MARKET STUDY ON THE AVAILABILITY OF MERCURY-FREE PRODUCTS IN ANTIGUA AND BARBUDA

Technical Report

SEPTEMBER 2023

An initiative of the Organisation of African, Caribbean and Pacific States funded by the European Union

Market Study on the Availability of Mercury-free Products in Antigua & Barbuda –

Technical Report

Prepared for: The European Environmental Bureau / Zero Mercury Working Group and The Department of Analytical Services, Antigua and Barbuda

Editors:

- Elena Lymberidi-Settimo, Policy Manager Zero Mercury Campaign, International co-ordinator Zero Mercury Working Group
- Rina Guadagnini PhD, Mercury Policy Officer, The European Environmental Bureau
- Tahlia Ali Shah, Independent Consultant
- Loretta Benjamin, National Consultant

As part of: The Africa, Caribbean, and the Pacific Multilateral Environmental Agreements Programme

Date: September 2023

Table of Contents

List of Acronyms

ABBS	Antigua and Barbuda Bureau of Standards
ACP	Africa, Caribbean, and the Pacific (regions)
APUA	Antigua Public Utilities Authority
ASGM	Artisanal and Small-scale Gold Mining
ASYCUDA	Automated Systems for Customs Data
BCRC-Caribbean	Basel Convention Regional Centre- Caribbean
BRI	Biodiversity Research Institute
CFLs	Compact Fluorescent Lamps
CCFLs	Cold Cathode Fluorescent Lamps
CLiC	Clean Lighting Coalition
COP-4	Fourth Meeting of the Conference of the Parties to the Minamata Convention on Mercury
DoAS	Department of Analytical Services
CRMMN	Caribbean Regional Mercury Monitoring Network
EEB	European Environmental Bureau
EEFLs	External Electrode Fluorescent Lamps
EU	European Union
FAO	Food and Agricultural Organisation
GEF	The Global Environment Facility
GHS	Global Harmonised System for Classification and Labelling of Chemicals
GoAB	Government of Antigua & Barbuda

Hg	mercury
HIDLs	High Intensity Discharge Lamps
HPMV	High Pressure Mercury Vapor
HS	Harmonised System
IISD	The International Institute for Sustainable Development
IMERC	The Interstate Mercury Education and Reduction Clearinghouse
ISLANDS	Implementing Sustainable Low and Non-Chemical Development in Small Island Developing States (Programme)
LED	Light Emitting Diode
LFLs	Linear Fluorescent Lamps
MAPs	Mercury-added products
MEAs	Multilateral Environmental Agreements
MeHg	Methylmercury
MIA	Minamata Initial Assessment
NEP	National Environmental Policy
NGO	Non-Governmental Organisation
NSWMA	National Solid Waste Management Authority
NWG	National Working Group
OACPS	Organisation of African, Caribbean and Pacific States
SIDS	Small Island Developing States
SOPs	Standard Operating Procedures
UNEP	United Nations Environment Programme
USA	United States of America
WHO	World Health Organisation

XRF	X-ray fluorescence spectroscopy
ZMWG	Zero Mercury Working Group
ZWAB	Zero Waste Antigua and Barbuda

List of Tables

List of Figures

About This Document

This report was developed under the project, Antigua & Barbuda Alternatives to Mercury Market Study as part of initiatives being conducted by the European Environmental Bureau (EEB)/ Zero Mercury Working Group (ZMWG). This project is being conducted and funded by the Africa, Caribbean, and the Pacific (ACP) Multilateral Environmental Agreements (MEAs) programme. The Department of Analytical Services (DoAS) within the Government of Antigua & Barbuda functions as the National Focal Point.

Sole responsibility for the contents of this document lies with the Consultant who developed the report.

Stakeholder consultations with private sector companies and individual professionals were conducted through surveys and interviews. In order to maintain confidentiality, these stakeholders and details on their activities related to the market study conducted are not provided. Labelling codes have been assigned for reference of certain stakeholders where necessary.

Public sector institutions have been identified although individual persons from these institutions remain unnamed in the report.

Every effort has been made to ensure that the data provided in the report does not cause commercial or other prejudice to any stakeholder.

Specific products or brands mentioned in this report should not be construed as providing any endorsement or marketing advantage.

The Consultant thanks the designated representatives from EEB/ZMWG, the Department of Analytical Services and the National Working Group assigned to this project for their support and feedback provided for the development of this report.

Executive Summary

Project Background

Mercury (chemical symbol: Hg) is a naturally occurring element that has been utilised by humans for centuries in a variety of processes but is also among the top ten (10) chemicals or groups of chemicals of major health concern.

Recognising the need to address the negative effects of mercury, the Minamata Convention on Mercury was developed to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds by, in part, regulating, *inter alia*, the supply, sources, trade, storage and disposal of mercury and its compounds; mercury-added products (MAPs) and processes; mercury waste; and the emissions and releases of mercury. The Minamata Convention entered into force on August 16, 2017, with 140 Parties to date (*as of March 2023*). Parties to the Minamata Convention on Mercury are required to meet the obligations set forth in the Convention's text and annexes.

Under Article 2 of the Minamata Convention, MAPs are defined as a "product or product component that contains mercury or a mercury compound that was intentionally added". Article 4 outlines measures to phase out or, in the case of dental amalgam, phase down the manufacture, import and/or export of certain MAPs.

The Government of Antigua & Barbuda became a Party to the Minamata Convention on Mercury on 23 September 2016 and has participated in several initiatives in recent years to better meet its obligations. These initiatives have included projects such as (but not limited to):

- "Development of Minamata Initial Assessment in the Caribbean: Antigua and Barbuda, Dominica, Grenada and Saint Vincent and the Grenadines (2021) which resulted in the completion of a National Minamata Initial Assessment Report
- The "Technical assistance to Parties to implement Articles 3, 4, 10 and 11 of the Minamata Convention on interim storage, disposal of waste in mercury-added products using guidelines from the Minamata Convention" coordinated by the Caribbean Community (CARICOM) Secretariat aimed to develop a training programme to regional/sub-regional authorities on the environmentally sound management of waste MAPs. A training manual was developed in 2021 that is available for participating countries which includes Antigua and Barbuda.
- The Caribbean Regional Mercury Monitoring Network (CRMMN) which is currently ongoing and aims to assist Caribbean countries to meet the obligations of the

Minamata Convention through the development of an integrated network of laboratories that will build the capacity for mercury testing in products and the biota (Evers and Burton, 2022).

- The global programme under the Global Environment Facility (GEF), Implementing Sustainable Low and Non-Chemicals Development in Small Island Developing States (ISLANDS) is being executed regionally by the Basel Convention Regional Centre-Caribbean (BCRC-Caribbean) and aims to strengthen countries' abilities to control the flow of chemicals, products and materials into their territories and to unlock resources for long term management of chemicals and wastes including integrated chemicals and wastes management in SIDS.

This project was developed as part of the European Environmental Bureau (EEB)/ Zero Mercury Working Group (ZMWG)'s activities to support countries under the Africa, Caribbean, and the Pacific (ACP) Multilateral Environmental Agreements (MEAs) programme. It aims to develop strategies to reduce the use and releases of elemental mercury and MAPs listed in Article 4 of the Minamata Convention in the context of the ACP MEAs programme.

The project is a partnership between the European Union (EU), United Nations Environment Programme (UNEP), Food and Agricultural Organisation of the United Nations (FAO), and the Organisation of African, Caribbean and Pacific States (OACPS).

As part of the project's activities, this market study is being conducted to determine the availability, accessibility, efficacy, and technical feasibility of replacing MAPs with alternatives that comply with Article 4 'Mercury-Added Products' of the Minamata Convention on Mercury. Due to the available data and resources available for the market study, the targeted products under this study include:

1. Lighting Devices
2. Switches, Relays and Thermostats
3. Medical Measuring Devices (Thermometers and Blood Pressure Gauges)
4. Dental Fillings

This rapid market study was conducted within the context of the relevant regulatory framework of Antigua and Barbuda and in consultation with stakeholders. In addition to reviewing information on relevant products from the existing body of research, surveys were also developed and distributed to gather feedback from public and private sector organisations/companies. While various measures were taken to encourage stakeholder participation for surveys, responses were generally low. Desktop research was conducted to further support the assessment.

Findings and Analysis of the Market Study on Target MAPs

Table 1 provides a summary of the results of the market study conducted for the targeted consumer products.

Table 1: Summary Assessment of the Availability of Minamata Convention-compliant Alternative Products to MAPs

Lighting Devices	
Type of Product	LED Lighting Devices
Availability	· LEDs are predominantly available on the national market. · The Government of Antigua and Barbuda has conducted several activities to implement the use of LED-alternatives.
Efficacy/Reliability	LEDs do not contain mercury and their use results in lower energy consumption which subsequently results in lower carbon emissions (in comparison to mercury-added or other types of light bulbs). LEDs demonstrate higher brightness (lumens) and have a longer functional lifespan than mercury-added lighting products.
Electrical Switches, Relays and Thermostats	
Type of Product	Mercury-free switches; mercury-free relays; electromechanical or digital thermostats
Availability	No local data could be found to confirm availability as typically, import data does not currently differentiate between mercury-added and mercury-free varieties and feedback from stakeholders was inconclusive (since these products are often components within larger products), but global trends indicate that mercury-free alternatives have become widely available over the past two (2) decades.
Efficacy/Reliability	While the specific suitability of switches, relays and thermostats vary across multiple potential applications, research indicates that mercury-free switches, relays and thermostats are globally available, reliable and adequate for a variety of functions.
Medical Measuring Devices – Thermometers	
Type of Product	Mercury-free thermometers may include alcohol or infrared types, but for clinical use, digital thermometers are the most well-known.
Availability	Mercury-free thermometers are the sole types of thermometers in use across all relevant sectors and appear to be predominantly available on the global and local market.
Efficacy/Reliability	Extensive research by the WHO and other recognised bodies have concluded that digital thermometers have a high efficacy (in comparison to mercury-added thermometers and other types).

Medical Measuring Devices – Blood Pressure Gauges	
Type of Product	Aneroid sphygmomanometers and several types of automated (electronic) blood pressure gauges. (Note: some types may contain small concentrations of mercury. Currently, these are not restricted under the Minamata Convention).
Availability	· Minamata Convention-compliant blood pressure measuring devices are the predominant types available on the global and local market. · Globally, the manufacture of these MAPs has reduced due to the increased preference for mercury-free and technologically advanced varieties and phase-out efforts of Parties under the Minamata Convention on Mercury.
Efficacy/Reliability	Research by the WHO concluded that mercury-free validated automatic blood pressure machines produce more accurate and consistent measurements (in comparison to mercury-added measuring devices).
Dental Restoration Materials (Fillings)	
Type of Product	Composite (resin) fillings
Availability	Composite fillings for dental restoration have become the predominant preference on the global and local market for many years.
Efficacy/Reliability	· Global assessments on technical efficacy of composite fillings have concluded that they exhibit satisfactory mechanical properties, require less preparation for use and are preferred by patients due to aesthetics (in comparison to dental amalgam fillings). · Providing adequate training of dental practitioners in the preparation and placement of composite fillings will ensure their effectiveness and durability.
NOTE: An economic analysis was not conducted under this report as the alternatives are already common on the global market and are generally considered relatively affordable. The economic feasibility of mercury-free products is also made more evident when the cost of ensuring environmentally sound disposal of MAPs is considered.	

Conclusions and Recommendations to ensure the implementation of Article 4 of the Minamata Convention on Mercury

When overall efficacy, availability and accessibility is considered, the replacement of MAPs with Minamata Convention-compliant products is determined to be both feasible and generally favoured due to the less or non-toxic nature of the mercury-free alternatives. Many of the global manufacturers of MAPs have already committed to the production of mercury free alternatives. In addition, Antigua and Barbuda has already been implementing successful measures for the replacement of MAPs with mercury-free alternatives. For continued enhancement of phase out measures, recommendations are made below.

- **Continued Implementation of Communication and Coordination Strategies to Promote Mercury-free Alternative Products:**

Through several initiatives that the Government of Antigua and Barbuda is involved in and through coordination with NGOs such as Zero Waste Antigua and Barbuda (ZWAB), awareness raising strategies for mercury management have been conducted. Additionally, under the MIA project conducted in Antigua and Barbuda, several awareness raising materials were developed to educate the public and key stakeholders in the public and private sector about the benefits of the Minamata Convention on Mercury, its obligations and the need to phase out MAPs.

Materials developed[1] included:

1. Non-technical Summary Document "The State of Mercury in Antigua and Barbuda"
2. Awareness Posters/Infographics on various mercury-related topics such as, but not limited to:
    a. Mercury in Everyday Products
    b. Mercury and Health
    c. Mercury in Medical and Industrial Devices

Further to this, under the regional "Development of Minamata Initial Assessments in the Caribbean" projects executed by the BCRC-Caribbean, an updated Communications Strategy and Guidance Document to enhance awareness of the Minamata Convention on Mercury was made available to the Department of Analytical Services in 2020 which included further material (available at: MIA-2 Awareness Raising Material – BCRC Caribbean (bcrc-caribbean.org).

The use of these materials and strategies facilitated through the BCRC-Caribbean can be adapted to develop an updated awareness campaign that highlights the

engagement of the public as well as relevant businesses and key stakeholders in the medical and dental sector.

Coordination of public awareness efforts between government stakeholders and private stakeholders in the relevant manufacturing, retail and medical sectors is essential to ensure clear communication and follow-through for the phase-out of MAPs and replacement with mercury-free alternative products.

- **Coordination with Related Projects and Initiatives for the Overall Protection of Human Health and the Environment:**

The Department of Analytical Services in Antigua and Barbuda in collaboration with Biodiversity Research Institute (BRI) and several Caribbean countries, is leading the execution of a Minamata Convention-facilitated Specific International Programme, "Caribbean Regional Mercury Monitoring Network" (CRMMN). The initiative aims to strengthen regional laboratory capacities for testing of products to identify or quantify mercury content.

The Government of Antigua and Barbuda is also a participating country under the Global Environment Facility (GEF) funded global programme, "Implementing Sustainable Low and Non-Chemicals Development in Small Island Developing States" (GEF ISLANDS) being executed regionally by the BCRC-Caribbean. This project aims to strengthen countries' abilities to control the flow of chemicals, products and materials into their territories and to unlock resources for long term management of chemicals and wastes including integrated chemicals and wastes management in SIDS. The project will specifically target the management of Persistent Organic Pollutants and mercury. Through this project, the enhancement of the national regulatory framework and training of Customs officials as needed to prevent the import of MAPs and other targeted chemicals/products will be implemented.

---

[1] Available at: MIA-1 Awareness Raising Material – BCRC Caribbean (bcrc-caribbean.org)

Chapter 1 – Introduction

1.1 Why is Mercury an Issue?

Mercury (chemical symbol: Hg) is a naturally occurring element that has been utilised by humans for centuries in a variety of processes such as precious metal mining and amalgamation due to its unique properties. For example, mercury is temperature and pressure sensitive, is a good electricity conductor and forms alloys with other metals. Despite its useful properties, mercury is also highly toxic and can pose a serious threat to human health and the environment. According to the World Health Organisation (WHO), mercury is among the top ten (10) chemicals or groups of chemicals of major health concern (WHO, 2017).

Mercury can be released to the environment through natural activities such as volcanic eruptions, or through anthropogenic activities. It has been estimated that 10% of mercury emissions to the atmosphere occur from natural sources, while anthropogenic sources can account for 30%. The remaining 60% of emissions are due to re-emissions of mercury already in the environment, mostly as a result of previous human activity (UNEP, 2019a). Recent global mercury inventory emissions have estimated that the largest source of mercury releases is due to Artisanal and Small-scale Gold Mining (ASGM) as liquid mercury is often directly used in the process. Although the ASGM sector is the largest source of mercury releases, the most commonly occurring source of mercury releases locally is due to the disposal of mercury-added products (MAPs) which accounted for approximately 7% of global mercury releases and was noted to occur in most countries worldwide (UNEP, 2019a).

Once released, mercury cannot be destroyed but is cycled through the air, land, and water. Mercury exists in three (3) forms:

1. Elemental or metallic mercury- this form is liquid at room temperature and is used in activities such as ASGM practices, some industrial processes and can be found as a component in products including but not limited to thermometers, dental amalgam, fluorescent light bulbs, and some electrical switches. If there are breakages, spills or poor maintenance of these products, mercury vapours may be released to the air. Elemental mercury may be also emitted to the air from processes when fossil fuels are burned. Once inhaled, elemental mercury can be converted to inorganic mercury in the body which can cause harmful effects on the nervous, digestive, respiratory, renal and immune systems, and may be fatal depending on the level and length of exposure. The human health effects from exposure to elemental mercury in the general environment are still unknown.

2. Inorganic mercury compounds- formed when mercury combines with other elements, such as sulphur or oxygen, to form compounds or salts. Inorganic compounds can occur naturally or through man-made activities for use in some industrial processes such as vinyl chloride monomer production. Inorganic mercury compounds have been used in some skin-lightening products as they inhibit the formation of melanin. Exposure to inorganic mercury compounds may occur through inhalation of vapours by persons who work in locations where the compounds are used. If ingested in large amounts, some inorganic mercury compounds can be irritating and corrosive to the skin, eyes and gastrointestinal tract, and may induce kidney toxicity. If repeatedly ingested or applied to the skin over extended periods of time, some inorganic mercury compounds can result in long-term effects such as neurological disturbances, skin rashes and kidney abnormalities.
3. Organic mercury compounds- formed when mercury bonds with carbon to form compounds such as methylmercury (MeHg). In water or soil, some microscopic organisms can convert elemental or inorganic mercury to the organic mercury compound, MeHg which may bioaccumulate up the food chain. Human exposure to MeHg commonly occurs through the consumption of certain fish or shellfish contaminated with MeHg over a period of time. Significant exposure to MeHg can result in serious health implications including neurological damage. The most vulnerable populations to MeHg contamination include children and pregnant or breastfeeding women as MeHg can pass through the placenta and breastmilk. Infants born to women with mercury poisoning have been found to have serious health issues such as, developmental abnormalities and cerebral palsy (WHO, 2017 and Centre for Disease Control and Prevention, 2017).

1.2 The Minamata Convention on Mercury

Recognising that mercury is a chemical of global concern, its persistence in the environment, its ability to bioaccumulate and its significant negative effects on human health and the environment, the Minamata Convention on Mercury was adopted, ratified, and is currently being implemented. This global treaty aims to protect human health and the environment from the adverse effects of anthropogenic emissions and releases of mercury and mercury compounds, in part, by regulating, *inter alia*, the supply, sources, trade, storage and disposal of mercury and its compounds; MAPs and processes; mercury waste; and the emissions and releases of mercury.

The text of the Minamata Convention was adopted on October 10, 2013, and the Convention entered into force on August 16, 2017, with 140 Parties to date (*as of March 2023*). Parties to

the Minamata Convention on Mercury are required to meet the obligations set forth in the Convention's text and annexes.

Under Article 2 of the Minamata Convention, MAPs are defined as a "product or product component that contains mercury or a mercury compound that was intentionally added". Article 4 outlines measures to phase out or, in some cases, phase down the manufacture, import and/or export of certain MAPs (f*urther discussed in Chapter 2 of this report*).

1.3 Mercury Activities in Antigua & Barbuda

The Government of Antigua and Barbuda has been actively working towards the phase out of mercury-added products and overall mercury management through several activities conducted over the years through the Department of Analytical Services (DoAS) which functions as the Focal Point Agency for the Minamata Convention on Mercury.

Some initiatives include:

- The National Solid Waste Management Authority (NSWMA) and DoAS led 2021 initiative for the distribution of specialised bins designed for the safe disposal of used and intact fluorescent light bulbs across prominent national retail locations for public access.

- "Development of Minamata Initial Assessment in the Caribbean (Antigua and Barbuda, Dominica, Grenada, Saint Vincent and the Grenadines)" which led to the completion of a National Minamata Initial Assessment Report for Trinidad and Tobago in 2021 that included a detailed national mercury inventory, regulatory framework assessment, identification of potential mercury hotspots and communication strategy to raise awareness on mercury issues. The public awareness material developed under this project have been utilised nationally.

- "Global Mercury Hair Monitoring in Women of Child-bearing Age in Small Island Developing States Pilot Project" (2018) which aimed to promote global mercury monitoring efforts in humans to raise awareness on mercury pollution (Bell, et. Al., 2019).

- "Fish Mercury Biomonitoring in the Caribbean Region" (2019) in which mercury concentrations in samples of specific species of fish were analysed to provide the Caribbean region with data that can be utilised as the basis for future mercury biomonitoring initiatives that will be able to guide mercury hotspot identification and

the development of consumption guidelines for local fish species (Evers and Sunderland, 2019).

- The "Technical assistance to Parties to implement Articles 3, 4, 10 and 11 of the Minamata Convention on interim storage, disposal of waste in mercury-added products using guidelines from the Minamata Convention" coordinated by the Caribbean Community (CARICOM) Secretariat aimed to develop a training programme to regional/sub-regional authorities on the environmentally sound management of waste MAPs. A training manual was developed in 2021 that is available for participating countries which include Antigua and Barbuda.

- The Caribbean Regional Mercury Monitoring Network (CRMMN) which is currently ongoing and aims to assist Caribbean countries to meet the obligations of the Minamata Convention through the development of an integrated network of laboratories that will build the capacity for mercury testing in products and the biota (Evers and Burton, 2022).

- The global programme under the Global Environment Facility (GEF), Implementing Sustainable Low and Non-Chemicals Development in Small Island Developing States (ISLANDS) is being executed regionally by the Basel Convention Regional Centre-Caribbean (BCRC-Caribbean) and aims to strengthen countries' abilities to control the flow of chemicals, products and materials into their territories and to unlock resources for long term management of chemicals and wastes including integrated chemicals and wastes management in SIDS. The project will specifically target the management of Persistent Organic Pollutants and mercury. Through this project, the enhancement of national regulatory framework and training of Customs officials as needed to prevent the import of MAPs and other targeted chemicals/products will be implemented.

1.4 Mercury-added Products under the Minamata Convention on Mercury

Article 4 'Mercury-added products' of the Minamata Convention on Mercury restricts the manufacture, import and export of certain MAPs (UNEP, 2021a). Annex A Part I of the Minamata Convention provides a listing of MAPs that Parties are obligated to phase out and phase out dates.

In terms of dental amalgam fillings, Parties are obligated to take several measures for the phase down of dental amalgam. These measures are included in Annex A Part II of the Minamata Convention.

At the Fourth Meeting of the Conference of Parties of the Minamata Convention on Mercury (COP-4) held in 2021-2022, Annex A of the Minamata Convention was reviewed and amended to include further obligations regarding MAPs. Table 2 provides a summary of the products regulated under Annex A inclusive of the COP-4 amendments, and the status of mercury-free alternatives currently available on the global market.

Table 2: Provisions for Mercury-Added Products Under Annex A of the Minamata Convention and a Summary on Mercury-free Alternatives Available (Lennett and Gutierrez, 2018; UNEP, 2019b; UNEP, 2021a; IISD, 2022;)

Product Category	Mercury Added Product to be phased out of manufacture, import and export	Status of Mercury-free Alternative Products
Batteries	Mercury-added batteries, except for button zinc silver oxide batteries with a mercury content < 2% and button zinc air batteries with a mercury content < 2% (**phase-out date: 2020**)	*Most batteries manufactured globally are already mercury free and widely available in Antigua and Barbuda.*
Switches and Relays	Mercury-added switches and relays, except very high accuracy capacitance and loss measurement bridges and high frequency radio frequency switches and relays in monitoring and control instruments with a maximum mercury content of 20 mg per bridge, switch or relay (**phase-out date: 2020**)	*Most switches and relays manufactured globally are already mercury free and widely available in Antigua and Barbuda.*
Lighting Devices	Compact fluorescent lamps (CFLs) for general lighting purposes that are: ● ≤ 30 watts with a mercury content exceeding 5 mg per lamp burner (**phase-out date: 2020**) ● ≤ 30 watts with a mercury content not exceeding 5 mg per lamp burner (**phase-out date: 2025**)[1]	*Light Emitting Diodes (LEDs) or other technologies are widely available (globally and in Antigua and Barbuda.) and are increasingly replacing mercury-added lighting devices.*
	Linear fluorescent lamps (LFLs) for general lighting purposes (**phase-out date: 2020**): (a) Triband phosphor < 60 watts with a mercury content exceeding 5 mg per lamp (b) Halophosphate phosphor ≤ 40 watts with a mercury content exceeding 10 mg per lamp	
	High pressure mercury vapour lamps (HPMV) for general lighting purposes (**phase-out date: 2020**)	
	Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays (**phase-out date: 2020**): (a) short length (≤ 500 mm) with mercury content exceeding 3.5 mg per lamp (b) medium length (> 500 mm and ≤ 1 500 mm) with mercury content exceeding 5 mg per lamp	

[1] As per COP-4 amendments.

Product Category	Mercury Added Product to be phased out of manufacture, import and export	Status of Mercury-free Alternative Products
	(c) long length (> 1 500 mm) with mercury content exceeding 13 mg per lamp *NOTE: CCFLs and EEFLs containing mercury of all lengths for electronic displays not already phased out are expected to be phased out by **2025**[3].	
Measuring Devices	The following non-electronic measuring devices except non-electronic measuring devices installed in large-scale equipment or those used for high precision measurement, where no suitable mercury-free alternative is available (**phase-out date: 2020**): (a) barometers (b) hygrometers (c) manometers (d) thermometers (e) sphygmomanometers	*Mercury-free alternatives (digital etc.) are already widely available and popular on the global market.*
Cosmetics	Cosmetics (with mercury content above 1ppm), including skin lightening soaps and creams, and not including eye area cosmetics where mercury is used as a preservative and no effective and safe substitute preservatives are available (**phase-out date: 2020**)	*Many countries have banned the sale of mercury in cosmetics, but the larger challenge is effective enforcement.*
Miscellaneous	Mercury-added pesticides, biocides and topical antiseptics (**phase-out date: 2020**)	*Mercury use in pesticides, biocides, and topical antiseptics is already banned in many countries.*
	The following devices should be **phased out by 2025**[3]: ● strain gauges used in plethysmographs ● melt pressure transducers, melt pressure transmitters, and melt pressure sensors, except those installed in large-scale equipment or those used for high precision measurement, where no suitable mercury-free alternative is available.	*Mercury-free alternatives are already widely available and popular on the global and local markets.*

Product Category	Mercury Added Product to be phased out of manufacture, import and export	Status of Mercury-free Alternative Products
	• mercury vacuum pumps • tyre balancers and wheel weights • photographic film and paper • propellant for satellites and spacecraft	

Dental Amalgam Provisions Under Annex A Part II of the Minamata Convention requiring Parties to adopt 2 or more Phase Down Provisions

Dental Amalgam Provisions	**Mercury-free Alternatives**
Phase Down Provisions: Measures to be taken by a Party to phase down the use of dental amalgam shall take into account the Party's domestic circumstances and relevant international guidance and shall include two or more of the measures from the following list: (i) Setting national objectives aiming at dental caries prevention and health promotion, thereby minimizing the need for dental restoration; (ii) Setting national objectives aiming at minimizing its use; (iii) Promoting the use of cost-effective and clinically effective mercury-free alternatives for dental restoration; (iv) Promoting research and development of quality mercury-free materials for dental restoration; (v) Encouraging representative professional organizations and dental schools to educate and train dental professionals and students on the use of mercury-free dental restoration alternatives and on promoting best management practices; (vi) Discouraging insurance policies and programmes that favour dental amalgam use over mercury-free dental restoration; (vii) Encouraging insurance policies and programmes that favour the use of quality alternatives to dental amalgam for dental restoration; (viii) Restricting the use of dental amalgam to its encapsulated form; (ix) Promoting the use of best environmental practices in dental facilities to reduce releases of mercury and mercury compounds to water and land.	Composite (resin) fillings *are already widely available and popular on the global and local markets.*

Product Category	Mercury Added Product to be phased out of manufacture, import and export	Status of Mercury-free Alternative Products
Parties are required to[3]: • exclude or not allow dental amalgam, by taking measures as appropriate, the use of mercury in bulk form by dental practitioners; and • exclude or not allow dental amalgam, by taking measures as appropriate, or recommend against the use of dental amalgam for the dental treatment of deciduous teeth, of patients under 15 years, and of pregnant and breastfeeding women, except when considered necessary by the dental practitioner based on the needs of the patient.		

1.5 Project Background

The Africa, Caribbean, and the Pacific (ACP) Multilateral Environmental Agreements (MEAs) programme is a partnership amongst the European Union (EU), United Nations Environment Programme (UNEP), Food and Agricultural Organisation of the United Nations (FAO), and the Organisation of African, Caribbean and Pacific States (OACPs). Under this programme, funding was made available to the European Environmental Bureau (EEB) to support ACP countries in the implementation of the Minamata Convention on Mercury.

The EEB is Europe's largest network of environmental citizens' organisations that advocates for environmental justice and sustainable development. For the implementation of mercury measures, the EEB has partnered with the Zero Mercury Working Group (ZMWG). ZMWG is an international coalition of more than 110 public interest environmental and health non-governmental organizations from over 55 countries from around the world formed in 2005 by the European Environmental Bureau and the Mercury Policy Project. ZMWG strives for zero supply, demand, and emissions of mercury from all anthropogenic sources, with the goal of reducing mercury in the global environment to a minimum.

As part of the EEB/ZMWG's activities, the project was developed in collaboration with the Government of Antigua and Barbuda. This national project aims to develop strategies to reduce the use and releases of elemental mercury and those MAPs listed in Article 4 of the Minamata Convention in the context of the ACP MEAs programme. Where determined feasible and there is receptivity, this will entail assisting in the development of the following components:

1. Roadmap for phasing out MAPs;
2. Market study of mercury-free alternatives;
3. Assessing/focusing institutional capacity;
4. Mercury-free product procurement;
5. Single stream product management pilot projects; and
6. National Implementation Plan.

The focus of this report is on Component 2 as listed above which involves a market study to determine the availability, accessibility, efficacy, and technical feasibility of replacing MAPs with alternatives that comply with the Minamata Convention on Mercury. An in-depth analysis of the economic feasibility of replacing MAPs with Convention-compliant alternatives was not conducted under this report as the alternatives are already common-place on the global market and are generally considered relatively affordable. The economic feasibility of mercury-free products is also made more evident when the cost of ensuring environmentally sound

disposal of MAPs is considered. A summary of cost comparisons of certain MAPs versus their Convention-compliant alternatives is included in Annex 1 for reference.

Due to the availability of data and resources for the market study, the products targeted include:

1. Lighting Devices
2. Switches, Relays and Thermostats
3. Medical Measuring Devices (Thermometers and Blood Pressure Gauges)
4. Dental Fillings

Details on how these products were selected for assessment are provided in Chapter 2 of this report.

Chapter 2: Brief Situational Analysis

2.1 Country Background

Antigua and Barbuda is located in the Lesser Antilles between the Caribbean Sea and the Atlantic Ocean. The larger island of Antigua located at 17° 10' N and 61° 55' W has an area of 108 square miles while Barbuda, located at 17° 35' N and 61° 48' W of the equator, has a total area of 62 square miles. The islands are mainly low lying with the highest point, Boggy Peak, being 1,319 feet high in Antigua. Barbuda's highest point is 125 feet high (Government of Antigua and Barbuda, n.d.). As of 2021, the total population was estimated to be 93,219 with the majority of people situated in Antigua and approximately 3% in Barbuda (The World Bank Group, 2023).

Antigua and Barbuda is a democratic, sovereign state with King Charles III of England is the Head of State represented by the Governor General. The Governor General acts on the advice of the Prime Minister under the authority of democratically appointed Cabinet of Ministers. Antigua and Barbuda is a member of the Caribbean Community (CARICOM) and the Organisation of Eastern Caribbean States (OECS).

Economically, the tourism industry is the main contributor to the Gross Domestic Product (GDP) both directly and indirectly via the synergies created with other sectors such as transport, construction and real estate. Financial services and foreign investments also create further GDP generation linked to other sectors. Productive sectors including agriculture, fishing and manufacturing accounted for less than 6% of GDP (World Trade Organisation, 2023).

2.2 National Legislative and Institutional Framework Related to MAPs

This section includes a rapid analysis of the national regulatory framework currently in place for implementing Article 4 of the Minamata Convention related to managing trade of Convention-compliant products. A listing of the relevant legislation and institutions analysed is provided in Table 3.

In Antigua and Barbuda, manufacture and export of MAPs does not exist. This brief analysis will therefore be focused primarily on the regulatory aspects related to the import of MAPs.

Table 3: Brief Details on the Policy/Legislation and Institutions Relevant to Managing Trade and Use of Minamata Convention-compliant Consumer Products

Policy/ Legislation	**Relevance**
The Customs (Control and Management) Act, 2013	Governs import and export of goods nationally.
The Pesticides and Toxic Chemicals Act, 2008	Manages the import and export of pesticides and toxic chemicals and provides for the establishment of the Pesticides and Toxic Chemicals Control Board
The Standards Act, 2017	Provides provisions for the labelling of chemicals and products.
Institution	**Relevance**
Department of Analytical Services (DoAS)	National Focal Point for project and is responsible for the management of plans, strategies and policies related to the environment.
Customs and Excise Division	Division responsible for the implementation of Customs regulations on goods which involves the protection of national physical borders, society and the environment.
Antigua and Barbuda Bureau of Standards (ABBS)	Corporate body responsible for establishing standards on goods and promoting standards development and maintenance.
Pesticides and Toxic Chemicals Control Board	Authorizes the import and export of chemicals through a licensing system. Additionally, inspects premises and registers items if marketable quantities of the item(s) are stored for the purposes of sale by wholesale, packaging, or manufacturing.
Ministry of Health, Wellness and Environment - The Antigua Barbuda Central Medical Procurement Unit	Responsible for planning and implementing government's health-related programmes and projects and administration. The Central Medical Procurement Unit provides pharmaceuticals and medical supplies to Mount St John's Medical Centre, public clinics and first responders.
Medical Association of Antigua and Barbuda Inc.	Body of registered medical professionals committed to improving the health of local communities through the advancement of physician learning.
Antigua & Barbuda Chamber of Commerce Limited	Private sector body representing a network of national business services across various sectors and industries. Relevant private companies include distributors and retailers of lighting devices and electrical products.
Antigua Public Utilities Authority	Tripartite government statutory agency responsible for the national telecommunications (including mobile & internet), electricity and water services.
Zero Waste Antigua and Barbuda	Non-governmental organization (NGO) aimed at reducing waste in Antigua and Barbuda and implementing several environmental initiatives.

Under the Customs (Control and Management) Act, 2013 (and Amendment No. 35 of 2017), authority is given to the Customs and Excise Division for the examination and control of imports/exports of products. Prohibited and restricted imports/exports of goods are outlined in Part XI and the related Third Schedule of the act. Restrictions on the import of MAPs as prohibited goods are not currently included but as outlined in Part XI, 90, the relevant Minister, "may, by Order published in the Gazette, amend the Third Schedule in respect of imported goods".

Through the work being conducted by the Secretariat of the Minamata Convention on Mercury and the UNEP Global Mercury Partnership's Mercury in Products partnership area, and in consultation with other stakeholders, a draft guidance document has been developed to support countries in the development of new HS Codes to further distinguish between MAPs and their mercury-free alternative products through the development of eight- or ten-digit HS codes. The process of implementing these HS codes is ongoing in Antigua and Barbuda.

It is noted that in terms of the import of mercury and mercury compounds, under The Pesticides and Toxic Chemicals Control Act, 2008, mercuric chloride is categorised under Schedule 2 as a Class 1 A "Extremely hazardous pesticide", and "phenylmercury acetate is listed as a Class 1b "Highly hazardous pesticide" for restriction of imports. The Pesticides and Toxic Chemicals Control Board being responsible for regulating these imports.

Another aspect related to phasing out of MAPs, relates to regulations for the proper labelling of products being imported and sold on the market. While the inspection and clearing of goods is noted under the Customs (Control and Management) Act, 2013 and the labelling of commodities is mandated by the ABBS under The Standards Act, 2017, identification of mercury in MAPs may require further incorporation. Through the work being conducted by the Secretariat of the Minamata Convention on Mercury and the UNEP Global Mercury Partnership's Mercury in Products partnership area, and in consultation with other stakeholders, a draft guidance document has been developed to support countries in the development of new Harmonised System (HS) Codes to further distinguish between MAPs and their mercury-free alternative products through the development of eight- or ten-digit HS codes which can be referenced.

Training of the customs officers should be conducted to ensure their awareness of the need for monitoring product labelling and assessing Safety Data Sheets to identify mercury-free alternative products (Thompson, 2020). Personnel should also be equipped with and trained in the use of tools to aid in the identification of mercury in products being imported such as handheld XRF (X-ray fluorescence) Analysers (BCRC-Caribbean, 2021). All training activities

conducted should also include or result in the development of Standard Operating Procedures that can be referenced as needed by relevant personnel (Thompson, 2020).

To ensure the effective phase out of MAPs and promotion of alternative products on the market, coordination amongst all relevant public and private sector bodies is essential. The promotion of mercury-free medical measuring devices and mercury-free dental fillings in the public and private health care sectors should be coordinated by the DoAS in collaboration with the Ministry of Health, Wellness and Environment (particularly the Central Medical Procurement Unit) and the Medical Association of Antigua and Barbuda Inc.

Coordination with the APUA to ensure the continued promotion and prioritization of mercury-free and energy efficient lighting is also needed. APUA has conducted awareness raising campaigns in the past to promote mercury-free lighting devices in terms of energy efficiency (and long terms household energy costs reductions) and environmental benefits.

The Antigua & Barbuda Chamber of Commerce Limited functions to represent the business community, including the import, export, and manufacturing sectors. Coordination and awareness raising between the Government and The Antigua & Barbuda Chamber of Commerce Limited to ensure all business enterprises are aware of, and engaged in the promotion of mercury-free alternative products is a key aspect to ensure the effective implementation of Article 4 of the Minamata Convention.

ZWAB has also functioned as a NGO body that raises awareness amongst the public of Antigua and Barbuda on several environmental issues including mercury management. Continued coordination with ZWAB by the DoAS for awareness-raising to promote mercury-free alternative products amongst the public and private sectors will also be beneficial.

2.3 Status of Mercury-Added Products in Antigua and Barbuda

2.3.1. Minamata Initial Assessment Findings

From 2018 – 2021, a sub-regional project, “Development of Minamata Initial Assessment in the Caribbean- Antigua and Barbuda, Dominica, Grenada, Saint Vincent and the Grenadines” (MIA Project) was conducted that was funded by the Global Environment Facility (GEF), implemented by UNEP, and executed by the Basel Convention Regional Centre-Caribbean (BCRC-Caribbean), with the DoAS acting as the National Executing Body.

Through this project, a national inventory of sources of mercury releases was conducted based mainly on 2016 quantitative data and assumptions made. It was found that the majority of mercury releases were attributed to the use and disposal of consumer products with

intentional use of mercury (approximately 13 kg/year), and a further 11 kg/year was found to be due to the use and disposal of medical blood pressure gauges, laboratory chemicals and equipment, and the preparation, use and disposal of dental amalgam (assessed under the source category: “Other intentional product/process use”) (BCRC-Caribbean, 2021).

Figure 1 shows the MAP sub-categories identified as responsible for mercury releases in Antigua and Barbuda based on 2016 data and assumptions. The sum of mercury releases from all MAPs quantified was used to determine the percentage distribution of mercury releases for each MAP sub-category.

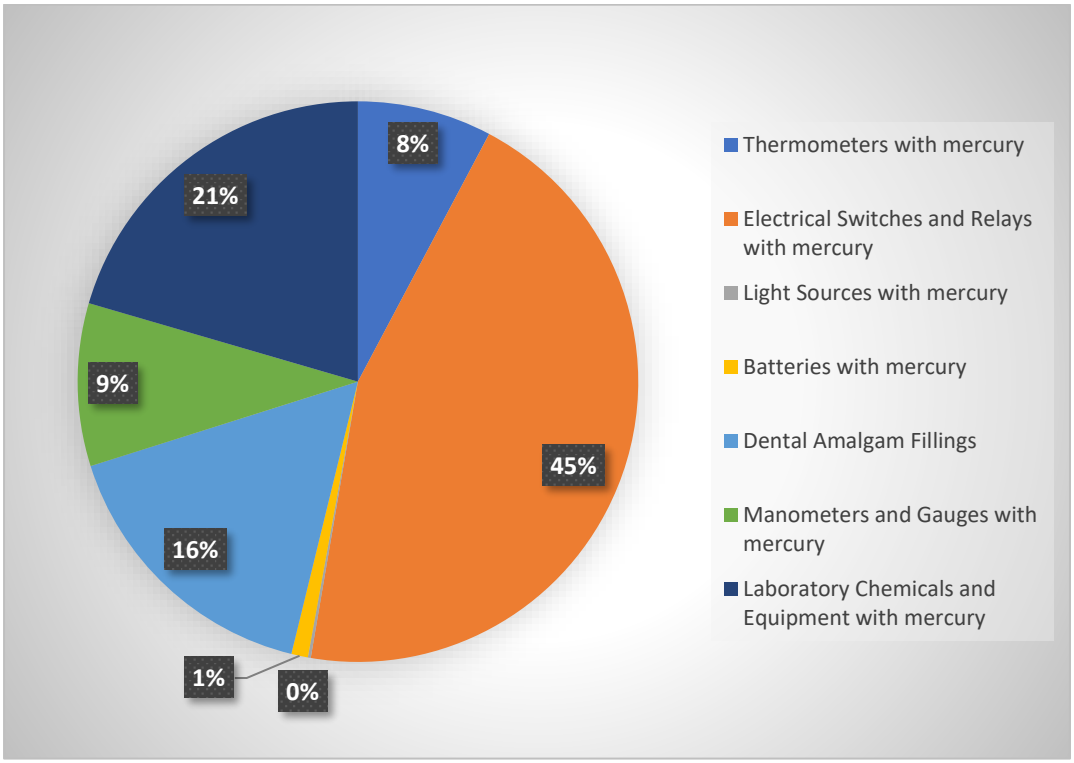

Figure 1: Estimated Percentage Distribution of Mercury Releases within the MAP Categories Identified in the Inventory of Mercury Releases in the MIA Project (created using data from BCRC-Caribbean, 2018. NOTE: See Footnote [2])

Lighting Devices with mercury

Assumptions made on Customs 2016 import data were undertaken to estimate the import of mercury-added light sources such as, CFLs, and High Intensity Discharge Lamps (HIDLs) such as High-pressure mercury vapour and high-pressure sodium lamps. It was noted that mercury-free Light Emitting Diodes (LEDs) had become increasingly popular in commercial and residential areas, and a venture to install solar-powered LED street lighting replacements

[2] Estimated mercury releases for these products, were made based on various uncertainties and assumptions which may have led to over-estimations.

had been initiated in 2016 (BCRC-Caribbean, 2021). One of the major Street Lighting initiatives was funded by the Caribbean Development Bank (CDB) in 2017 with the stated intention of the government to further reduce the use of HIDLs going forward (CDB, 2017). In 2022 there was continued movement towards the reduction goal with new streetlights being installed on the Sydney Walling Highway (Antigua News Room, 2022). These factors may have contributed to the estimated mercury releases from these products being considered minimal at the time.

Electrical Switches and Relays with mercury

Electrical switches and relays with mercury were assumed to cause the largest amount of mercury releases for the MAPs identified. Mercury is used in some switches and relays, generally found in various electronic equipment due to its high density, conductivity and sensitivity to temperature (UNEP, 2019b). Mercury content can range widely across these products with some being recorded as having 0.001 grams of mercury per item and others having up to 400 grams of mercury per item depending on type (UNEP, 2019b). Since these products are typically found as components of larger products, determining quantities that are in use in a country and their mercury content is extremely difficult which resulted in default calculations being used for the 2016 inventory.

Lab Chemicals and Equipment with mercury

For this category, the potential presence of mercury in laboratories was identified for assessment. The use of mercury containing lab chemicals and equipment could not be determined and as such default formulae based on 2016 population data and electrification rates were used to estimate releases.

Manometers and Gauges with mercury

Manometers and gauges were assumed to account for only approximately 9% of the mercury releases due to MAPs based on default calculations available in the UNEP Toolkit used to make estimations for the inventory. Based on data received from the Central Medical Procurement Unit, mercury-added sphygmomanometers were found in their inventory of 2017 and 2018 data with approximately 60 in stock as of 2018 (BCRC-Caribbean, 2021). Use of these MAPs was gradually decreasing as there was more awareness of mercury pollution and increased availability in mercury-free digital blood pressure gauges.

Thermometers with mercury

Data for the national inventory on mercury-added medical thermometers in Antigua and Barbuda was obtained from questionnaires and interviews with the national Central Medical

Procurement Unit and the Ministry of Education. Estimated releases were determined to be 1.86 kg Hg/y which was considered to represent the public health care sector and schools.

Dental Amalgam Fillings

For the assessment on dental amalgam under the MIA Project, quantities of dental amalgam imported or used were not able to be captured as dentists contacted did not maintain detailed logs of dental amalgam use and Customs and Excise data did not have any clear indication of these products. Instead, the national inventory of mercury releases from dental amalgam estimate used default formulae that used the number of dentists per 1,000 inhabitants estimated to be 0.2) as well as the number of inhabitants (BCRC-Caribbean, 2021). The releases estimated considered mercury inputs during the preparation, use and disposal of amalgam. Dental sector stakeholders engaged for the inventory indicated that, similarly to worldwide trends, dental amalgam was no longer a popular dental restoration material and instead mercury-free, teeth-coloured composite fillings have become the preference due to availability and aesthetics (BCRC-Caribbean, 2021).

Batteries with mercury

Mercury-added batteries were determined to be a minimal source of mercury releases from MAPs according to the 2016 inventory data. Globally, since 2019, market data on mercury-added batteries found that many well-known global battery suppliers such as, Duracell, Energizer, Varta and Panasonic 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).

2.3.2 MAPs Identified for Consideration Under Market Study

Due to the availability of data and resources for the market study, four main products were targeted for assessment. Based on the results of the previous national inventory of mercury releases, the following products were identified for review under this study:

- Lighting Devices
- Switches, Relays and Thermostats
- Medical Measuring Devices (Thermometers and Blood Pressure Gauges)
- Dental Fillings

Due to the recent global market assessment on batteries noted previously, most batteries are largely assumed to be mercury-free. As such, batteries were not considered as key products of focus under this market study.

Mercury-added cosmetics have been identified as a potential area of concern across the Caribbean but have not been included under this study as more in-depth assessments are expected to be conducted under ongoing global and regional projects.

Chapter 3 – Methodology

3.1 Stakeholder Engagement

Information for the assessment was gathered from meetings and interviews held with government stakeholders through which key stakeholders were identified for survey engagement.

Survey questionnaires were designed to capture key data from stakeholders to assess the status of MAPs and their mercury-free alternatives in Antigua and Barbuda. Survey distribution was done via email to key persons in the organizations identified for completion. Phone calls and in-person interviews ('door knocking') were also employed by the national consultant. The survey questionnaires were either completed electronically via email correspondence or in person interviews. The survey questionnaires used, aimed to be participatory and sought to actively engage relevant stakeholders in order to capture local knowledge, practices and data as relates to the use mercury products. Target stakeholders included dentist, medical associations (private and public), hardware stores, relevant government departments and users of light.

Despite several attempts at stakeholder engagement by the national consultant, responses from stakeholders were minimal. Market study challenges and mitigation measures can be found in Annex 2.

Each questionnaire developed is provided in Annex 3 of this report.

Identification codes were assigned to stakeholders from which data was obtained for the assessment as shown in Table 4.

Table 4: Identification Labelling Codes Assigned to Market Survey Stakeholders.

Sector	Market Survey Respondents' Identification Codes
Lighting Devices	Users: LDU1 Retailers: LD1 and LD2
Electrical Switches, Relays and Thermometers	not applicable
Medical Measuring Devices	not applicable (1 public sector stakeholder)
Dental Fillings	D1, D2, D3

Chapter 4: Findings and Analysis

4.1 Product Assessments

4.1.1 Lighting Devices

In assessing lighting devices, feedback was sought from both users and retailers/suppliers of the products. No quantitative data was obtained for this assessment, and it was assumed that mercury-added lighting devices referred to all types of lighting including compact fluorescent lamps (CFLs), linear fluorescent lamps (LFLs) and high intensity discharge lamps (HIDLs).

The one (1) respondent to the Light Devices User survey represented the largest chain of commercial stores in Antigua and Barbuda (referred to as LDU1) and indicated that most of the lighting devices used in their buildings or operations are mercury-free (e.g. LEDs) with some mercury-added lighting products still in use (e.g. CFLs, LFLs etc.). When assessing the criteria for selecting lighting devices, LDU1 indicated that power consumption of product, luminosity, lifetime/shelf-life and durability were highly important. Mercury-free lighting were also preferred for criteria such as affordability; level of information provided on packaging; availability in different forms/models; availability; compatibility and energy efficiency. In terms of longer lifetime/shelf life, LDU1 indicated that mercury-added lighting devices were preferred. In an assessment conducted by the Coalition for Clean Lighting (CLiC) in Antigua and Barbuda in 2021, mercury-added CFLs were compared to their LED alternatives, and it was found that on average, LEDs have a rated lifetime of 11,000 hours compared to 10,000 hours for CFLs. For LFLs, their rated lifetime was 24,000 hours in comparison to their LED alternatives which had a rated lifetime of 50,000 hours (Figure 2).

The respondents to the Lighting Devices Retailers/Suppliers survey included the two (2) largest hardware companies in Antigua and Barbuda that have been in operation for over ten (10) years, referred to as LD1 and LD2 respectively. Both are also importers of lighting devices and distributors to other retail companies within Antigua and Barbuda as well as, the wider Caribbean region. LD1 and LD2 indicated that they solely import and retail mercury-free lighting devices and that customers typically prefer mercury-free lighting such as LEDs.

LDU1 and LD1 indicated that they did not foresee any challenges in promoting mercury-free lighting alternatives while LD2 noted that potential disruptions in supply of mercury-free lighting could pose a potential challenge. As the popularity and accessibility of mercury-free lighting devices such as LEDs continues to increase on the global market, these challenges are expected to be alleviated.

All respondents indicated that the Government of Antigua and Barbuda a implements sufficient measures for the promotion of mercury-free lighting (such as LED bulbs).

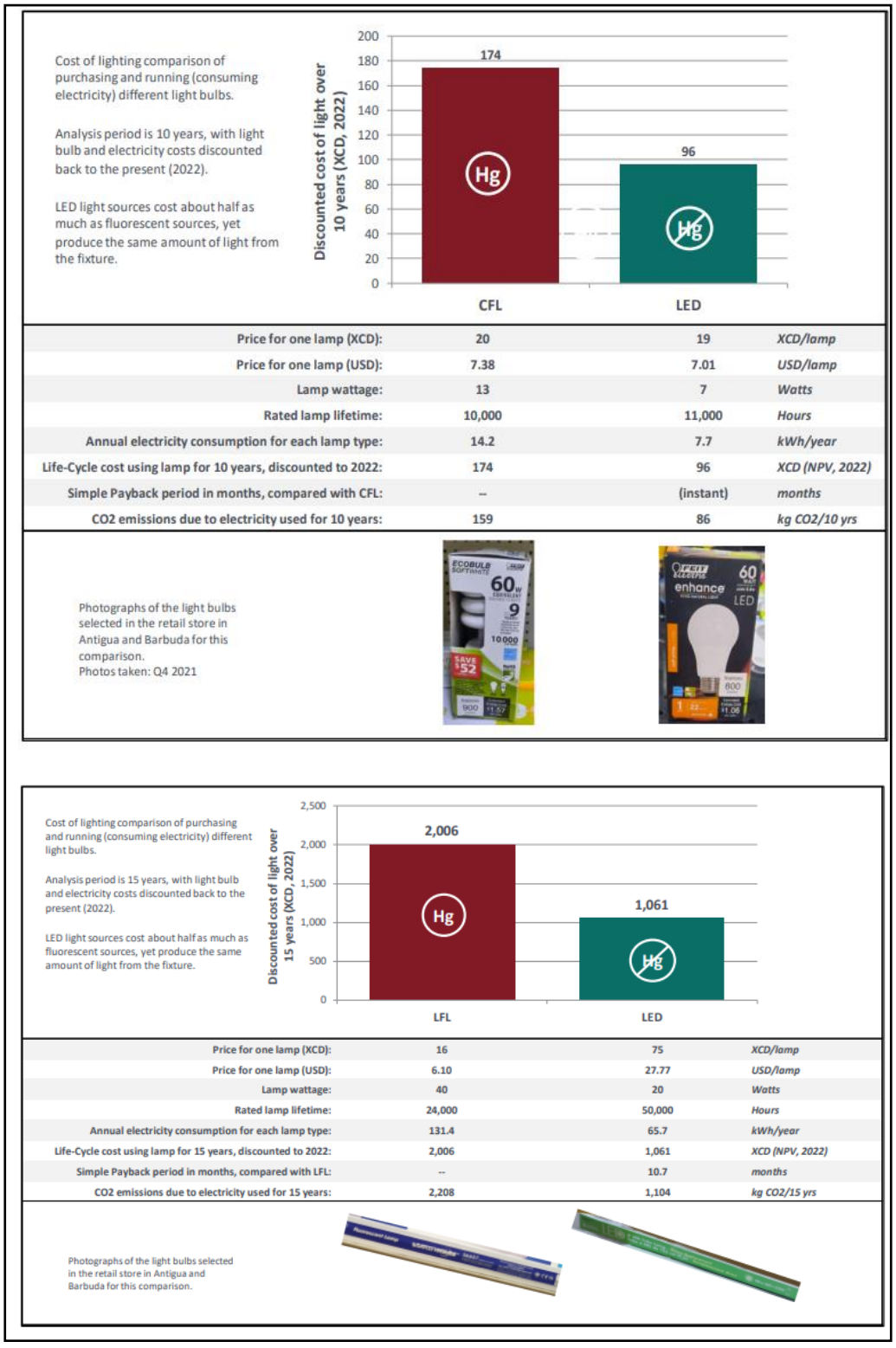

Figure 2: Summary of Economic Analysis Conducted in Antigua and Barbuda of Mercury-added CFLs and LFLs versus LED Alternatives Respectively (CLiC, 2022)

4.1.2 Electrical Switches, Relays (and Thermostats)

Obtaining quantitative data and survey responses to inform the market study of mercury-added versus mercury-free electrical switches, relays and thermostats in the electrical and lighting sector was unsuccessful under this survey.

Informal interviews were conducted by the national consultant under this project with potential users of electrical switches and relays in the electrical sector. One person interviewed indicated that in the air conditioning sector (of which there are only three (3) main suppliers in Antigua and Barbuda) mercury-free electrical switches and relays were used; however, a potentially minimal number of mercury-added electrical switches, relays and thermostats may still be used in the yachting industry within the country. This could not be verified at the time of the assessment, but it was found that persons are typically aware of the issues that may arise from mercury-added electrical switches and relays.

Global trends indicate that mercury-free switches, relays and thermostats have become more popular over the past twenty (20) years (UNEP, 2019b). Studies conducted in the United States of America (USA) indicate that as of 2016, all known thermostat manufacturers in the USA have phased out the production and sales of mercury thermostats in favour of mercury-free alternatives (IMERC, 2018). Based on 2014 data, over twenty (20) well-known USA-based manufacturers of electrical switches and relays also phased out the production and sales of various types of mercury switches and relays (IMERC, 2014). 2019 research indicated that certain types of mercury-added electrical switches and relays were still available from other suppliers such as Newark Element 14, Gordo Sales Inc., Comus International (all based in North America) as well as several suppliers based in India (UNEP, 2019b).

Table 5 below summarises the types of mercury-free electrical switches, relays and thermostats that have become readily available on the global market in comparison to their MAP counterparts (IMERC, 2014; IMERC, 2018).

Table 5: Alternatives to Mercury-Added Electrical Switches, Relays and Thermostats (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)

4.1.3 Medical Measuring Devices – Thermometers and Blood Pressure Gauges

Private retail of thermometers and blood pressure gauges is minimal in Antigua and Barbuda with the majority of the procurement of these products being handled by the Central Medical Procurement Unit of the Ministry of Health, Wellness and Environment. Data provided for the public sector indicated that mercury-free thermometers and mercury-free blood pressure gauges have been the sole types of products imported in recent years. Types of mercury-free thermometers that have been supplied since 2019 include: disposable “tempa-dot” thermometers, oral dual temperature thermometers, ear infrared thermometers, digital thermometers and infrared non-contact thermometers. Between 2019 – 2021, approximately 21,662 mercury-free thermometers have been procured for public sector use. Mercury-free blood pressure gauges supplied between 2019 – 2021 totalled 345 items and included various types of aneroid sphygmomanometers. The Organisation of Eastern Caribbean States Pharmaceutical Procurement System was referenced as the policy used to promote the procurement of mercury-free alternative products in health care.

4.1.4 Dental Restoration Materials

Three (3) dentists, representing approximately 15% of the total operational dentists in Antigua and Barbuda, provided feedback via the Dental Filling Survey that was distributed under the market study. Respondents indicated levels of professional dental experience ranging from over five (5) years to over twenty (20) years in both the public and private sector.

All 3 respondents indicated that mercury-free composite fillings were the sole type of dental restoration materials used in their practices, however it has been noted that mercury dental amalgam fillings may still be allowed in the public sector.

When asked about potential challenges in using mercury-free dental fillings, the potential cost differences and durability concerns were noted. In preparation for the Minamata Convention on Mercury's COP-4 held in 2021-2022, a number of Parties to the Convention and related stakeholders provided feedback on the technical efficacy of mercury-free fillings and concluded that mercury-free composite fillings exhibit satisfactory mechanical properties, require less preparation for use and provide better aesthetics since they are tooth-coloured. Emphasis is also placed on the provision of up-to-date dental training to ensure that dental practitioners are able to effectively use mercury-free fillings in various scenarios.

All dentist respondents indicated that they were aware of the environmental and health impacts of mercury and that dental amalgam was being phased down globally. Dental amalgam use is strongly discouraged for vulnerable population groups including children due to the potential health effects associated with mercury exposure on developing bodies. As of 2022, Part II of Annex A of the Minamata Convention on Mercury that refers to dental amalgam has been updated to include that Parties, "shall exclude or not allow, by taking measures as appropriate, or recommend against the use of dental amalgam for the dental treatment of deciduous teeth, of patients under 15 years, and of pregnant and breastfeeding women, except when considered necessary by the dental practitioner based on the needs of the patient".

Chapter 5: Conclusions and Recommendations

Globally, there are currently 140 Parties to the Minamata Convention on Mercury, including Antigua and Barbuda, that have agreed (among other obligations) to phase out the manufacture, import and export of MAPs listed under the Convention and phase down the use of dental amalgam. Many of these countries have already phased out these products according to the Convention's 2020 deadline with few countries, such as India and China, requesting exemptions to phase out certain MAPs within the next few years. As such, the manufacture of MAPs has declined in recent years with mercury-free alternative products becoming increasingly popular and overtaking the global market.

The findings of the national market study conducted indicate that Antigua and Barbuda has taken many strides to implement the phase-out of MAPs with mercury-free alternative products appearing to dominate the national market. Key factors were assessed to determine the feasibility of replacing MAPs identified with mercury-free alternatives in Antigua and Barbuda as detailed in Table 6 below.

Table 6: Summary Assessment of the Availability of Minamata Convention-compliant Alternative Products to MAPs

Lighting Devices	
Type of Product	LED Lighting Devices
Availability	● LEDs are predominantly available on the national market. ● The Government of Antigua and Barbuda has conducted several activities to implement the use of LED-alternatives.
Efficacy/Reliability	● LEDs do not contain mercury and their use results in lower energy consumption which subsequently results in lower carbon emissions (in comparison to mercury-added or other types of light bulbs). LEDs demonstrate higher brightness (lumens) and have a longer functional lifespan than mercury-added lighting products.
Overall Feasibility of Replacing MAPs with Mercury-free Alternatives	● The growing popularity of LEDs lighting devices over the past three (3) to five (5) years indicates a gradual phase-out of mercury-added lighting devices for Mercury Convention-compliant lighting products. ● LED lighting is also proven to be more energy efficient which further promotes MAP phase out under various energy efficient/green policies being promoted by the Government. ● Research has indicated that when factors such as wattage, brightness, energy efficiency and lifespan are assessed, LED alternatives are approximately 50% more economically feasible. Public awareness

	strategies can be conducted to educate suppliers and consumers on the durability and efficacy to further promote the use of LEDs. ● LED-replacing HIDLs have a higher efficacy than other types of HIDLs including High Pressure Sodium Lamps or Metal Halide Lamps. While the latter types are expected to be compliant with the Minamata Convention, LEDs are recommended for use in this lighting category where feasible. ● Current Customs HS Codes already distinguish between LED lighting devices and non-LED lighting devices however, amending the Custom Codes to distinguish amongst the types of LED lighting devices will enhance identification of their trade.
Electrical Switches, Relays and Thermostats	
Type of Product	Mercury-free switches; mercury-free relays; electromechanical or digital thermostats
Availability	No local data could be found to confirm availability as typically, import data does not currently differentiate between mercury-added and mercury-free varieties and feedback from stakeholders was inconclusive (since these products are often components within larger products), but global trends indicate that mercury-free alternatives have become widely available over the past two (2) decades.
Efficacy/Reliability	While the specific suitability of switches, relays and thermostats vary across multiple potential applications, research indicates that mercury-free switches, relays and thermostats are globally available, reliable and adequate for a variety of functions.
Overall Feasibility of Replacing MAPs with Mercury-free Alternatives	● In terms of the practical use, mercury-free alternative electrical switches, relays and thermostats appear to be widely available and highly reliable for their variety of applications. ● While mercury-free alternatives have become the main type on the global market over the past twenty (20) years, there may still be a small percentage of MAPs in use in the yachting industry in Antigua and Barbuda. Implementing effective safe storage and disposal for end-of-life MAPs can be considered to ensure sound phase-out. ● While recommendations for addressing these MAPs under HS Codes and labelling standards can be made nationally as well as the promotion of public awareness, there is global consensus that mercury-added electrical switches, relays and thermostats will be phased out globally in the coming years.
Medical Measuring Devices – Thermometers	

Type of Product	Mercury-free thermometers may include alcohol or infrared types, but for clinical use, digital thermometers are the most well-known.
Availability	Mercury-free thermometers are the sole types of thermometers in use across all relevant sectors and appear to be predominantly available on the global and local market.
Efficacy/Reliability	Extensive research by the WHO and other recognised bodies have concluded that digital thermometers have a high efficacy (in comparison to mercury-added thermometers and other types).
Overall Feasibility of Replacing MAPs with Mercury-free Alternatives	Mercury-added thermometers appear to have been phased out in Antigua and Barbuda. In the public sector, procurement policies also promote the use of mercury-free devices in health care.
Medical Measuring Devices – Blood Pressure Gauges	
Type of Product	Aneroid sphygmomanometers and several types of automated (electronic) blood pressure gauges. (Note: some types may contain small concentrations of mercury. Currently, these are not restricted under the Minamata Convention).
Availability	● Minamata Convention-compliant blood pressure measuring devices are the predominant types available on the global and local market. ● Globally, the manufacture of these MAPs has reduced due to the increased preference for mercury-free and technologically advanced varieties and phase-out efforts of Parties under the Minamata Convention on Mercury.
Efficacy/Reliability	Research by the WHO concluded that mercury-free validated automatic blood pressure machines produce more accurate and consistent measurements (in comparison to mercury-added measuring devices).
Overall Feasibility of Replacing MAPs with Mercury-free Alternatives	● Mercury-added sphygmomanometers appear to have been phased out in Antigua and Barbuda. ● In the public sector, procurement policies also promote the use of mercury-free devices in health care.
Dental Restoration Materials (Fillings)	
Type of Product	Composite (resin) fillings
Availability	● Composite fillings for dental restoration have become the predominant preference on the global and local market for many years.
Efficacy/Reliability	● Global assessments on technical efficacy of composite fillings have concluded that they exhibit satisfactory mechanical properties, require less preparation for use and preferred by patients due to aesthetics (in comparison to dental amalgam fillings).

	● Providing adequate training of dental practitioners in the preparation and placement of composite fillings will ensure their effectiveness and durability.
Overall Feasibility of Replacing MAPs with Mercury-free Alternatives	Under the Minamata Convention on Mercury, Parties are expected to take two (2) or more provisions to phase down its use. Measures outlined in Annex A Part II of the Convention that should be implemented nationally include: ● Promoting the use of cost-effective and clinically effective mercury-free alternatives for dental restoration; ● Encouraging representative professional organizations and dental schools to educate and train dental professionals and students 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. As of 2022, Parties shall, "exclude or not allow, by taking measures as appropriate, the use of mercury in bulk form by dental practitioners". The dental survey showed also that the encapsulated form was the predominant type used, aligning with the above provision. 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. This can be achieved through coordination with the Ministry of Health, Wellness and Environment.

Recommendations for Antigua and Barbuda to ensure the continued implementation of Article 4 of the Minamata Convention on Mercury are as follows:

- **Continued Implementation of Communication and Coordination Strategies to Promote Mercury-free Alternative Products:**

Through several initiatives that the Government of Antigua and Barbuda is involved in and through coordination with NGOs such as Zero Waste Antigua and Barbuda (ZWAB), awareness raising strategies for mercury management have been conducted. Additionally, under the MIA project conducted in Antigua and Barbuda,

several awareness raising materials were developed to educate the public and key stakeholders in the public and private sector about the benefits of the Minamata Convention on Mercury, its obligations and the need to phase out MAPs.

Materials developed[3] included:

1. Non-technical Summary Document "The State of Mercury in Antigua and Barbuda"
2. Awareness Posters/Infographics on various mercury-related topics such as, but not limited to:
    a. Mercury in Everyday Products (Figure 3)
    b. Mercury and Health
    c. Mercury in Medical and Industrial Devices

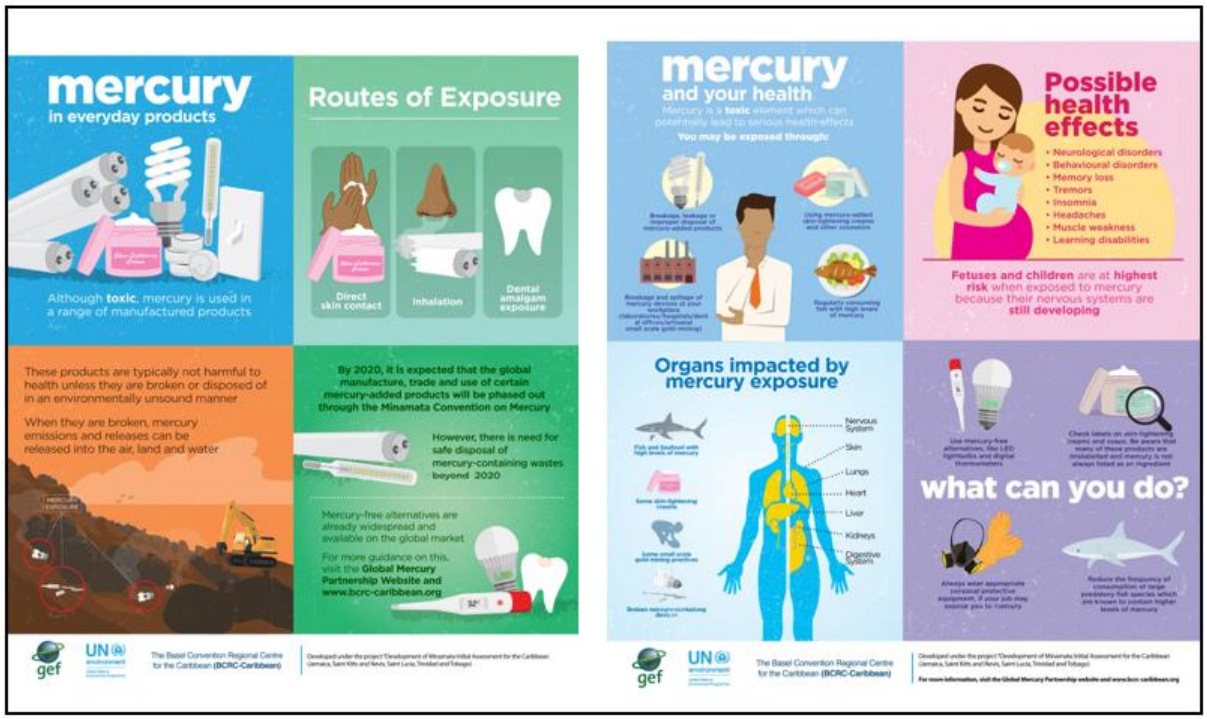

Figure 3: Images of the "Mercury in Everyday Products" and "Mercury and your Health" posters developed under the MIA Project.

Further to this, under the regional "Development of Minamata Initial Assessments in the Caribbean" projects executed by the BCRC-Caribbean, an updated Communications Strategy and Guidance Document to enhance awareness of the

[3] Available at: MIA-1 Awareness Raising Material – BCRC Caribbean (bcrc-caribbean.org)

Minamata Convention on Mercury was made available to the Department of Analytical Services in 2020 which included further material (available at: MIA-2 Awareness Raising Material – BCRC Caribbean (bcrc-caribbean.org).

The use of these materials and strategies facilitated through the BCRC-Caribbean can be adapted to develop an updated awareness campaign that highlights the engagement of the public as well as, relevant businesses and key stakeholders in the medical and dental sector.

Coordination of public awareness efforts between government stakeholders and private stakeholders in the relevant manufacturing, retail and medical sectors is essential to ensure clear communication and follow-through for the phase-out of MAPs and replacement with mercury-free alternative products.

- **Coordination with Related Projects and Initiatives for the Overall Protection of Human Health and the Environment:**

    - The Department of Analytical Services in Antigua and Barbuda in collaboration with Biodiversity Research Institute (BRI) and several Caribbean countries, is leading the execution of a Minamata Convention-facilitated Specific International Programme, “Caribbean Regional Mercury Monitoring Network” (CRMMN). The initiative aims to strengthen regional laboratory capacities for testing of products to identify or quantify mercury content.

    - The Government of Antigua and Barbuda is also a participating country under the global programme, “GEF ISLANDS” being executed regionally by the BCRC-Caribbean. This project aims to strengthen countries’ abilities to control the flow of chemicals, products and materials into their territories and to unlock resources for long term management of chemicals and wastes including integrated chemicals and wastes management in SIDS. The project will specifically target the management of Persistent Organic Pollutants and mercury. Through this project, the enhancement of national regulatory framework and training of Customs officials as needed to prevent the import of MAPs and other targeted chemicals/products will be implemented.

References

- Antigua and Barbuda. Commonwealth. (n.d.). Retrieved December 20, 2022, from https://thecommonwealth.org/our-member-countries/antigua-and-barbuda#:~:text=Antigua%20and%20Barbuda%20is%20a,Redonda%20is%20rocky%20and%20uninhabited.

- Antigua News Room. 2022. “Government commences National Street Lighting Project”. Antigua News Room. August 10, 2022 [online]. Available at: Government commences National Street Lighting Project - Antigua News Room

- Bell, L.; Evers, D.; Johnson, S.; Burton, M.; Regan, K.; Ingram, I.; DiGangi, J.; Federico; J.; Samanek, J.; Petrlik, L. (2019) Mercury Threat to Women & Children Across 3 Oceans. A joint study by the Biodiversity Research Institute, the International POPs Elimination Network, Arnika Association, and Island Sustainability Alliance (Cook Islands). November 2018. Berkeley California.

- CDB. 2022. “Over 14,000 streetlights in Antigua & Barbuda to be replaced with LEDs”. Central Development Bank. February 13, 2017 [online]. Available at: https://www.caribank.org/newsroom/news-and-events/over-14000-streetlights-antigua-barbuda-be-replaced-leds

- Central Intelligence Agency. (n.d.). Central Intelligence Agency. Retrieved December 20, 2022, from https://www.cia.gov/the-world-factbook/about/archives/2021/countries/antigua-and-barbuda/#people-and-society

- Centre for Disease Control and Prevention. 2017. Mercury Factsheet. [online] Available at: https://www.cdc.gov/biomonitoring/Mercury_FactSheet.html
- Clean Lighting Coalition (CLiC). 2022. Technical & Economic Assessment of Mercury-Free Lighting: Latin America & the Caribbean Region. Clean Lighting Coalition, 2022. [online] Available at: https://cleanlightingcoalition.org/wp-content/uploads/sites/96/CLiC-Regional-Profiles-GRULAC.pdf

- Department of Analytical Services, Ministry of Agriculture. (2021). *Antigua and Barbuda Minimata Initial Assessment Report*. Basel Convention Regional Centre for Training and Technology Transfer for the Caribbean (BCRC-Caribbean) under the GEF Project (GEFID9865).

- Evers, D. C. and M. Burton. 2022. Caribbean Region Mercury Monitoring Network. Biodiversity Research Institute, Portland, Maine. Science Communications Series BRI 2022-03. 8 pages.
- Evers, D.C. and E. Sunderland. 2019. Technical Information Report on Mercury Monitoring in Biota: Proposed components towards a strategic long-term plan for monitoring mercury in fish

and wildlife globally. UN Environment Programme, Chemicals and Health Branch, Geneva, Switzerland. 40 pp.

- Government of Antigua and Barbuda. n.d. About Antigua and Barbuda. [online] Available at: https://ab.gov.ag/detail_page.php?page=25
- International Institute for Sustainable Development (IISD). 2022. Summary of the Second Segment of the Fourth Meeting of the Conference of the Parties to the Minamata Convention on Mercury: 21-25 March 2022. Earth Negotiations Bulletin. 28 March 2022. Vol. 28. No. 65 [online] Available at: https://enb.iisd.org/Minamata-Convention-Mercury-COP4-2.
- Interstate Mercury Education and Reduction Clearinghouse (IMERC). 2014. IMERC Fact Sheet- Mercury Use in Switches & Relays. [online] Available at: https://www.newmoa.org/prevention/mercury/imerc/about.cfm
- Interstate Mercury Education and Reduction Clearinghouse (IMERC). 2018. IMERC Fact Sheet- Mercury Use in Thermostats. [online] Available at: https://www.newmoa.org/prevention/mercury/imerc/about.cfm
- Lennett D, Gutierrez R. 2018. Minamata Convention on Mercury: Ratification and Implementation Manual. Washington, DC: National Resources Defense Council. Available at: https://www.nrdc.org/sites/default/files/minamata-convention-on-mercury-manual.pdf
- Mohite, P. and Bhatnagar, M. 2008. Mercurochrome 1% as an antiseptic for burns: Economical - but is it efficacious and safe?. The Internet Journal of Surgery. Volume 21 Number 2. Available at: https://doi.org/10.1002/14651858.CD011821.pub2
- Secretariat to the Minamata Convention. 2021. Draft guidance document on the use of customs codes under the Minamata Convention. Secretariat of the Minamata Convention on Mercury. Available at: https://www.mercuryconvention.org/en/documents/draft-guidance-document-use-customs-codes-under-minamata-convention-pdf-version
- Thompson, Lawrence. 2020. Institutional Capacity Needs Assessment Report For Customs and Excise Departments for the Control of Trade in Chemicals and Waste for Eight Participating Countries (Antigua and Barbuda, Barbados, Belize, Guyana, Saint Kitts and Nevis, Saint Lucia, Suriname, and Trinidad and Tobago). BCRC-Caribbean. April 13, 2020.
- UNEP. 2019a. Global Mercury Assessment 2018. UN Environment Programme, Chemicals and Health Branch Geneva, Switzerland
- UNEP. 2019b. Toolkit for Identification and Quantification of Mercury Releases, Reference Report and Guideline for Inventory Level 2. Version 1.5, November 2019. UNEP Chemicals Branch, Geneva, Switzerland
- UNEP. 2021a. Minamata Convention on Mercury Text and Annexes. UNEP, Geneva, Switzerland.
- UNEP. 2021b. Matters for consideration or action by the Conference of the Parties: mercury-added products and manufacturing processes in which mercury or mercury compounds are used: information on dental amalgam. Information on dental amalgam. Note by the secretariat. Conference of the Parties to the Minamata Convention on Mercury Fourth Meeting. UNEP/MC/COP.4/5. 12 August 2021. UNEP.

- World Bank Group. 2023. Population, total- Antigua and Barbuda. [online] Available at: https://data.worldbank.org/country/antigua-and-barbuda?view=chart
- World Health Organisation (WHO). 2017. Mercury and health. [online] Available at: http://www.who.int/mediacentre/factsheets/fs361/en/.
- World Health Organisation (WHO). 2019. Strategic planning for implementation of the health-related articles of the Minamata Convention on Mercury https://apps.who.int/iris/rest/bitstreams/1257674/retrieve
- World Health Organisation (WHO). 2020. WHO technical specifications for automated non-invasive blood pressure measuring devices with cuff. Geneva: World Health Organization. Licence: CC BY-NC-SA 3.0 IGO
- World Health Organisation (WHO). 2021. Review of Minamata Convention initial assessment reports: key findings for health. Geneva: World Health Organization; Licence: CC BY-NC-SA 3.0 IGO.
- World Health Organization (WHO), 2017b. Road map to enhance health sector engagement in the Strategic Approach to International Chemicals Management towards the 2020 goal and beyond. WHO. [online] Available at: https://apps.who.int/iris/rest/bitstreams/1141165/retrieve
- World Trade Organisation, 2023. Saint Kitts and Nevis Member Information. WT/TPR/S/437 – Annex 1: Antigua and Barbuda. [online] Available at: s437-04_e.pdf (wto.org)

Annexes

Annex 1 – Brief Economic Analysis of Minamata Convention-compliant Products

Table A1: Economic Affordability of Minamata Convention-compliant Products in Comparison to MAPs

Economic Affordability of Minamata Convention-compliant Products in Comparison to MAPs
Lighting Devices
• LEDs replacing CFLs have a lower sale price than CFLs while LEDs replacing LFLs are still more expensive in terms of sale price than LFLs (by approximately 25% on average). Once factors such as lamp wattage, brightness and lifespan are assessed, LEDs are found to be more economically viable than the MAPs. • Due to the large variations in costs of the different types of HIDLs based on the different applications and fixtures required, cost differences were not able to be assessed. For this study, it is assumed that the economic feasibility of mercury-free LED versions of HIDLs would be similar to that of other LED lighting devices.
Electrical Switches, Relays and Thermostats
• While specific costs of switches, relays and thermostats vary across the multiple potential applications, research suggests that there is no significant difference in cost between mercury-added and mercury-free switches, relays and thermostats. • Higher costs may also be associated with the mercury-added types of these products when considerations are made for the need for environmentally sound storage and disposal. As such, mercury-free alternatives are considered generally more economically affordable.
Medical Measuring Devices – Thermometers
• Mercury thermometers have similar retail prices as basic digital thermometers. Prices of digital thermometers may vary based on several features such as temperature memory storage. • Higher costs may also be associated with the mercury thermometers when considerations are made for their need for environmentally sound storage and disposal.
Medical Measuring Devices – Blood Pressure Gauges
• Mercury sphygmomanometers are approximately half of the sale price of other automated varieties, but higher costs may also be associated with the mercury sphygmomanometers when considerations are made for their need for environmentally sound storage and disposal.

- Retail cost was also not determined to be a significant driver affecting the purchase of mercury sphygmomanometers.

Dental Restoration Material

- Dental amalgam is still considered to cost 25 – 50% less than composite fillings on average, however composite fillings continue to become more affordable with technical advancements.
- In Antigua and Barbuda, dental insurance policies do not differentiate between the different types of dental restoration material and a fixed percentage reimbursement on procedures is typically offered. The public sector has dental amalgam in use, however, all private sector dentists that were surveyed and interviewed did not use dental amalgam in their practice for both health and aesthetic reasons.
- Parties and related stakeholders that provided information in preparation for COP-4 detailed that for global trends indicated that the price difference between mercury-added and mercury-free alternatives is already being reduced as improvements in techniques are made. Reference was also made to the additional costs and efforts required for handling dental amalgam waste disposal which have made dental amalgam use less economically feasible for practitioners in countries with waste management mechanisms in place.

Annex 2 – Methodology Considerations: Market Study Challenges and Mitigation Measures

For the market study, the challenges for data collection and analysis were considered in order to better inform the methodology for this assessment. A summary is provided in the below table.

Table A3: Summary of Perceived Challenges in Stakeholder Survey Distribution and Measures Taken to Address Challenges

Perceived Challenge	Measures Taken to Mitigate Challenges
Due to the ongoing impacts of the COVID-19 pandemic, various protocols were put in place to reduce in-person contact. While the public sector offices and the majority of private sector offices were re-opened under restrictions in the last quarter of 2021, many offices remained under "work-from-home"/ staff rotation mandates which may have negatively impacted stakeholder engagement.	Stakeholder engagement was conducted mainly via virtual meetings, emails, and phone-calls. Questionnaires developed for data collection were distributed online via the Google Forms platform.
There was a general lack of data or lack of responsiveness from stakeholders.	User friendly formats for questionnaires and for dispensing project updates were utilised. Assistance from key members of the NWG was sought to enhance stakeholder communication. Available data from related projects and desktop research was assessed where possible.

Annex 3 – Market Surveys

Surveys developed for this market survey were developed and distributed via Google Forms.

PDF versions of the surveys developed can be accessed via the following online link:

https://www.dropbox.com/scl/fo/kw0rqc5rpsoyy15g2y6gl/h?dl=0&rlkey=v4y9dlp6sz3j9tzpp6ydvak7t