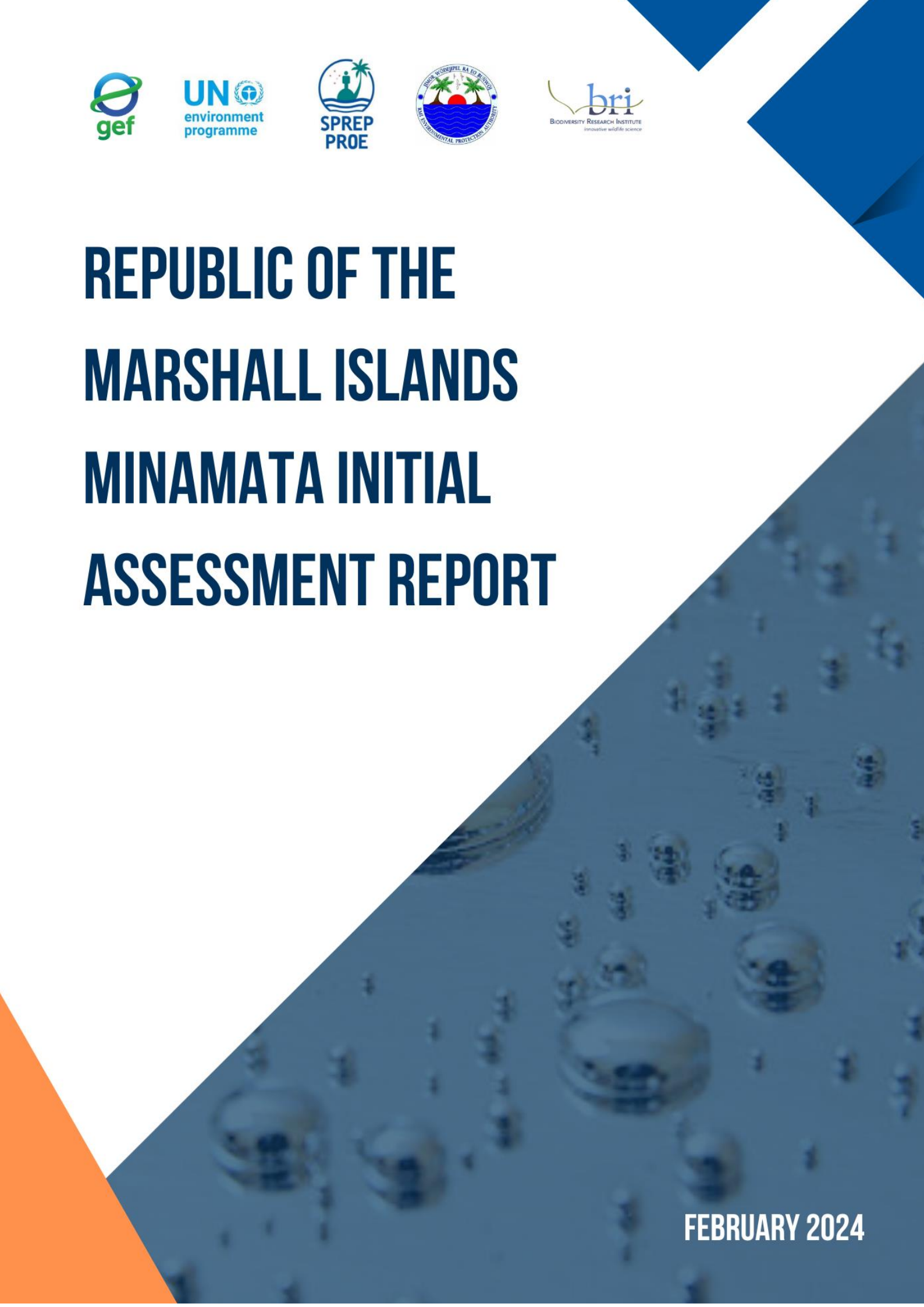
# REPUBLIC OF THE MARSHALL ISLANDS MINAMATA INITIAL ASSESSMENT REPORT



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**THE REPUBLIC OF THE MARSHALL ISLANDS MINAMATA INITIAL ASSESSMENT REPORT**

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Prepared by the Biodiversity Research Institute under the Project (GEF ID: 9992): "Development of the Minamata Initial Assessment in the Republic of Marshall Islands (MIA RMI)".

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Republic of the Marshall Islands Environmental Protection Authority (RMI EPA)

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## ABOUT THIS DOCUMENT

*The RMI Minamata Initial Assessment Report was developed under the project, "Development of Minamata Initial Assessment in the Republic of Marshall Islands".*

*The project is an enabling activity for the ratification and/or implementation of the Minamata Convention on Mercury. Funding was received from the Global Environment Facility (GEF) with the United Nations Environment Programme (UNEP) acting as the Implementing Agency and the Secretariat of the Pacific Regional Environment Programme (SPREP) functioning as the Executing Agency. The Biodiversity Research Institute (BRI) was the lead technical consultancy on the project.*

*The report consists of:*

- *an inventory of mercury releases primarily based on 2021 data, performed in accordance with UN Environment's "Toolkit for identification and quantification of mercury releases", Inventory Level 2 (version November 2019);*
- *an assessment of the policy, legislative and institutional framework in relation to the implementation of the Minamata Convention on Mercury;*
- *assessments relating to populations at risk, education and awareness-raising strategies and;*
- *recommendations and priorities for action to ensure the effective implementation of the Minamata Convention on Mercury.*

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# List of Abbreviations

| | |
|---|---|
| BAT | Best Available Techniques |
| BEP | Best Environmental Practices |
| BRI | Biodiversity Research Institute |
| CBD | United Nations Convention on Biological Diversity |
| CCFLs | Cold Cathode Fluorescent Lamps |
| CCKM | Coordination, Communication and Knowledge Management |
| CFLs | Compact Fluorescent Lamps |
| COP | Conference of the Parties |
| COVID-19 | Coronavirus Disease of 2019 |
| CSOs | Civil Society Organisations |
| ECOSOC | Economic and Social Council |
| EEFLs | External Electrode Fluorescent Lamps |
| ESM | Environmentally Sound Management |
| g | Gram |
| GDP | Gross Domestic Product |
| GEF | Global Environment Facility |
| GIC | Glass ionomer cement (dental fillings) |
| GIS | Geographic Information Systems |
| GLC | Great Lakes Commission |
| HDI | Human Development Index |
| Hg | Mercury |
| $HgCl_2$ | Mercury Chloride |
| HgO | Mercury Oxide |
| HgS | Mercury Sulphide |
| $HgSO_4$ | Mercury Sulfate |
| HIDLs | High Intensity Discharge Lamps |
| HPMV | High-Pressure Mercury Vapour |
| HS Code | Harmonised System Codes |
| ICM | Integrated Chemicals Management |
| ISLANDS | Implementing Sustainable Low and Non-Chemical Development in SIDS |
| ISM | Interim Storage of Mercury |
| KALGOV | Kwajalein Atoll Local Government |
| Kg | Kilogram |
| Kg Hg/y | kilograms per year |
| $km^2$ | Squared kilometres |
| Lbs | Pounds |
| LCD | Liquid Crystal Display |
| LEDs | Light-Emitting Diodes |
| LFLs | Linear Fluorescent Lamps |
| LPG | Liquid Petroleum Gas |
| M&E | Monitoring and Evaluation |
| MAPs | Mercury-Added Products |
| MAWC | Majuro Atoll Waste Company |
| MEAs | Multilateral Environmental Agreements |
| MEC | Marshall Island Energy Company |
| Mg | Milligrams |
| MIA | Minamata Initial Assessment |
| MIMRA | Marshall Islands Marine Resources Authority |
| Mm | Millimetres |
| MW | Megawatts |

| | |
|---|---|
| MWSC | Majuro Water and Sewer Company Inc |
| NGOs | Non-Governmental Organisation |
| NPTEL | National Programme on Technology Enhanced Learning |
| ODS | Ozone Depleting Substances |
| OEPPC | Office of Environmental Planning and Policy Coordination |
| POPs | Persistent Organic Pollutants |
| PPE | Personal protective equipment |
| Ppm | Parts Per Million |
| RMI | Republic of the Marshall Islands |
| RMI EPA | Republic of the Marshall Islands Environmental Protection Authority |
| SDG | Sustainable Development Goals |
| SIDS | Small Island Developing States |
| SPC | Secretariat of Pacific Communities |
| SPREP | The Secretariat of the Pacific Regional Environment Programme |
| sq. km | Square Kilometres |
| SWM | Solid Waste Management |
| T | Tonne |
| THg | Total Mercury |
| UN | United Nations |
| UNEP | United Nations Environment Programme |
| UNFCCC | United Nations Framework Convention on Climate Change |
| USA | United States of America |
| US EPA | United States Environmental Protection Agency |
| WEEE | Waste Electrical and Electronic Equipment |
| WHO | World Health Organisation |
| WTO | World Trade Organization |
| Ww | Wet Weight |
| µg/L | Microgram per litre |

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## Executive Summary

The Minamata Convention on Mercury is a global multilateral environmental agreement that aims to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds through a number of obligations. The Minamata Convention on Mercury entered into effect on August 16, 2017, and has 147 Parties as of November 2023. In the Pacific region, 6 countries are Party to the Convention including the Republic of the Marshall Islands (RMI).

To better inform needs for implementation of the Minamata Convention, RMI participated in the Minamata Initial Assessment (MIA) Project which aims to facilitate the ratification and implementation of the Convention using scientific and technical knowledge. The project is funded by the Global Environment Facility (GEF), implemented by the United Nations Environment Programme (UNEP) and executed regionally by the Secretariat of the Pacific Regional Environment Programme (SPREP). The Republic of the Marshall Islands Environmental Protection Authority (RMI EPA) acts as the National Project Focal Point for its implementation nationally.

Under the MIA Project, an inventory of mercury releases was developed using the "Toolkit for Identification and Quantification of Mercury Releases" (Toolkit) Level 2, made available by the Chemicals Branch of UNEP. Other aspects of the MIA Project included an assessment of the regulatory and institutional capacity needs for effective mercury management; identification of strategies to identify potential contaminated sites and risks to human health and the development of an awareness raising strategy for mercury management.

**Results of the Inventory of Mercury Releases**

It is important to note that in calculating estimations of mercury releases using the Toolkit, there were various uncertainties and complexities involved. Due to the limited available data for certain categories and the assumptions made, the estimations of mercury releases for RMI using this inventory should not be considered as definitive but rather as a guide for the identification of priorities and further assessments.

8.76 kilograms (Kg) of mercury (Hg) were determined to be released in RMI in 2021. The estimated mercury releases by source and by output through various release pathways identified are illustrated in Figures 1 and 2. The most significant source of mercury releases was found to be the consumption of products with intentional use of mercury throughout their use and disposal. This category accounted for 58% of estimated national mercury releases mainly due to the use and disposal of mercury containing electrical switches and relays, which accounted for inputs of approximately 5.00 Kg of mercury per year (Kg Hg/y).

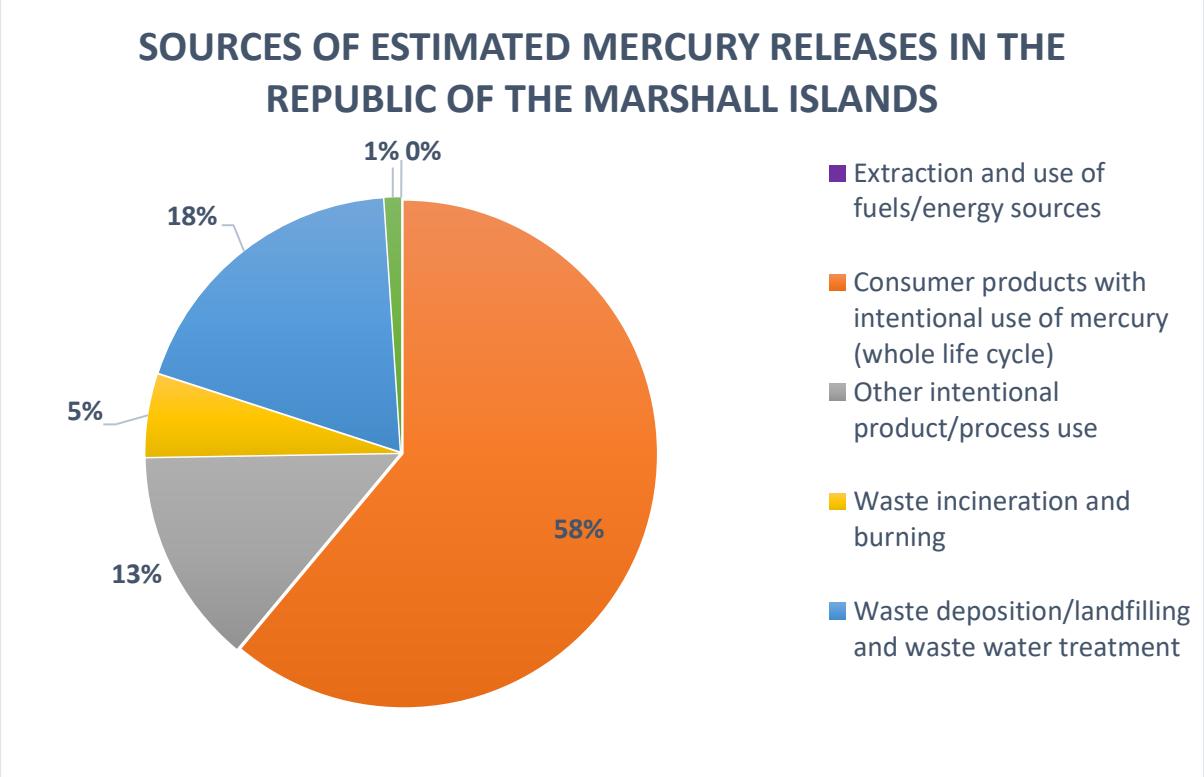



*Figure 1: Pie Chart showing the main sources of estimated mercury releases in RMI.*

Waste disposal (landfill and informal dumping) and wastewater treatment contributed to 18% of mercury releases, the second highest category. While the estimated mercury inputs from wastewater system/treatment and informal dumping of waste were determined to be 9.00 Kg Hg/y and 6.93 Kg Hg/y respectively, these included the mercury released from other categories such as from the disposal of consumer products with mercury and as such, the total estimated releases in 2021 (8.76 Kg Hg/y) reflected adjustments made to factor in double-counting from waste sub-categories. The third highest source of mercury releases (13%) was due to "Other Intentional Products/Process Uses" referring to the preparation, use and disposal of dental mercury-amalgam fillings (0.92 Kg Hg/y) and the use and disposal of manometers and gauges with mercury (0.21 Kg Hg/y).

For the source categories, the output pathways for mercury releases were also assessed. Mercury emissions to air was found to the be highest in comparison to other pathways at 3.13 Kg Hg/y. This was found to be mainly due to the use and disposal of consumer products with mercury, waste deposition and medical waste incineration. Releases to land and general waste accounted for the second and third highest output pathway for mercury releases at 2.17 Kg hg/y and 2.00 Kg Hg/y respectively.

RMI was found to have no major sources of mercury stockpiles, supply or trade.

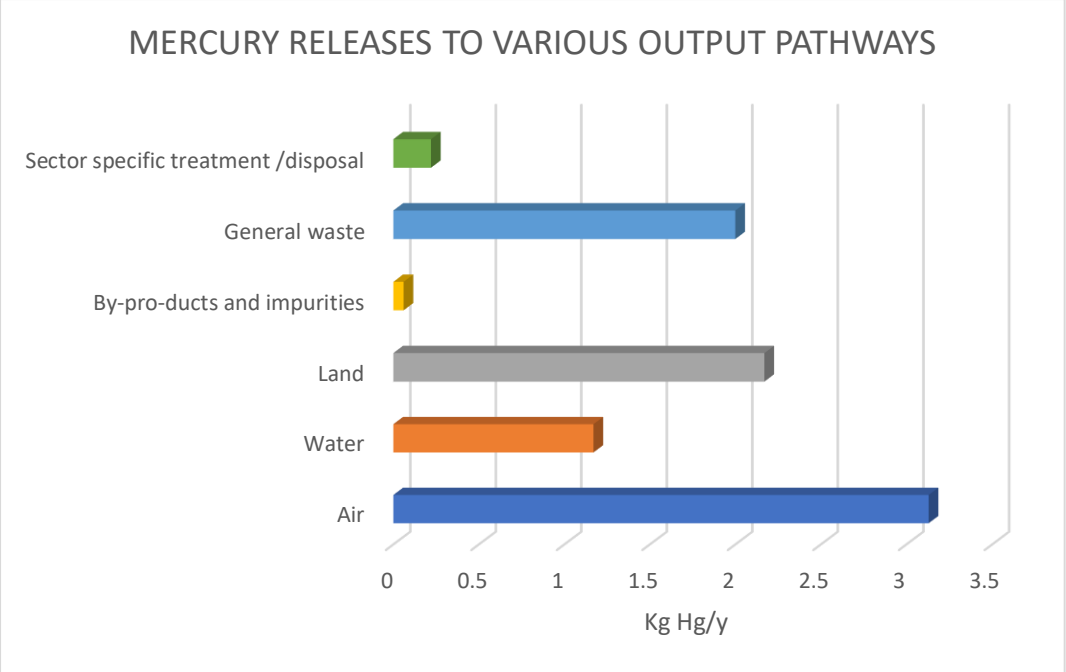



*Figure 2: Bar Chart showing the mercury releases estimated according to output pathway in RMI.*

**Major Findings of the Policy, Regulatory and Institutional Framework Assessment**

For the overall implementation of the Minamata Convention on Mercury, responsibility falls under the remit of the Office of Environmental Planning and Policy Coordination (OEPPC) and its designated authority, the RMI EPA in coordination with several relevant stakeholders across the government sector, public and private sector as well as, non-governmental organisations and civil society organisations.

To formally recognise the obligations for RMI as a Party to the Minamata Convention on Mercury, a standalone act or a regulation under the National Environmental Protection Act, 1984 should be developed by the OEPPC and RMI EPA (in coordination with relevant stakeholders) for approval by the Council. This should include the prohibition of the import of mercury, mercury compounds and mercury added products as outlined under Annex A (Part II) of the Minamata Convention and for Annex A (Part II), mercury in bulk form for dental amalgam.

Coordination with RMI-Customs, The Postal Service, private sector retailers and the Chamber of Commerce to ensure the implementation of the prohibition of mercury products and the promotion of safe mercury-free alternatives. Coordination with the Ministry of Health and Health Services to meet the obligations for phase down of dental amalgam and phase out of mercury added medical devices is recommended.

Other regulatory recommendations include the development of regulations under the National Environmental Protection Act, 1984 to monitor mercury releases from sources to land and wastewater. The RMI EPA should bear the responsibility for development of these standards

with reference to guidance provided under the Minamata Convention. Coordination with the Local Governments/Authorities and the health sector, where needed, to ensure management of potential mercury releases through proper health and sanitation practices should be conducted.

Any proposed amendments to laws should be done in alignment with the provisions of the Revision of Laws Act 1981 and Adoption and Revision of Laws, 1988 as needed. New or updated national plans and policies related to environmental management and strategic planning should also include the provisions of the Minamata Convention and any related agreements.

Challenges in implementation include the limited human resource capacity and technical capacity to carry out continuous activities related to mercury management. To address this, it is important to recognise the linkages between mercury issues and issues related to other hazardous or potentially harmful chemicals and how approaches can be harmonised. It is recommended that a national working group consisting of representatives from the aforementioned institutions be established with assigned representatives from the RMI EPA acting as the Chair. This working group can be linked to other environmental committees that may have been or will be established to avoid duplication of work. Furthermore, it is important to recognise regional linkages that can be made to further opportunities for information exchange and capacity building, which is ongoing through agencies such as SPREP, among others.

**Strategies for Identification of Contaminated Sites and Assessment of Risks to Human Health**

Hot spots of mercury contamination exist as the direct result of the use and release of mercury in processes leading to on-site deposition, as well as the inadequate disposal of mercury-contaminated materials. Previous deposits of mercury may still have the potential to release significant amounts of mercury and pose a risk to human health and the environment. Areas that are particularly sensitive to mercury deposition- where methylation rates are highest and biomagnification in the food web is greatest, and where animals experience significant reproductive harm- are called biological mercury hotspots. These areas generally represent aquatic ecosystems or have an aquatic connection within the food web.

A map of Majuro, RMI was developed to identify the locations of potentially mercury contaminated sites. Further geospatial data on the other islands of RMI is recommended to provide a clearer indication of potential sites of interest for the country as a whole. Additionally, further research on the spatial distribution of potentially contaminated sites in relation to ecosystem characteristics that increase the methylation potential of mercury inputs should be conducted to inform locations prioritized for further study on the threat from mercury on human health and the environment and for future use in evaluating the effectiveness of the Minamata Convention. These, and any additional, potentially contaminated sites should be verified by the relevant national authorities.

Methylmercury, the organic form of mercury, is the most toxic form of mercury to humans as it is a neurotoxin that can cause physiological harm and behavioural disorders in people. Humans are most exposed to methylmercury through dietary consumption. Fish from the sea or freshwater systems can be a major source of methylmercury. In general, fish species that are small, short-lived, and forage low in the food web contain less methylmercury, while predatory species that are long-lived and grow larger can contain higher levels of methylmercury. Many of the fish available in the Pacific are safe to eat, although more information is needed about the mercury concentrations to better characterize how mercury is distributed in different species of fish in the waterscape of Pacific nations.

In RMI, the Marshall Islands Marine Resources Authority (MIMRA) monitors exports of certain fish species by collecting samples of fish from local processing plants for analysis by registered laboratories overseas. Samples are analysed for mercury among other metals, persistent organic pollutants, and other potential contaminants for quality assurance. MIMRA is also currently building the capacity for in-country laboratory testing through several funded partnerships including with the Secretariat of Pacific Communities and the University of the South Pacific.

Monitoring mercury exposure to humans will help the global community to meet the requirements of the Minamata Convention on Mercury and will also help identify global biological hotspots that represent elevated levels of mercury exposure that may pose serious threats to both ecosystem and human health. Gender and occupational considerations in terms of identifying vulnerable groups for monitoring should be made.

**Awareness-raising Strategies for Mercury Management**

The current level of awareness on the risks associated with mercury amongst workers (such as dental professionals and waste disposal workers) and the general public is not considered to be high and measures should be adapted to educate these groups on the issue. Under the MIA Project, a brief animated awareness raising video was developed for dissemination in RMI. The video aims to educate the general public on the potentially mercury-added household products that may be present, the need for safe disposal and the promotion of mercury-free alternatives that are already popular on the local market. It is recommended that the video be shared widely via social media by the RMI EPA and other national stakeholder organizations.

To educate key stakeholders on the estimated sources of mercury releases and recommendations for mercury management developed under the project, a technical briefing document that summarizes the main findings of the MIA Project was developed by BRI.

Additionally, through RMI's participation in the GEF ISLANDS Programme, further mercury-related activities for information dissemination, inclusive of gender considerations, will be carried out.

The RMI EPA is actively involved in stakeholder outreach and school campaigns to educate persons on various environmental issues. The materials developed under this project and the ongoing GEF ISLANDS Programme, can be utilized in future public education campaigns on environmental awareness.

In terms of mercury's potential impact on human health and possible exposure through diets, fish consumption guidelines that are based on scientific research are recommended to assist vulnerable populations in determining the recommended frequency in consuming fish that considers their health benefits versus potential mercury risks.

Coordination with other relevant governmental, private and non-governmental organizations such as MIMRA and the Ministry of Health and Health Services is recommended to further promote mercury management awareness.

**Priority Areas for Consideration in the Implementation of the Minamata Convention**

Recommendations for consideration in the implementation of the Minamata Convention may include actions to:

1. Develop an Act or Regulation to formally recognise the obligations of the Minamata Convention and facilitate its implementation.
2. Establish a Coordinating Mechanism for mercury management.
3. Implement measures to address identified sources of mercury release through:
    a. Promotion of the continued phase-out and phase down of mercury-added products and;
    b. Ensuring Best Available Techniques/Best Environmental Practices (BAT/BEP) implementation for monitoring and preventing mercury releases from sources such as landfills and waste incinerators.
4. Public awareness and sensitisation of relevant stakeholders on mercury issues
5. Strengthen understanding of mercury issues in RMI through monitoring programmes.

Under the ongoing GEF-funded programme, Implementing Sustainable Low and Non-Chemical Development in Small Island Developing States (ISLANDS), RMI will also benefit from the development of draft model legislation to control mercury-added products for use by Pacific SIDS that can be tailored for adoption, and the provision of support for the sound repackaging, shipping, collection, and disposal of mercury waste.

# Introduction

### Mercury and the Minamata Convention on Mercury

Mercury (symbol: Hg), also known as quicksilver, is a natural element that exists in the earth's crust. Emissions of mercury to the environment may occur due to volcanic eruptions and other natural occurrences, but the majority of mercury releases have been found to be due to anthropogenic activities such as primary mercury mining, and re-emissions of mercury already in the environment, mainly as a result of previous human activity (UNEP, 2019a).

The release of mercury to the environment is of serious concern due its highly toxic and persistent nature, which can negatively affect human health and the environment. Mercury has been listed by the World Health Organisation (WHO) as one (1) of the top ten (10) chemicals or groups of chemicals of major health concern (WHO, 2017).

Mercury exists in three (3) main forms:

1. *Elemental or metallic mercury* which is a silvery-coloured liquid at room temperature and standard pressure. This form has been used in a variety of activities such as artisanal and small-scale gold mining in which mercury is used for its ability to form an amalgam with gold particles. It has also been used in the manufacture of some consumer products such thermometers, dental amalgam, fluorescent light bulbs, and some electrical switches.
2. *Inorganic mercury compounds* which are formed when mercury bonds with other chemicals to form compounds or salts. This may occur naturally or due to man-made activities for use in several industrial processes and in the manufacture of products.
3. *Organic mercury compounds* which are formed when mercury combines with carbon to form compounds. The most toxic organic mercury compound is methylmercury (MeHg) which typically forms in water or sediment when anaerobic bacteria convert elemental or inorganic mercury to MeHg. This form tends to bioaccumulate in the food chain and humans are typically exposed to MeHg consumption of certain contaminated fish or shellfish over a period of time (UNEP, 2019b).

Exposure to mercury can range from short-term effects such as headache, dizziness, skin and eye irritations to more serious and long-term impacts on the nervous, digestive, respiratory, renal and immune systems, and may be fatal depending on the level and length of exposure (WHO, 2017). The most vulnerable populations to the harmful impacts of mercury include children and pregnant or breastfeeding women as mercury can cross into the placenta and breastmilk.

The effects of mercury on ecosystem health can also be detrimental as studies have shown that the growth, behaviour and reproduction of fish with high concentrations of mercury can be negatively impacted. This can in turn impact the food web as wildlife who then regularly consume mercury-contaminated fish have been shown to have decreased reproductive success (BRI, 2019). Aquatic ecosystems such as beaches, lakes, mangroves among others, are particularly sensitive to mercury accumulation.

In recognising the need to address the issues posed by mercury, the global multilateral environmental agreement, the Minamata Convention on Mercury, was developed. The Convention aims to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds through a number of obligations that, among other things, regulate:

- mercury supply, sources and trade;
- mercury added products;
- manufacturing processes;
- artisanal and small scale gold mining;
- interim storage and disposal of mercury and mercury compounds;
- mercury waste management;
- mercury emissions and releases management, among other activities.

The Minamata Convention on Mercury entered into effect on August 16, 2017, and has 147 Parties as of November 2023. In the Pacific region, six (6) countries are Party to the Convention with several others actively taking measures to become a Party.

**Project Background**

The MIA Project aims to facilitate the ratification and implementation of the Minamata Convention on Mercury using scientific and technical knowledge in conducting an inventory of mercury releases (and emissions[1]). The development of an inventory of mercury releases will inform countries of their national mercury sources and subsequently assist in identifying actions to increase their capacity in mercury management.

The inventory was conducted with the use of the "Toolkit for Identification and Quantification of Mercury Releases" (Toolkit), made available by the Chemicals Branch of UNEP. The Toolkit is designed to produce a simple and standardised methodology and database to inform the national mercury inventory. It outlines a UNEP-recommended procedure to facilitate the development of consistent and comparable source inventories. The steps involved include:

1. The identification of the main mercury source categories present in the country;
2. The refining of the identified mercury source categories into further sub-categories in order to determine the individual activities that potentially release mercury, and gathering of qualitative information on the activities;
3. The development of a quantitative inventory; the Inventory Level 2 version of the Toolkit was utilised in this MIA Project as it provided a more comprehensive look at the releases of mercury. Estimations are calculated via equations and procedures specific to the source types identified; and

[1] Under the Minamata Convention, the term “releases” is typically related to mercury released to land and water while the term “emissions” refers to mercury released to air. Under the UN Environment Toolkit, “releases” is used to describe mercury released to all media, including air. For this report, the term “mercury releases” will be used predominantly as described under the UN Environment Toolkit.

4. The compilation of the standardised mercury inventory and identification of data gaps which will build on the country's knowledge base on mercury.

It is important to note that in calculating estimations of mercury releases using the Toolkit, there may be various uncertainties and complexities involved. As such, for each mercury source sub-category present, there will be an estimate of releases to all media where data is sufficient and an indication of the likely magnitude if full data is unavailable. Major data gaps will also be identified. These considerations will assist in the interpretation of results and prioritisation of future actions.

Further details on the project outputs are detailed in Table 1.

*Table 1: Outline of project components and expected outputs as stated in the MIA Project document*

| Project Component | Project Output |
|---|---|
| **Global technical support and capacity building for MIA development** | 1.1 Technical assistance provided to the RMI to develop the MIA while building sustainable foundations for its future implementation |
| **Development and validation of the Minamata Initial Assessment** | 2.1 Identified and strengthened national coordination mechanism dealing with mercury management that will guide the project implementation |
| | 2.2 National institutional and regulatory framework and national capacities on mercury management assessed |
| | 2.3 National inventories of mercury sources and releases developed using the UN Environment Mercury Toolkit Level II and strategy for the identification of mercury contaminated sites developed |
| | 2.4 Challenges, needs and opportunities to implement the Minamata Convention assessed and recommendations to ratify and implement the Minamata Convention developed |
| | 2.5 MIA validated by national stakeholders |
| **Monitoring and Evaluation** | 3.1 Status of project implementation and probity of use of funds accessed on a regular basis and communicated to the GEF |
| | 3.2 Independent terminal evaluation developed and made publicly available |

# Chapter 1: National Background Information

## 1.1 Geography and Population

The Republic of the Marshall Islands (RMI) comprises of 5 islands and 29 low-lying atolls (as seen in Figure 3) in the Pacific Ocean with a total land area of approximately 181 square kilometers ($km^2$) and an Exclusive Economic Zone that spreads over 2 million $km^2$ of ocean (World Bank, 2009). The total population estimated in a 2021 census was 42,418 inhabitants with the majority residing in the capital of Majuro Atoll (23,156) and the second most populated being Kwajalein/Ebeye Atoll with 9,789 inhabitants (SPC and EPSSO, 2022). Both Majuro and Kwajalein/Ebeye are more urbanized while the other atolls and islands (referred to commonly as the "outer Pacific islands") are more rural. Administrative district centers exist in these 2 atolls as well as in the atolls of Jaluit and Wotje (World Bank, 2009). RMI has a tropical climate with average temperatures of around 82 degrees Fahrenheit. Across the atolls, rainfall varies greatly, and the atolls have become dryer and warmer over the years (SPREP, 2016).

RMI is made up of mainly low coral limestone and sand islands and its highest point is only approximately 10 meters (m) high located on Likiep Atoll. There is approximately 70% of total forest cover in RMI that includes native forest, agro-forest and coconut plantations, though agricultural activities have reduced in recent years owing to changes in lifestyle and increasing dependence on foreign food imports. RMI has 2 RAMSAR sites (protected wetlands) in Namdrik and Jaluit (SPREP, 2016).

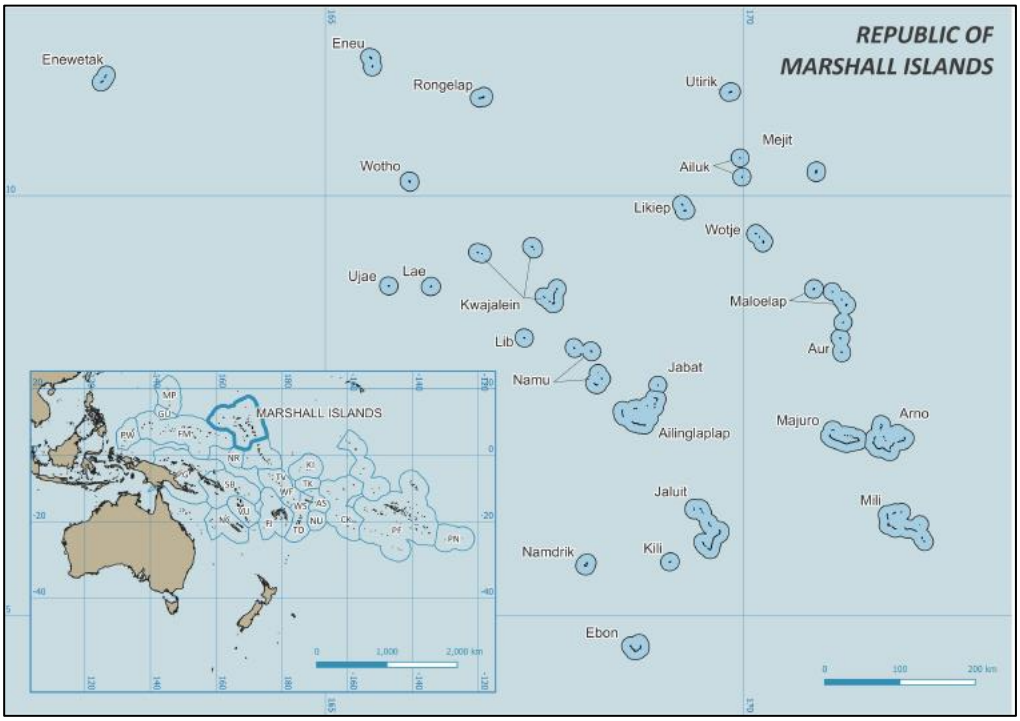



*Figure 3: Map of RMI (SPC and EPSSO, 2022)*

The majority of inhabitants are Marshallese with a small mixture of citizens from other Pacific islands, the Philippines, the United States of America (USA) and other countries. The official language of RMI is English and Marshallese.

## 1.2 Political, Economic and Legal Profile

The RMI is a democratic republic that gain independence from USA in 1986. Its Parliament consists of 33 members with a President acting as Head of State elected by members of Parliament and democratic elections for representatives are held every 4 years (UN Women, 2022.

Traditionally, Marshallese persons make up different clans (bwij) that own land under the leadership of their clan head (alap) and land rights can pass through both matrilineal and patrilineal lines (UN Women, 2022). Multiple bwij and alap then form a group that is led by a chief (irooj or leroij). Through a Council of Iroij, these leaders advise the Parliament on matters such as local land tenures.

Within the traditional structures, women have notable authority although it can be limited with female chiefs (leroij) rarely having as much exclusive power as their male counterparts, and as of 2015, 25% of the Council Iroij members were female (UN Women, 2022). A study conducted in 2022 indicated that of the 33 members of Parliament, only 2 were women, therefore accounting for 6.1% of legislature oversight while the first female President was elected and in office from 2016-2019 (UN Women, 2022).

Through the Compact of Free Association, an agreement between the Government of RMI and the USA, financial assistance is provided by the USA in exchange for the USA maintaining national defence and access rights. Financial aid measures include the unrestricted movement of Marshallese citizens to study, work and live in the USA which has resulted in population decreases in recent years with emigration to the mainland USA and Hawaii (SPREP, 2016).

Since its independence, RMI's rate of increase in Gross Domestic Product (GDP) has been low, averaging less than 1% per year (SPREP, 2016). RMI has been largely dependent on foreign aid for economic growth with Compact Association annual grants being distributed by the USA. The existing grant agreement expires in 2023 and discussions for renewal are ongoing. The sale of offshore fishing rights also contributes to the local economy by approximately 14% (SPREP, 2016). Tuna fishing is a major industry in RMI resulting in emphasis being place on careful management of pelagic fisheries since regionally, bigeye and Pacific Bluefin tuna are overharvested and other tuna species are on the verge of being fully developed or overdeveloped (SPREP, 2016).

## 1.3 Environmental Overview

RMI has an inshore reef system and fishery that has been listed as relatively stable despite widespread coral bleaching and impacts of fishing on marine species populations. There are 63

declared marine managed areas that make up 70% of the local reef area (SPREP, 2016). RMI is also home to 2 endangered turtle nesting populations and several endangered animal species (SPREP, 2016). Due to the legacy of military operations in RMI which began prior to World War II, widespread deforestation reduced plant diversity and following the impacts of nuclear testing by the USA during the war, radioactive debris deposition, vaporisation of islets and destruction of reef and terrestrial ecosystems have had lasting impacts on some atolls (SPREP, 2016).

RMI's environment is rapidly changing with climate change being one of the biggest drivers. 5 priority areas identified to be addressed in RMI are water security, food security, human health, land use and flood risks (SPREP, 2016).

RMI has conducted several initiatives to enhance environmental protection. This includes activities such as the banning of shark fishing in its Exclusive Economic Zone since 2011, the phasing out of Ozone Depleting Substance (ODS) under the Montreal Protocol through the development and enforcement of Regulations, and the prohibition of Styrofoam single-use products through the development of legislation. Table 2 summarises some of the key multilateral environmental agreements that RMI has committed to in order to enhance environmental protection, including, the Minamata Convention on Mercury.

*Table 2: Multilateral environmental agreements to which RMI is a Party*

| Treaty | | Year of Becoming a Party |
|---|---|---|
| | Minamata Convention on Mercury | 2019 |
| | Basel Convention on the Control of the Transboundary Movement of Hazardous Waste and their Disposal | 2003 |
| | Rotterdam Convention | 2004 |
| | Stockholm Convention on Persistent Organic Pollutants | 2004 |
| | Convention on Biological Diversity | 1993 |
| | Paris Agreement (as part of United Nations Framework Convention on Climate Change) | 2016 |

# Chapter 2: Mercury Inventory and Identification of Emissions and Releases

## 2.1 Summary of Mercury Releases, Stockpiles, and Supply and Trade

### 2.1.1 Mercury Release Source Types Present

Mercury released into the environment can come from a variety of sources. For the Toolkit, focus was placed on anthropogenic sources of mercury. In RMI, the presence of these sources was identified through consultations with national stakeholders (Table 3). Stakeholders were engaged through questionnaires, email correspondence, interviews, and project meetings. The categories identified as not being present will not be discussed further in the report

*Table 3: Identification of mercury release sources in RMI; sources present (Y), absent (N), and possible but not positively identified (?)*

| Toolkit Category # | Source category | Source presence (Y/N/?) |
|---|---|---|
| **5.1** | **Extraction and use of fuels/energy sources** | |
| 5.1.1 | Coal combustion in large power plants | N |
| 5.1.2 | Other coal combustion | N |
| 5.1.3 | Extraction, refining and use of mineral oil | **Y** |
| 5.1.4 | Extraction, refining and use of natural gas | N |
| 5.1.5 | Extraction and use of other fossil fuels | N |
| 5.1.6 | Biomass fired power and heat production | N |
| 5.1.7 | Geothermal power production | N |
| **5.2** | **Primary (virgin) metal production** | |
| 5.2.1 | Primary extraction and processing of mercury | N |
| 5.2.2 | Gold and silver extraction with the mercury-amalgamation process | N |
| 5.2.3 | Zinc extraction and initial processing | N |
| 5.2.4 | Copper extraction and initial processing | N |
| 5.2.5 | Lead extraction and initial processing | N |
| 5.2.6 | Gold extraction and initial processing by other processes than mercury amalgamation | N |
| 5.2.7 | Aluminium extraction and initial processing | N |
| 5.2.8 | Extraction and processing of other non-ferrous metals | N |
| 5.2.9 | Primary ferrous metal production | N |
| **5.3** | **Production of other minerals and materials with mercury impurities** | |
| 5.3.1 | Cement production | N |
| 5.3.2 | Pulp and paper production | N |
| 5.3.3 | Lime production and light weight aggregate kilns | N |
| 5.3.4 | Other minerals and materials | N |

| Toolkit Category # | Source category | Source presence (Y/N/?) |
|---|---|---|
| **5.4** | **Intentional use of mercury as an auxiliary material in industrial processes** | |
| 5.4.1 | Chlor-alkali production with mercury-technology | N |
| 5.4.2 | VCM (vinyl-chloride-monomer) production with mercury-dichloride ($HgCl_2$) as catalyst | N |
| 5.4.3 | Acetaldehyde production with mercury-sulphate ($HgSO_4$) as catalyst | N |
| 5.4.4 | Other production of chemicals and polymers with mercury compounds as catalysts | N |
| **5.5** | **Consumer products with intentional use of mercury** | |
| 5.5.1 | Thermometers with mercury | **Y** |
| 5.5.2 | Electrical and electronic switches, contacts and relays with mercury | **Y** |
| 5.5.3 | Light sources with mercury | **Y** |
| 5.5.4 | Batteries containing mercury | **Y** |
| 5.5.5 | Polyurethane with mercury catalysts | N |
| 5.5.6 | Biocides and pesticides | N |
| 5.5.7 | Paints | N |
| 5.5.8 | Pharmaceuticals for human and veterinary uses | N |
| 5.5.8 | Cosmetics and related products | **?** |
| **5.6** | **Other intentional products/process uses** | |
| 5.6.1 | Dental mercury-amalgam fillings | **Y** |
| 5.6.2 | Manometers and gauges | **Y** |
| 5.6.3 | Laboratory chemicals and equipment | N |
| 5.6.4 | Mercury metal use in religious rituals and folklore medicine | N |
| 5.6.5 | Miscellaneous product uses, mercury metal uses and other sources | N |
| **5.7** | **Production of recycled metals** | |
| 5.7.1 | Production of recycled mercury ("secondary production) | N |
| 5.7.2 | Production of recycled ferrous metals (iron and steel) | N |
| 5.7.3 | Production of other recycled metals | N |
| **5.8** | **Waste incineration** | |
| 5.8.1 | Incineration of municipal/ general waste | N |
| 5.8.2 | Incineration of hazardous waste | N |
| 5.8.3 | Incineration of medical waste | **Y** |
| 5.8.4 | Sewage sludge incineration | N |
| 5.8.5 | Informal waste burning | **Y** |
| **5.9** | **Waste deposition/landfilling and wastewater treatment** | |
| 5.9.1 | Controlled landfills/deposits | **Y** |
| 5.9.2 | Diffuse deposition under some control | N |
| 5.9.3 | Informal local deposition of industrial production waste | N |

| Toolkit Category # | Source category | Source presence (Y/N/?) |
|---|---|---|
| 5.9.4 | Informal dumping of general waste | **Y** |
| 5.9.5 | Wastewater system/treatment | **Y** |
| **5.10** | **Cremation and cemeteries** | |
| 5.10.1 | Crematoria | **Y** |
| 5.10.2 | Cemeteries | **Y** |

### 2.1.2 Summary of Estimated Mercury Inputs to Society

Mercury inputs to society should be understood here as the mercury made available for potential releases through economic activity in RMI. This includes mercury intentionally used in products such as blood pressure gauges and fluorescent light bulbs as well as mercury that can become available through the disposal of these products. It also includes mercury mobilized via extraction and use of raw materials which contains mercury in trace concentrations.

Mercury inputs to RMI for the source categories identified as being present in Table 4 are shown below in Table 4.

*Table 4: Summary of mercury inputs to RMI*

| Source category | Estimated Hg Input (Kg Hg/y) |
|---|---|
| **Extraction and use of fuels/energy sources** | |
| Mineral Oil- Extraction, refining and use | **0.31** |
| **Consumer products with intentional use of mercury** | |
| Thermometers with mercury | **Assumed to be negligible** |
| Electrical and electronic switches, contacts and relays with mercury | **5.00** |
| Light sources with mercury | **0.04** |
| Batteries containing mercury | **No data available** |
| Cosmetics with mercury catalysts | **No data available** |
| **Other intentional products/process uses** | |
| Dental mercury-amalgam fillings | **0.92** |
| Manometers and gauges | **0.21** |
| **Waste incineration** | |
| Incineration of medical waste | **0.44** |
| Informal waste burning | **Assumed to be negligible** |
| **Waste deposition/landfilling and wastewater treatment** | |
| Controlled landfills/deposits | **0.20** |

| Source category | Estimated Hg Input (Kg Hg/y) |
|---|---|
| Informal dumping of general waste | **6.93** |
| Wastewater system/treatment | **9.00** |
| **Cremation and cemeteries** | |
| Cemeteries | **0.10** |
| Crematoria | **Assumed to be negligible** |

### 2.1.3 Summary of Mercury Releases

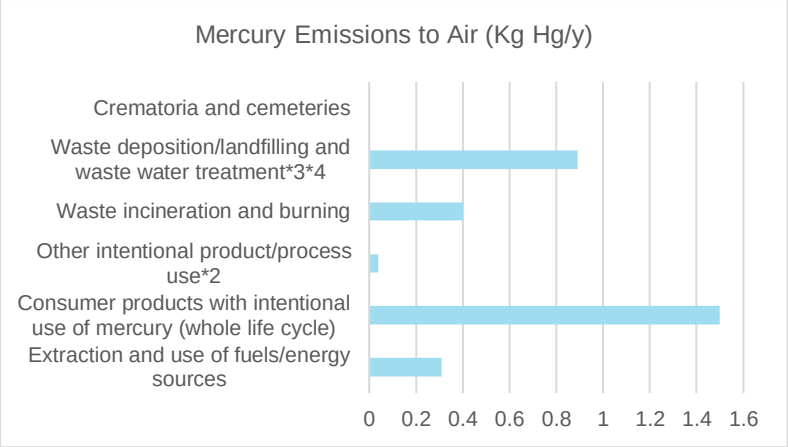
Mercury releases are to air (the atmosphere), water (marine and freshwater bodies, including via wastewater systems), land, general waste, and sector specific waste treatment/disposal. An additional output pathway is "by-products and impurities" which designates mercury flows back into the market in by-products and products where mercury does not play an intentional role. Table 5 describes these output pathways.

*Table 5: Descriptions of the types of output pathways for mercury releases*

| Calculation Result Type | Description<br>***(NOTE: Not all examples provided are relevant to RMI but are included for general reference)*** |
|---|---|
| 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:<br>• Point sources such as coal fired power plants, metal smelter, waste incineration;<br>• 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 wastewater 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:<br>• Wet flue gas cleaning systems on coal fired power plants;<br>• Industry, households, etc. to aquatic environments;<br>• Surface run-off and leachate from mercury contaminated soil and waste dumps. |

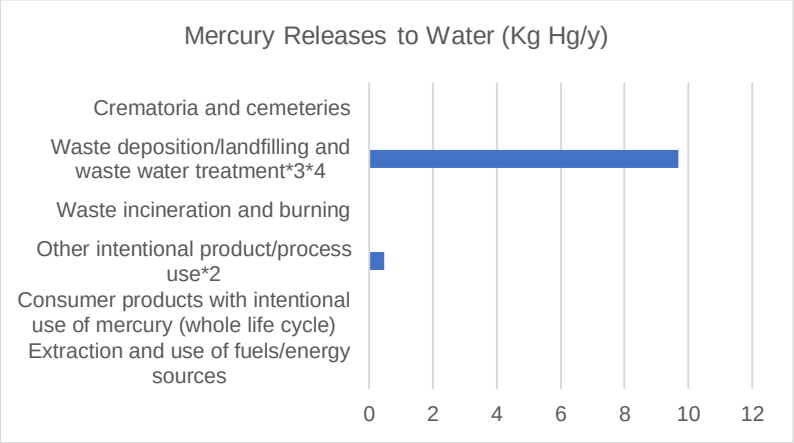
| Calculation Result Type | Description<br>*(NOTE: Not all examples provided are relevant to RMI but are included for general reference)* |
|---|---|
| Land | Mercury releases to the terrestrial environment: General soil and ground water. For example, releases from:<br>• Solid residues from flue gas cleaning on coal fired power plants used for gravel road construction;<br>• Uncollected waste products dumped or buried informally;<br>• Local un-confined releases from industry such as on-site hazardous waste storage/burial;<br>• Spreading of sewage sludge with mercury content on agricultural land (sludge used as fertilizer);<br>• Application on land, seeds or seedlings of pesticides with mercury compounds. |
| 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:<br>• Gypsum wallboard produced from solid residues from flue gas cleaning on coal fired power plants;<br>• Sulphuric acid produced from desulphurization of flue gas (flue gas cleaning) in non-ferrous metal plants with mercury trace concentrations;<br>• Chlorine and sodium hydroxide produced with mercury-based chlor-alkali technology; with mercury trace concentrations;<br>• 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:<br>• Confined deposition of solid residues from flue gas cleaning on coal fired power plants on dedicated sites;<br>• Hazardous industrial waste with high mercury content, which is deposited in dedicated, safe sites;<br>• Hazardous consumer waste with mercury content, mainly separately collected and safely treated batteries, thermometers, mercury switches, lost teeth with amalgam fillings, etc.;<br>• Confined deposition of tailings and high-volume rock/waste from extraction of non-ferrous metals. |

Table 6 summarises mercury releases to the various output pathways in RMI based on Toolkit calculations using mainly 2021 data and default values or extrapolations where data was not available. Details on how the release values were obtained are included in the respective subsections of this report. Source categories that were not identified as being present in RMI are not included in the table.



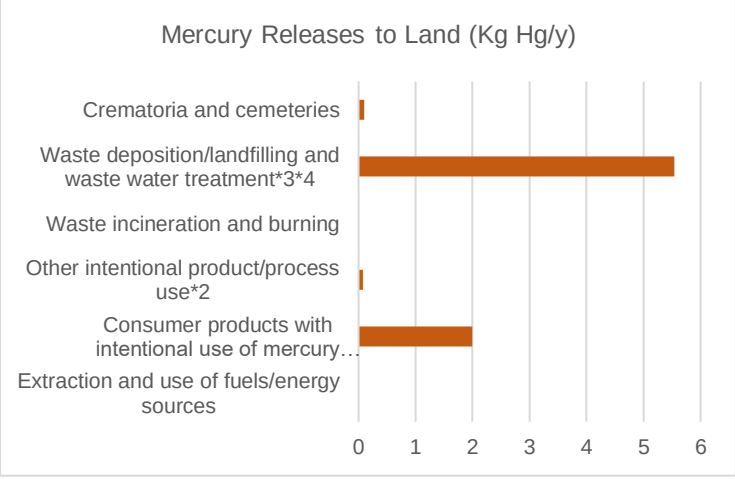

Consumer Products with mercury was found to contribute the most to air emissions at 1.50 Kg Hg/y.

*Figure 4: Mercury Emissions to Air Output Pathway from Present Mercury Source Categories*



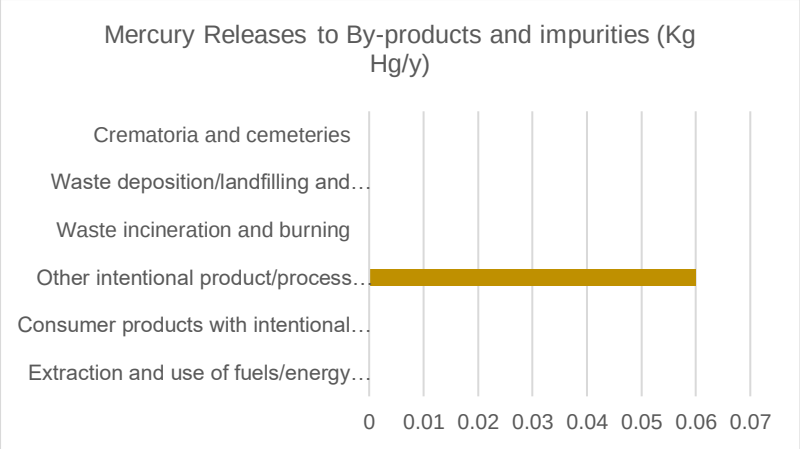

9.69 Kg Hg/y was estimated to be released from Waste Landfilling, Informal Waste Dumping and Wastewater Treatment/System. These categories also included waste accounted for in other categories such as Consumer Products with mercury. As such, when estimating overall mercury releases, 10% of mercury generated by the waste categories was accounted for in the total.

*Figure 5: Mercury Releases to Water Output Pathway from Present Mercury Source Categories*



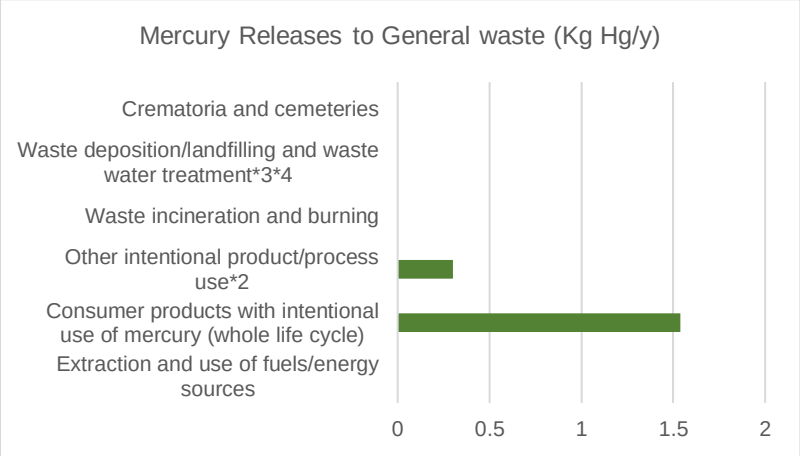

Similarly to releases to water, the waste category was found to have the highest initial releases to land at 5.54 Kg Hg/y. However, when double-counting is factored in, Consumer Products with mercury has the overall highest mercury releases to land at 2.00 Kg Hg/y.

*Figure 6: Mercury Releases to Land Output Pathway from Present Mercury Source Categories*



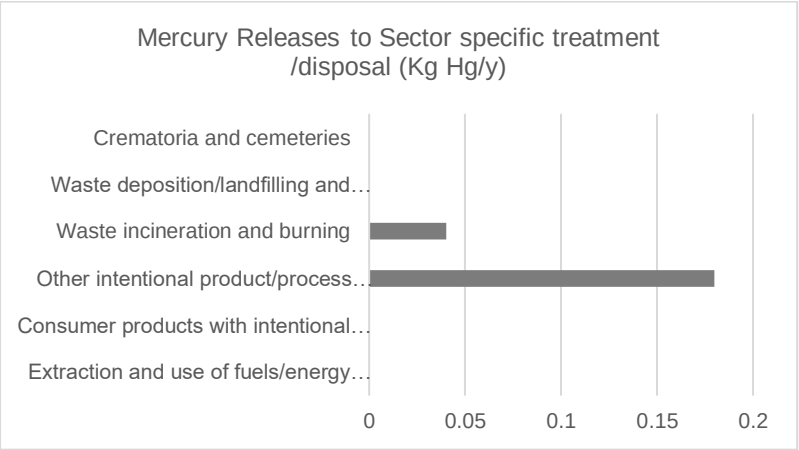

Other intentional products/process uses which include dental amalgam and manometers and gauges, was found to be the primary source of mercury releases to by-products and impurities.

*Figure 7: Mercury Releases to By-products and Impurities Output Pathway from Present Mercury Source Categories*




Consumer Products with mercury was found to contribute the most to general waste releases at 1.54 Kg Hg/y followed by 0.3 Kg Hg/y from Other intentional products/process use.

*Figure 8: Mercury Releases to General Waste Output Pathway from Present Mercury Source Categories*




Other intentional product/process uses was found to be responsible for 0.18 Kg Hg/y being released to sector-specific treatment/disposal pathways.

*Figure 9: Mercury Releases to Sector Specific Treatment/Disposal Output Pathway from Present Mercury Source Categories*

*Table 6: Summary of mercury releases in RMI for 2021*

| Source category | Calculated Hg output, Kg/y | | | | | |
|---|---|---|---|---|---|---|
| | Air | Water | Land | By-products and impurities | General waste | Sector specific treatment/ disposal |
| **Extraction and use of fuels/energy sources** | | | | | | |
| **Mineral oils - extraction, refining and use** | 0.31 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Consumer products with intentional use of mercury** | | | | | | |
| **Thermometers with mercury** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Electrical switches and relays with mercury** | 1.50 | 0.00 | 2.00 | 0.00 | 1.50 | 0.00 |
| **Light sources with mercury** | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 | 0.00 |
| **Batteries with mercury** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Cosmetics and related products with mercury** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Other intentional product/process use** | | | | | | |
| **Dental mercury-amalgam fillings** | 0.02 | 0.41 | 0.08 | 0.06 | 0.18 | 0.18 |
| **Manometers and gauges with mercury** | 0.02 | 0.06 | 0.00 | 0.00 | 0.13 | 0.00 |
| **Waste incineration[*3]** | | | | | | |
| **Incineration of medical waste** | 0.40 | 0.00 | 0.00 | 0.00 | 0.00 | 0.04 |
| **Informal waste burning** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Waste deposition/landfilling and wastewater treatment** | | | | | | |
| **Controlled landfills/deposits[*3]** | 0.20 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Informal dumping of general waste[*1*3]** | 0.69 | 0.69 | 5.54 | 0.00 | 0.00 | 0.00 |
| **Waste water system/treatment[*2]** | 0.00 | 9.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Crematoria and cemeteries** | | | | | | |
| **Cemeteries** | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 | 0.00 |
| **SUM OF QUANTIFIED INPUTS AND RELEASES [*1*2*3*4]** | **3.13** | **1.17** | **2.17** | **0.06** | **2.00** | **0.22** |

***Notes**:*

**1: 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.*

**2: The estimated release to water include mercury amounts which have also been accounted for under each source category. To avoid double counting release to water from wastewater system/treatment have been subtracted automatically in the TOTALS.*

**3: To avoid double counting of mercury inputs from waste and products in the input TOTAL, only 10% of the mercury input to waste incineration sources, 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 this Toolkit.*

**4 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.*

While the estimated mercury inputs from wastewater system/treatment and informal dumping of waste were determined to be 9.00 Kg Hg/y and 6.93 Kg Hg/y respectively, these included the mercury released from other categories such as from the disposal of consumer products with mercury. In order to estimate overall releases, the Toolkit implemented measures to address double-counting from the waste categories. Total mercury releases in RMI in 2021 were therefore estimated to be 8.76 Kg Hg/y.

The following sub-categories were estimated to be the top sources of mercury releases once double-counting for releases from the waste categories were subtracted:

1. Electrical switches and relays with mercury (5.00 Kg Hg/y)
2. Dental mercury-amalgam fillings (0.92 Kg Hg/y)
3. Wastewater system/treatment (0.90 Kg Hg/y)
4. Manometers and gauges with mercury (0.21 Kg Hg/y)

### 2.1.4 Summary of Mercury Stockpiles, Supply and Trade

The Minamata Convention on Mercury outlines the obligations of Parties in terms of managing mercury supply sources and trade in Article 3. The provisions of the article refer to restrictions for the Party's territory regarding:

- Primary mercury mining;
- Individual stocks of mercury or mercury compounds exceeding 50 metric tons;
- Sources of mercury supply generating stocks exceeding 10 metric tons per year; and
- The import and export of mercury under circumstances described within the article.

If any such stockpiles are identified, Article 10 of the Convention regarding environmentally sound interim storage of mercury, other than waste mercury, would also apply.

There are no industries in RMI, which generate or use mercury as described by the Convention. Therefore, there are no such stockpiles in the country and no supply and trade in this regard.

## 2.2 Data and Inventory on Extraction and Use of Fuels/Energy Sources

### 2.2.1 Use of Mineral Oils

Through the extraction, refining and use of various fuels, small amounts of mercury impurities which may be naturally present, can be released into the environment. In RMI, no extraction or refining of fuel sources occurs but fuels such as diesel, gasoline and aviation fuel are imported for electricity generation and transportation purposes.

When oil products are combusted, mercury is primarily emitted to the air. Mercury concentrations in oils vary widely based on their source geology and in order to estimate potential releases in the Toolkit, globally available data on mercury concentrations in oils assessed over the years was analysed.

**Data Collection and Assessment**

Data for use of mineral oils was obtained from interviews with representatives of the Marshall Island Energy Company (MEC) and from RMI- Customs 2022 data provided as summarised in Table 7.

MEC is the main state-owned energy sector enterprise and provides the majority of fuel for the country. Approximately 60% of diesel (15 parts per million sulfur content) imported by MEC is retailed (assumed for transport and other uses) while the remaining 40% is used internally (assumed for power generation). The small diesel-powered powerplant has no additional emission stack filters. Gasoline and LPG (Liquified Petroleum Gas) are also imported by MEC for mainly retail purposes. A private sector company also operates in RMI that controls the import and sale of jet fuel. 2022 import data for this company was provided by RMI-Customs for data entry.

For input into the Toolkit, these values were converted to tonnes per year (t/y) using the Unit Conversion tab in the UNEP Toolkit and the following conversions[2].

- 1 gallon [U.S.] of kerosene type jet fuel to tonne of oil equivalent = 0.00340 tonne of oil equivalent
- 1 gallon [U.S.] of automotive gasoline to tonne of oil equivalent = 0.00315 tonne of oil equivalent
- 1 gallon [U.S.] of diesel oil to tonne of oil equivalent = 0.00300 tonne of oil equivalent.

*Table 7: Summary of Estimated Imports of Fuels in 2022 Converted to tonnes/year*.

| Data Source | Type of Fuel | Estimated Use of Fuels per year (unit provided) | Estimated Use of Fuels (tonnes/year) |
|---|---|---|---|
| **MEC** | Diesel | 30,000 barrels/month | 48,257.4 |
| | Gasoline | 72,000 gallons/year | 8,480.6 |
| | LPG | 24,000 pounds/1.5 months | 96.0 |
| **RMI-Customs (for private fuel company)** | Diesel | 1,228,859 gallons/year | 12,262.0 |
| | Gasoline | 350,155 gallons/year | 38,698.0 |
| | Jet Fuel | 1,402,481 gallons/year | 47,666.0 |

Table 8 summarises the mercury inputs and releases to RMI from the extraction and use of mineral oils and natural gas. The input factors and output distribution factors used to estimate mercury releases were obtained from the Toolkit.

[2] Conversion factors found at: https://www.convertunits.com/from/gallon/to/tonne+of+oil+equivalent

*Table 8: Analysis of mercury inputs and outputs from the use of mineral oils*

| Use of Mineral Oils | Unit | Transportation and other uses | Other Oil Combustion Facilities (Powerplant) |
|---|---|---|---|
| **Activity rate** | t/y | 136,157 | 19,303 |
| Input factor for phase | mg Hg/t | 2.00 | 2.00 |
| **Calculated input to phase** | **Kg Hg/y** | **0.27** | **0.04** |
| **Output distribution factors for phase:** | | | |
| - Air | N/A | 1.00 | 1.00 |
| - Water | N/A | - | - |
| - Land | N/A | - | - |
| - Products | N/A | - | - |
| - General waste treatment | N/A | - | - |
| - Sector specific waste treatment | N/A | - | - |
| **Calculated outputs/releases to:** | | | |
| - Air | Kg Hg/y | 0.27 | 0.04 |
| - Water | Kg Hg/y | - | - |
| - Land | Kg Hg/y | - | - |
| - Products | Kg Hg/y | - | - |
| - General waste treatment | Kg Hg/y | - | - |
| - Sector specific waste treatment | Kg Hg/y | - | - |

Specific mercury content data was not available for any of the fuel sources obtained for the inventory. The recommended input factor provided in the Toolkit was used for calculations.

## 2.3 Data and Inventory on Consumer Products with Intentional Use of Mercury

Mercury has been added intentionally in several consumer products over the years due to its useful properties such as its high density and low vapour pressure. At each stage of the lifecycle of a product, mercury may be released due to the type of manufacturing processes used, handling procedures and disposal methods (UNEP, 2019a). In recent years, global trends have indicated that production and use of mercury-added products has greatly reduced due to more awareness of the dangers posed by mercury and technological advancements that have made mercury-free alternatives more accessible. While mercury releases from production and use are expected to be reduced, releases from the disposal of products over the years is also a factor considered in the Toolkit. Disposal of the products after use may occur directly to soil through landfills and informal dumping sites, to the air via waste incineration and informal burning, and to water through wastewater treatment, landfill leachate and runoff, according to the types and efficiency of waste collection and handling procedures implemented (UNEP, 2019a).

In RMI, no production of products containing mercury occurs. However, items may be imported, used and disposed of locally.

### 2.3.1 Use and Disposal of Thermometers

Mercury has been used in thermometers due to its various properties such as a high boiling point and high coefficient of expansion (UNEP, 2019a). Since the mercury in thermometers is contained within a sealed containment, it does not pose any risk during use. However, once

broken or cracked, the mercury contained within can be emitted to the air as vapours or released to the land and to water (UNEP, 2019a).

**Data Collection and Assessment**

In the past ten (10) years, mercury-free digital thermometers have become more common on the global and national market. Additionally, due to the onset of the COVID-19 pandemic in 2020, mercury-free contactless infrared thermometers were promoted. Observations made in RMI reflected the global trend towards mercury-free thermometer varieties. While confirmation of the complete phase-out of mercury-added thermometers could not be confirmed at the time of the inventory development, it was assumed that mercury releases from this source would be due to mercury added thermometers disposed of over the past 10 – 20 years. Based on population size, it was assumed that these releases would be negligible, as specific data to confirm numbers of thermometers within the country was unavailable.

### 2.3.2 Use and Disposal of Electrical Switches and Relays

Mercury has been used in some switches and relays, generally found in various electronic equipment due to its high density, conductivity, and sensitivity to temperature (UNEP, 2019a). Over the past twenty (20) years, mercury-free alternatives have become more common on the market (examples shown in Table 9). However, due to the long service life of mercury switches and relays (ranging from 10-50 years, primarily based on the life span of the equipment in which the switch or relay is contained), mercury from these items is expected to be present in wastes for many years despite the use of alternative products.

*Table 9: Mercury-added Electrical Switches and Relays and their Alternatives (IMERC, 2014; IMERC, 2018).*

| Potentially Mercury-added Component or Product | Mercury-free Alternative(s) |
|---|---|
| Float switch | Mechanical, magnetic dry reed, optical, conductivity, metallic ball, sonic or ultrasonic, pressure transmitter, alloy, thermal, and capacitance float switches |
| Tilt switch | Metallic ball, electrolytic, mechanical, solid-state, and capacitance tilt switches; potentiometers |
| Pressure switch | Mechanical or solid-state switches |
| Temperature switch | |
| Mercury displacement relay | Dry magnetic reed, electro-mechanical, and solid-state relays; silicon-controlled rectifiers |
| Mercury wetted reed relay | |
| Mercury contact relay | |
| Flame sensor | Electronic ignition systems |
| Mercury thermostat | Electromechanical Thermostats (e.g., reed switch, snap-switch etc.); Digital Thermostat (electronic programmable) |

### Data Collection and Assessment

As electrical switches and relays are typically found as components of larger products, determining quantities that are in use in a country and their mercury content is extremely difficult. Default Toolkit calculations were used to estimate mercury input to society and output from this category. The calculations utilized the number of inhabitants and the percent electrification rate from 2002 (20 years ago) to give a more accurate estimation of the historical consumption and 2022 disposal rates. Table 10 details the factors used to estimate mercury releases to various output pathways from the use and disposal of mercury-added electrical switches and relays.

*Table 10: Analysis of mercury inputs and outputs from the historical use and disposal of mercury-added electrical switches and relays.*

| Electrical Switches and Relays with Mercury | Unit | Use and Disposal of Electrical Switches and Relays |
|---|---|---|
| **Activity rate** | inhabitants (2002) | 52,368 |
| Input factor for phase | Percent of population with access to electricity (2002) | 71.4 |
| | g Hg/y*inhabitant | 0.14 |
| **Calculated input to phase (no separate collection. Informal waste handling)** | **Kg Hg/y** | **5.00** |
| **Output distribution factors for phase:** | | |
| - Air | N/A | 0.3 |
| - Water | - | - |
| - Land | N/A | 0.4 |
| - Products | - | - |
| - General waste treatment | N/A | 0.3 |
| - Sector specific waste treatment | - | - |
| **Calculated outputs/releases to:** | | |
| - Air | Kg Hg/y | 1.50 |
| - Water | Kg Hg/y | - |
| - Land | Kg Hg/y | 2.00 |
| - Products | - | - |
| - General waste treatment | Kg Hg/y | 1.50 |
| - Sector specific waste treatment | - | - |

## 2.3.3 Use and Disposal of Light Sources

Mercury has been used in various discharge lamps including linear fluorescent tubes (LFLs), compact fluorescent lamps (CFLs), mercury vapour lamps, high-pressure sodium lamps and metal halide lamps. CFLs and LFLs are typically used for general lighting in residences and buildings, while high-pressure sodium lamps and metal halide lamps can be used in streetlights and lights utilized in stadiums. The amount of mercury contained in these light sources vary

and depend on the type of bulb. While mercury-free Light Emitting Diode (LED) bulbs have become more popular in recent years, mercury added lighting devices are still found in stock globally.

Mercury is not considered a threat to the environment when it is contained within the glass tube of the bulbs. However, when lighting devices are broken accidentally or through disposal, mercury can be released into the environment (UNEP, 2019a).

Lighting products containing mercury are not produced in RMI, however, they are imported.

**Data Collection and Assessment**

Import data on lighting devices being imported over the past five (5) years was not available at the time of the inventory.

Site visits to two (2) major supermarkets and 2 major hardware stores in Majuro, RMI were conducted and it was found that mercury-free LED single-ended and linear bulbs were the predominant types found, although CFLs and LFLs were noted at one (1) major hardware store and 1 supermarket. Most lighting fixtures sold were LED-compliant.

It was also noted that the costs of CFLs versus their LED alternatives were comparable (US $20.49 4-pack 75W LED and US $20.49 - $21.99 for 4-pack 60W CFLs) which may further aid in consumers making the switch to mercury-free LEDs.

In terms of High Intensity Discharge Lamps (HIDLs), LED and LED-compliant lighting fixtures appeared to be the predominant types available. Halogen bulbs were also noted for larger lighting fixtures. Based on this observation, the number of mercury-added metal halide lamps were assumed to be negligible.

In order to estimate the number of CFLs and LFLs sold in 2022 for entry in the Toolkit, assumptions based on population data and retail store observations were made as detailed in Table 11.

*Table 11: Assumptions made in Data used for Input in Toolkit to Estimate Mercury Releases for Lighting Products*

| Toolkit Source Category for Lighting Products | Estimated Number of Items Sold in 2021 | Assumptions made |
|---|---|---|
| Fluorescent Tubes (double ended) | 3,640 | The number of private households in 2021 was estimated to be 7,123 and the number of public households (institutions) was estimated to be 78 (Pacific Community and the Marshall Islands Economic Policy, Planning and Statistics Office, 2022).<br><br>Assuming a 99.2% electrification rate, it was estimated that the average household purchases 2 double-ended lighting devices per year and the average public household purchases 4 double-ended lighting devices per year. |

| Toolkit Source Category for Lighting Products | Estimated Number of Items Sold in 2021 | Assumptions made |
|---|---|---|
| | | As LFLs were observed in smaller quantities at retail stores in Majuro, it was assumed that 25% of double-ended lighting devices purchased per household were LFLs.<br><br>This resulted in the estimation that (0.5 x 7,123) + (1 x 78) LFLs were purchased in 2021. |
| Compact Fluorescent Lamp (CFL single end) | 2,912 | The estimation that there were 7,123 private households and 78 public households (institutions) in 2021 was also applied to estimate the number of single-ended bulbs purchased in 2021.<br><br>It was assumed that 2 single-ended bulbs were used in private households per year and 4 single-ended bulbs were used in public institutions.<br><br>As CFLs were observed in lower quantities than their LED replacements at retail stores in Majuro, it was assumed that 20% of single-ended lighting devices purchased per household were CFLs.<br><br>This resulted in [20% x (2 x 7,123) + 20% x (4 x 78)] CFLs estimated to be purchased in 2021. |
| HIDLs (includes High pressure sodium lamps and Metal Halide Lamps) | 0 | Observations at Majuro retail stores found mainly LED alternatives and LED compliant lighting fixtures for these products as well as halogen varieties. The number of mercury added HIDLs was assumed to be negligible. |
| Note: Overall assumption that observations made in the four (4) retail stores in Majuro would be representative of the rest of the country. | | |

Table 12 summarises the mercury inputs and releases to RMI from the estimated number of mercury added lighting devices sold in 2021. The input factors and output distribution factors used to estimate mercury releases were obtained from the Toolkit.

*Table 12: Analysis of mercury inputs and outputs from the use and disposal of lighting devices*

| Use and Disposal of Lighting Devices | Unit | LFLs | CFLs |
|---|---|---|---|
| **Activity rate** | items/y | 3,640 | 2,912 |
| Input factor for phase | mg Hg/t | 8.00 | 2.70 |
| **Calculated input to phase** | **Kg Hg/y** | **0.03** | **0.01** |
| | | **0.04** | |
| **Output distribution factors for phase *(No separate collection; Waste Handling Controlled)*:** | | | |
| - Air | N/A | 0.05 | |
| - Water | N/A | - | |
| - Land | N/A | - | |
| - Products | N/A | - | |
| - General waste treatment | N/A | 0.95 | |
| - Sector specific waste treatment | N/A | - | |

| Use and Disposal of Lighting Devices | Unit | LFLs | CFLs |
|---|---|---|---|
| **Calculated outputs/releases to:** | | | |
| - Air | Kg Hg/y | 0.00 | |
| - Water | Kg Hg/y | - | |
| - Land | Kg Hg/y | - | |
| - Products | Kg Hg/y | - | |
| - General waste treatment | Kg Hg/y | 0.04 | |
| - Sector specific waste treatment | Kg Hg/y | - | |

### 2.3.4 Use and Disposal of Batteries

Mercury has been used in various types of batteries such as primary, non-rechargeable batteries which contain mercury include mercury oxide batteries, some cylindrical alkaline batteries, and some button cell batteries (alkaline, zinc/air, silver oxide) over the years. Mercury concentrations have ranged greatly amongst different types of batteries from less than 1% wet weight (w/w) to 30-32% w/w. Once intact, mercury added batteries do not pose a threat to human health or the environment while in use but become a hazard when the batteries are damaged or disposed of.

As of 2019, global market data on mercury-added batteries found that many well-known global battery suppliers only supply mercury-free batteries. Furthermore, as of January 2021, China prohibited the manufacturing and import of mercury-added batteries except for the types still allowed under the Minamata Convention (UNEP, 2019b).

In RMI, batteries are imported for use in various equipment and applications. There is no separate collection of batteries for disposal.

**Data Collection and Assessment**

Data on the imports of mercury-added batteries over the past 5 years was unavailable at the time of the inventory. Site visits to local hardware and retail stores located in Majuro were made to observe the types of batteries sold. Popular brands observed included:

- *MaxLife* brand of batteries which had labelling to state, “0% cadmium/mercury” and,
- *Fuji Novel* brand which also had a “Mercury Free” labelling.

Other brands observed included Duracell, Energizer and Ace. While these products did not have labelling to confirm the absence or presence of mercury, further research indicated that Duracell and Energizer have stated that all of their batteries manufactured after 2019 are mercury-free. The Ace brand is based in the USA with manufacturing in China. Based on China’s prohibition of the manufacturing of mercury-added batteries since 2021, it was assumed that batteries manufactured by these brands are also mercury-free.

As there is no separate collection of these types of batteries for end-of-life disposal, mercury releases to general waste are expected for mercury-added batteries imported, used and disposed of prior to the phase-out of mercury by the major manufacturing brands. Due to the lack of available data, mercury releases for batteries could not be quantified.

### 2.3.5 Use and Disposal of Cosmetics with mercury

For cosmetics, mercury has been used as a preservative in some cases over the years or may be present as an unintended contaminant. However, the most prevalent use of mercury in cosmetics globally has been its intentional use for the production of skin lightening products since mercury can inhibits the formation of melanin (the skin's dark brown or black pigment), thereby lightening the user's complexion (WHO, 2021b). The mercury in these products can accumulate within the body where it can cause damage to the nervous system and have adverse effects on the kidney and other organs (UNEP, 2019a).

**Data Collection and Assessment**

While the use of skin-lightening products is not anticipated to be a prevalent issue in RMI and the wider Pacific region, an increase in the import of cosmetic products from Asia has been observed by Customs in recent years. Site visits to retail shops in Majuro identified the presence of soaps labelled as "skin brightening" and "skin lightening", mainly produced in the Philippines. The presence of mercury in these products is uncertain as typically many mercury-added skin lightening products are unlabelled or mislabelled. While the presence of mercury-added skin-lightening products could not be confirmed under this assessment, samples of products available in the Pacific were collected for testing by BRI as part of a global project, GEF 10810 "Eliminating Mercury Skin Lightening Products". Findings and updates will be made available under the project's knowledge hub available at: www.unep.org/mercuryfreecosmetics.

## 2.4 Data and Inventory on Other Intentional Product/Process Use

### 2.4.1 Dental mercury-amalgam Fillings

Dental amalgam, which is a mixture of metals including mercury, is used in dental restoration procedures to fill cavities (FDA, 2017). The amalgam can be supplied to dentists in the following forms:

- Pre-capsulated dental amalgam (silver amalgam) (single-dental restoration capsules of pre-dosed amalgam)
- Powdered mercury alloy or liquid elemental mercury (requires manually taking out needed amounts and mixing).

Mercury releases from dental amalgam fillings occur to the air, water and waste during the production of amalgam at factories; when amalgam is being prepared, placed, shaped or repaired at clinics; through natural wearing away in a person's mouth; during disposal of the amalgam after it is removed; and when a person with amalgam is buried or cremated after death (UNEP, 2019a).

Under the Minamata Convention on Mercury, the manufacture, import and export of dental amalgam is not yet prohibited but a phase-down approach is outlined by which Parties should adopt at least two (2) of several suggested approaches for restricting use. Further to the recommended measures, as of 2022, Parties are obligated to, "exclude or not allow, by taking measures as appropriate, the use of mercury in bulk form by dental practitioners". The use of

pre-capsulated single-dose dental restoration capsules which have a lesser risk of mercury exposure is allowed.

As of 2022, Parties will also be expected to take appropriate measures to prevent dental amalgam use for patients under 15 years of age, and of pregnant and breastfeeding women, except when considered necessary.

**Data Collection and Assessment**

To gather information on the use of dental mercury amalgam fillings, a meeting was held with a representative from the Dental Department of the Ministry of Health and Human Services. It was noted that for dental restoration material (fillings), pre-capsulated amalgam, composite and glass ionomer cement (GIC) are used in RMI. The Dental Department in the public hospital is the sole dental operation in Majuro and was assumed to be comparatively similar to the other atolls in RMI.

It was noted that pre-capsulated dental mercury amalgam is used mainly for posterior teeth (average cost US $10.00 per filling) while composite fillings are mainly used for other teeth (average cost US $15.00 per filling). On average, it was estimated that if 5 fillings were done per day, 3 out of 5 fillings are dental mercury amalgam, however records of exact numbers of dental amalgam used were not available.

In terms of disposal, dental chair side trap screens are used, and residues are placed in red biohazard bags for disposal, typically through the medical waste incinerator.

Regarding the phase-down of dental amalgam, the representative of the Dental Department stated that dentists are generally aware of the issues associated with dental amalgam and some have decreased use but due to its use throughout the years, dentists may need to be reminded/briefed on the need to phase out its use.

In order to estimate mercury releases from dental amalgam fillings, default calculations derived from the Toolkit were used to obtain an estimate of mercury input to society. These calculations utilized the number of dentists per 1,000 inhabitants (estimated to be 0.0784 for RMI according to the Toolkit) as well as the number of inhabitants.

Population data from 2021 was used to calculate the mercury input from the preparation of dental amalgam fillings at dental clinics in RMI. Mercury input and releases occurring from the use of amalgam fillings were expected to have been from amalgam placed 10 years prior in 2012 since mercury amalgam can last between 10-20 years before needing to be replaced. Mercury input from the disposal of dental amalgam was calculated using the country's population from 20 years prior, 2002, due to the life expectancy of the fillings. Population data was sourced from the Pacific Community and the Marshall Islands Economic Policy, Planning and Statistics Office (2022) for 2021 data and from the World Bank Database (2023) for 2012 and 2002.

According to the Toolkit, the overall input of mercury to society from the preparation, placement, use and disposal of dental amalgam over the years was calculated to be approximately 0.92 Kg Hg/y once double-counting assumptions were accounted for. The

summary of estimated inputs and releases of mercury from dental amalgam is provided in Table 13.

Due to the gradual phasing out of mercury amalgam, estimated releases from this sector are expected to be reduced in further years.

*Table 13: Analysis of mercury inputs and outputs from the preparation, use and disposal of dental amalgam in 2021.*

| **Dental Mercury-Amalgam Fillings** | **Unit** | **Preparation** | **Use** | **Disposal** (In countries where only dental chair filters/strainers are used in most clinics) |
|---|---|---|---|---|
| **Activity rate** | Inhabitants | 42,418 | 56,712 | 52,368 |
| | Dentists per 1000 inhabitants | 0.0784 | 0.0784 | 0.0784 |
| Input factor for phase | g Hg/(y*inh) | 0.2 | 0.2 | 0.2 |
| **Calculated input to each phase** | **Kg Hg/y** | **0.80** | **1.07** | **0.99** |
| **Total input** | **Kg Hg/y** | **0.92** ***(once double-counting was factored in)*** | | |
| **Output distribution factors for phase:** | | | | |
| - Air | N/A | 0.02 | - | - |
| - Water | N/A | 0.14 | 0.02 | 0.28 |
| - Land | N/A | - | - | 0.08 |
| - Products | N/A | - | - | 0.06 |
| - General waste treatment | N/A | 0.12 | - | 0.08 |
| - Sector specific waste treatment | N/A | 0.12 | - | 0.08 |
| **Calculated outputs/releases to:** | | | | |
| - Air | Kg Hg/y | 0.02 | - | - |
| - Water | Kg Hg/y | 0.11 | 0.02 | 0.28 |
| - Land | Kg Hg/y | - | - | 0.08 |
| - Products | Kg Hg/y | - | - | 0.06 |
| - General waste treatment | Kg Hg/y | 0.10 | - | 0.08 |
| - Sector specific waste treatment | Kg Hg/y | 0.10 | - | 0.08 |

### 2.4.2 Use and Disposal of Manometer and Gauges

Mercury has been used in some manometers, gauges, pressure valves and other measuring devices (UNEP, 2019a) historically, as it has a non-evaporating quality under normal conditions and its high and stable density (National Programme on Technology Enhanced Learning (NPTEL), n.d.). Globally, mercury containing equipment have become less common as mercury-free alternatives are readily available.

**Data Collection and Assessment**

Specific data on the number of medical blood pressure gauges imported and used in RMI in 2021 was not obtained for this inventory due to difficulties in differentiating mercury-containing from mercury-free blood pressure gauges. In order to estimate mercury releases

from other manometers used in industry and equipment, default calculations for mercury input from the use and disposal of other manometers were used. 2021 population data and electricity rates were used in The Toolkit. It was also noted that no separate collection of manometers and gauges occurs within a controlled waste handling system.

The total input from the use and disposal of other manometers (not including medical devices) in 2021 was estimated to be 0.21 Kg Hg/y. A summary of estimated mercury releases from manometers and gauges is shown in Table 14.

*Table 14: Analysis of mercury inputs and outputs from the use and disposal of manometers and gauges with mercury*

| Manometers and Gauges with Mercury | Unit | Use and Disposal of Other Manometers |
|---|---|---|
| **Activity rate** | inhabitants | 42,418 |
| Input factor for phase | Percent of population with access to electricity | 99.2 |
| | g Hg/y*inhabitant | 0.005 |
| **Calculated input to phase** | **Kg Hg/y** | **0.21** |
| **Output distribution factors for phase:** | | |
| - Air | N/A | 0.1 |
| - Water | N/A | 0.3 |
| - Land | - | - |
| - Products | - | - |
| - General waste treatment | N/A | 0.6 |
| - Sector specific waste treatment | - | - |
| **Calculated outputs/releases to:** | | |
| - Air | Kg Hg/y | 0.02 |
| - Water | Kg Hg/y | 0.06 |
| - Land | - | - |
| - Products | - | - |
| - General waste treatment | Kg Hg/y | 0.13 |
| - Sector specific waste treatment | - | - |

## 2.5 Data and Inventory on Waste Incineration

### 2.5.1 Incineration of Medical Waste

Medical waste is any waste generated from medical activities taking place at hospitals, healthcare facilities, dental clinics, etc. and usually include human secretions, pharmaceuticals, packaging materials and various tools used in medical treatment. Incineration is usually used to destroy different toxins, pathogens and viruses contained within the waste (UNEP, 2019a).

Mercury may be released from incinerated medical products that may include medical thermometers, blood pressure gauges, dental amalgam fillings and mercury containing chemicals; it may also be released from human secretions.

## Data Collection and Assessment

In Majuro, most of the medical waste produced by Majuro Hospital is managed by a private company which operates a medical waste incinerator. Each month, a report that summarises the medical waste picked up by the private company is provided to the RMI EPA as part of the monitoring measures implemented. While the report does not provide the exact weight of waste incinerated, it indicates the number of hazardous waste (red) bags, needles boxes and other boxes collected. It is estimated that each red bag weighs on average, 2.5 pounds (lbs).

Data from the RMI EPA reports for the months of January to March 2023 indicated that 3,265 red bags were collected for that quarter. Assuming that the number of bags per quarter would be similar for every yearly quarter and that all red bags would be incinerated, it was deduced that 13,060 red bags weighing a total of 14.58 t are incinerated per year in Majuro.

For Ebeye Hospital, up to date data on the medical waste incinerated was not available at the time of the inventory development. As such, findings from a 2014 national study conducted by ENVIRON Australia Pty Ltd., "Baseline Study for the Pacific Hazardous Waste Management Project - Healthcare Waste" for SPREP were used. It was estimated that the SteriMed 70 (Shredder & Disinfector) medical waste incinerator had an average waste throughput of 3.92 t/y and it was assumed that this would be similar to the amount of medical waste incinerated in Ebeye each year since.

These estimations resulted in a total of 18.50 t of medical waste being assumed to be incinerated in RMI per year. Table 15 summarises the analysis of mercury released from medical waste incineration.

*Table 15: Analysis of mercury inputs and outputs from the incineration of medical waste*

| Incineration of Medical Waste | Unit | Incineration |
|---|---|---|
| **Activity rate** | Waste incinerated, t/y | 18.50 |
| Input factor for phase | g Hg/t waste incinerated | 24 |
| **Calculated input to phase (Particulate Matter reduced, simple ESP, or similar)** | **Kg Hg/y** | **0.44** |
| **Output distribution factors for phase:** | | |
| - Air | N/A | 0.9 |
| - Water | - | - |
| - Land | - | - |
| - Products | - | - |
| - General waste treatment | - | - |
| - Sector specific waste treatment | N/A | 0.1 |
| **Calculated outputs/releases to:** | | |
| - Air | Kg Hg/y | 0.40 |
| - Water | - | - |
| - Land | - | - |
| - Products | - | - |
| - General waste treatment | - | - |
| - Sector specific waste treatment | Kg Hg/y | 0.04 |

### 2.5.3 Open Waste Burning on Landfills and Informally

Informal/open waste burning refers to waste incineration undertaken in informal conditions such as in barrels, containers, or on bare land without emission controls (UNEP, 2019a). Mercury present in waste is released to air and incineration residue which may pollute the air, land, groundwater and surface waters (UNEP, 2019a).

**Data Collection and Assessment**

Informal burning of waste may occur throughout community areas in RMI, mainly by individuals. While no quantities of waste burnt have been recorded for the inventory development, it has been noted that mainly small amounts of green waste are burnt which may have trace amounts of mercury present that can be released to the air but in quantities that are assumed to be negligible.

## 2.6 Data and Inventory on Waste Deposition/Landfilling and Wastewater Treatment

### 2.6.1 Controlled Landfills

Controlled landfills refer to specially designated areas for waste deposition which are specially designed to prevent or reduce releases and emissions of waste components to the environment. Different types of designs for controlled landfills exist ranging from areas lined with impermeable materials such as clay or the development of leachate ponds to isolate liquid run-off to more technical engineering designs. Wastes deposited in landfills with efficient built-in measures are more effective at preventing contamination of surrounding areas with hazardous waste components including mercury (UNEP, 2019a).

Mercury in municipal waste varies typically depending on the amount of discarded, damaged or broken MAPs disposed of in the landfills (UNEP, 2019a). Mercury contained within MAPs may evaporate resulting in air emissions and small amounts of mercury may leach into waterways.

**Data Collection and Assessment**

In Majuro, the Majuro Atoll Waste Company (MAWC) collects waste for most of the island on a scheduled weekly basis for disposal at the open dump site/landfill. Citizens can also bring in waste themselves for a small gate fee. The landfill site is separated by a main road into two (2) areas. Currently no sorting or leachate management is done, however, a recycling centre is situated on site for the deposition of aluminium cans, glass bottles, PET and used lead-acid batteries. The aluminium cans and batteries are sorted for export to Korea. Green waste may also be sorted for composting at a facility located in Laura village.

Based on feedback from the MAWC General Manager, it is estimated that 34.6 tonnes of waste are deposited per day (inclusive of waste collected and waste brought in by people), resulting in an average of 12,629 t/y being estimated for Majuro.

For Ebeye, a public disposal site is located at the north end of the island and is estimated to generate approximately 7,084 t/y according to a recent Waste Audit Report for RMI produced by SPREP (2022). It was also noted that the waste produced by the US military base on the island is disposed of within the grounds of the base itself and quantities are not publicly available (SPREP, 2022).

In total, it was estimated that 19,713 t of waste are deposited at the dump sites/landfills in RMI per year.

Mercury-added product waste is not separated from general waste which is typically disposed of at public landfill/waste disposal sites across RMI. Table 16 provides a summary of the estimated mercury releases from controlled landfills/deposits for RMI. When calculations were adjusted to account for double-counting of mercury inputs due to other categories, it was determined that total releases to the environment was 0.20 Kg Hg/y released to air.

*Table 16: Analysis of mercury inputs and outputs from controlled landfills/ deposits*

| Controlled Landfills/ Deposits | Unit | Controlled Landfills |
|---|---|---|
| **Activity rate** | Waste landfilled, t/y | 19,713 |
| Input factor for phase | g Hg/t waste | 1 |
| **Calculated input to phase** | **Kg Hg/y** | **20.00** |
| **Output distribution factors for phase:** | | |
| - Air | N/A | 0.01 |
| - Water | N/A | 0.0001 |
| - Land | - | - |
| - Products | - | - |
| - General waste treatment | - | - |
| - Sector specific waste treatment | - | - |
| **Calculated outputs/releases to:** | | |
| - Air | Kg Hg/y | 0.20 |
| -Water | Kg Hg/y | 0.00 |
| - Land | - | - |
| - Products | - | - |
| - General waste treatment | - | - |
| - Sector specific waste treatment | - | - |

### 2.6.2 Informal Dumping of General Waste

Informal dumping refers to the disposal of general waste in areas that are not specifically designated for waste and are without any safeguards to prevent the release of pollutants into the environment (UNEP, 2019a). Waste may consist of residential, green and construction waste which may have trace amounts of mercury present in materials or through the disposal of MAPs.

**Data Collection and Assessment**

Informal dumping of waste has been noted to take place in community areas in RMI. The volumes of waste dumped was not available. As such, assumptions were made to estimate quantities for entry in the Toolkit.

According to SPREP (2022), 74% of the population reside in urban clusters in Majuro and Ebeye. It is assumed that this percentage of the population disposes of their waste at the public landfill sites in each island (amounting to 19,713 t/y) and the remaining 26% of the population dispose of their waste through informal dumping. It was then estimated that 6,926 t of waste are informally dumped per year. Analysis of mercury inputs and outputs estimated for this sector is provided in Table 17.

*Table 17: Analysis of mercury inputs and outputs from the informal dumping of general waste*

| Informal Dumping of General Waste | Unit | Informally Dumped |
|---|---|---|
| **Activity rate** | Waste dumped, t/y | 6,926 |
| Input factor for phase | g Hg/t waste | 1 |
| **Calculated input to phase** | **Kg Hg/y** | **6.93** |
| **Output distribution factors for phase:** | | |
| - Air | N/A | 0.1 |
| - Water | N/A | 0.1 |
| - Land | N/A | 0.8 |
| - Products | - | - |
| - General waste treatment | - | - |
| - Sector specific waste treatment | - | - |
| **Calculated outputs/releases to:** | | |
| - Air | Kg Hg/y | 0.69 |
| -Water | Kg Hg/y | 0.69 |
| - Land | Kg Hg/y | 5.54 |
| - Products | - | - |
| - General waste treatment | - | - |
| - Sector specific waste treatment | - | - |

### 2.6.3 Wastewater System/Treatment

Wastewater systems or treatment process are considered to be an intermediate mercury release pathways for mercury that may have originated from MAPs such as dental amalgam that may have been entered waterways through preparation or disposal or from other MAPs such as broken thermometers and other devices or industrial discharges. Atmospheric mercury, originating from both natural and anthropogenic sources may also enter wastewater when washed out by precipitation which makes its way into soil, surface and ground water (UNEP, 2019a).

Depending on the type of wastewater treatment, mercury content and distribution will vary as it may be released into waterways after treatment, distributed through sludge as fertiliser on land or as waste deposited at a landfill (UNEP, 2019a).

**Data Collection and Assessment**

For data collection on wastewater systems, a meeting was held with the General Manager of the Majuro Water and Sewer Company Inc. (MWSC) which currently deals with wastewater system management and water treatment plants in Majuro. It was noted that there is currently

no treatment of wastewater as the majority for the main business/residential areas of Majuro is collected and disposed of as raw sewage through an outfall system directly into the sea.

The outfall system in Majuro has been broken for approximately 20 years which resulted in raw sewage being released directly into the sea in a coral reef area. Though attempts have been made to prevent fishing in that area, communities still do. Funding has been provided by the USDA to begin developing a treatment/management plan. International consultants have conducted several assessments and the design phase for the wastewater treatment is expected to begin in August 2023.

It was estimated that approximately 1 million gallons of raw sewage is released per day (365 million gallons/y). The sewage system operates for approximately 25% of the Majuro population (mainly business, laundromats, hotels etc.). The rest of households use mainly septic tanks which is also the case for the other islands in RMI.

Converting gallons to $m^3$, the estimated wastewater released through the outfall system is Majuro was found to be 1,659,323.58 $m^3$/y. This value was entered into the Toolkit noting that it accounted for 25% of the population. The amount of wastewater generated by septic tanks for the assumed remaining 75% of the population could not be quantified at the time of the inventory. Results are shown in Table 18 below.

*Table 18: Analysis of mercury inputs and outputs for wastewater system/treatment*

| **Wastewater System/ Treatment** | **Unit** | **Wastewater** (No treatment; direct release from sewage pipe) |
|---|---|---|
| **Activity rate** | Wastewater, $m^3$/y | 1659323.58 |
| Input factor for phase | mg Hg/$m^3$ wastewater | 5.25 |
| **Calculated input to phase** | **Kg Hg/y** | **9.00** |
| **Output distribution factors for phase:** | | |
| - Air | - | - |
| - Water | N/A | 1.00 |
| - Land | - | - |
| - Products | - | - |
| - General waste treatment | - | - |
| - Sector specific waste treatment | - | - |
| **Calculated outputs/releases to:** | | |
| - Air | - | - |
| -Water | Kg Hg/y | 9.00 |
| - Land | - | - |
| - Products | - | - |
| - General waste treatment | - | - |
| - Sector specific waste treatment | - | - |

## 2.7 Data and Inventory on Crematoria and Cemeteries

Mercury can accumulate in humans through the use of dental amalgam, exposure to mercury contained in products and intentionally used in processes, and consumption of mercury contaminated aquatic species. This mercury may be released after death when a corpse is cremated or buried.

### 2.7.1 Crematoria

During cremation, mercury in human corpses may be released to the air or in cremation ash/residue depending on the process used.

**Data Collection and Assessment**

The medical waste incinerator for Majuro Hospital, which is managed by a private company, also has the capacity to cremate bodies. Based on the monitoring reports provided to the RMI EPA, the incinerator has not been used recently for any cremations.

### 2.7.1 Cemeteries

During decomposition, mercury in human corpses can be released into the soil in cemeteries. Mercury in corpses were typically estimated to be due to dental amalgam releases.

**Data Collection and Assessment**

Across RMI, cemeteries are located typically within communities. The number of deaths estimated in 2021 was used for entry in the Toolkit, as it was the most available year available via: https://www.globaldata.com/data-insights/macroeconomic/the-total-deaths-in-marshall-islands-240759/. Estimated mercury releases from burials are shown in Table 19.

*Table 19: Analysis of mercury inputs and outputs from cemeteries*

| Cemeteries | Unit | Cemeteries |
|---|---|---|
| **Activity rate** | Corpses buried/y | 253 |
| Input factor for phase | g Hg/corpse | 4 |
| Adjustment for dental personnel density as amalgam is the major contributor to Hg in the human body | Dentist per 1000 inhabitants, country | 0.0784 |
| **Calculated input to phase** | **Kg Hg/y** | **0.10** |
| **Output distribution factors for phase:** | | |
| - Air | - | - |
| - Water | - | - |
| - Land | N/A | 1 |
| - Products | - | - |
| - General waste treatment | - | - |
| - Sector specific waste treatment | - | - |
| **Calculated outputs/releases to:** | | |
| - Air | - | - |
| -Water | - | - |
| - Land | Kg Hg/y | 0.10 |
| - Products | - | - |
| - General waste treatment | - | - |
| - Sector specific waste treatment | - | - |

## 2.8 Stocks of Mercury and/or Mercury Compounds and Storage Conditions

As per Article 3, Part 1 of the Minamata Convention on Mercury, "mercury" and "mercury containing compounds" refer to mixtures of mercury with other substances, mercury (I) chloride, mercury (II) oxide, mercury (II) sulphate, mercury (II) nitrate, cinnabar and mercury sulphide.

Article 3, Part 5a states that each Party shall endeavour to identify individual stocks of mercury or mercury compounds (not including MAPs) over 50 metric tonnes. If any such stocks are identified, Article 10 of the Convention regarding environmentally sound interim storage of mercury, other than waste mercury, would also apply.

RMI does not currently have any notable stocks of mercury and/or mercury compounds as no significant activities occur that would require such stocks.

## 2.9 Supply and Trade of Mercury and Mercury Containing Compounds Including Sources, Recycling Activities and Quantities

Article 3 of the Minamata Convention also lists provisions for Parties to regulate the supply, export and disposal of mercury and mercury containing compounds. Part 5a states that each Party shall endeavor to identify sources of mercury supply generating stocks exceeding 10 metric tonnes per year, that are located within its territory.

Based on the inventory, it was determined that no significant sources, trade, or recycling of mercury and/or mercury compounds are present in RMI, and therefore the interim storage provisions outlined in Article 10 of the Minamata Convention are not currently applicable to RMI.

## 2.10 Identification of Hot Spots of Mercury Contamination (Contaminated Sites)

Article 12 of the Minamata Convention on Mercury states that Parties should "develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds". Risk reduction activities should be conducted using environmentally sound measures and should incorporate an assessment of the risks to human and environmental health from present mercury or mercury compounds. Hot spots of mercury contamination exist as the direct result of the use and release of mercury in processes leading to on-site deposition, as well as the inadequate disposal of mercury-contaminated materials. Previous deposits of mercury may still have the potential to release significant amounts of mercury and pose a risk to human health and the environment. Potential hot spots may include reservoirs where mercury containing materials have been stored, dumped or accumulated over many years.

Table 20 indicates potential sites that may be sources of mercury contamination. Figure 10 shows a map of Majuro, RMI where tracking of the locations of potentially mercury contaminated sites was initiated. Further geospatial data on the other islands of RMI is recommended to provide a clearer indication of potential sites of interest for the country as a whole.

*Table 20: Potentially contaminated sites for further analysis.*

| Potentially Contaminated Site | Description |
|---|---|
| Landfills | In Majuro, the main landfill is located along the coast of the island. Mercury-added products are not disposed of separately and therefore, result in mercury deposited at these sites. |
| Hospital | Medical waste generated at hospitals is potentially contaminated with mercury. On-site waste storage areas and wastewater may be sources of mercury contamination. |
| Medical Waste Incinerator | When disposed of or incinerated, mercury contained within equipment or dental amalgam, may be released to the environment. A medical waste incinerator is operated by a private company off-site from the main hospital in Majuro. |
| Sewage outflow | Wastewater can contain mercury waste from a variety of sources, including intentional use in products or processes Wastewater can contain mercury waste from a variety of sources, including intentional use in products or processes. In Majuro, raw sewage is disposed of through an outfall system directly into the sea. |
| Power plant and fuels | Fossil fuels naturally have small amounts of mercury that can be released during incineration or accumulate slowly through time. In Majuro, the operational power plant is mainly powered by diesel. |
| Crematorium | Upon cremation, mercury present in bodies may be released to the atmosphere. While the presence of a crematorium has been noted, it is not commonly used. |

Mercury inputs to the environment do not always directly correlate with mercury levels in biota and humans. Once in the environment, mercury can be converted into its more toxic and bioavailable form, methylmercury, by communities of iron- and sulphur- reducing bacteria. Methylmercury can bioaccumulate in individual organisms through time and biomagnify up trophic levels. A suite of factors impacts the potential of a particular system to methylate mercury depending on how favourable conditions are for the bacterial communities to methylate mercury.

For example, the wet-dry cycle associated with wetlands and mangroves or the ability of forest canopies to scavenge mercury from the air make them ecosystems particularly sensitive to mercury inputs. Sensitive systems may exhibit high concentration and effects of mercury in biota despite low to moderate mercury inputs, while conversely, areas with low methylation potential may exhibit little mercury impact despite high inputs. As a result, it is important to understand the spatial context of potentially mercury contaminated sites to inform the threat from mercury contamination in the environment.

Further research on the spatial distribution of potentially contaminated sites in relation to ecosystem characteristics that increase the methylation potential of mercury inputs should be conducted to inform locations prioritized for further study on the threat from mercury on human health and the environment and for future use in evaluating the effectiveness of the Minamata Convention. Additionally, these – and any additional – potentially contaminated sites should be verified by the relevant national authorities.




*Figure 10: Map indicating potentially mercury contaminated sites in Majuro, RMI.*

## 2.11 Impact of Mercury on Human Health and the Environment[3]

Elemental mercury, which is found in manufactured products, is not necessarily toxic to humans. Exceptions may include dental amalgam and cosmetics, the effects of which are further detailed in Chapter 4 of this report.

Methylmercury, the organic form of mercury, is toxic to humans because it can biomagnify in food webs and bioaccumulate over time in organisms. A neurotoxin, methylmercury can cause physiological harm and behavioural disorders in people. Fish from the sea or freshwater systems can be a major source of methylmercury. In general, fish species that are small, short-lived, and forage low in the food web contain less methylmercury, while predatory species that are long-lived and grow larger can contain higher levels of methylmercury. Many of the fish available in the Pacific are safe to eat, although more information is needed about the mercury concentrations to better characterize how mercury is distributed in different species of fish in the waterscape of Pacific nations.

[3] Section contains extracts from "State of Mercury in the Pacific Region" (BRI, 2023).

Studies have shown that high mercury concentrations in fish (measured in methylmercury) can have negative impacts on fish growth, behaviour, and reproduction. Consequently, fish-eating wildlife are shown to have decreased reproductive success when methylmercury concentrations in fish are high. As a neurotoxin, methylmercury can also have negative effects on behaviour such as foraging or nest protection. The process of methylation, the conversion of elemental mercury to organic methylmercury, varies widely on the landscape and within the waterscape.

Areas that are particularly sensitive to mercury deposition—where methylation rates are highest and biomagnification in the food web is greatest, and where animals experience significant reproductive harm—are called biological mercury hotspots. These areas generally represent aquatic ecosystems or have an aquatic connection within the food web.

Aquatic ecosystems, either marine (e.g., beaches and coral reefs) or freshwater (e.g., lakes and rivers), are often prime areas for high methylation rates. Fish and wildlife predators that live in rivers and lakes, or that forage in a food web associated with these habitats (e.g., mangroves), often contain elevated mercury levels. The combination of high methylation rates and longer-lived animals higher in the food web creates the greatest risk of adverse effects.

Habitats at the greatest risk of mercury methylation include wetlands, mangroves, and aquatic habitats near contaminated sites (such as landfills). Wildlife at greatest risk of mercury contamination (besides fish species) include Albatrosses, Cormorants, Frigatebirds, Petrels, Shearwaters and Tern.

BRI, in collaboration with other entities under the Minamata Convention on Mercury, is working on several fronts to conduct and promote mercury biomonitoring across the globe. Biomonitoring is the process of assessing the health of organisms and ecosystems and tracking changes in mercury risk and exposure over time. Monitoring mercury exposure to humans will help the global community to meet the requirements of the Minamata Convention on Mercury and will also help identify global biological hotspots that represent elevated levels of mercury exposure that may pose serious threats to both ecosystem and human health.

In RMI, fish such as skipjack tuna and yellowfin tuna are exported for consumption. As such, the Marshall Islands Marine Resources Authority (MIMRA) monitors exports by collecting samples of fish from local processing plants for analysis by registered laboratories overseas. Samples are analysed for mercury among other metals, persistent organic pollutants, and other potential contaminants for quality assurance. MIMRA is also currently building the capacity for in-country laboratory testing through several funded partnerships including with the Secretariat of Pacific Communities and the University of the South Pacific.

# Chapter 3 Policy, Regulatory and Institutional Framework Assessment

## 3.1 Regulatory Obligations Under the Minamata Convention on Mercury

The Minamata Convention on Mercury consists of 35 Articles with 5 supporting Annexes.

General areas of focus include control measures for mercury management, support mechanisms in place for Parties and administrative notes that refer to the functioning of the Minamata Convention itself.

Articles 1 and 2 state the overall objective of the Minamata Convention and relevant definitions outlined in its text. Table 21 provides an overall summary of the Articles of the Convention that are related to Party obligations and indicate their relevance to RMI for further discussion in this Chapter.

*Table 21: Summary of the Articles of the Minamata Convention on Mercury in relation to their Relevance to RMI*

| Article | Brief Description of Article | Relevance to RMI |
|---|---|---|
| Article 3 Mercury Supply, Source and Trade | Parties are obligated to control primary mercury mining activities and individual stocks of mercury or mercury compounds exceeding 50 metric tons, as well as sources of mercury supply generating stocks exceeding 10 metric tons per year within a territory. | Not relevant to RMI as no primary mercury mining occurs and no stocks of relevant quantities exist as stated. |
| **Article 4 Mercury-added products** | Parties are obligated to phase-out the manufacture, import and export of certain mercury-added products listed in Annex A Part I of the Convention. Under Annex A Part II, phase-down obligations for dental amalgam fillings are detailed. Following the COP-4 outcomes, further obligations for Annex A have been implemented. | While RMI does not manufacture or export mercury-added products, imports of certain MAPs are detailed in Chapter 2 of this report that must be phased out or phased down according to the Convention's obligations. |
| Article 5 Manufacturing processes in which mercury or mercury compounds are used | Parties must phase out the use of mercury or mercury compounds in manufacturing processes described in Annex B of the Convention. | Not relevant to RMI as the related manufacturing processes do not take place. |
| Article 7 Artisanal and small-scale gold mining | Parties must control the use of mercury and mercury compounds in artisanal and small-scale gold mining activities. | Not relevant to RMI as the related activities do not take place. |
| **Article 8 Emissions** | Parties must control and, where feasible, reduce emissions of mercury and | In RMI, as identified in Section 2.5 of this report, medical waste incinerators are |

| Article | Brief Description of Article | Relevance to RMI |
|---|---|---|
| | mercury compounds to the atmosphere (air) through measures to control emissions from the point sources listed in Annex D of the Convention. | present. "Waste incineration facilities" are included in Annex D for management. |
| **Article 9 Releases** | Aims to control and, where feasible, reduce releases of mercury and mercury compounds to the land and water from relevant point sources determined in the Party's national inventory. | Sources of mercury releases to land and water have been identified in Chapter 2 of this report for management. |
| Article 10 Environmentally sound interim storage of mercury, other than waste mercury | Aims to implement measures for environmentally sound interim storage of mercury and mercury compounds in relation to Article 3. | Not relevant as the related Article 3 is not relevant to RMI. |
| **Article 11 Mercury wastes** | Outlines obligations for the environmentally sound management, transport, storage and disposal of mercury wastes as defined under the Basel Convention on the Transboundary Movement of Hazardous Wastes and their Disposal. | Potential generation of mercury waste sources have been identified in Chapter 2 for management. RMI is also a Party to the Basel Convention. |
| **Article 12 Contaminated sites** | Encourages Parties to endeavour to develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds. A guidance document[4] on the management of contaminated sites was adopted by the Conference of the Parties of the Minamata Convention on Mercury to support countries. | Under Section 2.10 of this report, a strategy for the identification of potential mercury hotspots was developed. This can be used to further guide the Government of RMI in the identification of mercury-contaminated sites and the development of measures to address them. |
| **Article 16 Health Aspects** | Encourages Parties to promote the development and implementation of various tools and techniques to identify and protect populations at risk, particularly vulnerable populations, of mercury exposure. | Education and awareness strategies should be developed and can be guided through the findings of the MIA and through related GEF ISLANDS Project activities to be implemented. |
| **Articles of the Minamata Convention on Mercury related to Support Mechanisms for Implementation (may be briefly referenced in this Chapter)** | | |
| **Article** | **Brief Description of Article** | **Relevance to RMI** |
| **Article 13 Financial resources and mechanisms** | Aims to support small island developing states (SIDS) in the implementation of the Convention through an established financial mechanism. | As a SIDS, RMI can access financial resources and capacity-building assistance for the implementation of the Convention. The MIA Project was enabled under this Article as well as the GEF ISLANDS Project. |
| **Article 14** | Encourages Parties to provide appropriate capacity-building and | RMI can access available assistance from Parties. Currently, through the MIA Project |

[4] Available at: Guidance_Contaminated_Sites_EN.pdf (mercuryconvention.org)

| Article | Brief Description of Article | Relevance to RMI |
|---|---|---|
| **Capacity-building, technical assistance and technology transfer** | technical assistance to developing country Parties for the implementation of the Convention's obligations. | and GEF ISLANDS Project, RMI can benefit from the lessons learned sharing amongst participating countries. |
| **Article 17 Information exchange** | States that Parties should facilitate the sharing of relevant scientific, technical, economic and legal mercury information developed. This can be done through the Secretariat of the Minamata Convention or other relevant organisations. | The MIA Report and findings conducted under this MIA Project will be shared with the Secretariat of the Minamata Convention, Global Mercury Partnership and other relevant organisations as needed. |
| **Article 18 Public information, education and awareness** | Notes that each Party should promote and facilitate the sharing of available information on mercury to the public. The facilitation of education, training and public awareness related to the health and environmental effects of exposure to mercury should be done with relevant intergovernmental and non-governmental organisations as appropriate. | This may be done under the guidance of the RMI EPA and facilitated through the findings of the MIA and GEF ISLANDS. |
| **Article 19 Research, development and monitoring** | Notes that Parties shall endeavour to develop and improve upon various mercury monitoring and research activities. | Under the MIA Project, RMI has developed an inventory of mercury releases, developed potential mercury hotspot mapping, initiated mercury biomonitoring among other activities to promote research, development and monitoring. |
| **Article 20 Implementation Plans** | Details that following the MIA activities, each Party may develop and execute an implementation plan to meet their obligations to the Minamata Convention. | Chapter 6 of this MIA Report provides considerations that RMI can take into account for the development of an implementation plan which should be developed further in consultation with national stakeholders. Additional guidance[5] on the development of an implementation plan is provided on the Minamata Convention's website. |
| **Article 21 Reporting** | States that each Party shall report on the measures taken to implement the Convention and note the effectiveness of measures and possible challenges. | The national focal point must submit report to the Secretariat of the Minamata Convention in coordination with relevant stakeholders. An online reporting tool has been made available to Parties. |
| **NOTE:** *Other Articles not included in this table generally refer to the functioning of the Minamata Convention itself and will not be discussed in detail in this report.* | | |

[5] Forms and guidance documents | Minamata Convention on Mercury (mercuryconvention.org)

## 3.2 Assessment of Relevant Policies and Legislation in RMI

A summary of some of the relevant national policies and legislation relevant to the key obligations of the Minamata Convention on Mercury is provided as follows:

### Legislation and Regulations:

**Office of Environmental Planning and Policy Coordination (OEPPC) Act 2003-** Establishes the Environmental Planning and Policy Unit as the body responsible for advising Cabinet on the obligations of international agreements (such as the Minamata Convention) to which the country is Party; seeking financial assistance where needed under the relevant international agreements; coordinating with relevant government agencies to conduct research and activities for implementation of agreements. It is also noted that the Unit, "may delegate the implementation of any of its international projects under each Convention to an appropriate ministry or agency but will remain the operational focal point for any such project".

**National Environmental Protection Act, 1984–** establishes the role and functions of the RMI EPA to preserve and improve the quality of the environment. Some of the key functions of relevance are to, "recommend to the President, national environmental policy and criteria for the protection of any aspect of the environment with respect to the uses and values the power…" and to make regulations regarding pollutants and hazardous wastes, in consultation with the Council and relevant national stakeholders.

Under Section 134 of the Act, the requirement for stakeholders involved in development or potentially hazardous activities to provide an Environmental Impact Statement that details any potential environmental impacts of planned activities for review, monitoring and approval by the RMI EPA.

Under the National Environmental Protection Act, 1984, several regulations to further implement environmental protection were developed. Of relevance, the following are listed:

- ***Public Water Supply Regulation,1994 –*** outlines standards and enforcement of standards for piped water for human consumption. Under this regulation, a maximum contaminant level is listed for mercury of 0.002 mg/L for community water systems and bottled water producers.

- ***Marine Water Quality Regulation, 1992-*** outlines standards and enforcement of standards for marine waters surrounding RMI. Under this regulation, a toxic substance limit for mercury of 0.025 µg/L for surrounding waters.

- ***Solid Waste Regulation 1989 -*** establishes minimum standards for the design, construction, installation, operation, and maintenance of solid waste storage, collection, and disposal systems in RMI in order to prevent or minimise pollution. Basic standards for solid waste disposal facilities, wastewater system management, hazardous waste disposal and waste incineration are also outlined. Provisions for a sanitary engineered landfill and pollution abatement mechanisms for incinerators or wastewater systems are not currently included.

- ***Toilet Facilities and Sewage Disposal Regulations 1990-*** establishes, "minimum standards for toilet facilities and sewage disposal to minimize environmental pollution, health hazards, and public nuisance from such facilities". Up-to-data standards for pollution abatement mechanisms for wastewater treatment are not currently included.

- ***Pesticides and Toxic Chemical Substances Regulation, 2004-*** formally establishes the regulations for banning persistent organic pollutants under the Stockholm Convention to which RMI is a Party. Restrictions for importation of these products are outlined for implementation by RMI-Customs with support from RMI EPA.

**Ministry of Environment Act, 2018-** established the Ministry of Environment and sets out functions to enhance or strengthen collaboration and coordination in environmental management. The RMI EPA is established as the lead agency for waste management, including healthcare wastes, in a coordinated approach.

**Marshall Islands Public Health, Safety and Welfare Act, 1966-** establishes the needs for national public health, safety and welfare and also establishes the role of the Secretary of Health to, "either personally or by his duly authorized representatives maintain and improve health and sanitary conditions, minimize and control communicable disease, establish standards of medical and dental care and practice, encourage scientific investigation in the field of health, supervise and administer all government-owned hospitals, sanitariums, clinics, dispensaries and such other medical and dental facilities as are or may be established throughout the Republic".

**Majuro Atoll Local Government Ordinances (Nos.: 1986-16, 1986-17, 1986-20, and1988-3)-** gives jurisdiction to the Local Government of Majuro Atoll for the oversight of the atoll's core activities in alignment with the national laws and regulations.

**Kwajalein Atoll Development Authority Restoration Act 2008** – establishes a mechanism to enable the people of Kwajalein (Ebeye) to, "develop and implement programs and projects for social, economic and cultural betterment of the Kwajalein Atoll" and implement any plans specific to the Kwajalein Atoll in alignment with the overall Government of RMI.

**Wotje Atoll Development Authority Act 2002 -** establishes the Wotje Atoll Development Authority and to outlines its powers to, "plan for the development and implementation of all programs and projects for the social, economic and educational betterment of the people of Wotje Atoll, with responsible and appropriate review by the Government of the Republic of the Marshall Islands to ensure fiscal responsibility and consistency with the development policies of the Government of the Republic".

**Jaluit Atoll Economic Development Authority Act 2000-** establishes the Jaluit Atoll Economic Development Authority and outlines it powers to, "plan for the development and implementation of all programs and projects for the social, economic and educational betterment of the people of Jaluit Atoll, with responsible and appropriate review by the Government of the Republic of the Marshall Islands to ensure fiscal responsibility and consistency with the development policies of the Government of the Republic".

**Import Duties Act 1989-** establishes various aspects for imported goods such as imposition of duties on imports, labelling of food items, licencing for importers and the general functions of customs officers. No regulations currently exist to prohibit imports of potentially dangerous goods, aside from food items. As of September 2023, updates were provided on the drafting of a RMI Customs Act that will repeal the Import Duties Act, 1989. The development of the draft Bill was supported by the World Bank and has been submitted to the Attorney General's Office for review. It was noted by the World Bank team that critical gaps in the draft would have to be addressed before it can be sent forward for approval by Cabinet and are working to revise the draft by March 2024. The updating of the Harmonised System (HS) Codes for categorising imports is also being carried out.

**Postal Service Act 1983-** establishes the Marshall Islands Postal Services Authority as the body responsible for the effective provision of postal services nationally. Under Part VII-Prohibited Articles, it is stated that no person shall send by mail, "any postal article that is, or that contains an article or thing that is, prohibited by any other law of the Republic or of the country to which the postal article is addressed".

**Styrofoam Cups and Plates, and Plastic Products Prohibition, and Container Deposit Act 2016,** and **Styrofoam cups and plates, and Plastic Products Prohibition and Container Deposit (Amendment) Act 2018 –** formally establishes the measures by which importation, manufacture, sale or distribution of Styrofoam cups and plates, disposable plastic cups and plates, and plastic shopping bags are prohibited. The Act also gives power to, an immigration officer, customs officer, or RMI EPA officer (with priorly obtained warrant by the Attorney General's Office or the Police Commissioner) to seize, forfeit or destroy any reasonably suspicious items covered under the Act.

**Fisheries Act 1997 –** provides that the Government is responsible for the exclusive management and control over living and non-living resources in Fishery Waters. Under Section 203, obligations of the Authority to ensure conservation, management and sustainable use of fishery resources using the best available international standards are outlined.

**Marshall Islands Marine Resources Act 1997-** established the Marshall Islands Marine Resources Authority (MIMRA) and outlines its functions which include the conservation, management and sustainable development of all fishery resources (including seabed and subsoil) in accordance with any sub-regional, regional and international instruments to which the RMI is Party.

## Related Policies, Plans and Projects to Enhance National Regulatory Framework:

1. **National Environment Management Strategy 2017–2022** – outlines the priorities for sound environmental management for adoption nationally. Mercury-specific management is not identified but its management is broadly covered under the identification of priorities for sound waste management and pollution control.
2. **National Strategic Plan 2015–2017**- identifies objectives for sustainable development including measures to reduce solid waste generation through infrastructure development.

3. **Majuro Atoll Waste Company Solid Waste Management Plan for Majuro 2019 – 2028-** Recognising that the existing waste disposal site in Majuro has exceeded its capacity, a plan was developed to outline actions and proposed mechanisms for the establishment of a technically sound and financially sustainable solid waste management system. The plan consists of 4 key actions as follows:
    a. Action 1: Proper operation of the final disposal site(s);
    b. Action 2: Reduction of final disposal amount by composting and recycling;
    c. Action 3: Maintenance of waste collection services;
    d. Action 4: Careful examination of new SWM technologies.

4. **Kwajalein Atoll Solid Waste Management Plan, 2019-2028-** A Plan to enable the local government and related entities in Kwajalein (Ebeye) to establish a technically sound and financially sustainable solid waste management system. The plan provides objectives for municipal solid waste but does not cover medical or hazardous waste.

5. **Majuro Strategic and Development Planning (MWSC)** – developed by international consultants in collaboration with MWSC, a 20-year plan was developed to establish the most appropriate water and sanitation services for Majuro. Mechanisms for implementation were also included for technical assistance, capital upgrades, institutional strengthening and financial management improvements. Following this plan, the design phase for a wastewater treatment system is under development.

6. RMI is a participating country in the Pacific region's project under the GEF-funded global programme **Implementing Sustainable Low and Non-Chemicals Development in Small Island Developing States (GEF ISLANDS)** which aims to strengthen countries' abilities to control the flow of chemicals, products and materials into their territories and to unlock resources for long term management of chemicals and wastes including integrated chemicals and wastes management in SIDS.

7. RMI is a participating country in the **'Improving Pacific Islands Customs and Trade' (IMPACT) Project** funded by the European Union. Under this project, the United Nations Conference on Trade and Development (UNCTAD) in coordination with the Oceania Customs Organisation (OCO) will work with project countries to improve trade facilitation and harmonise customs operations through the review or drafting of Customs legislation and training in use of the global ASYCUDA (Automated System for Customs Data).

8. **National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants 2008-** an implementation plan for RMI to meet its Party obligations under the Stockholm Convention.

Table 22 provides a summary of the national policies, legislation and regulations relevant to the key obligations of the Minamata Convention on Mercury as outlined in Section 3.1 of this report.

**Note:** Any proposed amendments to laws should be done in alignment with the provisions of the *Revision of Laws Act 1981* and *Adoption and Revision of Laws, 1988* as needed.

*Table 22: Assessment of Existing Legislation Relevant to Mercury Control Measures in RMI*

| Provision of the Minamata Convention | Relevant Act, legislation and regulation | Policy and Legislative Gap Analysis (if present) | Proposed Legal Reform Action (if needed) |
|---|---|---|---|
| **Overarching Minamata Convention on Mercury (including: Article 13 Financial** Resources and Mechanisms**; Article 14** Capacity-building, technical assistance and technology transfer; **Article 17** Information Exchange**; Article 18** Public information, education and awareness**; Article 20** Implementation Plans; **Article 21** Reporting**)** | Office of Environmental Planning and Policy Coordination (OEPPC) Act 2003<br><br>National Environmental Protection Act, 1984 - *Pesticides and Toxic Chemical Substances Regulation, 2004*<br><br>Styrofoam Cups and Plates, and Plastic Products Prohibition, and Container Deposit Act 2016 (and 2018 Amendment)<br><br>Ministry of Environment Act 2018<br><br>National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants 2008<br><br>National Environment Management Strategy 2017–2022 | While the functions of the OEPPC and RMI EPA that are detailed under the Office of Environmental Planning and Policy Coordination (OEPPC) Act 2003 and the National Environmental Protection Act 1984, indirectly reference some of the obligations of the Minamata Convention under the broad international conventions or environmental umbrella, no current legislation is in place to facilitate its specific implementation.<br><br>Under the Ministry of Environment Act 2018, the mechanisms for coordination amongst government agencies for environmental management activities are outlined.<br><br>National plans such as the National Environment Management Strategy 2017–2022 and the National Strategic Plan 2015- 2017 do not specifically refer to the integration of measures to manage mercury or its releases. | Coordination between the OEPPC, RMI EPA and other relevant stakeholders as needed, should be carried out to develop a standalone Act or (regulation under the National Environment Protection Act 1984) to give formal recognition to the obligations of RMI as a Party to the Minamata Convention on Mercury and to facilitate its implementation. Examples that can be referenced are the Styrofoam Cups and Plates, and Plastic Products Prohibition, and Container Deposit Act 2016 (and 2018 Amendment) or the Pesticides and Toxic Chemical Substances Regulation, 2004 which enables the implementation of the Stockholm Convention.<br><br>The proposed Act or regulation for the Minamata Convention should not only include measures to facilitate the monitoring of mercury releases from sources and prohibition of imports of mercury, mercury compounds and mercury added products, but should also formally recognise the focal point or delegated authority's responsibility for implementing other administrative measures such as the facilitation of information exchange and reporting requirements. This can be further reflected in updated environmental and strategic national plans, along with other relevant environmental agreements.<br><br>The development of an implementation plan for the Minamata Convention is optional under Article 20. Reference can be made to the National Implementation Plan for the Stockholm |

| Provision of the Minamata Convention | Relevant Act, legislation and regulation | Policy and Legislative Gap Analysis (if present) | Proposed Legal Reform Action (if needed) |
|---|---|---|---|
| | National Strategic Plan 2015-2017 | | Convention on Persistent Organic Pollutants 2008 if an implementation plan is to be developed.<br><br>Note: Under the GEF ISLANDS regional project and global programme, funding under Article 13 is provided to facilitate national capacity building, information exchange and awareness raising activities for mercury issues). |
| **Article 4: Mercury-added Products** | Import Duties Act, 1989<br><br>Postal Service Act 1983<br><br>Styrofoam Cups and Plates, and Plastic Products Prohibition, and Container Deposit Act 2016, and Styrofoam cups and plates, and Plastic Products Prohibition and Container Deposit (Amendment) Act 2018<br><br>Pesticides and Toxic Chemical Substances Regulation, 2004<br><br>Marshall Islands Public Health, Safety and Welfare Act 1966 | Currently, mercury, mercury compounds and mercury added products are not prohibited from importation under the Import Duties Act 1989.<br><br>Under the Postal Service Act 1983, it is stipulated that sending by mail, postal articles that are prohibited by any other law no person shall send by mail, "any postal article that is, or that contains an article or thing that is, prohibited by any other law of the Republic or of the country to which the postal article is addressed". | An act similar to the Styrofoam Cups and Plates, and Plastic Products Prohibition, and Container Deposit Act 2016 (and amendment 2018) or the development of a regulation similar to the Pesticides and Toxic Chemical Substances Regulation, 2004 is recommended to prohibit the import mercury, mercury compounds and mercury added products as outlined under Annex A (Part II) of the Minamata Convention and for Annex A (Part II), mercury in bulk form for dental amalgam. The development of any such act or regulation should also give power to the RMI-Customs and RMI Postal Service to enforce prohibitions on imports.<br><br>Under the new Customs Act that is currently in development, a mechanism to allow for the implementation of the recommended act/regulation should be included. The inclusion of mercury, mercury compounds and mercury added products can also be considered for inclusion under the Custom's Act prohibited items stipulations. To further enhance identification of mercury-added products being imported, guidance on the use of Harmonised System (HS) Codes to categorise products should be incorporated. Guidance for the possible development of specific HS Codes |

| Provision of the Minamata Convention | Relevant Act, legislation and regulation | Policy and Legislative Gap Analysis (if present) | Proposed Legal Reform Action (if needed) |
|---|---|---|---|
| | | | for mercury added products is also under development by the Minamata Convention.<br><br>Regarding phase down requirements for dental amalgam under Article 4, Annex A Part II, The Secretary of Health has the power to coordinate with and advise the national dental sector on such measures under the Marshall Islands Public Health, Safety and Welfare Act 1966. The RMI EPA, OEPPC Unit and other relevant stakeholders should coordinate with the Secretary of Health and relevant departments for this activity. |
| **Articles 8: Emissions, Article 9: Releases, Article 11: Mercury Wastes** | National Environmental Protection Act, 1984 and its regulations:<br><br>• Public Water Supply Regulation,1994<br>• Marine Water Quality Regulation, 1992<br>• Solid Waste Regulation 1989<br>• Toilet Facilities and Sewage Disposal Regulations 1990<br>• Pesticides and Toxic Chemical Substances Regulation, 2004 | Currently under the Public Water Supply Regulation 1994 and Marine Waste Quality Regulation 1992, thresholds for mercury contamination in piped or bottled water and marine waters are set. However, thresholds for mercury releases to air, land, wastewater and solid waste are not stipulated.<br><br>Mercury-specific monitoring for air emissions from point sources such as waste incinerators is not specified under any regulation or waste management plans.<br><br>Implementation of waste management measures and monitoring of releases from activities and developments do not specifically include the implementation of BAT/BEP for mercury management. | Regulations, under the National Environmental Protection Act, 1984, on environmental standards for management of mercury releases to the air, land and for waste management (wastewater and solid waste) should be developed. Guidance on appropriate mercury thresholds can be obtained through the Minamata Convention Secretariat. Following the Fifth Conference of the Parties for the Minamata Convention in November 2023, mercury waste thresholds for imported and exported waste were established.<br><br>Environmental Impact Statements to monitor the impact of mercury releases from sources identified in the national inventory of mercury releases can then be effectively carried out by the RMI EPA and can further guide the functions of the Local Governments/Authorities, MWSC and MAWC and the development of a Waste Management Action Plan as appropriate and the inclusion of mercury waste management from healthcare waste (including waste incineration). |

| Provision of the Minamata Convention | Relevant Act, legislation and regulation | Policy and Legislative Gap Analysis (if present) | Proposed Legal Reform Action (if needed) |
|---|---|---|---|
| | Majuro Atoll Local Government Ordinances. (Nos.: 1986-16, 1986-17, 1986-20, and 1988-3)<br><br>Constitution of the Kwajalein Atoll Local Government, 1985<br><br>Wotje Atoll Development Authority Act 2002<br><br>Jaluit Atoll Economic Development Authority Act 2000<br><br>Majuro Atoll Waste Company Solid Waste Management Plan for Majuro 2019 – 2028<br><br>Kwajalein Atoll Solid Waste Management Plan, 2019-2028<br><br>Majuro Strategic and Development Planning (MWSC)<br><br>Marshall Islands Public Health, Safety and Welfare Act 1966 | | A National Waste Policy has been noted to be in development. The management of mercury wastes and any other potentially hazardous wastes should be included and measures should aim to incorporate the waste management guidelines provided under the Basel Convention. |

| Provision of the Minamata Convention | Relevant Act, legislation and regulation | Policy and Legislative Gap Analysis (if present) | Proposed Legal Reform Action (if needed) |
|---|---|---|---|
| **Article 12: Contaminated Sites** | National Environmental Protection Act, 1984 | Under Section 126 (c) and (d) of the Act, the RMI EPA is expected to:<br>• "to undertake and carry out surveys and investigations as to the causes, nature, extent and prevention of pollution, and to assist and cooperate with other persons or bodies carrying out similar surveys or investigations;<br>• to conduct, promote and coordinate research in relation to any aspect of environmental degradation or the prevention thereof, and to develop criteria for the protection and improvement of the environment…" | No reforms needed as endeavouring to develop strategies to identify and assess potential mercury hotspots or contaminated sites is indirectly captured as a function of the RMI EPA under Section 126 of the National Environmental Protection Act, 1984. |
| **Article 16: Health Aspects** | Marshall Islands Public Health, Safety and Welfare Act 1966<br><br>Office of Environmental Planning and Policy Coordination (OEPPC) Act 2003<br><br>National Environmental Protection Act, 1984<br><br>Majuro Atoll Local Government Ordinances. (Nos.: 1986-16, 1986-17, 1986-20, and 1988-3) | The Secretary of Health, under the Public Health Act is expected to provide guidance on matters of public health concern.<br><br>Under the OEPPC Act 2003 and National Environmental Protection Act 1984, the OEPPC Unit and RMI EPA respectively, have functions that provide for the development of awareness raising initiatives to protect human health and the environment. The social and educational betterment are also priorities for implementation by Local Governments/Authorities.<br><br>Currently no measures are in place for the development and implementation of strategies. | Under the Acts identified, the framework is in place for the development of health-related initiatives for mercury monitoring, treatment and educational awareness.<br><br>The inclusion of strategies to identify and protect at-risk populations from the health impacts of mercury and other potential pollutants should be considered for inclusion in an Act or regulation for implementation of the obligations of the Minamata Convention, |

| Provision of the Minamata Convention | Relevant Act, legislation and regulation | Policy and Legislative Gap Analysis (if present) | Proposed Legal Reform Action (if needed) |
|---|---|---|---|
| | Constitution of the Kwajalein Atoll Local Government, 1985<br><br>Majuro Atoll Waste Company Solid Waste Management Plan for Majuro 2019 – 2028<br><br>Kwajalein Atoll Solid Waste Management Plan, 2019-2028 | and programmes to identify and protect populations at risk, particularly vulnerable populations from mercury or other potential hazardous chemicals. | |
| **Article 19**<br>Research, development and monitoring | OEPPC Act 2003<br><br>Marshall Islands Marine Resources Act 1997<br><br>Fisheries Act 1997<br><br>Marshall Islands Public Health, Safety and Welfare Act 1966<br><br>National Environmental Protection Act, 1984<br><br>Ministry of Environment Act 2018 | No gaps identified-<br><br>Under the OEPPC Act 2003, research for activities under the Minamata Convention is a function of the Environmental Planning and Protection Unit in coordination with other relevant bodies such as the RMI EPA and Ministry of Health and Human Services.<br><br>Biomonitoring of mercury concentrations in fish species falls broadly under the functions of MIMRA under the Marshall Islands Marine Resources Act 1997 and Fisheries Act 1997. | Consideration to formally recognise the specific recommendations under Article 19 for research, development and monitoring as part of the previously recommended regulation under the National Environmental Protection Act, 1984 to specify the obligations under the Minamata Convention can be made. |

## 3.3 Institutional Framework Assessment

Table 23 summarises the national institutions and functions relevant to the implementation of the key obligations of the Minamata Convention on Mercury as outlined in Section 3.1 of this report.

*Table 23: Assessment of Existing Institutions Relevant to Mercury Control Measures in RMI*

| Relevant Institution | Summary of Existing Functions and Capacities | Relevance to the provisions of the Minamata Convention on Mercury and Needs for its Implementation |
|---|---|---|
| **Office of Environmental Planning and Policy Coordination (OEPPC)** | The OEPPC and its Planning Unit are established as the body responsible for advising Cabinet on the obligations of international agreements (such as the Minamata Convention) to which the country is Party; seeking financial assistance where needed under the relevant international agreements; coordinating with relevant government agencies to conduct research and activities for implementation of agreements. The delegation of implementation for related projects to other appropriate ministries or agencies is also provided for. | The OEPPC is responsible for the overall implementation or delegation of implementation of the Minamata Convention on Mercury in coordination with relevant stakeholders such as the RMI EPA.<br><br>The OEPPC is the Operational Focal Point for projects related to implementation but can designate other bodies such as the RMI EPA to operate as the functional Focal Point. |
| **RMI- EPA** | Mandated by the National Environmental Protection Act, 1984, the RMIA EPA functions as a policymaker and regulator of environmental management issues. It is also responsible for coordinating with other relevant bodies to research, monitor and raise awareness on the environment.<br><br>The RMI EPA is the Focal Point assigned to the Minamata Convention. | The RMI EPA is responsible for, *inter alia*:<br>1. acting as the National Focal Point for the Minamata Convention and coordinating implementation with related stakeholders.<br>2. consulting with relevant stakeholders for the development of regulations to manage mercury releases to air, land, water and waste;<br>3. working with relevant stakeholders to research and assess potentially contaminated sites;<br>4. review, assess and monitor Environmental Impact Statements provided by bodies with activities that can potentially affect the environment;<br>5. collaborate with relevant NGOs and local communities as needed for awareness raising on environmental issues. |

| Relevant Institution | Summary of Existing Functions and Capacities | Relevance to the provisions of the Minamata Convention on Mercury and Needs for its Implementation |
|---|---|---|
| | | Guidance on appropriate mercury thresholds can be obtained through the Minamata Convention Secretariat. Following the Fifth Conference of the Parties for the Minamata Convention in November 2023, mercury waste thresholds for imported and exported waste were established.<br><br>Further mechanisms to guide on the implementation of the obligations of the Minamata Convention will be provided under the GEF ISLANDS programme where, RMI will benefit from the development of draft model legislation to control mercury-added products for use by Pacific SIDS that can be tailored for adoption, and the provision of support for the sound repackaging, shipping, collection, and disposal of mercury waste.<br><br>Funding opportunities for enforcement of monitoring and other capacity-building needs can be coordinated on a national or regional approach in collaboration with bodies such as SPREP and SPC. The integration of mercury issues with other related pollutant issues for a harmonised approach to environmental protection is also recommended. |
| **Ministry of Environment** | The Ministry of Environment functions to enhance or strengthen collaboration and coordination in environmental management. | The Ministry of Environment is responsible for overall management or delegation of management of the coordination efforts to establish a national committee for the implementation of the Minamata Convention. |
| **Ministry of Health & Human Services** | Within the Ministry, the Secretary of Health or duly authorised representatives within the Ministry are responsible for the maintenance and improvement of health and sanitary conditions, establishment of standards of medical and dental care and practice, encouragement of scientific investigation in the field of health and overall supervision of government-owned healthcare centres. | The overarching authorities for the implementation of the Minamata Convention must work closely with the Ministry of Health and Human Services (through its relevant departments) to:<br>1. advise the Government and dental healthcare professionals on phase down approaches for dental amalgam;<br>2. advise the Government and medical supply procurement personnel on phase out measures for mercury-added medical devices; |

| Relevant Institution | Summary of Existing Functions and Capacities | Relevance to the provisions of the Minamata Convention on Mercury and Needs for its Implementation |
|---|---|---|
| | Under the Ministry, relevant departments include, the Bureau of Oral Health, the Medical Supply and Procurement department and Risk Communications department. | 3. develop strategies to identify and protect at-risk populations from mercury impacts on health and;<br>4. coordinate the development and implementation of public awareness activities to raise awareness on potential sources of mercury pollution and its impacts on health;<br>5. coordinate as appropriate for the environmentally sound management and prevention of mercury emissions due to the operation of the medical waste incinerator. |
| **RMI-Customs** | Responsible for the monitoring of imported products and carrying out related functions under the Import Duties Act 1966. | In coordination with the RMI EPA and relevant authorities, an import prohibition order/regulation to prevent the import of mercury added products as listed in Annex A Part 1 of the Minamata Convention as well as, mercury and mercury compounds, should be developed and implemented.<br><br>The building of capacity to implement the prohibition of these items is needed as currently import records are based on item imported/exported, quantity, value and tax for all importers and exporters, however the capacity to itemise imported goods according to HS Codes is lacking. Through the IMPACT project, work is currently ongoing to work with RMI- Customs and the Government to enable the development of a Customs Act to better regulate the system. The updating of the HS Code System is also being carried out. |
| **The Postal Service** | Responsible for the monitoring of postal items and related functions under the Postal Service Act 1983. The powers to prevent the posting by mail of items that are prohibited by any other law of RMI or of the country to which the postal article is addressed, also lies with the Postal Service. | Currently, for the implementation of prohibitions on imports of products such as those under the Styrofoam Cups and Plates, and Plastic Products Prohibition, and Container Deposit Act 2016 (and 2018) amendment, The Postal Service coordinates with the RMI EPA and RMI-Customs for its enforcement in the postal service.<br><br>In order for the implementation of the same for products under the Minamata Convention, a regulatory mechanism must be in place. Activities to build the |

| Relevant Institution | Summary of Existing Functions and Capacities | Relevance to the provisions of the Minamata Convention on Mercury and Needs for its Implementation |
|---|---|---|
| | | capacity in the Postal Service for implementation of any prohibitions must be carried out by the overarching authorities. |
| **Majuro Atoll Waste Company (MAWC)** | MAWC was established under the Ministry of Public Works and is responsible for waste collections, operation and maintenance of the final disposal site on Majuro Atoll and, strengthening organisational and financial systems for waste management in Majuro. | MAWC has facilitated testing of the current Majuro waste disposal site for various parameters under related initiatives. The inclusion of analysis of samples for mercury concentrations were not carried out. In order to better understand mercury contamination from the waste disposal sites (identified as sources of mercury releases under the inventory), capacity must be built to include testing of the Majuro waste disposal site. This should be coordinated by the RMI EPA with MAWC and other relevant bodies.<br><br>The development of a new waste disposal site that will have BAT/BEP to prevent and to monitor pollution from mercury and other pollutants is a priority identified under various waste management plans and draft policies. This must be carried out in close coordination with MAWC. |
| **Majuro Water and Sewer Company Inc (MWSC)** | The MWSC currently deals with wastewater system management and water treatment plants. There is currently no treatment of wastewater as the majority for the main business/residential areas of Majuro is collected and disposed of as raw sewage through an outfall system directly into the sea.<br><br>The outfall system has been broken for approximately 20 years which has resulted in raw sewage being released directly into the coral reef area. Bleaching of the corals in that area has occurred. Though attempts have been made to prevent fishing in that area, communities still do.<br><br>Funding has been provided by the US to begin developing a treatment/management plan. International Consultants, Beca has conducted several assessments and design phase for the wastewater treatment was tentatively set for August 2023. | The development of best available techniques and best environmental practices for the operations of potential points sources of mercury releases would enhance implementation of Article 9- Releases (to water) and Article 11- Mercury Wastes. The current outflow of sewage is also a potential contributor to a mercury contaminated site and the development of a sound wastewater system will aid in the prevention of further contamination (Article 12- Contaminated Sites).<br><br>Continued capacity building and support for the implementation of a sustainable wastewater treatment system is needed. Efforts to support the MWSC in achieving this should be incorporated under any future waste management/environmental plans and projects. |

| Relevant Institution | Summary of Existing Functions and Capacities | Relevance to the provisions of the Minamata Convention on Mercury and Needs for its Implementation |
|---|---|---|
| **Majuro Atoll Local Government** | Majuro Atoll Local Government is responsible for the oversight of Majuro Atoll's core activities in alignment with the national laws and government entities. | The close collaboration and involvement of Local Governments and related Authorities must be carried out by the OEPPC, Ministry of Environment and RMI-EPA for the implementation of the Minamata Convention for activities that include, but are not limited to:<br>- the building of capacity to manage waste disposal, waste incineration and wastewater treatment in an environmentally sound manner to prevent mercury (and other pollutants) releases,<br>- the coordination for development of strategies to identify and monitor potentially mercury hotspots/mercury contaminated sites,<br>- the coordination for outreach activities to educate the public on mercury issues and identify strategies to assess potential health impacts of mercury on local populations. |
| **Kwajalein Atoll Local Government (KALGOV)** | KALGOV is established under the Constitutions to implement any plans specific to the Kwajalein Atoll in alignment with the overall Government of RMI. | |
| **Wotje Atoll Development Authority** | The Wotje Atoll Development Authority has powers to, "plan for the development and implementation of all programs and projects for the social, economic and educational betterment of the people of Wotje Atoll, with responsible and appropriate review by the Government of the Republic of the Marshall Islands to ensure fiscal responsibility and consistency with the development policies of the Government of the Republic". | |
| **Jaluit Atoll Economic Development Authority** | Jaluit Atoll Economic Development Authority functions to, "plan for the development and implementation of all programs and projects for the social, economic and educational betterment of the people of Jaluit Atoll, with responsible and appropriate review by the Government of the Republic of the Marshall Islands to ensure fiscal responsibility and consistency with the development policies of the Government of the Republic". | |
| **Marshall Islands Marine Resources Authority (MIMRA)** | MIMRA is given the authority to conserve, manage and sustainably develop all fishery resources (including seabed and subsoil) in accordance with any sub-regional, regional and international instruments to which the RMI is Party.<br><br>The key divisions in MIMRA are Coastal Division and Oceanic Division. Under the Oceanic Division, sampling is done of pelagic fish species such as skipjack tuna and yellowfin tuna, which are exported for consumption. Samples are obtained from local processing plants and sent to registered labs in Fiji, Taiwan, | Under Article 19 Research, Development and Monitoring, MIMRA should continue to work in close collaboration with the RMI EPA and relevant stakeholders to conduct biomonitoring activities on fish species to determine mercury concentrations and develop plans for abatement. |

| Relevant Institution | Summary of Existing Functions and Capacities | Relevance to the provisions of the Minamata Convention on Mercury and Needs for its Implementation |
|---|---|---|
| | and New Zealand. Samples are tested for mercury among other metals and persistent organic pollutants.<br><br>Export of fish for consumption is done to countries in the European Union and China.<br><br>Sampling of reef fish by the Coastal Division is not as common and interest in testing species under this project was expressed.<br><br>In terms of existing capacities, a laboratory is currently under construction in the MIMRA building with capacity building initiatives. There are also several funded partnerships including with the Secretariat of Pacific Communities and the University of the South Pacific to have more science-based testing and reporting activities. | |
| **College of the Marshall Islands** | The College of the Marshall Islands is the main established national college for tertiary education and further studies. | For public awareness, education and outreach activities on mercury management and monitoring, inclusion of the College of the Marshall Islands is highly recommended to further build national capacity. |
| **Non-governmental Organisations (NGOs), Civil Society Organisations (CSOs)** | NGOs and CSOs function to ensure representation of various community groups and carry out outreach activities for various causes. | The involvement of relevant environmental-based, gender equality-based and youth outreach groups in public awareness outreach and educational campaigns is highly recommended to ensure the widespread knowledge generation and action needed to reduce mercury issues. |
| **Private Sector** | Private sector stakeholders function to import and sell household products on the national market. | To phase out the import and use of mercury-added products as identified under Article 4 of the Minamata Convention, and to promote the use of safe mercury-free alternatives, engagement of the private sector in stakeholder consultations and awareness for mercury-related issues is highly recommended. |

| Relevant Institution | Summary of Existing Functions and Capacities | Relevance to the provisions of the Minamata Convention on Mercury and Needs for its Implementation |
|---|---|---|
| **RMI Chamber of Commerce** | The RMI Chamber of Commerce functions as an NGO that promotes the coordination of activities amongst the private sector stakeholders. | To phase out the import and use of mercury-added products as identified under Article 4 of the Minamata Convention, and to promote the use of safe mercury-free alternatives, engagement of the Chamber of Commerce in stakeholder consultations and awareness for mercury-related issues is highly recommended to promote their cooperation. |

Challenges in implementation include the limited human resource capacity and technical capacity to carry out continuous activities related to mercury management. To address this, it is important to recognise the linkages between mercury issues and issues related to other hazardous or potentially harmful chemicals and how approaches can be harmonised. It is recommended that a national working group consisting of representatives from the aforementioned institutions be established with assigned representatives from the RMI EPA acting as the Chair. This working group can be linked to other environmental committees that may have been or will be established to avoid duplication of work. For example, under the GEF ISLANDS project, national stakeholders will need to coordinate related environmental work under a steering committee and sub-committees. Furthermore, it is important to recognise regional linkages that can be made to further opportunities for information exchange and capacity building which is ongoing through agencies such as SPREP and SPC, among others.

## 3.4 Recommendations for Policy, Legislative and Institutional Capacity Strengthening

A summary of the proposed actions related to the regulatory and institutional capacity building for the accession to and implementation of the Minamata Convention is presented in Table 24.

*Table 24: Summary of Applicable Regulatory Framework and Proposed Action for Implementation of the Minamata Convention*

| Provision of the Minamata Convention | Relevant Institutions | Relevant Legislation/Regulatory Framework for Amendment | Proposed Action |
|---|---|---|---|
| Article 4 *Mercury-added products* | RMI-Customs<br><br>The Postal Service<br><br>Ministry of Health and Health Services<br><br>RMI EPA<br><br>Private Sector<br><br>RMI Chamber of Commerce<br><br>NGOs and CSOs | Import Duties Act, 1989<br><br>National Environmental Protection Act, 1984 | Prohibition (through the development of a standalone act or a regulation under the Environment Protection Act) of the import of mercury, mercury compounds and mercury added products as outlined under Annex A (Part II) of the Minamata Convention and for Annex A (Part II), mercury in bulk form for dental amalgam.<br><br>Coordination with RMI-Customs, The Postal Service, private sector retailers and the Chamber of Commerce to ensure the implementation of the prohibition of mercury products and the promotion of safe mercury-free alternatives. Coordination with the Ministry of Health and Health Services to meet the obligations for phase down of dental amalgam and phase out of mercury added medical devices is recommended.<br><br>Promotion of safe alternatives can also include public awareness campaigns that can involve relevant NGOs and CSOs as appropriate. |
| Article 8 *Emissions* | RMI-EPA<br><br>Ministry of Health & Human Services<br><br>Private Sector | National Environmental Protection Act, 1984<br><br>Marshall Islands Public Health, Safety and Welfare Act, 1966 | As a as a policymaker and regulator of environmental management issues, the RMI-EPA should coordinate with relevant bodies to develop regulations under the Environmental Protection Act to monitor mercury emissions from identified point sources that include medical waste incinerators or other waste incinerators as needed. |

| Provision of the Minamata Convention | Relevant Institutions | Relevant Legislation/Regulatory Framework for Amendment | Proposed Action |
|---|---|---|---|
| | | | Under the Public Health, Safety and Welfare Act, the Ministry of Health and Health Services is responsible for the management of healthcare facility operations that includes that disposal (for either on-site or off-site incineration) of medical waste. Coordination amongst the RMI-EPA, Ministry of Health and Health Services and any private waste incinerator contractors should be conducted to achieve this.<br><br>Any health or healthcare plans and strategies for the management of healthcare waste should include mercury emission abatement measures from the operation of medical waste incinerators. |
| Article 9<br>*Releases* | RMI-EPA<br><br>Majuro Atoll Local Government<br><br>Kwajalein Atoll Local Government (KALGOV)<br><br>Wotje Atoll Development Authority<br><br>Jaluit Atoll Economic Development Authority<br><br>Majuro Atoll Waste Company (MAWC)<br><br>Majuro Water and Sewer Company Inc (MWSC)<br><br>Ministry of Health & Human Services | National Environmental Protection Act, 1984<br><br>Majuro Strategic and Development Planning (MWSC) | As a as a policymaker and regulator of environmental management issues, the RMI-EPA should coordinate with relevant bodies to develop regulations under the Environmental Protection Act to monitor mercury releases from sources to land and wastewater. The RMI-EPA should bear the responsibility for development of these standards with reference to guidance provided under the Minamata Convention.<br><br>Coordination with the Local Governments/Authorities and health sector, where needed, to ensure management of potential mercury releases through proper health and sanitation practices should be conducted. |
| Article 11 | RMI-EPA | National Environmental Protection Act, 1984 | As a as a policymaker and regulator of environmental management |

| Provision of the Minamata Convention | Relevant Institutions | Relevant Legislation/Regulatory Framework for Amendment | Proposed Action |
|---|---|---|---|
| *Mercury wastes* | Majuro Atoll Local Government<br><br>Kwajalein Atoll Local Government (KALGOV)<br><br>Wotje Atoll Development Authority<br><br>Jaluit Atoll Economic Development Authority<br><br>Majuro Atoll Waste Company (MAWC)<br><br>Majuro Water and Sewer Company Inc (MWSC)<br><br>Ministry of Health & Human Services | Solid Waste Regulation 1989<br><br>Toilet Facilities and Sewage Disposal Regulations 1990<br><br>Majuro Atoll Waste Company Solid Waste Management Plan for Majuro 2019 – 2028<br><br>Kwajalein Atoll Solid Waste Management Plan, 2019-2028 | issues, the RMI-EPA should coordinate with relevant bodies to develop regulations under the Environmental Protection Act to monitor mercury wastes. The RMI-EPA should bear the responsibility for development of these standards with reference to guidance provided under the Minamata Convention. Considerations to amend/update relevant existing regulations such as the Solid Waste Regulation 1989 and Toilet Facilities and Sewage Disposal Regulations 1990, to improve the enforcement of environmentally sound management should be considered.<br><br>Coordination with the Local Governments/Authorities and health sector, where needed, to ensure management of potential mercury releases through proper health and sanitation practices should be conducted.<br><br>Any waste management plans and strategies for the management of waste, including healthcare waste, should include mercury waste management measures. The potential development of waste management legislation should include mercury waste management among other hazardous wastes. |
| Article 12<br><br>Contaminated Sites | RMI EPA | No amendments to existing legislation required. | In coordination with other relevant authorities, the RMI EPA should endeavour to develop ecological mapping surveys to build upon the strategies to identify potential mercury hotspots or contaminated sites |
| Article 16<br><br>*Health aspects* | Ministry of Health and Human Services<br><br>RMI EPA | No amendments to existing legislation required. | Coordination amongst entities should be carried out to develop strategies to identify and protect at-risk populations from mercury |

| Provision of the Minamata Convention | Relevant Institutions | Relevant Legislation/Regulatory Framework for Amendment | Proposed Action |
|---|---|---|---|
| | | | impacts on health, and coordinate the development and implementation of public awareness activities to raise awareness on potential sources of mercury pollution and its impacts on health. |
| Overarching Implementation of the Minamata Convention including:<br><br>Article 13 *Financial Resources and Mechanisms*;<br><br>Article 14 *Capacity-building, technical assistance and technology transfer*;<br><br>Article 17 *Information Exchange*;<br><br>Article 18 *Public information, education and awareness*;<br><br>Article 20 *Implementation Plans*;<br><br>Article 21 *Reporting* | RMI EPA<br><br>OEPPC<br><br>Ministry of Environment<br><br>*(in coordination with stakeholders identified in Section 3.3 of this report)* | OEPPC Act 2003<br><br>National Environmental Protection Act, 1984 | The responsibility of the implementation of the Minamata Convention on Mercury falls under the remit of the OEPPC and its designated authority, the RMI EPA (as the designated National Focal Point for the Minamata Convention) in coordination with relevant stakeholders.<br><br>To formally recognise the obligations for RMI as a Party to the Minamata Convention on Mercury, a standalone act or a regulation under the National Environmental Protection Act, 1984 should be developed by the OEPPC and RMI EPA (in coordination with relevant stakeholders) for approval by the Council.<br><br>New or updated national plans and policies related to environmental management and strategic planning should also include the provisions of the Minamata Convention and any related agreements. |
| Article 19 *Research, development and monitoring* | RMI EPA<br><br>MIMRA<br><br>Ministry of Health and Human Services<br><br>College of Marshall Islands | No amendments to existing legislation required. | Collaboration amongst these entities responsible for environmental management, management of fisheries, human health, and any other relevant stakeholders (such as an NGOs) should be promoted to develop strategies for the monitoring of mercury in humans, fish and other biota. |

# Chapter 4: Identification of Populations at Risk and Gender Dimensions

## 4.1 Preliminary Review of Potential Populations at Risk and Potential Health Risks

Mercury is known to be highly toxic to human health, but its level of impact varies based on a number of factors including:

- form of mercury (methylmercury is the most toxic form of mercury to humans);
- amount of mercury the person is exposed to;
- age, sex, and condition of person exposed;
- duration of exposure;
- route of exposure; and
- dietary patterns of fish consumption (WHO, 2021a)

Figure 11 below summarises the typical ways in which humans may be exposed to mercury and its effects which can range from short-term to long-term.

**HUMAN EXPOSURE TO MERCURY AND ITS COMPOUNDS**

| Mercury form | Source of exposure | Pathway of exposure | Absorption rate | Main excretion pathways | Toxicity |
|---|---|---|---|---|---|
| Elemental $Hg^0$ | Dental amalgam, air, accidental spills, worksites, food from contaminated sites | Inhalation | 75–85% | Urine, faeces | Acute: lungs, gastrointestinal tract |
| | | Ingestion | Almost no absorption | | Chronic: central nervous system, kidneys |
| | | Dermal | | | |
| Inorganic $Hg^{2+}$ | Cosmetics, soaps | Ingestion | 10–30% | Urine | Acute: gastrointestinal tract (vomiting, bloody diarrhoea), kidneys (nephritis) |
| | | Dermal | Can be high | | Chronic: kidneys (kidney damage), central nervous system, skin (acrodynia in children), immune system |
| Organic MeHg | Food, mother during pregnancy | Ingestion | 95% | Faeces (half life ($T_{1/2}$) is 45–70 days in adults) | Central nervous system, cardiovascular system |
| | | Parenteral | 100% | | |
| | | Transplacental | | | |

*Figure 11: Human exposure to mercury and its compounds* (WHO, 2021b).

Depending on the type of exposure, mercury can affect several functions throughout the body. Children, infants and foetuses (through their mother during pregnancy) are more susceptible to central nervous system damage that can result in long term developmental issues with brain function and motor skills (WHO, 2021b). Newborns may typically be exposed to mercury through the consumption of contaminated breastmilk. As such, new mothers, pregnant women and women who may become pregnant are also considered to be vulnerable to the effects of

mercury (WHO, 2021b). Other vulnerable groups include persons who suffer from diseases of the liver, kidney, nervous system, and lung (WHO, 2021b).

In the Pacific, research has been conducted to assess potential trends in mercury exposure. In 2018, a global study was conducted in which hair samples for 757 women of child-bearing age were analysed for mercury concentrations and it was found that 58% of samples indicated an elevated mercury body burden exceeding 1 ppm (IPEN et al., 2018). RMI was among the countries assessed that had an average range of mercury concentrations that exceeded 1 ppm for the total samples analysed. Based on the responses to surveys conducted for the sample group, frequent consumption of fish was a common trend found amongst persons with high mercury concentrations in their hair samples (IPEN et al., 2018).

Humans are most exposed to the most toxic form of mercury, methylmercury (MeHg), through dietary consumption. Due to the presence of mercury in waterways and the bioaccumulation of mercury up the food chain, frequent consumption of mercury-contaminated fish is considered to be the most common source of methylmercury exposure to humans (WHO/UNEP, 2008). Predatory fish and large, long-living fish species tend to contain elevated levels of mercury, though further analysis of fish species should be conducted to more accurately inform this.

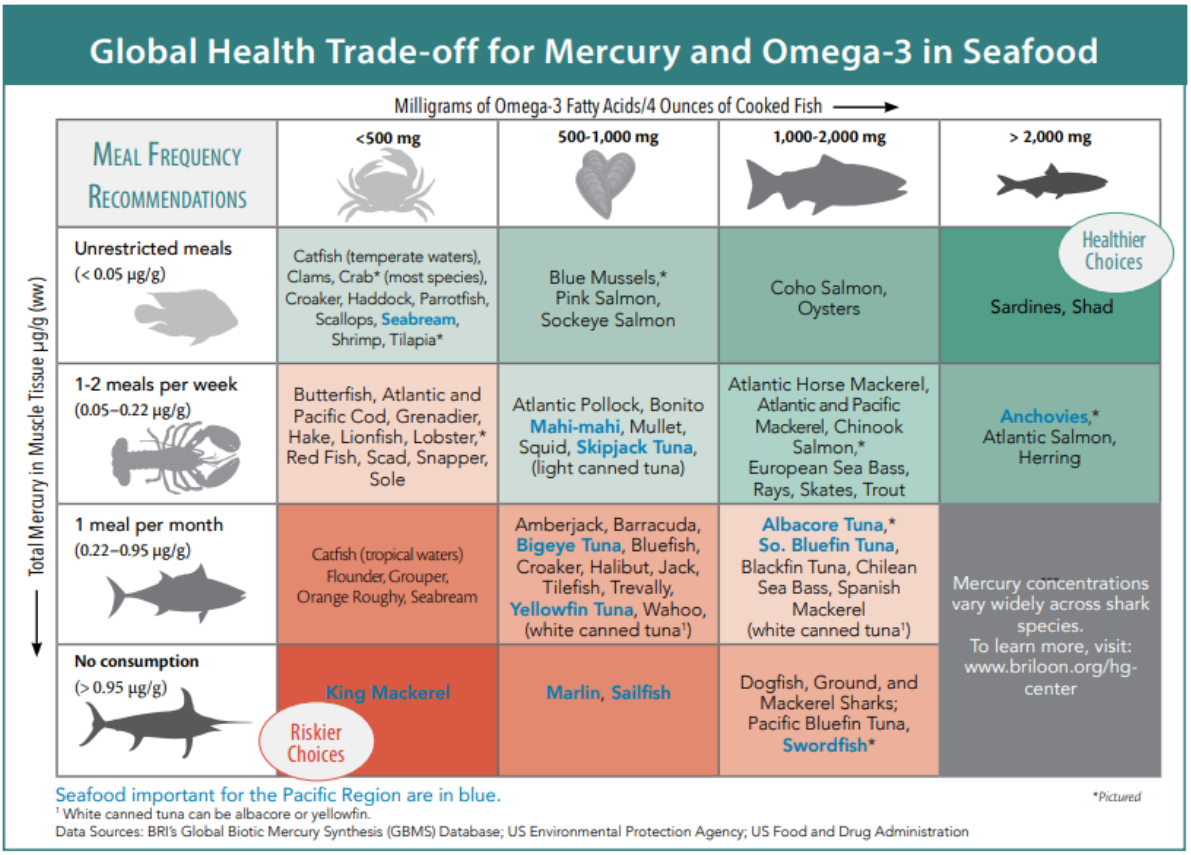



*Figure 12: Example of Fish Consumption Guidelines developed for the Pacific Region* (BRI, 2022).

Fish are a staple to many people in the Pacific region and other Small Island Developing States (SIDS) as fish are an essential source of protein that tends to be more accessible than other sources of animal protein; additionally, certain species such as tuna are exported commercially (FAO, 2022). Recognising the benefits associated with fish consumption, it is essential to educate the population on recommended consumption patterns to help limit mercury exposure to protect human health as well as the livelihoods of persons who depend on fisheries economically. Fish consumption guidelines (as illustrated in Figure 12) that are based on scientific research are recommended to assist vulnerable populations in determining the recommended frequency in consuming fish that considers their health benefits versus potential mercury risks.

In terms of occupational exposure to mercury in the Pacific, possible groups that may be affected include dental care professionals who prepare dental amalgam fillings, and waste handling and disposal personnel who may deal with mercury-containing waste.

Dental care professionals (this includes dentists and dental assistants/technicians) may be exposed to low levels of mercury when preparing dental amalgam fillings for implantation. Exposure may occur via inhalation of mercury vapors. To limit exposure, the use of proper personal protective equipment (PPE) such as face masks and gloves are recommended. Further to that, limiting the type of dental amalgam used to pre-capsulated types rather than using powdered alloys or elemental mercury will reduce the risk of exposure. In RMI, pre-capsulated amalgam is the predominant type of mercury-added amalgam used.

Many consumer products with mercury such as lighting devices and thermometers, do not pose a danger to human health while in use, but once broken, mercury can be released to the environment and to humans. During the handling of waste that may contain these items, waste workers may be routinely exposed to mercury. The use of proper PPE is recommended for all waste handlers. Diverting end-of-life mercury-added products from landfills for environmentally sound storage, handling and disposal will greatly reduce this occupational risk of exposure in the long-term.

## 4.2 Assessment of Potential Gender Dimensions related to the Management of Mercury

Gender mainstreaming is a strategy used to recognise the varying impacts of activities on different genders and to ensure that concerns or experiences of all genders are incorporated into the design, implementation, monitoring and evaluation of all policies and programs for the achievement of gender equality (ECOSOC, 1997).

As discussed in the previous section of this chapter, it is apparent that certain groups are more vulnerable to the effects posed by mercury and as such, mercury management strategies must be developed accordingly.

The development of future activities to continue research on the effects of mercury on the population must take into account the heightened vulnerability of women of childbearing age

and pregnant women. Human biomonitoring activities to assess mercury concentrations are typically done via biomarkers such as hair, urine, blood, and umbilical cord blood (WHO, 2021b). It is noted that results of mercury assessments on maternal hair samples can act as a proxy for determining foetal mercury exposure to further inform the overall population's mercury exposure (WHO, 2021b).

Any development and dissemination of communication materials on mercury management should include measures to ensure that materials can be easily accessed by women. For example, in the Pacific, women tend to be the primary household caretakers (PRIF, 2016); and as such communication materials on fish consumption guidelines should be widely accessible by the overall population but especially by women who may be the primary preparers of meals in the household.

In terms of occupational exposure, further research is needed to inform the gender considerations that should be implemented.

Administratively, previous research in the region has indicated that women are poorly represented in government and private institutions resulting in women having less active participation in discussions, planning and monitoring of national programmes (PRIF, 2016). Ensuring that women are adequately represented in the committees responsible for making future decisions for mercury management in RMI, including in the development of communication strategies for mercury, is a key factor to be implemented for successful implementation.

# Chapter 5: Awareness/Understanding of the Workers and Public; and Existing Training and Educating Opportunities of Target Groups and Professionals

Under Article 18 of the Minamata Convention on Mercury,

*"Each Party shall, within its capabilities, promote and facilitate:*

*a) Provision to the public of available information on:*

*i. The health and environmental effects of mercury and mercury compounds;*

*ii. Alternatives to mercury and mercury compounds;*

*iii. The topics identified in paragraph 1 of Article 17;*

*iv. The results of its research, development and monitoring activities under Article 19; and*

*v. Activities to meet its obligations under this Convention;*

*b) Education, training and public awareness related to the effects of exposure to mercury and mercury compounds on human health and the environment in collaboration with relevant intergovernmental and non-governmental organizations and vulnerable populations, as appropriate…"*

In RMI, the risks associated with mercury releases are considered to be mainly from the use and disposal of consumer products such as CFLs and other mercury-added lighting devices; and the preparation, use and disposal of dental amalgam fillings. Other perceived mercury risks are related to the potential consumption of mercury-contaminated fish over a period of time.

Currently, the level of awareness on the risks associated with mercury amongst workers (such as dental professionals and waste disposal workers) and the general public is not considered to be high and measure should be adapted to educate these groups on the issue.

Under the MIA Project, a brief animated awareness raising video was developed for dissemination in RMI (Figure 13). The video aims to educate the general public on the potentially mercury-added household products that may be present, the need for the safe disposal and the promotion of mercury-free alternatives that are already popular on the local market.

It is recommended that the video be shared widely via social media by the RMI EPA and other national stakeholder organisations.

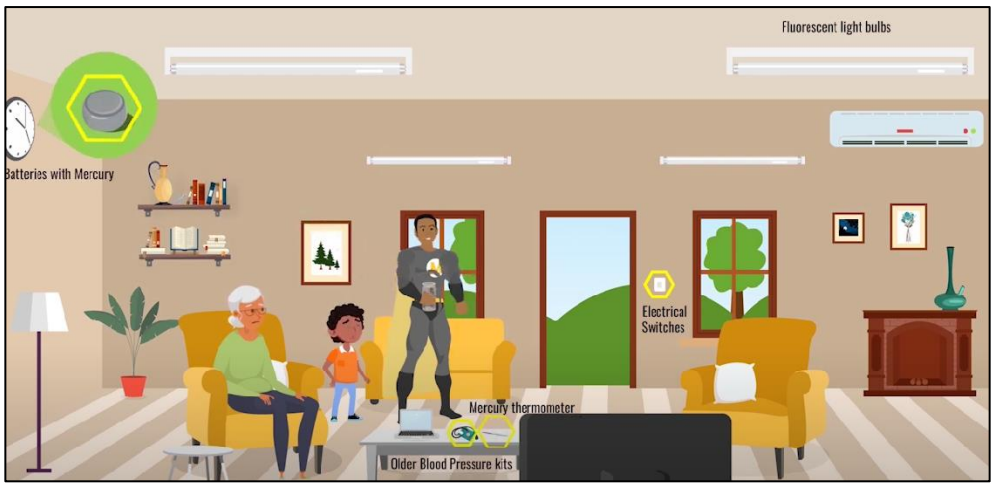



*Figure 13: Still from the awareness raising video developed under the project.*

To educate key stakeholders on the estimated sources of mercury releases and recommendations for mercury management developed under the project, a technical briefing document that summarises the main findings of the MIA Project was developed.

Further to the MIA Project, RMI is also participating in the GEF ISLANDS Programme that will include information dissemination, inclusive of gender considerations, on mercury related issues to inform stakeholders and change behaviours in the Pacific region via the Coordination, Communication and Knowledge Management (CCKM) activities.

The RMI EPA is actively involved in stakeholder outreach and school campaigns to educate persons on various environmental issues. The materials developed under this project and the ongoing GEF ISLANDS project, can be utilised in future public education campaigns on environmental awareness.

In order to better inform the public on the potential risks associated with consumption of fish, further information on mercury concentrations in RMI and the Pacific region is being gathered by BRI in collaboration with the RMI EPA and MIMRA. MIMRA is also building their capacity for analysing marine species through several funded partnerships including with the Secretariat of Pacific Communities and the University of the South Pacific to have more science-based testing and reporting activities.

Coordination with other relevant governmental, private and non-governmental organizations is recommended to further promote mercury management awareness.

# Chapter 6: Implementation Plan and Priorities for Action

Under Article 20 of the Minamata Convention on Mercury, Parties, "may, following an initial assessment, develop and execute an implementation plan, taking into account its domestic circumstances, for meeting the obligations under this Convention" (UNEP, 2023). Further guidance on the development of an implementation plan can be obtained from the Minamata Convention Secretariat.

This Chapter serves to highlight some of the potential target areas that should be considered for the successful implementation of the Minamata Convention by the Government of RMI.

## Priorities for Action:

1. **Develop an Act or Regulation to formally recognise the obligations of the Minamata Convention and facilitate its implementation.**

   As discussed in further detail in Chapter 3, coordination between the OEPPC, RMI EPA and other relevant stakeholders as needed, should be carried out to develop a standalone Act or (regulation under the National Environment Protection Act 1984). Examples that can be referenced are the Styrofoam Cups and Plates, and Plastic Products Prohibition, and Container Deposit Act 2016 (and 2018 Amendment) or the Pesticides and Toxic Chemical Substances Regulation, 2004 which enables the implementation of the Stockholm Convention.

   The proposed Act or regulation for the Minamata Convention should not only include measures to facilitate the monitoring of mercury releases from sources and prohibition of imports of mercury, mercury compounds and mercury added products, but should also formally recognise the focal point or delegated authority's responsibility for implementing other administrative measures such as the facilitation of information exchange and reporting requirements. This can be further reflected in updated environmental and strategic national plans, along with other relevant environmental agreements.

   Further regulatory reforms and institutional considerations to prohibit imports of mercury-added products, manage mercury releases and enhance other measures for implementation of the Minamata Convention can be found in Chapter 3 of this report.

   It is key to note that through participation in the ongoing GEF-funded programme, Implementing Sustainable Low and Non-Chemical Development in Small Island Developing States (ISLANDS), RMI will also benefit from the development of draft model legislation to control mercury-added products for use by Pacific SIDS that can be tailored for adoption, and the provision of support for the sound repackaging, shipping, collection, and disposal of mercury waste.

## 2. Establish a Coordinating Mechanism for Mercury Management

Under the GEF ISLANDS Project, a national steering committee is being formed to oversee the project's activities (which include mercury management activities). It is recommended that this committee or a sub-committee comprising of stakeholders from all relevant authorities identified in Chapter 3 of this report, continue to coordinate on the development of activities for mercury management. A mechanism for information exchange on mercury issues amongst these stakeholders should also be established. Gender considerations must also be factored into the makeup of the committee as well as for the implementation of management activities as women and children have been identified as the more vulnerable groups to the impacts of mercury on health.

## 3. Implement measures to address identified sources of mercury releases.

These measures may include:

### a. Promotion of the continued phase-out and phase down of mercury-added products.

Mercury-added products (and other intentional products/process uses) have been identified as a main source of mercury releases in RMI. In addition to regulatory bans to phase out their importation, sensitisation of government agencies, the private and public sectors is needed to ensure the sound phase out of these products.

Mercury-free alternative products are increasingly available on the global and local markets and have been proven to be highly reliable replacements. A summarised list for some key mercury-added products and their readily available alternatives is provided in Table 25.

*Table 25: Summarised List of Key Mercury-added Products and their Mercury-free Alternatives*

| Mercury-added Product | Mercury-free Alternative |
|---|---|
| CFLs, LFLs, Mercury Vapour Lamps, some HIDLs | Light Emitting Diodes (LEDs), mercury-free HIDLs |
| Mercury thermometers | Digital thermometers, infra-red no-contact thermometers, alcohol thermometers |
| Mercury-added electrical switches, relays and thermostats such as, mercury wetted reed relays and mercury thermostats. | Mercury-free switches; mercury-free relays; electromechanical or digital thermostats *(over the past 20 years, mercury-free electrical switches, relays and thermostats have become the predominant type on the global market)* |

| | |
|---|---|
| Blood pressure medical measuring devices such as Mercury-added sphygmomanometers | Aneroid sphygmomanometers and several types of automated (electronic) blood pressure gauges. |
| Mercury-added batteries such as: Mercury Oxide/Mercury-Zinc Batteries, Zinc-air Button Cells, Alkaline Button Cells, Silver Oxide Button Cells, Alkaline, other than button. | Most of these types of alkaline and button cell batteries are now mercury-free on the global market. |
| Dental mercury amalgam (fillings) | Composite (resin) fillings |
| Mercury-added Skin Lightening Products | Global databases are currently under development and many existing databases are available online to guide on skin lightening products that should be avoided due to mercury contamination or other harmful ingredients. |

For dental amalgam, under Article 4, Annex A, Part II of the Convention, Parties are expected to phase down dental amalgam by taking at least 2 provisions specified. Some key provisions for consideration by stakeholders in RMI include:

- Promoting the use of cost-effective and clinically effective mercury-free alternatives for dental restoration;
- Encouraging representative professionals to educate and train dental professionals on the use of mercury-free dental restoration alternatives and on promoting best management practices;
- Promoting the use of best environmental practices in dental facilities to reduce releases of mercury and mercury compounds to water and land.

Furthermore, as of 2022, Parties shall, "exclude or not allow, by taking measures as appropriate, the use of mercury in bulk form by dental practitioners" and Parties are expected to, "take appropriate measures to prevent dental amalgam use for patients under 15 years of age, and of pregnant and breastfeeding women, except when considered necessary".

**b. Ensuring BAT/BEP implementation for monitoring and preventing mercury releases from sources such as landfills and waste incinerators.**

Close coordination amongst stakeholders across the government and private sector to build capacity and infrastructure for sound waste management is key to reducing mercury releases from major sources. The incorporation of mercury management under national waste strategies and training of relevant personnel in the subject is highly recommended.

**4. Public awareness and sensitisation of relevant stakeholders on mercury issues**

It is recommended that greater awareness and education of the general public and key stakeholders through existing outreach programmes be carried out. Further details on this priority are provided in Chapter 5 of this report.

5. **Strengthen understanding of mercury issues in RMI through monitoring programmes.**

   To enhance the understanding of the risks posed by mercury locally, efforts to enhance strategies to identify potential mercury hotspots in the local environment through mapping and monitoring programmes can be coordinated. Partnering with regional and global organisations like SPREP, the UNEP Global Mercury Partnership and BRI, among others for the development of funded projects to enhance monitoring capabilities can be assessed. Currently global mercury monitoring activities are being conducted by organisations such as BRI for the collection and analysis of human hair samples, fish muscle tissue samples, blood, feather and egg samples from birds and blood or fur samples from bats. Data generated will contribute to a global mercury database in coordination with UNEP.

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## References


BRI, 2019. State of Mercury in the Pacific Region. [online] Available at: Pacific-Region-1-MIA-Brochure-2019.pdf (briwildlife.org)

BRI. 2023. State of Mercury in the Pacific Region. BRI, 2023

FAO. 2022. The State of World Fisheries and Aquaculture 2022. Towards Blue Transformation. Rome, FAO. https://doi.org/10.4060/cc0461en

IPEN, BRI, Arnika Association, Island Sustainability Alliance. 2018. Mercury Threat to Women & Children Across 3 Oceans ELEVATED MERCURY IN WOMEN IN SMALL ISLAND STATES & COUNTRIES. IPEN, Göteborg, Sweden.

Pacific Community (SPC), the Marshall Islands Economic Policy, Planning and Statistics Office (EPSSO) 2022. Republic of the Marshall Islands 2021 Census Report Volume 1: Basic Tables and Administrative Report. May 2023. SPC. Noumea, New Caledonia

PRIF. 2016. 2016 Review of Gender and Infrastructure. PRIF Coordination Office c/- Asian Development Bank. Sydney, Australia.

RMI, 2021. Welcome to the RMI (RMI). [online] Available at: RMI – YAP, CHUUK, POHNPEI, KOSRAE (visit-micronesia.fm)

SPREP, 2016. The Republic of the Marshall Islands State of Environment Report 2016 [online] Available at: Republic of the Marshall Islands Environment Data Portal | Information for Decision Making (sprep.org)

The World Bank Group. 2023. Micronesia, Fed. Sts. Overview. [online] Available at: Micronesia, Fed. Sts. | Data (worldbank.org)

The World Bank, 2009. Reducing the Risk of Disasters and Climate Variability in the Pacific Islands: Republic of the Marshall Islands Country Assessment. The World Bank. East Asia and the Pacific Region. Washington, D.C. 20433

UN Women, 2022. Gender Equality Brief for the Republic of Marshall Islands. United Nations Entity for Gender Equality and the Empowerment of Women (UN Women). [online] Available at: https://asiapacific.unwomen.org/en/digital-library/publications/2022/11/gender-equality-brief-for-the-republic-of-marshall-islands

UNEP and WHO. 2008. Guidance for Identifying Populations at Risk from Mercury Exposure. 2008. UNEP DTIE Chemicals Branch and WHO Department of Food Safety, Zoonoses and Foodborne Diseases, Geneva, Switzerland.

UNEP, 2019a. Toolkit for Identification and Quantification of Mercury Releases, Reference Report and Guideline for Inventory Level 2. Version 1.5. November, 2019. UNEP Chemical Branch, Geneva, Switzerland.

UNEP, 2019b. Global Mercury Assessment 2018. UNEP Chemical Branch, Geneva, Switzerland. [online] Available at: Global Mercury Assessment 2018 | UNEP - UN Environment Programme

UNEP, 2023. Minamata Convention on Mercury. UNEP Chemical Branch, Geneva, Switzerland.

United Nations' Economic and Social Council (ECOSOC). 1997. Excerpt from A/52/3. Chapter IV: Coordination segment: Mainstreaming the gender perspective into all policies and programmes in the United Nations system. [online] http://www.un.org/womenwatch/osagi/pdf/ECOSOCAC1997.2.PDF.

WHO. 2021a. Exposure to mercury: a major public health concern, second edition. Preventing disease through healthy environments: Second Edition. WHO 2021: ISBN 978-92-4-002356-7.

WHO. 2021b. Mercury and human health: educational course. WHO Regional Office for Europe, Copenhagen. 2021. Licence: CC BY-NC-SA 3.0 IGO.

World Health Organisation (WHO), 2017. Mercury and Health. [online] Available at: Mercury and health (who.int)

Yauvoli, A.V. 2010. The RMI Five Year Review of the Mauritius Strategy for the Further Implementation of the Programme of Action for the Sustainable Development ff Small Island Developing States- The Case of the RMI. 2010. Government of the RMI.

## Annex 1: UNEP TOOLKIT Calculation Spreadsheet

The UNEP Toolkit Calculation Spreadsheet is available for download at the following link: https://docs.google.com/spreadsheets/d/1T4fTR-B1Vfq26Y0gBu2TprYnnBUnLW_9/edit?usp=sharing&ouid=111368229179989433735&rtpof=true&sd=true