs. The mercury input was calculated for the base year 2016/2017 based on the number and size of sculptures registered with the DOArch. According to DOArch, the sculptures are mainly made in sizes of 8, 12, 18, 24 inches in height and larger and the exported sculptures constitute 15%, 60%, 10 % 10% and 5%, respectively. Similarly, the mercury input for each size was estimated as informed by gold plating entrepreneurs. According to DOArch, a total of 190212 pieces of sculptures having a total weight of 1255.33 MT of the gold-plated sculpture were exported and this led to an estimation of 12825 Kg of mercury input while preparing the above sculptures.

The MIA process has not identified the sites contaminated by mercury or mercury compounds within the country. However, in the immediate vicinity of the gold plating activities, especially the residential area of north-eastern side of Lalitpur district (**our project area**) has been identified as a potential contaminated site among others.

## Equivalent and even higher exposure that ASGM in Metal plating using mercury in Nepal

The metal gliding process taking place in Nepal especially in some communities in Lalitpur, in the Kathmandu Valley, results in very high exposure to mercury among the metal plating workers and surrounding communities equivalent to or even higher than exposure levels of workers in ASGM. Among 20 samples from child bearing age female metal plating workers, the average levels of mercury in women's hair was 3.62 ppm  $\pm$  6.11 ppm (fw) and 75% exceeded the 1 ppm reference level. The maximum mercury level found reported was 28.46 ppm.

The workers and general public needs to be protected from their continued occupational exposure to mercury along with mass awareness raising.

A bio monitoring of mercury study conducted in Nepal among metal plating workers by UNEP/IPEN/BRI clearly shown very high level of Mercury contamination.



Table 1. Mercury concentration in hair sample of 20 women

Avg. THg (ppm)	Max. THg (ppm)	Min. THg (ppm)	% Samples exceeding 1 ppm
3.62	28.46	0.35	75 % (15 of 20)
Source: <a href="http://www.mercuryconvention.org">www.mercuryconvention.org</a> or <a href="http://ipen.org/Mercury-Monitoring-in-Women">http://ipen.org/Mercury-Monitoring-in-Women</a>			

***As mercury exposure is very high among metal plating workers using mercury in Nepal but this process has not yet been included in the Minamata Convention and hence urgently needs to be included suitably in the Convention most appropriately in Article 5 Annex B Part I and should have appropriate control measures. Information suggests this process might be happening in Iran, India, Bhutan, Sri Lanka, Thailand, Malaysia, Indonesia and needs to be further explored.***