



MINISTRY OF ENVIRONMENT

MINAMATA INITIAL ASSESSMENT REPORT 2019

Maldives Mercury Assessment



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Acronyms

ASGM	Artisanal and small scale gold mining
DPH	Department of Public Health
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
EPPA	Environmental Protection and Preservation Act
FDA	Food and Drug Authority
GW	Giga Watt
GWh	Giga Watt hour
HCW	Health Care Waste
HCWM	Health Care Waste Management
HPA	Health Protection Agency
HCFC	Hydrochlorofluorocarbons
IGMH	Indhira Gandhi Memorial Hospital
IOMC	Inter-Organization Programme for the Sound Management of Chemicals
ITE	International Technical Experts
Lpg	Liquid petroleum gas
MCS	Maldives Customs Services
ME	Ministry of Environment
MFDA	Maldives Food and Drug Authority
MIA	Minamata Initial Assessment
MoD	Ministry of Defence
MoH	Ministry of Health
MoFMRA	Ministry of Fisheries Marine Resources and Agriculture
MVR	Maldivian Rufiyaa
MW	Mega Watt
MWSC	Maldives Water and Sewerage Company
ODS	Ozone Depleting Substances
UNEP	United Nations Environment Programme
WAMCO	Waste Management Cooperation
WHO	World Health Organisation

Foreword

The Maldives recognises the threat that mercury and mercury compounds pose to human health and the environment. We are currently working towards becoming a Party to the Minamata Convention.

The Minamata Initial Assessment (MIA) has been conducted to identify the current status and existing challenges to mercury management, and the regulatory frameworks that need to be developed to fully comply with our obligations and realise the objectives under the Convention.

There is no mining, manufacturing or production of mercury or mercury-added products in the Maldives. Our only source of mercury is through the import of mercury compounds and mercury-containing products. However, we are exposed and remain vulnerable to the risks of the anthropogenic release of mercury.

The largest local sources of emissions to the air include open-burning of waste. While, the second-largest contributor to local mercury releases in the Maldives is from use and disposal of products with mercury such as batteries, paints and other laboratory and medical equipment containing mercury.

To phase out mercury-containing products and reduce mercury emissions, policies and strategies need to be developed and strengthened. We also need to develop partnerships with relevant sectors, including the health sector and private sector, to strengthen our efforts to regulate the use of mercury in the country. Given that safe disposal of mercury-containing products presents some of the greatest challenges for us, international collaboration for their transfer and safe disposal is crucial.

To transit to a mercury-free society, there is a pressing need for education and awareness on the risks of mercury, and its uses. We also need to focus on the uptake of mercury-free alternatives and strengthening our capacity to better monitor and manage the use of mercury. The government of Maldives is fully committed towards this goal and will work towards the ratification and implementation of the Minamata Convention.

Dr Hussain Rasheed Hassan
Minister

Executive Summary

The Minamata Initial Assessment (MIA) is intended to facilitate countries to ratify and implement the Minamata Convention on Mercury. The primary objective of the Initial Assessment Report is to provide a basis for further activities relevant to the implementation of the Convention. In this regard, the MIA report will assist Maldives in notifying the Convention in accordance with Article 7, and with respect to the development of its National Implementation Plan in accordance with Article 20. MIA will enable the preparation of a National Plan to reduce mercury emissions as set out in Article 8 of the Convention.

The report gives an overview of the initial inventory of stocks of mercury and/or mercury compounds; supply of mercury, including relevant sources of mercury emissions and release sectors that use mercury or mercury compounds; and the amount of Hg per year based on the data collection exercises conducted for the MIA in the Maldives.

Maldives is a country that depends on import. There is no mining, manufacturing or production of mercury or mercury added products in the country. The only source of mercury in the Maldives is estimated to be through the import of mercury and mercury containing products.

Results of the national mercury inventory

The inventory for mercury in Maldives is presented through four different output pathways: 1) emissions to air, 2) direct releases to water, 3) direct releases to land, and 4) others. The “others” category includes output pathways for “products”, “general waste” and “sector-specific waste treatment”. Mercury identified in Maldives comes from mercury containing products/ devices, such as batteries, compact fluorescent lamps (CFL), sphygmomanometers, thermometers and dental amalgam. Major source groups that contribute mercury inputs in the Maldives are: waste incineration and open waste burning; use and disposal of other products; application, use and disposal of dental amalgam fillings; other fossil fuel and biomass, combustion and: cemeteries. These are released mostly through air, water and general waste.

National strategy to identify mercury contaminated sites in the Maldives

Developing a national strategy to identify mercury-contaminated sites is a specific requirement of the Article 12 of the Minamata Convention. The strategy will be integrated into the “National Waste Management Policy” and “Waste Management Strategic Action Plan” adopted by the Ministry of Environment. These envisage the establishment of Waste Management Centres on each inhabited island and the construction of Regional Waste Management Facilities.

Contaminated sites

Large waste landfill/disposal sites and large cemeteries in the country, particularly Malé are the only sites that are potentially contaminated with mercury. Waste dumpsites in urban islands with large population can also be considered as potential contaminated sites. Thilafushi is the largest operational waste disposal site in the Maldives, where the whole reef has been reclaimed, and it is most likely the largest contaminated site in the Maldives. Waste dumpsites in urban islands such as Hithadhoo, and Kulhudhufushi are also presumably contaminated with mercury waste.

Mercury input

The largest inputs of mercury in the Maldives are from the source categories 'Use and Disposal of Other Products', and 'Waste Incineration and Open Waste Burning'. Total mercury input from the 'Use and Disposal of Other Products' is estimated to be 202 kg Hg/y and the amount from 'Waste Incineration and Open Waste Burning' is estimated to be 110 kg Hg/y.

Emission to air

'Waste Incineration and Open Waste Burning' contributed the highest mercury releases to air at approximately 1090 kg Hg/y, which is about 96% of the total amount of Hg released to the air. Hg released to air from 'Use and Disposal of other Products' is estimated to be 37.2 kg Hg/y, which is 3% of the total releases to the atmosphere. Mercury can be released to air due to combustion of mercury-containing products or due to diffusion of mercury vapour such as small scale fuel burning, electric lamp breakage, laboratory use dental preparation, landfills etc.

Release to water

Two main sectors responsible for releases of mercury to water are the 'Waste water Treatment Systems' (22.6 kg Hg /y), 'Use, and Disposal of Other Products' (19.6 kg Hg/y), with a minute amount of Hg released to water from 'Use, and Disposal of Dental Amalgam Fillings' (1.6 kg Hg/y).

Release to land

In the Maldives the estimated mercury release to land is 10 kg Hg/y from three main sources. The highest release to land is from 'Use and Disposal of Other Products' (5.5 kg Hg/year), followed by 'Cemeteries' (3 kg Hg/year approximately), and 'Use and Disposal of Dental Amalgam Fillings' (0.3 kg Hg/year) and 1.2 kg Hg/year from other sources.

Others

A total of 140 kg Hg/y is estimated to be released to general waste. Approximately 96% (134.7 kg Hg/y) of the Hg released to general waste is contributed from the 'Use and Disposal of Other Products'. Approximately 2.5 kg Hg/y is released from 'Waste Water Treatment Systems'.

Calculated annual releases of mercury for Maldives is estimated to be 1310 kg Hg/year (1.3 tonnes).

Policy, regulatory and institutional assessment

As ratification (or acceptance, approval or accession) by the Maldives of the Minamata Convention on Mercury legally binds the country to the Convention's obligations, the ratification process involves carrying out a national situation analysis, identifying existing relevant legislation and identifying legal or administrative actions that may be needed. A summary of policy, regulatory and institutional assessment of existing national policies and regulatory measures (in place and under development), and their scope with special focus on the extent they already meet the requirements as stipulated in the provisions of the Minamata Convention is provided in this report. In this regard, the report provides an analysis of existing policy and regulatory measures in place and remaining gaps in relation to implementation of each article of Minamata Convention on Mercury in the Maldives and gives recommendations to meet the obligations of the Convention.

Data gaps and recommendations

The biggest challenge in completing the inventory was acquiring adequate data in a very short timeframe. Maldives depends entirely on imports, and therefore to collect the information required, questionnaires on instruments, products and laboratory chemicals used in hospitals and the health sector that may contain mercury were formulated and distributed to the relevant institutions.

The data collection heavily relied on the import data obtained from the Maldives Customs Services (MCS). MCS data are sorted with HS codes, but the HS codes are not given based on the presence of mercury in the products. Therefore, in all categories, it was difficult to distinguish between the products that contain mercury and mercury-free products. With the limited information in MCS data, obtaining product-specific information is extremely difficult and time-consuming. Often the product's information sheet does not provide the full list and quantities of ingredients in the product, which makes the identification and quantification of mercury present difficult. With the increasing number of mercury-free products and replacing of mercury-based products to mercury-free products, distinguishing between such products brands is difficult.

Significant challenges were encountered in identifying and obtaining the data necessary to complete Step 5 regarding 'waste handling and recycling'. It is compulsory to have waste incinerators in tourist resorts, but the quantities of waste incinerated in the resorts are not available due to a lack of recording this data. In terms of medical waste, there are no proper management or incineration facilities in any hospital. In most of the regional hospitals, including the largest hospital, Indhira Gandhi Memorial Hospital (IGMH), medical waste is dumped into the municipal waste dumpsites to be burned with the municipal waste without adequate treatment. In some hospitals, medical waste is burned in closed burners, but there were only broad estimates available on the amount of waste incinerated per year due to lack of record-keeping. Medical waste is an area that needs to be addressed to establish a proper mechanism for waste disposal. Therefore, the amount of waste generation and data on the sub-categories 'Waste incineration', 'Incineration/burning of Medical Waste',

‘Open fire waste burning’ (on landfills and informally), and ‘Waste water system/treatment’ were estimated based on published values for waste generation/person/day (SOE, 2016) and assumptions were made on the amount of incineration, open burning/landfill and waste water.

Step 6 of the inventory focuses on data collection and inventory of the consumption of mercury-added products. In the sub-categories ‘Batteries with mercury’, ‘Paints with mercury’, and ‘Skin lightening cream’, the Customs data collected did not specify or it was difficult to distinguish the types of products with mercury and mercury-free products imported in Maldives. The data for batteries only specified quantities imported and a limited number of types/brands imported such as AA, AAA, C, D alkaline, atomic, lithium-ion batteries, mercury-zinc cells, etc. Identifying the type is of significant importance because not all types of batteries, paints and skin lightening creams contain mercury.

Recommendations

The following recommendations aims to strengthen subsequent reporting on mercury.

1. Improve imports data collection by having more detailed entries to the various products listed. A sub classification within the HS code could be introduced to capture sub-categories containing Hg products.
2. WAMCO/ME should improve data collection on municipal waste that is collected in all waste management centres in the country.
3. ME and the Ministry of Health can develop a system to properly manage medical waste and record quantities of medical wastes that are generated, incinerated or burned in the country.
4. Cosmetics sector need to be better regulated in terms of imports and targeting products that may contain harmful substances, including mercury
5. Establish appropriate testing capacity for mercury in relevant government authorities (eg: MFDA, HPA, EPA)
6. Review and revise relevant laws, regulations and other legislative tools to address the use and management of mercury – there is a need for a comprehensive law on mercury management, defining obligations and rights of different institutions and their responsibilities in controlling and monitoring of mercury and mercury-containing products, addressing occupational and public health issues related to the disposal of mercury containing waste and all other aspects of mercury management.
7. Review and revise relevant laws, regulations and other legislative tools to address the use and management. Until specific legislative measures can be developed, these issues can be incorporated into relevant existing legal and regulatory instruments.
8. Create awareness among government institutions on the extensiveness of mercury flow and its impact on human health and environment
9. Strengthen policy and regulatory structures for HCWM

Introduction

Minamata Convention on Mercury

The harmful impacts on human health due to mercury exposure are now well documented and accepted within the scientific community. Many countries have already initiated actions to mitigate emissions and exposure to mercury. However, considering that mercury is both a local, as well as a global pollutant, actions by national governments alone would not suffice in addressing the issue of pollution due to mercury and its harmful impacts on the environment and human health.

In view of the risks that mercury poses to human health and the environment, the global community agreed in 2009 to start intergovernmental negotiations with the objective of developing a legally binding treaty to limit global mercury emissions. The treaty known as the Minamata Convention was opened for signature on 10th October 2013 and entered into force on 16 August 2017. Maldives is in the ratification process of this Convention. This assessment is a partial requirement to fulfill the ratification process. As of November 2019, there are 128 signatories and 114 ratifications¹.

The primary objective of the Convention is “to protect human health and the environment from anthropogenic releases of mercury and mercury compounds”. The Convention’s main thrust is for countries to ban new mercury mines and carry out a systematic phase-out of existing ones. It also provides for the phase-out of mercury containing products and reducing mercury supply and trade, and to make a significant reduction in mercury releases to air, water and land. The Convention also addresses: interim storage of mercury and its disposal once it becomes waste; sites contaminated by mercury and: human and environmental health issues related to exposure to mercury.

Mercury in Maldives

Maldives is a country that depends on imports. The only source of mercury in the Maldives is through the import of mercury and mercury containing products. Mercury identified in Maldives comes from mercury containing products and devices, such as batteries, compact fluorescent lamps (CFL), sphygmomanometers, thermometers and dental amalgam. Major source groups that contribute mercury inputs in the Maldives are: waste incineration and open waste burning; use and disposal of other products; application, use and disposal of dental amalgam fillings; other fossil fuel and biomass combustion; and cemeteries.

Mercury is not a regulated substance in the Maldives. However, permission from HPA and MoD is required to import mercury into the country. There are no specific legal instruments for managing mercury in the Maldives. Existing general laws and regulations on chemicals

¹ <http://www.mercuryconvention.org/Countries/Parties/tabid/3428/language/en-US/Default.aspx>

and environmental management are used to address issues related to the management of mercury in the absence of specific legal framework in the Maldives.

Maldives is a country that depends on imports. The only source of mercury in the Maldives is through the import of mercury and mercury containing products.

Table 1-1 Summary of mercury inventory results

Source category	Estimated Hg input, kg Hg/y	Estimated Hg releases, standard estimates, kg Hg/y							Percent of total releases *3*4
		Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment / disposal	Total releases *3*4*5	
Coal combustion and other coal use	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Other fossil fuel and biomass combustion	3.1	3.1	0.0	0.0	0.0	0.0	0.0	3	0%
Oil and gas production	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Primary metal production (excl. gold production by amalgamation)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Gold extraction with mercury amalgamation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Other materials production ¹	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Chlor-alkali production with mercury-cells	-	-	-	-	-	-	-	0	0%
Other production of chemicals and polymers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Production of products with mercury content*1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Application, use and disposal of dental amalgam fillings	3.6	0.1	1.6	0.3	0.2	0.7	0.7	4	0%
Use and disposal of other products	202.3	37.2	19.6	5.5	0.0	134.0	6.0	202	15%
Production of recycled metals	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Waste incineration and open waste burning*2	1,096.9	1,090.5	0.0	0.0	0.0	0.0	6.4	1,097	84%
Waste deposition*2	-	-	-	-	-	-	-	0	0%
Informal dumping of general waste *2*3	-	-	-	-	-	-	-	0	0%
Waste water system/treatment *4	25.2	0.0	22.6	0.0	0.0	2.5	0.0	3	0%
Crematoria and cemeteries	2.8	0.0	0.0	2.8	0.0	0.0	0.0	3	0%
TOTALS (rounded) *1*2*3*4*5*6	320	1,130	20	10	0	140	10	1,310	100%

1 To avoid double counting, fossil fuel mercury contributions to cement production was subtracted automatically in the TOTALS.

Notes to table above: *1 To avoid double counting of mercury in products produced domestically and sold on the domestic market (including oil and gas), only the part of mercury inputs released from production are included in the input TOTAL. *2: To avoid double counting of mercury inputs from waste and products in the input TOTAL, only 10% of the mercury input to waste incineration, waste deposition and informal dumping is included in the total for mercury inputs. These 10% represent approximately the mercury input to waste from materials which were not quantified individually in Inventory Level 1 of the Toolkit. *3: The estimated quantities include mercury in products which has also been accounted for under each product category. To avoid double counting, the release to land from informal dumping of general waste has been subtracted automatically in the TOTALS. *4: The estimated input and release to water include mercury amounts which have also been accounted for under each source category. To avoid double counting, input to, and release to water from, waste water system/treatment have been subtracted automatically in the TOTALS. *5: Total inputs do not necessarily equal total outputs due to corrections for double counting (see notes*1-*3) and because some mercury follows products/metal mercury which are not sold in the same country or in the same year. *6: To avoid double counting, fossil fuel mercury contributions to cement production was subtracted automatically in the TOTALS

Key priority sectors for implementation of the Convention

The key priority areas that needs to be focused in implementation of Minamata Convention on Mercury in the Maldives includes the following:

1. Strengthening the legal framework
2. Interim storage and disposal of mercury waste
3. Education awareness and capacity building
4. Research, monitoring and reporting

Strengthening the legal framework

There are no specific legal instruments for managing mercury in the Maldives. Existing general laws and regulations on chemicals and environmental management are currently used to address issues related to the management of mercury in the absence of specific legal framework in the Maldives. Key recommendations from the policy and regulatory report are:

- Develop a comprehensive law on mercury management, defining obligations and rights of different institutions and their responsibilities in controlling and monitoring of mercury and mercury-containing products, addressing occupational and public health issues related to the disposal of mercury containing waste and all other aspects of mercury management.
- Review and revise relevant laws, regulations and other legislative tools to address the use and management of mercury.
- Incorporate mercury management issues into relevant existing legal and regulatory instruments until specific instruments can be developed

Interim storage and disposal of mercury waste

The major source of mercury in the country is in mercury-containing equipment. Replacement of these items with non-mercury containing alternatives will generate a waste stream that would need to be managed. There are two main waste streams to consider, namely: 1) waste equipment from the medical sector including dental amalgams, thermometers and sphygmomanometers, etc. and 2) from other products such as compact fluorescent lights, paint and batteries etc.

Mercury containing waste should not be dumped in municipal waste yards, but rather sent to specialized facilities abroad for safe disposal. Maldives would not be able to produce sufficient amounts for viable export. Therefore, interim storage will be required to enable

the stock to accumulate over months and years. Integrated interim storage facility for chemicals and mercury can be constructed to safely contain these until export for processing at specialized facilities. Mercury waste management is therefore cross-linked with similar action under POPs and SAICM as storage facilities can be shared.

Education, awareness, training and capacity building

There is a need for education, awareness and capacity building particularly among the key technical ministries and institutions, which lack specialists with chemistry knowledge, and decision makers that have limited background knowledge of the subject. The same is true for the public.

Training of primary national stakeholders for mercury including ME (the Convention focal point and main implementing agency) and other front line agencies, such as MCS, MFDA, HPA, MoH, MoFMRA, MoD, hospitals, media personnel, fish processing, and export facilities etc. Awareness activities should focus on:

- Creating awareness among government institutions on the extensiveness of mercury flow and its impact on human health and environment
- Creating awareness among government institutions on the need for separate laws to manage mercury
- Strengthening policy and regulatory structures for Healthcare Waste Management (HCWM)

Research, monitoring and reporting

The Health Protection Agency currently has the technical and physical capacity to undertake testing of mercury. In addition, some laboratories in fish processing plants have the capacity to test for mercury in fish and the environment. However, the scientific and personnel resources are limited within the national laboratories. Therefore, a dedicated programme for monitoring of mercury nationwide is required to be established that would build capacity within existing institutions (FDA, MFDA, EPA, MoFMRA) that are actively involved in monitoring and research. Research, monitoring and reporting should include collaboration and information sharing between regional and international scientific institutions.

Monitoring and reporting will also allow for the update of the baseline mercury inventory to facilitate reporting to the Convention.

Country Profile

Geography and Population

The Maldives is an island nation consisting of approximately 1,190 low-lying coral reef islands that form a chain of 26 natural atolls that stretches over an area of 90,000 sq kms on the Laccadive-Chargos submarine ridge at the central part of the Indian Ocean. Ninety-nine percent of the Maldivian territory is ocean.

The total population is approximately 400,000 people dispersed across 187 inhabited islands. The country's GDP per capita reached \$11,151 in 2017, compared to \$3,630 in 2004. The Human Development Index ranking of Maldives is 103rd, out of 187 countries in 2013, which places Maldives at the top of the 'medium human development' category and above the average for South Asia.

Average life expectancy at birth is 75.15 years (2014) with females having a slightly longer life expectancy at 77.55 years and males at 72.86 years. Infant mortality rate is 6 infants per 1000 live births in 2010 and the unemployment rate is 11.7% in 2010, calculated from the population 15 years and above. The overall poverty ratio is 8.2 percent in 2016 (6.6 percent under the poverty line of \$5.50 per person per day in 2011 purchasing power parity terms).

Main development challenges are geographic dispersion, environmental sustainability, risk from climate change and disaster resilience. Increased frequency and intensity of natural disasters are expected to be aggravated through the effects of climate change on weather patterns. This compounds trends of increasing coastal erosion and pressure on scarce land resources, and increases the physical vulnerability of island populations, infrastructure and livelihood assets. Almost half of all settlements and over two thirds of critical infrastructure are located within 100 meters of the shoreline and are under immediate threat from rising sea levels. Geographic dispersion of the population across many small islands makes service delivery difficult and can limit opportunities for economic growth and development.

Climate

Maldives experiences tropical monsoonal climate due to its proximity to the equator. The Southwest monsoon (rainy season) extends from May to December, while Northeast monsoon (dry season) begins from January and continues up to April. The average annual temperature in Maldives is 28°C and relative humidity ranges from 71% to 84%. The mean daily maximum temperature is 30.4 °C and the mean daily minimum temperature is 25.7 °C. Rainfall is higher on the southern region of the country than the northern region with an annual average of 2,277 mm for south and 1,786 mm for the north.

Profiles of economic sectors

The Maldivian economy has grown relatively quickly with the advent of the tourism industry in the 1970s. The Maldives has surpassed all South Asian countries to achieve the highest income per capita. However, it is important to note that while the GDP per capita is high, the

country's economy is still very small. The Maldivian economy maintained its robust growth trajectory during 2018 with real GDP growth accelerating to 7.6% according to estimates of October 2018. This was driven by the exceptional performance of the tourism sector on the back of strong global demand and increased air connectivity. In 2018, growth was also bolstered by strong activity in wholesale and retail trade, and construction investment led by the mega infrastructure projects of the government and strong bank credit growth to the private sector.

Tourism

Tourism is the main player in the local economy, which accounts for 28% of GDP and more than 60 percent of foreign exchange earnings to the country. Over 90 percent of government tax revenue comes from import duties and tourism-related taxes.

The resilient growth of the tourism sector in 2018 was driven by vigorous promotional activities undertaken by the industry, favourable global economic conditions and strong demand from major source markets. Tourist arrivals grew annually by 7%, after increasing to 8% in 2017, and reached 1,484,274 in 2018. While bed nights grew by 10%, average stay increased from 6.2 days in 2017 to 6.4 days in 2018. Tourism receipts are estimated at US\$3.0 billion in 2018, a growth of 10% compared with the US\$2.7 billion estimated in 2017 (MMA 2018).

Fisheries and Agriculture

The contribution of fisheries to the economy is declining. The fisheries sector continued to be affected by the persistent decline in fish catch, owing to both environmental factors and higher fuel prices. Fish purchases grew marginally by 2% in annual terms and amounted to 78.3 thousand metric tons in 2018. This was a significant deceleration in growth compared with the 42% annual growth recorded in 2017. Yellowfin tuna purchases declined by 4% in 2018 following a 19% growth in 2017, while skipjack tuna purchases grew by 6% after a 64% growth in 2017. In addition, purchases of bigeye tuna decreased significantly during the year and as a result, the share of bigeye tuna reached its lowest (0.4% of total fish purchases) for the past five years. The volume of fish exports declined by 9% compared with 2017 and totalled 65.8 thousand metric tons in 2018 (MMA 2018).

The agriculture sector is prominent in the livelihoods of the rural population of Maldives and plays an important role in food and nutrition security, especially for those who are residing in the rural areas. Agriculture provides food for consumption and constitutes an important primary source of livelihood for over 7,000 farmers and their families (MoFMRA 2012). The contribution of the agriculture sector to GDP is significantly low yet from a livelihood and employment perspective, agriculture is vital to the economy in terms of its economic and social welfare value.

Agricultural production in the country is limited by the poor soil conditions and availability of land, which restricts farming on a larger scale. For every 1,000 people, there is only 0.3 square kilometres of land used for agricultural purposes. Commonly grown field crops for domestic use includes sweet potatoes, taro, cassava, chilies, watermelons, papaya, eggplant, green leaves cabbage, gourds, and pumpkins. Seasonal crops such as mango, breadfruit and

drumstick contributes significantly to the farmers' income. Growth in the agriculture sector is critical for the country's economy in the face of global climate change and its likely impact on the economy.

Construction

The construction sector is the second largest contributor to the economy after tourism. Past few years have seen a progressive growth in the construction sector and the trend continued into 2018. In 2018, the annual growth in construction sector-related imports accelerated to 35% from 24% in 2017. Commercial banks' credit to the construction sector recorded an annual growth of 21% in 2018 and accounted for 52% of total private sector credit, up from the 47% recorded in 2017 (MMA 2018).

Environmental overview

Maldives is known globally for its pro-environmental stance, making commitments to global efforts in environmental protection and sustainable development. Maldives has played a key role in highlighting the special vulnerability of low-lying small islands developing states to climate change and getting the attention on this issue in international forums.

Table 2-1 A list of multilateral and regional environmental agreements Maldives is party to

Multilateral/ Regional agreement	Signed/joined
Vienna Convention for the Protection of Ozone layer	1988
Montreal Protocol	1989
United Nations Framework Convention on Climate Change (UNFCCC)	1992
Basel Convention	1992
Convention on Biological Diversity	1993
Malé Declaration on Control and Prevention of air pollution and its likely transboundary effect for South Asia	1998
United Nations Convention to Combat Desertification (UNCCD)	2002
Cartagena Protocol on Biosafety	2003
Rotterdam Convention	2006
Stockholm Convention	2006
International Plant Protection Convention (IPPC)	2006
Indian Ocean Tuna Commission	2011
Climate and Clean Air Coalition (CCAC)	2012
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)	2013

Mercury Inventory

This chapter presents the results of the mercury inventory for Maldives developed in 2019. Data for the year 2017 have been used in the inventory, when available. In cases where data for both 2016 and 2017 is available, the average of the two years was used. The year for all data given is noted with the data in question in the relevant sections of this report.

Methodology

This mercury release inventory was made with the use of the ‘Toolkit for identification and quantification of mercury releases’ made available by the Chemicals Branch of the United Nations Environment Programme. The Toolkit is available at ‘UNEP’ website:

<http://web.unep.org/chemicalsandwaste/what-we-do/technology-and-metals/mercury/toolkit-identification-and-quantification-mercury-releases>

This inventory was developed on the Toolkit’s Inventory Level 1. The Toolkit is based on mass balances for each mercury release source type. Inventory Level 1 works with pre-determined factors used in the calculation of mercury inputs to society and releases, the so-called default input factors and default output distribution factors. These factors were derived from data on mercury inputs and releases from the relevant mercury source types from available literature and other relevant data sources.

For the mercury source sub-categories, data was collected for the following sectors relevant to the Maldives:

- Energy consumption and fuel production
 - * Combustion/use of gasoline, petroleum, kerosene, LPG and jet fuel
 - * Charcoal combustion
- Waste handling and recycling
 - * Waste incineration
 - * Incineration/burning of medical waste
 - * Open fire waste burning (on landfills and informally)
 - * Waste water system/treatment
- General consumption of mercury in products
 - * Dental amalgam
 - * Thermometers
 - * Electric switches and relays
 - * Light source with mercury
 - * Batteries with mercury
 - * Polyurethane
 - * Paints with mercury
 - * Skin lighting creams
 - * Medical blood pressure gauges (mercury sphygmomanometers)

- * Other manometers and gauges with mercury
- * Laboratory chemicals
- Cemeteries

See further description of these estimations in the relevant source type sections.

The inventory involved a four-step process¹:

Step 1: A coarse screening matrix is used to identify the main mercury source categories present in the country,

Step 2: The main categories were further classified into sub-categories in order to identify the individual activities that potentially release mercury,

Step 3: Quantitative inventory was developed,

Step 4: Compilation of the standardized mercury inventory using results generated in steps 1-3. A standardized presentation format is provided to ensure that all known sources are considered (even if they cannot be quantified), data gaps are apparent, and inventories are comparable and transparent.

Mercury release source types present

Table 3-1 shows which mercury release sources were identified as present or absent in the Maldives. Only source types positively identified as present are included in the quantitative assessment.

It should be noted, however, that the presumably minor mercury release source types shown in *Table 3-1* were not included in the detailed source identification and quantification work

Table 3-1 . Identification of mercury release sources in the country; sources present (Y), absent (N).

Source category	Source present? Y/N
Energy consumption	
Coal combustion in large power plants	N
Coal combustion in coal fired industrial boilers	N
Other coal uses	N
Combustion/use of petroleum coke and heavy oil	N
Combustion/use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates	Y
Use of raw or pre-cleaned natural gas	N
Use of pipeline gas (consumer quality)	N
Biomass fired power and heat production	N
Charcoal combustion	Y
Fuel production	

¹ <http://wedocs.unep.org/bitstream/handle/20.500.11822/14777/Hg-Toolkit-Guideline-IL1-January2017.pdf?sequence=1&isAllowed=y>

Oil extraction	N
Oil refining	N
Extraction and processing of natural gas	N
Primary metal production	
Mercury (primary) extraction and initial processing	N
Production of zinc from concentrates	N
Production of copper from concentrates	N
Production of lead from concentrates	N
Gold extraction by methods other than mercury amalgamation	N
Alumina production from bauxite (aluminium production)	N
Primary ferrous metal production (pig iron production)	N
Gold extraction with mercury amalgamation - from whole ore	N
Gold extraction with mercury amalgamation - from concentrate	N
Other materials production	
Cement production	N
Pulp and paper production	N
Production of chemicals	
Chlor-alkali production with mercury-cells	N
VCM production with mercury catalyst	N
Acetaldehyde production with mercury catalyst	N
Production of products with mercury content	
Hg thermometers (medical, air, lab, industrial etc.)	N
Electrical switches and relays with mercury	N
Light sources with mercury (fluorescent, compact, others: see guideline)	N
Batteries with mercury	N
Manometers and gauges with mercury	N
Biocides and pesticides with mercury	N
Paints with mercury	N
Skin lightening creams and soaps with mercury chemicals	N
Use and disposal of products with mercury content	
Dental amalgam fillings ("silver" fillings)	Y
Thermometers	Y
Electrical switches and relays with mercury	Y
Light sources with mercury	Y
Batteries with mercury	Y
Polyurethane (PU, PUR) produced with mercury catalyst	Y
Paints with mercury preservatives	Y
Skin lightening creams and soaps with mercury chemicals	Y
Medical blood pressure gauges (mercury sphygmomanometers)	Y
Other manometers and gauges with mercury	Y
Laboratory chemicals	Y
Other laboratory and medical equipment with mercury	Y
Production of recycled of metals	
Production of recycled mercury ("secondary production")	N
Production of recycled ferrous metals (iron and steel)	N

Waste incineration	
Incineration of municipal/general waste	Y
Incineration of hazardous waste	N
Incineration / burning of medical waste	Y
Sewage sludge incineration	N
Open fire waste burning (on landfills and informally)	Y
Waste deposition/landfilling and waste water treatment	
Controlled landfills/deposits	N
Informal dumping of general waste *1	N
Waste water system/treatment	Y
Crematoria and cemeteries	
Crematoria	N
Cemeteries	Y

Table 3-2 . Miscellaneous potential mercury sources not included in the quantitative inventory; with preliminary indication of possible presence in the country.

Source category	Source present? Y/N/?
Combustion of oil shale	N
Combustion of peat	N
Geothermal power production	N
Production of other recycled metals	N
Production of lime	N
Production of light weight aggregates (burnt clay nuts for building purposes)	N
Production of other chemicals (than chlorine and sodium hydroxide) in Chlor-alkali facilities with mercury-cell technology	N
Polyurethane production with mercury catalysts	N
Seed dressing with mercury chemicals	N
Infra red detection semiconductors	N
Bougie tubes and Cantor tubes (medical)	Y
Educational uses	Y
Gyroscopes with mercury	N
Vacuum pumps with mercury	N
Mercury used in religious rituals (amulets and other uses)	Y
Mercury used in traditional medicines (ayurvedic and others) and homeopathic medicine	N
Use of mercury as a refrigerant in certain cooling systems	N
Light houses (levelling bearings in marine navigation lights)	N
Mercury in large bearings of rotating mechanic parts in for example older waste water treatment plants	N
Tanning	N
Pigments	N
Products for browning and etching steel	N
Certain colour photograph paper types	N

Recoil softeners in rifles	N
Explosives (mercury-fulminate a.o.)	N
Fireworks	N
Executive toys	N

Summary of mercury inputs to society

Mercury inputs to society should be understood here as the mercury amounts made available for potential releases through economic activity in the country. This includes mercury intentionally used in products such as thermometers, blood pressure gauges, fluorescent light bulbs, etc. It also includes mercury mobilised via extraction and use of raw materials that contain mercury in trace concentrations.

Note that the following source sub-categories made the largest contributions to mercury inputs to society:

- Open fire waste burning (on landfills and informally) (1,030 kg Hg/y)
- Incineration of municipal/general waste (64 kg Hg/y)
- Batteries with mercury (57 kg Hg/y)
- Electrical switches and relays with mercury (49 kg Hg/y)

Table 3-3. Summary of mercury inputs to society

Source category	Source present? Y/N/?	Activity rate	Unit	Estimated Hg input, kg Hg/y
				Standard Estimate
Energy consumption				
Coal combustion in large power plants	N	0	Coal combusted, t/y	-
Coal combustion in coal fired industrial boilers	N	0	Coal combusted, t/y	-
Other coal uses	N	0	Coal used, t/y	-
Combustion/use of petroleum coke and heavy oil	N	0	Oil product combusted, t/y	-
Combustion/use of diesel, gasoil,petroleum, kerosene, LPG and other light to medium distillates	Y	549,247	Oil product combusted, t/y	3
Use of raw or pre-cleaned natural gas	N	0	Gas used, Nm ³ /y	-
Use of pipeline gas (consumer quality)	N	0	Gas used, Nm ³ /y	-
Biomass fired power and heat production	N	0	Biomass combusted, t/y	-
Charcoal combustion	Y	430	Charcoal combusted, t/y	0
Fuel production				
Oil extraction	N	0	Crude oil produced, t/y	-
Oil refining	N	0	Crude oil refined, t/y	-
Extraction and processing of natural gas	N	0	Gas produced, Nm ³ /y	-

Primary metal production				
Mercury (primary) extraction and initial processing	N	0	Mercury produced, t/y	-
Production of zinc from concentrates	N	0	Concentrate used, t/y	-
Production of copper from concentrates	N	0	Concentrate used, t/y	-
Production of lead from concentrates	N	0	Concentrate used, t/y	-
Gold extraction by methods other than mercury amalgamation	N	0	Gold ore used, t/y	-
Alumina production from bauxite aluminium production	N	0	Bauxit processed, t/y	-
Primary ferrous metal production (pig iron production)	N	0	Pig iron produced, t/y	-
Gold extraction with mercury amalgamation - from whole ore	N	0	Gold produced, kg/y	-
Gold extraction with mercury amalgamation - from concentrate	N	0	Gold produced, kg/y	-
Other materials production				
Cement production*4	N	0	Cement produced, t/y	-
Pulp and paper production	N	0	Biomass used for production, t/y	-
Production of chemicals				
Chlor-alkali production with mercury- cells	N	0	Cl ₂ produced, t/y	-
VCM production with mercury catalyst	N	0	VCM produced, t/y	-
Acetaldehyde production with mercury catalyst	N	0	Acetaldehyde produced, t/y	-
Production of products with mercury content				
Hg thermometers (medical, air, lab, industrial etc.)	N	0	Mercury used for Production, kg/y	-
Electrical switches and relays with mercury	N	0	Mercury used for production t, kg/y	-
Light sources with mercury (fluorescent, compact, others: see guideline)	N	0	Mercury used for production, kg/y	-
Batteries with mercury	N	0	Mercury used for production, kg/y	-
Manometers and gauges with mercury	N	0	Mercury used for production, kg/y	-
Biocides and pesticides with mercury	N	0	Mercury used for production, kg/y	-
Paints with mercury	N	0	Mercury used for production, kg/y	-
Skin lightening creams and soaps with mercury chemicals	N	0	Mercury used for production, kg/y	-
Use and disposal of products with mercury content				
Dental amalgam fillings ("silver" fillings)	Y	352,795	Number of inhabitants	4
Thermometers	Y	182	Items sold/y	1
Electrical switches and relays with mercury	Y	352,795	Number of inhabitants	49
Light sources with mercury	Y	1,749,79	Items sold/y	21
Batteries with mercury	Y	7	t batteries sold/y	57

Polyurethane (PU, PUR) produced with mercury catalyst	Y	352,795	Number of inhabitants	11
Paints with mercury preservatives	Y	13	Paint sold, t/y	33
Skin lightening creams and soaps with mercury chemicals	Y	0	Cream or soap sold, t/y	11
Medical blood pressure gauges (mercury sphygmomanometers)	Y	1	Items sold/y	0
Other manometers and gauges with mercury	Y	352,795	Number of inhabitants	2
Laboratory chemicals	Y	352,795	Number of inhabitants	4
Other laboratory and medical equipment with mercury	Y	352,795	Number of inhabitants	14
Production of recycled of metals				
Production of recycled mercury ("secondary production")	N	0	Mercury produced, kg/y	-
Production of recycled ferrous metals (iron and steel)	N	0	Number of vehicles recycled/y	-
Waste incineration				
Incineration of municipal/general waste	Y	12,813	Waste incinerated, t/y	64
Incineration of hazardous waste	N	0	Waste incinerated, t/y	-
Incineration / burning of medical waste	Y	119	Waste incinerated, t/y	3
Sewage sludge incineration	N	0	Waste incinerated, t/y	-
Open fire waste burning (on landfills and informally)	Y	205,989	Waste burned, t/y	1,030
Waste deposition/landfilling and waste water treatment				
Controlled landfills/deposits	N	0	Waste landfilled, t/y	-
Informal dumping of general waste *1	N	0	Waste dumped, t/y	-
Waste water system/treatment	Y	4,790,62	Waste water, m3/y	25
Crematoria and cemeteries				
Crematoria	N	0	Corpses cremated/y	-
Cemeteries	Y	1,110	Corpses buried/y	3
TOTAL of quantified inputs*1*2*3*4				320

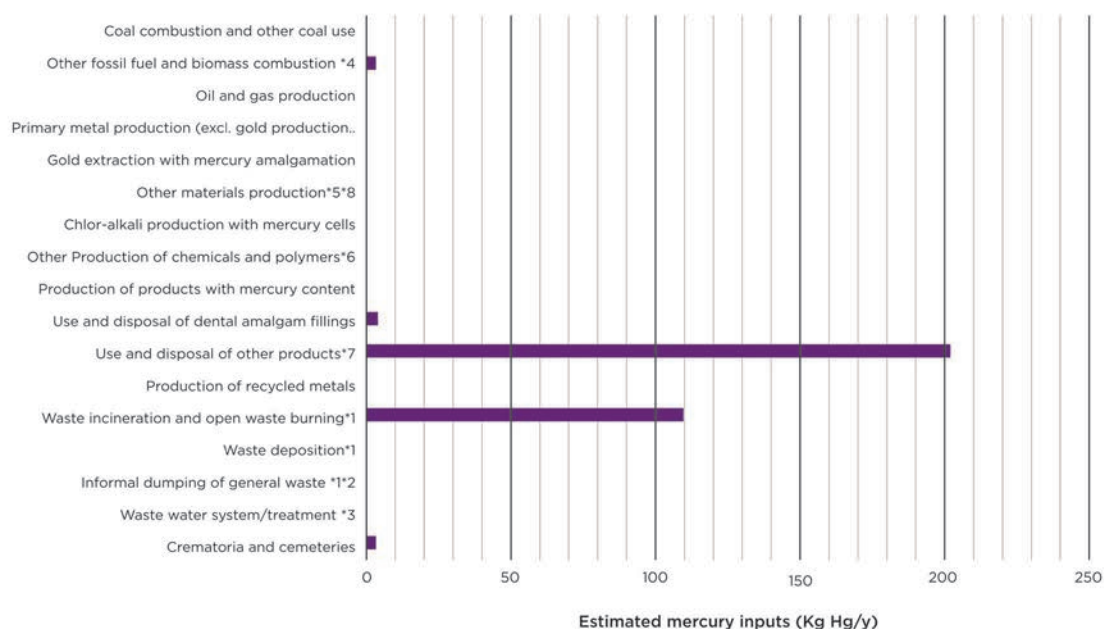


Figure 3-1 Estimating Hg Input (kg Hg/y)

Summary of mercury releases

In the *Table 3-4* below, a summary of mercury releases from all source categories present is given. The key mercury releases here are releases to air (the atmosphere), to water (marine and ground water, including via waste water systems), to land, to general waste, and to sectors specific waste treatment. An additional output pathway is “by-products and impurities” which designate mercury flows back into the market with by-products and products where mercury does not play an intentional role. See *Table 3-4* below for a more detailed description and definition of the output pathways.

Table 3-4 . Summary of mercury releases

Source category	Estimated Hg releases, standard estimates, kg Hg/y					
	Air	Water	Land	By-products and impurities	General	Sector specific waste treatment / disposal
Energy consumption						
Coal combustion in large power plants	-	-	-	-	-	-
Coal combustion in coal fired industrial boilers	-	-	-	-	-	-
Other coal uses	-	-	-	-	-	-
Combustion/use of petroleum coke and heavy oil	-	-	-	-	-	-
Combustion/use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates	3.0	0.0	0.0	0.0	0.0	0.0
Use of raw or pre-cleaned natural gas	-	-	-	-	-	-

Use of pipeline gas (consumer quality)	-	-	-	-	-	-
Biomass fired power and heat production	-	-	-	-	-	-
Charcoal combustion	0.1	0.0	0.0	0.0	0.0	0.0
Fuel production						
Oil extraction	-	-	-	-	-	-
Oil refining	-	-	-	-	-	-
Extraction and processing of natural gas	-	-	-	-	-	-
Primary metal production						
Mercury (primary) extraction and initial processing	-	-	-	-	-	-
Production of zinc from concentrates	-	-	-	-	-	-
Production of copper from concentrates	-	-	-	-	-	-
Production of lead from concentrates	-	-	-	-	-	-
Gold extraction by methods other than mercury amalgamation	-	-	-	-	-	-
Alumina production from bauxite (aluminium production)	-	-	-	-	-	-
Primary ferrous metal production (pig iron production)	-	-	-	-	-	-
Gold extraction with mercury amalgamation - from whole ore	-	-	-	-	-	-
Gold extraction with mercury amalgamation - from concentrate	-	-	-	-	-	-
Other materials production						
Cement production*3	-	-	-	-	-	-
Pulp and paper production	-	-	-	-	-	-
Production of chemicals						
Chlor-alkali production with mercury-cells	-	-	-	-	-	-
VCM production with mercury catalyst	-	-	-	-	-	-
Acetaldehyde production with mercury catalyst	-	-	-	-	-	-
Production of products with mercury content						
Hg thermometers (medical, air, lab, industrial etc.)	-	-	-	-	-	-
Electrical switches and relays with mercury	-	-	-	-	-	-
Light sources with mercury (fluorescent, compact, others: see guideline)	-	-	-	-	-	-
Batteries with mercury	-	-	-	-	-	-
Manometers and gauges with mercury	-	-	-	-	-	-
Biocides and pesticides with mercury	-	-	-	-	-	-
Paints with mercury	-	-	-	-	-	-
Skin lightening creams and soaps with mercury chemicals	-	-	-	-	-	-
Use and disposal of products with mercury content						
Dental amalgam fillings ("silver" fillings)	0.1	1.6	0.3	0.2	0.7	0.7
Thermometers	0.1	0.3	0.0	0.0	0.5	0.0
Electrical switches and relays with mercury	4.9	0.0	4.9	0.0	39.4	0.0
Light sources with mercury	1.1	0.0	0.0	0.0	20.1	0.0
Batteries with mercury	0.0	0.0	0.0	0.0	57.0	0.0

Polyurethane (PU, PUR) produced with mercury catalyst	1.1	0.5	0.0	0.0	9.0	0.0
Paints with mercury preservatives	29.9	1.6	0.0	0.0	1.0	0.0
Skin lightening creams and soaps with mercury chemicals	0.0	10.8	0.6	0.0	0.0	0.0
Medical blood pressure gauges (mercury sphygmomanometers)	0.0	0.0	0.0	0.0	0.0	0.0
Other manometers and gauges with mercury	0.2	0.5	0.0	0.0	1.1	0.0
Laboratory chemicals	0.0	1.2	0.0	0.0	1.2	1.2
Other laboratory and medical equipment with mercury	0.0	4.6	0.0	0.0	4.6	4.8
Production of recycled of metals						
Production of recycled mercury ("secondary production")	-	-	-	-	-	-
Production of recycled ferrous metals (iron and steel)	-	-	-	-	-	-
Waste incineration						
Incineration of municipal/general waste	57.7	0.0	0.0	0.0	0.0	6.4
Incineration of hazardous waste	-	-	-	-	-	-
Incineration / burning of medical waste	2.9	0.0	0.0	0.0	0.0	0.0
Sewage sludge incineration	-	-	-	-	-	-
Open fire waste burning (on landfills and informally)	1,029.9	0.0	0.0	0.0	0.0	0.0
Waste deposition/landfilling and waste water treatment						
Controlled landfills/deposits	-	-	-	-	-	-
Informal dumping of general waste *1	-	-	-	-	-	-
Waste water system/treatment *2	0.0	22.6	0.0	0.0	2.5	0.0
Crematoria and cemeteries						
Crematoria	-	-	-	-	-	-
Cemeteries	0.0	0.0	2.8	-	0.0	0.0
TOTAL of quantified releases*1*2*3	1,130.0	20.0	10.0	0.0	140.0	10.0

Notes to table above: *1 To avoid double counting of mercury in products produced domestically and sold on the domestic market (including oil and gas), only the part of mercury inputs released from production are included in the input TOTAL. *2: To avoid double counting of mercury inputs from waste and products in the input TOTAL, only 10% of the mercury input to waste incineration, waste deposition and informal dumping is included in the total for mercury inputs. These 10% represent approximately the mercury input to waste from materials which were not quantified individually in Inventory Level 1 of the Toolkit. *3: The estimated quantities include mercury in products which has also been accounted for under each product category. To avoid double counting, the release to land from informal dumping of general waste has been subtracted automatically in the TOTALS. *4: The estimated input and release to water include mercury amounts which have also been accounted for under each source category. To avoid double counting, input to, and release to water from, waste water system/treatment have been subtracted automatically in the TOTALS. *5: Total inputs do not necessarily equal total outputs due to corrections for double counting (see notes*1-*3) and because some mercury follows products/metal mercury which are not sold in the same country or in the same year.

Note that the following source sub-categories made the largest contributions to mercury releases to the atmosphere:

- Open fire waste burning (on landfills and informally) (1,030 kg Hg/y)
- Incineration of municipal/general waste (57.7 kg Hg/y)
- Paints with mercury preservatives (29.9 kg Hg/y)
- Electrical switches and relays with mercury (4.9 kg Hg/y)

Table 3-5. Below provides general descriptions and definitions of the output pathways.

Calculation result type	Description
Estimated Hg input, kg Hg/y	The standard estimate of the amount of mercury entering this source category with input materials, for example calculated mercury amount in coal used annually in the country for combustion in large power plants.
Air	Mercury emissions to the atmosphere from point sources and diffuse sources from which mercury may be spread locally or over long distances with air masses; for example from: • Point sources such as coal fired power plants, metal smelter, waste incineration; • Diffuse sources such as small-scale gold mining, informal burning of waste with fluorescent lamps, batteries, thermometers.
Water	Mercury releases to aquatic environments and to waste water systems; point sources and diffuse sources from which mercury will be spread to marine environments (oceans), and freshwaters (rivers, lakes, etc.). for example releases from: • Wet flue gas cleaning systems on coal fired power plants; • Industry, households, etc. to aquatic environments • Surface run-off and leachate from mercury contaminated soil and waste dumps
Land	Mercury releases to the terrestrial environment: general soil and ground water. For example releases from: • Solid residues from flue gas cleaning on coal fired power plants used for gravel road construction. • Uncollected waste products dumped or buried informally • Local un-confined releases from industry such as on site hazardous waste storage/burial • Spreading of sewage sludge with mercury content on agricultural land (sludge used as fertilizer) • Application on land, seeds or seedlings of pesticides with mercury compound
By-products and impurities	By-products that contain mercury, which are sent back into the market and cannot be directly allocated to environmental releases, for example: • Gypsum wallboard produced from solid residues from flue gas cleaning on coal fired power plants. • Sulphuric acid produced from desulphurization of flue gas (flue gas cleaning) in non-ferrous metal plants with mercury trace concentrations • Chlorine and sodium hydroxide produced with mercury-based chlor-alkali technology; with mercury trace concentrations • Metal mercury or calomel as by-product from non-ferrous metal mining (high mercury concentrations)

General waste	General waste: Also called municipal waste in some countries. Typically household and institution waste where the waste undergoes a general treatment, such as incineration, landfilling or informal dumping. The mercury sources to waste are consumer products with intentional mercury content (batteries, thermometers, fluorescent tubes, etc.) as well as high volume waste like printed paper, plastic, etc., with small trace concentrations of mercury.
Sector specific waste treatment / disposal	Waste from industry and consumers which is collected and treated in separate systems, and in some cases recycled; for example: • Confined deposition of solid residues from flue gas cleaning on coal fired power plants on dedicated sites. • Hazardous industrial waste with high mercury content which is deposited in dedicated, safe sites • Hazardous consumer waste with mercury content, mainly separately collected and safely treated batteries, thermometers, mercury switches, lost teeth with amalgam fillings, etc. • Confined deposition of tailings and high volume rock/waste from extraction of non-ferrous metals

An aggregated presentation of the results for main groups of mercury release sources is presented in *Figure 3-1*, *Figure 3-6* and *Table 3-4*.

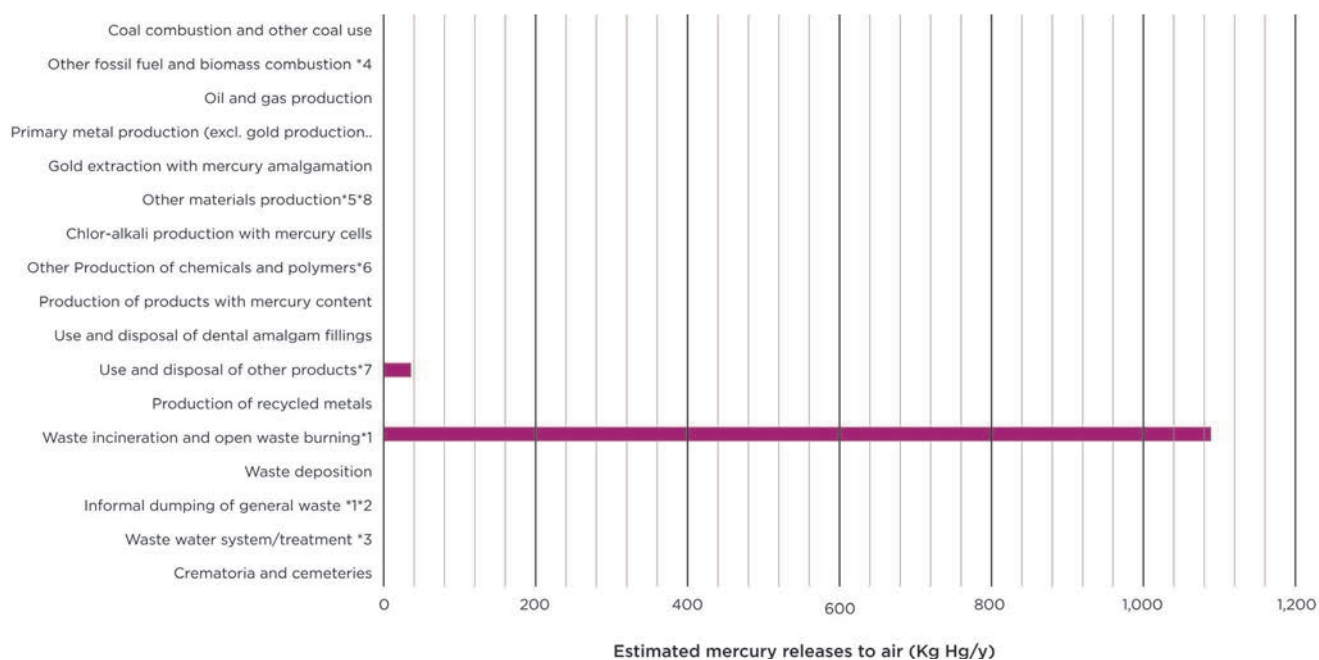


Figure 3-2 Estimating Hg release to air (kg Hg/y)

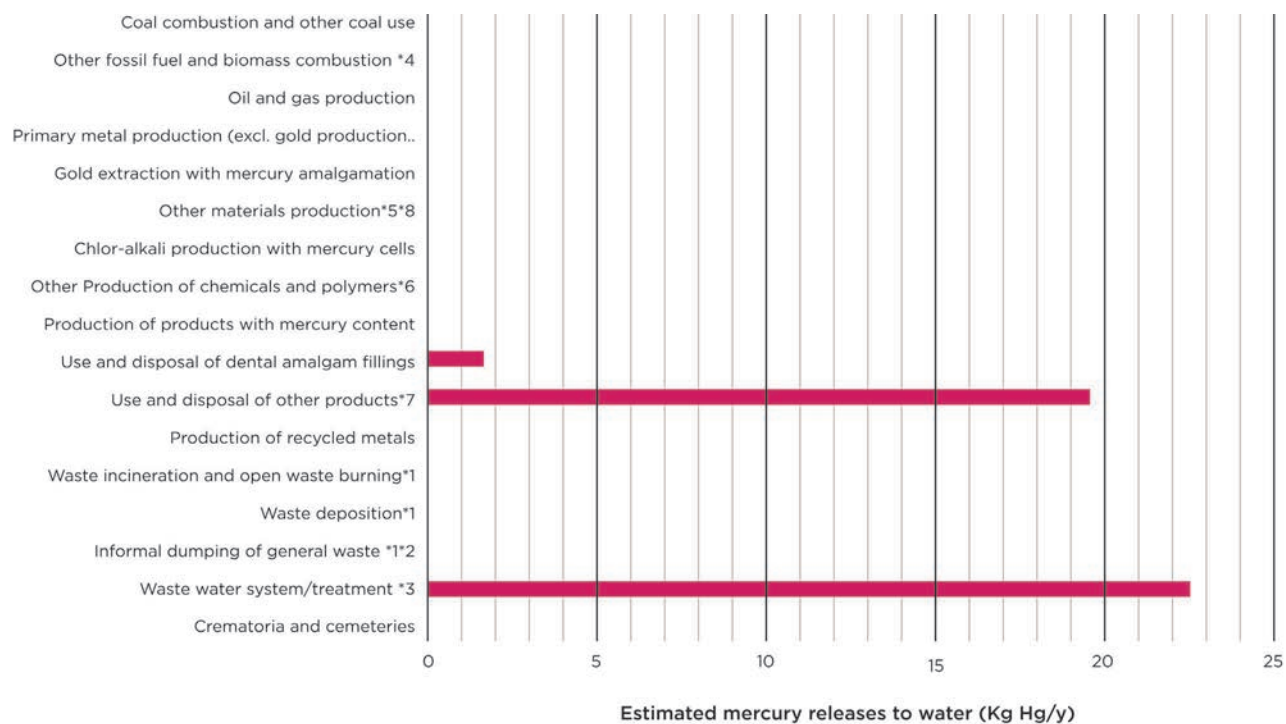


Figure 3-3 .Estimating Hg release to water (kg Hg/y)

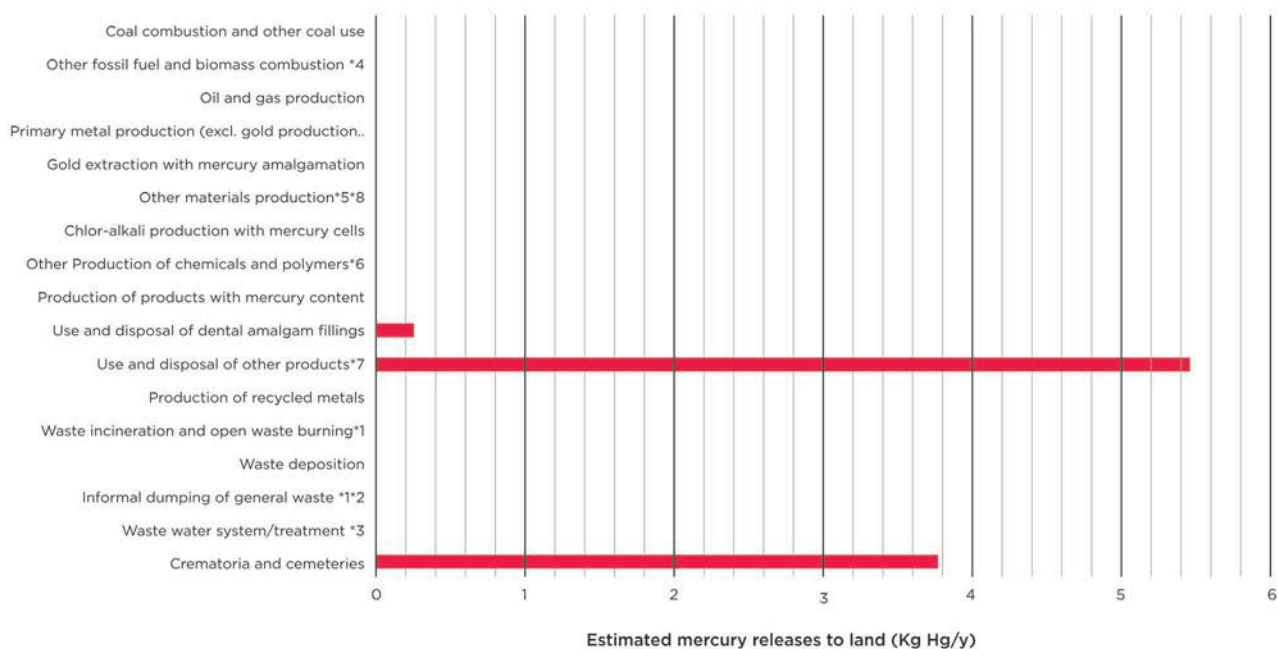


Figure 3-4 Estimating Hg release to land (kg Hg/y)

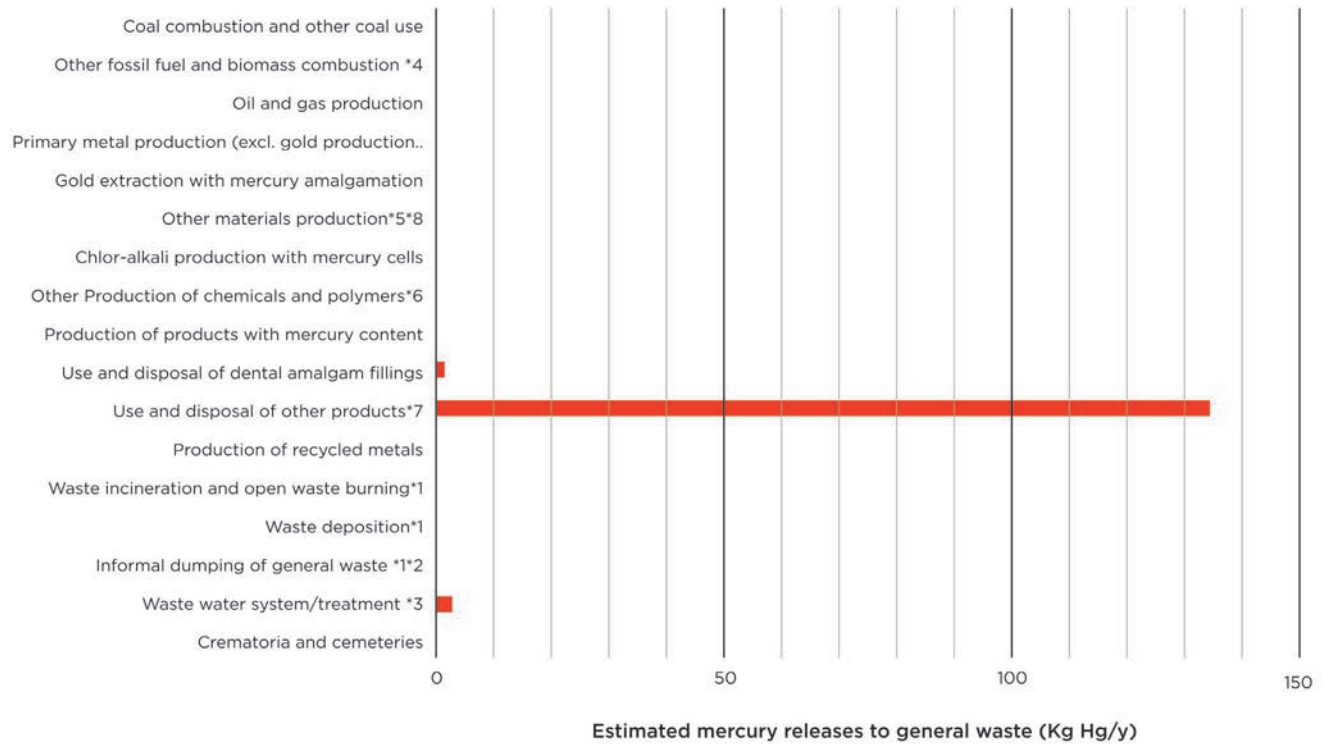


Figure 3-5 Estimated Hg release to general waste (kg Hg/y)

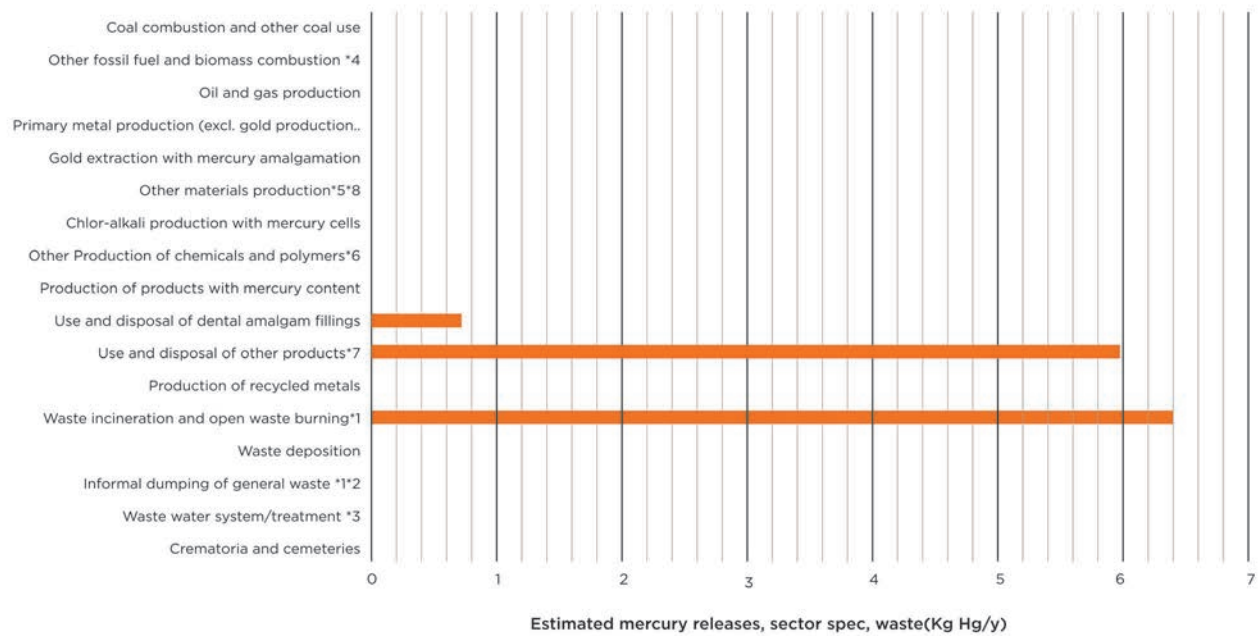


Figure 3-6 Estimated Hg releases sector specific waste (kg Hg/y)

Data and inventory on energy consumption and fuel production

Combustion/use of Diesel, gasoil, Petroleum, Kerosene, LPG and other light to medium distillates

The Maldives achieved universal access to electricity in 2008. Electricity in Maldives is produced by diesel generators and through renewable energy sources. There are a total of 186 powerhouses in inhabited islands. The inhabited islands of the Maldives have a total installed capacity of 240 MW of diesel generators to cater to the electricity demand. Electricity generation for the greater Malé region (Malé, Villingili and Hulhumale') accounts for 56.9% of the total electricity generation of all the inhabited islands. This is the largest electricity-consuming region with consumption of about 400 GWh/year and having an installed capacity of 101 MW. Total power generation from renewable energy in the Maldives is 11 MW (Source: Island Electricity Data Book 2018).²

The inventory data is based on the customs imports published and the Island Electricity Data Book 2018, published by ME. The activity rate entered into the toolkit is an average of the both 2016 and 2017 (*Table 3-6*). The total input from combustion/use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates was determined to be 3 kg Hg/year.

Table 3-6 . Use of fuel (Diesel, Petrol aviation gas and cooking gas) in Maldives 2016-2017 (Source: Island Electricity Data Book, 2018).

Fuel Type	Quantity (mt)		Activity rate (mt)
	2016	2017	
Diesel	445,036	447,555	446,295.5
Aviation gas	30,611	41,666	36,138.5
Petrol	47,794	57,730	52,762
Cooking gas	13,619	14,483	14,051
Total	537,060	561,434	549,247

Charcoal Combustion

Charcoal is not produced in Maldives, but is imported mainly for cooking and barbecuing purposes in some resorts, restaurants and hotels. The average annual import of charcoal is 430 mt. based on the imports of charcoal in 2016 and 2017 (Maldives Customs Service 2017).

Biomass Fired Power and Heat Production

There is no structured use of biomass in Maldives. The only form of biomass which can be considered to be used on a broader scale is firewood used for cooking in the rural islands. Heating facilities in households are not used in Maldives due to its tropical temperatures.

² <http://www.environment.gov.mv/v2/en/download/8106>.

Data gaps and priorities for potential follow up

Major data gap in this category is biomass fired power and heat production, which is widely used in the outer islands. There is no systematic data collection on the use of firewood for cooking in rural islands.

Data and inventory on waste handling and recycling

General waste management setup

The overall questions about the overall waste treatment setup in the country were answered as follows:

Table 3-7. Waste treatment setup in the Maldives (UNEP's Toolkit (Inventory Level 1, Version 2 January 2017))

Please answer questions about the current waste treatment set-up in your country:	Y/N		Y/N
a) Is more than 2/3 (two thirds = 67%) of the general waste collected and deposited on lined landfills or incinerated in closed incinerators?	Y	b) Is more than 1/3 (one third = 33%) of the mercury-added products waste safely collected and treated separately?	N

Waste handling and recycling

The following sub-categories on waste handling and recycling do not apply for Maldives:

- Production of recycled mercury ("Secondary Production")
- Production of recycled ferrous metal (iron and steel)
- Incineration of hazardous waste
- Sewage sludge incineration

Waste management in Maldives is in a developmental stage, and existing systems are struggling to cope with the waste generated, particularly in outer islands. Solid waste management is widely recognized as a pressing environmental issue in the Maldives. There is a national waste management policy and a Waste Management Regulation (R-58-2013) which addresses: hazardous waste (e.g. explosives, flammable liquid/solids, corrosives, toxic/poisonous substances/organic peroxides, etc.) and special waste (e.g. combustible/reactive/corrosive/poisonous waste). Details of Waste Management Regulation are given in the section on Regulatory and Institutional Setup on this report.

Details of the estimates for Municipal Waste, Biomedical Waste and Waste Water calculation are given in *Table 3-8*. Each subcategory is explained in the relevant sections.

Over the last decade, waste generation in Malé increased 155% and 57.6% in the outer atolls. Waste generation per capita per day is estimated to be 1.7 kg for Malé, 0.8 kg for islands and 3.5 kg for resorts (State of the Environment 2016). The total number of resort beds and

waste generation per capita in the resort sector (3.5 kg/day) was used for the estimation of waste generation in the tourism sector.

Waste generation rate multiplied by the total population is used for the estimation of total amount of waste generated (waste kg/day) in the country. These values were subsequently converted to waste tons/day and waste tons/year (*Table 3-8*).

Table 3-8 . Details of Municipal Waste, Biomedical Waste and Waste Water calculation

	Malé	Atolls	Resort	Total
Waste generation rate ³	1.7 kg/day	0.8 kg/day	3.5 kg/day	
Population	157,935 ⁴	249,725	37,482 ⁵	
Waste kg/day	268,489.5	199,780	131,187	
Waste t/day	268.4	199.7	131.1	599.2
Waste t/year	97,998.6	72,919.7	47,883.2	218,801.5
Incineration of municipal/general waste (t/year)	4,900	729	7,182.48	12,813.48
Open Fire Waste Burning (t/year)	58,799.16	10,937.85	19,153.28	88,890.29
Landfill Dumpster (t/year)	34299.51	61251.96	21547.5	117099.06

Incineration of municipal waste

Installation of waste incinerators is compulsory mandated in all resorts. At present, there are no functional waste incinerators of municipal waste in the country. An ongoing Regional Waste Management project in R. Vandhoo has installed an incinerator, but it is yet to be in operation. Even though resort facilities have installed incinerators, most of the resorts don't have records for the amount of incinerated waste. Usually most of the waste generated in the resort is transported to be disposed of at Thilafushi waste disposal area. Therefore, it was assumed that incinerated waste accounts for 15% of waste generated in the resorts (7,182 t/y), 5% of the municipal waste in the Malé region (4,900 t/y), and 1% in the atolls (729 t/y) (EPA, 2010). To calculate the activity rate for Incineration of Municipal Waste (t/y), the waste (t/y) for each general location was multiplied by the estimated percentage of waste incinerated, for a total of 12,813 t/y of waste incinerated (*Table 3-8*). The total input from the Incineration of Municipal/General Waste was determined to be 64 kg Hg/year.

Incineration of hazardous waste

At present, Maldives does not have a dedicated facility to store or dispose of hazardous waste. Small quantities of hazardous waste are often transported to Thilafushi waste disposal site and burned in an open fire at the site. Records on the quantities of hazardous waste generated in the country is not available.

³ State of the Environment Report 2016

⁴ Census 2014 (including expatriates in the country)

⁵ Tourism yearbook 2017

Incineration and open burning of medical waste

The survey of medical waste management in hospitals and clinics has revealed that hospitals treat their medical waste differently. In some hospitals, eg: Kulhudhufushi regional hospital and ADK, medical waste are separately collected, autoclaved, and sent to the municipal waste dumpsite where it is burned with the municipal waste. In other regional hospitals, eg: L Gan, R. Ungoofaaru and Gn. Fuvahmulah, biomedical waste is separately collected and burned daily in a closed furnace within the hospital premises. In most of the hospitals, including the largest hospital IGMH and S. Hithadhoo Regional Hospital, biomedical waste is separately collected and taken to a municipal waste management area for final disposal and open burning as indicated in the filed survey report (*Table 3-9*).

Medical waste generated in hospitals are estimated using the bed capacity and 0.2kg/day (WHO fact Sheet 253).

Table 3-9 Medical waste generation

	Malé	Atolls	Resorts	Total
Bed Capacity	810	700	125	1635
Incineration/burning of medical waste (t/y)	162 kg/day	140 kg/day	25 kg/day	119 t/year

Sewage sludge incineration

Sewage sludge incineration is not practiced in Maldives.

Open fire waste burning (on landfills and informally)

In the Malé region and some outer islands, waste is collected on a daily or weekly basis by WAMCO and disposed of at designated waste management areas. In most of the islands, waste collection does not occur regularly or at all, and residents carry waste to the designated waste management areas. In most of the waste disposal sites, including Thilafushi, waste is burned with open fires.

To estimate the amount of municipal waste burned in open fires it was assumed that 60% (58,799.16 t/year) in the Malé region, 15% (10,937.85 t/year) in atolls and 45% (19,153.28 t/year) in resorts of total waste is burned in open fires (SOE 2016). A simple calculation was made with the given numbers (88,890.29 t/year) as waste burned in the open fire and this accounts for about 40% of the total waste generated in the country (*Table 3-8*). To calculate the activity rate of 'open fire waste', the amount of landfill dumpsites and the open fire waste were combined and entered to the toolkit as inputs. Therefore, the total input from the Open fire waste burning (on landfills and informally) was determined to be 1030 kg Hg/year.

Controlled landfills /deposits

Maldives does not have a controlled landfill and most garbage is deposited in an open dumpsite in Thilafushi and waste management sites in outer island. A proper controlled landfill site has been constructed in R. Vandhoo Island, but the facility is not fully operational yet. Most of the waste generated in the Malé region and resorts in the area is disposed in the open dumpsite at Thilafushi, about 8 km from the Capital, Malé. Thilafushi dumpsite operates at a low level of efficiency and poses health and environmental risks to persons entering and operating within the facility and surrounding environment.

Wastewater treatment

Waste water treatment facilities in the Maldives are mostly found in tourist resort islands. It is mandatory to have treatment plants in the upcoming new resort facilities. Generally, resorts have waste water treatment plants within the capacity ranging between 150-200 m³/day. Based on this, the amount of waste water treatment is calculated to be (4,790,625 m³/year) assuming 60 % of the resorts already have waste water treatment plants (Ministry of Tourism 2017). The total input from wastewater treatment was determined to be 25 kg Hg/year.

Test of waste and wastewater default factors

In this inventory, default input factors were used for the estimation of mercury releases from general waste treatment and wastewater treatment. The following test of the results was performed to qualify the results for these sources.

The test made for general waste compares the calculated inputs to all four general waste sub-categories with the sum of general waste outputs from intentional mercury uses in products plus processes as follows, using data from the Inventory Level 1 spreadsheet:

In the IL1 spreadsheet, the test was done as follows: Tab “Level 1-total summary”:

$$(E60+E64+E66+E67) > 2*(J25+J26+\sum(J31 \text{ to } J55)). \text{ The result gives } 89 < 271.2$$

We found the inequality $(E60+E64+E66+E67) > 2*(J25+J26+\sum(J31 \text{ to } J55))$ to be found false

The test made for wastewater compares the calculated inputs to wastewater treatment with the sum of outputs to water from intentional mercury uses in products plus processes as follows, using data from the Inventory level 1 spreadsheet:

In the IL1 spreadsheet the test was done as follows: Tab “Level 1-ExecSummary”:

$$B19 > 2*(D8+D10+D11+D12+D13+D14+D15) \text{ The result gives } 25.2 < 62.7$$

$$B19 > 2*(D8+D10+D11+D12+D13+D14+D15)$$

Therefore, the second inequality was false.

The calculations made indicate that the default input factors for general waste and wastewater treatment does not necessarily over-estimate the mercury releases from these sub-categories. Therefore, it was determined that the default input factors represent the best available estimates and associated calculation of mercury releases for general waste and wastewater treatment in Maldives.

Data gaps and priorities for potential follow up

Proper assessments of quantities and types of municipal waste (waste audits) needs to be carried out nationwide (Malé, atolls, industrial islands, resorts etc).

Appropriate assessments on management and disposal of biomedical waste and hazardous waste should be established throughout the country.

It is difficult to distinguish between the informal dumping of general waste and landfill dumpsites. Since all the islands have designated dumpsites, it is difficult to quantify informal dumping (illegal dumping).

Data and inventory on general consumption of mercury in products, as metal mercury and as mercury containing substances

General background data

Background calculations for the product groups listed below were based on the data on population, electrification rate and dental personnel density shown in *Table 3-11*.

Table 3-10 Sub-categories with their data type

Sub-category	Data types used as activity rates
Dental amalgam fillings ("silver" fillings)	Population, density of dental personnel
Electrical switches and relays with mercury	Population, electrification rate (percent of population with access to electricity)
Polyurethane (PU, PUR) produced with mercury catalyst	Population, electrification rate (percent of population with access to electricity)
Other manometers and gauges with mercury	Population, electrification rate (percent of population with access to electricity)
Laboratory chemicals	Population, electrification rate (percent of population with access to electricity)
Other laboratory equipment with mercury	Population, electrification rate (percent of population with access to electricity)

Table 3-11 Background data for default calculations for dental amalgam and certain other product types.

Country	Population in 2014 (Census 2014)	Dental personnel per 1000 inhabitants	Electrification rate, % of population with access to electricity
Maldives	352,795	0.043	100

Dental amalgam fillings (“silver” fillings)

The total population of the Maldives is 352,795 inhabitants. With an estimate of 0.043 as the number of dental personnel/1000 inhabitants, it is estimated that input of 4 kg Hg/year from dental amalgam waste is generated in the Maldives.

Dental restoration is a standard technique used to treat cavities. If left untreated, cavities often lead to severe pain or discomfort, requiring the removal of affected teeth. Dental amalgam is a broadly used restorative material that contains roughly 50% mercury (UNEP, 2016).⁶ The Global Mercury Assessment of 2013 revealed that mercury in dental use accounted world-wide for 270-341 tonnes of mercury releases in 2010, 10% of the mercury consumption overall. One of the requirements of the Minamata Convention is for countries to reduce their use of dental amalgam (UNEP, 2016). Other mercury-free materials can also be used to fill cavities caused by dental decay. The primary alternatives to dental amalgam are as follows (FDA, 2015)⁷

- **Composite Resin Fillings:** the most common alternative to dental amalgam. They are made of a type of plastic (an acrylic resin) reinforced with powdered glass filler. The colour (shade) of composite resins can be customized to closely match surrounding teeth. Composite resin fillings are often light cured by a “blue light” in layers to build up the final restoration. Some advantages of these fillings are that they blend with surrounding teeth; they are very strong and; require minimal removal of healthy tooth structure for placement. The disadvantages are that they are less durable than dental amalgam, more difficult to place and are higher in cost.
- **Glass Ionomer Cement Fillings:** contain organic acids, such as eugenol, and bases, such as zinc oxide, and may include acrylic resins. Like some composite resins, glass ionomer cements include a component of glass filler that releases fluoride over time. Also, like composite fillings, glass ionomer cements are toothcoloured. The composition and properties of glass ionomer cements are best suited for very small restorations. Unlike composite resin fillings, glass ionomer cements are self-curing and usually do not need a “blue light” to harden. The advantages of glass ionomer cements are ease of use and appearance. Their chief disadvantage is that they are limited to use in small restorations.

Thermometers

Medical mercury thermometers

Import data on medical thermometers with or without mercury was obtained from Maldives Customs and *Table 3-12* shows the imported quantity in numbers. These data were entered into the Toolkit.

⁶ UNEP. (2016). Lessons from Countries Phasing Down Dental Amalgam Use.

⁷ FDA. (2015, January 27). U.S. Department of Health and Human Services. Retrieved from U.S. Food and Drug Administration: <http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/DentalProducts/DentalAmalgam/ucm171108.htm#1>

Table 3-12 *Thermometers with or without mercury imported 2016-2017*

Item	Relevant HS Customs Code1	Units imported in 2016	Units imported in 2017	Average
Clinical thermometer containing mercury (Nmb)	9025111000	149	-	74.5
Clinical thermometer mercury free (Nmb)	9025111000	27	234	130
Thermometer (liquid filled not Hg) (Nmb)	9025119010	346	166	
Thermometer (medical use) containing Hg (Nmb)	9025191000	10	78	44
Thermometer (medical use) non Hg (Nmb)	9025191000	4369	4671	4520
Thermometer others containing (Hg) (Nmb)	9025199010	2		1
Thermometer others (non Hg) (Nmb)	9025199010	12302		12302
Glass thermometers Hg free for laboratories (Nmb)	9025199010	38		19
Barometers/manometers containing mercury (Nmb)	9025 8020	30	96	63
Barometers/manometers mercury free (Nmb)	9025 8020	269	371	320
Hydrometers, pyrometers, hygrometers, etc, containing mercury and combinations (excluding 9025 1120 and 9025 1180) (Nmb)	9025 8080	63		31.5
Hydrometers, pyrometers, hygrometers, etc, mercury free and combinations (excluding 9025 1920) (Nmb)	9025 8040	174	15	94
sphygmomanometers mercury free (medical blood pressure gauges) (Nmb)	9025 8020	198		99
sphygmomanometers containing mercury (medical blood pressure gauges) (Nmb)	9025 8020	1		0.5
Thermostats mercury free (Nmb)	9032 1000	1031	1913	1472

Further verification of import data on Hg based thermometers reveal that most of the imports are for school laboratories and not for use in hospitals or clinics. The average of units imported in 2016 and 2017 (highlighted in green) in *Table 3-12* was used to determine the estimate of 118 items sold/year that was entered into the Toolkit.

Other glass Hg thermometers (air, laboratory, dairy, etc.)

Import data on glass thermometers obtained from MCS shows that Hg-based glass thermometers were not imported in 2016-2017. However, 38 Hg-free glass thermometers were imported in 2016 for laboratory use. The average of units imported in 2016 and 2017 (highlighted in yellow) in *Table 3-12* was used to determine the estimate of 64 items sold/year that was entered into the Toolkit. The total input from all thermometers was determined to be 1 kg Hg/year.

Engine control Hg thermometers and other large industrial/specialty Hg thermometers

Import data on Hg thermometers obtained from Maldives Customs shows that Hg based thermometers and other large industrial Hg thermometers were not imported in 2016-2017.

Electrical switches and relays with mercury

This estimate is automatically calculated in the Toolkit based on the population and electrification rate (percent of population with access to electricity). The total input from 'Electrical Switches and Relays' with mercury was determined to be 49 kg Hg/year.

Light sources with Mercury

Six different types of light sources can be recognized from the MCS data (*Table 3-13*). More sub categories can be found in Customs HS codes. Based on HS codes, the number of light sources with mercury imported during the year 2016 and 2017 were estimated and divided into three broad categories:

1. Fluorescent tubes (double end)

This sub category includes discharge lamps, fluorescent, hot cathode with/without double ended cap imported in 2016 and 2017. The average import of 2016-2017 (203,515 items) was used to determine the activity rate from this sub category, with an estimated mercury input of 5 kg Hg/year.

2. Compact Fluorescent lamps (CFL single end)

This sub category includes various types of low energy consumption lamps/light bulb that have been imported under 5 different HS codes. The average import of 2016-2017 (1,494,563.5 items) was used to determine the activity rate from this sub category, with an estimated mercury input of 15 kg Hg/year.

3. Other Hg containing light sources

This sub-category includes: Arc Lamps (901 items); Mercury or sodium vapour lamps, metal halide lamps (22 items); discharge lamps, other than ultra-violet, low energy and fluorescent lamps (50,484.5 items); and Ultra-violet or infra-red lamps, excluding arc-lamps (309 items). The average import of 2016-2017 (51,717 items) was used to determine the activity rate from this sub category, with an estimated mercury input of kg Hg/year.

Table 3-13 Types of light source with mercury imported in 2016 and 2017 into Maldives

tem	HS Code	Units imported in 2016	Units imported in 2017	Average 2016-2017
Discharge lamps, fluorescent, hot cathode with/without double ended cap (Nmb)	8539 31000	386,260	20,770	203,515
Arc- Lamps (Nmb)	8539410000	1,155	647	901
Mercury or sodium vapour lamps; metal halide lamps (Nmb)	8539 3200	31	13	22
Low energy consumption lamps/light bulb (Nmb)	8539 3910	2,203,133	785,994	1,494,563.5
	8506800010			
	8539210000			
	8539220000			
	8539291000			

Discharge lamps, other than ultra-violet, low energy and fluorescent lamps(Nmb)	8539 3900	7,748	93,221	50,484.5
Ultra-violet or infra-red lamps (excluding arc-lamps) (Nmb)	8539 49000	353	265	309

The average of 2016 and 2017 (1,749,795 items) was used in the Toolkit to calculate an estimated mercury input of 21 kg/yr from light sources. Major mercury-added lamp categories and the amount of mercury content per lamp is shown in *Table 3-14* (UN Environment, 2017).

Table 3-14 Major mercury-added lamp categories (UN Environment 2017)

Description	Mercury content per lamp (mg)
Discharge lamps, fluorescent, hot cathode, with double ended cap	10-40
Discharge lamps, fluorescent, hot cathode (excl. with double ended cap)	5-15
Mercury and sodium vapour lamps	10-30
Discharge lamps (excl. fluorescent, hot cathode lamps, mercury/sodium vapour lamps, metal halide lamps and ultraviolet lamps)	25

Batteries with Mercury

There are different types of batteries containing mercury that were inventoried in the Toolkit (*Table 3-15*), such as:

- Mercury oxide (button cells and other sizes); also called mercury-zinc cells, button cell batteries and miniature batteries. They are used in small portable electronic devices such as watches, cameras, digital thermometers, calculators and toys. These batteries do not pose a health risk when in use since the chances of the mercury leaking out are minimal (EPA 2016).
- Other button cells (zinc-air, alkaline button cells, silver-oxide)
- Other batteries with mercury (plain cylindrical alkaline, permanganate, etc.)

Table 3-15 Types of batteries that may contain mercury (UN Environment, 2017)⁸

Mercury-added batteries	Mercury content (kg Hg/tonne batteries)
Mercury oxide (also called mercury-zinc cells), all sizes	320

⁸ UN Environment, 2017. Global mercury supply, trade and demand. United Nations Environment Programme, Chemicals and Health Branch. Geneva, Switzerland

Zinc-air button cells	12
Silver oxide button cells	4
Alkaline button cells	5
Alkaline, other than button cell shapes	0.25

The following include various types of batteries that may contain mercury imported to Maldives in 2016-2017 (*Table 3-16*):

Table 3-16 Batteries imported to Maldives that may contain mercury (MCS)

Item	HS Code	Units imported in 2016	Units imported in 2017	Unit Weight (grams)	Average weight 2016-2017 (Tons)	Activity rate (Tons/y)	Input kg Hg/y
Silver oxide primary cells or batteries	8506 4000	77,868		1.3	0.05	0.025	8
Other primary cells/batteries	8506 8000	2,582,818	3,239,791	5	14	7	49
Button cell Watch Battery	8506800010	28,895	34,028	0.89	0.027	0.013	0

In the past decade, the battery manufacturing industry has reduced its use of mercury significantly. Therefore, mercury is not contained in all types of batteries that are produced. Now, only button batteries, such as those used in hearing aids, watches and other items requiring a small battery, contain mercury. Battery weights are obtained from product specification and the calculated total weight of imported batteries and the activity rate calculated for each type is shown in *Table 3-16*. The total input from batteries with mercury was determined to be 57 kg Hg/year.

Polyurethane (PU, PUR) produced with mercury catalyst

This is automatically calculated in the Toolkit based on the population and electrification rate (percent of population with access to electricity). The total input from polyurethane (PU, PUR) produced with mercury catalyst was determined to be 11 kg Hg/year

Paints with mercury preservatives

Paints are not produced in Maldives. All the types of paint are imported. The Customs data shows 6 different categories of paints are imported into the Maldives (*Table 3-17*). From the various types of paints imported, it is difficult to distinguish which type of paint contains mercury. According to UNEP (2017), 20- 30% of the paint factories, particularly in Asia (eg: Thailand), still use mercury as an additive in the process and in quantities of not more than 0.5 % of total weight. Based on this, it is assumed that 0.1 % of the paints imported contain mercury and 0.1 % of the average total weight of paints imported into Maldives in 2016 and 2017 was entered (13 tons/year) into the Toolkit. The total input from paints with mercury

preservatives was determined to be 33 kg Hg/year.

Table 3-17 Customs data showing the imports of various types of paints into Maldives 2016-2017

Item	Units im-ported in 2016 (ltr)	Units im-ported in 2017 (ltr)	Average 2016- 2017 (ltr)	Mercury containing paint 20% (mt)
Antifouling paint	0	32,836.23	16,418.1	3.28
Paint (based on acrylic or vinyl polymers in a non- aqueous medium)	156,116.31	174,096.16	165,106.2	33.02
Paint (based on polyester in a non-aqueous medium)	19,489.65	72,844.83	46,167.2	9.23
Paint (in a non-aqueous medium)	3,387,596.15	6,937,406.43	5,162,501	1,032.50
Paints and varnishes, in an aqueous medium,	1,008,031.20	386,958.73	697,495	139.50
Paints... Based on acrylic or vinyl polymers, in an aqueous medium	395,837.86	0	197,918.9	39.58
Totals	4,967,071.17	7,604,142.37	6,285,607	1,257.12

Skin lightening creams and soaps with mercury chemicals

Skin-lightening products may be in the form of creams, milks, oils, ointments or soaps. Hundreds, if not thousands, of them are available in the global market. Those that use mercury as an active ingredient often contain from 2 to 10 percent mercury by weight.

In Maldives, all the cosmetic products are imported and the imports are broadly regulated by the MFDA, HPA, and Ministry of Economic Development. There are neither legislations nor standards in place to limit or prohibit mercury content in cosmetics. Therefore, no record of mercury content in cosmetics exists in the country.

For this study, cosmetic products import data from Maldives Customs was obtained. A literature study on mercury content in cosmetics was conducted and more than 213 brands of cosmetics used in Asia, Africa, Latin America and USA⁹ were checked to confirm if the same brands of cosmetics that contain mercury were imported into the Maldives. *Table 3-18* shows the compiled list of various brands of cosmetics imported into the Maldives between 2016-2017 that contain mercury content as reported in the study.

⁹ <https://patch.com/us/across-america/cosmetics-may-contain-dangerous-levels-mercury-fda> (accessed Dec 2018)

Table 3-18 *Compiled list of various brands of cosmetics imported into the Maldives that have been reported to contain mercury*

Product Brand Name	Import 2016 (ltr)	Import 2017 (ltr)	Reporting country & Reference
FAIR & LOVELY	2.4	1.3	Nepal, Sri Lanka, Bangladesh, Pakistan ¹⁰
TOP	0.8		Spain
OLAY	153.4	43.8	Bangladesh, Pakistan, Sri Lanka
KELLY	0.6		Saudi Arabia
CUSSON	10.8	697.68	Not Identified(NI) ¹¹
VASELINE	27.9	467.03	Sri Lanka
LOREAL	9.6		Sri Lanka, Pakistan
Pond kg		1,935	Pakistan, Bangladesh
ASEPSO		14.9	Kenya ¹²
LOTUS		5	Nepal
Garnier		9.22	Sri Lanka, Nepal, Pakistan
PALMER'S		295.37	Saudi Arabia, Cote
d'Voire1			
Loreal		216.2	Pakistan
Civic		54	Saudi Arabia
Dove		96	Nigeria
Revlon		62.4	Sri Lanka
Total	205.5	3897.9	

The assessment shows that 16 different brands of skin-lighting products in the form of creams, milks, oils, ointments or soaps with records of mercury content are available in the market in the Maldives. Seven brands were imported in 2016 and 13 were imported in 2017. It is difficult to determine if the different brands of skin-lighting product imported into Maldives contain mercury as no proper testing is carried out. Therefore, based on the literature and source of cosmetics imports into the Maldives it is assumed that 10% of the skin-lightening products imported contain mercury and 10 % of the total weight of 2017 imports was entered (0.38 tonnes) into the Toolkit. The total input from skin lightening creams and soaps with mercury chemicals was determined to be 11 kg Hg/year.

10 Ali. S.W., and Khwaja M.A., (2016) Assessment of Prevalence of Health Complication and skin disease due to Mercury Containing Skin Whitening Creams (SWCs) Use among the population at selected Cities of Pakistan, Sustainable Development Policy Institute (SDPI), Islamabad Pakistan October 2016, 73PP

11 Haradaa M., Nakachib S.,Tasakac K.,Sakashitad S., Mutae K., Yanagidaf K., Doig R., Kizakih T., Ohnoh H., (2001) Wide use of skin-lightening soap may cause mercury poisoning in Kenya, Short Communication, The Science of the Total Environment 269 Ž2001. 183 187, 2001 Elsevier Science B.V. All rights reserved. PII: S 0 0 4 8 - 9 6 9 7 Ž 0 0. 0 0 8 1 2 - 3

12 Oyelakin O., Saidykhan J, Secka P; Adjivon A and Acquaye H.B.(2010) Assessment of the Level of Mercury Present in Soaps by the Use of Cold Vapour Atomic Fluorescence Spectrometric Analysis – A Gambian Case Study, Ethiopian Journal of Environmental Studies and Management Vol.3 No.1 2010.

Medical blood pressure gauges (mercury sphygmomanometers)

The import data shows that only one sphygmomanometer with mercury was imported in 2016 and 198 mercury-free sphygmomanometers were imported in the same year (*Table 3-19*). Field surveys on hospitals have found 19 sphygmomanometers with mercury, including 6 in Kulhudhufushi, 5 in Ungooaar, and 8 in ADK Hospital. All these sphygmomanometers are taken from the service. It is estimated that nationwide 50-75 mercury-containing sphygmomanometers may exist in the Maldives.

Other manometers and gauges with mercury

This is automatically calculated in the Toolkit based on the population and electrification rate (percent of population with access to electricity). The default values are used because it seems to be the standards followed in the Toolkit for countries with a population size of Maldives. Import data on manometers and other various types of gauges were collected for the inventory (*Table 3-19*). The total input from other manometers and gauges with mercury was determined to be 2 kg Hg/year.

Table 3-19 Import data on manometers and gauges (2016-2017)

Product Brand Name	HS Code	Import 2016 (Nmb)	Import 2017 (Nmb)
Barometers/manometers containing mercury	9025 8020	30	96
Barometers/manometers mercury free	9025 8020	269	371
Hydrometers, pyrometers, hygrometers, etc, containing mercury and combinations (excluding 9025 1120 and 9025 1180)	9025 8080	63	
Hydrometers, pyrometers, hygrometers, etc, mercury free and combinations (excluding 9025 1920)	9025 8040	174	15
sphygmomanometers mercury free (medical blood pressure gauges)	9025 8020	198	
sphygmomanometers containing mercury (medical blood pressure gauges)	9025 8020	1	
Thermostats mercury free	9032 1000	1031	1913

Laboratory chemicals

This estimate is automatically calculated in the Toolkit based on the population and electrification rate. The default values are used for the inventory for two reasons. First, it seems to be the standards followed in the Toolkit for countries with a population size of Maldives. Second, there are discrepancies between the compiled data from various sources, including MoD, MFDA and Maldives Customs Services. However, a compiled list of chemicals that may contain mercury imported in 2016 and 2017 for laboratory and analytical use is given in *Table 7-11*. The import of chemicals is administered by various government authorities, particularly MoD and MFDA. The total input from other manometers and gauges with mercury was determined to be 4 kg Hg/year.

Table 3-20 *Compiled list of chemicals that may contain Mercury, Imported in 2016 and 2017*

Chemical name	Country origin	Relevant HS Customs Code	Imported in 2016	Imported in 2017
Mercury liquid	India/Turkey	2805400000		1502 (kg)
Mercury (II) Oxide-red	India	2852100000		1 (kg)
Mercury (I) Chloride Mercurous	India	2852100000		1 (kg)
Mercury metal	India	2852900000		3 (kg)
Mercury (II) nitrate	India			100 (g)
Mercury ICP Standard	India	2852100000	400 (ml)	100 (ml)
Mercury (II) acetate	India			100 (g)
Mercury (II) Chloride	India			20 (g)
Mercury reagent	India		13.7 (kg)	
Mercury (III) Chloride	India			20 (g)

Other Laboratory and medical equipment with mercury

This is automatically calculated in the Toolkit based on the population and electrification rate. The default values are used because it seems to be the standards followed in the Toolkit for countries with a population size of Maldives. The total input from other manometers and gauges with mercury was determined to be 14 kg Hg/year.

Data gaps and priorities for potential follow up

The data collection heavily relied on the import data obtained from MCS. The following were identified as potential areas for improved estimation with an Inventory Level 2:

- It is difficult to distinguish between the products that contain mercury and mercury-free products from HS codes
- Inaccurate coding of some commodities and errors encountered in transferring information from manual documents to digital
- Product-specific information is extremely difficult to obtain and time-consuming.
- Often the products information sheet does not provide the full list and quantities of ingredients in the product, which makes the identification and quantification of mercury difficult (eg: paints, cosmetics, battery etc).
- With the increasing number of mercury-free products and conversion of mercury-based products to mercury-free products, distinguishing between such products brands is difficult.

Data and inventory on crematoria and cemeteries

Cemeteries

The annual number of deaths was obtained from the census where the average number of deaths per year from 2006-2014 was calculated. The value of 1,110 corpses buried/year was entered into the Toolkit to represent the number of burials that takes place annually and resulted in a total input of 3 kg Hg/year of mercury released to the environment.

Policy, Regulatory and Institutional Framework Assessment

Legal framework for Management of Mercury

There are no specific legal instruments for managing mercury in the Maldives. Existing laws and regulations on general chemicals and environmental management can be considered as relevant and used to address issues related to the management of mercury in the absence of specific legal framework in the Maldives.

This section presents an overview of key legal instruments which address the management of chemicals in the Maldives. The following table (*Table 4-1*) presents existing/draft legal instruments (laws, regulations, standards etc.) that address various aspects of environmental and chemical management, which is also considered to be appropriate to address mercury management in the country. The table provides names of the existing/draft legal instrument, year of enactment, government agency responsible for implementation and enforcement, and the main objectives of the legal instrument. Additional details of the legal instruments are given in each subsection following *Table 4-1*.

Table 4-1 Existing/draft Legal Instruments to Manage Chemicals Relevant to Mercury Management in the Maldives

Laws, Regulations, Standards and Guidelines	Year of Enactment	Relevant Agency	Objective of the Legal Instrument
Environment Protection and Preservation Act – Law No. 4/93	1993	Ministry of Environment Environmental Protection Agency	Environmental Protection and Preservation Act of the Maldives, EPPA (Law No. 4/93) provides the framework law for environmental management, including Environmental Impact Assessment (EIA)
Law on importation of prohibited items to the Maldives Act No. 4/75	1975	Maldives Customs Service Ministry of Defence	Regulating imports/exports of prohibited substances (eg:- chemicals, acid, poisons, toxic substances, explosives)
Waste Management Regulation – 2013/R-58	2014	Ministry of Environment Environmental Protection Agency	Waste management including: hazardous waste (e.g. explosives, flammable liquid/solids, corrosives, toxic/ poisonous substances/organic peroxides, etc); Special waste (e.g. combustible/ reactive/ corrosive/ poisonous waste)
Ozone Layer Protection Act 14/2015	2015	Ministry of Environment	Banned import of HCFC-based equipment starting on 31st May 2016

Regulation on Management, Use and Control of HCFC Substances, and HCFC based equipment 2010 (2010/R-19)	2010	Ministry of Environment	Control, import/export use and sale of HCFC and HCFC blends ODS-containing equipment starting in 2011 and complete phase-out of HCFCs by 2020.
Regulation on Protection and Conservation of Environment in the Tourism Industry	1998	Ministry of Tourism	The purpose of this regulation is to protect the environment in the tourism industry and to encourage and facilitate sustainable development of tourism. Covers disposal of toxic and hazardous waste
Regulation on Fuel Storage, Handling and Use (2015/R-160)	2015	Ministry of Defence	To regulate the storage, handling, transport and sale of petroleum products.
Regulation on Environmental Damage and Liabilities (2011/R-9)	2011	Ministry of Environment	The purpose of this regulation is to stop unlawful activities and adequately implement a fining procedure for violations, as well as implement a compensation mechanism on environmental damages.
The first National Standard for Clinical Laboratories in Maldives	2013	Ministry of Health	Waste management standards that are followed at all clinical and medical laboratories, regional hospitals, and atoll hospitals in Maldives.
National Healthcare waste management Policy	2016	Ministry of Health	The “National Policy on Healthcare Waste Management” is a framework of strategies, legal regulations, guidelines and operational procedures.
National health care waste management strategic plan 2016-2021	2016	Ministry of Health	Strategic plan is developed to enforce the “National Health Care Waste Management Policy” by establishing a countrywide integrated healthcare waste system, which is managed without adverse effects on human health and environment, and that is environmentally and economically sustainable
Draft Mercury free policy for healthcare	2018	Ministry of Health (pending political endorsement)	To support health care facilities to create a mercury- free environment and to mitigate the effects of mercury exposure on human health and environment with contribution to achieve the global objectives of the Minamata Convention to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. This policy applies to all health care facilities; public and private including companies importing and selling health care products and agencies responsible for environmental protection and waste management in the Maldives.

Pesticides Act (year 2019)	Draft	Ministry of Fisheries, Marine Resources and Agriculture	To regulate the management, import/export, use and distribution of pesticides with the objective of protecting human, animal and plant health and the marine and terrestrial environment.
Chemical Regulation	2019	Ministry of Defence	To regulate the import, sale, use permits, safe handling, storage, and disposal of hazardous chemicals.

The Environment Protection and Preservation Act of Maldives (Act No. 4/93)

The Environmental Protection and Preservation Act of the Maldives, EPPA (Law No. 4/93), provides the basic framework for environmental management, including the Environmental Impact Assessment (EIA) process in the Maldives, which is currently being implemented by the Environmental Protection Agency (EPA)

The EPPA gives provisions to the Ministry of Environment to formulate policies, rules and regulations regarding the protection of the environment and makes environmental impact assessments a mandatory requirement for all development projects. The EPPA also gives provisions to terminate any project that has an undesirable impact on the environment and levying fines up to one hundred million Rufiya for offenses in breach of this law. The EPPA gives the government of the Maldives the right to claim compensation for all damages caused by activities that are detrimental to the environment.

Clause 7 of the EPPA refers to the disposal of oil, wastes and poisonous substances in the Maldivian territory. According to this clause, any type of waste, oil, toxic gas or any substance that may have harmful effects on the environment should not be disposed of within the Maldivian territory. If, however, the disposals of such substances become absolutely necessary, the clause states that they should be disposed only within the areas designated for that purpose and if incinerated, appropriate precautions should be taken to avoid harm to the health of the population.

The EPPA is the single most important legal instrument with regards to environmental management and it gives very high prominence towards safeguarding the environment with regard to all development activities. Under this Act, the Ministry of Environment have developed regulations and guidelines concerning environmental protection through implementation of EIA procedures.

If a specific focused regulatory measure is necessary for the management of mercury in the Maldives, EPPA is the appropriate tool for such an intervention.

Law on importation of prohibited items to the Maldives (Act No. 4/75)

The objective of this Act is to define, control and manage substances that are prohibited from importation or only to be imported with special permission from the relevant authorities and agencies specified. The Act also provides a list of materials which are completely banned from import and a list of chemicals (*Table 4-2*) that can be imported under special permission from relevant government authorities.

Generally, chemical substances are under import, use and manufacture controls unless accompanied with a special permission from the Ministry of Defence and other related ministries, such as the Ministry of Health, Ministry of Fisheries, Marine Resources and Agriculture, and Ministry of Environment. These include hazardous chemicals and chemical-based substances that do not fall under the category of explosives, but can be used as substances for chemical weapons.

The Ministry of Defence is the custodian of this Act, in coordination with other relevant government agencies, including: Ministry of Health, Ministry of Fisheries, Marine Resources and Agriculture, Ministry of Environment, and the Maldives Customs Service.

Under the provisions of this Act, prior written consent is required from the Ministry of Defence to import hazardous chemical substances.

Table 4-2 List of Class A chemicals banned from import into the Maldives

Common Name	Trade Name
Insecticides/Acaricides	
Aldrin	Aldrex, Aldrite
Chlrodane	Chlorotox, Octachlor, Pentichlor
Endvin	Hexadrin
DDT (dichloro diphenyl trichloroethane)	Neocide, Pentachlorin, Chlorophenothate
Heptachlore	Dromex, Heptamol, Heptox
Mirex	
HCH (<99% gamma isomer)	Hexachlorohexane
Hexachlorobenzene	
Camphechlor	Toxaphene, Polychloro camphene
Nitrofew	
1,2 Dibromoethane	
1,2 Dichloroethane	
Monocrotophos	
Bromochloromethane (CH ₂ BrCl)	
Methylbromide (CH ₂ Br)	
Fungicides	

Source: Ministry of Defence

Waste Management Regulation (2013/R-58)

The Waste Management Regulation drawn under the EPPA provides a set of comprehensive guidelines on collection, storage, transportation and management of wastes, including management of hazardous waste. The purpose of this Regulation is to implement national policies regarding waste management and to conserve the environment. The Environmental Protection Agency is given the main responsibility to enforce the Waste Management Regulation.

Two main categories of chemical use are covered in the Waste Management Regulation. The Regulation addresses aspects of import, storage, transport, use, handling, export and disposal of specified waste products that falls into Category 1 and 2.

Special waste that has any of the following characteristics is considered as Category 1 waste in the Regulation:

- Waste generated from products having fire combustible sign;
- Reactive waste;
- Corrosive waste; and
- Poisonous waste.

Special waste generated from the following is considered as Category 2 waste in the Regulation:

- Engine oil;
- Batteries;
- Fibre resin;
- Pesticides;
- Rat poison;
- Paint and chemical solvents;
- Substances containing mercury;
- Electronics;
- Laboratory chemicals;
- Lead; and
- Asbestos.

Mercury is covered and can be addressed in both of these chemical waste Categories 1 and 2 as defined in the Waste Management Regulation.

Ozone Layer Protection (Act No. 14/2015)

Under the Ozone Layer Protection Act 14/2015, the government has banned the import of HCFC-based equipment. The Act also has provisions for establishing annual import quota, registration of importers and for levying fines for importing Ozone Depleting Substances listed in Schedule 1 and 2 of the Act. This also includes the use of HCFC and HCFC blends without registration, exceeding the annual quota and unauthorized importation.

Regulation on Management, Use and Control of HCFC Substances, and HCFC based equipment (Act No. 2010/R-19)

The HCFC Regulation is developed under the Environmental Protection and Preservation Act (4/93) to regulate HCFCs through the control of imports, use, and sale of HCFC substances. The complete phasing out and elimination of HCFC substances in the Maldives is scheduled by 2020.

Under this Regulation, designed to meet obligations under the Montreal Protocol, the Regulation will manage and control the importation and establish a system to monitor the sale and usage of HCFC, HCFC-blends and HCFC-containing equipment.

The Ministry of Environment is responsible for the implementation and enforcement of both the Ozone Layer Protection Act 14/2015 and Regulation on Management, Use and Control of HCFC Substances, and HCFC based equipment (2010/R-19).

Regulation on Protection and Conservation of Environment in the Tourism Industry

This Regulation stipulates the standards for the protection and conservation of the environment in the tourism industry. The purpose of this Regulation is to protect the natural and physical environment from activities within the tourism industry and to encourage and facilitate sustainable development of tourism. It is strictly enforced on islands and land areas leased for the development of tourist resorts and facilities by the Ministry of Tourism. The key attributes of the Regulation relevant to chemicals and chemical management are given below:

1. All chemicals used as pesticides and fertilizers imported for use in a tourist resort, picnic islands, marina or such a place shall be imported after obtaining written permission from the relevant government authority (Ministry of Defence, Ministry of Fisheries, Marine Resources and Agriculture, and Ministry of Environment).
2. Waste disposal in tourist resorts, picnic islands, and marinas operating in the Maldives shall be carried out in a manner that would have the least impact on the environment, and in accordance with the laws and regulations and in accordance with the rules prescribed by the Ministry of Tourism. Hence, toxic or hazardous waste (such as battery and waste oil) must be separated and has to be properly labeled prior to disposal. This Regulation requires certain types of equipment such as bottle crushers, can crushers, and incinerators to be installed and functional in the islands as part of a condition of the license to operate the resort.
3. Sewage shall be disposed in a manner that is least harmful to the environment

If any provision of this regulation is contravened by any tourist resort, picnic island, marina, hotel, guesthouse, or tourist vessel, they shall be guilty of an offence, and shall be liable to a fine, taking into consideration the seriousness of the non-compliance, between MVR 1,000.00 and MVR 10,000.00 in the first instance. Parties repeatedly in non-compliance shall be liable to a fine between MVR 50,000.00 and MVR 100,000.00. If non-compliance of a provision occurs more than once, the Ministry reserves the right to revoke the operating license of the resort.

Regulation on Fuel Storage, Handling and Use (2015/R-160)

The Regulation on Fuel Storage, Handling and Usage (2015/R-160) came into effect on 12 August 2015. The Regulation deals with the installation, registration, security, safety and inspection of fuel storage facilities, design requirements for fuel/petrol storage tanks/

containers, specifics of filling points, and prohibits keeping wet cells, acids and pressurized containers in petrol sheds or petrol storage area. The Regulation also sets the requirements for fuel delivery lines.

Regulation on Environmental Damage and Liabilities (Act No. 2011/R-9)

The Regulation on Environmental Damage and Liabilities is drawn under the EPPA. The main purpose of this Regulation is to deter and prevent unlawful activities detrimental to the environment and adequately implement penalties in the form of fines for violations, as well as implement a compensation mechanism on environmental damages. The Schedules under the Regulation form the basis for levying fines on various environmental damages, components and activities. The Ministry of Environment is the custodian for the implementation of this Regulation.

Damages and detrimental effects resulting from the use of mercury and compensations arising from the effects of mercury may be covered under this Regulation with relevant amendments.

National Standard for Clinical Laboratories in Maldives

The first National Standard for Clinical Laboratories in Maldives was published by the Ministry of Health in February 2013. This Standard applies to ‘all medical laboratories both public and private which shall include laboratories at the central level, regional hospitals and atoll hospitals’.

According to the national Standard, clinical laboratories are responsible for proper management of the waste that are generated. The Manager of the facilities should understand and comply with all relevant regulations and shall reduce the amount of wastes to be incinerated by proper segregation, collection, treatment and disposal. Additionally, clinical waste should be segregated from municipal solid waste or other waste streams.

Waste generated from clinics and laboratories are categorized into the following five categories that are defined in the national Standards:

1. Non-contaminated (non-infectious) waste that can be reused, recycled or disposed of as general “household” waste
2. Contaminated (infectious) “sharps” – hypodermic needles, scalpels, knives and broken glass should be collected in puncture-proof containers that are fitted with covers and treated as infectious
3. Contaminated material for decontamination by autoclaving and thereafter washing and reuse or recycling
4. Contaminated material for autoclaving and disposal
5. Contaminated material for direct incineration

The Standards provide guidelines for handling, storage, transportation and disposal of infectious waste to avoid environmental contamination and to minimize potential human exposure.

National Healthcare Waste Management Policy

The purpose of the National Healthcare Waste Management Policy is to ensure that all waste generated within the health sector is managed safely without adverse effects on human health and environment in an integrated manner that is environmentally and economically sustainable. The policy encompasses both hazardous healthcare waste as well as the non-hazardous waste along the complete logistic chain: procurement, generation, segregation, collection, storage, transport, treatment and disposal. The policy does not specifically address mercury waste generated from healthcare facilities. Main objectives of the Policy are:

- To manage healthcare waste through healthcare waste management policies and strategies
- To integrate healthcare waste with the national waste management policy and strategy;
- To minimize the quantities and risks associated with healthcare waste.
- To protect health of patients, health workers, and public from hazards related to healthcare waste.
- To protect the environment from the hazardous materials of healthcare waste.
- To promote economically sustainable practices for healthcare waste management
- To promote the proper management of healthcare waste by institute training programs and raising awareness of health workers, patients and public.
- To ensure the proper management of healthcare waste through availability and accessibility of required tools and equipment.
- To adopt healthcare waste management practices that support the international treaties such as Stockholm Convention on Persistent Organic Pollutants and the Basel Convention on the Control of Trans boundary Movements of Hazardous Wastes and their disposal.

The policy also identifies the following as the priorities of action towards healthcare waste management:

- Governance and legal framework
- Public health, occupational safety and environmental protection
- Waste Handling
- Education, Training and Research
- Resource Mobilization
- Monitoring and Evaluation
- Contracting

National strategy and implementation plan that has been developed under this policy is discussed in following section.

National Healthcare Waste Management Strategic Plan 2016-2021

This strategic plan was developed in line with the “National Waste Management Policy” and “Waste Management Strategic Action Plan” endorsed by the Ministry of Environment, which envisages the establishment of waste management centres on each inhabited island and the construction of Regional Waste Management Facilities.

Priorities identified in the strategic plan and the objectives of each priority is summarised in the following table.

Table 4-3 *Priorities identified in the national healthcare waste management strategic plan*

Strategic Priority	Objective
Strategic Priority 1: Improving the legal framework for healthcare waste management	• Review and revise existing legal documents • Strengthen policy and regulatory structures for HCWM
Strategic Priority 2: Improving knowledge management and capacity building healthcare waste management	• Develop national training packages on healthcare waste management • Implementation of developed HCWM training programs • Promote research, new technologies and innovative methods for sound management of HCW
Strategic Priority 3: Implementing of an integrated healthcare waste management	• Assessment of the current waste management situation • Set up of an integrated system in a pilot atoll • HCWM planning • Promote green procurement and minimizing wastes • Improvement of Infectious Waste and Sharp Waste Management
Strategic Priority 4: Improving and adapting of national and local monitoring	• Assessment of current monitoring situation • Strengthen reporting, monitoring, and evaluation mechanism on HCWM • Regular monitoring and evaluation of the HCWM system and performance of the equipment
Strategic Priority 5: Resource Mobilization	• Establish sustainable sources of funding • Budget completion

Mercury Free Policy for Healthcare Facilities

Mercury Free Policy For Healthcare Facilities is a policy developed by the Ministry of Health to support healthcare facilities to create a mercury- free environment and to mitigate the effects of mercury exposure on human health and environment with contribution to achieve the global objectives of the Minamata Convention to protect the human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. The policy was developed in September 2018 and it is pending political endorsement from the Government.

When the policy is endorsed it will apply to all healthcare facilities operating in the Maldives; public and private including companies importing and selling healthcare products and agencies responsible for environmental protection and waste management in the Maldives.

Objectives specified in the policy are:

- To evaluate and monitor the situation of mercury use in healthcare facilities.
- To phase out and ban mercury thermometers and sphygmomanometers and other mercury containing healthcare products used in healthcare facilities.
- To link management of mercury waste at healthcare facilities with healthcare waste management policy.
- To strengthen capacity of health service providers to prevent, detect, treat and care for populations affected by mercury exposure.
- To conduct policy advocacy and public education regarding the health and environmental effects of mercury and mercury compounds

The policy also identifies a number of policy interventions with very specific targets to phase-out/phase-down mercury from healthcare facilities. The following policy interventions are identified in the document with a proposal to be reviewed by Ministry of Health in consultation with stakeholders in 3-5 years.

1. A stakeholder engagement strategy shall be developed to achieve goals and objectives cited under this policy to phase out mercury in healthcare facilities
2. Baseline survey shall be carried out in collaboration with relevant organizations to identify mercury containing products, knowledge practices and belief of healthcare providers towards mercury product use and its impact.
3. An assessment shall be carried out to identify availability of reliable and economically feasible alternatives for mercury containing equipment and devices in the health sector.
4. A plan shall be developed to substitute and eliminate use of mercury containing equipment and devices in the healthcare facilities. The plan shall prioritize list of targets with measurable goals for all levels of healthcare facilities
5. Mercury phase out guideline shall be developed which provides direction for procurement, use, safe handling, storage, collection and environmentally sound disposal of mercury-containing products.
6. An inventory shall be developed for items that contain mercury in the healthcare facilities detailing use, storage and other relevant information.
7. Inventory for mercury containing equipment in healthcare facilities shall be maintained at central level linked with National Waste Management System.
8. Sensitization and capacity development programs shall be carried out for policy makers, managers and health care professionals to enhance substitution of mercury containing products, management of mercury and mercury-containing wastes in healthcare facilities, practical procedures for handling of broken devices and use of new mercury-free equipment.
9. Strengthen health sector and institutional capacity to prevent, diagnose, treat, monitor and manage health risks that occur due to exposure to mercury and mercury compounds.

10. Inform public through health promotion and public education programs; strategize these interventions through existing public health plans and awareness programs of relevant sectors.
11. Develop and implement strategies and programs with stakeholders to identify and protect populations at risk including healthcare providers. Annual budgeting of all public and private healthcare facilities shall facilitate procurement of safer alternatives to mercury and health promotion programs
12. Mechanism for safe collection, disposal of mercury wastes shall be established in line with the National Waste Management Regulation (2013/R-58).
13. Mercury containing thermometers and sphygmomanometers shall be phased out by 2020 to achieve the target as per the Minamata Convention on Mercury (Article 4; mercury manometers shall be replaced with Aneroid – mercury free alternatives.)
14. Dental service providers shall develop a plan and implement to phase down the use of dental amalgam by 2020.
15. Evaluation and monitoring mechanism shall be established to monitor and assess the progress of the implementation of relevant policy and guidelines.
16. Conduct safer mercury safety audits.

Pesticides Act (21/2019)

The Act serves as the primary legal instrument to regulate the import, handling, transport, management, use and distribution of pesticides during all stages of their life cycle, including the disposal of pesticide wastes. The objective of this Act is to protect human, animal and plant health, the marine and terrestrial environment, and promote sustainable agricultural production in the Maldives.

Ministry of Fisheries and Agriculture is mandated to issue permits on the use of pesticides and manage both direct and indirect effects of pesticides. The enforcement of this legislation will enable the country to more effectively meet its international obligations and further collaboration with international partners.

Chemical Regulation (R-1057-2019)

This Regulation is vested from the Law No. 4/75, under Article No. 5a(3) enforced by the Ministry of Defence. It was drafted in 2005 and has been enacted in 2019. The Regulation covers different aspects of hazardous chemical management such as its import, sale, use permits, safe handling, storage, and disposal. The Regulation will be implemented and enforced by the Ministry of Defence

Institutional capacities on Mercury Management

There is no designated government institution or agency that is responsible for the specific management of mercury in the Maldives. Furthermore, an analysis of the existing legislation, within the scope of mercury management, shows a lack of special legislation and standards for mercury management. The existing institutional capacity to control and monitor chemicals can be considered as the existing legislative system for mercury management in the Maldives as well.

The purpose of this chapter is to provide a description of roles and responsibilities of relevant ministries, agencies and other governmental institutions relating to chemical management in the Maldives. The control and regulation of chemicals are divided between various government institutions and the role and responsibilities of each institution is briefly described in the following subsections.

Ministry of Defence (MoD)

The Ministry of Defence is the main institution mandated with regulating the monitoring and import control of dangerous chemicals into the country in coordination with other government relevant authorities. All dangerous chemicals (except for fireworks), including acids and other poisonous items produced using these chemicals can only be imported into the country with prior written permission from the MoD. The Ministry also implements decisions and provides coordination of activities by relevant ministries, departments and institutions dealing with imports, usage and distribution of chemical and chemical compounds.

Ministry of Environment (ME) and MoD has recently launched a national chemical management database, MAKUDI. This is a harmonized database that shows the most common types of chemicals imported to Maldives, which will strengthen the monitoring and surveillance of imported chemicals.

Although, Mod is the overarching agency dealing with the disposal of chemicals, the Ministry lacks capacity, appropriate means and Standard Operating Procedures (SOPs) required to safely dispose of various types of chemicals.

Maldives Customs Service

The Maldives Customs Service (MCS) ensures that the regulations on import of chemicals into the country are fully enforced and the records are well kept and maintained. The MCS maintains a database for the imports of chemicals that shows a broad category of chemicals that are imported into the country. The database maintained by Customs is very comprehensive and is based on internationally recognized HS cores. MCS also verifies that the necessary permissions from the relevant government authorities on chemicals imported are obtained prior to importation and withholds any attempt to import chemicals brought into the country without proper documentation, and necessary permissions required from the Government authorities.

Ministry of Fisheries, Marine Resources and Agriculture (MoFMRA)

The main responsibility of MoFMRA, regarding chemicals is related to pesticides and fertilizers and includes the following:

- Developing standards and regulations related to the import and handling of pesticides and fertilizers;
- Storing and treatment of pesticides;
- Determination of alternative methods for control of pests, plant diseases and weeds;
- Elaboration of effective measures on safe use of plant protection chemicals;

- Official control of observation rules on use and treatment of pesticides;
- Regulation of import and distribution of pesticides;
- Establish and maintain a pesticides and chemical database; and
- Issuing licenses for the import of pesticides and chemical fertilizers.

MoFMRA also provides advice on the control of pests and proper treatment of pesticides. The Ministry also provides information to farmers and other consumers on the recommended pesticides and effective use, which give instructions and precautions in handling and application of pesticides.

Since some older pesticides contain mercury and may still be in use or have stockpiles, it is important that safe use and mercury-free pesticides be controlled within the framework of the new pesticide regulation to be implemented in the agriculture sector.

Ministry of Environment (ME)

The Ministry of Environment (ME), is mandated to set appropriate policies and formulate the required laws and regulations on waste management, including chemical and hazardous wastes. ME is responsible for the management and guidance of control of environmental hazards caused by chemicals. ME also issues quota, and controls and manages the import, use, sales and distribution of Ozone Depleting Substances (ODS), such as HCFCs and HCFC blends, as per obligations under the Montreal Protocol.

Environmental Protection Agency (EPA)

EPA is the regulatory body, affiliated with the ME, assigned to implement the environmental laws and regulations. The Agency is also responsible for implementation of the Environmental Impact Assessment Regulation (EIA).

Ministry of Health (MoH)

Ministry of Health is mandated with overseeing the country's health and social protection sectors. The Health Ministry is also responsible for development of health policies, related standards overseeing and implementing national standards in hospitals, clinics laboratories and other health facilities in the sector. Hospitals, clinics and laboratories can be considered as the main consumers of mercury and mercury-containing products. Previously, the Ministry has taken an initiative to manage mercury in hospitals and developed Mercury Free Policy for HealthCare in Maldives. The policy is pending political endorsement from the Government. This initiative is anticipated to contributed to a reduction in the use of mercury containing equipment in hospitals. Also, the use of mercury based dental amalgam is almost completely phased out except in rare cases where it is kept for use in emergency cases in some hospitals. This has been verified and confirmed during the survey conducted to assess the mercury in hospitals.

The Health Protection Agency and the Maldives Food and Drug Authority are both institutions operating under the umbrella of Ministry of Health.

Health Protection Agency (HPA)

Health Protection Agency operates under the MoH with a mandate to undertake the responsibilities assigned in the Public Health Protection Act (Law No. 7/2012) and to take the lead to protect public health, maintain public well-being and improve health awareness among Maldivians and all people living in Maldives. HPA does not have specific responsibilities towards mercury management, but HPA's main responsibilities in relation to chemicals management is to identify hazards or the possibility of health hazards, measure the extent of possible public health risks, and to establish a monitoring system to protect people working or living in surrounding areas from any gas, chemicals, radiation or vibrations emanating from a residential or non-residential building. Furthermore, HPA also regulates chemicals that are used for controlling mosquitoes that cause vector borne diseases, such as dengue fever and chikungunya. Some of the responsibilities of the Agency include the following:

- Establish policies to protect public health in Maldives;
- Identify communicable, dangerous and notifiable diseases and develop policies on how such diseases can be classified;
- Identify lifestyle related diseases and non-communicable diseases, increase public awareness on such diseases and establish policies to protect the public from such diseases;
- Establish policies to respond to public health emergencies;
- Classify situations which may be harmful to health and establish methods to act in such a situation;
- Establish roles and responsibilities of the island, atoll and city councils in the protection of public health; and
- Make each Maldivian citizen a responsible and accountable person with regard to public health protection.

Maldives Food and Drug Authority (MFDA)

Maldives Food and Drug Authority (MFDA) is an institution under the Ministry of Health responsible for standardization, certification monitoring and quality control of the import and export of food and drug items. The main responsibilities of MFDA, with regard to general chemicals, includes developing guidelines and monitoring the storage, production, and sales and distribution of items for food, water, medicine, chemicals, medical gas, vaccine, and other biological medical devices and diagnostics and radiation emitting devices.

Prior approval from MFDA is required for the import of chemicals, including mercury, pesticides and drugs that are not included in the approved list drug published by the Ministry of Health on a yearly basis. The importer is required to complete a special application form to import chemicals and the request form includes brand name, chemical name, quantity, and intended use of the product. However, information on the formulation or the concentration is not included in these requests. The requests are approved based on public health considerations.

The National Health Laboratory operates under MFDA and is used for conducting a range of tests including, water quality tests, histamine and mercury in fish, and alcohol traces

in beverages. As part of EU compliance standard, fish exporters are required to regularly check mercury levels in exported fish and MFDA will ensure that all the fish exports meet EU standards prior to shipping.

There are no specific guidelines and national standards established in the Maldives for mercury-containing products, such as soaps and skin lightening creams and other cosmetic products which are harmful for human health.

Policy and regulatory measures in place and remaining gaps

This section presents policy and regulatory measures in place and remaining gaps in relation to implementation of each article of Minamata Convention on Mercury in the Maldives. The following Tables (from *Table 4-4*) will give a brief description of each article, succinct summary of provisions relevant to the Maldives, relevant institutions, policy and regulatory measures in place and outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions.

Article 3 - Mercury supply sources and trade

Table 4-4 Policy and Regulatory Measures in Place and Remaining Gaps related to Article 3 : Mercury supply sources and trade.

Article 3 - Mercury supply sources and trade	
Description of Article:	Contains control measures aimed at limiting the global supply of mercury to complement and reinforce the demand reduction control measures in Articles 4-7. The Article 3 provisions limit the sources of mercury available for use and trade, and specify procedures to follow where such trade is still allowed.
Succinct summary of provisions relevant to the Maldives	• Not allow new primary mercury mining • Prevent the import and use of mercury from primary mercury mining for artisanal and small-scale gold mining (ASGM) • Obtain information on stocks of mercury or mercury compounds exceeding 50 metric tons (MT), and mercury supply generating stocks exceeding 10 MT/yr • Not allow the export of mercury • Not allow the import of mercury without government consent, • Not allow the import of mercury from a non-Party
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	There is no specific national regulation on mercury but the provisions are being addressed by the following regulatory measure: • Environment Protection and Preservation Act – Law No.4/93 • Law on importation of prohibited items to the Maldives Act No. 4/75 • Mercury Free Policy for HealthCare Maldives, 2018
Relevant institutions	MNDS, ME, MCS, MoT, and MOH
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):	
• Law on mercury management, • Defining obligations and rights of different institutions and their responsibilities in controlling and monitoring of mercury and mercury-containing products • Include provisions in Customs law on import/export of mercury to not allow the import of mercury without government consent, and not allow the import of mercury from a non-Party	

Article 4 - Mercury-added products

Table 4-5 Policy and Regulatory Measures in Place and Remaining Gaps related to Article 4: Mercury-added products.

Article 4 - Mercury-added products	
Description of Article:	The aim of the article is to reduce mercury demand in products through a combination of measures which phase out mercury uses in many key products, phase down mercury use in another, require the review of remaining products for possible restrictions within five years, and discourage the manufacture of new products using mercury.
Succinct summary of provisions relevant to the Maldives	Not allow, by taking appropriate measures, the manufacture, import or export of mercury-added products listed in Part I of Annex A after the phase-out date specified for those products, Take measures for the mercury-added products listed in Part II of Annex A in accordance with the provisions set out therein. Discourage the manufacture and the distribution in commerce of mercury-added products not
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	• Environment Protection and Preservation Act – Law No.4/93 • The first National Standard for Clinical Laboratories in Maldives 2013 • Law on importation of prohibited items to the Maldives Act No. 4/75 • Mercury Free Policy for HealthCare Maldives, 2018
Relevant institutions	MCS, ME, MoH and MoT
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):	
• Include provisions in Customs law on import of mercuryadded products • Encourage importation of non Hg products through waiver of customs duties	

Article 5 - Manufacturing processes in which mercury or mercury compounds are used

Table 4-6 Policy and Regulatory Measures in Place and Remaining Gaps related to Article 5: Manufacturing processes in which mercury or mercury compounds are used.

Article 5 - Manufacturing processes in which mercury or mercury compounds are used	
Description of Article:	Control measures to prohibit or restrict mercury use in manufacturing processes to reduce global mercury demand
Succinct summary of provisions relevant to the Maldives	Discourage the development of any facility using any other manufacturing process in which mercury or mercury compounds are intentionally used that did not exist prior to the date of entry into force of the Convention, Encouraged to exchange information on relevant new technological developments, economically and technically feasible mercury-free alternatives, and possible measures and techniques to reduce, eliminate the use of mercury and mercury compounds in manufacturing processes listed in Annex B.
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	As there aren't any manufacturing in the Maldives this provision is not relevant to Maldives • Environment Protection and Preservation Act – Law No.4/93
Relevant institutions	ME, MoH, MoT, MoFMRA
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):	
• To amend the EIA regulation to discourage the development of any facility using mercury; and • To encourage to exchange information on relevant new technological developments	

Article 6 - Exemptions available to a Party upon request

Table 4-7 Policy and Regulatory Measures in Place and Remaining Gaps related to Article 6: on exemptions available to a Party upon request.

Article 6 - Exemptions available to a Party upon request	
Description of Article:	Seeking additional time to comply with the deadlines for the phase out of mercury use in products (Article 4) or industrial processes (Article 5) must use the procedures specified in Article 6.
Succinct summary of provisions relevant to the Maldives	May register for one or more exemptions from the phase-out dates listed in Annex A and Annex B on becoming a Party to this Convention; (this means a Party should determine whether it can meet the Article 4 and 5 deadlines before it ratifies the Convention)
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	Not relevant to Maldives
Relevant institutions	ME
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):	
• Depending on the preparedness of the country ME will develop a policy on becoming a Party to this Convention or request for exemption	

Article 7 - Artisanal and small-scale gold mining

Table 4-8 Policy and Regulatory Measures in Place and Remaining Gaps related to Article 7: Artisanal and small-scale gold mining.

Article 7 - Artisanal and small-scale gold mining	
Description of Article:	Article 7 applies to artisanal and small-scale gold mining (ASGM), in which mercury is used to extract gold.
Succinct summary of provisions relevant to the Maldives	Not relevant to Maldives
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	Not relevant to Maldives

Article 8- Emissions

Table 4-9 Policy and Regulatory Measures in Place and Remaining Gaps related to Article 8: Emissions.

Article 8 - Emissions	
Description of Article:	To reduce mercury emissions to air from five of the most significant source categories identified during the Convention negotiations. Man-made sources are responsible for about 30% of annual emissions of mercury to air and contribute to mercury re-released into the environment annually from surface soils and oceans, now accounting for about 60% of the global air pollution pool. Progress in reducing mercury global pollution cannot be achieved without significant reductions in atmospheric emissions leading to corresponding direct and re-release declines over time.
Succinct summary of provisions relevant to the Maldives	Emission from waste incineration facilities include incinerators burning hazardous waste, municipal waste, medical waste, and/or sewage sludge
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	• Waste Management Regulation (2013/R-58) 2014 • Environment Protection and Preservation Act – Law No.4/93 • Regulation on Protection and Conservation of Environment in the Tourism Industry, 1998 • Regulation on Fuel Storage, Handling and Use (2015/R-160), 2011 • National Standard for Clinical Laboratories in Maldives, 2013 • Mercury Free Policy for HealthCare Maldives, 2018
Relevant institutions	ME, MoD, MoH, MoT, WAMCO
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):	
• Standards for the management of mercury in hospitals, health facilities and laboratories • Regulations on mercury containing waste, biomedical hospital waste and no current Regulations address mercury management • Define obligations and rights of different institutions and their responsibilities in controlling and monitoring of mercury and mercury-containing products, addressing occupational and public health issues related to the disposal of mercury containing waste and all other aspects of mercury management. • Review and amend Waste Management Regulation to include control measure on emission from mercury wastes	

Article 9 - Releases

Table 4-10 : Policy and Regulatory Measures in Place and Remaining Gaps related to Article 9: Releases

Article 9 - Releases	
Description of Article:	To reduce mercury releases to land and water from sources not addressed by other provisions of the Convention.
Succinct summary of provisions relevant to the Maldives	Countries need to identify these “relevant point sources” no later than 3 years after the Convention enters into force • Release limit values; • The use of BAT and BEP; • A multi-pollutant control strategy that will deliver co-benefits for control of mercury releases; and • Alternative measures to reduce releases from relevant sources (Article 9.5). • Establish and maintain an inventory of emissions from the relevant sources, as soon as practicable, but no later than 5 years after entry into force of the Convention for that Party (Article 9.6)
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	• Waste Management Regulation (2013/R-58) 2014 • Environment Protection and Preservation Act – Law No.4/93 • Regulation on Protection and Conservation of Environment in the Tourism Industry, 1998 • Mercury Free Policy for Health Care Maldives, 2018
Relevant institutions	ME, MoH, MoT, and MoD
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention’s provisions (only in relation to binding provisions):	
• Comprehensive law on chemicals, and mercury defining obligations, roles and responsibilities of different parties and their authority for control of mercury, addressing occupational and public health, disposal and all other aspects of mercury management. • Law on mercury management, • Defining obligations and rights of different institutions and their responsibilities in controlling and monitoring of mercury and mercury-containing products	

Article 10 - Environmentally sound interim storage of mercury, other than waste mercury

Table 4-11 Policy and Regulatory Measures in Place and Remaining Gaps related to Article 10: Environmentally sound interim storage of mercury, other than waste mercury.

Article 10 - Environmentally sound interim storage of mercury, other than waste mercury	
Description of Article:	Improper or inadequate care in the collection, handling, transport and storage of mercury and mercury compounds can result in emissions and releases of the toxic material that can eventually harm humans and the environment. To prevent the possible adverse effects of mercury as it is held in various locations prior to its intended use, the Convention requires countries to take measures to ensure the environmentally sound storage of mercury
Succinct summary of provisions relevant to the Maldives	Measures to ensure the interim storage of mercury and mercury compounds, other than wastes. The storage obligation also does not apply to mercury-added products. Assess the types of facilities which may need to store mercury, Prepare the appropriate industry or sector for environmentally sound interim storage compliance such as facility identification, data gathering, and developing guidance or regulations outlining handling and storage procedures,
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	• Waste Management Regulation (2013/R-58) 2014 • Environment Protection and Preservation Act – Law No.4/93 • Basel Convention has developed draft technical guidelines on the environmentally sound management of mercury wastes
Relevant institutions	ME, WAMCO, MoD, MoH
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):	
• Law on mercury management, • Defining obligations and rights of different institutions and their responsibilities in controlling and monitoring of mercury and mercury-containing products	

Article 11 - Mercury wastes

Table 4-12 Policy and Regulatory Measures in Place and Remaining Gaps related to Article 11: Mercury wastes.

Article 11 - Mercury wastes	
Description of Article:	Mercury wastes can come in a variety of forms, depending upon the source. Industrial processes using mercury will create wastes from both the manufacturing process and pollution control operations, such as sludges and spent catalysts. Mercury-added products become wastes when discarded, typically at the end of their useful life. Products also become wastes if the product cannot be sold legally or lacks a market due to consumer preference. The cleanup of contaminated sites may generate mercury wastes, such as treatment residuals and contaminated soil. Finally, mercury and mercury compounds can and will become wastes when they are destined for disposal instead of an allowed use.
Succinct summary of provisions relevant to the Maldives	• Parties should manage mercury waste in an environmentally sound manner, taking into account the guidelines developed under the Basel Convention and in accordance with requirements that the Conference of the Parties shall adopt in an additional annex in accordance with Article 27. • Only recovered, recycled, reclaimed or directly re-used for a use allowed to a Party under this Convention or for environmentally sound disposal pursuant to paragraph 3 (a) • Parties to the Basel Convention, not transported across international boundaries except for the purpose of environmentally sound disposal in conformity with this Article and with that Convention cooperate with each other and with relevant intergovernmental organizations and other entities, to develop and maintain global, regional and national capacity for the management of mercury wastes in an environmentally sound manner,
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	• Waste Management Regulation (2013/R-58) 2014 • Environment Protection and Preservation Act – Law No.4/93 • draft technical guidelines on the environmentally sound management of mercury wastes • Mercury Free Policy for Health Care Maldives, 2018
Relevant institutions	ME, WAMCO, MoT
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):	
• Law on mercury management, • Defining obligations and rights of different institutions and their responsibilities in controlling and monitoring of mercury and mercury-containing products • Amend waste regulation to include provisions on transport, storage and disposal of mercury waste	

Article 12 - Contaminated Sites

Table 4-13 Policy and Regulatory Measures in Place and Remaining Gaps related to Article 12: Contaminated Sites.

Article 12 - Contaminated Sites	
Description of Article:	Contaminated can be active, where existing processes or practices continue to contribute to the contamination, and historical, where such processes or practices have stopped but the pollution remains. The sources of the contamination may be waste management activities, stack emissions, fugitive emissions, and/or spills and emergency incidents. The risks to local communities and exposed populations is the principle concern at contaminated sites.
Succinct summary of provisions relevant to the Maldives	• To develop strategies for identifying and assessing sites contaminated by mercury or mercury compounds (Article 12.1). • To reduce risks posed by contaminated sites shall be done in an environmentally sound manner, assessment of risks to human health and the environment (Article 12.2). • Parties are encouraged to cooperate in developing strategies and implementing activities for identifying, assessing, prioritizing, managing, and remediating contaminated sites. (Article 12.4)
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	• Environment Protection and Preservation Act – Law No.4/93 • Waste Management Regulation (2013/R-58) 2014
Relevant institutions	ME
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):	
• Law on mercury management, • defining obligations and rights of different institutions and their responsibilities in controlling and monitoring of mercury and mercury-containing products • Amend waste regulation to include provisions on transport, storage and disposal of mercury waste	

Article 13 - Financial resources and mechanism

Table 4-14 Policy and Regulatory Measures in Place and Remaining Gaps related to Article 13: Financial resources and mechanism.

Article 13 - Financial resources and mechanism	
Description of Article:	To provide effective implementation of the Convention, Article 13 establishes a Financial Mechanism with two components: (1) the Global Environment Facility Trust Fund, and (2) an International Programme to support capacity building and technical assistance. Article 13 also elaborates on the governance of the Financial Mechanism and provides specific guidance on its operation. The Financial Mechanism is meant to support developing country Parties and Parties with economies in transition in implementing their obligations under the Convention (Article 13.5).
Succinct summary of provisions relevant to the Maldives	• Institutional strengthening at the national level for implementation of the Minamata Convention • Enhancing national capacity to develop, adopt, monitor, and enforce policy, legislation and regulation, and to gain access to financial and other resources for the implementation of the Minamata Convention • Identifying national institutional capacity, weaknesses, gaps and needs • Strengthening institutional capacity to plan, develop, undertake, monitor and coordinate the implementation of policies, strategies and national programmes for the sound management of chemicals and wastes • Promoting an enabling environment to foster the ratification the Minamata Convention;
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	• Environment Protection and Preservation Act – Law No.4/93 • Mercury Free Policy for HealthCare Maldives, 2018
Relevant institutions	ME, WAMCO, MoD, MoH
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):	
• Law on mercury management, • Defining obligations and rights of different institutions and their responsibilities in controlling and monitoring of mercury and mercury-containing products	

Article 14 - Capacity-building, technical assistance and technology transfer

Table 4-15 Policy and Regulatory Measures in Place and Remaining Gaps related to Article 14: F Capacity-building, technical assistance and technology transfer.

Article 14 - Capacity-building, technical assistance and technology transfer	
Description of Article:	Capacity-building and technical assistance may be delivered through regional, sub-regional and national arrangements, including existing regional and sub-regional centres, through other multilateral and bilateral means, and through partnerships, including partnerships involving the private sector.
Succinct summary of provisions relevant to the Maldives	Parties should cooperate to provide, within their respective capabilities, timely and appropriate capacity-building and technical assistance to developing country Parties, in particular LDCs and SIDS and Parties with economies in transition, to assist these countries in implementing their obligations under the Convention (Article 14.1). Developed country Parties and other Parties within their capabilities shall promote and facilitate, supported by private sector and other relevant stakeholders as appropriate: • Development; • Transfer and diffusion; and • Access to up-to-date environmentally sound alternative technologies to developing countries, in particular LDCs, SIDS, and Parties with economies in transition.
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/number of relevant regulatory measure,	• Environment Protection and Preservation Act – Law No.4/93 • Waste Management Regulation (2013/R-58) 2014 • Mercury Free Policy for Healthcare Maldives, 2018
Relevant institutions	ME, MoH, MoT, MoFMRA, MoD
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):	
• Create awareness among the government authorities on the flow of mercury containing products in the country • Need establishment of separate regulatory mechanisms to manage mercury	

Article 16 - Health aspects

Table 4-16 Policy and Regulatory Measures in Place and Remaining Gaps related to Article 16: Health aspects.

Article 16 - Health aspects	
Description of Article:	Mercury adversely impacts both human health and the environment. Article 16 promotes program development related to the health aspects of mercury, recognizing the activities will involve WHO, public health ministries, and other stakeholders involved in the delivery of health services. Article 16 provides guidance to health ministries on the activities they can undertake to minimize the mercury exposure of vulnerable populations, and the adverse consequences of such exposures. Establish and strengthen, the institutional and health professional capacities for the prevention, diagnosis, treatment and monitoring of health risks related to the exposure to mercury and mercury compounds.
Succinct summary of provisions relevant to the Maldives	• Promote the development and implementation of strategies and programmes to identify and protect populations at risk, particularly vulnerable populations. Setting targets for mercury exposure reduction, where appropriate; • Public education, for public health and other involved stakeholders • Fish consumption advisories • Promote the development and implementation of science-based educational and preventive programmes on occupational exposure to mercury and mercury compounds; • Promote appropriate healthcare services for prevention, treatment and care for populations affected by the exposure to mercury or mercury compounds; • Establish and strengthen, as appropriate, the institutional and health professional capacities for the prevention, diagnosis, treatment and monitoring of health risks related to the exposure to mercury and mercury compounds.
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	• National Standard for Clinical Laboratories in Maldives, 2013 • Mercury Free Policy for Healthcare Maldives, 2018
Relevant institutions	MoH, MoFMRA, ME, NGOs
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):	
• Develop and implement strategies and action plan and set targets for mercury exposure reduction; • Education, and awareness on public health aspects of mercury • Fish consumption advisories • Implementation of science-based educational and preventive measures on occupational exposure to mercury and mercury compounds; • Develop mercury consumption phase-out management plans in hospitals • Develop institutional and health professional capacities for the prevention, diagnosis, treatment and monitoring of health risks related to the exposure to mercury and mercury compounds. • Need to develop separate regulation on handling transport storage of biomedical waste management in Hospitals and clinics • Improve the existing National Standard for Clinical Laboratories in Maldives, 2013 to include mercury products	

Article 17 - Information Exchange

Table 4-17 Information exchange

Article 17 - Information exchange	
Description of Article:	Article 17 focuses on the exchange of information between countries. It identifies key information that Parties to the Convention need to share with each other and identifies mechanisms for sharing the information.
Succinct summary of provisions relevant to the Maldives	Parties to the Convention shall facilitate the exchange of: 1. Scientific, technical, economic and legal information concerning mercury and mercury compounds, including toxicological, eco-toxicological and safety information; 2. Information on the reduction or elimination of the production, use, trade, emissions and releases of mercury and mercury compounds; 3. Information on technically and economically viable alternatives to: I. Mercury-added products; II. Manufacturing processes in which mercury or mercury compounds are used; and III. Activities and processes that emit or release mercury or mercury compounds; Health and environmental risks and economic and social costs and benefits of such alternatives; and 4. Epidemiological information concerning health impacts associated with exposure to mercury and mercury compounds, in close cooperation with the World Health Organization and other relevant organizations, as appropriate (Article 17.1). 5. Each Party shall designate a national focal point for the exchange of information under the Convention, including exchanging information related to providing consent for mercury trade transactions under Article 3 (Article 17.4)
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	Environment Protection and Preservation Act – Law No.4/93 • Mercury Free Policy for Health Care Maldives, 2018
Relevant institutions	ME, MoH, MoFMRA, MCS, MoD, NGOs

Article 18 - Public information, awareness and education

Table 4-18 : Policy and Regulatory Measures in Place and Remaining Gaps related to Article 18: Public information, awareness and education.

Article 18 - Public information, awareness and education	
Description of Article:	Article 18 focuses on the sharing of information between government and the public. Similar to Article 17, Article 18 identifies key information that governments need to share with the public and the mechanisms that can be employed for public awareness-raising.
Succinct summary of provisions relevant to the Maldives	Parties to the Convention are required to promote and facilitate :Provision to the public of available information on: 1. The health and environmental effects of mercury and mercury compounds; 2. Alternatives to mercury and mercury compounds; 3. The topics identified in Article 17 4. The results of its research, development and monitoring activities under Article 19; and 5. Activities to meet its obligations under this Convention. Education, training and public awareness related to the effects of exposure to mercury and mercury compounds on human health and the environment, Information on preventative measures in order to protect against mercury exposure, such as fish advisories,
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	• Environment Protection and Preservation Act – Law No.4/93 • Mercury Free Policy for Health Care Maldives, 2018
Relevant institutions	ME, MoH, MoT, MoFMRA
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):	
• Develop public information awareness and education strategy • Create awareness among the government authorities on the flow of mercury containing products in the country • Available mercury free alternative products • Health and environmental risks and economic and social costs and benefits of such alternatives; and; • Health impacts associated with exposure to mercury and mercury compounds,	

Article 19 - Research, development and monitoring

Table 4-19 Policy and Regulatory Measures in Place and Remaining Gaps related to Article 19: Research, development and monitoring.

Article 19 - Research, development and monitoring	
Description of Article:	Article 19 seeks cooperation among countries to develop and improve on key areas of research that can support effective implementation of the Convention. These research areas include, among others, inventories of mercury use and consumption; the levels of mercury in people, aquatic food sources, and wildlife; and information on mercury commerce and trade.
Succinct summary of provisions relevant to the Maldives	Party shall cooperate in the following areas: 1. Inventories of use, consumption, and anthropogenic emissions to air and releases to water and land of mercury and mercury compounds; 2. Modelling and geographically representative monitoring of levels of mercury and mercury compounds in vulnerable populations and in environmental media, such as fish, marine mammals, sea turtles and birds, as well as collaboration in the collection and exchange of relevant and appropriate samples; 3. Assessments of the impact of mercury and mercury compounds on human health and the environment, in addition to social, economic and cultural impacts, particularly in respect of vulnerable populations; 4. Information on the environmental cycle, transport transformation and fate of mercury and mercury compounds in a range of ecosystems, 5. Information on commerce and trade in mercury and mercury compounds and mercury added products; and 6. Information and research on the technical and economic availability of mercury-free products and processes and on best available techniques to reduce and monitor emissions and releases of mercury and mercury compounds.
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	• Environment Protection and Preservation Act – Law No.4/93 • Mercury Free Policy for Health Care Maldives, 2018
Relevant institutions	ME, MoFMRA, MoH, MCS
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):	
• Need to develop research development and monitoring strategy for the Maldives the strategy should cover the following: • Assessments of the impact of mercury and mercury compounds on human health and the environment, • Environmental cycle, transport transformation and fate of mercury and mercury compounds in marine ecosystems, particularly bio accumulation in fish and marine life, • Develop a database on import/export of mercury added products; and • provide technical and economic availability of mercury-free products to importers and business community. • Mechanism to monitor emissions and releases of mercury and mercury compounds.	

Article 21 - Reporting

Table 4-20 Policy and Regulatory Measures in Place and Remaining Gaps related to Article 21: Reporting.

Article 21 - Reporting	
Description of Article:	Article 21 reporting will be a principal basis for evaluating both individual government compliance and the overall effectiveness of the Convention.
Succinct summary of provisions relevant to the Maldives	Countries report on: 1. Measures taken to implement the provisions of the Convention, the effectiveness of such measures, and the possible challenges in MEting the objectives of the Convention 2. Information as called for in Articles 3 (Supply and Trade), 8 (Emissions) and (Releases)
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Title and reference/ number of relevant regulatory measure,	• Environment Protection and Preservation Act – Law No.4/93
Relevant institutions	ME, MOH, MoFMRA,
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):	
• Establish a proper institutional mechanism to collect mercury related data (supply, trade, emissions and releases) and reporting • Establish a special unit within the ME and develop capacity to implement the Minamata convention on mercury • Establish institutional strengthening to implement Minamata Convention on Mercury to ensure timely reporting obligations	

National Strategy to identify mercury contaminated sites

Introduction

This is the National Strategy to identify mercury contaminated sites developed as part of the Minamata Initial Assessment for Maldives to identify, assess and reduce risks from mercury-contaminated sites. It provides strategies for identification of contaminated sites by mercury. According to the Minamata Convention all countries shall endeavour to develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds.

Article 12 of the Minamata Convention on Mercury states:

1. Each Party shall endeavour to develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds.
2. Any actions to reduce the risks posed by such sites shall be performed in an environmentally sound manner incorporating, where appropriate, an assessment of the risks to human health and the environment from the mercury or mercury compounds they contain.
3. The Conference of the Parties shall adopt guidance on managing contaminated sites that may include methods and approaches for:
 - a. Site identification and characterization;
 - b. Engaging the public;
 - c. Human health and environmental risk assessments;
 - d. Options for managing the risks posed by contaminated sites;
 - e. Evaluation of benefits and costs; and
 - f. Validation of outcomes.
4. Parties are encouraged to cooperate in developing strategies and implementing activities for identifying, assessing, prioritizing, managing and, as appropriate, remediating contaminated sites.

This document addresses the specific requirement of the Article in the context of Maldives. The national strategy for management of contaminated sites is considered to be a necessity with national importance and the strategy will be integrated into the 'National Waste Management Policy' and 'Waste Management Strategic Action Plan' adopted by the Ministry of Environment which envisages the establishment of Waste Management Centres on each inhabited island and the construction of Regional Waste Management Facilities.

Priorities of national strategy

Based on the evaluation of the different aspects of the situation and the capacity of the country in the management of contaminated site, the following strategic actions are identified at the national level.

Legislative framework

- Define responsibilities and roles of the various Government agencies NGOs and public
- Define the conditions and tools required for technical operations—inventory method, creation of a register of contaminated sites, definition of procedures to assess pollution on a site, prioritization of intervention measures, choice of objectives and rehabilitation scenarios
- Revise the existing legal framework and development of new instruments which are in line with the national strategy as needed.

Financial resources

- Enforce the legal provisions
- Create a contingency fund to finance supervision of the programme, monitor performance of certain preliminary actions (e.g. inventories, initial assessments), and for rehabilitation of sites.
- Resource mobilization will ensure different types of support such as physical, financial, technical, and human capacity to achieve the strategic actions.

Technical measures

- Establish administrative services which will contain a network of technical expertise capable of providing support in the different operational phases.
- Design and develop training and capacity or create technical tools, such as investigation equipment, laboratories, and treatment facilities identified as necessary through assessment of existing facilities.
- Promote proper knowledge and management of mercury waste by instituting training programs and raising awareness among stakeholders (policy makers, waste handlers, general public etc.).
- Technical resources will be generated over time.
- Transfers of technology and foreign technical assistance may be significant at the beginning, but their need should diminish thereafter.
- Avoid the use of excessively sophisticated and costly technologies unsuitable for the local context.

Political initiatives

- Integration of contaminated site management into national policy for protection of the environment, and coordination, with water protection and waste management programmes.

- Development of a programme for communication among the different stakeholders, public authorities, industry representatives, land owners, scientists, contractors of studies and works, and between the various stakeholders and the general public.
- Implementation of a policy on contaminated sites will be lengthy and often costly. It should therefore be spread over several years.
- Action programmes should be designed to be gradual and adaptable.
- Initial estimates of needs should be approximate and should be refined gradually once inventories are completed and experience has been gained.

Potential mercury contaminated sites in the Maldives

During the Inception Workshop and field surveys based on discussions with stakeholders, it was clear that there has not been any historical handling of large amounts of mercury in the Maldives. The only sites that are potentially contaminated with mercury are large waste landfill/disposal sites and large cemeteries in the country, particularly in Malé (*Figure 5-7*). Waste dump sites in urban islands, with large population, can also be considered as potential contaminated sites.

Thilafushi is the largest operational waste disposal site in the Maldives, where the whole reef has been reclaimed and is most likely the largest contaminated site in the Maldives. Waste dump sites in urban islands, such as Hithadhoo and Kulhudhufushi are also presumably contaminated with mercury waste. This would need to be confirmed with further investigation

Education, awareness, training and capacity building

There is a need for education, awareness and capacity building particularly among the key technical ministries and institutions. The same is true for the public.

Training of primary national stakeholders for mercury, including ME (the Convention focal point and main implementing agency) and other front line agencies, such as MCS, MFDA, HPA, MoH, MoFMRA, MoD, hospitals, media personnel, fish processing stations, and export facilities etc. Awareness activities should focus on:

- Creating awareness among government institutions on the extensiveness of mercury flow and its impact on human health and environment
- Creating awareness among government institutions on the need for separate laws to manage mercury
- Strengthening policy and regulatory structures for Healthcare Waste Management

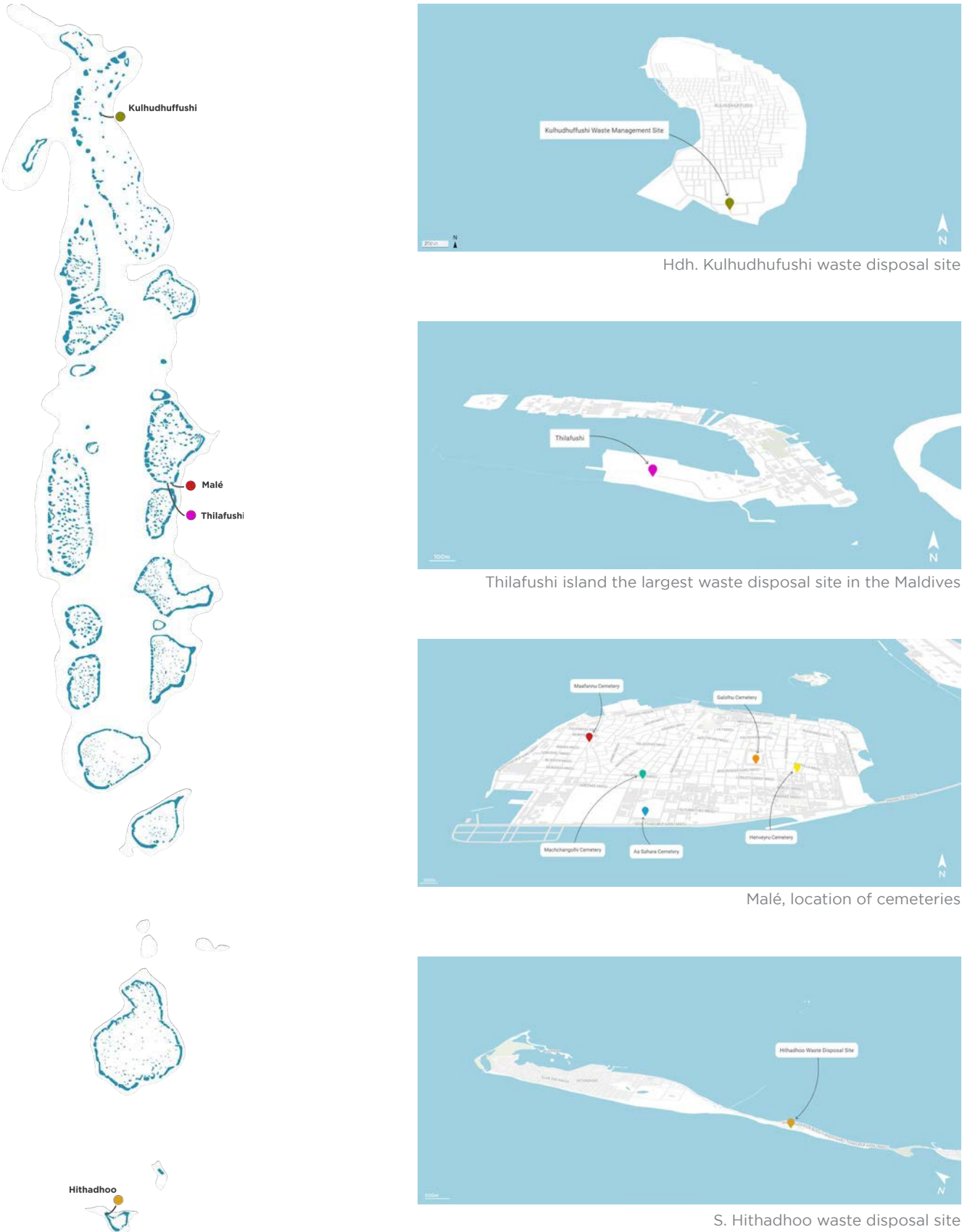


Figure 5-1 Potential mercury contaminated sites in Maldives

Research, monitoring and reporting

The Health Protection Agency currently has the technical and physical capacity to undertake testing of mercury. In addition, some laboratories in fish processing plants have the capacity to test for mercury in fish and the environment. However, the scientific and personnel resources are limited within the national laboratories. Therefore, a dedicated programme for monitoring of mercury nationwide is required to be established that would build capacity within existing institutions (FDA, MFDA, EPA, MoFMRA) that are actively involved in monitoring and research. Monitoring and reporting should include collaboration and information sharing between regional and scientific institutions.

Monitoring and reporting will also allow for the update of the baseline mercury inventory to facilitate reporting to the Convention.

Conclusion

The Minamata Convention has not yet been ratified by the Maldives. This assessment report is the first step for the facilitation of ratification and early implementation of the Minamata Convention on Mercury in the Maldives. The country's mercury releases have not been thoroughly monitored, but preliminary findings of this inventory provide evidence that mercury emissions from the relevant sectors in Maldives can have a substantial impact on the environment. The inventory has shown that the annual mercury release in the Maldives is estimated to be 1,310 kg Hg/year (1.3 tonnes). *Figure 6-1* shows the estimated significant categories of mercury release in the Maldives.

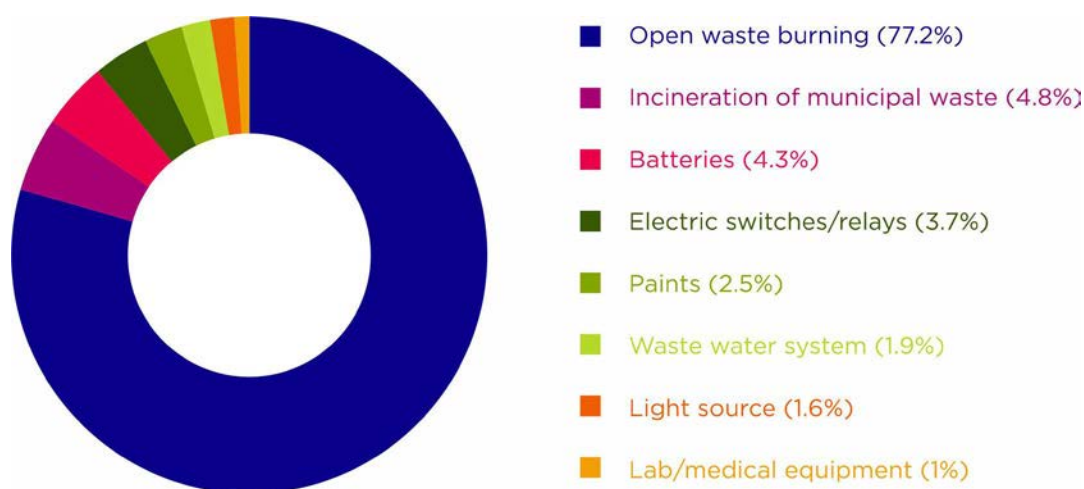


Figure 6-1 Estimated significant categories of mercury release in Maldives

As can be seen from *Figure 6-1*, the primary release of mercury to air in the Maldives is from 'Open Fire Waste Burning', which accounts for 77% of the total input (1,030 kg Hg/year). A total of 84% of mercury releases are from the source category of 'waste incineration and open waste burning'. The second largest contributor to mercury releases (15%) in the Maldives is from use and disposal of products with mercury content, such as batteries, electrical switches and relays with mercury, paints, light sources with mercury, and other laboratory and medical equipment with mercury. Mercury release from all other potential source categories were estimated to account for less than 9% of the remaining releases of mercury in Maldives. The most significant of the remaining categories was the incineration of municipal waste, which accounts for approximately 4.8% of total release of mercury in the Maldives. From the management and elimination perspective, mercury releases from the use and disposal of mercury-containing products can be easily reduced through implementation of regulatory measures to control and ban mercury-containing products. Solid waste management is widely recognized as a pressing environmental issue in the Maldives.

Reducing the release of mercury from open burning of municipal waste, which is the largest contributor of mercury release in the Maldives, can be considered as a challenge in the future. However, with the existing national waste management policy, strict implementation of the Waste Management Regulation (2013/R-58), and development of regional waste management centres, these measures can significantly contribute to the reduction and subsequent elimination of mercury releases associated with open burning of municipal waste.

In order to facilitate the ratification process of the Minamata Convention, reviewing of the regulatory framework relating to mercury and mercury containing compounds is necessary as discussed in the relevant section on regulatory framework. Relevant regulations should be revised and updated to include provisions of the Convention to the national and local regulatory framework. This would significantly improve knowledge regarding flows of mercury and mercury-containing equipment within the country. There is also a need to develop specific regulations to manage the import, export, handling and storage for disposal of mercury-containing products in the Maldives. It is anticipated that this assessment process will provide more detailed information on the existing mercury sources which can lead to informed decision making.

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