TUVALU MINAMATA INITIAL ASSESSMENT REPORT



MARCH 2024

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PUBLISHED MARCH 2024
Prepared by the Biodiversity Research Institute under the GEF Project (GEF ID: 10582): "Development of Minamata Initial Assessment in Tuvalu (MIA Tuvalu)".

GEF IMPLEMENTING AGENCY

United Nations Environment Programme

PROJECT EXECUTING AGENCY
Secretariat of the Pacific Regional Environment Programme (SPREP)

NATIONAL EXECUTING AGENCY
Department of Environment, Ministry of Home Affairs, Climate Change, Culture, Environment & Waste Management, Government of Tuvalu

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ABOUT THIS DOCUMENT

The Tuvalu Minamata Initial Assessment Report was developed under the project, GEF Project (GEF ID: 10582): "Development of Minamata Initial Assessment in Tuvalu (MIA Tuvalu"

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 2020 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.*

Data collection was coordinated by the Department of Environment, Ministry of Home Affairs, Climate Change, Culture, Environment & Waste Management (formerly under the Ministry of Public Works, Infrastructure, Environment, Labour, Meteorology and Disaster), Tuvalu; Mr. Lamese Saamu, Data Expert, Local Consultant; Ms. Tahlia Ali Shah, International Environmental Specialist, BRI and Mr. Mark Burton, Senior Ecological Analyst and Geospatial Scientist, BRI, via stakeholder consultations and background research. The legislative and institutional capacity assessment was conducted by Mrs. Chrisanthy Baniani, the Legal Consultant.

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Report issuing date	March 2024

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List of Abbreviations

Abbreviation	Full Name
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
FoFA	Fishermen of Funafuti Association
g	Gram
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIC	Glass ionomer cement (dental fillings)
GIS	Geographic Information Systems
GLC	Great Lakes Commission
GJ	Gigajoules
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
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
MEAs	Multilateral Environmental Agreements
mg	Milligrams
MIA	Minamata Initial Assessment
ML	Megalitres
mm	Millimetres
MW	Megawatts
NAFICOT	National Fisheries Corporation of Tuvalu

NGOs	Non-Governmental Organisation
NPTEL	National Programme on Technology Enhanced Learning
OCO	Oceania Customs Organisation
ODS	Ozone Depleting Substances
POPs	Persistent Organic Pollutants
PPE	Personal protective equipment
Ppm	Parts Per Million
PRIF	Pacific Region Infrastructure Facility
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
TEC	Tuvalu Electricity Corporation
THg	Total Mercury
TuFHA	Tuvalu Family Health Association
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
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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Acknowledgements

- Global Environment Facility (GEF)
- United Nation Environment Programme (UNEP)
- Biodiversity Research Institute (BRI)
- Secretariat of the Pacific Regional Environment Programme (SPREP)
- Government of Tuvalu
- Tuvalu National Stakeholders
- Local Consultants

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 Tuvalu.

To better inform needs for implementation of the Minamata Convention, Tuvalu 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 Department of Environment 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 Tuvalu using this inventory should not be considered as definitive but rather as a guide for the identification of priorities and further assessments.

3.24 kilograms (Kg) of mercury (Hg) were determined to be released in Tuvalu per year. 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 1.24 Kg of mercury per year (Kg Hg/y).

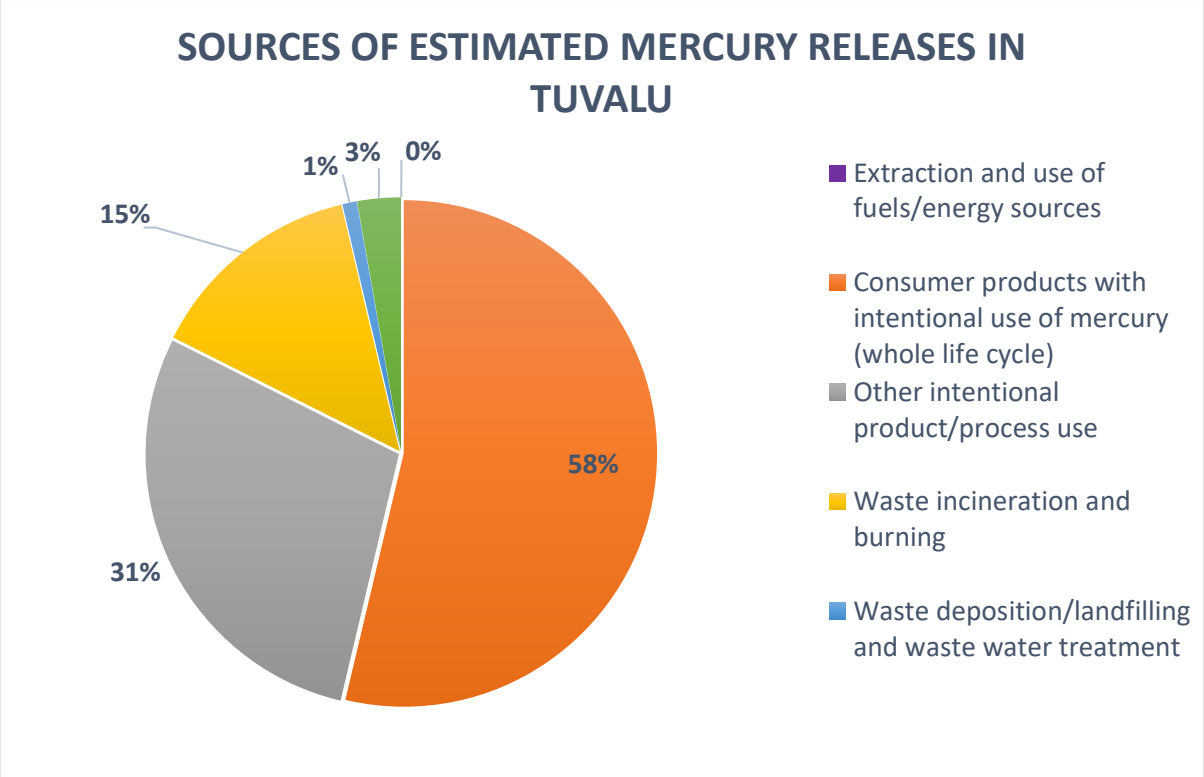


Figure 1: Pie Chart showing the main sources of estimated mercury releases in Tuvalu.

The second highest category source of mercury releases at 31% was "Other Intentional Products/Process Uses" referring to the preparation, use and disposal of laboratory chemicals and equipment with mercury (0.52 Kg Hg/y), dental mercury-amalgam fillings (0.45 Kg Hg/y) and the use and disposal of manometers and gauges with mercury (0.05 Kg Hg/y).

For the source categories, the output pathways for mercury releases were also assessed. Mercury releases to general waste was found to be highest in comparison to other pathways at 1.00 Kg Hg/y. This was found to be mainly due to the use and disposal of consumer products with mercury and waste deposition. The air output pathway was also found to be comparable at 0.90 Kg Hg/y estimated to be released mainly due to waste incineration. Releases to land accounted for the third highest output pathway for mercury releases at 0.63 Kg Hg/y.

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

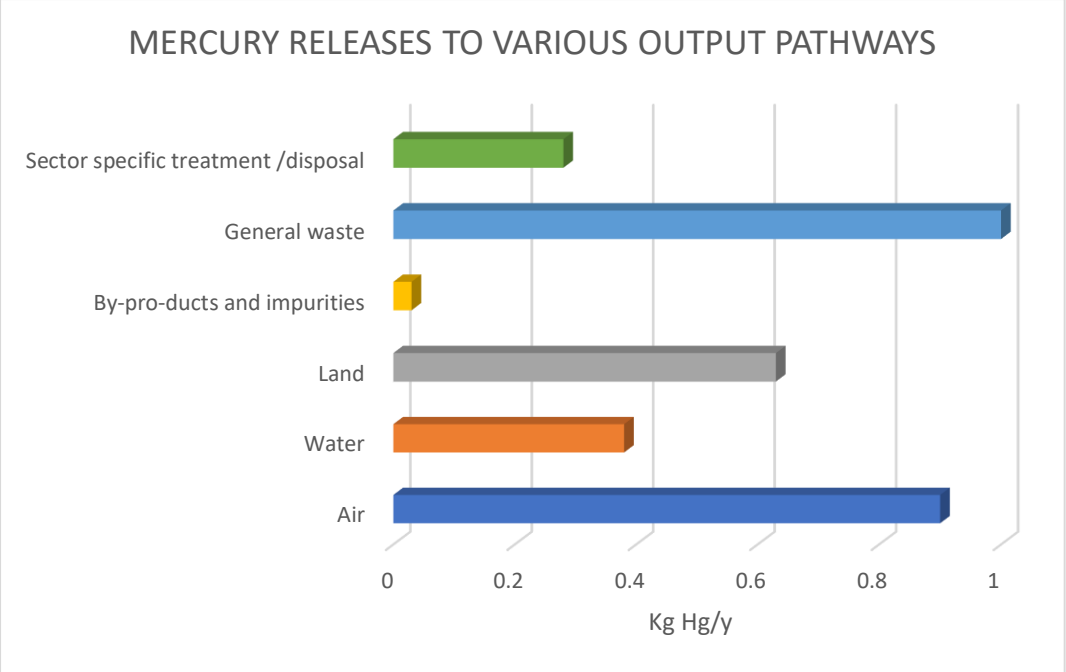


Figure 2: Bar Chart showing the mercury releases estimated according to output pathway in Tuvalu.

Major Findings of the Policy, Regulatory and Institutional Framework Assessment

For the overall implementation of the Minamata Convention on Mercury, a regulatory mechanism is already in place under the Environment Protection Act 2008 to give power to the Department of Environment to implement the Minamata Convention on Mercury. Implementation should be done 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 further build on the key obligations of the Minamata Convention for the management of mercury releases, a regulation under the Environment Protection Act 2008 to include environmental standards for management of mercury releases to the air, water and land should be developed. The Department of Environment should bear the responsibility for development of these standards with reference to guidance provided under the Minamata Convention. Coordination with the other national authorities such as the Department of Waste and Department of Health, where needed, to ensure management of potential mercury releases through proper health and sanitation practices should be conducted.

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 agreement.

Under Section 78 *Prohibited Imports* of the Customs Revenue and Border Protection Act 2014, a regulation should be established to prohibit 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.

Collaboration between the Customs Revenue and Border Protection Department and private sector retailers to ensure the implementation of the prohibition of mercury products and the promotion of safe mercury-free alternatives should also be carried out. Coordination with the Department of Health to meet the obligations for phase down of dental amalgam and phase out of mercury added medical devices is recommended.

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 mercury management coordination be formally established under the guidance of the Department of Environment. 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 Funafuti, Tuvalu was developed to identify the locations of potentially mercury contaminated sites. Further geospatial data on the other parts of Tuvalu 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.

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 Tuvalu. 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. A version of the video with subtitled captions in the national language of Tuvalu was also provided for further dissemination. It is recommended that the video be shared widely via social media by the Department of Environment 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 Tuvalu's participation in the GEF ISLANDS Programme, further mercury-related activities for information dissemination, inclusive of gender considerations, will be carried out. 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 the Department of Fisheries, Department of Health and Tuvalu Family Health Association, 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 legislative regulations such as:
    a. Under the Environment Protection Act 2008 for the management of mercury releases to air, land, and water. (Note: coordinate amongst the Department of Waste Management and Department of Health to establish monitoring measures for mercury wastes from medical and general waste incineration).
    b. Under the Customs Revenue and Border Protection Act 2014, prohibit the import of mercury, mercury compounds and mercury added products.
2. Establish a multi-stakeholder 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 Tuvalu through monitoring programmes.

Under the ongoing GEF-funded programme, Implementing Sustainable Low and Non-Chemical Development in Small Island Developing States (ISLANDS), Tuvalu 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 to 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 (ASGM) 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 Tuvalu 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 archipelago of Tuvalu lies between latitude of 5º to 11º south and between longitude of 176º and 180º east of Greenwich. It is located approximately 1,100 kilometres (km) north of Fiji and 1,400 km south of the Republic of Kiribati. Situated in the South Pacific Ocean consisting of 9 islands that stretch 579 km in length, the islands have a combined land area of 26 square kilometers (km^2) and are surrounded by 1.3 million km^2 of ocean, including an Exclusive Economic Zone of 719,174 km^2. The average height above sea level is less than 3 metres (m) with the highest point above sea level being 4.6 m in Niulakita (Government of Tuvalu, 2017).

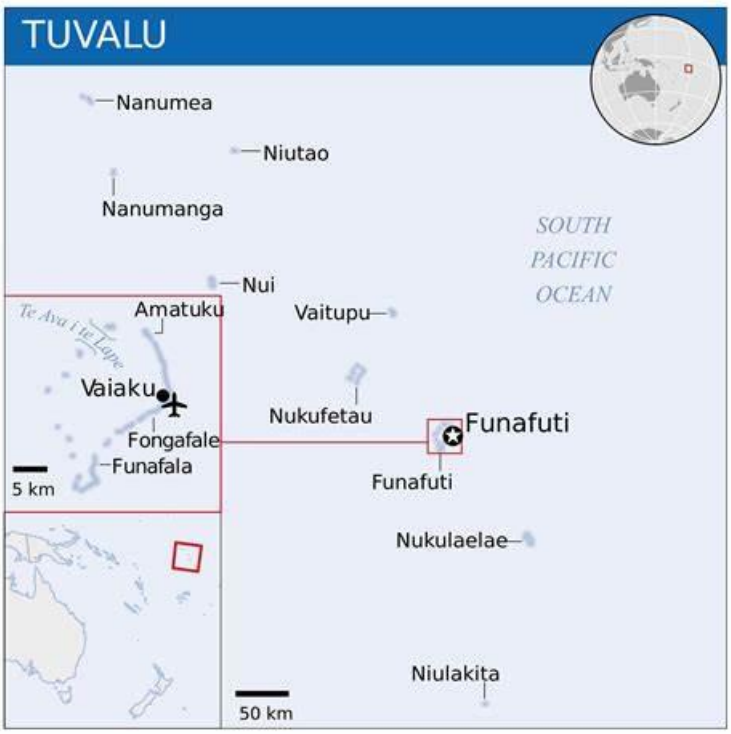


Figure 3: Map of Tuvalu showing main atolls (Mapsland, 2024)

The 9 atolls (Figure 3), which extend over a distance of about 570 km from Nanumea in the northwest to Niulakita in the southeast, include:

- 5 classic "true atolls" (Nanumea, Nui, Nukufetau, Funafuti and Nukulaelae) consisting of varying numbers of reef islets or motu encircling or bordering a central lagoon or lagoons,
- 3 single raised limestone islets with no central lagoon, but with small remnant landlocked "fossil" lagoons (Niutao, Nanumaga and Niulakita) and,
- 1 island, Vaitupu, which has the greatest land area of 5.6 km^2 and which is a broad, pear-shaped limestone island with 2 small relatively land-locked internal lagoons (Kench et al., 2018).

Most of the islands of Tuvalu have an average elevation of only 1 to 2 m above sea level with only limited areas rising above 3 m (Kench et al., 2018).

The name "Tuvalu" means "8 islands in unity" and although there are 9 islands comprising the country today, only 8 were initially inhabited so the 9th (Niulakita) is not included in its name.

The total enumerated population for Tuvalu during the 2017 mini census was 10,645 people, with 10,507 permanent residents and 138 visitors or non-residents. Within the 5 years from 2012 to 2017, the total population has decreased by 137 people. The first decline experienced with the census population, and a straight decrease of -1.3%, making an annual average growth rate of -0.3% per annum (Government of Tuvalu, 2017).

1.2 Political, Economic and Legal Profile

In 1892, Tuvalu became a British Protectorate as part of the Gilbert and Ellice Islands. Although under one administration, the 2 island groups were not equally represented with the Ellice Islands population being outnumbered by the Gilbert Islands. This eventually led to the 1974 referendum, which resulted in the separation of the 2 island groups. Following the UN administered referendum in 1974, the Ellice Islands were separated from the Gilbert Islands to form the separate British dependency of Tuvalu on 1 October 1975 (Isala, 1983). Tuvalu gained political independence from Britain on 1 October 1978. The Independence Constitution adopted a Westminster system of government with the British monarch as Head of State who appoints a Governor General who must be a Tuvaluan citizen (Isala, 1983).

The Parliament comprises of 16 elected members (2 from each island) serving a 4-year term. Independent candidates run for election as there are no political parties. The Prime Minister and Speaker of Parliament are elected by the Members of Parliament. In terms of gender representation, as of April 2022, 3 women have been Parliament members since independence (UN Women, 2022). Local government systems in Tuvalu maintain their traditional structure with decisions being led by an assembly of elders, the Falekaupule (UN Women, 2022). The continuous strengthening of traditional and political leadership for Tuvalu's commitment to addressing high impact issues such as climate change and supporting the economic status of the country has been highlighted as a priority nationally.

The dispersed nature of the islands, isolation from key international and regional markets, tiny land mass, small population, and narrow natural resource base are major constraints to economic development in Tuvalu. The national economy is reliant on donor aid with additional revenue being sourced from taxes, custom duties, postage stamp sales, fishing and dot TV domain licenses. Tuvalu's gross domestic product (GDP) was estimated at US$67 million in 2020 (Government of Tuvalu, 2020). The main drivers of the Tuvaluan economy are fishing and the maritime industries.

1.3 Environmental Overview

Tuvalu is among the most vulnerable to the impacts of climate change and rising-sea levels. To enhance national capacities to address environmental challenges and protect the environment, Tuvalu is a Party to several Multilateral Environment Agreements (MEAs) and is a member and affiliation to various regional and international organizations. A list of some

relevant organizations and MEAs that Tuvalu is a Party to is provided in Table 2, including the Minamata Convention on Mercury. The Department of Environment is the key stakeholder for the overall management of the environment in Tuvalu.

Table 2: Relevant organisations and multilateral environmental agreements to which Tuvalu is a Party

REGIONAL ORGANIZATIONS
Forum Secretariat
Secretariat to the Pacific Region (SPC)
Secretariat to the Pacific Regional Environment Organization (SPREP)
INTERNATIONAL ORGANIZATIONS
United Nation Development Programme (UNDP)
United Nations Environment Programme (UNEP)
ENVIRONMENT INTERNATIONAL INSTRUMENT
WASTE AND POLLUTION: Hazardous waste and pollution: - Basel Convention - Rotterdam Convention - Stockholm Convention Atmospheric Pollution: Vienna Convention Montreal Protocol Ship-based pollution: - UNCLOS (Part XII: Protection and Preservation of the Marine Environment) - London Convention: Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter - London Protocol Health –based pollution: Minamata Convention
BIODIVERSITY: Convention on Biological Diversity (CBD) - Cartagena Protocol on Biosafety - Nagoya Protocol on Access and Benefit-Sharing Convention on International Trade in Endangered Species (CITES) Convention on Migratory Species (CMS) Convention on Wetlands (RAMSAR) World Heritage Convention (WHC)
CLIMATE CHANGE: UNFCCC Kyoto Protocol Paris Agreement
LAND DEGRADATION UNCCD
ENVIRONMENT REGIONAL AGREEMENT
Waigani Convention Noumea Convention Dumping Protocol Emergencies Protocol

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 Tuvalu, 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 Tuvalu; 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	**Y**
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	**Y**
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	**Y**
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	N
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 Tuvalu. 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 Tuvalu for the source categories identified as being present in Table 3 are shown below in Table 4.

Table 4: Summary of mercury inputs to Tuvalu

Source category	Estimated Hg Input (Kg Hg/y)
Extraction and use of fuels/energy sources	
Mineral Oil- Extraction, refining and use	**0.00**
Biomass fired power and heat production	**0.01**
Consumer products with intentional use of mercury	
Thermometers with mercury	**0.05**
Electrical and electronic switches, contacts and relays with mercury	**1.24**
Light sources with mercury	**0.04**
Batteries containing mercury	**0.56**
Cosmetics and related products with mercury	**No data available**
Other intentional products/process uses	
Dental mercury-amalgam fillings	**0.45**
Manometers and gauges	**0.05**
Laboratory chemicals and equipment	**0.52**
Waste incineration	
Incineration of general waste	**0.17**
Incineration of medical waste	**0.12**
Informal waste burning	**0.21**

Source category	Estimated Hg Input (Kg Hg/y)
Waste deposition/landfilling and wastewater treatment	
Controlled landfills/deposits	**0.02**
Informal dumping of general waste	**Assumed to be negligible**
Wastewater system/treatment	**No data available**
Cremation and cemeteries	
Cemeteries	**0.10**

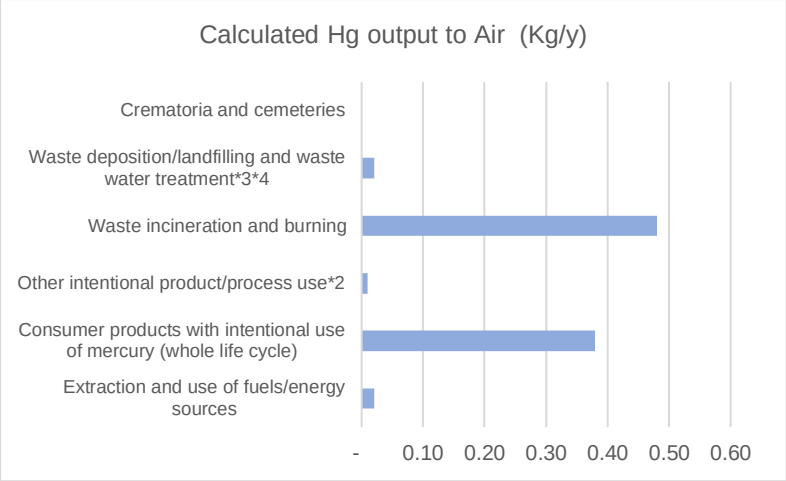
2.1.3 Summary of Mercury Releases

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

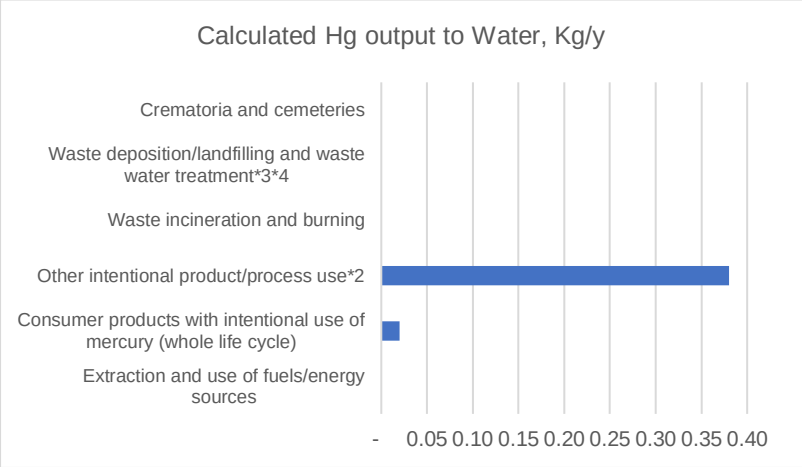
Calculation Result Type	Description ***(NOTE: Not all examples provided are relevant to Tuvalu but are included for general reference)***
Estimated Hg input, Kg Hg/y	The standard estimate of the amount of mercury entering this source category with input materials, for example calculated mercury amount 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: • Point sources such as coal fired power plants, metal smelter, waste incineration; • Diffuse sources such as small-scale gold mining, informal burning of waste with fluorescent lamps, batteries, thermometers.
Water	Mercury releases to aquatic environments and to 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: • Wet flue gas cleaning systems on coal fired power plants; • Industry, households, etc. to aquatic environments; • Surface run-off and leachate from mercury contaminated soil and waste dumps.

Calculation Result Type	Description *(NOTE: Not all examples provided are relevant to Tuvalu but are included for general reference)*
Land	Mercury releases to the terrestrial environment: General soil and ground water. For example, releases from: • Solid residues from flue gas cleaning on coal fired power plants used for gravel road construction; • Uncollected waste products dumped or buried informally; • Local un-confined releases from industry such as on-site hazardous waste storage/burial; • Spreading of sewage sludge with mercury content on agricultural land (sludge used as fertilizer); • Application on land, seeds or seedlings of pesticides with mercury 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: • Gypsum wallboard produced from solid residues from flue gas cleaning on coal fired power plants; • Sulphuric acid produced from desulphurization of flue gas (flue gas cleaning) in non-ferrous metal plants with mercury trace concentrations; • Chlorine and sodium hydroxide produced with mercury-based chlor-alkali technology; with mercury trace concentrations; • Metal mercury or calomel as by-product from non-ferrous metal mining (high mercury concentrations).
General waste	General waste: Also called municipal waste in some countries. Typically, household and institution waste where the waste undergoes a general treatment, such as incineration, landfilling or informal dumping. The mercury sources to waste are consumer products with intentional mercury content (batteries, thermometers, fluorescent tubes, etc.) as well as high volume waste like printed paper, plastic, etc., with small trace concentrations of mercury.
Sector specific waste treatment /disposal	Waste from industry and consumers which is collected and treated in separate systems, and in some cases recycled; for example: • Confined deposition of solid residues from flue gas cleaning on coal fired power plants on dedicated sites; • Hazardous industrial waste with high mercury content, which is deposited in dedicated, safe sites; • Hazardous consumer waste with mercury content, mainly separately collected and safely treated batteries, thermometers, mercury switches, lost teeth with amalgam fillings, etc.; • Confined deposition of tailings and high-volume rock/waste from extraction of non-ferrous metals.



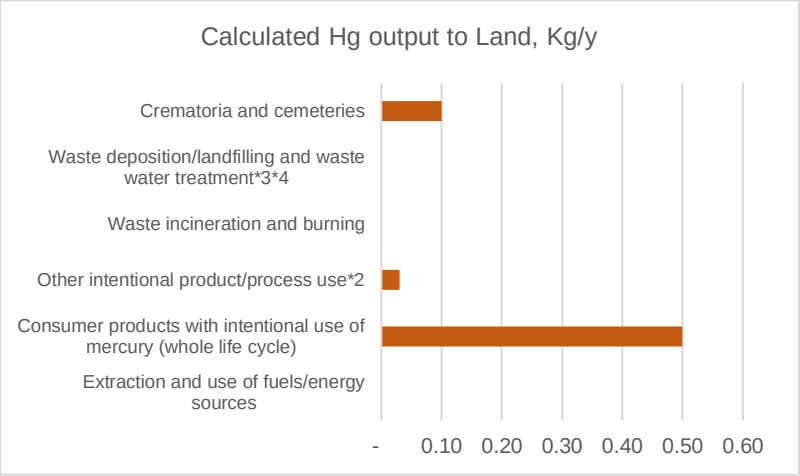
Waste incineration resulted in the highest estimated air emissions of mercury annually at 0.48 Kg/y. The use and disposal of consumer products with mercury accounted for the second highest estimated mercury emissions to air with 0.38 Kg/y.

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



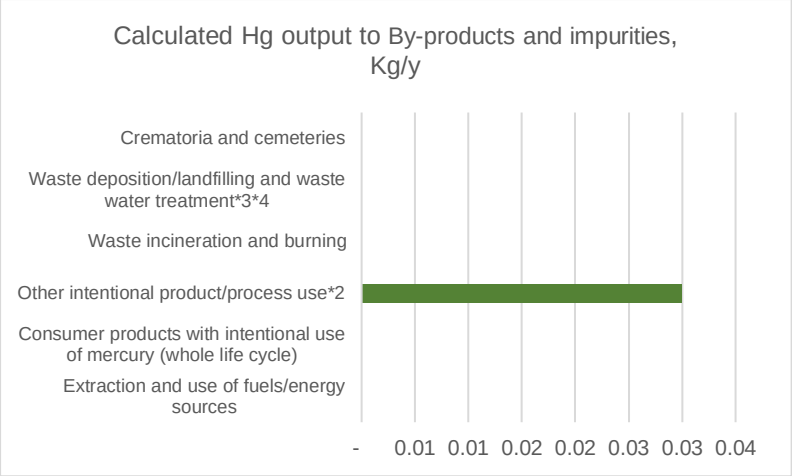
Other intentional product/process use which refers to the preparation, use and disposal of dental amalgam fillings as well as manometers and gauges resulted in 0.38 Kg Hg/y of releases to water.

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



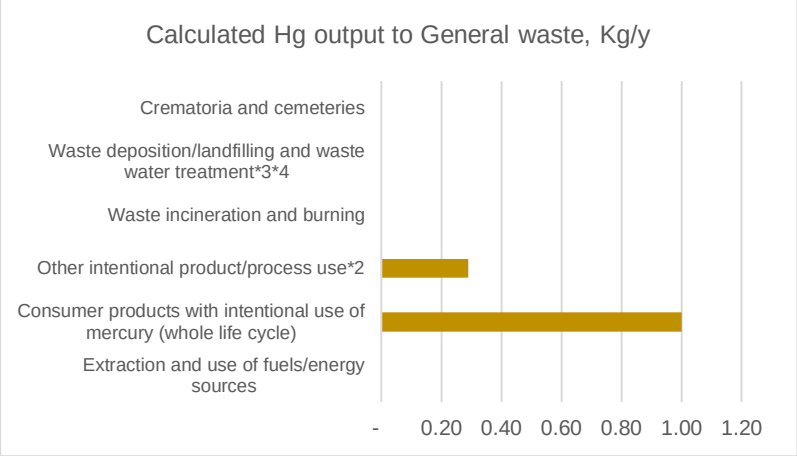
Consumer products with mercury resulted in an estimated 0.50 Kg/y of mercury being released to land, likely due to disposal in landfills. The release of mercury from bodies after burial was estimated to be responsible for approximately 0.10 Kg/ of mercury being released.

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



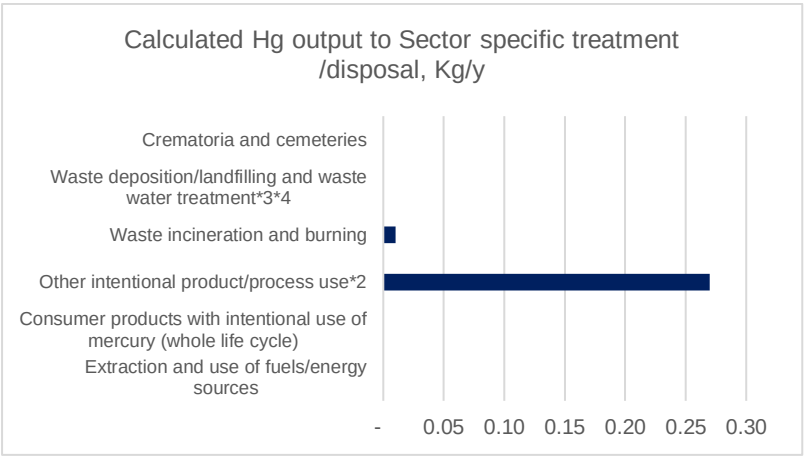
0.03 Kg/y of mercury were estimated to be released to by-products and impurities, mainly due to the preparation, use and disposal of dental amalgam fillings under the category: other intentional products/process use.

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



The disposal of consumer products with mercury resulted in the highest estimated releases to general waste (1.00 Kg/y Hg) followed by other intentional products/process use with 0.29 Kg Hg/y.

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



For sector-specific treatment/disposal pathways, Other intentional product/process uses was found to be responsible for 0.27 Kg/y of mercury releases with minor releases of 0.01 Kg/y estimated from waste incineration and burning.

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

Table 6 summarises mercury releases to the various output pathways in Tuvalu based on Toolkit calculations using mainly 2021 data and default values or previous years' data 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 Tuvalu are not included in the table.

Table 6: Summary of estimated yearly mercury releases in Tuvalu

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	0.00	0.00	0.00	0.00	0.00	0.00
Biomass fired power and heat production	0.01	0.00	0.00	0.00	0.00	0.00
Consumer products with intentional use of mercury						
Thermometers with mercury	0.01	0.02	0.00	0.00	0.03	0.00
Electrical switches and relays with mercury	0.37	0.00	0.50	0.00	0.37	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	0.56	0.00
Cosmetics and related products with mercury	-	-	-	-	-	-
Other intentional product/process use						
Dental mercury-amalgam fillings	0.01	0.20	0.03	0.03	0.09	0.09
Manometers and gauges with mercury	0.01	0.02	0.00	0.00	0.03	0.00
Laboratory chemicals and equipment	0.00	0.17	0.00	0.00	0.17	0.18
Waste incineration[*3]						
Incineration of general waste	0.17	0.00	0.00	0.00	0.00	0.00
Incineration of medical waste	0.11	0.00	0.00	0.00	0.00	0.01
Informal waste burning	0.21	0.00	0.00	0.00	0.00	0.00
Waste deposition/landfilling and wastewater treatment						
Controlled landfills/deposits[*3]	0.02	0.00	0.00	0.00	0.00	0.00
Informal dumping of general waste[*1*3]	-	-	-	-	-	-
Waste water system/treatment[*2]	-	-	-	-	-	-
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]	**0.90**	**0.40**	**0.63**	**0.03**	**1.00**	**0.28**

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.*

Total annual mercury releases in Tuvalu were estimated to be 3.34 Kg Hg/y.

The following sub-categories were estimated to be the top sources of mercury:

1. Electrical switches and relays with mercury (1.24 Kg Hg/y)
2. Batteries with mercury (0.56 Kg Hg/y)
3. Laboratory chemicals and equipment with mercury (0.52 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 Tuvalu, 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 Tuvalu, 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

In Tuvalu, the state-owned Tuvalu Electricity Corporation (TEC) manages the supply of electricity across the country using mainly diesel-generating stations. There are 8 main power generating stations, 1 in Funafuti which is estimated to supply approximately 4 million kWh, and 7 across the outer islands that supply 165 kWh. Power generation facilities fall into the "Other Oil Combustion Facilities" for this Toolkit. Data was obtained from the TEC's Logistics 2020 – 2015 Technical Report which estimated a total fuel consumption of 2,203,700 litres in 2020 which was converted to 1,858 tonnes per year (t/y) using the Conversion tab in the UNEP Toolkit. It is anticipated that the amount of fuel used for energy generation will continue to decrease as Tuvalu is moving towards 100% renewable energy power generation by 2025.

Tuvalu also imports various mineral oils for other activities such as transportation. Data on the types and quantities of fuels used in Tuvalu was available for 2012 from a Pacific Region Infrastructure Facility (PRIF), Pacific Power Association (PPA) and the Secretariat of the Pacific Community (SPC) report developed by Morgan, C. and Atkinson, D. (2016). For input into the Toolkit, it was assumed that the 2012 values would be the same as those used in 2021. The values were converted to tonnes per year (t/y) using the Unit Conversion tab in the UNEP Toolkit. Table 7 summarises the converted values used for data entry.

Table 7: Summary of Fuel Quantities for Tuvalu in 2012 Converted to tonnes/year.

Type of Fuel	Amount per year in units provided	Conversion to tonnes/year (t/y)
Diesel	1.09 Megalitres (ML) *(representing 39% of 2.97 ML estimated to be used for activities besides power generation)*	927
Gasoline	0.82 ML	691
Liquified Petroleum Gas (LPG)	259 t	259
Kerosene	0.2 ML	161
TOTAL:	-	2,038

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

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	2,038	1,858
Input factor for phase	mg Hg/t	2.00	2.00
Calculated input to phase	**Kg Hg/y**	**0.00**	**0.00**
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	0.00	0.00
- 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.

2.2.2 Biomass fired power and heat production.

Biomass may naturally contain mercury as an impurity which can be released during burning as a fuel source (UNEP, 2019a). Vegetation also absorbs atmospheric mercury overtime which is readily re-released to the air upon combustion (UNEP, 2019a).

Data Collection and Assessment

In 2005, an assessment to determine the potential for biomass energy production and use in Tuvalu was conducted as the need for self-sufficient energy production was being explored. Biomass sources such as coconuts, copra, pig manure and organic waste has been used to some extent in Tuvalu as a fuel source historically, though currently on a much smaller scale (Hemstock, S. L., 2005). Surveys were conducted on biomass use in households and based on the assessment of total domestic biomass energy use conducted, it was determined that the total annual biomass energy consumption for domestic purposes was 4,558 Gigajoules (GJ). This was derived from estimating the biomass energy from 696,668 coconut husks, 431,690 coconut shells and 7 tonnes of firewood used in communal cooking. While the amount of biomass use estimated in the assessment was for 2005, it was assumed that the amounts used in more recent years would be comparable.

Table 9 summarises the mercury inputs and releases to Tuvalu from the burning of biomass. The input factors and output distribution factors used to estimate mercury releases were obtained from the Toolkit. The “Unit conversion” tab of the Toolkit was used to convert 4,558 GJ /y to 397 t/y for input in the inventory.

Table 9: Analysis of mercury inputs and outputs from the burning of biomass

Biomass	Unit	Burning of Biomass
Activity rate	t/y	397
Input factor for phase	g Hg/t	0.03
Calculated input to phase	**Kg Hg/y**	**0.01**
Output distribution factors for phase:		
- Air	N/A	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	0.01
- 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	-

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 Tuvalu, 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. Tuvalu is no longer using thermometers with mercury in the health and education departments; however, 51 mercury thermometers were identified to still be in stock at the Health and Education Government Departments. For the purposed of the inventory, it was assumed that those in stock would be the average number used per year although it was noted that they were likely shipped to Japan for proper disposal.

Table 10 summarises the mercury inputs and releases to Tuvalu from the use and disposal of thermometers. The input factors and output distribution factors used to estimate mercury releases were obtained from the Toolkit.

Table 10: Analysis of mercury inputs and outputs from thermometers with mercury

Use and Disposal of Thermometers	Unit	Use and Disposal of medical thermometers
Activity rate	item/y	51
Input factor for phase	g Hg/item	1.00
Calculated input to phase	**Kg Hg/y**	**0.05**
Output distribution factors for phase:		
- Air	N/A	0.10
- Water	N/A	0.30
- Land	N/A	-
- Products	N/A	-
- General waste treatment	N/A	0.60
- Sector specific waste treatment	N/A	-
Calculated outputs/releases to:		
- Air	Kg Hg/y	0.01
- Water	Kg Hg/y	0.02
- Land	Kg Hg/y	-
- Products	Kg Hg/y	-
- General waste treatment	Kg Hg/y	0.03
- Sector specific waste treatment	Kg Hg/y	-

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 11). 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 11: 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 from 2001 to give a more accurate estimation of the historical consumption and 2021 disposal rates. A default electrification rate of 92% was used in the calculations. Table 12 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 12: 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 (2001)	9,621
Input factor for phase	Percent of population with access to electricity	92
	g Hg/y*inhabitant	0.14
Calculated input to phase (no separate collection. Informal waste handling widespread)	**Kg Hg/y**	**1.24**
Output distribution factors for phase:		

Electrical Switches and Relays with Mercury	Unit	Use and Disposal of Electrical Switches and Relays
- 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	0.37
- Water	Kg Hg/y	-
- Land	Kg Hg/y	0.50
- Products	-	-
- General waste treatment	Kg Hg/y	0.37
- 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 Tuvalu, however, they are imported.

Data Collection and Assessment

Import data on lighting devices being imported in 2018 was obtained by the Department of Environment and used for entry in the Toolkit. It is important to note that as mercury-added lighting devices are gradually being replaced with mercury-free and more energy efficient lighting such as Light Emitting Diodes (LEDs), the number of CFLs, LFLs and metal halide lamps imported in Tuvalu will continue to decrease.

Table 13 summarises the mercury inputs and releases to Tuvalu from the estimated number of mercury added lighting devices imported in 2018. The input factors and output distribution factors used to estimate mercury releases were obtained from the Toolkit.

Table 13: Analysis of mercury inputs and outputs from the use and disposal of lighting devices

Use and Disposal of Lighting Devices	Unit	LFLs	CFLs	High-Pressure Sodium Lamps	Metal Halide Lamps
Activity rate	items/y	1,590	12	12	961
Input factor for phase	mg Hg/t	8.00	2.70	40	25
Calculated input to phase	**Kg Hg/y**	**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	-			
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 Tuvalu, batteries are imported for use in various equipment and applications. There is no separate collection of mercury-added batteries for disposal.

Data Collection and Assessment

According to data obtained from Customs and reviewed by the Department of Environment, it was found that 3 types of potentially mercury-added batteries were imported in recent years.

These included mercury oxide cells, zinc-air button cells and silver oxide button cells. It is possible that other types were not captured from Customs data due to overall difficulty in tracking these types of product imports. The import data obtained was used for entry in the Toolkit.

It can be noted that most popular brands of batteries observed in the Pacific region in 2023, were found to be mercury-free as global trends reflect a phase out of mercury-added batteries by most major manufacturers.

Table 14 summarises the mercury inputs and releases to Tuvalu from the estimated number of mercury-added batteries imported in recent years. The input factors and output distribution factors used to estimate mercury releases were obtained from the Toolkit.

Table 14: Analysis of mercury inputs and outputs from the use and disposal of batteries

Use and Disposal of Batteries	Unit	Mercury Oxide	Zinc-Air button cells	Silver Oxide button cells
Activity rate	t/y	0.001	0.02	0.001
Input factor for phase	kg Hg/t	320	12	4
Calculated input to phase	**Kg Hg/y**	**0.56**		
Output distribution factors for phase *(No separate collection; Waste Handling Controlled)*:				
- Air	N/A	-		
- Water	N/A	-		
- Land	N/A	-		
- Products	N/A	-		
- General waste treatment	N/A	1.00		
- Sector specific waste treatment	N/A	-		
Calculated outputs/releases to:				
- Air	Kg Hg/y	-		
- Water	Kg Hg/y	-		
- Land	Kg Hg/y	-		
- Products	Kg Hg/y	-		
- General waste treatment	Kg Hg/y	0.56		
- Sector specific waste treatment	Kg Hg/y	-		

2.3.5 Cosmetics with mercury *(presence unknown)*

While the use of cosmetics overall is minimal in Tuvalu, the presence of mercury in these products is uncertain as typically many mercury-added skin lightening products are unlabeled or mislabeled. Mercury-added skin lightening products (creams and soaps) have been identified as a global issue and several initiatives are being carried out to further inform the elimination of these products on the international market. Further information can be found at: www.unep.org/mercuryfreecosmetics. It is recommended that the findings of these initiatives be used to further determine the presence and/or extent of the issue in Tuvalu in coming years.

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

Since 2019, it was noted that Tuvalu no longer uses dental amalgam but still have some in storage awaiting disposal at the Department of Health. 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 0.18 for Tuvalu according to the Toolkit) as well as the number of inhabitants.

Population data from 2019 was used to calculate the mercury input from the preparation of dental amalgam fillings at dental clinics in Tuvalu. Mercury input and releases occurring from the use of amalgam fillings were expected to have been from amalgam placed years prior in 2011 since mercury amalgam can last between 5-15 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, 2001, due to the life expectancy of the fillings.

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 0.45 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 15.

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

Table 15: Analysis of mercury inputs and outputs from the preparation, use and disposal of dental amalgam.

Dental Mercury-Amalgam Fillings	**Unit**	**Preparation**	**Use**	**Disposal** (In countries where only dental chair filters/strainers are used in most clinics)
Activity rate	Inhabitants Dentists per 1000 inhabitants	10,956	10,700	9,621
Input factor for phase	g Hg/(y*inh)	0.2	0.2	0.2
Calculated input to each phase	**Kg Hg/y**	**0.48**	**0.47**	**0.42**
Total input	**Kg Hg/y**	**0.45** ***(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	0.01	-	-
- Water	Kg Hg/y	0.07	0.01	0.12
- Land	Kg Hg/y	-	-	0.03
- Products	Kg Hg/y	-	-	0.03
- General waste treatment	Kg Hg/y	0.06	-	0.03
- Sector specific waste treatment	Kg Hg/y	0.06	-	0.03

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 Tuvalu in 2021 was not obtained for this inventory due to difficulties in differentiating mercury-containing from mercury-free blood pressure gauges. It was noted that most high blood pressure measurement devices that contained mercury have been replaced with new digital devices in the Department of Health. From consultations with the Meteorology Department, it was noted that a barometer containing mercury is still in use and should be disposed of in a sound manner once it stops working.

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 0.05 Kg Hg/y. A summary of estimated mercury releases from manometers and gauges is shown in Table 16.

Table 16: 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	11,204
Input factor for phase	Percent of population with access to electricity	92
	g Hg/y*inhabitant	0.005
Calculated input to phase	**Kg Hg/y**	**0.05**
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	0.01
- Water	Kg Hg/y	0.02
- Land	-	-
- Products	-	-
- General waste treatment	Kg Hg/y	0.03
- Sector specific waste treatment	-	-

2.4.3 Use and Disposal of Laboratory Chemicals and Equipment

Mercury may be used in laboratories as components of instruments and equipment, reagents, preservatives and catalysts (UNEP, 2019a). Some laboratory chemicals which contain mercury include mercury oxide (HgO), mercury chloride ($HgCl_2$) and mercury sulfate ($HgSO_4$).

In recent years, most mercury-added instruments and some methods using mercury compounds have been replaced with mercury-free alternatives. The mercury-added laboratory chemicals and equipment used in Tuvalu is expected to be low but may still be present, especially if in storage.

Date Collection and Assessment

The use of mercury-added laboratory chemicals and equipment in Tuvalu is expected to be minor as there has been a general shift towards mercury-free digital equipment in recent years. As such, to determine possible mercury releases from these products, data from 2019 (prior to the 2020 phase-out date for MAPs) was used for entry in the Toolkit.

Default calculations made available in the Toolkit were used to estimate releases based on global references available. The 2019 population data and electrification rate were used as the activity rate in these default calculations.

A summary of mercury inputs and releases to each category is provided in Table 17.

Table 17: Analysis of mercury inputs and outputs from the use and disposal of laboratory chemicals and equipment

Laboratory Chemicals and Equipment with Mercury	Unit	Laboratory Chemicals	Other Laboratory Equipment
Activity rate	inhabitants	11,204	11,204
Input factor for phase	Percent of population with access to electricity	92	92
	g Hg/y*inhabitant	0.01	0.04
Calculated input to phase	**Kg Hg/y**	**0.10**	**0.41**
Output distribution factors for phase:			
- Air	-	-	-
- Water	N/A	0.33	0.33
- Land	-	-	-
- Products	-	-	-
- General waste treatment	N/A	0.33	0.33
- Sector specific waste treatment	N/A	0.34	0.34
Calculated outputs/releases to:			
- Air	-	-	
- Water	Kg Hg/y	0.17	
- Land	-	-	
- Products	-	-	

Laboratory Chemicals and Equipment with Mercury	Unit	Laboratory Chemicals	Other Laboratory Equipment
- General waste treatment	Kg Hg/y	0.17	
- Sector specific waste treatment	Kg Hg/y	0.18	

2.5 Data and Inventory on Waste Incineration

2.5.1 Incineration of General Waste

The mercury content for municipal/general waste can vary as it may be derived from a wide range of discarded MAPs and process waste; natural mercury impurities in high volume materials such as paper and minerals; and mercury as a human-generated trace pollutant in high volume materials (UNEP, 2019a). Municipal solid waste may be incinerated under controlled conditions (using an incinerator with emission controls) in some cases and mercury content can range widely based on the type of waste present in a country.

Data Collection and Assessment

In Tuvalu, 1 wood-fired incinerator is present for incineration of municipal waste at the Funafuti dumpsite. Data for entry in the Toolkit was obtained from the Department of Waste by the Department of Environment. A summary of mercury inputs and releases due to incineration of general waste is provided in Table 18.

Table 18: Analysis of mercury inputs and outputs from general waste incinerated.

General Waste Incineration	Unit	General Waste
Activity rate	Waste incinerated, t/y	165
Input factor for phase	g Hg/t waste	1
Calculated input to phase	**Kg Hg/y**	**0.17**
Output distribution factors for phase:		
- Air	N/A	1.00
- Water	-	-
- Land	-	-
- Products	-	-
- General waste treatment	-	-
- Sector specific waste treatment	-	-
Calculated outputs/releases to:		
- Air	Kg Hg/y	0.17
-Water	-	-
- Land	-	-
- Products	-	-
- General waste treatment	-	-
- Sector specific waste treatment	-	-

2.5.2 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

The Department of Health has 1 incinerator which is out of service and medical waste is currently incinerated at the general waste incinerator present at the Funafuti dumpsite. Recent data on quantities transported to the general waste incinerator site was not available as record-keeping issues arose. Data for entry in the Toolkit was obtained from records kept by the Department of Health on quantities of waste incinerated in the medical waste incinerator managed by the Department of Health while it was functional for the year 2018. It was assumed that this amount would be comparable to the amounts of medical waste now transported to the Funafuti dumpsite's general waste incinerator. Results of estimations made for mercury releases is provided in Table 19 below.

Table 19: Analysis of mercury inputs and outputs from medical waste incinerated.

Medical Waste Incineration	Unit	Medical Waste
Activity rate	Waste incinerated, t/y	5.2
Input factor for phase	g Hg/t waste	24
Calculated input to phase	**Kg Hg/y**	**0.12**
Output distribution factors for phase:		
- Air	N/A	0.90
- Water	-	-
- Land	-	-
- Products	-	-
- General waste treatment	-	-
- Sector specific waste treatment	N/A	0.10
Calculated outputs/releases to:		
- Air	Kg Hg/y	0.11
-Water	-	-
- Land	-	-
- Products	-	-
- General waste treatment	-	-
- Sector specific waste treatment	Kg Hg/y	0.01

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 is not a common practice in Tuvalu as regular waste collection for landfill disposal occurs across the country. Open burning has occurred as a result of accidental landfill fires which have occurred in the past. The most recent data on quantities of waste unintentionally burned in a landfill fire was approximately 205,000 kg of waste in 2019 (Government of Tuvalu, 2019). This estimation was used for entry in the Toolkit (Table 20).

Table 20: Analysis of mercury inputs and outputs from open waste burning

Waste burned	Unit	Open Burning
Activity rate	Waste burned, t/y	205
Input factor for phase	g Hg/t waste	1
Calculated input to phase	**Kg Hg/y**	**0.21**
Output distribution factors for phase:		
- Air	N/A	1.00
- Water	-	-
- Land	-	-
- Products	-	-
- General waste treatment	-	-
- Sector specific waste treatment	-	-
Calculated outputs/releases to:		
- Air	Kg Hg/y	0.30
-Water	-	-
- Land	-	-
- Products	-	-
- General waste treatment	-	-
- Sector specific waste treatment	-	-

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 Tuvalu, the major controlled dumpsite is located at Funafuti managed by the Department of Waste. Based on the data collected for the inventory by the Department of Environment, the amount of waste that has been deposited is approximately 1642.6 tonnes annually. The information provided was only for Funafuti and does not include the outer islands. Due to population size, it was assumed that the amount of waste disposed in dumps in the outer islands is negligible.

Table 21 provides a summary of the estimated mercury releases from controlled landfills/deposits for Tuvalu. 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 0.02 Kg Hg/y released to air.

Table 21: Analysis of mercury inputs and outputs from controlled landfills/ deposits

Controlled Landfills/ Deposits	Unit	Controlled Landfills
Activity rate	Waste landfilled, t/y	1,642.6
Input factor for phase	g Hg/t waste	1
Calculated input to phase	**Kg Hg/y**	**1.64**
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	0.02
-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 occur in some locations in Tuvalu, particularly near coastal areas. The volumes of waste dumped was not available for entry in the Toolkit. Based on population size, it was assumed that volumes of waste informally dumped would be negligible in terms of potential mercury releases.

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

The volume of wastewater generated in Tuvalu has not been quantified and as such, no data on this source could be determined for the inventory of mercury releases.

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 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

The number of deaths in Tuvalu was estimated using the 2021 average death rate of 8.04 per 1,000 inhabitants (obtained from the CIA World Factbook) and the population data for 2021 of 11,204. An estimate of 119 deaths in 2021 was then used for entry in the Toolkit. Estimated mercury releases from burials are shown in Table 22.

Table 22: Analysis of mercury inputs and outputs from cemeteries

Cemeteries	Unit	Cemeteries
Activity rate	Corpses buried/y	119
Input factor for phase	g Hg/corpse	4
Adjustment for dental personnel density as dental amalgam is the major contributor to mercury in the human body	Dentist per 1000 inhabitants, country	0.18182
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.

Tuvalu 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 Tuvalu, and therefore the interim storage provisions outlined in Article 10 of the Minamata Convention are not currently applicable to Tuvalu.

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 23 indicates potential sites that may be sources of mercury contamination. Figure 8 shows a map of Funafuti, Tuvalu where tracking of the locations of potentially mercury contaminated sites was initiated. Further geospatial data on the other parts of Tuvalu is recommended to provide a clearer indication of potential sites of interest for the country as a whole.

Table 23: Potentially contaminated sites for further analysis.

Potentially Contaminated Site	Description
Landfills/Dumpsites	In Tuvalu, the main landfill/dumpsite is located in Funafuti. 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 has been noted but is not currently operational.
Waste Incinerator	When disposed of or incinerated, mercury contained within disposed products may be released to the air. A waste incinerator is present at the Funafuti dumpsite.
Power plant and fuels	Fossil fuels naturally have small amounts of mercury that can be released during incineration or accumulate slowly through time. In Funafuti, the operational power plant is mainly powered by heavy oil and petroleum coke.

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.



Figure 10: Map indicating potentially mercury contaminated sites in Funafuti, Tuvalu.

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.

2.11 Impact of Mercury on Human Health and the Environment[2]

Elemental mercury, which is found in manufactured products, is not necessarily toxic to humans. Exceptions may include dental amalgam and cosmetics, but these products are still under scientific investigation, so their potential harm is not yet fully characterized.

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

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 behavioral 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.

Studies have shown that high mercury concentrations in fish (measured in methylmercury) can have negative impacts on fish growth, behavior, 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 behavior 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 Tuvalu, coordination between BRI and Department of Environment is ongoing to conduct a rapid mercury analysis of potential fish species of interest. Coordination with the 2 main fish

market suppliers: The National Fisheries Corporation of Tuvalu (NAFICOT) and the Fishermen on Funafuti Association (FOFA) is highly recommended. NAFICOT is a government organization which is under the supervision of the Department of Fisheries and FOFA is an NGO. Both associations serve as fish markets that sell raw, cooked and smoke fish to the public.

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 24 provides an overall summary of the Articles of the Convention that are related to Party obligations and indicate their relevance to Tuvalu for further discussion in this Chapter.

Table 24: Summary of the Articles of the Minamata Convention on Mercury in relation to their Relevance to Tuvalu

Article	Brief Description of Article	Relevance to Tuvalu
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 Tuvalu 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 and COP-5 outcomes, further amendments to Annex A have been implemented.	While Tuvalu 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 Tuvalu as the related manufacturing processes do not take place.

Article	Brief Description of Article	Relevance to Tuvalu
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 Tuvalu as the related activities do not take place.
Article 8 Emissions	Parties must control and, where feasible, reduce emissions of mercury and mercury compounds to the atmosphere (air) through measures to control emissions from the point sources listed in Annex D of the Convention.	In Tuvalu, as identified in Section 2.5 of this report, medical waste incinerators are 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 Tuvalu.
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. Tuvalu 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[3] 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 Tuvalu 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.

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

Article	Brief Description of Article	Relevance to Tuvalu
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 Tuvalu**
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, Tuvalu 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 Capacity-building, technical assistance and technology transfer	Encourages Parties to provide appropriate capacity-building and technical assistance to developing country Parties for the implementation of the Convention's obligations.	Tuvalu can access available assistance from Parties. Currently, through the MIA Project and GEF ISLANDS Project, Tuvalu 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 MELAD 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, Tuvalu 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 Tuvalu can take into account for the development of an implementation plan which should be developed further in consultation with national stakeholders. Additional guidance[4] on the development of an implementation plan is provided on the Minamata Convention's website.

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

Article	Brief Description of Article	Relevance to Tuvalu
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.*		

3.2 Assessment of Relevant Policies and Legislation in Tuvalu

There is no specific legislative instrument designed for the management of mercury in Tuvalu. However, this section aims to identify the existing and relevant legal instruments to mainstream the obligations and as necessary, domestic measures for the effective management of mercury.

An assessment of the policy and regulatory measures in place as relevant to the compliance of the provisions of the articles under the Convention at the national level is provided in Table 25.

Table 25: Assessment of Existing Legislation Relevant to Mercury Control Measures in Tuvalu.

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	Environment Protection Act 2008	Capacity exists for the functioning of the Department of Environment as the focal point for the Minamata Convention on Mercury to which Tuvalu is a Party.	No reform needed. Under Part VII- International and Regional Environmental Obligations, the Department of Environment, which is the focal point of the Minamata Convention, is vested with the responsibility to, "… perform such roles and duties as are necessary to implement any Convention to which this Act applies, and which may be vested in it by any Act or regulations making provision for any such Convention to be implemented in Tuvalu."
Article 4: Mercury-added Products	Customs Revenue and Border Protection Act 2014 Pesticides Act 1991 Pharmacy and Therapeutic Products Act 2016 Explosives Act 1927 National Health Strategic Plan 2020-2024 Companies and Business Registration (Fees) Regulations 1981	No legislation or policies mention the control of mercury-added products. Exception: the mercury-added explosive, fulminate mercury, is listed under the Explosives Act 1927 and authority is vested with the Police Commissioner to issues licenses for the use or sale of explosives. It is unclear whether this product is still available on the market.	Under Section 78 Prohibited Imports of the Customs Revenue and Border Protection Act 2014, a regulation should be established to prohibit the importation of 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 (as well as mercury and mercury compounds overall). The regulation should also apply under: • Pesticides Act 1991 (if mercury-added pesticides are present) • Pharmacy and Therapeutic Products Act 2016 – to ensure that no future import of Hg-added pharmaceuticals or cosmetics are allowed. • Public Health Act 1926 for restriction of mercury-added healthcare products • The National Health Strategic Plan 2020- 2024: the Ministry of Health can consider mainstreaming measures under Part II of Annex A on dental amalgam phase down under its plan as well as develop plans for procuring mercury-free equipment for healthcare facilities. • Companies and Business Registration (Fees) Regulations

Provision of the Minamata Convention	Relevant Act, legislation and regulation	Policy and Legislative Gap Analysis (if present)	Proposed Legal Reform Action (if needed)
			1981: mainstream clearance from Department of Environment in relation to businesses to ensure that no mercury-added products are traded. 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 for mercury added products is being developed under the Minamata Convention Secretariat. Additionally, Tuvalu 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).
Articles 8: Emissions, **Article 9:** Releases, **Article 11:** Mercury Wastes	Environment Protection Act 2008 -Environment Protection Regulations Marine Pollution Act 2008 Waste Management Act 2017 Pharmacy and Therapeutic Products Act 2016 National Health Strategic Plan 2020 – 2024	No legislation or policies in place currently regulate the specific release of mercury to air (from waste incineration), water, land or waste from point sources. The management of mercury releases may be covered to some extent under overarching sections of some related legislation.	An amendment or regulation under the Environment Protection Act 2008 should be developed to include environmental standards for management of mercury releases to the air, water and land. 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. In compliance with the Convention, the regulations can also establish a monitoring/reporting and otherwise establish a mercury emissions inventory for sources listed in Annex D (waste incineration). The regulations should also include a licensing system to certify and monitor industries or processes that may cause mercury air emissions or releases to land and water.

Provision of the Minamata Convention	Relevant Act, legislation and regulation	Policy and Legislative Gap Analysis (if present)	Proposed Legal Reform Action (if needed)
	Tuvalu Integrated Waste Policy and Action Plan: TOWARDS CLEANER AND HEALTHIER ISLANDS 2017 - 2026		It is also noted under Part VI of the Environment Protection Act that, "Compliance with the requirements of this Act shall not absolve a person from separate compliance with any rights, obligations or authorities prescribed under the Marine Pollution Act." Under the Marine Pollution Act 2008, the discharge of pollutants into marine waters including waste is an offence unless permits and assessments are obtained. This can broadly cover mercury related wastes that may be released in marine waters from any marine-related activities. For waste management, the Waste Management Act 2017 stipulates that the overarching responsibility for hazardous waste management is led by the Waste Department. However, the waste administration is divided into 3 sectors: medical waste, marine waste and general waste, wherein only general waste is specifically managed by the Waste Department. Under the Waste Department, hazardous waste is shipped to Fiji for proper disposal. For medical waste disposal, the Health Department is the lead agency responsible. Under the Minamata Convention, management of mercury wastes is noted to follow the same guidelines as stipulated by the Basel Convention, to which Tuvalu is a Party and the Department of Waste Management is the Competent Authority. As such, under Part VI, Section 33, "...The Department (of Waste Management) shall perform such roles and duties as are necessary to implement any Convention to which this Part applies, and which may be vested in it by any Act or regulations making provision for any such Convention to be implemented in Tuvalu." Implementing best available techniques and practices for the environmentally sound management of waste is already a priority of the Department of Waste Management under the related Act. The National Drugs and Therapeutic Committee under section 7(1)(b) of the Pharmacy and Therapeutic Products Act 2016 is mandated to develop and review relevant guidelines, including the Guidelines for Medical Waste Management. These guidelines have yet to be

Provision of the Minamata Convention	Relevant Act, legislation and regulation	Policy and Legislative Gap Analysis (if present)	Proposed Legal Reform Action (if needed)
			established. However, a new waste incinerator is about to be installed for disposal of medical wastes. It is strongly recommended that measures to monitor and reduce mercury air emissions from this incinerator be incorporated into the guidelines with reference to the proposed regulations under the Environment Protection Act 2008. Under Key Result Area 6 of the National Health Strategic Plan 2020 - 2024, one of its strategic objectives is to: "6.11.4 Improve medical waste practices by procuring a medical waste incinerator, a medical waste transportation vehicle/truck and an industrial style medical waste weighing scale to enable best practice general and medical waste segregation, transportation and disposal practices". As medical waste incinerators are an identified source of mercury air emissions, best practices for management of medical waste (including mercury-medical waste) should be factored in to any related activities by the Health Department. Under the Tuvalu Integrated Waste Policy and Action Plan, a strategic action highlighted is for the Health and Environment departments to cooperate in the handling, storage and disposal of hazardous wastes (chemicals, asbestos, healthcare wastes, used oil, e- wastes, etc.) according to international convention regulations and best practice management approaches that will minimize health and environmental impacts.
Article 12: Contaminated Sites	Environment Protection Act 2008 National Environment Management Strategy 2021	Though mercury-specific language is not included, the obligations to regulate and rehabilitate areas and buildings contaminated by hazardous substances is highlighted under the	Considerations for the development of policies for the National Environment Management Strategy can include specific actions to carry out the proper assessment of contaminated sites by mercury or mercury compounds.

Provision of the Minamata Convention	Relevant Act, legislation and regulation	Policy and Legislative Gap Analysis (if present)	Proposed Legal Reform Action (if needed)
		Environment Protection Act 2008.	
Article 16: Health Aspects	National Health Strategic Plan 2020 – 2024	Key result area 5.1.1 of the National Health Strategic Plan 2020-2024 aims to support health communication and education strategies for all public health programs.	The inclusion of the development of strategies to identify and protect at-risk populations from the health impacts of mercury and other potential pollutants should be considered as a cross-cutting issue under future revisions to the National Health Strategic Plan or other related health plans.
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 19** Research, development and monitoring**;** **Article 20** Implementation Plans;	Environment Protection Act 2008 Food Safety Act 2008	The responsibility for implementing these articles is vested with the Department of Environment under the Environment Protection Act 2008 Part VII- International and Regional Environmental Obligations.	To further build on capacity for the Department of Environment to implement information exchange, awareness raising and other obligations, coordination with other related funded projects can be sought. For example, through the GEF ISLANDS project executed regionally by SPREP and in coordination with other SIDS, mercury related management efforts will be carried out. Under the Food and Safety Act, the Minister is empowered to make regulations for regulating fish and fish products. This can initiate the development of fish consumption guidelines to include a database and support procurement of testing equipment's for mercury which are always absent during fish poisoning cases.

Provision of the Minamata Convention	Relevant Act, legislation and regulation	Policy and Legislative Gap Analysis (if present)	Proposed Legal Reform Action (if needed)
Article 21 Reporting			

3.3 Institutional Framework Assessment

Roles of Institutions in chemical management

There is an important contribution that all relevant stakeholders must undertake towards the successful management of chemicals and hazardous wastes at the national level. This section will outline the relevant key authorities and their roles and responsibilities towards the Convention including an assessment of some of the key institutions that are relevant to the management of mercury issues.

The institutions involved are the government ministries and departments, non-government organizations, church-based and civil-based organizations and their roles are briefly outlined in Table 26.

Table 26: Assessment of Existing Institutions Relevant to Mercury Control Measures in Tuvalu

Relevant Institution	Summary of Existing Functions and Capacities	Relevance to the provisions of the Minamata Convention on Mercury and Needs for its Implementation
Department of Environment	The Department of Environment's functions include, *but are not limited to*: 1. administration and implementation of the Environment Protection Act 2008 through the Director and Environment Officers, 2. development and implementation (in collaboration with other Departments as appropriate): a. environmental impact assessments. b. waste and pollution management. c. pollution control. 3. to implement obligations under international and regional environmental obligations that Tuvalu is a part of (this would include the Minamata Convention on Mercury to which the Department of Environment is the focal point). The Department is stretched across a number of projects and demands for involvement in other Department developments. Recently a Chemical Management Officer position was established that suites well for the implementation of the Minamata Convention. However, technical assistance, research and laboratory are still needed, as well as the establishment of a databases of resources.	The Department of Environment is responsible for: 1. acting as the focal point for the Minamata Convention and coordinating its implementation with related stakeholders and, 2. consulting with relevant stakeholders for the development of regulations to manage mercury releases to air, land, water and waste. 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. Further mechanisms to guide on the implementation of the obligations of the Minamata Convention will be provided under the GEF ISLANDS programme where, Tuvalu 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. Further 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.
Department of Waste Management	The Department of Waste Management is responsible for the for the overall regulation of wastes in Tuvalu. This includes management of waste disposal sites and general waste incinerators as well as, licencing for private waste operations.	The Department of Waste Management is responsible for implementing measures to ensure Best Available Techniques/Best Environmental Practices (BAT/BEP) to reduce releases to land and water from waste disposal sites. This is already a priority for the Department as highlighted under the Tuvalu Integrated Waste Policy and Action Plan: TOWARDS CLEANER AND HEALTHIER ISLANDS 2017 – 2026. If regulations are implemented (as

Relevant Institution	Summary of Existing Functions and Capacities	Relevance to the provisions of the Minamata Convention on Mercury and Needs for its Implementation
	It is also responsible for, "…implementation of international conventions relating to the management of hazardous wastes shall be the responsibility of the Department of Waste Management in accordance with the provisions of this Act (Waste Management Act 2017), and whenever the Department is designated as the competent authority for Tuvalu under any such convention". In this capacity, the Department of Waste Management is the competent authority for the Waigani Convention and Basel Convention. As of 2017, an arrangement for the shipment of hazardous waste for sound disposal in importing countries was established and monitored by the Department. Management of healthcare and marine wastes are delegated to the Department of Health and Department of Marine and Port Services respectively.	recommended) to monitor mercury thresholds from identified sources, the Department of Environment and Department of Waste Management should work together to coordinate monitoring efforts. This would also fulfil recommendations under Article 12 of the Minamata Convention for monitoring potentially mercury-contaminated sites. Additionally, the Department should ensure BAT/BEP measures are implemented to prevent mercury emissions to air from the general waste incinerator. This may include prevention of mercury waste from entering the general waste streams through prior segregation of waste.
Ministry of Health: **Department of Health/ Department of Public Health**	The Department of Health is responsible for: - the management and disposal of medical wastes in Tuvalu - the development of health programmes and dissemination of health-related information - protecting the health of citizens. The Dental Unit also falls under the Department of Health. While the Department is responsible for medical waste incineration, the medical waste incinerator is currently out of service so medical waste is incinerated at the general waste	The Department of Health is responsible for coordinating with the Department of Environment, Department of Waste Management and other relevant institutions to: 1. advise on phase down approaches for dental amalgam if needed (note that as of November 2023, Parties who have not yet phased out dental amalgam should submit a brief report to the Minamata Convention Secretariat on their phase down measures and challenges), 2. develop strategies to identify and protect at-risk populations from mercury impacts on health, 3. develop clear guidelines for the safe handling and disposal of medical waste. Guidance can be found on the official Minamata Convention website (www.minamataconvention.org),

Relevant Institution	Summary of Existing Functions and Capacities	Relevance to the provisions of the Minamata Convention on Mercury and Needs for its Implementation
	incinerator present at the Funafuti dumpsite managed by the Department of Waste Management. Currently, medical waste collection and management is the duty of the Biomedical Officer at the national hospital, however, when on leave, the duties fall to the hospital's Handyman though it is outside of his job scope. It is unclear if proper training on handling of medical waste (including mercury-added waste) is done.	4. coordinate the development and implementation of public awareness activities to raise awareness on potential sources of mercury pollution and its impacts on health, and 5. coordinate with the Department of Environment and Department of Waste Management for the environmentally sound management and prevention of mercury emissions due to the disposal of the medical waste.
Customs Revenue and Border Protection Department	Responsible for the monitoring of imported products and carrying out related functions under the Customs Revenue and Border Protection Act.	In coordination with the Department of Environment 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. The implementation of prohibition on these items would be further improved through the ongoing work for the adoption of the ASYCUDA World Customs Management System under the IMPACT Project.
Department of Fisheries	Responsible for the management and development of Tuvalu's fisheries.	Under Article 19 Research, Development and Monitoring, the Department of Fisheries should work in close collaboration with the Department of Environment and relevant stakeholders to conduct biomonitoring activities on fish species to determine mercury concentrations and develop plans for abatement.
Fishermen of Funafuti Association (FoFA)	FOFA is a NGO in Funafuti that coordinates the sale of raw, cooked and smoked fish to the public.	FoFA should be engaged by the Department of Environment and Department of Fisheries for any activities under Article 19 Research, Development and Monitoring related to biomonitoring activities on fish species to determine mercury concentrations and develop plans for abatement.
National Fisheries Corporation of Tuvalu (NAFICOT)	NAFICOT is a government organization under the supervision of the Department of Fisheries that coordinate the sale of fish and fish products to the public.	NAFICOT should be engaged by the Department of Environment and Department of Fisheries for any activities under Article 19 Research, Development and Monitoring related to 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
Department of Local Government	There are 8 local governments of Tuvalu, being an administrative branch of the Falekaupule (traditional council). However, local governments report to the Government through the Department of Local Government. Any development or initiative to be hosted at the local level must be communicated through the respective Kaupule.	To ensure dissemination of information and public awareness on the issues posed by mercury and the efforts to reduce mercury in Tuvalu, the Department of Environment should coordinate with the local government. If any research and monitoring activities are going to be conducted for mercury research, the Department of Local Government is a relevant stakeholder to include in efforts.
Department of Marine and Port Services	The Department of Marine and Port Services is responsible for the regulation of waste disposal at sea by the dumping and incineration of wastes.	The Department of Marine and Port Services should coordinate with the Department of Environment to ensure that BAT/BEP measures for mercury emissions from incineration of waste are implemented for offshore waste practices.
Department of Agriculture	The Department of Agriculture is responsible for the management of pesticides in Tuvalu under the Quarantine Division. This administrative function includes facilitating registration for pesticides and is at the forefront of border assessments for import items with powers to search and seize.	The Department of Environment and Customs should coordinate with the Department of Agriculture to ensure that no pesticides containing mercury are imported. It is likely that mercury-added pesticides are not readily available on the global market so ensuring that they are not currently present in the country would inform if any further prevention of imports need to be regulated.
Ministry of Finance	All donor funding is channelled through the Ministry of Finance. However, there are some situations where a regional organization may be an implementing agency directly and therefore will make its own direct payments. The Government will carry on with its own in-kind contribution. The Procurement Unit, the Aids Coordination Unit and Statistics Department are presently housed under the Ministry of Finance.	The Department of Environment should coordinate with the Ministry of Finance as needed to determine funding needs to build national capacity for mercury management and explore the possibility of funded national initiatives under the Minamata Convention on Mercury's financial mechanisms once feasible.
Pacific Energy	The Pacific Energy is an independent regional group that supplies petroleum products and lubricants to the Pacific Islands including Tuvalu. Tuvalu Pacific Energy mostly supplies local business and government agencies with petroleum and lubricants. This group's top priority is to ensure a healthy and secure environment for both the employees and the public (Tuvalu Pacific Energy. n.d.).	Coordination with Pacific Energy can be explored to determine if the mercury content in fuels supplied is known to further promote management of releases in processes that use fuel such as incineration.

Relevant Institution	Summary of Existing Functions and Capacities	Relevance to the provisions of the Minamata Convention on Mercury and Needs for its Implementation
Tuvalu Family Health Association (TuFHA)	TuFHA is an NGO responsible for promoting and providing sexual and reproductive health services to the people of Tuvalu. The association work collaboratively together with young people to implement/carry out health-related needs.	As mercury is known to typically have a greater impact on the health of pregnant women, developing foetuses and children, the involvement of the TuFHA in public awareness outreach and development of health strategies to inform at-risk groups is highly recommended.
Tuvalu Red Cross Society	The Tuvalu Red Cross Society is the largest humanitarian network in Tuvalu with nearly volunteers from various islands of Tuvalu.	Involvement of the Tuvalu Red Cross Society in public awareness outreach and development of health strategies to inform at-risk groups across Tuvalu is highly recommended.
Private Sector Organization of Tuvalu	A group of private sector stakeholders that promote information dissemination and advocacy for the members on business-related developments.	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 to promote their cooperation.

The existing functions of the institutions discussed in the previous tables provide a suitable framework for the implementation of the Minamata Convention. 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 Department of Environment 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 27.

Table 27: Summary of Applicable Regulatory Framework and Proposed Action for Implementation of the Minamata Convention

Provision of the Minamata Convention	Relevant Institutions	Relevant Legislation	Proposed Action
Article 4 *Mercury-added products*	Customs Revenue and Border Protection Department Private Sector Organization of Tuvalu Department of Health Department of Environment Department of Agriculture	Customs Revenue and Border Protection 2014 *Optional additional considerations under:* • *Pesticides Act 1991* • *Pharmacy and Therapeutic Products Act 2016* • *Public Health Act 1926* • *The National Health Strategic Plan 2020- 2024* • *Companies and Business Registration (Fees) Regulations 1981*	Under Section 78 Prohibited Imports of the Customs Revenue and Border Protection Act 2014, a regulation should be established to prohibit the importation of 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 (as well as mercury and mercury compounds overall). The regulation should also apply under: • Pesticides Act 1991 (if mercury-added pesticides are identified by the Department of Agriculture) • Pharmacy and Therapeutic Products Act 2016 to ensure that no future import of Hg-added pharmaceuticals or cosmetics are allowed. • Public Health Act 1926 for restriction of mercury-added healthcare products • The National Health Strategic Plan 2020- 2024: the Department of Health can consider mainstreaming measures under Part II of Annex A on dental amalgam phase down under its plan as well as develop plans for procuring mercury-free equipment for healthcare facilities. • Companies and Business Registration (Fees) Regulations 1981: mainstream clearance from Department of Environment in relation to businesses to ensure that no mercury-added products are traded. To further enhance identification of mercury-added products being imported, guidance on the Under the 'Improving Pacific Islands Customs and Trade' (IMPACT) Project, the UNCTAD in

Provision of the Minamata Convention	Relevant Institutions	Relevant Legislation	Proposed Action
			coordination with the 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 global ASYCUDA which should promote the identification of mercury-added products compared to mercury-free alternatives. Coordination with the Customs Department and private sector stakeholders to ensure the implementation of the prohibition of mercury products and the promotion of safe mercury-free alternatives should be done. Coordination should also be carried out between the Department of Environment and Department of Health to meet the obligations for phase down of dental amalgam.
Article 8 *Emissions*	Department of Environment Department of Waste Management Department of Health Department of Marine and Port Services	Environment Protection Act 2008	The Department of Environment should develop a regulation, under the Environment Protection Act 2008, on environmental standards for management of mercury air emissions from point sources such as waste incinerators as identified in the national inventory on mercury releases. The development of these standards should be done with reference to guidance provided under the Minamata Convention. Any waste, health or healthcare plans and strategies for the management of general, marine and healthcare waste should include mercury emission abatement measures from the operation of waste incinerators.
Article 9 *Releases*	Department of Environment Department of Waste Management Department of Health	Environment Protection Act 2008	The Department of Environment should develop a regulation, under the Environment Protection Act 2008, on environmental standards for management of mercury releases to land and water. The development of these standards should be done with reference to guidance provided under the Minamata Convention. Coordination with the Department of Waste

Provision of the Minamata Convention	Relevant Institutions	Relevant Legislation	Proposed Action
	Department of Marine and Port Services		Management, Department of Health and Department of Marine and Port Services, where needed, to ensure management of potential mercury releases through proper health and sanitation practices should be conducted.
Article 11 *Mercury wastes*	Department of Environment Department of Waste Management Department of Health Department of Marine and Port Services	Environment Protection Act 2008	The recommendations to develop environmental standards regulations for the reduction of mercury releases to land and water under the Environment Protection Act 2008 by the Department of Environment would also be relevant to mercury wastes monitoring and should be further implemented by the Department of Waste Management, Department of Health and Department of Marine and Port Services for their respective waste streams. Any waste management plans and strategies for the management of waste, including healthcare waste, should include mercury waste management measures. The implementation of BAT/BEP to reduce pollution from waste disposal is already captured under the Waste Management Act 2017 and Marine Pollution Act 2008. This can be applied to mercury waste management as well. Under the Pharmacy and Therapeutic Products Act 2016, there is a mandate to develop and review relevant guidelines, including the Guidelines for Medical Waste Management. These guidelines have yet to be developed and it is strongly recommended that mercury waste management measures are included.
Article 12 Contaminated Sites	Department of Environment	No amendments to existing legislation required.	The Department should endeavour to develop ecological mapping surveys to build upon the strategies to identify potential mercury hotspots or contaminated sites. Coordination with other regional bodies such as SPREP, SPC etc. can be explored to build capacity for such activities.

Provision of the Minamata Convention	Relevant Institutions	Relevant Legislation	Proposed Action
Article 16 *Health aspects*	Department of Health Department of Environment TuFHA Tuvalu Red Cross Society	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 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.
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*	Department of Environment *(in coordination with stakeholders identified in Section 3.3 of this report)*	No amendments to existing legislation required.	As focal point to the Minamata Convention on Mercury, the responsibility of its implementation is the Department of Environment's in coordination with relevant stakeholders (as provided for under the Environment Protection Act 2008).
Article 19 *Research, development and monitoring*	Department of Environment Department of Health Department of Fisheries FoFA NAFICOT	No amendments to existing legislation required.	Collaboration amongst these entities responsible for environmental management, management of fisheries and oversight of community affairs should be promoted to develop strategies for the monitoring of mercury in humans, fish and other biota.

Provision of the Minamata Convention	Relevant Institutions	Relevant Legislation	Proposed Action
	Department of Local Government TuFHA Tuvalu Red Cross Society		

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/UNEP, 2008). Other vulnerable groups include persons who suffer from diseases of the liver, kidney, nervous system, and lung (WHO/UNEP, 2008).

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). Tuvalu 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.

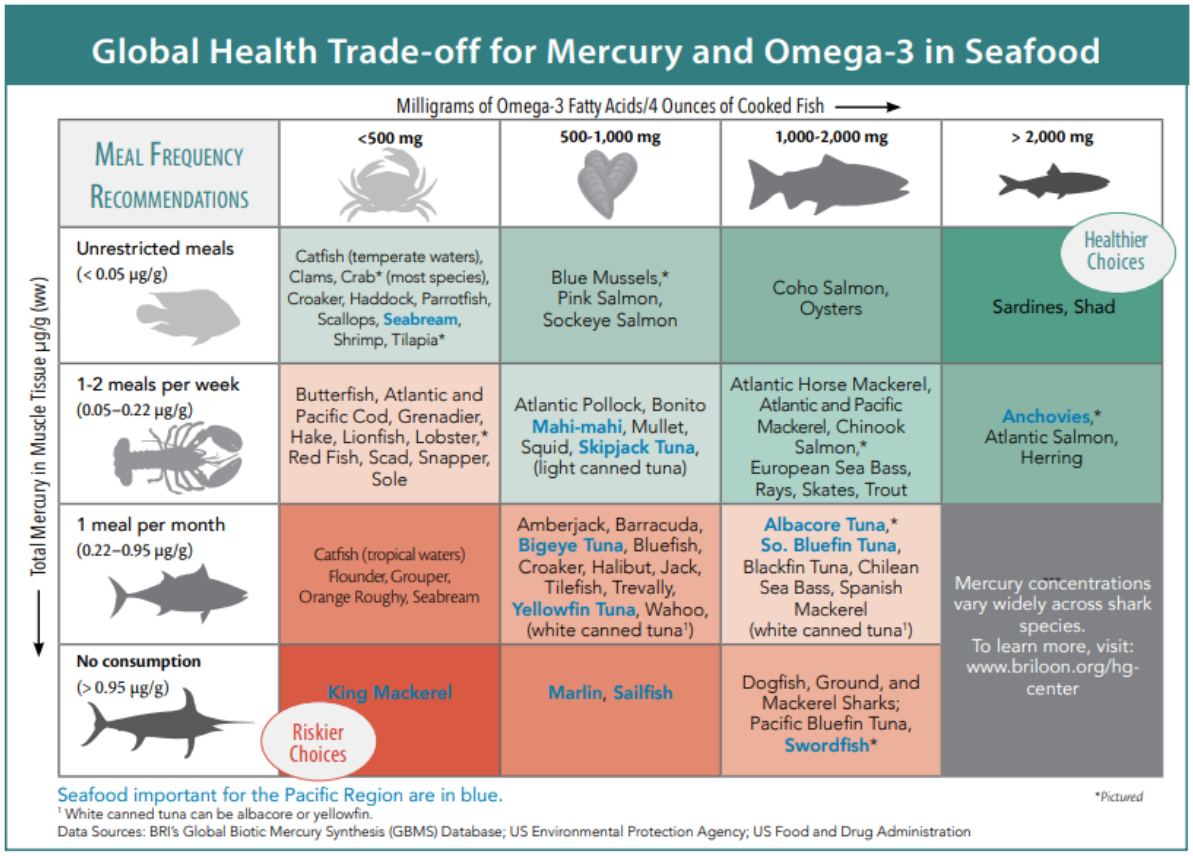


Figure 12: Example of Fish Consumption Guidelines developed for the Pacific Region (BRI, 2022).

Fish are a staple to many people in the Pacific region and other 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). In Funafuti, Tuvalu, pelagic fish (mainly tuna fish) and shallow reef fish are the main types of fish

consumed. The people in outer islands obtain various fish species mainly from artisanal fishing activities and purchasing from local fishermen.

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.

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 Tuvalu, including in the development of communication strategies for mercury, is a key factor to be implemented for successful implementation. Efforts to ensure inclusion of other marginalised groups including, but not limited to, youths and disabled persons, should also be made.

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 Tuvalu, 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. Efforts to educate persons should be coordinated with the Department of Waste, Health Department (in coordination with the World Health Organization) and NGOs. This was initiated in Tuvalu as part of the National Inception Workshop for the project held in May 2021 in which several key governmental stakeholders from across different sectors were able to be briefed on the issues associated with mercury. Furthermore, a short talk on mercury was done by the National Project Coordinator during the Environment Week in 2021.

Under the MIA Project, a brief animated awareness raising video was developed for dissemination in Tuvalu (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. A version of the video with subtitles in the national language of Tuvalu was also developed to aid in dissemination.

It is recommended that the video be shared widely via social media by all key stakeholder organisations.

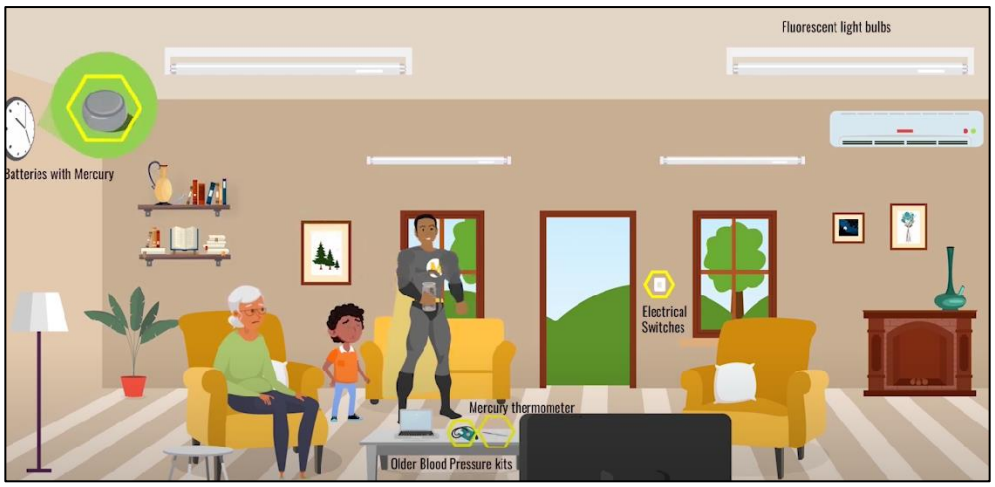


Figure 13: Scene in the awareness raising video developed under the project.

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.

In order to better inform the public on the potential risks associated with consumption of fish, further information on mercury concentrations in Tuvalu and the Pacific region is being gathered by BRI in collaboration with the Department of Environment.

Coordination with other relevant governmental, private and non-governmental organizations is recommended to further promote mercury management awareness. Table 28 provides further examples of the mechanisms that can be used to raise awareness among all key stakeholders including the general public.

Following endorsement of the MIA Report by national stakeholders, a national action plan for advocacy or awareness can be developed. Noting limited resources for the development of any mercury-specific activities, it is also noted that Tuvalu 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.

Stakeholder outreach and school campaigns to educate persons on various environmental issues are common tools implemented by government bodies responsible for the environment. The materials developed under this project and the ongoing GEF ISLANDS project, can be utilised in future public education campaigns on environmental awareness.

Table 28: Considerations for the types of awareness raising that are recommended in Tuvalu.

MERCURY AWARENESS PROGRAMME				
TYPES OF AWARENESS	**AUDIENCE**	**MESSAGE**	**VENUE**	**REMARKS**
Workshop	• Men & Women • Primary & Secondary Students (Year 10 and above) • Island and Church Youths • Profession – Health Workers including NGO's (Tuvalu Red Cross (TRC) and Tuvalu Family Health Association (TuFHA)) • Tuvalu Electricity Corporation (TEC) • Public Works & Infrastructure • Agriculture • Fisheries • Fishermen of Funafuti Association (FOFA) • Department of Environment • Department of Meteorology • Pacific Energy	• What is mercury and how is it released? • Mercury added products in daily life. • Mercury in diet (fish). • Effects of mercury compound to human health • Proper disposal of mercury-added products	Hon. Sir Tomasi Puapua Convention Centre (TPCC) Main Plenary	Ensure representatives from all 9 islands of Tuvalu are included.
Radio & Media Talk			Tuvalu Media Corporation Studio	-
Posters/Flyers				• These can be shown during workshop and radio/media talk. • Distribute to the public. • Distribute and post in public places/social media.

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 Tuvalu.

Priorities for Action:

1. **Develop regulations to formally recognise the obligations of the Minamata Convention and facilitate its implementation.**

   As discussed in further detail in Chapter 3, coordination between Department of Environment and other relevant stakeholders as needed, should be carried out to develop environmental standards for monitoring mercury releases from sources under the Environment Protection Act 2008.

   Under the Customs Revenue and Border Protection Act 2014, prohibition of the import of mercury, mercury compounds and mercury added products should also be implemented. Further regulatory reforms and institutional considerations 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), Tuvalu 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 Tuvalu. 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 29.

Table 29: 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 Tuvalu 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 Tuvalu 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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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/1BwtpxO50HwJngpsNbCVa-J5LDsXu_sMJ/edit?usp=sharing&ouid=111368229179989433735&rtpof=true&sd=true