Final Workshop of the Project
Minamata Initial Assessment
Istanbul - Turkey
26th - 27th March 2019

THE MIA BANGLADESH:
FINDINGS, CHALLENGES AND NEXT STEPS

Dr. Masud Iqbal Md. Shameem
Department of Environment, MoEFCC
shameem@doe.gov.bd

Dr. Tanvir Ahmed
Dept. of Civil Engineering, BUET
tanvirahmed@ce.buet.ac.bd
Country Profile

- Area 147,570 square kilometers
- 8th most populous country in the world with 158.9 million inhabitants.
- An annual GDP growth of 7.284% largely driven by its exports of ready-made garments (80% of total exports)
- Natural gas is the main energy source of Bangladesh for power generation
- Does not manufacture consumer products (except light, paint and cosmetic products) but relies on imports from other countries
Sectors contributing to Mercury Emissions

- **No mercury /gold mining in Bangladesh.** Source of mercury mostly from imports (legal import 3.73MT according to NBR).

- **Coal use:**
  - Barapukuriya power plant: 4,500 tons coal combusted per day
  - Bangladesh is producing about 23 billion bricks annually in approximately 7,000 brick kilns (consumption of coal would be 3,942,200 ton per year)

- Natural gas and LNG: 29,660,963,040 Nm³/y

- Crude oil refining is 1,400,000 MT/ y
Sectors contributing to Mercury Emissions

- Clinker produced in 2 cement factories (1,500,000 t/y)

- most of the paper factories import pulp to locally produce paper (94000MT pulp used per year)

- there are several chlor-alkali production plants, but none of those use mercury cells in the production process

- major demand of light source in Bangladesh is met by florescent tubes and compact fluorescent lamps

<table>
<thead>
<tr>
<th>Type and average size of unit</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incandescent (60W)</td>
<td>15.1 million</td>
</tr>
<tr>
<td>Fluorescent T8 (60W)</td>
<td>14 million</td>
</tr>
<tr>
<td>Fluorescent T5(40W)</td>
<td>3.5 million</td>
</tr>
<tr>
<td>CFL (15W)</td>
<td>36.6 million</td>
</tr>
<tr>
<td>LED (7W)</td>
<td>1.18 million</td>
</tr>
</tbody>
</table>

Source: World Bank
Sectors contributing to Mercury Emissions

- Total production of paint in Bangladesh = $125 \times 10^6$ kg/y. 90% of the cheaper paint types may contain mercury 30 to 60 ppm

- Total national production of skin cream is around 25 lac piece/month

<table>
<thead>
<tr>
<th>Name of product</th>
<th>Hg concentration (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Garnier</td>
<td>4653</td>
</tr>
<tr>
<td>Fair and Lovely Ayurvedic</td>
<td>4004</td>
</tr>
<tr>
<td>Fair and Lovely Max Fairness</td>
<td>4174</td>
</tr>
<tr>
<td>Modern</td>
<td>4152</td>
</tr>
<tr>
<td>Fair and Handsome</td>
<td>4133</td>
</tr>
<tr>
<td>Botanic</td>
<td>3929</td>
</tr>
<tr>
<td>Tibbat</td>
<td>3752</td>
</tr>
<tr>
<td>PONDS</td>
<td>3450</td>
</tr>
<tr>
<td>Olay</td>
<td>3603</td>
</tr>
<tr>
<td>Sumon’s Aroma</td>
<td>3361</td>
</tr>
</tbody>
</table>

Source: ESDO (2015) study
Sectors contributing to Mercury Emissions

- much of the recycled ferrous metal comes from dismantling of old ships

- Incineration of municipal waste is not practiced in Bangladesh. After collection, municipal waste is partly transported to the landfills, rest are burnt openly
Poor waste management activities

waste generation rate nearly 22million tons year\(^{-1}\) of which, only 20% of waste is under collection coverage

very limited electronic waste recycling and medical waste management facilities

**Mercury-containing wastes** (such as batteries, CFL bulbs, broken thermometers, disused sphygmanometers) will find its way to municipal dumpsites.
Estimated total Hg release to society: **32,660 kg Hg/y**

- **Waste incineration and open waste burning**: 44%
- **Crematoria and cemeteries**: 6%
- **Informal dumping of general waste**: 7%
- **Production of recycled metals**: 3%
- **Production of products with mercury content**: 4%
- **Use and disposal of dental amalgam fillings**: 2%
- **Use and disposal of other products**: 20%
- **Coal combustion and other coal use**: 2%
- **Other fossil fuel and biomass combustion**: 2%
- **Oil and gas production**: 8%
- **Oil and gas production**: 8%
- **Production of products with mercury content**: 4%
- **Use and disposal of dental amalgam fillings**: 2%
- **Production of recycled metals**: 3%
- **Use and disposal of other products**: 20%
Mercury Release Pathways

- Air, 60%
- Land, 10%
- Water, 13%
- By-products and impurities, 2%
- General waste, 10%
- Sector specific waste treatment /disposal, 5%

MIA Bangladesh: Findings, Challenges and next steps
Dr. Tanvir Ahmed
Energy Consumption (4,133 kg Hg/y)

- Extraction and processing of natural gas
- Oil refining
- Biomass fired power and heat production
- Use of pipeline gas (consumer quality)
- Combustion/use of diesel, gasoil, petroleum,...
- Combustion/use of petroleum coke and heavy...
- Other coal uses
- Coal combustion in large power plants

Domestic Production of Metals and Raw Metals (192 kg Hg/y)

- Pulp and paper production
- Cement production*4
- Other materials production
  - Gold extraction with mercury amalgamation -...
  - Gold extraction with mercury amalgamation -...
  - Primary ferrous metal production (pig iron...
  - Alumina production from bauxite (aluminium...
  - Gold extraction by methods other than mercury...
  - Production of lead from concentrates
- Mercury (primary) extraction and initial processing
Industrial Mercury Use (Input: 5,589 kg Hg/y, Release: 1,258 kg Hg/y)

- Skin lightening creams-soaps with mercury: 117 kg Hg/y
- Paints with mercury: 1063 kg Hg/y
- Biocides and pesticides with mercury
- Manometers and gauges with mercury
- Batteries with mercury
- Light sources with mercury (LFL, CFL, others): 343 kg Hg/y
- Electrical switches and relays with mercury
- Hg thermometers (medical, air, lab)
- Acetaldehyde production with mercury
- VCM production with mercury catalyst
- Chlor-alkali prod. with mercury-cells

- Paints with mercury: 85%
- Skin lightening creams and soaps with mercury chemicals: 9%
- Light sources with mercury (fluorescent, compact, others): 6%
Waste Treatment and Recycling (Input: 27,457 kg Hg/y, Release: 17,667 kg Hg/y)

- Waste water system/treatment
- Informal dumping of general waste *1
- Controlled landfills/deposits
- Open fire waste burning (landfills and informally)
- Sewage sludge incineration
- Incineration / burning of medical waste
- Incineration of hazardous waste
- Incineration of municipal/general waste
- Production of recycled ferrous metals (iron and...
- Production of recycled mercury ("secondary...

Estimated Hg Release, kg Hg/y
Estimated Hg Input, kg Hg/y
Use and Disposal of Mercury Product Substances (19,434 kg Hg/y)

- **Thermometers**: 27%
- **Dental amalgam fillings ("silver" fillings)**: 4%
- **Paints with mercury preservatives**: 24%
- **Polyurethane (PU, PUR) produced with mercury catalyst**: 10%
- **Medical blood pressure gauges (mercury sphygmomanometers)**: 4%
- **Light sources with mercury**: 7%
- **Batteries with mercury**: 2%
- **Electrical switches and relays with mercury**: 3%
- **Polyurethane produced with mercury**: 10%
- **Laboratory-medical...**
- **Laboratory chemicals**
- **Other manometers and...**
- **Mercury...**
- **Skin lightening creams and...**
- **Paints with mercury...**
- **Polyurethane produced with...**
- **Batteries with mercury**
- **Light sources with mercury**
- **Electrical switches-relays...**
- **Thermometers**
- **Dental amalgam fillings**

**Estimated Hg Input, kg Hg/y**

0 1000 2000 3000 4000 5000 6000
Who are the populations at risk?

Bangladesh remains vulnerable to mercury contamination from

- uncontrolled dumping of mercury along with medical, industrial, electronic wastes into the waters and soil,
- uncontrolled coal burning in brick kilns,
- fish-dependent protein diet of the population,
- through the use of mercury-added products
- medical applications of mercury (dental amalgam).
recycling of municipal wastes is being carried out by informal sectors such as the rag-pickers. The rag-pickers are less likely to be wearing any sort of personal protective equipment.

Unauthorised persons collecting waste from the wards (pilferers)
Precautionary measures are not always present (use of PPE, mixing done near patients, accidental spills, leaky capsules, vaporization of mercury)

Professional dentists, students, health workers and patients are exposed.

Approx. 1173 kg mercury is used currently per year for preparation of fillings at dentist clinics.
Population at risk from Fish-dependent Diet

Concentration of Mercury in inland freshwater fish in Bangladesh has been found to be very low (2 to 430 ng Hg /g fresh weight of the fish)

Marine fisheries are 16.28% of the national fish production. It is estimated that about 88,593 tonnes of fish are imported which is just 1.6% of the total current fish demand of Bangladesh.

Bangladesh Food Safety Authority (BSFA), has recently become increasingly concerned about heavy metal contamination in imported fishes

Published quantitative evidence on the presence of mercury in imported and marine fishes are unavailable.
Population at risk from Mercury-added products

widespread and growing popularity of face whitening products owing to a strong cultural preference for fairer skin. **Females from lower to middle class were more likely to engage in skin bleaching**

**Level of awareness very low**

521 kg of mercury is used in skin creams per year in Bangladesh
Population at risk in Urban Areas

Most of the brick kilns are clustered around major urban centers such as Dhaka city.

The open burning of municipal solid waste takes place in and around major urban centers where population density is high.
Challenges and limitations

• Lack of awareness regarding the ill-effects of mercury among general people (both supply and demand-side)

• Lack of institutional capacity
  • Lack of implementation of existing laws and rules (e.g. Hazardous Waste and shipbreaking Rules)
  • Lack of technical knowledge in our scientific institutions regarding mercury
  • Lack of instrumentation, equipment to detect mercury in our technical/scientific institutions

• Lack of waste management facilities (E-waste, medical waste, municipal solid waste)

• Problems in phasing out mercury use in dentistry and light production
Policy legal Framework and Institutions

Regulatory Framework

- Bangladesh Environment Conservation Act 1995
- Environmental Conservation Rules 1997
- Bangladesh Labor Act, 2006
- Bangladesh Export Policy, 2015-2018 and Import Policy Order, 2015-2018
- The Bangladesh Standards and Testing Institution Ordinance, 1985
- Right to Information Act 2009

Non-regulatory Framework

- National Environmental Policy 2013
- National 3R Strategy for Waste Management 2009
- Bangladesh Standards and Guidelines for Sludge Management 2015
- National Health Policy 2011
- National Industrial Policy 2010
Gaps with diff. provisions of Minamata Convention

With regard to Article 3, *(Mercury supply sources and trade)* there is no current stock of mercury.

With regard to Article 4 *(Mercury-added products)*, Bangladesh needs to align the import policy order with the hazardous waste and ship-breaking Rules, 2011 to ban the import of prohibited items under the Basel Convention and Annex A part 1 products.

With regards to Article 8 *(Emissions)*, although generic mercury emission standards have been set in Bangladesh, it needs to be made industry-specific.

With regard to Article 9 *(mercury releases to land and water)*, although there are some guidelines to restrict the release of mercury from wastes in land and water, the guidelines are not legally binding.
Gaps with diff. provisions of Minamata Convention

With regard to **Article 10 (environmentally sound interim storage of mercury)**, Bangladesh has to develop more specific guidelines for safe handling and storage of mercury.

With regard to **Article 11 (Mercury wastes)**, Bangladesh will need to consider how best to reduce emissions and releases from the waste sector, in particular through the improved management of end-of-life mercury-added products.

With regard to **Article 17 (Information Exchange)**, a national focal point on Mercury for exchange of information needs to be designated.
## Summary of Mercury Priorities

<table>
<thead>
<tr>
<th>Plan</th>
<th>Title and Components</th>
<th>Articles Addressed</th>
<th>Lead Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Legal and institutional arrangements to implement the convention at the national level</td>
<td>3, 4, 5, 8, 11, 14, 17, 18, 19, 21</td>
<td>DoE, MoI, NBR</td>
</tr>
<tr>
<td>2</td>
<td>Phasing down of dental amalgam</td>
<td>4, 11, 14, 18</td>
<td>DoE, DGHS, Bangladesh Dental Society, NBR</td>
</tr>
<tr>
<td>3</td>
<td>Phasing out of mercury-added products</td>
<td>4, 11, 14, 17, 18</td>
<td>DoE, DGS, BSTI</td>
</tr>
<tr>
<td>4</td>
<td>Environmentally sound management of solid and hazardous wastes</td>
<td>11, 14</td>
<td>City Corporations and municipalities, DGHS, DoE</td>
</tr>
<tr>
<td>5</td>
<td>Research and Development, information dissemination and mass awareness</td>
<td>14, 16, 17, 18, 19</td>
<td>Technical and scientific institutions, DoE</td>
</tr>
</tbody>
</table>
Plan 1: Legal and institutional arrangements to implement the convention at the national level

<table>
<thead>
<tr>
<th>Activities/Actions</th>
<th>Responsible agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incorporate obligations of the Minamata Convention into existing national legislation through amendments, particularly:</td>
<td>MoI (for the import policy order and export policy), DoE to coordinate</td>
</tr>
<tr>
<td>(a) Incorporation the provision of keep records of current stocks of mercury in industries in the Hazardous Waste and Ship-breaking Waste Management Rules, 2011</td>
<td></td>
</tr>
<tr>
<td>(b) Include the products listed in Part I of Annex A as banned items for import in the Import Policy Order</td>
<td></td>
</tr>
<tr>
<td>(c) Include the products listed in Part I of Annex A as banned items for export in the Export Policy</td>
<td></td>
</tr>
<tr>
<td>(d) In the Environmental Clearance Application process as per ECR 1997, ensure that processes listed in Annex B do not use mercury</td>
<td></td>
</tr>
<tr>
<td>(e) Amend ECR 1997 to set industry-specific gaseous emission standards for mercury including standards for brick kilns, coal plants and applicable processes listed in Annex B</td>
<td></td>
</tr>
<tr>
<td>(f) Separate directive with respect to monitoring and emission control technology of coal-based power plants need to be developed</td>
<td></td>
</tr>
</tbody>
</table>
## Plan 1: Legal and institutional arrangements to implement the convention at the national level

<table>
<thead>
<tr>
<th>Activities/Actions</th>
<th>Responsible agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Establish a protocol for obtaining environmental clearance before importing mercury</td>
<td>DoE, NBR, Bangladesh Bank</td>
</tr>
<tr>
<td>DoE to enforce “environmental audits” in the industries using mercury as a condition for renewal of the license to operate.</td>
<td>DoE</td>
</tr>
<tr>
<td>Establishing a monitoring cell at the national level for mercury management in line with the provisions of Minamata Convention including: designating an information focal point, assigning staff and allocating resources for the development and implementation of action plans, reporting, information dissemination to public, identifying development assistance programmes, national strategies etc.</td>
<td>DoE</td>
</tr>
<tr>
<td>Establish and maintain a data management system (online) for current stocks of mercury, mercury usage, and emissions of mercury (as waste product). This will aid reporting of data and information pertaining to Bangladesh’s emissions and releases of mercury the progress of such implementation to the Conference of the Parties as required in implementing the Convention.</td>
<td>DoE</td>
</tr>
</tbody>
</table>
### Plan 1: Legal and institutional arrangements to implement the convention at the national level

<table>
<thead>
<tr>
<th>Activities/Actions</th>
<th>Responsible agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing guidelines for environmentally safe operation of incinerators,</td>
<td>DoE</td>
</tr>
<tr>
<td>hazardous waste recycling and re-refining</td>
<td></td>
</tr>
<tr>
<td>Inclusion of the provision of “Extended Producer Responsibility principle” in the</td>
<td>DoE</td>
</tr>
<tr>
<td>Hazardous Waste and Ship-breaking Waste Management Rules, 2011 in order to</td>
<td></td>
</tr>
<tr>
<td>foster active industry involvement of the industry to manage hazardous waste.</td>
<td></td>
</tr>
<tr>
<td>Developing a portal for inter-agency database sharing regarding import and export</td>
<td>DoE, NBR, Bangladesh Bank</td>
</tr>
<tr>
<td>of mercury and mercury compounds.</td>
<td></td>
</tr>
<tr>
<td>Formulate mechanisms for implementation of existing guidelines for mercury</td>
<td>DoE</td>
</tr>
<tr>
<td>management in different sectors, amend or modify existing standards if necessary</td>
<td></td>
</tr>
<tr>
<td>Financing local research to gain more understanding on the prevalence of mercury</td>
<td>DoE to arrange funding, universities and</td>
</tr>
<tr>
<td>in various mercury-added products in Bangladesh and their potential health effects</td>
<td>technical institutions to carry out</td>
</tr>
<tr>
<td></td>
<td>research</td>
</tr>
</tbody>
</table>
## Plan 2: Phasing Down Dental Amalgam

<table>
<thead>
<tr>
<th>Activities/Actions</th>
<th>Responsible agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevent the use of dental amalgam, particularly for populations at risk (young children and pregnant women) while minimize the use of amalgam for other population groups</td>
<td>DoE, DGHS, Bangladesh Dental Society</td>
</tr>
<tr>
<td>Promote the use of alternative dental restorative materials by capacity building and awareness among dental practitioners (training of dental staff by national dental institutions), providing tax breaks for import of mercury-free restoration materials (increase affordability)</td>
<td>DoE, DGHS, Bangladesh Dental Society, NBR</td>
</tr>
<tr>
<td>In case of amalgam use, encourage the use in its encapsulated form with automatic mixing device by making it more affordable (tax breaks) and thereby reducing the probability of mercury wastage and exposure by dental practitioners</td>
<td>DoE, NBR, Bangladesh Dental Society</td>
</tr>
<tr>
<td>Establish and promote a system for the separate interim storage and collection of amalgam waste from dental clinics, providing occupational health and safety training to workers engaged in such systems</td>
<td>DoE, DGHS, DCC, Bangladesh Dental Society</td>
</tr>
<tr>
<td>Prepare a national policy and roadmap for phasing out and reducing the use of dental amalgam and managing mercury waste from dental clinics</td>
<td>DoE, Bangladesh Dental Society</td>
</tr>
</tbody>
</table>

---

**MIA Bangladesh: Findings, Challenges and next steps**

Dr. Tanvir Ahmed
## Plan 3: Phasing Out Mercury-added Products

<table>
<thead>
<tr>
<th>Activities/Actions</th>
<th>Responsible agencies/stakeholders</th>
</tr>
</thead>
<tbody>
<tr>
<td>Separation, collection and environmentally-sound storage of mercury-added products such as batteries, lamps, medical equipment etc by electronic waste, medical waste and domestic waste handlers and recyclers, preparation and adoption of guidelines for safe use and disposal.</td>
<td>DoE, DGHS, Dhaka City Corporation</td>
</tr>
<tr>
<td>Raising public awareness to encourage regulation at individual household level regarding use and disposal of mercury-added products.</td>
<td>DoE</td>
</tr>
<tr>
<td>Making people aware of the dangers of using mercury-added skin cream products, making public the list of unregulated cream brands and their respective mercury content, modify existing standards of skin cream products if necessary</td>
<td>DoE, BSTI</td>
</tr>
<tr>
<td>Undertaking research and study on the pervasiveness of mercury in beauty products and making information available to public</td>
<td>DoE, academic and research institutions</td>
</tr>
<tr>
<td>Increasing enforcement activities (penalty, seizure of products, etc) against unsafe skin cream and beauty products manufacturing</td>
<td>DoE, BSTI</td>
</tr>
</tbody>
</table>
## Plan 4: Environmentally Sound Management of Solid and Hazardous Wastes

<table>
<thead>
<tr>
<th>Activities/Actions</th>
<th>Responsible agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eliminate open burning of solid and hazardous waste in dump sites, formulate and endorse solid waste management rules</td>
<td>City Corporations and municipalities, DoE to formulate guidelines/rules</td>
</tr>
<tr>
<td>Construct centralized facilities for their safe storage and management of electronic waste containing mercury and follow the best available techniques to segregate and dispose mercury waste.</td>
<td>City Corporations and municipalities, DoE to formulate guidelines/rules</td>
</tr>
<tr>
<td>Provide OHS training for workers engaged in hazardous waste management including mercury in centralized facilities</td>
<td>City Corporations and municipalities, DoE</td>
</tr>
<tr>
<td>Prevent incineration of mercury waste in healthcare facilities, segregating mercury waste from medical waste and sending them to specialized facilities</td>
<td>DGHS, DoE</td>
</tr>
</tbody>
</table>
## Plan 5: Research and Development, information dissemination and mass awareness

<table>
<thead>
<tr>
<th>Activities/Actions</th>
<th>Responsible agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct surveys on the extent of contamination of mercury on various mercury-added</td>
<td>DoE, BSTI</td>
</tr>
<tr>
<td>products (skin-whitening creams, paints etc) and imported fishes in Bangladesh</td>
<td></td>
</tr>
<tr>
<td>Design and conduct surveys of the mercury burden on vulnerable groups, including</td>
<td>DoE, DGHS</td>
</tr>
<tr>
<td>those subject to occupational exposure.</td>
<td></td>
</tr>
<tr>
<td>Build expertise for research on mercury at the local level, increase capacity for</td>
<td>DoE, DGHS, BSTI, BCSIR</td>
</tr>
<tr>
<td>better detection and analysis (equipment and technical manpower) of mercury in</td>
<td></td>
</tr>
<tr>
<td>local institutions and participate in international networks conducting research</td>
<td></td>
</tr>
<tr>
<td>on mercury</td>
<td></td>
</tr>
<tr>
<td>Develop capacity (manpower and equipment) for monitoring gaseous emissions of</td>
<td>DoE, BSTI, BCSIR</td>
</tr>
<tr>
<td>mercury from power plants, brick kilns, incinerators</td>
<td></td>
</tr>
</tbody>
</table>
Next steps

- Ratification of the Minamata Convention
- Promulgation of the E-waste/solid waste rules
- Modification of the regulatory framework (e.g. import policy order)
- Incorporation of priority measures in the country-level planning process (e.g. 8th FYP)
- Undertaking development projects for different priority actions
Acknowledgement

- Dr. Mohidus Samad Khan, Dept of Chemical Engineering, BUET
- Nafisa Islam, Research Associate, MIA Project
- Jakob Maag, Senior Mercury Expert, UNITAR
Beauty s-care

Mercury found way beyond limit in almost half of skin lightening creams available in market

The market is flooded with skin lightening products by often obscure manufacturers. But there is not any effective monitoring of the level of mercury present in the seemingly innocuous products. Photo: Star