SAINT KITTS AND NEVIS

MINAMATA INITIAL ASSESSMENT REPORT

DEVELOPMENT OF MINAMATA INITIAL ASSESSMENT IN THE CARIBBEAN

(Jamaica, Saint Kitts and Nevis, Saint Lucia, Trinidad and Tobago)

SEPTEMBER 2018

Basel Convention Regional Centre for Training and Technology Transfer in the Caribbean

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SAINT KITTS AND NEVIS MINAMATA INITIAL ASSESSMENT REPORT

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GEF IMPLEMENTING AGENCY
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Saint Kitts and Nevis Bureau of Standards

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ABOUT THIS DOCUMENT

The Saint Kitts and Nevis Minamata Initial Assessment Report was developed under the project, "Development of Minamata Initial Assessment in the Caribbean: Jamaica, Saint Kitts and Nevis, Saint Lucia and Trinidad and Tobago".

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 with the United Nations Environment (UN Environment) acting as the Implementing Agency and the Basel Convention Regional Centre for Training and Technology Transfer for the Caribbean (BCRC-Caribbean) acting as the Executing Agency. Nationally, the project was executed by the Saint Kitts and Nevis Bureau of Standards (SKNBS).

The development of the Report was guided by the Biodiversity Research Institute (BRI) who was contracted as the lead technical consultancy. The report consists of an inventory of mercury emissions and releases, primarily based on 2015 data, and was performed in accordance with UN Environment (formerly United Nations Environment Programme) "Toolkit for identification and quantification of mercury releases", Inventory Level 2 (version 1.04, January 2017).

The report also includes an assessment of the Policy, Legislative and Institutional Framework in relation to the implementation of the Minamata Convention on Mercury, which was developed by legal consultant, Dr Winston McCalla. Additional assessments and recommendations are outlined in chapters relating to populations at risk, education and awareness-raising strategies, and priorities for action to ensure the effective implementation of the Minamata Convention on Mercury.

Contact point responsible for inventory of mercury releases	
Full name of institution	Saint Kitts and Nevis Bureau of Standards
Contact person	Dr Marcus L Natta, Science and Research Manager
E-mail address	marcus.natta@gov.kn; marcuslnatta@gmail.com
Telephone number	+1 (869) 465-5279; +1 (869) 467-1587
Website of institution	www.sknbs.org; facebook.com/sknbs
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Table of Contents

List of Tables

List of Figures

List of Abbreviations

AMAP	Artic Monitoring and Assessment Programme
BAT	Best Available Techniques
BCRC-Caribbean	Basel Convention Regional Centre for Training and Technology Transfer in the Caribbean Region
BEP	Best Environmental Practices
BRI	Biodiversity Research Institute
CARICOM	Caribbean Community
CARPHA	Caribbean Public Health Agency
CCFLs	Cold Cathode Fluorescent Lamps
CFLs	Compact Fluorescent Lamps
DCPA	Development Control and Planning Act
ECCU	Eastern Caribbean Currency Union
EEFL	External Electrode Fluorescent Lamps
FDI	Foreign Direct Investments
GDP	Gross Domestic Product
GEF	The Global Environment Facility
Hg	Elemental Mercury, CAS No. 7439-97-6
HPMV	High-Pressure Mercury Vapour Lamps
IADB	Inter-American Development Bank
JNF	Joseph N. France General Hospital
kg Hg/y	Kilograms of Mercury per Year
LCD	Liquid Crystal Display
LEDs	Light Emitting Diodes
LFLs	Linear Fluorescent Lamps
LPG	Liquefied Petroleum Gas

m^3	Cubic metres
MAPs	Mercury Added Products
MIA	Minamata Initial Assessment
NCEMA	National Conservation and Environmental Management Act
NCEPA	National Conservation and Environmental Protection Act
NEVLEC	Nevis Electricity Company Limited
NPDP	National Physical Development Plan
NSWMA	Nevis Solid Waste Management Authority
OECS	Organisation of Eastern Caribbean States
POPs	Persistent Organic Pollutants
PDVSA	Petróleos de Venezuela, S.A.
ppm, ww	Parts per Million, Wet Weight
SEL	Specially Engineered Landfill
SIDS	Small Island Developing States
SKELEC	Saint Kitts Electricity Company Limited
SKNBS	The Saint Kitts and Nevis Bureau of Standards
Sol EC Ltd	Sol Eastern Caribbean Limited
SWMC	Solid Waste Management Corporation
t/y	Tonnes per year
THg	Total mercury
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme (now United Nations Environment)
UNIDO	United Nations Industrial Development Organisation
UNITAR	United Nations Institute for Training and Research
US EPA	United States Environmental Protection Agency

WEEE	Waste Electrical and Electronic Equipment
WHO	World Health Organisation

Foreword

Mercury is a naturally occurring element in the earth's crust that presents a major public health concern as it is toxic to both humans and animals. The Minamata Convention on Mercury is a global treaty that was designed to protect human health and the environment from the adverse effects of mercury and mercury compounds.

On 24 May, 2017, the Government of Saint Kitts and Nevis deposited its instrument of ratification, thereby becoming the 53rd future Party to the Minamata Convention on Mercury. As a result, Saint Kitts and Nevis was among the 81 countries in the world to be recognised as a "Party" to this Convention at the first Conference of the Parties (COP1), hosted in Geneva, Switzerland in September, 2017.

The Global Environment Facility (GEF) has made funding available for countries that need assistance with early ratification and implementation efforts related to the Minamata Convention through enabling activities called Minamata Initial Assessments (MIAs). For this project, the United Nations Environment Programme (now United Nations Environment) acted as the Implementing Agency, and the Basel Convention Regional Centre for Training and Technology Transfer in the Caribbean Region (BCRC-Caribbean) acted as the Executing Agency.

Under the MIA project, Saint Kitts and Nevis conducted a national mercury inventory and identified and quantified the mercury releases and emissions within the country. This inventory was done with the use of the UNEP Toolkit for Identification and Quantification of Mercury Releases - Inventory Level 2. Nationally, of particular concern are mercury-added products (Article 4 of the Convention); e.g. switches and relays, fluorescent lamps, cosmetics and measuring devices. The results of the inventory will be used to determine the priority areas for recommended action.

An assessment of the policy, regulatory and institutional capacity framework was also conducted. In order for Saint Kitts and Nevis to continue to meet its obligations as a Party and to successfully implement the Convention, it will be necessary to strengthen the institutional framework, amend existing relevant legislation and enact new legislation (where needed), in accordance with Articles of the Convention.

Based on the results and gaps identified in the MIA project, the Government of Saint Kitts and Nevis will continue to work on efforts to improve the legal framework on management of chemicals and hazardous waste and strengthen institutional and administrative capacities for sound management of chemicals. Additionally, Best Available Technology (BAT) and Best

Environmental Practice (BEP) standards related to the reduction/elimination of mercury emissions and releases will be established, and intensive awareness raising and education activities will be carried out. All of these actions will give Saint Kitts and Nevis an opportunity to accomplish the primary objective of the Convention - protecting the environment and human health from adverse effects of mercury.

Executive Summary

On the May 24, 2017, the Government of Saint Kitts and Nevis deposited its instrument of ratification for the Minamata Convention on Mercury, thereby becoming its 53rd Party. The Minamata Convention aims to protect human health and the environment from the anthropogenic emissions and releases of mercury and mercury compounds.

In order to assess the priorities for the implementation of the Minamata Convention's obligations, the Government of Saint Kitts and Nevis participated in a project entitled, "Development of Minamata Initial Assessment in the Caribbean (Jamaica, Saint Kitts and Nevis, Saint Lucia, and Trinidad and Tobago)" (MIA Project). The MIA Project aims to facilitate the ratification and early implementation of the Minamata Convention on Mercury through the use of scientific and technical knowledge in participating countries. The Project outputs within each of the project countries were overseen by respective National Working Groups comprising of representatives from relevant ministries and institutional bodies.

Under the MIA Project, a national inventory of the major sources of mercury releases and emissions was conducted using the "Toolkit for Identification and Quantification of Mercury Releases" (Toolkit), made available by the Chemicals Branch of the United Nations Environment (formerly United Nations Environment Programme Chemicals). This project utilized the Level 2 Toolkit as it provided a more comprehensive assessment of mercury releases. It should be noted that in the Toolkit, the term "releases" is used to cover mercury emissions to air as well as releases to water, land and other output pathways. The methodology is based on mass balances for each mercury release source sub-category and so, estimations provided by the Toolkit have various uncertainties and complexities involved.

For Saint Kitts and Nevis, the inventory primarily used 2015 data obtained through research, interviews and stakeholder questionnaires. However, for some sub-categories, data from the year 2015 was not available and so previous years or default calculations were used to develop estimates. Default calculations were based on the Toolkit assumptions and may have resulted in over- or under- estimations of the actual mercury input. Data gaps were also noted for some sub-categories where no estimations could be

made such as the use of natural gas, polyurethane products with mercury catalysts, pharmaceuticals for human and veterinary use, cosmetics containing mercury, incineration of medical waste, informal waste burning and informal dumping. The completed inventory Toolkit spreadsheet; a listing of national project stakeholders; and templates of questionnaires used for data collection, are included as Annexes to this document.

Results of the National Mercury Inventory

Based on the data available, approximately 33.95 kilograms (kg) of mercury were determined to be released in Saint Kitts and Nevis during 2015. The estimated mercury releases by source and by output through various release pathways identified are illustrated in Figures 1 and 2.

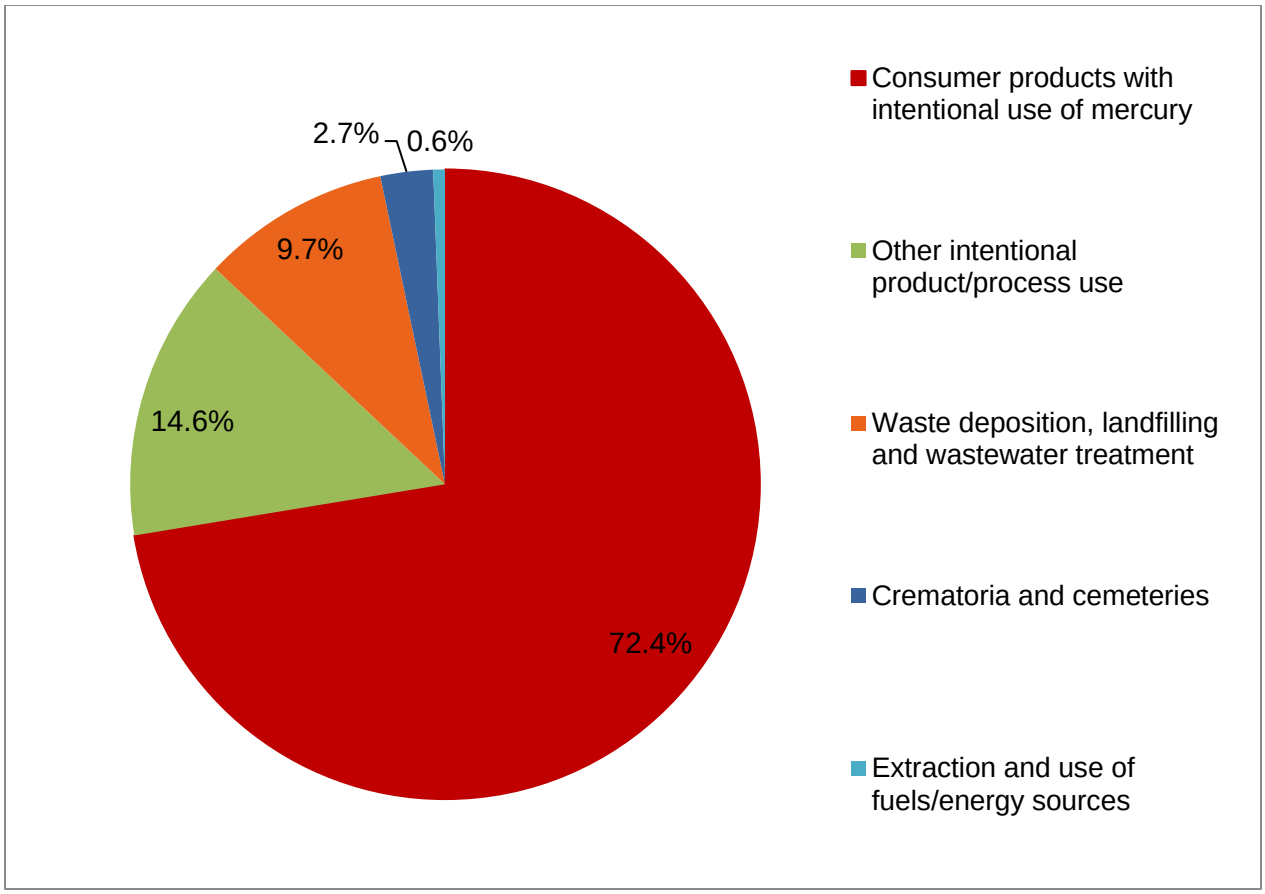

Figure 1: Estimations of total releases from the major sources of mercury identified in the mercury inventory conducted using primarily 2015 data for Saint Kitts and Nevis

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 72.4% of estimated national mercury releases due to the use and disposal of mercury thermometers, electrical switches and relays and batteries, which accounted for inputs of approximately 16 kg, 6 kg and 3 kg of mercury per year (kg Hg/y) respectively. These products are not produced within Saint Kitts and Nevis but rather imported from countries such as the United States of America and China.

Releases due to the use and disposal of other intentional products/processes including dental amalgam fillings, and laboratory equipment and chemicals, accounted for 14.6% of mercury releases in 2015. While the use of dental amalgam fillings has been reduced significantly over the years in Saint Kitts and Nevis due to the preference of patients for more discreetly coloured alternative fillings, the mercury releases estimated from its use and disposal over the past fifteen (15) to twenty (20) years would still be accounted for under the inventory.

Data obtained from two (2) designated controlled landfills in Saint Kitts and Nevis as well as the wastewater treatment system in Saint Kitts, showed that these sources accounted for 9.7% of the total estimated mercury releases. While landfilling contributed to an estimated input of 310.44 kg Hg/y, when adjusted for double-counting from other sectors, this amounted to approximately 3.14 Kg Hg/y. The wastewater treatment system in Saint Kitts was determined to have contributed to approximately 1.43 kg Hg/y based on 2012 data obtained from previously published research.

Lesser sources of mercury releases were found to be crematoria and cemeteries (2.7%) and combustion of mineral oils (0.6%)

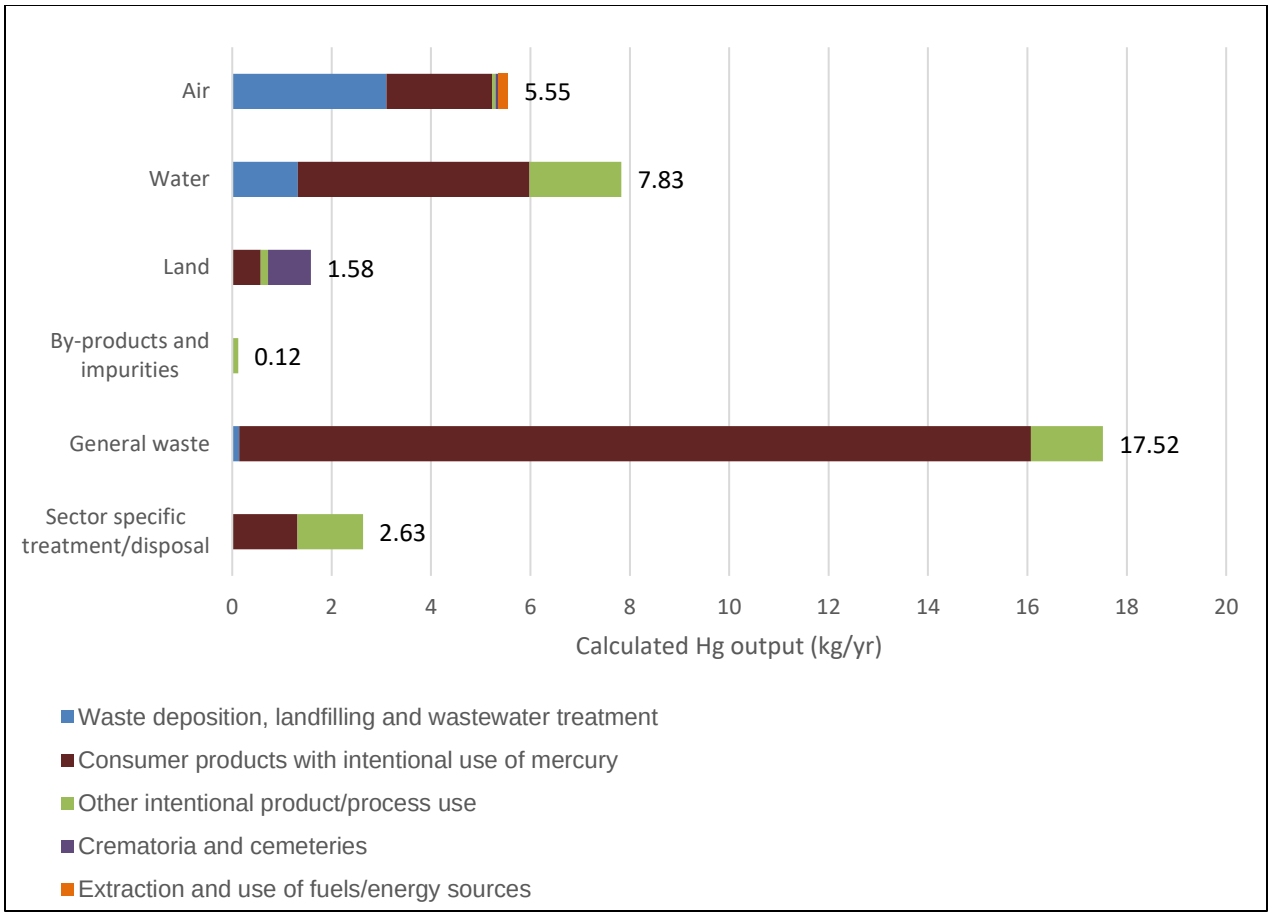

Figure 2: Estimations of releases to each output pathway from the major sources of mercury identified in the mercury inventory conducted using 2015 data for Saint Kitts and Nevis[1]

The most significant mercury release pathway was to general waste through which 17.52 kg Hg/y were estimated. Consumer products contributed the most to this pathway with an estimated mercury output of 15.93 kg/y.

No mercury stockpiles over 50 metric tonnes; supply or trade generating stocks exceeding 10 metric tonnes of Hg per year; or hot spots for mercury contamination were identified in Saint Kitts and Nevis. There are also no known regulated storage systems for the collection of mercury wastes generated from the disposal of mercury-added products (MAPs). As such, it was assumed that the main source of mercury contamination in the country is the disposal of mercury-added or contaminated products at landfills. It

[1] Totals presented in Figure 2 show the full estimations for mercury releases due to waste deposition and waste water treatment. When determining mercury releases from sectors as shown in Figure 1, only a percentage of these estimations were used in order to avoid double-counting.

was noted that storage of MAPs, such as compact fluorescent lamps (CFLs) and batteries, is being done informally by some consumers in temporary locations or in designated areas at the landfills.

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

The development of a strategy to identify sites contaminated by mercury and MAPs was initiated under this project. National-scale data on potential point sources of mercury and ecosystems that might be sensitive to mercury inputs were incorporated into a model to help identify areas of the country that are sensitive to mercury inputs from a standpoint of methylmercury generation and availability.

The results were presented in a map which showed that the watershed to the north-west of Boyd's in Saint Kitts had the highest sensitivity to mercury, and the northern segment of the island had the lowest overall sensitivity. On Nevis, the watershed to the southwest of Newcastle had the highest sensitivity. The relationship between mercury sensitivity and disposal sites was not confirmed from the information obtained. The model developed can be used by the Government of Saint Kitts and Nevis to further its assessments in determining mercury contaminated sites as suggested under Article 12 of the Minamata Convention.

Exposure to elemental mercury and mercury compounds can pose a higher risk to certain populations that are more sensitive to their effects or have an increased frequency of exposure. In Saint Kitts and Nevis, these groups include pregnant women and women of childbearing age, foetuses, new-borns and young children, individuals with health-related preconditions, populations with a regular diet of contaminated high trophic level aquatic organisms, and individuals who consistently use MAPs such as skin-lightening creams with mercury. Also at risk are people living in areas that are more susceptible to environmental contamination by mercury such as locations surrounding the Conaree and Low Ground Landfills, and workers exposed to mercury on a regular basis including dental and medical professionals and assistants, waste handlers, environmental officers,

firemen and first responders, laboratory workers and other industrial workers.

A rapid assessment of total mercury concentrations in twenty-five (25) fish tissue samples taken from several species of fish in Saint Kitts and Nevis revealed that the mean tissue mercury concentrations ranged from 0.014 ± 0.007 parts per million, wet weight (ppm, ww). This is considered to be safe for human consumption as the World Health Organisation's recommended consumption advisory level is 0.500 ppm, ww. However, one of the samples analysed had a mercury concentration of 0.888 ppm, ww. Due to the small sample size and lack of additional data, there was limited opportunity to conduct a statistical analysis on the data and to identify trends among species or potentially contaminated sites. It is recommended that additional fish sampling analysis be conducted to better inform the development of local fish advisory guidelines.

Exposure to mercury in Saint Kitts and Nevis is expected to occur through fish consumption, household use and disposal of MAPs, occupational exposure to mercury and its compounds, and the use of skin lightening creams containing mercury. It was noted that while mercury exposure from fish consumption and domestic use of MAPs may not vary significantly between sexes, the health risk is likely greater in pregnant women and women of childbearing age. Identifying these trends is useful when considering training, education, and awareness-raising strategies regarding mercury exposure. These trends allow for the development of more gender-sensitive communication strategies that can target the sexes differently to achieve maximum benefit in Saint Kitts and Nevis.

Major Findings of the Policy, Regulatory and Institutional Framework Assessment

An assessment of the policy, regulatory and institutional framework related to mercury management was conducted under the MIA Project by legal consultant, Dr. Winston McCalla.

The lack of appropriate legislation to effectively implement certain components of the Minamata Convention was the main barrier identified. This barrier can be overcome by the enactment of new legislation, or in appropriate cases, the promulgation of regulations under existing legislation. Details of such recommendations are listed in Table 1. It should be noted that under the Minamata Convention, Article 4 is the only article relevant to Saint

Kitts and Nevis that has stipulated deadlines for compliance. It states that a Party must disallow the manufacture, import and export of certain MAPs listed in the Convention by 2020, unless the Party applies for an exemption, as detailed in Article 6, upon ratification of the Convention. Therefore, consideration should be given to the legislative amendments recommended pertaining to MAPs.

Table 1: Legislative recommendations for the effective implementation of the Minamata Convention

Legislation	Recommendation
Pesticides and Toxic Chemicals Act (Chapter 30:03, Section 4A (1) (d)	Amend Section 4A (1) (d) of the Act which prohibits the import, export and disposal, *inter alia*, of a "controlled chemical" without doing so in a prescribed manner, to include considerations for the provisions listed under Article 4 of the Minamata Convention on mercury-added products.
National Conservation and Management Bill, 2017	Enact this Bill so that the following could be developed and promulgated: • air pollution regulations that would have provisions for the management of mercury emissions from processes such as waste incineration; • water pollution regulations and land-based pollution regulations that would address releases of mercury and mercury compounds to water and land; • regulations that would give effect to the implementation of international conventions such as the Basel Convention on Control of Transboundary Movements of Hazardous Waste and their Disposal which deals with mercury waste management; • regulations that would provide for the environmentally sound management of contaminated sites.

Institutional strengthening is also needed for national implementation of the Minamata Convention. The implementation process would involve development of a sound and proactive communication plan, and a carefully designed governance and accountability

action plan. The Saint Kitts and Nevis Bureau of Standards (SKNBS) is the national focal point for the coordination and implementation of the Minamata Convention. Coordination would have to be done in collaboration and cooperation with other designated agencies that have specific responsibility for various areas involved in the implementation of the Minamata Convention. A permanent steering committee made up of representatives from these key organizations should therefore be formed. A National Working Group was created under the MIA Project and can be continued post-project with leadership by the SKNBS.

Priority Areas for Consideration in the Implementation of the Minamata Convention

In addition to the legislative and regulatory recommendations for consideration in the implementation of the Minamata Convention, other practical considerations may include:

- Promotion of mercury-free alternative consumer products which are already widespread on the market. Public awareness on the hazards of mercury and the benefits of using mercury-free alternatives should be enhanced to encourage a higher substitution rate.
- Development of proper separation methods for the disposal of mercury-added products both at the household consumer level and in landfill management procedures. The Government should ensure that the public has access to environmentally sound facilities/locations that could aid in the disposal process, as well as information and guidelines on disposing MAPs. A holistic approach for the establishment of suitable storage and disposal facilities to manage mercury waste as well as other hazardous wastes from all sectors in Saint Kitts and Nevis or the wider Caribbean region would prove beneficial in the overall environmentally sound management of waste in the Caribbean.
- Management of mercury releases from processes such as waste incineration, through the implementation of further best available techniques/ best environmental practices (BAT/BEP) to ensure maximum control and reduction of mercury emissions and releases. The efficiencies of these measures should be

continuously monitored and evaluated. It is also recommended that the locations for development of future industries/ processes/ disposal sites should be considered with respect to environmentally sensitive areas.

Introduction

Mercury in the Environment

Mercury (atomic symbol, Hg) is a naturally occurring element in the earth's crust. It is contained in several minerals and is commonly found as a reddish-brown compound called cinnabar; mercury sulphide. Mercury cannot be destroyed, and once released from the crust and mobilized into the environment, it cycles between air, land and water. It may eventually be removed naturally by burial in deep ocean sediments. The biogeochemical cycle of transport and mobilization processes of mercury is illustrated in Figure 3.

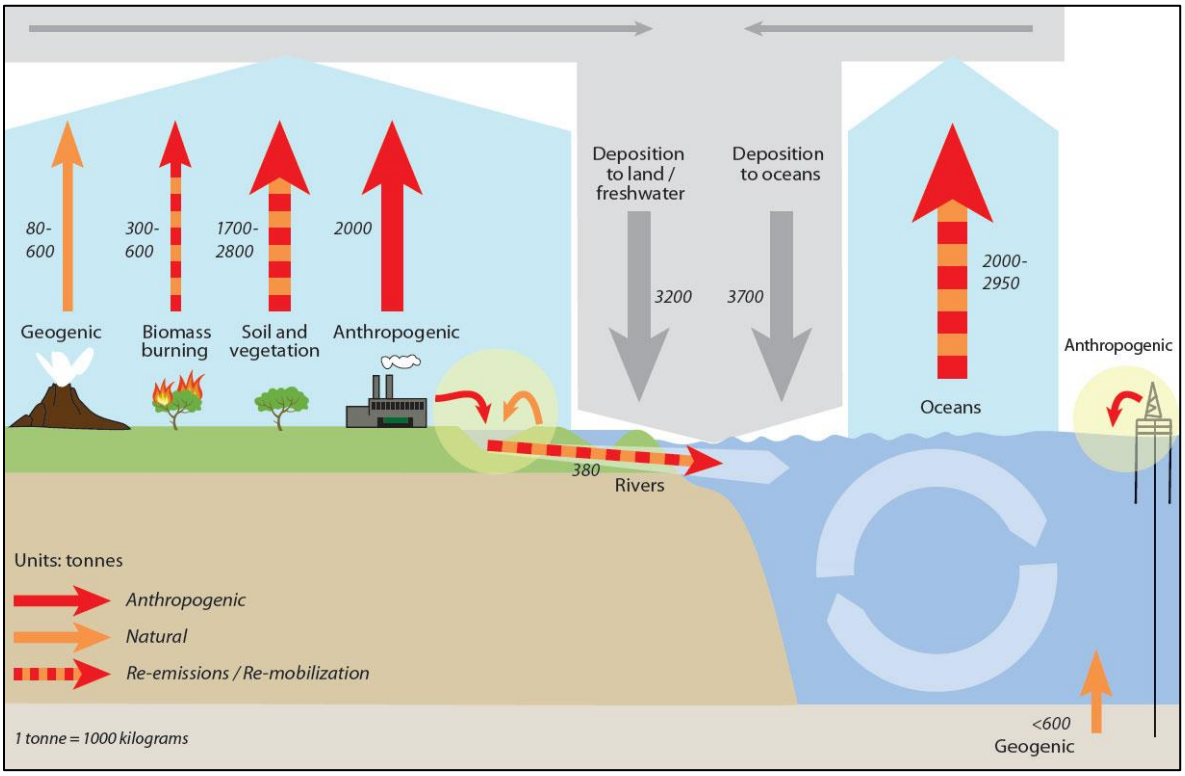

Figure 3: The Global Mercury Cycle (Values in tonnes of mercury)
(Source: AMAP/ UNEP, 2013)

As a highly toxic chemical element, mercury is considered one of the top ten (10) chemicals of major public health concern (WHO, 2017). It can damage the central nervous system and affect numerous organs, resulting in neurological and behavioral disorders. Symptoms include tremors, insomnia, memory loss, neuromuscular effects, headaches, and cognitive and motor dysfunction (UNEP, 2017a). The severe effects

caused by exposure to mercury in humans are largely seen in foetuses and young children, due to their developing nervous systems.

Mercury can enter the human body through inhalation, direct contact with the skin or ingestion of contaminated food or water. Some common sources of exposure for humans include dental amalgam fillings, occupational exposure, use of mercury-containing skin-lightening creams and the consumption of fish contaminated with mercury. When mercury is deposited into water bodies, it is converted into methylmercury by the action of bacteria. This highly toxic organic form of mercury biomagnifies up the food web, and exposure to humans can occur through their diet of large predatory fish which in general, contain higher levels of methylmercury. This is discussed further in Section 4.1.1 of this report.

The sources from which Hg is released into the environment can be grouped as follows:

Natural Sources

Volcanic eruptions, weathering of mercury-containing rock materials, forest fires and ocean vents are some of the natural pathways that release mercury from the earth's crust into the environment. Volcanic eruptions can release as much as 57 tonnes of mercury per year (t Hg/y), whilst degassing activities may release as much as 37.6 t Hg/y (Nriagu and Becker, 2003). Natural sources of mercury are not addressed under the Minamata Convention.

Anthropogenic Sources

Human activities, such as mining, combustion, production of metal from ores, the intentional use of mercury in products and processes and the re-mobilization of previous mercury releases have led to an increase in the mobilization of mercury into the environment. Anthropogenic sources can account for 30% of the mercury emissions in the atmosphere (AMAP/UNEP, 2013).

In 2013, the United Nations Environment Programme (UNEP: now the UN Environment) with the Artic Monitoring and Assessment Programme (AMAP) published the Global Mercury Assessment 2013, in which the major sources of global mercury emissions were identified and assessed. It was found that artisanal and small-scale gold mining contributed the most to mercury emissions as large amounts of elemental mercury are

often used in the process. Other key sources included coal combustion, industrial processes, and the use and disposal of mercury-added products, such as thermometers and compact fluorescent lightbulbs. The estimations for the top sources of mercury emissions are shown in Figure 4, with the estimated releases from Central America and the Caribbean highlighted in darker blue. From this region, the largest estimated source of mercury releases was due to artisanal and small-scale mining operations in countries, like Guyana and Suriname.

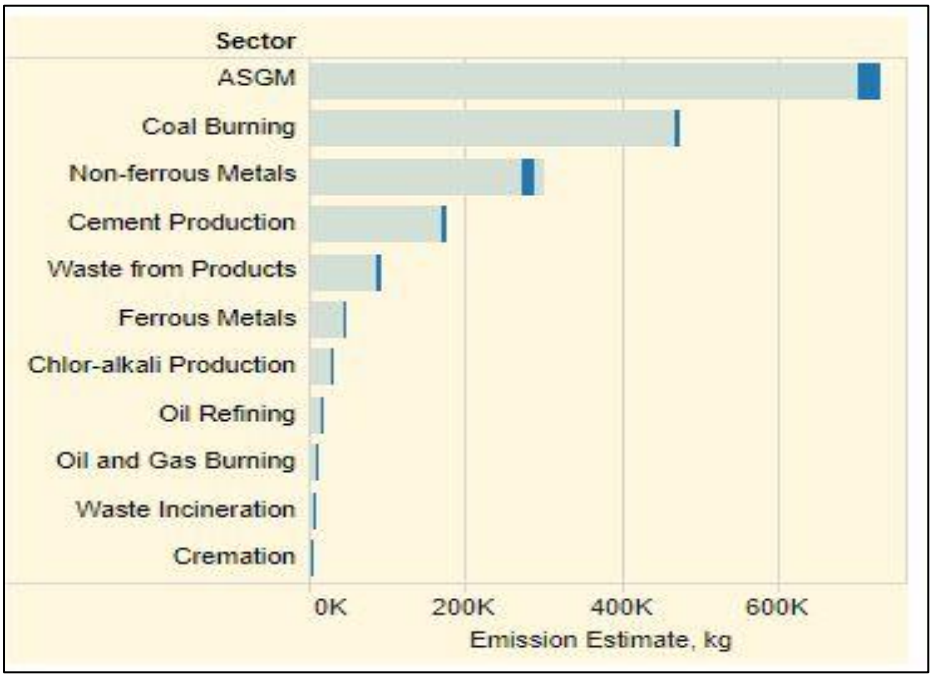

Figure 4: Estimations of global emissions (light blue) and Central American and Caribbean emissions (dark blue) of mercury based on 2010 data from various sources (Source: AMAP/UNEP, 2013)

Minamata Convention on Mercury

In order to address the negative impacts posed by the release of mercury, a global treaty called the Minamata Convention on Mercury was developed. Article 1 of the Convention states the objective which is to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. The text of the Minamata Convention was adopted on October 10, 2013, and the Convention entered into force on August 16, 2017. The Convention regulates, *inter alia*, mercury supply, sources and trade; mercury-added products and processes; interim storage and disposal

of mercury, its compounds and mercury waste; and the emissions and releases of mercury.

Saint Kitts and Nevis is a signatory to the Minamata Convention on Mercury. On 24th May, 2017, the Government of Saint Kitts and Nevis deposited its instrument of ratification, thereby becoming the 53rd future Party to the Minamata Convention on Mercury.

As of August, 2018, Antigua and Barbuda, Cuba, Dominican Republic, Guyana, Jamaica and Suriname are the other countries in the Caribbean region which have also become Parties to the Convention.

Project Background

The project entitled, "Development of Minamata Initial Assessment in the Caribbean (Jamaica, Saint Kitts and Nevis, Saint Lucia, and Trinidad and Tobago)", or the MIA Project, aims to facilitate the ratification and early implementation of the Minamata Convention on Mercury through the use of scientific and technical knowledge in conducting an inventory of mercury releases (and emissions)[2] in the respective countries. The MIA Project will assist the Government of Saint Kitts and Nevis in its implementation of the Convention by providing a general overview of the current situation regarding mercury and its compounds in the country.

The MIA Project was funded by the Global Environment Facility (GEF); and the United Nations Environment (UN Environment; formerly the United Nations Environment Programme - UNEP) acted as the implementing agency. The Basel Convention Regional Centre for Training and Technology Transfer in the Caribbean (BCRC-Caribbean) served as the project executing agency. The Saint Kitts and Nevis Bureau of Standards (SKNBS), under the Ministry of International Trade, Industry, Commerce and Consumer Affairs, functioned as the national executing agency.

[2] 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.

The development of an inventory of mercury releases in each participating country is a key component of the MIA Project, as it will inform participating countries of their national mercury sources and subsequently assist in applying action to increase their capacity in mercury management. The sharing of experiences and lessons learned throughout the project is also expected to be an important contribution to other countries in the region. The aim of the project is to be achieved through the six components outlined in Table 2.

Table 2: Outline of the project components, outcomes and the expected outputs as stated in the MIA Project Document

Project Component	Outcome	Expected Output
1. Establishment of Coordination Mechanism and organization of process	Participating countries make full use of enhanced existing structures and information available dealing with mercury management to guide ratification and early implementation of the Minamata Convention	Technical support provided for the establishment of National Coordination Mechanisms and organization of process for the management of mercury
2. Assessment of the national infrastructure and capacity for the management of mercury, including national legislation	Full understanding of comprehensive information on current infrastructure and regulation for mercury management enables participating countries to develop a sound roadmap for the implementation of a national legal framework for the ratification and early implementation of the Minamata Convention	Assessment prepared of the national infrastructure and capacity for the management of mercury, including national legislation
3. Development of a mercury inventory using the UN Environment mercury Toolkit and strategies to identify and assess mercury contaminated sites	Enhanced understanding on mercury sources and releases facilitated the development of national priority actions	Mercury inventory developed using the UN Environment mercury tool kit and strategies to identify and assess mercury contaminated sites

4. Identification of challenges, needs and opportunities to implement the Minamata Convention on Mercury	Improved understanding on national needs and gaps in mercury management and monitoring enables a better identification of future activities	Technical support provided for identification of challenges, needs and opportunities to implement the Minamata Convention on Mercury
5. Preparation, validation of National MIA reports and implementation of awareness raising activities and dissemination of results	Participating countries and key stakeholders make full use of the MIA and related assessments leading to the ratification and early implementation of the Minamata Convention on Mercury	Technical support provided for preparation and validation of National MIA reports and implementation of awareness raising activities and dissemination of results
6. Information exchange, capacity building and knowledge generation	Enhanced communication, support and training facilitate the development of the Minamata Initial Assessment by participating countries and build the basis for future cooperation and regional approaches for mercury management	Information exchange undertaken and capacity building and knowledge generation for mercury management provided

In order to acquire information and develop a comprehensive national mercury management strategy for mercury releases, a stakeholder list (provided in Annex 1) was developed with assistance from representatives of the BCRC-Caribbean, SKNBS and Biodiversity Research Institute (BRI), the overall MIA Report Consultant. The stakeholders, which included professionals with experience in dealing with chemicals and environmental issues, waste disposal, industrial activities, and representatives from relevant ministries, academic institutions and non-governmental organizations, were invited to the “National Inception Workshop and Mercury Inventory Toolkit Training” held on 16 March, 2017.

Sector-specific questionnaires were then presented by BRI at the Inception Workshop using guidelines from the United Nations Institute for Training and Research (UNITAR).

These questionnaires were distributed to representatives of each sector (Annex 2). Face-to-face interviews were also conducted where necessary.

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 the United Nations Environment. The Toolkit is designed to produce a simple and standardised methodology and database to inform the national mercury inventory. It outlines a UN Environment-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
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.

This inventory was developed from February to November, 2017 using data obtained primarily from the year 2015. In cases where 2015 data was unavailable, estimations were made using either data from previous years or using default calculations provided by the Toolkit. Further details are provided in the respective sections of the report. The full inventory for Saint Kitts and Nevis is included as Annex 3.

Chapter 1: National Background Information

1.1 Geography and Population

Saint Kitts and Nevis (also known as Saint Christopher and Nevis), shown in Figure 5, is comprised of two volcanic islands located in the Caribbean Sea and is part of the Leeward Island chain collectively known as the Organization of Eastern Caribbean States (OECS). It is recognized as the smallest independent country in the Americas and Western Hemisphere, having a combined area of 269 square kilometres, with Saint Kitts being 168 square kilometres and Nevis being 93 square kilometres. The islands are separated by a 3-kilometre-wide channel called The Narrows.

Saint Kitts is located at geographic coordinates 17º.15'N and 62º.45'W and Nevis at 17º.10'N and 62º.35'W. The islands are the peaks of oceanic mountain ranges that form part of the Caribbean chain of islands. The highest peak on Saint Kitts is Mount Liamuiga, a dominant volcano that stands 1,156 meters above sea level. On Nevis, the highest peak is Nevis Peak which rises 985 meters above sea level. Both islands have a series of ghauts that radiate down from the mountains.

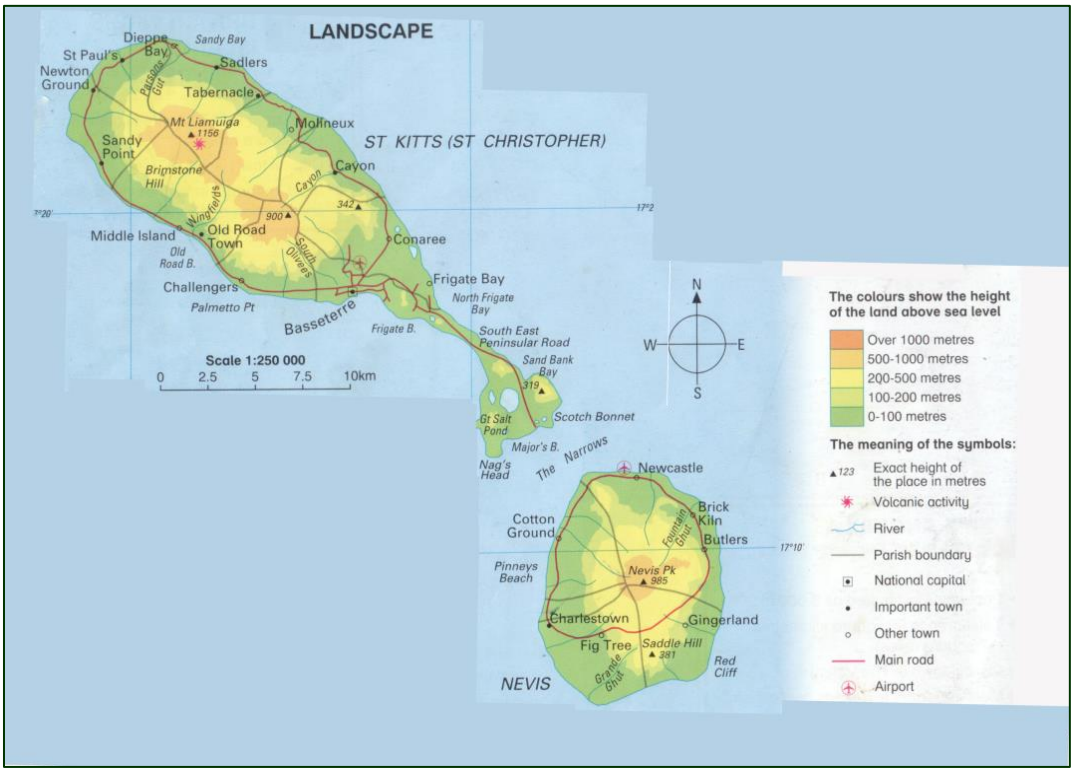

Figure 5: Map of Saint Kitts and Nevis
(Source: Elizon Maps, 2015)

Both Saint Kitts and Nevis are characterized by central mountainous regions with rich fertile soils and tropical rain forests supporting an array of biodiversity. The mountains and hills slope gradually down to the sea with a settlement pattern mostly along the coast, valleys and foothills.

Saint Kitts and Nevis is comprised of fourteen (14) parishes, nine (9) on Saint Kitts and five (5) on Nevis. The parishes consist of a series of small villages mostly located along the main coastal road. The capital city, Basseterre, is located on Saint Kitts, and the primary urban area of Nevis is Charlestown.

According to the World Bank, the population of Saint Kitts and Nevis for 2015 was 54,288. It has been a slow, but steady, growth since 1990, and this has been due primarily to immigrants from Guyana and the Dominican Republic. About 78% of the population reside on the island of Saint Kitts and 22% on the island of Nevis. An estimate of 68.1% of the total population live in rural areas.

1.2 Political, Legal and Economic Profile

The Federation of Saint Kitts and Nevis is a parliamentary democracy, which consists of a constitutional monarchy, with the Governor General representing Queen Elizabeth II as its Head of State. The Head of State acts on the advice of the Prime Minister and Cabinet. The Prime Minister is the leader of the majority party of the House, and the Cabinet conducts affairs of the State. The country has a single National Assembly, comprised of 14 members; eleven (11) of whom are directly elected representatives, eight (8) representing constituents in Saint Kitts and three (3) representing Nevis. The other 3 members are appointed senators; two (2) appointed on the advice of the Prime Minister and the other by the Opposition Leader. Saint Kitts and Nevis gained independence from the United Kingdom in 1983.

Saint Kitts and Nevis is a full participating member of the Caribbean Community (CARICOM), the OECS, and of the Eastern Caribbean Currency Union (ECCU).

According to a 2013 report by the Inter-American Development Bank (IADB), following a decline in industry and agriculture since the 1980s, tourism became a main sector of the economy of Saint Kitts and Nevis. This has in turn driven the hotel and restaurant industry

and other tourism-related areas, such as foreign direct investments (FDI). The global economic downturn in recent years, negatively affected tourism and related industries, causing a surge in imported food costs and fuel prices. In 2005, the centuries-old sugar industry, which had been operating at a loss, was closed. This led to export-oriented manufacturing assuming a larger role in the economy.

The four (4) largest private sectors in Saint Kitts and Nevis are real-estate, renting and business activities; construction; transport; and storage, communications and manufacturing. Together, these account for nearly 60% of the country's Gross Domestic Product (GDP). A 2012 partial scope agreement on trade with Brazil and Guyana has encouraged manufacturers of electrical components in Saint Kitts and Nevis to increase their export of higher-value added electronic communications equipment which is expected to continue to grow. A brewery also contributes to the economic manufacturing sector in the country. In 2013, FDI, which included investment in international financial services, contributed to 20% of the GDP.

The development of offshore education as an industry has also been encouraged and is expected to develop the economy even further.

1.3 Environmental Overview

The Government of Saint Kitts and Nevis is a Party to several multilateral environmental agreements including the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal; the Stockholm Convention on Persistent Organic Pollutants; the United Nations Framework Convention on Climate Change; and most recently, the Minamata Convention on Mercury.

The Government of Saint Kitts and Nevis has expressed its commitment to becoming the smallest "green" nation in the world. In its Medium Term Economic Strategy Paper (2003 – 2005), the Government expressed its commitment to exploring alternative sources for electricity generation and introducing economic incentives for the renewable energy sector. In accordance with the objectives of the multilateral environmental agreements, the 2030 Sustainable Development Goals, and as a member of the GEF-funded Caribbean Renewable Energy Development Programme which aims to remove barriers to renewable energy use in the Caribbean, the Government has embarked on a strategy

to implement a renewable energy programme to reduce its dependence on imported fossil fuels, reduce energy cost, facilitate positive economic growth and competitiveness, eliminate many of the energy sector challenges, and ensure a sustainable energy future. A National Energy Policy (2011), with its associated action plan, has been finalised and projects an energy sector wholly made up of renewable energy sources such as solar, wind and geothermal being developed by 2020.

In terms of previous mercury research in Saint Kitts and Nevis, there is little information available. A study entitled *Prenatal Exposure to Persistent Organic Pollutants, Pesticides, and Heavy Metals in the CARICOM Region* was published in a CARICOM Report by Ford and Dewailly (2012). This study obtained data from 442 test subjects in the CARICOM region and compared these results to approximately 3,000 participants in the United States of America and Canada. The geometric mean of mercury concentrations in the blood of Caribbean women was assessed, and the result for Saint Kitts and Nevis showed a mid-range value when compared to other Caribbean countries. When compared to Canadian and American women of similar ages, Caribbean women had a blood Hg concentration 2 – 3 times higher. This report suggests that Caribbean women are being exposed to mercury either from their food (most likely fish), mercury-added products, or their environment.

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

At the National Project Inception Workshop held in March, 2017 in Saint Kitts and Nevis, stakeholders from relevant sectors in the country were invited to confirm which source categories were present and required further assessment in the inventory. Their feedback was further assessed by the National Project Coordinator (Inventory).

Table 3 shows the possible release sources under each category identified for Saint Kitts and Nevis. The positive identifications were then further quantified using the methods highlighted in the Toolkit for Identification and Quantification of Mercury Releases Level 2 (Toolkit). The categories identified as being "absent" are not discussed further in this report.

Table 3: Identification of mercury release sources in Saint Kitts and Nevis; Sources Present (Y), Absent (N), and Possible but Not Positively Identified (?)

Cat. no.	Source category	Source presence (y/n/?)
5.1	**Main category: Extraction and use of fuels/energy sources**	**Y**
5.1.1	Coal combustion in power plants	N
5.1.2.1	Coal combustion in coal fired industrial boilers	N
5.1.2.2	Other coal use	N
5.1.3	Mineral oils - extraction, refining and use	Y
5.1.4	Natural gas - extraction, refining and use	?
5.1.5	Other fossil fuels - extraction and use	N
5.1.6	Biomass fired power and heat production	N
5.1.7	Geothermal power production	N
5.2	**Main category: Primary (virgin) metal production**	**N**
5.2.1	Mercury (primary) extraction and initial processing	N
5.2.2	Gold (and silver) extraction with mercury amalgamation processes	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 methods other than mercury amalgamation	N
5.2.7	Aluminium extraction and initial processing	N
5.2.8	Other non-ferrous metals - extraction and processing	N

Cat. no.	Source category	Source presence (y/n/?)
5.2.9	Primary ferrous metal production	N
5.3	**Main category: Production of other minerals and materials with mercury impurities**	**N**
5.3.1	Cement production	N
5.3.2	Pulp and paper production	N
5.3.3	Production of lime and light weight aggregates	N
5.4	**Main category: Intentional use of mercury in industrial processes**	**N**
5.4.1	Chlor-alkali production with mercury-technology	N
5.4.2	VCM production with mercury catalyst	N
5.4.3	Acetaldehyde production with mercury catalyst	N
5.4.4	Other production of chemicals and polymers with mercury	N
5.5	**Main category: Consumer products with intentional use of mercury**	**Y**
5.5.1	Thermometers with mercury	Y
5.5.2	Electrical switches and relays with mercury	Y
5.5.3	Light sources with mercury	Y
5.5.4	Batteries with mercury	Y
5.5.5	Polyurethane with mercury catalysts	?
5.5.6	Biocides and pesticides with mercury	N
5.5.7	Paints with mercury	N
5.5.8	Pharmaceuticals for human and veterinary uses	?
5.5.9	Cosmetics and related products with mercury	Y
5.6	**Main category: Other intentional product/process use**	**Y**
5.6.1	Dental mercury-amalgam fillings	Y
5.6.2	Manometers and gauges with mercury	Y
5.6.3	Laboratory chemicals and equipment with mercury	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	**Main category: Production of recycled metals ("secondary" metal production)**	**N**
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	**Main category: Waste incineration**	**?**
5.8.1	Incineration of municipal/general waste	N
5.8.2	Incineration of hazardous waste	N
5.8.3	Incineration of medical waste	Y
5.8.4	Sewage sludge incineration	N
5.8.5	Informal waste burning	Y
5.9	**Main category: Waste deposition/landfilling and waste water treatment**	**Y**
5.9.1	Controlled landfills/deposits	Y
5.9.2	Diffuse disposal under some control	N

Cat. no.	Source category	Source presence (y/n/?)
5.9.3	Informal local disposal of industrial production waste	N
5.9.4	Informal dumping of general waste	Y
5.9.5	Waste water system/treatment	Y
5.10	**Main category: Crematoria and cemeteries**	**Y**
5.10.1	Crematoria/cremation	Y
5.10.2	Cemeteries	Y

2.1.2 Summary of Mercury Inputs to Society

Mercury inputs to society should be understood here as the mercury made available for potential releases through economic activity in Saint Kitts and Nevis as estimated in the Toolkit. This includes mercury intentionally used in products such as thermometers, blood pressure gauges and fluorescent light bulbs, and mercury that can become available through the disposal of these products. These inputs were calculated using input factors present in the Toolkit. Mercury inputs to Saint Kitts and Nevis' society for the source categories identified as being present in Table 3 are shown below in Table 4.

Table 4: Summary of mercury inputs to society

Toolkit Category no.	Source category	Estimated Hg input, Kg Hg/y, from the Use and Disposal of the Source Category (as relevant)
5.1	**Main category: Extraction and use of fuels/energy sources**	
5.1.3	Extraction, refining and use of mineral oil	**0.19**
5.1.4	Extraction, refining and use of natural gas[1]	**0**
5.5	**Main category: Consumer products with intentional use of mercury**	
5.5.1	Thermometers with mercury	**15.52**
5.5.2	Electrical and electronic switches, contacts and relays with mercury	**5.70**
5.5.3	Light sources with mercury	**0.09**
5.5.4	Batteries with mercury	**3.28**
5.5.5	Polyurethane with mercury catalysts[1]	**0**
5.5.8	Pharmaceuticals for human and veterinary uses[1]	**0**
5.5.9	Cosmetics and related products[1]	**0**
5.6	**Main category: Other intentional products/process uses**	

Toolkit Category no.	Source category	Estimated Hg input, Kg Hg/y, from the Use and Disposal of the Source Category (as relevant)
5.6.1	Dental mercury-amalgam fillings	**2.13**
5.6.2	Manometers and gauges	**0.26**
5.6.3	Laboratory chemicals and equipment	**2.58**
5.8	**Main category: Waste incineration**	
5.8.3	Incineration of medical waste[1]	**0**
5.8.5	Informal waste burning[1]	**0**
5.9	**Main category: Waste deposition/landfilling and waste water treatment**	
5.9.1	Controlled landfills/deposits[2]	**3.14**
5.9.4	Informal dumping of general waste[1]	**0**
5.9.5	Waste water system/treatment	**1.43**
5.10	**Main category: Cremation and cemeteries**	
5.10.1	Crematoria	**0.06**
5.10.2	Cemeteries	**0.86**

1 Identified as possibly being present, however, not enough information to determine the quantity of mercury input to Saint Kitts and Nevis.

2 For waste deposition in controlled landfills, the Hg input for 2015 was calculated to be 310.44 kg, however, only 3.14 kg was estimated to have been input into society to avoid double counting of mercury inputs from waste and products accounted for in other source category inputs. The latter value was therefore recorded in the table.

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

- Thermometers with mercury (15.52 kg Hg/y);
- Electrical switches and relays with mercury (5.70 kg Hg/y); and
- Batteries with mercury (3.28 kg Hg/y).

2.1.3 Summary of Mercury Releases

The key mercury releases in Saint Kitts and Nevis are releases to air (the atmosphere), to water (marine and freshwater bodies, including via wastewater systems), to land, to general waste, and to sector specific waste treatment and disposal. An additional output

pathway is "by-products and impurities" which designate mercury flows back into the market in by-products and products. Table 5 gives a more detailed description and definition of the output pathways.

Table 5: Description of the types of output pathways for mercury release

Calculation result type	Description
Estimated Hg input, Kg Hg/y	The standard estimate of the amount of mercury entering this source category with input materials, for example calculated mercury amount in the amount of 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 as small-scale gold mining, informally burned waste with fluorescent lamps, batteries, thermometers.
Water	Mercury releases to aquatic environments and to waste water systems: Point sources and diffuse sources from which mercury will be spread to marine environments (oceans), and freshwaters (rivers, lakes, etc.). for example, releases from: • Wet flue cleaning systems from coal fired power plants; • Industry, households, etc. to aquatic environments; • Surface run-off and leachate from mercury contaminated soil and waste dumps.
Land	Mercury releases to soil, 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 unconfined 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 trace concentrations of mercury; • Chlorine and sodium hydroxide produced with mercury-based chlor-alkali technology; with trace concentrations of mercury; • 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 or burning. 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. The country-specific waste treatment/disposal method is described for each sub-category in the detailed report sections below.

Table 6 provides a summary of the mercury releases to the various output pathways in Saint Kitts and Nevis based on data provided in the Toolkit. Source categories that were not identified as being present in Saint Kitts and Nevis are excluded from the table, however, releases from categories that were determined to be potentially present are included and should be updated as more information is obtained. The factors by which the releases to each pathway were estimated are detailed further in the "Analysis of mercury input and output factors" tables in each of the relevant source category sections of this report.

Table 6: Summary of mercury releases estimated based on available 2015 data

Toolkit Category No.	Source category	Calculated Hg output, Kg/y					
		Air	Water	Land	By-products and impurities	General waste	Sector specific treatment/ disposal
5.1	**Main category: Extraction and use of fuels/energy sources**						
5.1.3	Mineral oils - extraction, refining and use	0.19	0	0	0	0	0
5.1.4	Natural gas - extraction, refining and use[1]	0	0	0	0	0	0
5.5	**Main category: Consumer products with intentional use of mercury**						
5.5.1	Thermometers with mercury	1.55	4.66	0	-	9.31	0

Toolkit Category No.	Source category	Calculated Hg output, Kg/y					
		Air	Water	Land	By-products and impurities	General waste	Sector specific treatment/ disposal
5.5.2	Electrical switches and relays with mercury	0.57	0	0.57	-	4.56	0
5.5.3	Light sources with mercury	0	0	0	-	0.09	0
5.5.4	Batteries with mercury	0	0	0	-	1.97	1.31
5.5.5	Polyurethane with mercury catalysts[1]	0	0	0	-	0	0
5.5.8	Pharmaceuticals for human and veterinary uses[1]	0	0	0	-	0	0
5.5.9	Cosmetics and related products with mercury[1]	0	0	0	-	0	0
5.6	**Main category: Other intentional product/process use**						
5.6.1	Dental mercury-amalgam fillings	0.05	0.92	0.15	0.12	0.45	0.45
5.6.2	Manometers and gauges with mercury	0.03	0.08	0	0	0.16	0
5.6.3	Laboratory chemicals and equipment with mercury	0	0.85	0	0	0.85	0.88
5.8	**Main category: Waste incineration[4]**						
5.8.3	Incineration of medical waste[1]	0	0	0	0	0	0
5.8.5	Informal waste burning[1]	0	0	0	0	0	0
5.9	**Main category: Waste deposition/landfilling and waste water treatment**						
5.9.1	Controlled landfills/deposits[4]	3.10	0.03	0	0	0	0
5.9.4	Informal dumping of general waste[1,2,4]	0	0	0	-	-	-
5.9.5	Waste water system/treatment[3]	0	1.29	0	0	0.14	0
5.10	**Main category: Crematoria and cemeteries**						
5.10.1	Crematoria/cremation	0.06	0	0	-	0	0
5.10.2	Cemeteries	0	0	0.86	-	0	0
SUM OF QUANTIFIED INPUTS AND RELEASES[2,3,4]		5.56	6.54	1.59	0.12	17.52	2.64

1 Identified as possibly being present, however, not enough information to determine the quantity of mercury input to Saint Kitts and Nevis.

2 The estimated quantities will 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 should be subtracted automatically in the TOTALS when information is obtained and included.

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

4 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.

Overall, once all adjustments were made to account for double-counting of mercury releases through various outputs, the total estimated releases of mercury in 2015 was 33.95 Kg.

The output pathway to which the highest quantity of mercury was discharged was estimated to be general waste (17.52 Kg). The top three (3) sources of releases to general waste were:

- Thermometers with mercury (9.31 Kg Hg/y)
- Electrical switches and relays with mercury (4.56 Kg Hg/y)
- Batteries with mercury (1.97 Kg Hg/y)

2.1.4 Summary of Mercury Stockpiles, and 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.

At the time of this inventory, it was determined that in Saint Kitts and Nevis, no such mercury stockpiles, supply or trade exist.

2.2 Identified 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, as well as the inadequate disposal of mercury-contaminated materials in landfills. The potential presence of such hot spots in Saint Kitts and Nevis was discussed by stakeholders at the National Inception Workshop held in March, 2017, and the findings are shown in Table 7.

Table 7: Identification of potential hot spots of mercury in Saint Kitts and Nevis; Sources Present (Y), Absent (N), and Possible but Not Positively Identified (?)

Potential hot spots	Source presence (y/n/?)
Closed/abandoned chlor-alkali production sites	**N**
Other sites of former chemical production where mercury compounds are/were produced (pesticides, biocides, pigments etc.), or mercury or compounds were used as catalysts (VCM/PVC etc.)	**N**
Closed production sites for manufacturing of thermometers, switches, batteries and other products	**N**
Closed pulp and paper manufacturing sites (with internal chlor-alkali production or former use of mercury-based slimicides)	**N**
Tailings/residue deposits from mercury mining	**N**
Tailings/residue deposits from artisanal and large-scale gold mining	**N**
Tailings/residue deposits from other non-ferrous metal extraction	**N**
Sites of relevant accidents	**N**
Dredging of sediments	**N**
Sites of discarded district heating controls (and other fluid controls) using mercury pressure valves	**N**
Sites of previous recycling of mercury ("secondary" mercury production)	**N**

As none of the major potential hot spots for mercury contamination are present in the country, it is assumed that the main source of mercury contamination is due to the disposal of mercury containing or contaminated products at landfill sites.

In order to assist Saint Kitts and Nevis in the identification of contaminated sites, BRI collected national-scale spatial data on the location of waste disposal sites. Data was also obtained on ecosystem types, major watersheds and topography. This data was used to develop a model to improve the understanding of areas potentially sensitive to mercury contamination. Identifying these spatial patterns in sensitivity is important for improving targeting for monitoring and mitigation efforts and for prioritizing risk reduction strategies. Due to the characteristics of mercury contamination in the environment, watershed and catchment areas were used as the units of analysis and examined in Saint Kitts and Nevis (Buck and Burton, 2017).

The predictor variables accepted for use in Saint Kitts and Nevis are shown in Table 8. The percent coverage of rice, wetlands, waterbodies, ponds and lakes were not relevant, and wetland, wastewater treatment plant and bauxite plant occurrence data were not needed for the mercury sensitivity by watershed analysis in Saint Kitts and Nevis.

Table 8: Predictor variables accepted in Saint Kitts and Nevis and used to analyze mercury sensitivity by watershed

Parameter	Predictor Variable	Used in Analysis (X=Present)
Percent Coverage	Mangrove	X
	Forest Cover	X
	Agriculture	X
	Rice	
	Wetlands	
	Waterbodies	
	Ponds, Lakes, Swamps	X
	Ponds, Lakes	
Occurrence Data	Wetlands	
	Landfills and Disposal Sites	X
	Wastewater Treatment Plants	
	Bauxite Plants	

After a ranking was assigned to each watershed for each predictor variable available in Saint Kitts and Nevis, the rankings were summed across each watershed or catchment.

An increasing number of assigned total points indicates the presence of a set of variables that combines to expose the watershed to increased sensitivity to mercury contamination. In order to compare watersheds across other Caribbean countries with varying numbers of predictor variables, the results were normalized by dividing the total cumulative points of each watershed by the maximum number of points that could be awarded for each individual watershed to create a final proportional ranking (Buck and Burton, 2017). Figure 6 shows the results of this study.

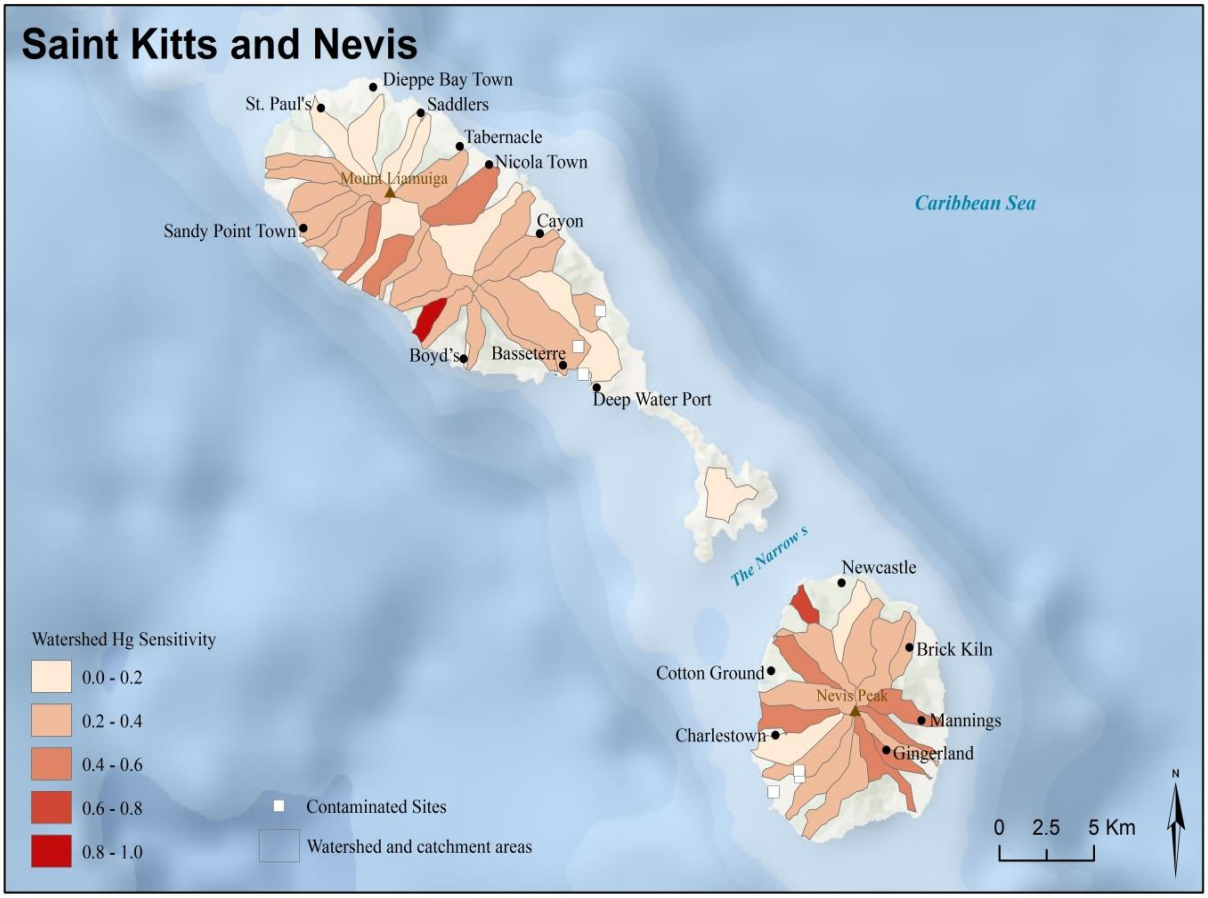

Figure 6: Saint Kitts and Nevis watershed mercury sensitivity analysis results (Source: BRI, 2017)

The area to the northwest of Boyd's in Saint Kitts has the highest watershed sensitivity to mercury. Contrastingly, the northern segment of the island has the lowest overall watershed sensitivity to mercury. On Nevis, the watershed to the southwest of Newcastle was determined to have the highest sensitivity to mercury. It was further noted that the

watershed sensitivity on both islands does not seem to correlate with the presence of the country's landfills.

To further optimize the analysis, the presence and location of additional potential sources of mercury should be verified. To do this, relevant authorities in Saint Kitts and Nevis should document the location of informal dumping sites as well as other potential point sources of mercury inputs to society.

2.3 Data and Inventory on Extraction and Use of Fuels/Energy Sources

Saint Kitts and Nevis does not extract, refine or process coal, petroleum products, mineral oils, lubricants and natural gas. Coal is also not imported or combusted.

Historically, bagasse was an important fuel in the sugar industry, but it no longer plays a role in the energy sector. Also, dried fuel wood was a staple for domestic and commercial activities, such as cooking and baking, and later on, charcoal and kerosene use became popular. However, as the country progressed and developed, and with the advent of gas and electric stoves and ovens, the use of mineral oils for energy generation has become the main source of fuel.

Like most other Caribbean countries, Saint Kitts and Nevis depends heavily on imported fossil fuels, primarily for electricity generation, transportation and domestic activities.

According to a report by the International Monetary Fund (IMF) in 2013, the Federation of Saint Kitts and Nevis contributed minimally to global fossil fuel consumption, and the country's oil import bill has historically been lower than the average for other Eastern Caribbean islands, partly due to efficient generation practices. Therefore, the contribution of the fuels sector to mercury releases is expected to be very low. An even further reduction in mercury releases due to energy consumption is anticipated as the Government has embarked upon a strategy to implement a renewable energy programme to reduce its dependence on imported fossil fuels, reduce energy cost, facilitate positive economic growth and competitiveness, and ensure a sustainable energy future.

Currently, it is estimated that approximately 59% of oil imports are used for electricity consumption, with the remainder being used for transport services and other minimal uses.

There are three (3) main companies that import mineral oils into Saint Kitts and Nevis:

1. Delta Petroleum which imports diesel, gasoline and liquefied petroleum gas (LPG) from Trinidad and Tobago for use by electricity generation companies and in other industrial activities;

2. Petróleos de Venezuela, S.A. (PDVSA), (Petroleum of Venezuela) which imports oil and natural gas from Venezuela to supply electricity generation companies; and
3. Sol Eastern Caribbean Limited (Sol EC Ltd.) which supplies the fuels used mainly in the transport sector.

Use of Fossil Fuels for Electricity Generation

In Saint Kitts and Nevis, there are two (2) government-associated utility companies; Saint Kitts Electricity Company Limited (SKELEC) and the Nevis Electricity Company Limited (NEVLEC) that operate as the main electricity suppliers for Saint Kitts and for Nevis respectively.

Royal Utilities Limited is a private company which is located on the grounds of the Saint Kitts Marriott Resort in Frigate Bay and generates electricity from four (4) generators for the sole use by the resort. The estimated output, type of fuel and supplier used by each of the generating companies is detailed in Table 9.

Table 9: Estimated yearly electricity output, type of fuel used and fuel suppliers for the electricity generation plants on Saint Kitts and Nevis

Electricity Generation Plant	Estimated Yearly Output (MWh)	Type of Fuel Used	Main Supplier
SKELEC	163,612	High Sulphur Diesel, Low Sulphur Diesel	PDVSA
NEVLEC	55,112	Low Sulphur Diesel	Delta Petroleum
Royal Utilities Limited	26,280	Low Sulphur (No.2) Diesel	Delta Petroleum

Electricity generation, transmission and distribution to 95% of the residents of Saint Kitts are controlled by the corporate enterprise, SKELEC, which is owned by the Government of Saint Kitts and Nevis. Its power station (Figure 7) is located at Needsmust, and the plant presently operates nine (9) generators.

Figure 7: Photo of SKELEC Power Station in Needsmust, Saint Kitts (Source: www.sknlist.com)

NEVLEC is the sole provider of electricity on the island of Nevis and was established in 2000 as a subsidiary of the Nevis Island Administration, under the Electricity Supply Act of Nevis (1998). The NEVLEC generation plant is located in Prospect, Nevis, and the administrative offices are located in the capital of Nevis.

When assessing releases of mercury from power plants, the main output pathway is typically to air. During stakeholder consultations for this inventory, it was indicated that none of the three power plants in operation have any mercury air emission monitoring or control systems on their generators.

Development of Renewable Energy Sources for Electricity Generation

The Government of Saint Kitts and Nevis has made considerable strides in the development of a renewable energy strategy that is comprised of the development of wind, solar and geothermal energy. This effort has been largely due to high electricity rates, increased transportation fuel prices and global climate change awareness. Solar panels and wind farms are already in use to some degree in both islands and are being developed further. For example, Figure 8 shows a 1-megawatt (MW) solar farm constructed at the Robert L. Bradshaw International Airport in Saint Kitts.

Figure 8: Solar farm constructed at the Robert L. Bradshaw International Airport in Saint Kitts (Source: Saint Christopher Air and Sea Ports Authority, 2016)

In terms of geothermal energy, geothermal reservoirs have already been identified in Nevis and assessed to be capable of producing up to 500 MW of constant base load power year-round. Three (3) productive wells have been established in Spring Hill and operations were tentatively scheduled to begin in December 2017. It is estimated that Nevis' electricity generation will be powered by 100% renewable energy by 2020. There is a potential for mercury to be released to the air through the geothermal plant's off-gas ejector and cooling towers; however, data on this has not been validated. It should be ensured that measures are put in place to reduce the potential for mercury and other pollutant emissions during geothermal power production.

Data Collection and Assessment

Questionnaires were sent to the fossil fuel import companies, electricity generation companies and to the Saint Kitts Statistics Department. Data was received from each of the respondents; however, the units and figures for some of the data received from the Statistics Department could not be verified in time for the inventory. Therefore, only data from the import and electricity generation companies were compared.

Some data was received in different units such as imperial gallons and pounds. Conversion calculators from the following links were used to convert the units into metric tonnes for entry into the Toolkit spreadsheet:

- http://www.cmegroup.com/tools-information/calc_refined.html; and
- http://www.etoolsage.com/converter/Oil_converter.asp.

Table 10 illustrates the average imports of the various fossil fuel types by the main importing companies for 2015. It should be noted that data was also received from the Saint Kitts Statistics Department on the import of aviation fuels and other lubricating oils; however, the data could not be verified in time for this report, and so was not included.

Table 10: Average imports of primary fossil fuels used in Saint Kitts and Nevis for 2015 (t/y)

Suppliers	Unleaded Gasoline (t/y)	Gas Oil (t/y)	High Sulphur Diesel (t/y)	Low Sulphur Diesel (t/y)	LPG (t/y)	Jet Fuel (t/y)	Asphalt (Bitumen) (t/y)
Delta Petroleum	4,994	2,245	-	16,995*a	736	-	-
SOL EC Ltd	16,183	-	8,594*b	1,433	2,201	4,996	-
PDVSA	-	-	33,954	-	-	-	156
TOTAL	**21,177**	**2,245**	**42,548**	**18,428**	**2,937**	**4,996**	**156**

**a: Compiled from NEVLEC and Royal Utility Company inventory data sheets*

**b: SOL EC Ltd. data sheet estimated that 86% of High Sulphur Diesel imported was used for industrial processes and 14% was used for Marine Vehicles.*

A certainty assessment of the data used is illustrated in Table 11 below.

Table 11: Certainty assessment of data used in the inventory for the fuel sector

Data Type	Assessment	Reason/Comment
Activity Data	Medium	2015 data was received by all companies; however, some data was missing from one of the fuel supply companies and had to be obtained from the electricity generation companies directly. Data obtained from Statistics Department could not be verified at the time of the report and so was not included or compared to data received from companies.
Input Data	Low	There was no local data on mercury content for imported fuel, and the default input data from UN Environment Toolkit, 2015 was used.
Output Data	Low	It is based on the Toolkit's default output distribution factors that assumed that all mercury releases were atmospheric. Missing information also reduces range of output data.

Table 12 provides a summary of the inputs and releases for the category, energy consumption and fuel production (referring to the use of mineral oils), determined by the 2015 data used for this inventory. There were no significant outputs/releases of mercury determined from the amounts of mineral oils used in Saint Kitts and Nevis.

Table 12: Analysis of mercury input and output factors for use of mineral oils

Use of Mineral Oils	Unit	Use			Sum of releases to pathway from assessed part of life-cycle
		Heavy Fuel Oil (uses other than combustion)	**Other Oil Products (transportation and other uses other than combustion)**	**Other Oil Products (other oil combustion facilities)**	
Activity rate	t oil/y	156	33,991	58,340	-
Input factor for phase	mg Hg/t oil	20	2	2	-
Calculated input to phase	kg Hg/y	0.00	0.07	0.12	0.19
Output distribution factors for phase:					
- Air	N/A	1.00	1.00	1.00	-
- Water	-	-	-	-	-
- Land	-	-	-	-	-
- Products	-	-	-	-	-
- General waste treatment	-	-	-	-	-
- Sector specific waste treatment	-	-	-	-	-
Calculated outputs/releases to:					
- Air	kg Hg/y	0.00	0.07	0.12	0.19
- Water	-	-	-	-	-
- Land	-	-	-	-	-
- Products	-	-	-	-	-
- General waste treatment	-	-	-	-	-
- Sector specific waste treatment	-	-	-	-	-

2.4 Data and Inventory on Consumer Products with Intentional Use of Mercury

Reducing and eventually eliminating the use of consumer products in which mercury is intentionally used throughout their life-cycle are priority areas for action for Saint Kitts and Nevis to implement the Minamata Convention on Mercury. These products can result in mercury releases during their manufacture, use, and end-of-life disposal. Under the Convention, Parties must phase out, by 2020, the manufacture, import and export of certain mercury-added products (MAPs) listed under Annex A, Part I. These products include certain electrical switches and relays, batteries, lighting devices, medical devices and cosmetics. Details on the types of products and their exemptions are also listed in the Annex. Annex A, Part II provides phase-down measures for dental amalgam which is discussed in 2.5.1.

Saint Kitts and Nevis does not manufacture any MAPs; though it should be noted that there has been the development of an electrical and electronic equipment assembly industry for a US-based aircraft manufacturer, Boeing, in Saint Kitts (IADB, 2013). In recent years, manufacturers of electrical components have endeavoured to increase their output of electronic communications equipment under a 2012 partial scope agreement on trade between Saint Kitts and Nevis, Brazil and Guyana. Export is expected to increase in the coming years, therefore, regulations must be put in place to ensure that these products are not comprised of mercury containing components, such as mercury-added batteries, or mercury-added electrical switches and relays.

Currently, the main areas of concern in the life-cycle of mercury products for Saint Kitts and Nevis are their import, use and disposal. It was determined that the following sources were not present in Saint Kitts and Nevis:

- Biocides and pesticides with mercury; and
- Paints with mercury.

Data used in this section was obtained mainly from Customs data sheets and by using default calculations in the Toolkit spreadsheet.

2.4.1 Thermometers Containing Mercury

Historically, mercury has been used in thermometers because of its low vapour pressure which makes it ideal for detecting small changes in temperature and facilitates measurements within a large range of temperatures. Different types of mercury thermometers have been used for medical applications, ambient air temperature monitoring, laboratory or educational purposes, or industrial uses and special applications, such as for the control of large diesel engines in ships.

The presence of numerous medical and veterinary universities, in addition to the hospitals in Saint Kitts and Nevis, may have accounted for a large number of mercury thermometers being imported. It was noted that the Customs data sheet received from the Saint Kitts and Nevis Customs and Excise Department differentiated between the import of clinical thermometers with and without mercury. For 2015, mercury-free clinical thermometers accounted for 87% of imports, as mercury-free alternatives were already being promoted on the global market. The number of mercury containing thermometers imported in 2015 is shown in Table 13. There is no local data on the mercury content in medical or other types of thermometers, and the UN Environment Toolkit's default input factors were used.

Table 13: Summary of Types of Mercury Thermometers used in Saint Kitts and Nevis

Type of mercury thermometer	Mercury content, g Hg/ item	Number of items imported in 2015	Country of origin
Medical Thermometers	0.5-1.5 (1)	38	United States, Taiwan
Ambient air temperature thermometer	2-5 (3.5)	10	Puerto Rico, United States
Industrial and special application thermometers (e.g. marine engine control)	5-200 (103)	150	United States, China, Algeria
Miscellaneous glass thermometers with mercury, including for laboratories	1-40	Not available	Not available

Data Collection and Assessment

Questionnaires to determine the importation of medical thermometers were sent to the Chief Medical Officer, the Director of Health, doctors, medical laboratories and institutions, Customs and Excise Department, and the Ministry of Health.

Information on ambient air, industrial and special application thermometers was requested from the Bureau of Standards, Water Services Department, Department of Agriculture, laboratories, Metrological Office, and various institutional and industrial facilities.

Data from the Customs and Excise Departments in both Saint Kitts and Nevis was received for entry into the Toolkit.

While there was no data received on the disposal of mercury thermometers, it was assumed that waste handling was controlled due to feedback received from medical personnel. These personnel indicated that while thermometers were not collected separately, if disposed of with biohazardous waste, they would be treated either at medical waste incineration facilities or at landfill sites where hazardous waste is currently stored in a separate shed.

The certainty of the data was assessed and shown in Table 14.

Table 14: Certainty assessment of data used in the inventory for thermometers

Data Type	Assessment	Reason/Comment
Activity Data	High	Data was received from the Customs and Excise Departments in both Saint Kitts and in Nevis.
Input Data	Low	Based on the default factor used in the Toolkit spreadsheet.
Output Data	Medium	Based on Toolkit's default output distribution factors.

Table 15 provides a summary of the analysis conducted under this inventory to assess mercury inputs and releases from medical thermometers, ambient air temperature thermometers and industrial and special application thermometers.

Table 15: Analysis of mercury input and output factors for imported mercury thermometers

Use and Disposal of Thermometers with Mercury	Unit	Use and Disposal			Sum of releases to pathway from assessed part of life-cycle
		Medical	**Ambient air temperature**	**Industrial and special application**	
Activity rate	items/y	38	10	150	-
Input factor for phase	g Hg/item	1	3.5	103	-
Calculated input to phase	kg Hg/y	0.04	0.04	15.45	15.52
Output distribution factors for phase:					
- Air	N/A	0.1	0.1	0.1	-
- Water	N/A	0.3	0.3	0.3	-
- Land	-	-	-	-	-
- Products	-	-	-	-	-
- General waste treatment	N/A	0.6	0.6	0.6	-
- Sector specific waste treatment	-	-	-	-	-
Calculated outputs/releases to:					
- Air	kg Hg/y	0.00	0.00	1.55	1.55
- Water	kg Hg/y	0.01	0.01	4.64	4.66
- Land	-	-	-	-	-
- Products	-	-	-	-	-
- General waste treatment	kg Hg/y	0.02	0.02	9.27	9.31
- Sector specific waste treatment	-	-	-	-	-

2.4.2 Electrical Switches and Relays Containing Mercury

Electrical switches and relays can be found in numerous electrical apparatus, and elemental mercury has been a commonly used component in these products throughout the years. Globally, mercury-free switches and relays have become more popular in the last two (2) decades, but due to the long service life of most switches and relays, mercury-containing ones are expected to be present for many years in disposed wastes (UNEP, 2017a).

The most common use of elemental mercury in the manufacture of electrical equipment is in tilt switches or “silent” switches; which are used for silent electric wall switches, convenience lights (such as those used in car trunks when they are opened), Antilock Braking Systems and active ride-control systems in vehicles, as well as thermostats for air conditioning and ventilation units.

Relays, which are electrically controlled switches, may also use mercury as a component. Some mercury-containing relays include mercury displacement relays, mercury wetted reed relays and mercury contact relays. Although the mercury relays may be widely used, the total mercury consumption with relays has been relatively small when compared to mercury switches.

Electrical switches and relays are not produced in Saint Kitts and Nevis, but they are assembled in the electronic manufacturing industry. It was noted that the switches and relays assembled in Saint Kitts do not contain any mercury.

Data Collection and Assessment

Due to switches and relays being components of larger products that are imported into the country, the number used and whether mercury was a component could not be specifically determined. Therefore, the estimation for mercury releases from electrical switches and relays in the Toolkit was determined by using the default calculations provided that were based on electrification rates, population data and a default mercury input concentration.

Since the estimated lifespan of mercury switches and relays is 20 years, it was assumed that products purchased in 1995 would contribute to the mercury released from disposal of these products in 2015. As such, World Bank population data from 1995 was used to give a more accurate estimation of the historical consumption data. While switches and relays are not collected separately, there is some degree of control in their disposal in Saint Kitts and Nevis, as electrical waste and discarded vehicles are stored separately from general waste at the landfill sites.

The certainty of the data was assessed and shown in Table 16.

Table 16: Certainty assessment of data used in the inventory for electrical switches and relays

Data Type	Assessment	Reason/Comment
Activity Data	Medium	Based on default factors using population data and electrification rate.
Input Data	Low	Based on the default factor used in the Toolkit spreadsheet.
Output Data	Low	Based on Toolkit's default output distribution factors.

Table 17 summarises the mercury input factors and determined releases via relevant pathways for electrical switches and relays.

Table 17: Analysis of mercury input and output factors for imported electrical switches and relays

Use and Disposal of Electrical Switches and Relays with Mercury	Unit	Use and Disposal
Activity rate	inhabitants	42,891
Input factor for phase	g Hg/(y*inhabitant)	0.14
Calculated input to phase	kg Hg/y	5.70
Output distribution factors for phase:		
- Air	N/A	0.1
- Water	-	-
- Land	N/A	0.1
- Products	-	-
- General waste treatment	N/A	0.8
- Sector specific waste treatment	-	-
Calculated outputs/releases to:		
- Air	kg Hg/y	0.57
- Water	-	-
- Land	kg Hg/y	0.57
- Products	-	-
- General waste treatment	kg Hg/y	4.56
- Sector specific waste treatment	-	-

2.4.3 Light Sources with Mercury

Mercury is used in small amounts in different types of discharge lamps: linear fluorescent light tubes, compact fluorescents bulbs, specialty lamps (such as metal halide, mercury vapour, high pressure sodium and neon lamps); for commercial and municipal use. Other light sources that may contain mercury include special lamps for photographic purposes, atomic absorption spectrometry lamps, ultraviolet sterilisation, and back lights of flat-screens for computers (UNEP, 2017a).

Mercury is used as a multiphoton source as it produces ultraviolet light when an electric current is passed through the tube. Eventually, the light loses its efficiency as mercury in the tube reacts with the phosphorus powder which coats the inside surface of the tube. The lifespan of these lighting devices varies between five (5) to ten (10) years, and while

they are in use, there is little risk of mercury exposure. However, if broken or when disposed of, mercury vapour may be released to the atmosphere.

Lighting devices are not manufactured in Saint Kitts and Nevis but are imported for use. According to the Customs data received, the majority of bulbs are imported from the United States of America, with some also being imported from other countries, such as Puerto Rico and China.

The use of compact fluorescent lamps (CFLs) and linear fluorescent lamps (LFLs) is still prevalent, though efforts are becoming more effective in phasing them out. At the time of the MIA Results Validation Workshop held in October, 2017, a realtor company representative indicated that they were in the process of conducting inventories on the number of CFLs and LFLs present in their buildings and had separated the CFLs for disposal in storage locations. Mercury-free alternatives, such as Light Emitting Diodes (LEDs), are becoming increasingly popular in commercial and residential areas.

From 2013, in a joint venture between the Governments of Saint Kitts and Nevis and Taiwan, a project was implemented to replace street lamps with solar-powered LED alternatives in an effort to promote green energy (Brown, 2013).

Data Collection and Assessment

Data from the Customs and Excise Departments in both Saint Kitts and Nevis were received for entry into the Toolkit. The certainty of the data was assessed and shown in Table 18.

Table 18: Certainty assessment of data used in the inventory for light sources

Data Type	Assessment	Reason/Comment
Activity Data	High	Data was received from the Customs departments in both Saint Kitts and in Nevis.
Input Data	Low	Based on the default factor used in the Toolkit spreadsheet.
Output Data	Medium	Based on the Toolkit's default output distribution factors.

Table 19 indicates the mercury inputs and releases from light sources imported in 2015 in Saint Kitts and Nevis. It was apparent that despite the import of these light sources, their contribution to mercury releases was negligible.

Table 19: Analysis of mercury input and output factors for imported Hg containing light sources

Use and Disposal of Light Sources with Mercury	Unit	Use and Disposal		Sum of releases to pathway from assessed part of life-cycle
		Fluorescent Tubes (double ended)	**CFLs (single ended)**	
Activity rate	items/y	2843	1940	-
Input factor for phase	mg Hg/item	25	10	-
Calculated input to phase	kg Hg/y	0.07	0.02	0.09
Output distribution factors for phase:				
- Air	N/A	0.05	0.05	-
- Water	-	-	-	-
- Land	-	-	-	-
- Products	-	-	-	-
- General waste treatment	N/A	0.95	0.95	-
- Sector specific waste treatment	-	-	-	-
Calculated outputs/releases to:				
- Air	kg Hg/y	0.00	0.00	0.00
- Water	-	-	-	-
- Land	-	-	-	-
- Products	-	-	-	-
- General waste treatment	kg Hg/y	0.07	0.02	0.09
- Sector specific waste treatment	-	-	-	-

2.4.4. Batteries with Mercury

Batteries are among the largest product uses of mercury globally. Mercury is a very effective suppressor of zinc corrosion which ultimately prevents the build-up of hydrogen, a potentially explosive gas, in various types of batteries. It is also used in high concentrations as a positive electrode in mercury-oxide batteries which are also called zinc-mercury batteries (UNEP, 2017a).

Prior to 1997, mercury-oxide batteries were found in motorized equipment, hearing aids, watches, calculators, computers, smoke detectors, tape recorders, regulated power supplies, scientific equipment, pagers and portable electrocardiogram monitors. Over the

years, developed countries have banned or limited the use of mercury in batteries and are now manufacturing batteries without intentionally adding mercury. However, mercury is still used in some button-cell shaped batteries of alkaline, silver oxide and zinc/air types that can be found in hearing aids, electronics, small toys and watches.

The main mercury release pathways for batteries are through the atmosphere, land and general waste (UNEP, 2017a).

Batteries are not produced in Saint Kitts and Nevis but are imported. Batteries may also be used in the electrical manufacturing sector during product assembly, but no information could be obtained on this. Batteries are typically disposed of in separate storage areas in the designated landfills.

Data Collection and Assessment

Data from the Customs and Excise Departments in both Saint Kitts and Nevis were received for entry into the Toolkit. In terms of alkaline button cells, the data received did not differentiate between alkaline batteries that were button cells and those that were other shapes. It was assumed that all were button cells for the purpose of the Toolkit. Due to batteries being components of larger products that are imported into Saint Kitts and Nevis, it is possible that the actual number of batteries imported into the country was not fully captured by the Customs data used. The certainty of the data was assessed and shown in Table 20.

Table 20: Certainty assessment of data used in the inventory for batteries

Data Type	Assessment	Reason/Comment
Activity Data	Medium	Data was received from the Customs departments in both Saint Kitts and in Nevis though assumptions were made.
Input Data	Low	Based on the default factor used in the Toolkit spreadsheet.
Output Data	Medium	Based on the Toolkit's default output distribution factors.

The following table (Table 21) summarizes the mercury inputs and releases to Saint Kitts and Nevis from the use and disposal of mercury containing batteries during 2015.

Table 21: Analysis of mercury input and output factors for imported Hg containing batteries

Use and Disposal of Batteries with Mercury	Unit	Use and Disposal			Sum of releases to pathway from assessed part of life-cycle
		Mercury Oxide	**Alkaline Button Cells*1**	**Silver Oxide Button Cells**	
Activity rate	t batteries/y	0.01	0.016	0.001	-
Input factor for phase	kg Hg/t batteries	320	5	4	-
Calculated input to phase	kg Hg/y	3.20	0.08	0.00	3.28
Output distribution factors for phase:					
- Air	-	-	-	-	-
- Water	-	-	-	-	-
- Land	-	-	-	-	-
- Products	-	-	-	-	-
- General waste treatment	N/A	0.6	0.6	0.6	-
- Sector specific waste treatment	N/A	0.4	0.4	0.4	-
Calculated outputs/releases to:					
- Air	-	-	-	-	
- Water	-	-	-	-	
- Land	-	-	-	-	
- Products	-	-	-	-	
- General waste treatment	kg Hg/y	1.92	0.05	0.00	1.97
- Sector specific waste treatment	kg Hg/y	1.28	0.03	0.00	1.31

1 Assumptions were made that all the manganese oxide (alkaline) batteries listed on the data sheets received from Customs were button cells.

2.4.5 Polyurethane with Mercury Catalysts

Polyurethane is used in the manufacture of products including high resilience foam seating, high performance adhesives, surface coating and sealants, synthetic fibres, and durable wheels for products, such as shopping carts, escalators and elevators. The production of polyurethane materials may involve the use of organic mercury compounds as catalysts to harden or cure the polyurethane materials. The catalyst may become embedded in the structure of the compound and remain in the final product where it may be released to the environment during use or disposal.

The use of mercury and the prevalence of polyurethane in Saint Kitts and Nevis could not be determined at the time of this inventory but should be investigated in future research for mercury management.

2.4.6 Pharmaceuticals for Human and Veterinary Uses

Mercury has been used in various pharmaceuticals, such as vaccines, eye drops, herbal medicines and other products, mainly due to its function as a preservative. While the use of mercury in pharmaceuticals has decreased significantly in recent years, it may still be present in some products. For example, mercurochrome is still used as a key ingredient in antiseptics being sold in some pharmacies in Saint Kitts and Nevis. Mercury in pharmaceuticals may be released through the body to wastewater which can directly enter oceans and bio-magnify up the food chain in aquatic species.

The prevalence of mercury in pharmaceuticals for human and veterinary purposes in Saint Kitts and Nevis could not be confirmed at the time of the inventory but should be noted for future consideration in the management of mercury releases.

2.4.7 Cosmetics and Related Products with Mercury (Skin-lightening Cosmetics)

Skin bleaching involves the use of products, such as creams, soaps, injections and home-made products, to depigment skin. Depigmentation is a procedure by which the melanin produced in the skin is reduced, resulting in lightened skin (Mohammed, et al., 2017). Inorganic mercury is an effective suppresser of melanin production and is therefore found in some skin-lightening products identified on the global market (Boischio, 2017). Additionally, some skin-lightening creams may contain other harmful melanin suppressors such as hydroquinone rather than mercury.

Under the Minamata Convention, the manufacture, import and export of skin lightening creams with mercury contents greater than 1 ppm would not be allowed from 2020.

The use of skin lightening creams has been found to be prevalent around the globe, especially in African and Asian countries, and Afro-diaspora regions like the Caribbean (Hamann, et al., 2014; Copan et al., 2015) where the trend of skin lightening has become prominent in beauty fads, culture and music. While some skin-lightening products may be

safe to use, many products on the global and local markets are unlabelled, mislabelled, counterfeit or labelled in a foreign language. Therefore, the risk of using any of these products is increased as consumers are not able to identify their components (Zero Mercury Working Group, 2010). Further discussions on the social issues associated with skin lightening creams and the recommendations to address them are noted in Chapters 4, 5 and 6 of this report.

In Saint Kitts and Nevis, the use of skin-lightening creams has been noted, and the presence of mercury in some of the products used has been identified. However, skin-lightening creams are generally sold in informal settings and import data to quantify its presence is lacking. Furthermore, the amount of mercury present in a skin lightening cream can only be accurately determined through scientific analysis of the product. More research is therefore needed to determine the extent of the issue of mercury-added skin lightening products in Saint Kitts and Nevis.

2.5 Data and Inventory on Other Intentional Product/Process Uses

2.5.1 Dental Mercury Amalgam Fillings

Dental mercury amalgam is one of the materials that may be used to restore teeth with dental cavities. It is a mixture of liquid mercury and a powder containing silver, tin, copper, zinc and other metals (US EPA, 2016a). Some dental facilities may prepare dental amalgam by directly measuring out and mixing the liquid mercury and powder in an agitator; however, the more common practice for preparing dental amalgam fillings is through the use of small capsules in which the right formula of mercury and powder are pre-mixed and ready for immediate use in the clinic.

According to UNEP (2017a), dental amalgam fillings have an approximate life-time of 10-20 years, and mercury can be released to air, water, products and general waste through its production, preparation in clinics, use and disposal. The use of pre-mixed dental amalgam capsules reduces the risk of exposure during the preparation process. However, mercury can be released when amalgam left-over from placement of fillings is washed down sinks in a clinic or discarded in general waste, and when particles are expelled while adjusting the shape of the filling. Additionally, procedures to renew and replace dental amalgam may lead to particulate releases into wastewater systems if dental chairs and sinks are not equipped with mesh filters or more efficient central filters which can capture the releases. Low quantities of mercury are also continuously emitted from placed fillings due to natural wearing away of amalgam in the mouth. Disposal occurs when teeth containing dental amalgam are removed or when a corpse with dental amalgam fillings is cremated or buried, thus causing the mercury to be released into the air or land respectively.

There is no known production of dental amalgam in Saint Kitts and Nevis.

For the year of 2015, there were approximately 19 personnel who practised dentistry in the twin-island Federation. This includes volunteers from mission programmes, general practitioners and dental specialists. In Saint Kitts, there were 15 personnel; 9 of which were private practitioners and 1 from a visiting mission program. In Nevis, there were 4 registered dentists; 2 were in the private sector. Many of the private practice dentists have already phased out the usage of dental mercury-amalgam and have replaced it with

composite material. This has typically been due to the preference of customers for white fillings which are less noticeable than the silver-coloured mercury amalgam fillings.

Data Collection and Assessment

Questionnaires were sent to dental practitioners to gather specific information on mercury dental amalgam use (Annex 2). Typically, responses indicated that no records were kept pertaining to the amount of dental amalgam used historically, though most indicated that dental amalgam was no longer used in their practices. Only one (1) of the dentists contacted indicated that dental amalgam fillings were still used in his practice, though the number of these fillings used could not be determined. It was also indicated that dental residues were typically washed down the sink.

Default calculations in the Toolkit spreadsheet were used to estimate releases of mercury from this sector. The estimated mercury inputs from preparation, use and disposal of dental amalgam were calculated using a default input factor of 0.2 g mercury consumed with dental amalgam per inhabitant. The number of registered dental personnel per 1000 inhabitants in Saint Kitts and Nevis (0.186) was provided in the Toolkit Reference Report (2017a) and used in calculations. It should be noted that this value was obtained using data from 1997 and is significantly lower than the calculated corresponding factor for 2015 (0.35). However, since the rate of dentists using amalgam could not be determined, the default factor was used to provide a lower and potentially more accurate estimate.

The total mercury input for Saint Kitts and Nevis from the preparation of dental amalgam was calculated based on 2015 population data. The output to the environment from this life-cycle phase was noted to be a fraction of the input as it did not account for the mercury that would be released in subsequent years through use and disposal. The output through the use of amalgam in 2015 was estimated using the mercury input from dental amalgam consumed 15 years prior, in 2000. These releases were assumed to occur from damaged fillings that were replaced or repaired in 2015, and from direct releases from the user's mouth during 2015. Mercury releases from the disposal of "spent" dental amalgam were determined from population data for 1995 since the expected end-of-life of dental amalgam is 20 years after its initial consumption. Releases from cremation and burial of people with dental amalgam were also taken into consideration in the disposal life-cycle

phase of dental amalgam. Population data for 2015, 2000 and 1995 were retrieved from the World Bank.

Table 22 indicates the certainty of the data used to determine estimated releases.

Table 22: Certainty assessment of data used in the inventory for dental amalgam

Data Type	Assessment	Reason/Comment
Activity Data	Medium	Based on population data and number of dentists.
Input Data	Low	Based on the default factor used in the Toolkit spreadsheet.
Output Data	Medium	Based on the Toolkit's default output distribution factors.

The data entered is provided in Table 23. As the prevalence of mercury dental amalgam has been low according to persons consulted, it is likely that the mercury releases estimated may be an over-estimation.

Table 23: Analysis of input and output factors for dental mercury amalgam fillings

Dental Mercury Amalgam Fillings	Unit	Preparation	Use	Disposal	Sum of releases to pathway from assessed part of life-cycle
Activity rate	Inhabitants	54,288 (2015)	45,374 (2000)	42,891 (1995)	-
Input factor for phase	g Hg/(y*inh.)	0.2	0.2	0.2	-
	dentists/1000 inh.	0.186	0.186	0.186	
Calculated input to phase	kg Hg/y	2.44	2.04	1.92	6.40
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	0.05	-	-	0.05
- Water	kg Hg/y	0.34	0.04	0.54	0.92

- Land	kg Hg/y	-	-	0.15	0.15
- Products	kg Hg/y	-	-	0.12	0.12
- General waste treatment	kg Hg/y	0.29	-	0.15	0.45
- Sector specific waste treatment	kg Hg/y	0.29	-	0.15	0.45

2.5.2 Manometers and Gauges with Mercury

Mercury is used in some blood pressure gauges, pressure valves, and industrial and meteorological manometers. Mercury was popularly used due to its high density and effectiveness in responding to various pressure changes. The majority of mercury-added devices are sphygmomanometers or blood pressure gauges. Non-mercury alternatives exist for all uses and are gradually being substituted for mercury-using equivalents in some countries; though it was noted that there is some reluctance to promote mercury-free alternatives due to the belief that the mercury-containing devices are more accurate (Palmer, 2016).

According to medical officials contacted in Saint Kitts and Nevis, the use of mercury containing manometers and gauges is decreasing every year due to concerns for mercury contamination and poisoning. Alternatives such as digital blood pressure gauges are becoming more common in medical institutions and for personal use.

Data Collection and Assessment

Questionnaires to determine the prevalence of these items were sent to the Chief Medical Officer, the Director of Health, doctors, medical laboratories and institutions, the Customs and Excise Department, and the Ministry of Health. The presence of some mercury containing medical devices was indicated, however the number could not be confirmed. Therefore, the default calculations available in the Toolkit spreadsheet were used to estimate the mercury releases from these devices. A certainty assessment of the data used for this sub-category is shown in Table 24. The 2015 population data and the electrification rate were used to determine releases as shown in Table 25.

Table 24: Certainty assessment of data used in the inventory for manometers and gauges

Data Type	Assessment	Reason/Comment

Activity Data	Low	Based on default factors using population data and electrification rate.
Input Data	Low	Based on the default factor used in the Toolkit spreadsheet.
Output Data	Low	Based on the Toolkit's default output distribution factors.

The actual impact on mercury releases from the use and disposal of mercury containing manometers and gauges could not be determined. More research should be conducted to determine the actual number of manometers and gauges in use in the country in order to more accurately assess mercury impacts from this sector.

Table 25: Analysis of mercury input and output factors for manometers and gauges with mercury

Use and Disposal of Manometers and Gauges with Mercury	Unit	Use and Disposal of Manometers and Gauges
Activity rate	inhabitants	54,288
Input factor for phase	electrification rate (%)	95
	g Hg/y*inhabitant	0.005
Calculated input to phase	kg Hg/y	0.26
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	0.03
- Water	kg Hg/y	0.08
- Land	-	-
- Products	-	-
- General waste treatment	kg Hg/y	0.16
- Sector specific waste treatment	-	-

2.5.3 Laboratory Chemicals and Equipment with Mercury

Mercury is used in laboratories as instruments, reagents, preservatives and catalysts, such as mercury electrodes. Mercury has also been commonly used in thermostat equipment, whether as a component in electrical switches or as a major component for the thermostat function. For example, mercury may be used in "accustat" thermostats to

switch on and off the electrical flow, or in mercury thermostat probes (UNEP, 2017a). Most of the mercury in labs is released into wastewater and general waste, but some may be released via laboratory vents.

Data Collection and Assessment

Questionnaires to determine the use of mercury in laboratories were sent to the Chief Medical Officer, the Director of Health, doctors, medical laboratories and institutions, the Customs and Excise Department, and the Ministry of Health.

According to the Customs and Excise Department's data sheet, 431 mercury containing thermostats were imported in 2015, primarily from Puerto Rico. The mercury content in these thermostats was not available. Quantities of mercury containing lab chemicals and other equipment used in laboratories in Saint Kitts and Nevis could not be obtained.

As such, the default calculations available in the Toolkit spreadsheet were used to estimate the mercury releases from lab chemicals and equipment. The 2015 population data and the electrification rate were used in the calculations. Table 26 shows the certainty of data used in the inventory.

Table 26: Certainty assessment of data used in the inventory for laboratory chemicals and equipment

Data Type	Assessment	Reason/Comment
Activity Data	Low	Based on default factors using population data and electrification rate.
Input Data	Low	Based on the default factor used in the Toolkit spreadsheet.
Output Data	Low	Based on the Toolkit's default output distribution factors.

Table 27 indicates the mercury input and output factors for laboratory chemicals and equipment with mercury.

Table 27: Analysis of mercury input and output factors for laboratory chemicals and equipment with Hg

Use and Disposal of Laboratory Chemicals and Equipment with Mercury	Unit	Use and Disposal		Sum of releases to pathway from assessed part of life-cycle
		Laboratory Chemicals	**Other Laboratory Equipment**	

Activity rate	inhabitants	54,288	54,288	-
Input factor for phase	g Hg/y*inhabitant	0.01	0.04	-
Calculated input to phase	kg Hg/y	0.52	2.06	2.58
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	0.68	0.85
- Land	-	-	-	-
- Products	-	-	-	-
- General waste treatment	kg Hg/y	0.17	0.68	0.85
- Sector specific waste treatment	kg Hg/y	0.18	0.70	0.88

2.6 Data and Inventory on Waste Incineration and Burning

No data was received to indicate that official incineration of general waste, hazardous waste or sewage sludge occurs on the island. A waste oil incinerator is present at the Nevis Solid Waste Management Authority (NSWMA) Landfill, but it is currently not in operation.

Based on the feedback from the Solid Waste Management Corporation (SWMC), it was noted that small fires or underground burn do occur at both the Conaree Landfill Site and the NSWMA Landfill; however, no further information was available on the frequency of such occurrences or on how they are managed. Therefore, no data could be entered into the Toolkit to account for this.

In terms of medical waste incineration, it was noted that the Joseph N. France (JNF) General Hospital, Buckley's Site, Basseterre, Saint Kitts has a *MediBurn 30* diesel-powered, dual chamber combustion incinerator. However, the incinerator is not currently in use due to difficulties experienced during its operation. It was only used twice in 2 years, and no records of the quantities of waste incinerated while it was operational were kept (Caribbean Public Health Agency [CARPHA], 2017).

Medical waste is still burned on the JNF General Hospital grounds in an informal oven (shown in Figure 9) that operates approximately 3-4 times per week. No data was available on the quantities of waste burned.

Figure 9: Burning of waste takes place in an informal oven at the JNF Hospital site (Picture taken in September, 2017 by the National Project Coordinator under the MIA Project)

According to CARPHA (2017), in Saint Kitts, the Ross University also collects medical waste and animal carcasses for incineration. The incinerator used is a diesel-powered Kirk Enterprises Inc. pathological waste incineration unit with a batch load capacity of 500 pounds. The incinerator is in operation 3-5 times per week; however, data on the quantities of waste burned could not be obtained.

Additionally, medical waste from the Alexandra Hospital, Charlestown, Nevis is handled by the Medical University of America's Ltd., Potworks Estate, Nevis, where it may be incinerated. However, no further information on this could be obtained.

In the future, further investigations should be conducted to better estimate the mercury input from this sector.

2.7 Data and Inventory on Waste Disposal, Deposition/Landfilling and Wastewater System/Treatment

2.7.1 Waste Deposition and Landfilling

Under the Saint Christopher and Nevis Solid Waste Management Corporation Act (1996), the Solid Waste Management Corporation (SWMC) was established to manage solid waste for the country. The SWMC is now guided by the amended Solid Waste Management Act (2009); and the Nevis Solid Waste Management Authority (NSWMA) was developed to manage the solid waste for Nevis.

Mercury in waste is typically secondarily sourced from discarded end-of-life MAPs, such as light sources, batteries, cosmetics, medical devices and lab equipment; and industrial wastes from processes such as cement production, oil refining and incineration (UNEP, 2017a).

Saint Kitts

In Saint Kitts, the Conaree Sanitary Engineered Landfill is the main waste disposal site. It is located on the eastern side of Saint Kitts and is bound by the Greatheeds Pond in the north; the Canada Hills in the west; the Conaree Hills and the community of Upper Conaree in the south; and the Atlantic Ocean to the east.

Prior to the development of the engineered landfill, the site was known as Conaree Dump, spanning an area of 24 hectares. The majority of the dump site consisted of a mixture of different types of refuse deposits, with surface refuse cover averaging 2.5 metres above the natural gradation of the land in some areas. The total quantity of surface refuse was estimated to be 117,000 cubic metres (m^3). During the development of the engineered landfill, approximately 98,000 m^3 of this refuse and other subsurface deposits were excavated and consolidated in a central depository which was capped.

An engineered cell of 115,000 m^3 was developed in an area of the dump site which was relatively devoid of refuse deposits. The cell was excavated out of the earth as a large, shallow cavity, with sloped sides and a flat base which were lined with a continuous sheet of 60 mil High Density Polyethylene (HDPE). Further, protective layers of geotextile, compacted sand and stone were also included in the design. A leachate collection system

and a drainage layer were installed to allow for leachate to be collected and possibly pumped through a leachate treatment system (pending further upgrades). A perimeter berm surrounds the landfill cell.

The engineered landfill was opened in 2002 and was expected to provide a 15-year capacity for waste disposal. The landfill consisted of a 2-phase development design, with the first phase providing for 7 years of waste storage, followed by further installations to provide an additional 8 years of waste storage. Currently, implementation of the second phase and additional future waste management plans and policies, is under consideration.

A vehicle weighbridge system is also in operation at the landfill site to allow for the collection of data on the weights of waste deposited and to assist in the development of a cost recovery system that will facilitate the introduction of a tipping fee.

The current Conaree Landfill functions to provide a safe and secure disposal facility for waste generated within Saint Kitts, as well as waste from cruise ships and the commercial ports of Basseterre. The landfill was designed on the assumption that the majority of incoming deposits would be household waste, solid waste, and non-hazardous, commercial and industrial wastes. Table 28 shows a rough estimate of the composition by weight percentage of solid waste currently being accepted into the landfill based on information from SWMC.

Table 28: Percent composition by weight of solid waste from local sources

Types of Waste	Percentage Composition of Solid Waste (by weight %)
Hospital	0 – 5%
Municipal/Household	> 50%
Hazardous	0 – 5%
Industrial	5 – 15%

Provisions were also made for receiving and storing limited quantities of other wastes including waste oils, used vehicle tyres, spent vehicle batteries, sewage (night soil) waste, white goods and construction debris. The on-site structures built for these other wastes

include a waste oil storage tank, a hazardous waste storage shed, a general materials storage shed, a night soil pond, a concrete chamber for battery storage, and a concrete oily water separation system. Batteries and scrap metal recycling have also been noted to take place on-site.

Table 29 shows the estimated average quantities of waste generated per year at the Conaree Landfill, inclusive of cruise ship waste which is privately collected and transported to the landfill and mainly consists of glass and cardboard boxes.

Table 29: Estimated annual waste generated at Conaree Landfill by primary category (t/y)

Waste Category	Estimated Annual Quantity of Waste Generated, tonnes per year (t/y)
Household	43,800
Commercial/ Industrial	40
TOTAL	**43,840**

Nevis

The NSWMA Landfill is located at Low Ground, Long Point Road, Nevis and has been in operation for 17 years. Currently, the landfill is a controlled site, and NSWMA is responsible for the management of the landfill, the collection of waste, and the identification and separation of the different types of waste.

The site is separated into a landfill cell, areas for designated storage of different types of waste, a weighbridge to measure the volumes of incoming waste and an area previously used as a dump site which was closed off in 2001 after the development of the cell. Household wastes are deposited in the cell and covered with soil daily. There are also designated areas for storage of used tyres and general areas for other wastes, such as white goods, scrap metal, derelict vehicles and electronic waste. An area for burial of dead animals also exists. Hazardous waste is stored separately in a shed, and sewage is contained in a sewage tank. An oil incinerator is also present on-site but is currently not in operation.

It is estimated that wastes from construction and demolition activities account for 63% of landfill waste generated. This is followed by commercial waste (18%), household waste (9%), green waste (7%) and industrial waste (3%).

NSWMA noted that the landfill cell was initially expected to have a 15-year lifespan but has been in operation past that timeframe. This has led to an overflow of waste deposits. Numerous fires over the years have also occurred which destroyed the vents that were put in place to alleviate issues, such as methane production.

Data Collection and Assessment

Questionnaires were developed and distributed to the SWMC and the NSWMA. All background information for this section was provided from the detailed questionnaire responses from both authorities. Table 30 indicates the average tonnage of waste generated by both of the main landfills for Saint Kitts and Nevis. Conaree Landfill, responsible for Saint Kitts' waste deposition, accounts for approximately 71% of the total average, while the landfill in Nevis accounts for the remaining 29%.

While illegal dumping is strictly prohibited in and around the landfill sites, informal dumping may still occur in other areas; however, no information was available to confirm this.

Table 30: Average annual waste generated in Saint Kitts and Nevis (t/y)

Landfill	Average Annual Waste Generated, tonnes/year (t/y)
Conaree (Saint Kitts)	43,840.0
Low Ground (Nevis)	18,248.4
TOTAL	**62,088.4**

Test of Waste Default Factors

In this inventory, default input factors were used for the estimation of mercury releases from general waste treatment. The default factors were based on literature data of mercury contents in waste, and these data were only available from developed countries. The following test of the results was performed to qualify the results for these sources.

The test made for general waste compares the calculated inputs to all relevant general waste sub-categories; i.e. controlled landfills/deposits (E68)[3], with the sum of general waste outputs from the intentional use of mercury in products and processes (J37 to J56, where relevant) using data from the Inventory Level 2 Spreadsheet.

The test was done as follows;

$$\text{Tab "Level 2-Summary": } E68 > 2*(J24 + \Sigma(J37 \text{ to } J56))$$

$$3.14 \text{ kg} > 2*(17.39 \text{ kg})$$

The derived expression is false as 3.14 kg is less than 34.78 kg. Therefore, the calculations made indicate that the default input factors for general waste do not necessarily over-estimate the mercury releases from these sub-categories. It is important to note, however, that there are data gaps for mercury releases from several categories of products and processes, and the quantities of general waste disposed through incineration of municipal/general waste, informal waste burning and informal dumping were not determined. This assessment should be updated when new information is obtained.

An assessment of the certainty of the data received is provided in Table 31.

Table 31: Certainty assessment of data used in the inventory for waste deposition and landfilling

Data Type	Assessment	Reason/Comment
Activity Data	High	Data was received from the Saint Kitts SWMC and the NSWMA. Due to the use of weighbridges at both landfills, it can be assumed that the average data received is accurate.
Input Data	Low	Based on the default factor used in the Toolkit spreadsheet.
Output Data	Medium	Based on the Toolkit's default output distribution factors.

Table 32 provides a summary of the inputs and estimated releases of mercury due to waste landfilling for Saint Kitts and Nevis.

Table 32: Analysis of mercury input and output factors for waste deposition and landfilling

[3] Values refer to the cells used from the Level 2-Summary sheet in the Inventory Level 2 Spreadsheet. The full spreadsheet is available in Annex 3 of this report.

Controlled Landfills/Deposits	Unit	Deposition
Activity rate	t waste landfilled/y	62,088.4
Input factor for phase	g Hg/t waste dumped	5
Calculated input to phase	kg Hg/y	310.44
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	3.10
- Water	kg Hg/y	0.03
- Land	-	-
- Products	-	-
- General waste treatment	-	-
- Sector specific waste treatment	-	-

2.7.2 Informal Dumping of General Waste

This relates to the disposal of general waste in the absence of safeguards preventing the release of pollutants into the environment (UNEP, 2017a). Though illegal, informal dumping has been noted to occur in Saint Kitts and Nevis. Residential, green and construction waste represent the major waste types dumped. The amount of general waste informally dumped was unable to be quantified at the time of the inventory, and it is unknown whether this practice presents a potential mercury danger to groundwater or the local community.

2.7.3 Wastewater System/Treatment

Mercury in wastewater originates from two main source groups:

- Intentionally used mercury in products, such as dental amalgam, thermometers and other devices, and processes, such as industrial discharges; and

- Atmospheric mercury originating from both natural and anthropogenic sources that is washed out by precipitation and which goes into storm drains.

Therefore, wastewater systems are an intermediate mercury release pathway, where the mercury will either be released into the waterways after treatment of wastewater, distributed through sludge as fertiliser on land or deposited as waste at the landfill (UNEP, 2017a).

Wastewater treatment processes can include different stages - primary (involves mechanical filtration of debris, sand and sludge); secondary (involves clarification and disinfection through processes involving chlorine or ultraviolet light); and tertiary (involving nutrient removal).

In Saint Kitts and Nevis, domestic wastewater is traditionally treated on-site with the use of septic tanks and soak-away pits. Due to the small population and limited commercial and industrial activities, there are no municipal or central wastewater systems in place except for a wastewater treatment plant that was introduced by the Saint Kitts Marriott Hotel in Frigate Bay, Saint Kitts. Based on 2012 data, it was estimated that the hotel treated an average of 272,800 m^3 of wastewater annually, of which 87% was re-utilised after treatment for irrigation of the hotel's golf course (Chapman et al., 2012).

Wastewater sewage from municipal and commercial areas is typically disposed of through a collection system, where it is deposited in sewage tanks at the designated landfills. Grey water from municipalities is disposed of directly to oceans. Some businesses recycle their wastewater for flushing bathrooms. Industrial wastewater is managed by the industrial companies and treated before being deposited to oceans via drains (Chapman et al., 2012).

The Department of Environment under the Ministry of Agriculture, Human Settlement, Cooperatives and Environment is responsible for monitoring the wastewater streams from commercial and domestic wastewater systems to ensure that they operate efficiently and meet the discharge standards so as to protect underground freshwater resources and the marine environment. The Water Services Department has also partnered with stakeholders to provide training in the environmentally sound construction and

management of septic tanks (Ministerial Address by Minister of Public Infrastructure, the Honourable Ian “Patches” Liburd, 2017).

Data Collection and Assessment

Questionnaires were sent to the wastewater treatment plant in operation in Saint Kitts, but no responses were obtained. All information for this section was obtained from previous research conducted using 2012 data by Chapman et al. (2012). Further investigations should be conducted to obtain up-to-date data.

Test of Wastewater Default Factors

In this inventory, default input factors were used for the estimation of mercury releases from wastewater treatment. The default factors were based on literature data of mercury contents in wastewater, and these data were only available from developed countries. The following test of the results was performed to qualify the results for these sources.

The test made for wastewater compares the calculated inputs to wastewater treatment (E72)[4] with the sum of outputs to water from the intentional use of mercury in products and processes (G37 to G56, where relevant) using data from the Inventory Level 2 Spreadsheet.

The test was done as follows;

$$\text{Tab "Level 2-Summary": } E72 > 2*(G24 + \Sigma(G37 \text{ to } G56))$$

$$1.43 \text{ kg} > 2*(6.51 \text{ kg})$$

The derived expression is false as 1.43 kg is not greater than 13.02 kg. Therefore, the calculations indicate that the default input factor for wastewater treatment does not necessarily over-estimate the mercury releases from these sub-categories. It is important to note, however, that there are data gaps for mercury releases from several categories of products and processes, and this assessment should be updated when new information is obtained.

[4] Values refer to the cells used from the Level 2-Summary sheet in the Inventory Level 2 Spreadsheet. The full spreadsheet is available in Annex 3 of this report.

The following table (Table 33) summarizes the mercury inputs and releases to Saint Kitts and Nevis from wastewater systems and treatment.

Table 33: Analysis of mercury input and output factors for wastewater systems and treatment

Wastewater System/Treatment	Unit	Operation of Wastewater Systems
Activity rate	m^3 wastewater/y	272,800
Input factor for phase	mg Hg/m^3 waste	5.25
Calculated input to phase	kg Hg/y	1.43
Output distribution factors for phase:		
- Air	-	-
- Water	N/A	0.9
- Land	-	-
- Products	-	-
- General waste treatment	N/A	0.1
- Sector specific waste treatment	-	-
Calculated outputs/releases to:		
- Air	-	-
- Water	kg Hg/y	1.29
- Land	-	-
- Products	-	-
- General waste treatment	kg Hg/y	0.14
- Sector specific waste treatment	-	-

2.8 Data and Inventory on Crematoria and Cemeteries

Mercury may be released to air from crematoria during the cremation process and to land from cemeteries when corpses decay after burial. This is due to the presence of dental amalgam fillings in the corpses' teeth and small amounts of mercury accumulated in body tissue from the consumption of contaminated fish over time and the use of products containing mercury (UNEP, 2017a).

In 2015, the number of deaths registered for Saint Kitts and Nevis was 370, with approximately 70% of those deaths being registered in Saint Kitts and the remainder in Nevis. Of the registered deaths, it is estimated that 345 corpses were buried, while the remaining 25 were cremated.

It was also noted that Saint Kitts has a large population of vervet monkeys *(Chlorocebus aethiops)* which have been known to cause damage to crops and pose a challenge to food production. The Saint Kitts and Nevis Ministry of Agriculture, as of 2010, embarked on solutions to the monkey issue. This included allowing behavioural science and biomedical research institutions to purchase and use monkeys in research, and testing for pharmaceutical and biotech corporations (NevisBlog, 2012). There may have been mercury present in the pharmaceuticals or amalgams used on the monkeys which may be a minor source of mercury released to the environment when the animals are buried. Further information on this was not available.

In both Saint Kitts and Nevis, there are 14 cemeteries, many of which are located near to the coast. The proximity of cemeteries to coastlines may be a potential source of mercury in the oceans, as mercury released into the ground during the decay process can be leached into groundwater and the ocean.

Currently, 1 crematorium exists in the nation in Lime Kiln, Basseterre, Saint Kitts. Cremations are becoming more popular due to its cost-effectiveness. A questionnaire sent to the crematorium confirmed that for the year 2015, 25 bodies were cremated at the funeral home's on-site crematory. According to CARPHA (2017), the crematorium uses a B&L Cremation Systems Inc. Cremation Retort, Model - N20SA and Serial – 1567-1350-15 which utilises propane gas as fuel and has been in operation for 2 years.

Data Collection and Assessment

Data on the number of deaths registered by parish was received from the Statistics Department. A questionnaire was sent to the funeral homes, and follow-up interviews were conducted. The assessment of the certainty of data collected is shown in Table 34. As no data was available on the cremation process or on the estimated amount of mercury present per corpse in Saint Kitts and Nevis, default input factors provided by the Toolkit spreadsheet were used to estimate releases as shown in Table 35.

Table 34: Certainty assessment of data used in the inventory for crematoria and cremation sectors

Data Type	Assessment	Reason/Comment
Activity Data	High	Data was received from the Saint Kitts Statistics Department and the crematorium.
Input Data	Low	Based on the default factor used in the Toolkit spreadsheet.
Output Data	Medium	Based on the Toolkit's default output distribution factors.

Based on the data obtained, crematoria and cemeteries accounted for 0.92 kg of mercury releases in Saint Kitts and Nevis for 2015.

Table 35: Analysis of mercury input and output factors for crematoria and cemeteries

Crematoria and Cemeteries	Unit	Crematoria	Cemeteries	Sum of releases to pathway from assessed part of life-cycle
Activity rate	corpses cremated/y	25	-	-
	corpses buried/y	-	345	
Input factor for phase	g Hg/corpse	2.5	2.5	-
Calculated input to phase	kg Hg/y	0.06	0.86	0.92
Output distribution factors for phase:				
- Air	N/A	1.0	-	-
- Water	-	-	-	-
- Land	N/A	-	1.0	-
- Products	-	-	-	-
- General waste treatment	-	-	-	-
- Sector specific waste treatment	-	-	-	-
Calculated outputs/releases to:				
- Air	kg Hg/y	0.06	-	0.06

- Water	-	-	-	-
- Land	kg Hg/y	-	0.86	0.86
- Products	-	-	-	-
- General waste treatment	-	-	-	-
- Sector specific waste treatment	-	-	-	-

2.9 Stocks of Mercury and/or Mercury Compounds, and Storage Conditions

As per Article 3 of the Minamata Convention on Mercury, each Party shall endeavour to identify individual stocks of mercury or mercury compounds over 50 metric tonnes, as well as sources of mercury supply generating stocks exceeding 10 metric tonnes per year, that are located within its territory.

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.

Saint Kitts and Nevis does not have any notable stocks of mercury and/or mercury compounds as the largest sources of mercury are due to the use and disposal of MAPs.

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

Under Article 3 of the Minamata Convention, “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.

Based on the inventory, it was determined that no significant sources of (nor recycling activities of) mercury and mercury compounds are present in Saint Kitts and Nevis and therefore the interim storage provisions outlined in Article 10 of the Minamata Convention are not applicable.

2.11 Impacts of Mercury on Human Health and the Environment

Mercury is noted to be toxic to humans and the environment when it forms the organic compound, methylmercury. The process of methylation, whereby mercury is converted to methylmercury, varies widely across various landscapes and within waterscapes. Areas that are particularly sensitive to mercury deposition generally represent aquatic ecosystems or have an aquatic connection within the food web. Methylmercury tends to bio-magnify in food webs and bioaccumulate over time in organisms which are then consumed by humans. Fish from the sea or freshwater systems can be a major source of methylmercury, and it has been determined that generally, predatory species that are long-lived and grow larger can contain higher levels of methylmercury, though it may vary from species to species (BRI, 2018).

Methylmercury is a neurotoxin which can cause physiological harm and behavioural disorders in people. As stated in Section 1.3 of this report, previous studies in Saint Kitts and Nevis and the wider Caribbean showed that Caribbean women had higher mercury blood concentration levels than women of similar ages in Canada and the United States of America. This may be due to the increased consumption of local fish species contaminated by methylmercury.

The indication that mercury may have effects on human health and ecology in Saint Kitts and Nevis demonstrates a need for further investigation into the quantities of mercury being released into the environment in order to fully understand what should be done to eliminate this toxic metal and reduce its impacts. Chapters 4 and 5 of this report give further detail on the risks of exposure to mercury by the population of Saint Kitts and Nevis.

Chapter 3: Policy, Regulatory and Institutional Framework Assessment

An assessment of the policy, regulatory and institutional framework was conducted by a legal consultant hired under Component 2 of the MIA project, Dr Winston McCalla. The following has been extracted from Dr McCalla's Report, "Assessment of, and Recommendations for, the Legislative and Institutional Framework in Relation to the Implementation of the Minamata Convention on Mercury in Jamaica, Saint Kitts and Nevis, Saint Lucia and Trinidad and Tobago", 2018.

3.1 Assessment of Policy

This section deals with policies that are related to mercury or potentially related to mercury. There are no specific policies that address chemical management or hazardous waste management in Saint Kitts and Nevis. The general environmental policies are however, relevant.

National Adaptation Strategy (2006-2017)

This strategy focuses on:

- maintenance of macro-economic stability to reduce vulnerability and facilitate investment;
- improvement of competitiveness in the production and export of goods and services;
- adaptation of social policies to support economic development and protect the most vulnerable;
- promotion of a sustainable development agenda;
- restructuring and transformation of the economy;
- development of appropriate legal and regulatory frameworks; and,
- efficient provision of public goods (such as education and health).

The National Adaption Strategy broadly supports the obligations of the Minamata Convention which relate to the promotion of the sustainable development agenda.

National Physical Development Plan (2006-2021)

The Saint Kitts and Nevis National Physical Development Plan (2006-2021) [NPDP] describes the policy directions that the Government of Saint Kitts and Nevis will take towards the realization of the achievement of sustainable development goals. The NPDP looks at sustainable development policies for the different sectors of the economy against the dual backdrop of a proposed “growth pole” strategy and environmental concerns. It describes what the Government has done for sustainable development and what it proposes to do to ensure the continued growth of the economy, the protection of the environment and the provision of an improved quality of life for its citizens in the future.

The control of mercury releases to land and the identification of potentially mercury-contaminated sites or areas of high mercury sensitivity would also be promoted under this Plan.

National Implementation Plan for the Management of Persistent Organic Pollutants

The Saint Christopher (Saint Kitts) and Nevis Persistent Organic Pollutants (POPs) National Implementation Plan is an all-inclusive strategic policy document, the purpose of which is to construct an effective POPs management system through the application of a sustainable policy to protect human health and secure environmental protection as defined in the Stockholm Convention. Under the Stockholm Convention, provisions are made to assist countries with acting to reduce and eliminate the releases of these chemicals by providing the required technical and financial resources. The Convention has identified that:

1. POPs pose significant threats to human health and the environment in Saint Kitts and Nevis;
2. Saint Kitts and Nevis is a Small Island Developing State (SIDS) that does not manufacture any of the groups of POPs and other toxic chemicals under control by the Stockholm Convention but may be unintentionally producing POPs; and
3. It is possible that Saint Kitts and Nevis may be utilizing POPs, other toxic chemicals of this nature and equipment containing POPs.

As a Party to the Stockholm Convention, there are specific obligations which must be met, and thus, several actions must be taken. The management of POPs and the National Implementation Plan may also be relevant to the management of mercury as both are classified as hazardous chemicals. A multi-pollutant management approach can be considered.

National Environmental Management Strategy and Action Plan (2005-2009)

The Saint Kitts and Nevis National Environmental Management Strategy (2005-2009) sets out actions and strategies to guide agencies in implementing the principles of the St. George's Declaration (2000), the benchmark environmental management framework in the OECS region. The Strategy sets out forty-eight (48) environmental management strategies arranged in sections corresponding to seventeen (17) of the Declaration's twenty-one (21) principles, as well as specific activities that support these strategies and the agencies responsible for implementing them. The Strategy is intended to "guide programmes in environmental management over the long term." At the end of its five-year period of applicability, agencies are expected to review progress on implementation and plan for another five-year cycle.

Objectives of relevance include:

- Integration of environmental considerations into national development policies, plans and programs, specifically:
    a) Pursuit of "sustainable development policies aimed at... the conservation of biological diversity, the mitigation of adverse effects of climate change and the maintenance of essential ecological processes and life support systems."
- Improvement of legal and institutional frameworks, specifically:
    a) The clarification and rationalization of regional and national environmental agencies – and the creation of new agencies where necessary – to maximize efficiency and accountability in management of the environment and natural resources; and

b) The development, integration, strengthening and enforcement of environmental legislation to implement the Principles of the St. George Declaration.

- Protection of cultural and natural heritage, specifically:

  a) The institution of "appropriate measures, including legislation, to provide for the researching, documenting, protecting, conserving, rehabilitating and management of areas of outstanding scientific, cultural, spiritual, [and] ecological significance."

In the reviews and updates of the Strategy and Plan, it should be ensured that the relevant aspects for the successful implementation of the Minamata Convention on Mercury are considered.

Medium-Term Economic Strategy

The Medium-Term Economic Strategy Paper sets out policies and approaches which the Government of Saint Kitts and Nevis will pursue to sustain growth and development. The plan identifies tourism as the "main engine of economic growth." It also notes that the Government is wholly committed to sustainable development, and that there is a need for legislation that will address coastal zone and watershed management.

Medium Term Objectives of relevance to the Minamata Convention include:

- Promotion of sound environmental practices through enforcement;
- Adherence to all international environmental conventions;
- The institutionalization of greater capacities at the Department of the Environment;
- With regard to fisheries, the development of an effective monitoring, surveillance, and enforcement programme; and
- Also, with regard to fisheries, the promotion of scientific research.

3.2 Assessment of Legislation

This section reviews the legislation related to mercury or potentially related to mercury.

3.2.1 Saint Kitts and Nevis Legislation

National Bureau of Standards Act, Act 7 of 1999

The National Bureau of Standards Act makes provisions for the preparation, promotion and control of standards in relation to commodities, services and practices, and also establishes a National Bureau of Standards.

The functions of the Bureau of Standards are broadly set out in Section 4 of the Act. These are broad functions which include the following:

- to prepare, promote and generally adopt standards on a national, regional or international basis relating to structures, commodities, materials, articles and other things offered to the public commercially;
- to promote standardization, quality assurance and simplification in industry and commerce;
- to maintain testing laboratories for the purpose of testing and providing facilities for examining commodities, products, materials, processes and practices, and in so doing, conduct such research and investigations as may be necessary;
- to certify those products, commodities and processes that conform to national standards; and
- to coordinate the efforts of producers and users of materials, products, appliances, processes and methods for the improvement of the materials, products, appliances, processes and methods.

Under Section 18 of the Act, inspectors (appointed under Section 17) have wide powers to enter premises where commodities with mandatory standards are manufactured, prepared, packaged, stored, or kept for export or imported for sale. The inspectors are also empowered to test the content (including mercury content) of any commodity detained by them in accordance with Section 18 and to take samples of such commodities.

Under section 28, the Minister may prohibit the sale or importation of a commodity for sale if the commodity is proved by a laboratory to be unsafe for use.

Pesticides and Toxic Chemicals Control Act, Chapter 9:18

The Pesticides and Toxic Chemicals Control Act provides for regulation and control of importation, storage, manufacture, sale, transportation, disposal and use of pesticides and toxic chemicals. The Act also provides for the establishment of a Pesticides and Toxic Chemicals Control Board.

Under Section 5 of the Act, the functions of the Pesticides and Toxic Chemicals Control Board (hereinafter referred to as the Board) include the following:

- to determine any application submitted to it for registration, licensing or the issuance of research permits; and
- to grant or cancel any registration, licence or permit in accordance with the Act.

Medical examiners appointed under Section 10(1) of the Act have wide powers under Section 13(1) of the Act to inspect and examine vehicles, land or premises, and to ensure compliance with the Act.

Under Section 15(1)(a) of the Pesticides and Toxic Chemicals Control Act, no person shall manufacture, import, sell, store in marketable quantities or transport a controlled product unless that controlled product is regulated under the Act.

By Section 5(1)(b), there is a restriction on importing controlled products into Saint Kitts and Nevis without a licence. In accordance with Section 15(1)(c), storage of a controlled product in marketable quantities is not allowed unless the premise where the controlled product is stored is licensed in accordance with the Act.

Section 15(4) provides that a “controlled product” includes a pesticide, toxic chemical or any other substance or product specified in the Second Schedule to the Act.

The second Schedule includes mercuric chloride. Thus, the provisions of Section 15 regarding the restriction on the manufacture, import, sale, and storage of a “controlled

product" would apply to mercuric chloride. It is to be noted that there are the following limitations on Section 15:

a) it does not apply generally to mercury and mercury related compounds but only to mercuric chloride;

b) Section 45 applies to imported items but does not extend to exports; and

c) Section 15 would permit the registration of mercuric chloride.

In regard to the storage of controlled products, only mercuric chloride is included under this Act, and only when the storage is in marketable quantities.

Section 15 does not impose any general restriction on mercury-related products and would therefore need to be amended to restrict the import or export of mercury-related products.

Under Section 17 of the Act, any substance or product specified in the third Schedule to this Act is hereby declared a prohibited substance or product. By Section 17, no person shall import into Saint Kitts and Nevis any substance or product that is declared a prohibited substance or product. The relevant Minister (under Section 17[3]) may, on the recommendation of the Board, amend the third Schedule to this Act and, such order may provide for the withdrawal from sale or use, and disposal of any substance or product added to the third Schedule to this Act. MAPs are not currently covered under the third Schedule. However, the third Schedule could be amended to include these items.

Solid Waste Management Act, 2009 (11 of 2009)

The Solid Waste Management Act, 2009 was enacted for the management of solid waste in conformity with best environmental practices. The Act also establishes a Solid Waste Management Corporation (SWMC).

Under Section 4 of the Act, the Corporation is generally responsible for overseeing the management of solid waste collection and disposal systems in the islands of Saint Kitts and Nevis. In addition, under Section 4, the Corporation has a wide range of functions including the following:

- to develop and manage new sanitary landfill sites and other disposal methods;

- to provide facilities for the treatment and disposal of medical and hazardous waste; and
- to prepare plans and programmes to address the problems of solid waste management.

Section 15 of the Act requires the Corporation to undertake and complete an inventory to characterize the solid waste generated in Saint Kitts and Nevis. Section 15(4) also requires that the Corporation prepare a National Waste Management Strategy.

By Section 29(1), no person shall import into Saint Kitts and Nevis any waste other than:

- waste governed by the Merchant Shipping Act imported under conditions authorized by that Act;
- waste generated on board any aircraft landing in Saint Kitts and Nevis no earlier than 24 hours before the time of such landing; and
- any secondary resource which is imported under conditions prescribed by regulations for the purposes of any manufacturing process.

It is to be noted that in respect of Section 29(1)(c), if there are no regulations, secondary resources cannot be imported into Saint Kitts and Nevis for purposes of a manufacturing process.

Section 29(2) makes it an offence to import hazardous waste and lists penalties for such offences. The importation of any waste other than hazardous waste is also an offence and is subject to the penalties set out in Section 29(3).

Under Section 33, waste should be stored in containers that prevent the escape of waste, liquids or objectionable levels of odour and which prevent infestation by pests or vermin.

Section 43 of the Act requires the Corporation to comply with any directives given by the Environmental Health Department regarding the management of solid waste in the interests of public health.

Under Section 29(1) of the Solid Waste Management Act, there is a prohibition on the importation of “waste”. However, Section 29(1) makes the importation of hazardous waste contrary to a Section 29(1) offence.

It is to be noted that whereas Section 29(1) refers to “waste”, Section 29(2) refers to “hazardous waste”, but the term “hazardous” is not found in Section 29(1).

Currently, whilst the use of dental amalgam has generally been phased out, there may be stocks of dental amalgam being stored in the public sector. The Corporation needs to take steps to ensure that such storage complies with Section 33 of the Act.

Under Section 84(5)(a) the Minister may, by order, delete from, vary or add to the goods, classes or description of goods prescribed in the fourth Schedule. In addition, under Section 85(5)(b), the Minister may prohibit or restrict (subject to such conditions and restrictions as the Order may impose) the importation, exportation or carriage coastline of any goods, class or description of goods specified in the Order to or from any place in Saint Kitts and Nevis. By Section 2 of the Act, “Minister” means the Minister charged with the responsibility for Customs which currently is the Minister of Finance. Section 2 of the Act defines “restricted or prohibited goods” as meaning “goods of a class or description of which the importation, exportation or carriage coastline is, for the time-being, prohibited or restricted under or by virtue of an enactment”. The effect of Section 84(5) is that the Minister of Finance is empowered by Order to add to the list of prohibited or restricted goods.

Customs (Control and Management) (Amendment) Act 2001

The Customs (Control and Management) Act provides a comprehensive legal framework for customs management in Saint Kitts and Nevis. The Act covers a range of matters: Administration (Part II); Customs Controlled Areas (Part III); Importation (Part IV); Exportation (Part V); Coastal Trade (Part VI); Warehousing (Part VII); Duties, Drawbacks, Prohibitions and Restrictions (Part VIII); Powers (Part IX); Offences (Part X); Legal Proceedings, Forfeiture, Sale of Goods (Part XI); Determination of Disputes (Part XIII); and Miscellaneous (Part XIII).

Section 84(1) provides that no goods, class or description of goods prescribed in Part I of the Fourth Schedule shall be imported into Saint Kitts and Nevis. Similar prohibitions are contained in Section 84(2), 84(3) and 84(4) in regard to goods prescribed in Part II, Part III and Part IV of the Fourth Schedule respectively. MAPs should be included under this Schedule.

National Conservation and Environmental Protection Act (NCEPA) (No. 5 of 1987)

The National Conservation and Environmental Protection Act (NCEPA) is a comprehensive environmental statute providing for, *inter alia*:

- the establishment and management of protected areas;
- the preparation of coastal zone management plans;
- the conservation of forestry, soil and water; and
- the protection of wild animals.

A 1996 Amendment provides for the entry into force of various international agreements and conventions. Of particular relevance to mercury is the Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal, under which guidelines for mercury waste are included.

The NCEPA mandates the preparation of a coastal zone management plan and regulations to control development in the coastal zone. Administrative responsibility for the Act lies with the Minister responsible for the Environment in consultation with the Conservation Commission.

Under the Act, the coastal zone extends 2 kilometres seaward of the mean low watermark and includes the foreshore and floor of the sea. The coastal zone management plan may declare protected beaches and, within areas covered by the declaration, prohibit fishing, anchoring of boats and docking of cruise ships, disposal of waste, water skiing, sand mining or dredging, or removal of “treasure or artefact” from the sea.

There is a specific provision in Section 34 for fouling or polluting the coastal zone. By Section 34(1), no person shall pollute any part of the coastal zone by depositing sewage, solid waste, garage oil or other waste in the coastal zone. Section 34(2) defines “pollute” as including “to cause such contamination or other alteration of the physical or biological properties of any part of the coastal zone as well or is likely to create a nuisance, render the area harmful, detrimental or injurious to public health, safety or welfare, or to domestic, recreational or other beneficial uses or to livestock, wild animals, plants or marine life”.

Section 63 of the Act allows the Minister to make regulations for a wide range of matters, including 63(1)(a):

> "prescribing the sanitary and clean conditions and practices to be observed at and in respect of protected areas, beaches and public places, and for prevention and punishment of environmental pollution".

However, no regulations have been made under Section 63 to address the issue of environmental pollution.

Development Control and Planning Act (2000)

The purpose of the Development Control and Planning Act (DCPA) is to assist in the orderly, efficient, and equitable planning, allocation and development of the resources of Saint Kitts. The DCPA's definition of land includes submerged land extending to seaward limit of territorial sea, which the Maritime Areas Act sets at 12 miles seaward of a landward baseline. Thus, development occurring thereon may only proceed with permission of the Development Control and Planning Board created by the Act.

The Development Control and Planning Board is also responsible for preparing development plans. Development plans may provide for zoning, allocate land for the protection of marine life and/or protect the coastal zone (defined as extending to seaward limit of the territorial sea).

In carrying out its duties (i.e. producing development plans), the Board may designate comprehensive planning areas for conservation and other purposes and may designate environmental protection areas. For both, in consultation with Minister responsible for NCEPA, the Board is responsible for developing management plans.

Management plans may contain special resources and use areas in which the Minister (in consultation with the Minister responsible for NCEPA) may permit and prohibit certain activities, such as designating protected swimming and surfing areas; designating anchoring, mooring and beaching areas; and designating where water-skiing, wind-surfing or other water sports may occur. Management plans may also arrange for protection of marine flora and fauna, and specifically provide for the regulation of hunting and fishing to achieve this purpose.

Section 51 of the Act allows the Development Control and Planning Board to prepare and submit to the Minister a draft amenity order where it considers that any land is:

a) unsightly and injurious to the amenity of the area and visible to persons using a public road or any other area to which the public has a right of access; or

b) likely to be or is offensive to persons residing in the immediate neighbourhood of such land by reason of any waste, rubbish, derelict or abandoned machinery or articles or materials of any kind, or the dilapidated state of any structure or building thereon.

An Amenity Order shall state, *inter alia*, (i) any matter that is required to be cleared; (ii) in the case of an order requiring clearance, the matter which must be destroyed, or the place, being an authorized place for the disposal of rubbish, to which it must be removed as appropriate.

By Section 51(4), where a draft Amenity Order is approved by the Minister, the approved Amenity Order shall be served on the owner or occupier of the land concerned. This Act may be of relevance if the Government decides to take measures to implement Article 12 of the Convention.

National Conservation and Environmental Management Bill (NCEMA) (Draft) 2017

This Act would allow the Minister responsible for the environment, in consultation with the Conservation Commission, to designate protected areas. Schedule 1 lays out the various classes of protected areas and their purposes. Part IV sets out requirements for the management of protected areas.

The Act also calls for the Department of the Environment's collaboration with the Department of Physical Planning and Development Control to develop strategies to promote environmentally sound and sustainable development in areas adjacent to protected areas.

The NCEMA would update and modify the NCEPA. Among other things, it provides for the development of coastal zone management plans.

Part XI of the draft Act specifically relates to pollution control.

By Section 73(1) the Minister may by regulations:

a) designate as a pollutant any substance, thing or man-made phenomenon (including energy, noise, vibration, electro-magnetic or ionizing radiation, colour or temperature variation) which, in a specified quantity, concentration or condition, is likely to cause harm to human health or affect the quality of the environment; and

b) prescribe allowable standards of pollution and, in so doing, may prescribe different-standards for the deposit, release or escape of pollutants on or into land, water or the air or within different geographical areas.

In accordance with Section 73(2), unauthorized deposition, release or escape of pollutants into the environment in excess of allowable standards of pollution applicable to the receiving environment is prohibited. However, Section 73(2) would depend on regulations having first been promulgated under Section 73(1).

Under Section 77(1), if any part of the environment is found to have been polluted before the coming into force of this Act, the Department may, by notice served under that person, require any person who it finds to have been solely or partly responsible for causing or allowing that pollution to take place to take such measures to clean up or rehabilitate the environment as the Department may specify.

By Section 79(1), the Minister may by regulations:

a) designate specific substances as hazardous substances; and

b) prescribe procedures for the safe storage, handling, use and disposal of such substances.

Under Section 92, the International Conventions listed in Schedule 2 have the force of law in Saint Kitts and Nevis. Among the Conventions listed in Schedule 2 is the Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal. As the draft Act is not yet finalized, the Minamata Convention on Mercury could be added as one of the listed Conventions.

Under Section 93, the Minister may make regulations to give effect to the International Conventions specified in Schedule 2.

Similarly, Section 98 allows the Minister to make regulations for a wide range of matters including regulations for the implementation of the environmental conventions to which Saint Kitts and Nevis is a Party.

By Section 94, the Minister may from time to time amend, add or remove any Convention in Schedule 2 by way of Notice to be published in the *Gazette.*

Public Health Act 1969

The Public Health Act makes provisions for a wide range of public health matters. By Section 2 of the Act, the Minister is vested with the following powers:

- the prevention, treatment, limitation and suppression of disease, including the conduct of investigations and inquiries in respect of such diseases;
- the publication of reports, information and advice on public health, including the education of the public and the promotion and preservation of health;
- the abatement of nuisances and the removal or correction of any condition that may be injurious to public health;
- (subject to the provisions of any law dealing with the distribution and price of goods) the importation of food and drugs and the sale and conditions of sale of foods and drugs; and
- the administration of the Act.

Under Section 2 of the Act, “nuisance” includes any act not warranted by law, or any omission to discharge a legal duty where the act or omission causes inconvenience or interferes with personal comfort or is likely to be prejudicial to public health or public safety.

Section 10 of the Act empowers the Minister to make a wide range of regulations under the Act. Among the Regulations made under the Act are the following:

- Public Health (Offensive Trades) Regulations;
- Public Health (Collection and Disposal of Refuse) Regulations;
- Food Regulations; and

- Public Health (Nevis) Regulations.

Under Regulation 6 of the Public Health (Collection and Disposal of Refuse) Regulations, the Minister may approve the installation and operation of incinerators. Regulation 8 prohibits the deposit of any discarded fluorescent lighting tubes or aerosol containers in any refuse intended or likely to be burnt, but allows for the disposal of the same by burial or in any other manner in a place approved by the Minister. By Regulation 20, no person shall burn refuse at any place or in any manner likely to create a health hazard or nuisance. In addition, Regulation 8 prohibits the burning of any material likely to cause excessive smoke or to liberate any toxic substance.

Fisheries Act, 1984

The Fisheries Act of 1984 aims to provide an institutional framework for the "management, planning, development, and conservation of fishery resources." Administration of the Act is the responsibility of the Chief Fisheries Officer, and if one is not appointed, then the Chief Agricultural Officer. Section 4 requires the Chief Fisheries Officer to "prepare and keep under review a plan for the management and development of fisheries in the fishery waters."

The Act allows for and anticipates regional cooperation in the regulation of fisheries, e.g. the Caribbean Regional Fisheries Mechanism. It allows the responsible Minister to enter into agreements with other countries or organizations in the region to collaborate in developing a uniform licensing system, enforcement mechanisms and other fisheries management systems. Any agreement entered into should be published as an order in *the Gazette* and then approved by Parliament.

Marine reserves are areas where the Minister feels that special measures are necessary to protect the flora and fauna of the designated areas, to preserve breeding grounds and habitat, to allow for natural regeneration of life, to promote scientific research, or to preserve and enhance natural beauty. Within these areas, it is illegal to take fish, destroy flora and fauna other than fish, dredge, pollute or build without prior authorization.

Regulations can set out rules for the management and protection of marine reserves and fishing priority areas.

Fisheries Regulations, 1995

The Regulations contain conservation measures for lobster, turtles, conch, coral, sponges, marine algae, sea stars and aquarium fish. The regulations also affirm that in fishery waters, no person or company may introduce pollutants, poisons or other harmful substances.

Merchant Shipping Act, 2002

The Act provides for registration of vessels, prevention of collisions and safety of navigation, the establishment and management of aids to navigation, and prevention of pollution from ships.

The Port Authority Act, 1981

The Port Authority Act creates the Saint Christopher Air and Sea Ports Authority and Nevis Air and Sea Ports Authority which are responsible for developing an integrated system of lighthouses, ports and port services, and regulating navigation to the ports.

The Port Authority, with the approval of the Minister of Finance, has the authority to make regulations concerning the:

> [...]c) controls and prohibitions on the doing or omission of anything or class of things within the limits of any port;
>
> d) the regulation, restriction and control (without prejudice to the conduct of navigation) of the depositing of any substance, solid matter, article or thing polluting or likely to cause pollution of the waters of any port; and
>
> e) the regulation of traffic and navigation of ships within the limits and approaches to a port and all matters relating to the protection of life and property.

3.2.2 Nevisian Legislation

The 1983 Constitution of the Federation of Saint Kitts and Nevis reserves certain powers to the Nevis Island Administration. The following ordinances are relevant to mercury management.

Nevis Solid Waste Management Authority Ordinance

The Nevis Solid Waste Management Authority Ordinance establishes the Nevis Solid Waste Management Authority (NSWMA) which is responsible for solid waste storage, collection, treatment and disposal in Nevis. Under Section 8 of the Ordinance, the Authority is empowered to:

- provide storage facilities for solid waste;
- develop and manage any new sanitary landfill sites and other disposal methods;
- provide facilities for the treatment and disposal of medical and hazardous waste; and
- prepare plans and programmes to address the problems of solid waste management in Nevis

Section 2 of the Ordinance defines “hazardous waste” as meaning any solid or liquid material, product, or combination of solid and liquid materials that contains highly persistent chemical elements and compounds that are likely to be hazardous to human health and the environment.

Section 10 of the Ordinance requires the Authority to comply with the provisions of the Public Health Act and any other Act relating to public health and the environment.

The Nevis Coastal Protection Levy Ordinance

The Nevis Coastal Protection Levy Ordinance allows the member of the Administration responsible for the environment to appoint an Advisory Committee to inform him or her on:

- measures for protecting coastal areas against the ravages and any other natural or man-made disasters;
- protection and preservation of the marine environment; and
- the causes, nature, extent and prevention of damage to the coastal area.

3.2.3 Minamata Convention and Saint Kitts and Nevis Legislation

This section highlights some the articles of the Minamata Convention on Mercury that may be relevant as they relate to national legislation in Saint Kitts and Nevis (Table 36).

Table 36: Overview of Minamata Convention provisions and coverage by existing legislation in Saint Kitts and Nevis

Article 2: Definitions	
Description of Article:	**Relevant Policy and Regulation Measures**
Defines relevant terms such as "mercury-added product" which means a product or product component that contains mercury or a mercury compound that was intentionally added".	This definition will need to be added to any relevant legislation which is to be enacted or amended.
Article 3: Mercury supply source and trade[5]	
Description of Article:	**Relevant Policy and Regulation Measures**
This article deals with mercury supply sources and trade, not including mercury and mercury compounds used for laboratory purposes, naturally-occurring trace quantities or mercury-added products. Mercury supply sources covered under this article include primary mercury mining and decommissioning of chlor-alkali facilities.	- Under the MIA project, it was determined that none of the mercury supply sources and relevant trade stipulated under this article are relevant to Saint Kitts and Nevis. - Considerations to amend the Pesticides and Toxic Chemicals Act Chap. 30:03 to include the provisions for the import of mercury can be made, if deemed necessary, as Section 4A (1) (d) of that Act prohibits the import, export and disposal, *inter alia*, of a "controlled chemical" without doing so in a prescribed manner. Amending the Act to take into consideration the provisions of this article should follow the usual legislative process.
Article 4: Mercury-added products *Article 2 defines "mercury-added product" as meaning a product or product component that contains mercury or a mercury compound that was intentionally added.*	
Description of Article:	**Relevant Policy and Regulation Measures / Action:**
(1) Not allow the manufacture, import, and export of products listed in Part I of Annex A not otherwise excluded following the phase out date listed in the Annex[6] (3) Phase down the use of dental amalgam through two or more measures listed in Part II of Annex A	- There is no import ban for mercury, however, there are restrictions in place regarding the import and sale of specific MAPs. - This would also be governed by the already cited section in the Pesticides and Toxic Chemicals Act Chapter 30:03. Section 4A (1) (d) of that Act prohibits the import, export and disposal, *inter alia*, of a "controlled chemical" without doing so in a prescribed manner. Amending the Act to take into consideration the provisions of this article should follow the usual legislative process. - Dental Amalgam is currently being phased out.
Article 8: Emissions *Article 8 defines "emissions" as meaning emissions of mercury or mercury compounds to the atmosphere.*	

[5] Since this checklist is primarily intended for developing countries, it is assumed that governments will desire control over individual mercury shipments entering the country and thus not provide a general notification of import consent or waive restrictions on the sources of mercury imports under Articles 3.7 and 3.9.
[6] The prohibition date must be consistent with Articles 4 and 6 of the Convention.

Description of Article:	Relevant Policy and Regulation Measures / Action:
Require control and, where feasible, reduce emissions of mercury and mercury compounds, often expressed as "total mercury" to the atmosphere through measures to control emissions from point sources falling within the source categories listed in Annex D	- Saint Kitts and Nevis does not have any Air Pollution Regulations. - This may be relevant in Saint Kitts and Nevis with respect to waste incineration facilities. - Through the MIA project, the following areas should be addressed: • Required BAT/BEP for new sources; • Emission control measures for existing sources; • Establish emissions inventory; • Identify relevant sources for releases (to water and land); • Releases control; • Establish emissions inventory;

Article 9: Releases

Description of Article:	Relevant Policy and Regulation Measures / Action:
(5) Take one or more measures below to control/reduce mercury and mercury compound releases to land and water from significant sources it identifies: • release limit values to control and, where feasible, reduce releases from relevant sources; • the use of best available techniques and best environmental practices to control releases from relevant sources; • a multi-pollutant control strategy that would deliver co-benefits for the control of mercury releases; and • alternative measures to reduce releases from relevant sources	- Saint Kitts and Nevis has a Public Health Act, but this does not expressly have any Pollution Regulations, any Water Pollution Regulations or any provisions dealing with hazardous waste. These regulations should be promulgated under the NCEMA Bill once enacted.

Article 10: Environmentally sound interim storage of mercury other than waste mercury

Description of Article:	Relevant Policy and Regulation Measures / Action:
(2) Take measures to ensure interim mercury storage is conducted in an environmentally sound manner, taking into account guidelines to be developed by the Conference of the Parties (COP)[7]	- There are no express provisions in the legislation of Saint Kitts and Nevis which deal with this matter. It should also be noted that the Basel Convention, to which Saint Kitts and Nevis is a signatory, defines "environmentally sound manner" in its Article 2, allowing for this to be incorporated into local legislation. - Under the MIA project conducted, it was determined that this article is not relevant to Saint Kitts and Nevis.

[7] The authority may address areas such as quantity limits, duration, best practices, reporting, etc.

Article 11: Mercury wastes	
Description of Article:	**Relevant Policy and Regulation Measures / Action:**
(3)(a) Take measures to manage mercury wastes in an environmentally sound manner, taking into account guidelines developed under the Basel Convention and in accordance with COP requirements to be developed. (3)(b) Take measures to restrict mercury derived from the treatment or re-use of mercury waste to allowed uses under the Convention or environmentally sound disposal (3)(c) Require transport across international boundaries in accordance with the Basel Convention, or if the Basel Convention does not apply, consistent with international rules, standards, and guidelines	- The Basel Convention addresses mercury wastes; however, Saint Kitts and Nevis has no legislation to implement the Basel Convention and no Hazardous Waste Regulations. Schedule 2 to the Draft National Conservation and Environmental Management Act lists the Basel Convention as one of the Conventions which shall have the force of law in Saint Kitts and Nevis. Thus, when this draft Act is enacted, the Basel Convention will be in force in Saint Kitts and Nevis. Further, section 93 of the draft Act would allow the Minister to make regulations in respect of the international conventions listed in Schedule 2, e.g. the Basel Convention.

Article 12: Contaminated Sites	
Description of Article:	**Relevant Policy and Regulation Measures / Action:**
(1) Develop strategies for identifying and assessing mercury/mercury compound contaminated sites	- There are no specific provisions governing contaminated sites which would be a concern to Environment Health, Physical Planning, the Department of the Environment and also the Solid Waste Management Corporation. - Under the MIA project, an assessment of potentially contaminated sites has been conducted in order to inform the Government of Saint Kitts and Nevis.

Article 16: Health Aspects	
Description of Article:	**Relevant Policy and Regulation Measures / Action:**
(1)(a) Promote the development and implementation of strategies to identify and protect populations at risk from exposure to mercury and mercury-based compounds (1)(b) Promote the development and implementation of educational programmes on occupational exposure to mercury and mercury compounds (1)(c) Promote appropriate healthcare services for prevention, treatment and care of populations affected by the exposure to mercury or mercury compounds (1)(d) Address the need to establish and strengthen the appropriate institutional and health professional capacities for the prevention, diagnosis, treatment or monitoring of health risks related to the exposure to mercury and mercury compounds	- There is no legislation in Saint Kitts and Nevis dealing specifically with occupational health, but the Public Health Act generally addresses health issues in by policies related to: • Public health; • Water; • Drinking water; • Food safety; • Occupational health and safety; and • Protecting general public vulnerable groups, and workers.

3.2.4 Gaps

There are several gaps in the existing policies and legislation regarding mercury and its environmentally sound management in Saint Kitts and Nevis. These include:

1. The Pesticides and Toxic Chemicals Control Act does not impose a clear ban on the import or export of MAPs listed in Part I of Annex A in compliance with Article 4 of the Minamata Convention. At present, Section 15(1) only applies to mercuric chloride.

2. The Pesticides and Toxic Chemicals Control Act does not expressly prohibit the manufacture of mercury and mercury compounds in compliance with Article 5 of the Minamata Convention.

3. At present, Saint Kitts and Nevis does not have any legislation dealing with air pollution in compliance with Article 8 of the Minamata Convention. However, once the National Conservation and Environmental Management Bill, 2017 is enacted, air pollution regulations could be developed and promulgated, and such regulations could deal with “emissions of mercury or mercury compounds to the atmosphere” (Article 8 (2)(a)).

4. At present, Saint Kitts and Nevis has no legislation which addresses the releases of pollutants to land or water in compliance with Article 9 of the Minamata Convention. However, once the National Conservation and Environmental Management Bill, 2017 is enacted, regulations could be developed and promulgated to deal with water pollution and pollution to land. These regulations could address releases of mercury and mercury compounds to land and water (Article 9 (2)(a)).

5. At present, the Basel Convention does not have the force of law in Saint Kitts and Nevis. However, once the National Conservation and Environmental Management Bill, 2017 is enacted, the Basel Convention will have the force of law in Saint Kitts and Nevis by the combined effect of Section 92 and Schedule 2 of the Bill. Further, by Section 93 of the Bill, the Minister may make regulations to give effect to the

implementation of the International Conventions listed in Schedule 2 (e.g. Basel Convention)**.**

Additionally, by Section 79 of the Bill, the Minister may make regulations to designate specific substances as hazardous substances and also prescribe procedures for the safe storage, handling, use and disposal of such substances. Thus, regulations could be promulgated under Section 79 to ensure environmentally sound interim storage of wastes including mercury waste to comply with Articles 10 and 11 of the Minamata Convention, if necessary.

6. There is no current legislative framework to implement the provisions of Article 11 of the Minamata Convention. Once the draft National Conservation and Environmental Management Bill, 2017 is enacted, the Basel Convention will have the force of law in Saint Kitts and Nevis. Regulations could then be made under the National Conservation and Environmental Management Bill (once enacted) to deal with the environmentally sound disposal of mercury waste.

7. There are no clear provisions in Saint Kitts and Nevis legislation to address the issue of contaminated sites in compliance with the suggestions outlined in Article 12 of the Minamata Convention. However, Section 51 of the DCPA allows for the making of an Amenity Order in circumstances where the conditions set out in Section 51(1)(a) and (b) are satisfied, namely when land is “unsightly or injurious to the amenity of the area or likely to be offensive to persons by reason of waste etc. on such land”.

   Further, Section 77(1) (a) of the National Conservation and Environmental Management Bill, 2017 provides that where any “land is found to have been polluted before the coming into force of this Act, the Department may require any person who it finds to be solely or partly responsible for causing or allowing that pollution to take place to take such measures to clean up or rehabilitate the land”.

3.3 Assessment of Institutional Framework

This section includes an assessment of some of the key institutions that are relevant to the management of mercury issues.

3.3.1 Key Institutions

Saint Kitts and Nevis Bureau of Standards

The Saint Kitts and Nevis Bureau of Standards (SKNBS) was officially established on the March 8, 1999 and has the responsibility of protecting the environment, health and safety of consumers. Its activities also focus on preparing, promoting and generally adopting standards on a national, regional or international basis relating to structures, commodities, materials, articles and other things offered to the public commercially, hence promoting standardization, quality assurance and simplification in industry and commerce.

Solid Waste Management Corporation

The Solid Waste Management Corporation (SWMC) is responsible for solid waste management on Saint Kitts. With a population of approximately 40,000 individuals on the island, the amount of disposed solid waste material is relatively high. The slightly higher rate of waste disposal in Saint Kitts than Nevis may be due to the greater influence of long-term tourism.

Nevis Solid Waste Management Authority

The Nevis Solid Waste Management Authority (NSWMA) is the agency responsible for the collection of domestic waste in Nevis. The island is divided into five (5) districts for this purpose. Four (4) districts are served directly by the Government, and the fifth, by a private contractor hired by the Government.

Department of Environment

The Department of the Environment was established to prevent, mitigate and/or reverse environmental degradation through scientific and technological methods and raise public awareness. The Department also seeks to achieve its mission by providing for the stewardship of the country's environmental resources.

The Department is the focal point for a number of multilateral environmental conventions such as the Convention on Biological Diversity, the Cartagena Protocol on Biosafety and the Nagoya Protocol on Access and Benefit Sharing.

Environmental Health Department

The Environmental Health Department is part of the Ministry of Health. At present, the Environmental Health Department relies on the Public Health Act and Regulations and the Litter (Abatement) Act to carry out its mandate. In response to pollution issues, the Environmental Health Department currently monitors the state of pollution in Saint Kitts and Nevis.

Saint Kitts and Nevis Customs and Excise Department

The Customs and Excise Department is a Government agency responsible for protecting the country from potential risks arising from international trade and travel and facilitating the legitimate movement of people and goods across the border.

The Customs and Excise Department uses intelligence and risk assessment to select and target physical checks of containers, vessels or travellers. The Customs and Excise Department also conducts investigations and audits and prosecutes offenders who breach Customs Laws and other Government regulations. Customs also exercises controls over restricted and prohibited imports, including drugs, firearms and harmful substances such as hazardous waste and ozone-depleting products.

Department of Physical Planning, Natural Resources and the Environment

The Department of Physical Planning, Natural Resources and the Environment is responsible for physical planning, development control and environmental management in Nevis.

3.3.2 Institutional Challenges and Priorities

It appears that the institutional challenges in Saint Kitts and Nevis, that may hinder the country's ability to mitigate future mercury pollution, revolve around some critical cross-cutting issues spanning three (3) broad institutional thematic areas, as follows:

- Roles of institutional arrangements for assessing the risks for unsound use, management and release of mercury into the environment;
- Coordination, coherence and synergies; and
- Data and knowledge sharing.

Initial assessment and progress on current work on the Minamata Convention on Mercury will considerably enhance national data on mercury. Table 37 below summarizes, the cross-cutting issues related to mercury under each thematic area.

Table 37: Institutional cross-cutting issues related to mercury in Saint Kitts and Nevis

Roles of Institutional Arrangements for Assessing and Managing Risks for Implementation of the Convention	**Coordination, Coherence and Synergies**
• Providing scientific advice; • Providing policy guidance; • Generating research; • Sharing research and best practices; • Generating data, observations and monitoring; and • Mainstreaming the consideration of the Minamata Convention on Mercury into existing policies and process.	• Need for better coordination between the institutions, their portfolio Ministries, Departments and Agencies.
Data and Knowledge Sharing • No overarching system, arrangement, institution or process for collecting, exchanging or disseminating relevant knowledge among stakeholders.	

Institutional mechanisms should exist at different levels within Saint Kitts and Nevis to mitigate the impact of mercury on the environment, specifically at the legislative and policy levels.

Table 38 highlights a proposed framework for addressing institutional challenges related to the implementation of the Minamata Convention on Mercury.

Table 38: Proposed institutional framework for addressing institutional challenges for the implementation of the Minamata Convention on Mercury

Area	Proposed Aim
Core Institutional Challenge	To build leadership, trust and mutual accountability in advancing the transitions to low mercury releases in Saint Kitts and Nevis.
Governance and Accountability	To establish credible, inclusive and effective governance arrangements.
Designated National Agencies	To establish a common approach to establishing nation-level co-ordination and implementation functions.
Implementation Measures	To establish flexible, inclusive approaches to developing generally-accepted methods that can support the implementation of the Minamata Convention on Mercury.

3.4 Recommendations for Policy, Legislation and Institutional Strengthening

The major recommendations for Saint Kitts and Nevis to fill the identified legislative gaps and to promote environmentally sound mechanisms for mercury management are shown in Table 39. It is suggested that these actions be completed by December, 2018.

Table 39. Legislative recommendations for Saint Kitts and Nevis

Legislation	Recommendation
Pesticides and Toxic Chemicals Control Act, Chapter 9:18	Amend to expressly: a) prohibit the manufacture of mercury and mercury compounds; and b) prohibit the import and export of mercury or mercury-added products listed in Part I of Annex A in the Minamata Convention.
National Conservation and Management Bill (Draft), 2017	Amend the Bill to include the Minamata Convention on Mercury as one of the International Conventions listed in Schedule 2.
	Enact the Bill.

	Use the provisions listed in Section 73(1) to authorize the Minister to make regulations in respect of:
	a) Air pollution (Section 73(1)(b));
	b) Water pollution (Section 73(1)(b));
	c) Releases of pollutants on land (Section 73(1)(b)); and
	d) Hazardous waste.

	The Minister should exercise the power given under Section 93 of the Bill to give effect to the International Conventions listed in Schedule 1.

Table 40 lists recommended actions that could help to fill the identified gaps in policy and legislation related to the implementation of the Minamata Convention and compliance with various Articles of relevance to Saint Kitts and Nevis.

Table 40: Overview of legislative gaps and recommendations to implement the Minamata Convention

Convention Article	Gap	Recommended Action
Article 4: Mercury-added Products	No import ban for MAPs.	The Pesticides and Toxic Chemicals Control Act needs to be amended to impose a clear ban on the import and export of mercury-added products listed in Part I of Annex A.

Article 8: Emissions	Saint Kitts and Nevis does not have any legislation dealing with air pollution.	Once the National Conservation and Environmental Management Bill, 2017 is enacted, air pollution regulations could be developed and promulgated under section 73(1)(b), and such regulations could deal with "emissions of mercury or mercury compounds to the atmosphere".
Article 9: Releases	Saint Kitts and Nevis has no legislation which addresses the releases of pollutants to land or water.	Once the National Conservation and Environmental Management Bill, 2017 is enacted, regulations could be developed and promulgated to deal with water pollution and also pollution to land under section 73(1)(b). These regulations could address releases of mercury and mercury compounds to land and water.
Article 11: Mercury wastes	The Basel Convention does not have the force of law in Saint Kitts and Nevis. There is no current legislative framework to implement the provisions of Article 11.	Once the National Conservation and Environmental Management Bill 2017 is enacted, the Basel Convention will have the force of law in Saint Kitts and Nevis by the combined effect of section 92 and Schedule 2 of the Bill. Further, by section 93 of the Bill, the Minister may make regulations to give effect to the implementation of the International Conventions listed in Schedule 2 (e.g. Basel Convention). Further, by section 79 of the Bill, the Minister may make regulations to designate specific substances as hazardous substances and also prescribe procedures for the safe storage, handling, use and disposal of such substances. Thus, regulations could be promulgated under section 79 to ensure the environmentally sound disposal of mercury waste.
Article 12: Contaminated sites	There are no clear provisions in Saint Kitts and Nevis legislation to address the issue of contaminated sites.	Section 51 of Development Control and Planning Act allows for the making of an amenity order in circumstances where the conditions set out in section 51(1)(a) and (b) are satisfied; namely where land is "unsightly or injurious to the amenity of the area or likely to be offensive to persons by reason of waste etc. on such land. Further, section 77(1) (a) of the National Conservation and Environmental Management Bill, 2017 provides that where any "land is found to have been polluted before the coming into force of this Act, the Department may require any person who it finds to be solely or partly responsible for causing or allowing that pollution to take place to take such measures to clean up or rehabilitate the land.

It is recommended that the above recommendations be implemented by December, 2018 in order to ensure the effective and timely implementation of the Minamata Convention on Mercury nationally. As Article 4 is the only article with stipulated deadlines for compliance that are relevant to Saint Kitts and Nevis, it is recommended that particular

consideration should be placed on the recommendations provided to meet these obligations.

Inter-Agency Committee

There is a need to establish an inter-agency committee for the implementation of the Minamata Convention on Mercury. The proposed representative organizations that can form this Committee are detailed below in Table 41.

Table 41: Proposed steering committee /inter-agency committee representative organizations

Proposed Steering Committee Representative Organizations	Summary of Overall Responsibilities and Potential Role under the Minamata Convention on Mercury
Bureau of Standards	• Focal point; • Policy formulation; • Implementation oversight; • Where necessary, preparation and drafting of instructions or, in appropriate cases, working with agencies that have to prepare new legislation.
Department of Environment	• Hazardous waste: ○ Assessments of the impact of mercury and other hazardous wastes on the environment.
Waste Management Corporation (Saint Kitts) Solid Waste Management Agency (Nevis)	• Proper waste disposal of mercury and mercury-related products and other hazardous materials at landfills; for example, thermometers, blood pressure gauges, dental amalgam, fluorescent lamps, batteries, etc.; • Disposal of containers; • Export wastes, where required (in accordance with the Basel Convention).

Environmental Health	• Monitors the state of:
	  ○ Water pollution;
	  ○ Air pollution;
	  ○ Food and drugs.

Customs and Excise	• Control over the import of all goods into the Federation (including mercury and mercury compounds).

Ministry of Health	• Assisting in the phase-out of Hg-added products used in the sector such as:
	  ○ Dental amalgam;
	  ○ Manometers and gauges, etc.;
	  ○ Laboratories;
	  ○ Chemicals and equipment.

Marine Resources	• Monitor fish and marine-related products for traces of mercury.
Fire and Rescue Services	• Hazard mitigation, chemical spills.

Chapter 4: Identification of Populations at Risk and Gender Dimensions

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

Exposure to elemental mercury and mercury compounds can pose a higher risk to certain populations and targeted groups that are more sensitive to its effects. These groups include:

- Women of childbearing age;
- Pregnant women;
- Foetuses;
- Newborns; and
- Young children (less than 12 years of age).

Pregnant women and women of childbearing age in Saint Kitts and Nevis are considered to be high risk groups since their exposure to mercury can impact the foetus. The sensitivity of the developing system of foetuses, newborns and young children can enhance the dangerous impacts of the toxic effects of mercury. Similarly, individuals with preconditions, such as diseases of the liver, kidney, lung and nervous system, may be at risk of suffering at this same higher intensity.

Certain groups are exposed to higher levels of mercury, either through a regular diet of fish and aquatic organisms (particularly larger predatory marine animals), occupational or environmental exposure, or through the consistent use of MAPs. Article 16 of the Minamata Convention encourages Parties to develop strategies and programmes to identify these populations at risk, including sensitive groups, to adopt science-based health guidelines and targets to reduce the negative health impacts of mercury exposure, and to increase the capacity of health-care systems to be able to better monitor, prevent and treat affected populations.

4.1.1 Mercury Exposure to Humans Through Seafood[8]

Saint Kitts and Nevis is considered a SIDS. Some of the country's population is concentrated along the coast, and fish is a staple food for most of its communities. Methylmercury, the organic form of mercury, biomagnifies in aquatic food webs and can therefore affect the population if contaminated species are frequently consumed.

There are many studies on the impact of methylmercury toxicity to the neurological, cardiovascular and immune systems within humans. For example, neurological impacts are often measured and become evident through lowered IQ levels (Spadaro and Rabl, 2008) and through various neuropsychological tests (Grandjean et al., 1998). Cardiovascular and immunological impacts are often related to chronic exposure to mercury (Sweet and Zelikoff, 2001; Downer et al., 2017). The relative impacts from methylmercury's toxic effects can vary across human populations as some groups are more sensitive to the impacts of exposure. Methylmercury is known to affect neurological development in children and is also linked to cardiovascular disease in adults (Clarkson et al., 2003; Valera et al., 2011; Grandjean et al., 2012).

Since fish and other seafood are regularly eaten by persons in Saint Kitts and Nevis, groups in this country may have a higher risk of exposure to mercury as the mercury bioaccumulates in the aquatic species. Health based organisations such as the World Health Organisation (WHO), the United States Environmental Protection Agency (US EPA) and the European Commission (EC) have examined fish mercury concentrations to identify the types of fish that are likely to have higher mercury content and to develop consumption guidelines which indicate the number of seafood meals that could be eaten to stay within recommended doses.

Table 42 shows guidelines for the safe consumption of seafood containing mercury that were created based on the US EPA reference dose of $1x10^4$ mg of Hg/kg of body weight/day, a body weight of 132 pounds (60 kg) for an adult female person and a fish meal size of about 6 ounces (170 gm). These guidelines are for muscle tissues in fish as

[8]Seafood includes marine and freshwater fish and shellfish, as well as marine mammals.

>95% of Hg is in the methyl form, and therefore, this consumption guidance cannot be directly used with the shellfish total mercury data.

Table 42: US EPA guidance for seafood consumption based on mercury concentrations

Mercury in Seafood (ppm, ww)	Consumption Guidance
≤ 0.05	Unrestricted
0.05 – 0.11	2 meals per week
0.11 – 0.22	1 meal per week
0.22 – 0.95	1 meal per month
> 0.95	No consumption

For further reference, the WHO and the EC general guidance level for fish mercury concentrations is 0.5 ppm with an “exemption” for larger, predatory fish species of up to 1.0 ppm, which is noted to be similar to the US EPA “no consumption” level.

As part of the MIA Project, a rapid assessment of total mercury (THg) concentrations in fish was conducted in Saint Kitts and Nevis. This assessment involved the collection of tissue samples from several commonly consumed fish and the determination of where the sampled species were captured. Its purpose was to evaluate the potential risk of exposure through human consumption and to assess and identify sites or habitats that may contain elevated concentrations of mercury and that could represent a risk to fish and wildlife. This assessment would also be able to inform the identification of potentially contaminated sites (Lane, 2017).

For the rapid assessment, a total of 25 fillet tissue samples were collected from 8 species of marine fish from Saint Kitts and Nevis in 2017. 4 species were tested from a Fish Cooperative in Saint Kitts: Glasseye Snapper (*Heteropriacanthus cruentatus*), Yellow-eye (or Silk) Snapper (*Lutjanus vivanus*), French Grunt (*Haemulon flavolineatum*) and Redband Parrotfish (*Sparisoma aurofrenatum*); and four species from 2 locations in Nevis (Figure 10): Yellowtail Snapper (*Ocyurus chrysurus*), Princess Parrotfish (*Scarus taeniopterus*), Mahi Mahi (*Coryphaena hippurus*) and invasive Lionfish (*Pterois volitans*).

Figure 10: Sampling locations for fish in Saint Kitts and Nevis, 2017[9]

The number of species sampled and the relatively small sample sizes per taxon limited any robust statistical assessment of the data. It was also difficult to compare locations because in general, different species of fish were collected from each location.

Results from this rapid assessment of fish mercury concentrations provide important information on the potential for mercury exposure through the consumption of marine fishes from the waters adjacent to Saint Kitts and Nevis. Overall, THg concentrations in the tested fish were relatively low as mean tissue mercury concentrations ranged from 0.014 ± 0.007 ppm, ww which is considered to be safe for human consumption. However, the data highlights certain taxa (Snappers) where further assessments of mercury concentrations are recommended to better inform the risk of mercury exposure to humans and fish-eating wildlife.

[9] Sampling locations highlighted as yellow dots on the map

The THg concentrations in 1 of the Glasseye Snapper samples from the Saint Kitts Fish Cooperative were elevated (0.888 ppm, ww) relative to established human health criteria for fish consumption. However, it is important to note that the weight of the fish sampled was unknown as only a filet was collected for sampling, and only 1 sample of the species was analysed under this assessment. Therefore, further study is required to investigate whether there is a consistent source(s) of elevated mercury in this region, in addition to expanding sampling of other fish species and expanding sampling to additional areas adjacent to Saint Kitts and Nevis in order to confirm if this sampling area has uniquely high levels of mercury, and if the Glasseye Snapper can serve as a bioindicator in future studies of mercury contamination in the region and elsewhere within their range (Lane, 2017).

4.1.2 Occupational and Environmental Exposure to Mercury

Populations involved in professions that expose them to elemental mercury or mercury compounds are at a higher risk due to the increased frequency of exposure. The potential risks to the relevant occupations in Saint Kitts and Nevis are described below in Table 43.

Table 43: Occupational exposure to mercury

Occupation	Cause of Potential Mercury Exposure
Dental professionals, including dental assistants	Preparation, use and disposal of dental amalgam fillings Handling of mercury-containing medical equipment
Medical professionals	Handling of mercury-containing medical equipment such as thermometers, sphygmomanometers and other manometers and gauges Clean-up of damaged or broken equipment
Waste collectors, medical waste incinerator workers and landfill workers	Handling of end-of-life mercury containing products from households and hospitals, including fluorescent light bulbs, batteries, cosmetics, and electrical switches and relays Handling of mercury containing wastes from industries such as bauxite residues, and flue ash from cement and lime aggregate production Incineration of mercury containing products
Environmental/enforcement officers	Identification, monitoring and evaluation of potentially contaminated sites and mercury-containing products

Occupation	Cause of Potential Mercury Exposure
Firemen and first responders to chemical accidents	Clean-up of mercury-containing chemicals and products
Laboratory workers	Use and clean-up of mercury-containing chemicals
Other industrial workers	Inhalation of mercury-contaminated particles from waste incineration facilities, etc.

People living in areas that are more susceptible to environmental contamination by mercury are also more likely to be affected by mercury exposure. These higher risk areas are typically around hot spots and point sources of uncontrolled mercury release such as the landfills and other waste disposal sites. Point sources of mercury release should implement controls to reduce emissions to the environment and decrease the risk to nearby residents. Further, a buffer zone around areas susceptible to environmental contamination should be identified and implemented.

In the past, the island of Saint Kitts used what is now the Conaree Landfill as an open dump and burned the solid waste. Due to its close proximity to the island's main road and international airport, the smoke from the burning waste would usually affect traffic safety and visibility. Additionally, there was a substantial number of cases of respiratory problems which could be directly associated with living downwind from the old Conaree landfill on Saint Kitts. According to the Saint Kitts SWMC, the Conaree site was formally turned into a sanitary landfill in 2002. The changes to the final disposal system (i.e. sanitary landfill) in Saint Kitts resulted in the elimination of fire, smoke and odours from the previous "open dump" system.

4.2 Assessment of Potential Gender Dimensions Related to the Management of Mercury

The Basel, Stockholm and Rotterdam Conventions have highlighted the importance of ensuring gender mainstreaming in countries in order to implement these Conventions as well as the Minamata Convention on Mercury. The United Nations Economic and Social Council (UN ECOSCO) has defined 'gender mainstreaming' as "a strategy for making women's as well as men's concerns and experiences an integral dimension of the design, implementation, monitoring and evaluation of the policies and programmes in all political, economic and societal spheres so that women and men benefit equally and inequality is not perpetuated" (UNDP, 2007).

Gender mainstreaming is also a critical component for countries to achieve gender equality; that is, a society where "the interests, needs and priorities of both women and men are taken into consideration" and where "the diversity of different groups of women and men" is recognized. Gender equality is listed as one of the United Nations Sustainable Development Goals.

Mercury exposure to men and women vary due to differences in the frequency of contact through gender-determined occupational and household roles, and cultural practices. The health impacts resulting from exposure also varies between men and women as a result of physical differences that make women more sensitive to the effects of the toxic compound. It is therefore important to consider the differing roles of gender with regards to the exposure and management of mercury, and to ensure that gender considerations are effectively mainstreamed into any future mercury management plans.

An extensive survey and assessment of gender issues related to mercury exposure in Saint Kitts and Nevis is not yet defined, however, a descriptive summary was developed to broadly apply across the country's populations relating to general exposure and gender risks within various sectors where mercury contamination is likely to occur. Exposure to mercury in Saint Kitts and Nevis is expected to occur through fish consumption, household use and disposal of MAPs, occupational exposure to mercury and its compounds, and the use of skin lightening creams containing mercury. It was noted that while mercury exposure from fish consumption and domestic use of MAPs may not vary

significantly between sexes, the health risk is likely greater in pregnant women and women of childbearing age.

Identifying these trends is useful when considering training, education, and awareness-raising strategies regarding mercury exposure. These trends allow for the development of more gender-sensitive communication strategies that can target the sexes differently to achieve maximum benefit in Saint Kitts and Nevis.

4.2.1 Occupational Exposure

According to data from the Caribbean Development Bank (Table 44), in 2012, more females were employed in the manufacturing sector; wholesale and retail trade; repair of motor vehicles, motorcycles, personal and household goods; and hotel and restaurants (Vassell, 2014). The gender distribution for the transport, storage and communication sector were relatively similar between the sexes.

Table 44: Employment in Saint Kitts and Nevis by sex and sector in 2012 (Vassell, 2014)

Sector	Males	Females	Total
Agriculture, Hunting, Fishing, Forestry	282	79	361
Manufacturing (including Mining and Quarrying)	865	1304	2169
Electricity, Gas and Water Supply	223	92	315
Construction	2497	257	2754
Wholesale and Retail Trade; Repair of Motor Vehicles, Motorcycles, Personal and Household Goods	1519	1977	3496
Hotel and Restaurant	1381	2229	3610
Transport, Storage and Communications	812	768	1580
Financial Intermediation	371	873	1244
Real Estate, Renting and Business Activities	797	786	1583

While the gender dimensions for the health sector and waste sectors could not be determined, gender disparities typically exist in these sectors. For example, in the health sector, there is generally a stigma against male nurses and hence, many nurses tend to be female. Nurses are more likely to use mercury-added medical devices and to clean-up broken products. Healthcare workers also include dentists, doctors, nurses, technical

assistants, facility maintenance staff, administrative staff and other medical staff who may or may not come into contact with mercury and its compounds. Waste collectors and workers at waste incineration and landfill facilities are estimated to be primarily male and mercury exposure through the handling of mercury containing wastes may be higher than in other sectors.

A more in-depth study of the gender ratios for these professions would be required to accurately confirm and quantify patterns of exposure and at-risk populations, according to gender and occupation type. Further assessments are encouraged in order to develop health-related policies and programmes that would ensure that all genders benefit equally.

4.2.2 Mercury in Cosmetics

The use of mercury-added cosmetic products such as soaps, shampoos and especially skin-lightening creams can act as an avenue to mercury exposure in Saint Kitts and Nevis. In the Caribbean, skin-lightening creams have grown in popularity among women and some men as there is a social stigma that a lighter skin complexion is believed to increase attractiveness and social standing (Edmond, 2014).

However, the risk of exposure to mercury poisoning through the use of these mercury-containing cosmetic products is still being determined. The precise rate of dermal absorption of inorganic mercury is influenced by many factors which have made it difficult to assess (WHO, 2014). Some research has shown that the use of skin lightening creams by women with children have led to greater risks of mercury transfer to their children. Copan, et al (2015) detailed a case in which a 20-month old child was diagnosed with mercury poisoning which was attributed to the use of a skin lightening cream found to contain 38,000 ppm Hg by the child's mother. It is likely that the general public has limited knowledge of the harmful chemicals in these cosmetics, especially as labelling is not regulated in the Caribbean and manufacturers are not required by law to list all the components of their products.

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

The level of awareness on the risks of mercury among identified stakeholders and target populations in Saint Kitts and Nevis can vary based on the information provided. Measures should be put in place to educate these groups on the hazards of mercury exposure and the possible action to mitigate the risks. Article 18 in the Minamata Convention on Mercury states that:

1. 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.
2. Each Party shall use existing mechanisms or give consideration to the development of mechanisms, such as pollutant release and transfer registers where applicable, for the collection and dissemination of information on estimates of its annual quantities of mercury and mercury compounds that are emitted, released or disposed of through human activities.

Residents in close proximity to mercury point-sources, such as industries that burn fossil fuels and facilities that handle waste disposal and incineration, should be informed of the added risk of mercury exposure. These targeted groups should be directed on proper

safety measures to reduce risks. Similarly, workers at these facilities can be educated on the proper use of personal protective equipment to reduce exposure, and measures to reduce the release of mercury to the environment.

It is recommended that medical and environmental professionals in Saint Kitts and Nevis be trained in assessing and monitoring mercury-related issues in order to better identify the extent of the effects of exposure to communities. This information would also serve to further expound on preventative measures and appropriate treatment options for affected populations. Collaborating with the WHO may aid the Government of Saint Kitts and Nevis in these efforts.

MAPs add risk of mercury exposure to the population on a whole. Awareness of alternatives to MAPs sold in Saint Kitts and Nevis can be raised to encourage a safer consumer choice for the citizens. Citizens should be encouraged to support initiatives that would lead to the complete phase-out of MAPs. National action to raise public awareness of mercury hazards should be undertaken in parallel with encouragement for public involvement in reducing environmental and health impacts of mercury contamination. Avenues to facilitate public responsibility should be put in place, such as access to collection, recycling and disposal systems, and incentives for using mercury-free alternatives. Guidelines for separation of contaminated wastes should be created and enforced by municipalities and private waste collectors.

The mercury content in specific brands of skin lightening creams, soaps, batteries and other potentially mercury-containing goods needs to be identified through testing or from existing inventories. Lists of these items should be compiled and distributed to consumers to raise awareness of the sources and risks of mercury exposure, and proper methods to safely store, handle, transport and dispose of mercury wastes.

The Government should ensure that the public has access to environmentally sound facilities that could aid in the disposal process. The public should also be informed on where they would be able to access additional information and guidelines for cleaning up discarded MAPs, such as broken fluorescent tubes. The US EPA guidelines on cleaning up broken CFL bulbs demonstrates how an online interface can be used to provide

effective, concise information (US EPA, 2016b). This can be used as a resource when creating similar tools for spreading information.

It is also important to inform the public of available, cost-effective mercury-free and mercury-reduced alternatives that could replace the harmful products being used. The department that oversees consumer affairs within the relevant ministry that regulates trading and industry activities would be responsible for disseminating this information.

Under the MIA project, a national video and infographics will be developed to highlight the issues posed by mercury in Saint Kitts and Nevis and the wider Caribbean.

Chapter 6: Implementation Plan and Priorities for Action

Article 20 of the text of the Minamata Convention on Mercury states that, “each Party may, following an initial assessment, develop and execute an implementation plan, taking into account its domestic circumstances, for meeting the obligations under this Convention.”

The development of an implementation plan is the responsibility of the Government and is optional. However, as a Party to the Convention, it is important for Saint Kitts and Nevis to implement activities that would help the country to achieve its obligations to the Convention.

In Saint Kitts and Nevis, the general consumption of mercury in products was the main source of mercury releases that needs to be addressed in order to ensure that Saint Kitts and Nevis is in compliance with the obligations of the Minamata Convention. Waste deposition is also an area that needs to be effectively managed.

This chapter highlights some general practical considerations that may be taken should the Government of Saint Kitts and Nevis choose to develop an implementation plan and a list of priorities for action regarding the management of mercury and its compounds.

6.1 Recommendations for Management of Mercury-Added Products (Whole Life Cycle)

The manufacture and use of mercury in products and in mercury containing processes or devices (MAPs) needs to be addressed to ensure that the Government of Saint Kitts and Nevis is in compliance with the obligations of the Minamata Convention as set out in Article 4.

Annex A of the Minamata Convention lists the products that a Party must disallow from being manufactured, imported and exported by 2020. It also lists the mercury-containing products not regulated by the Convention, and those that are exempt from the 2020 phase-out.

The obligations for the disposal of such MAPs are also outlined in Article 11. While some of the mercury in these products can be collected and recycled, Saint Kitts and Nevis

faces issues which reduce the feasibility of such measures. These issues include a lack of enforced requirements for manufacturers to list all of the components of their products, which leaves users and disposers unaware of the need for special disposal, inefficient collection and disposal systems, a lack of access to storage and recycling facilities, and little public awareness on the hazards of MAPs and their proper disposal.

Additionally, while there is a general push to promote the use of mercury-free and mercury-reduced alternatives, public awareness on the hazards of mercury and the benefits of using mercury-free alternatives should be enhanced to encourage a higher substitution rate. There is also an unfounded perception that mercury-free alternatives do not perform as accurately as their mercury-containing counterparts.

Specific recommendations for managing the manufacture, import and export of these products under legislation and regulatory framework were detailed in Chapter 3 of this report. Other general recommendations for the phase-out of MAPs in Saint Kitts and Nevis are listed in Table 45 as detailed by Lennett and Gutierrez (2016).

Table 45: Recommended action for phasing out MAPs (adapted from Lennett and Gutierrez, 2016)

MAP	Recommended Action for Phase-Out
Switches and Relays	• Promote the use of Hg-free alternatives which are already widespread on the market. For example, electronic mercury-free alternatives are proven effective and widely available and many manufacturers now produce mercury-free switches and relays because of restrictions in the EU's RoHS Directive. Mercury-free alternatives include hybrid tilt switches and electronic thermostats[1] • Take measures to prevent use as components in larger products like pumps, appliances, ovens and circuit boards • Ensure that allowable high accuracy capacitance and loss measurement bridges and high frequency radio frequency switches and relays in monitoring and control instruments maintain a maximum mercury content of 20 mg per bridge, switch, or relay • Set up waste electrical and electronic equipment (WEEE) dismantling plants to remove switches and relays from non-hazardous waste streams
Batteries	• Promote the use of Hg-free alternatives, such as cylinder (alkaline rechargeable) batteries which are already common on the market[1] • Prevent the import and use of mercury containing batteries in devices used for medical, industrial or military applications and electronics • Ensure that allowable mercury-containing button zinc silver oxide and

	button zinc air batteries used maintain acceptable limit of <2% Hg content. This limit is typically in accordance with the batteries on the global market currently ● Put measures in place, eg. WEEE dismantling plants, to remove batteries from non-hazardous waste streams
Lighting Devices (CFLs, LFLs, HPMV, CCFLs, EEFLs)[2]	● Promote the use of LEDs and other Hg-free lamp alternatives for general purpose lighting and LCD backlighting[1]. The amount of Hg needed per lamp has decreased over the years due to technology/production improvements, including better dosing. Therefore, meeting this requirement globally is becoming easier. The People's Republic of China which manufactures many of these products for worldwide export is Party to the Minamata Convention and has implemented plans to meet the obligations for manufacture in accordance with the Convention's obligations (Kamande, 2017) ● Set and enforce low maximum mercury content limits for lamps imported and used ● Restrict the use of HPMV and enforce the use of available alternatives ● Purchase bulb-eaters to facilitate recycling or environmentally sound disposal of end-of-life fluorescent tubes ● Set up WEEE dismantling facilities to separate CCFLs and EEFLs from non-hazardous waste streams
Non-Electronic Measuring Devices (Barometers, Hygrometers, Sphygmomanometers, Thermometers etc.)	● Promote the use of cost-effective Hg-free alternatives. Digital and aneroid Hg-free alternatives to these products are already popular on the global market. ● Utilise guidance documents on phasing out these products which have been developed by the World Health Organization and Health Care Without Harm who began a global campaign to shift the production of mercury-added medical devices to Hg-free alternatives by 2017[1] ● Enforce on-site separation of these devices from non-hazardous waste streams and waste incineration streams
Cosmetics (Skin Lightening Products)	● Establish measures to regulate the import and local manufacture of skin lightening products[3] ● Compile a local inventory of mercury containing cosmetics to better inform governments and public[3] ● Develop and enforce proper labelling standards ● Promote the use of cost-effective Hg-free alternatives ● Ban the manufacture, import and export of mercury-added cosmetics ● Conduct public awareness campaigns
Dental Amalgam	● Encourage the use of cost-effective and clinically effective mercury-free dental restoration options to phase-out the use of Hg-added dental amalgam ● Provide training and education opportunities for professional dentists and students in dental school on mercury-free dental restoration options and best practices[4] to prevent release of mercury into the environment

1 Some of the recognized existing guidance documents are available at the following links (Kamande, 2017):

- *Report on the major mercury-containing products and processes, their substitutes and experience in switching to mercury-free products and processes, UN Environment OEWG2: http://www.mercuryconvention.org/Portals/11/documents/meetings/oewg2/English/2_7.pdf.*
- *Mercury-added Product Fact Sheets, Northeast Waste Management Officials Association: http://www.newmoa.org/prevention/mercury/imerc/FactSheets/.*
- *Developing National Strategies to Phase Mercury Out of Thermometers and Sphygmomanometers Including in the Context of the Minamata Convention on Mercury, WHO: http://www.who.int/ipcs/assessment/public_health/WHOGuidanceReportonMercury2015.pdf.*

2 Compact fluorescent lamps (CFLs), linear fluorescent lamps (LFLs) and high-pressure mercury vapour lamps (HPMV) are used for general lighting purposes; Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) are used in electronic displays.

3 Skin-lightening products are one of the most unregulated MAP sectors in the Caribbean. Due to the rising popularity of skin bleaching within communities and the prevalence of informal local and international manufacturers and retailers, it is critical that countries put measures in place to identify and restrict products on the market that contain mercury. As many of these products tend to be mis-labelled/ improperly labelled, the mercury concentration in such products can only be accurately determined through laboratory analysis and research. Projects are currently being conducted globally by organizations under the Global Mercury Partnership to assess mercury concentrations in popular skin lightening creams and make the results publicly available. Locally, research is being conducted by the University of the West Indies with funding from the Pan American Health Organisation (PAHO) to analyze mercury concentration in skin-lightening creams and conduct public awareness campaigns based on the results.

4 To prevent the release of mercury into water supplies during the removal of existing mercury-containing dental amalgams, dentists should be strongly encouraged to purchase brands of dental chairs that are fitted with amalgam separators which trap excess amalgam. Amalgam captured by the filters should be captured during periodic cleaning efforts, and the mercury-containing waste should be transported to a facility for recycling. Temporarily stored dental amalgam should utilize the underwater storage method outlined on page 13 of the UNDP/GEF Global Healthcare Waste Project: "Guidance on the cleanup, temporary or intermediate storage, and transport of mercury waste from healthcare facilities" document (Emmanuel, 2010).

Other recommendations to promote the phase-out of MAPs include the following:

Import Regulations

Under Article 4 of the Minamata Convention, Parties will not be permitted to manufacture, import or export certain MAPs after the year 2020. To facilitate this transformation, the Government of Saint Kitts and Nevis should strengthen the standards with regards to MAPs by continuing to phase-out these products, setting and enforcing maximum allowable mercury content for products that have no available mercury-free alternatives, and ensuring transparent product labelling and training of Customs Officers to inspect and regulate the import of these products.

The responsible entity in Saint Kitts and Nevis for the inspection and approval of goods that may contain mercury is the Saint Kitts and Nevis Bureau of Standards (SKNBS).

Product Labelling

Manufacturers of certain goods are not required by law to list all of the components of their products. As such, numerous imported and local brands of items, including skin lightening creams, cosmetics and electronics are not properly labelled to reflect mercury as an ingredient, do not disclose the toxic properties of the compound, and do not inform users of proper end-of-life management. Since consumers and disposers are unaware of the hazardous nature of these products, they are ignorant of the risks associated with handling them, and proper separation and environmentally sound disposal do not take place.

Developing and enacting legislation that enforces transparent labelling of products by their producers are therefore critical steps to aid in the proper collection and disposal of such goods, and to raise public awareness that would lead to the subsequent phase-out of manufactured and imported MAPs. Figure 11 is an example of a label that discloses the presence of mercury in fluorescent bulbs and directs users to further information on clean-up procedures and safe disposal.

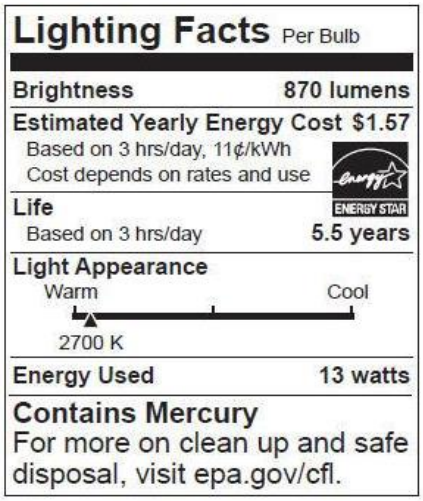

Figure 11: Sample of label for bulbs containing mercury (Source: US EPA, date unknown)

Inspection and Testing

Local Government Divisions that oversee the inspection and approval of imported and locally manufactured goods will need to acquire equipment for the inspection and testing of MAPs entering the country as well as being used by the citizenry. These Divisions may consider purchasing a Direct Mercury Analyzer (DMA) to test potentially mercury-containing products that are available, or will be made available, to the public. The Milestone DMA-80 is an example of equipment that could be used to test up to 40 liquid or solid samples at a time (Figure 12). Samples do not need to be prepared with additional chemicals as with older mercury analysers, and mercury concentrations between 0.01-300 ppm can be detected in as little as 120 seconds (Milestone, 2013). The cost of this equipment averages at US $35,000 based on the application and configuration required to achieve the aims of the establishment.

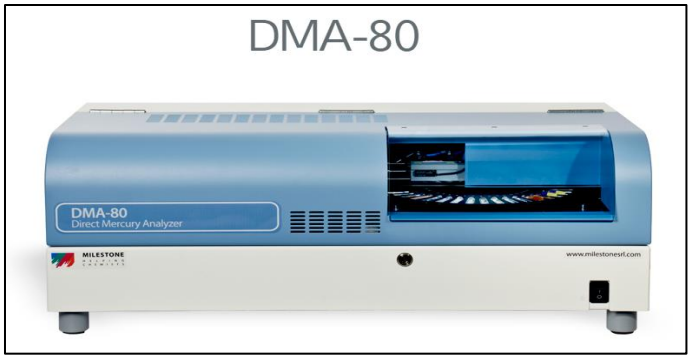

Figure 12: Milestone DMA-80 direct mercury analyser (Source: Milestone, 2013)

Identified mercury-containing products should be placed on a restricted list, and Customs workers should be trained to recognize them to aid in preventing them from entering the country. Furthermore, Customs Officers should be trained and equipped with a portable mercury analyser, such as the Lumex RA-915M Mercury Analyzer (Figure 13), which would enable them to identify unlisted mercury-added items being collected at the ports, and more importantly, incoming MAPs that are not clearly labelled to show that they contain mercury. The RA-915M can detect mercury in air samples with concentrations as low as 0.5 ng/m^3 or 0.0005 ppm, and will give a real-time rapid analysis of mercury contained in complex objects (Lumex Instruments, 2017). The sensitivity of the RA-915M will aid in the identification of smaller, unidentified mercury-containing components, such as batteries and switches in electronic equipment. The Lumex RA-915M mercury analyser costs approximately US $30,000.

Figure 13: Lumex RA-915M portable mercury analyser
(Source: Lumex Instruments, 2017)

Extended Producer Responsibility

Measures can be put in place to transfer the responsibility of the end-of-life management of MAPs from municipalities to producers and retailers through take-back collection programmes and extended producer responsibility (EPR). With established take-back programmes, consumers would be able to return mercury-containing wastes to the producers and retailers that sold them the items. These producers and retailers must then ensure the environmentally sound interim storage, transportation and disposal of the collected wastes. The Government of Saint Kitts and Nevis should encourage participation by relevant stakeholders and provide legislation that directs the

responsibilities of the involved parties and the methods that would be used for monitoring and enforcement of the programme requirements.

6.2 Recommendations for Management of Mercury Wastes

Under Article 10 of the Minamata Convention, measures for the environmentally sound interim storage of mercury other than waste mercury are outlined. Further, under Article 11 of the Minamata Convention, measures should be taken to ensure the environmentally sound management of wastes that are:

a) Consisting of mercury or mercury compounds;
b) Containing mercury or mercury compounds; or
c) Contaminated with mercury or mercury compounds.

The results of the MIA Project in Saint Kitts and Nevis gave an indicator of the anticipated volumes of mercury and MAPs that would need to be stored and eventually disposed. However, the amount of mercury waste in the inventory showed that it would not prove economically viable to create mercury-specific interim storage facilities in Saint Kitts and Nevis. An integrated waste management approach, where mercury would be stored with other hazardous waste chemicals, is suggested as a more feasible option. Suggestions for management of mercury wastes are detailed below.

Stabilization, Solidification and Interim Storage of Mercury Wastes

It is important to create guidelines that ensure that the compatibility of these waste chemicals is considered first and that radioactive, infectious or explosive wastes are excluded. Further detailed guidelines for construction, placement and important inclusions for interim storage sites for mercury can be found in the Draft Interim Storage Guidelines outlined at the first Conference of the Parties to the Minamata Convention (UNEP, 2017b) and the UNEP 'Practical Sourcebook of Mercury Storage and Disposal' (2013). The development of regulations for managing mercury wastes should be considered under the NCEPA Draft Bill once enacted.

Collection methods and transportation procedures are crucial in the success of an environmentally sound hazardous waste storage facility. Saint Kitts and Nevis' Government may dedicate collection centres throughout the nation with easy access to

the public or organize mail-in or pick-up services. Vehicles transporting mercury waste need to adhere to specific requirements, such as creating routing plans to ensure the shortest and fastest routes are used, ensuring the presence of a bulkhead between the driver and the vehicle body, and confirming appropriate safety and emergency equipment are on board. It is essential for mercury waste to be packaged in compatible and sealed containers and not stacked more than 1.5 meters high (Emmanuel, 2010).

Another recommendation for developing a comprehensive mercury management plan in Saint Kitts and Nevis is to assess the feasibility of designing and implementing a fixed storage, pre-treatment and stabilization/solidification facility for mercury waste before sending it off to a recycling facility or a specially engineered landfill (SEL). It is recommended that this facility be developed and led by the relevant waste management authority in Saint Kitts and Nevis. The requirements for this proposed facility will be the same as was recommended for the interim storage sites. However, the site will also include the implementation of measures for the environmentally sound separation of contaminated and non-contaminated materials to reduce the volumes of waste exported for mercury recovery, and the stabilization of mercury-containing wastes for disposal. As with the interim storage facility, it is recommended that this facility should also be capable of storing and treating other hazardous chemicals for safe disposal.

Mercury-contaminated wastes being disposed in SELs should be minimized and subsequently eliminated. The fixed storage, pre-treatment and stabilization facility will achieve this by implementing processes, such as chemical oxidation and precipitation, which solidify mercury dissolved in liquid wastes, such as waste sludge from industries, thus facilitating separation and recovery. The facility should also be equipped with chemicals needed to successfully execute stabilization and solidification procedures on mercury-contaminated cosmetics, dental amalgam, sewage sludge, residues and other wastes that cannot be recovered or recycled.

Hydramag, an industrial stabilizing agent based on magnesium oxide, was shown to significantly decrease the volumes of leachable mercury from mercury-contaminated soil in Mongolia (Figure 14). The results of this study showed that using stabilization methods to treat similar wastes before disposal in SELs can greatly reduce the leaching potential

of mercury and prevent pollution of surface water and groundwater (UNIDO, 2017). Treated material should be temporarily stored until a SEL is established or transported to an international disposal site in accordance with Basel Convention requirements.

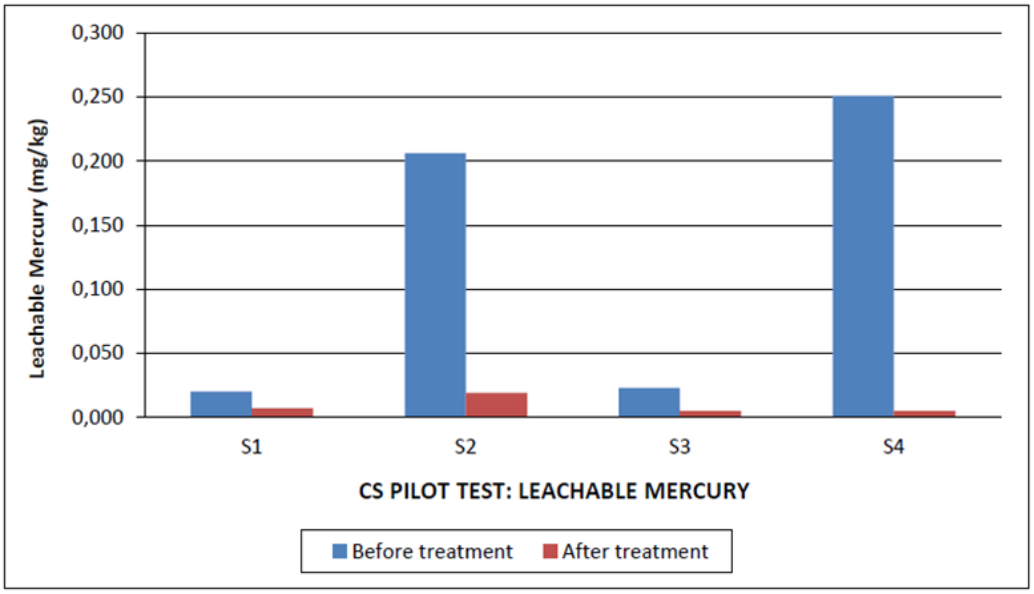

Figure 14: Mongolia chemical stabilization pilot test on mercury-contaminated soils (Source: UNIDO, 2017)

Additionally, facility operations should include dismantling of waste electrical and electronic equipment (WEEE) into mercury-containing components, such as switches and relays, batteries, CCFLs and EEFLs, and non-hazardous recyclable components. Section 7.3 of the Basel Convention Partnership for Action on Computing Equipment Guideline on environmentally sound material recovery and recycling of end-of-life computing equipment has information that could be used to determine the best methods for engaging in e-waste dismantling activities.

To facilitate the safe recycling or disposal of fluorescent tubes (CFLs and LFLs), a bulb recycler system or a bulb crusher should be purchased. The purchased equipment should be able to handle various sizes and shapes of fluorescent bulbs and should utilize vapor filters to minimize dust and mercury vapor emissions. A bulb recycler system would separate mercury bearing phosphor powder from the other components of fluorescent bulbs (glass and aluminium/plastic) and clean the separated materials which can then be

recycled or disposed. CMA Ecocycle in Australia is an example of a facility that successfully manages this approach (CMA Ecocycle, 2015).

A drum-top bulb-crusher or other bulb-crusher mechanically crushes the fluorescent tubes and collects the waste-material in an airtight drum. The bulb crusher does not separate the glass, end caps or mercury bearing phosphor powder, and all collected material, including used filters, will have to be sent to another facility for separation and recycling, or encapsulated in a mercury-immobilizing material before being disposed of in a managed engineered landfill. Crushing the bulbs before shipping for treatment or disposal reduces the volumes needed to be transported, and therefore reduces the associated costs. The Dextrite bulb crusher shown below (Figure 15) costs approximately US $15,000, inclusive of transportation costs.

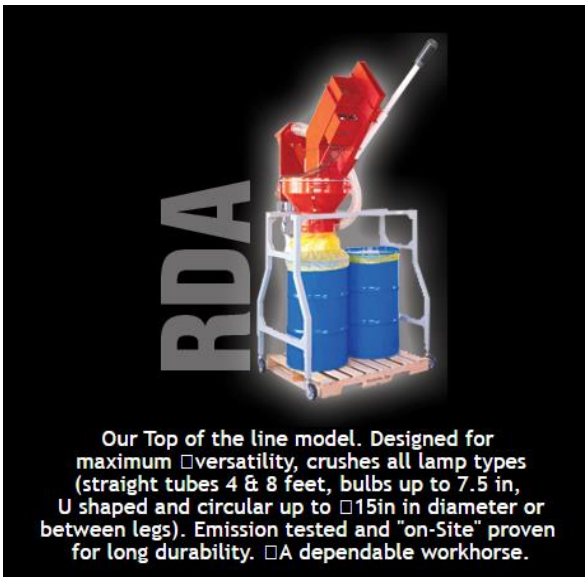

Figure 15: Features of the Dextrite bulb crusher (Source: Dextrite, 2017)

The Basel Convention 'Technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with mercury or mercury compounds' (UNEP/CHW.12/INF/8, 2015) is a useful resource for environmentally sound handling (F1), separation (F2), collection (F3), packaging and labelling (F4), transportation (F5), storage (F6) and disposal (G) of mercury contaminated wastes. The listed measures should be followed when constructing and operating the recommended facility.

All processes should be conducted under reduced pressure to prevent leakage of mercury vapour. Additionally, exhausted air should be directed through a series of particulate filters and a carbon bed to prevent mercury releases into the environment. Workers need to receive thorough training on the appropriate and environmentally sound measures of handling purchased equipment and contaminated materials, as well as measures to ensure occupational safety and health. They should also have access to appropriate personal protective equipment which they should wear at all times. There needs to be consistent ambient testing done at the site to ensure that emissions are contained and that the concentration of mercury is within the allowable limits.

Waste Disposal

Proper waste management methods are essential for the protection of Saint Kitts and Nevis' health and environment. As detailed in Section 2.7.1, waste disposal in Saint Kitts and Nevis is done in a controlled manner through the development of the designated sanitary engineered landfills. At both sites, there are measures for separation of municipal, medical and hazardous waste and the use of protective lining under the deposits.

The Conaree Landfill's existing cell was subject to closure in 2012 following the construction of a second phase, but as of this year, it has yet to cease operations. This may lead to issues as the amount of waste being deposited may exceed capacity and cause potential leaching of toxic substances, including mercury. Spontaneous combustion of waste and underground burn also occurs, and measures should be put in place to manage this. The NSWMA Landfill cell has also been operating past the initial expected lifespan causing an overflow of the landfill's capacity. It was noted that several fires throughout the years have hampered the cell's ventilation system. Measures to effectively manage these issues must be considered. The development of a SEL is guided by the guidelines under the Basel Convention.

The complete phase-out of mercury waste disposal will not be an immediate action, and measures need to be put in place to ensure that controlled SELs with design features that prevent leaching of hazardous chemicals into the environment are implemented. These features include measures to prevent rainwater and groundwater inflow, to isolate

different types of hazardous wastes, to drain, collect, test and treat leachate, and to maintain detailed records on all collected wastes.

Many household consumer products and medical waste products that contain mercury or mercury compounds, such as fluorescent light bulbs, batteries and thermometers end up at landfills mixed in with municipal waste. The predominant recommendation to reduce this mercury content in the landfills will coincide greatly with the recommendations for the nation to switch to the use of mercury-free alternative products. However, as MAPs are still currently circulating throughout society, these mercury control waste management procedures need to applied in unison.

To assist in the prevention of mercury releases from the deposition of waste at landfills, the prevention of mercury emissions from the spontaneous combustion, and the intentional burning of municipal and medical waste, a controlled separation system is a significant step for the waste management authorities to undertake. The waste containing mercury can then be transported to an interim storage facility, final treatment or disposal site. At-home measures can also be encouraged for the public to separate out the waste products containing mercury and, thus nation-wide collection points and methods can be put in place. Training waste management personnel, as well as educating the general public on the identification of MAPs is an important inclusion in these separation methods. Other measures to further the mercury management in the waste handling sector include improving the regulations for controlled and uncontrolled landfill requirements, implementing fines on the informal burning of waste, and also creating public awareness campaigns.

Regulated waste incineration facilities also contribute high mercury emissions. If the municipal and medical waste transferred to the incineration facilities did not include mercury-containing waste, emissions would have a much lower mercury concentration and, therefore, separation methods are also extremely beneficial in this aspect. As for the facility itself, control procedures to minimize mercury emissions and contamination can be set in place with regards to site selection, design and construction of future incinerators, as well as operation and monitoring procedures for current incinerators. Flue gas stack controls and dust removal techniques, such as fabric filters can be added to the

system to remove the mercury from emissions. Depending on the technique chosen, the mercury may be transferred to flue gas or fly ash, and therefore subsequently create a new solid or liquid mercury-containing waste stream. This stream then has to be transported and correctly disposed of in a qualified hazardous storage or treatment facility. If resources to invest in these new control technologies are low or unavailable, the modification of operation techniques such as furnace temperature, reagent type, and injection rate can be applied to assist with emission controls until the purchase of equipment can be made.

Periodic monitoring and evaluations are needed to ensure that these control methods are effectively reducing the mercury releases and emissions within the waste deposition and incineration sector. Each landfill and incineration facility can be required to submit periodic reports with required data to keep a track of the measures being implemented. Successful cases can then be shared among the Caribbean region to encourage continued efforts regarding mercury waste management.

6.3 Recommendations for Management of Mercury Emissions and Releases

Under Article 8 of the Minamata Convention, measures should be undertaken to control and reduce emissions of mercury and mercury compounds (total mercury) to the atmosphere from point sources within the source categories listed in Annex D. In Saint Kitts and Nevis, the only relevant point source identified as possibly contributing to mercury emissions was waste incineration. Recommendations for the environmentally sound management of emissions from this source category were provided in the previous section.

Under Article 9 of the Minamata Convention, Parties shall take measures to control releases to water and land from major point sources and may prepare a national plan to assist in the monitoring of the effectiveness of implementation. Based on the mercury inventory conducted, mercury released from crematoria and cemeteries as well as the extraction and use of fuels/energy sources were found to contribute to minor releases of mercury.

Under these Articles, Parties must implement either one or more of the following measures to “control” releases:

- Develop mercury release limit values;
- Use Best Alternative Techniques (BAT) / Best Environmental Practices (BEP);
- Implement a multi-pollutant control strategy; and/or
- Develop alternative measures to reduce releases.

In Chapter 3 of this report, it was noted that provisions to meet the obligations of Articles 8 and 9 should be developed under the NCEMA once enacted. Further recommendations that may be considered for point sources of mercury releases are detailed below.

Although it is difficult to remediate existing cemeteries of their potential mercury contamination, there are procedures that may be considered for the future reduction of mercury releases in cemetery and cremation practices. It is recommended that future cemetery site developments should be considered with respect to environmentally sensitive areas. Cemeteries should not be located near waterbodies, vulnerable ecosystems and floodplains. It is also necessary to consider the future placement of crematories as they should not be located in areas that are downwind of densely populated or vulnerable areas.

For crematoria, emission stacks can be monitored for mercury emissions and the funeral homes may consider the introduction of modern mercury filtration systems, carbon injection methods, scrubbers or dust filters into their crematoria chambers; however, this is an expense that may not be feasible. Both alternative and “end-of-pipe” measures need to be adopted and applied in parallel due to the already accumulated dental amalgam in the population. Removing the dental amalgam from a corpse before the burial or cremation will reduce the mercury emissions, but this can be regarded as unacceptable in certain cultures. A voluntary tooth-extraction system, similar to an organ donor system, can be set up for the person to consent to while still alive or for the next of kin to make this decision. Cultural, social, structural, financial and heritage boundaries of individual funeral homes are to be considered when recommending changes to determine feasibility.

It should also be ensured that environmentally sound measures are in place to control the release of pollutants including mercury from the use of fuels, and in the development of geothermal energy production processes.

Under the Minamata Convention, Parties are also encouraged to regularly update their inventories of mercury emissions and releases.

References

AMAP/UNEP. 2013. “Technical Background Report for the Global Mercury Assessment 2013 Workbook: Global Mercury Emissions by Country and Sector”. [online] Available at: http://public.tableau.com/views/GlobalMercuryEmissions/Dashboard1?:embed=y&:display_count=no&:showVizHome=no#1.

Biodiversity Research Institute (BRI). 2018. “The State of Mercury in the Caribbean”. Biodiversity Research Institute. Portland, Maine.

Boischio, A. 2017. “Mercury added in skin-lightening products: Toxicological note”. Pan American Health Organisation (PAHO), World Health Organisation (WHO). [online] Available at: http://www.paho.org/hq/index.php?option=com_docman&task=doc_view&gid=39797&Itemid=270&lang=es.

Brown, Desmond. 2013. “Solar Streetlights Light the Way Toward Green Energy in Caribbean”. Inter-Press Service News Agency. [online] Available at: http://www.ipsnews.net/2013/02/solar-streetlights-light-the-way-toward-green-energy-in-caribbean/.

Buck, D., Burton, M. 2017. "Linking Mercury Sources and Ecosystem Sensitivity in Caribbean – A Summary of Methods." Biodiversity Research Institute. Portland, Maine.

Caribbean Public Health Agency (CARPHA). 2017. “GEF 5558: DEVELOPMENT AND IMPLEMENTATION OF A SUSTAINABLE MANAGEMENT MECHANISM FOR PERSISTENT ORGANIC POLLUTANTS (POPs) IN THE CARIBBEAN National Inventory Report for Inventory of Unintentionally Released POPs (UPOPs) in Saint Kitts and Nevis (2016)”. The Caribbean Public Health Agency.

Chapman, I., Paul, D., Moise, G. and Riley, A. 2012. “Wastewater Production, Treatment and Use in St. Kitts”. Proceedings of the 4th Regional Workshop on the ‘Safe Use of Wastewater in Agriculture’ for Latin America and the Caribbean, Lima, Peru. [online] Available at: http://www.ais.unwater.org/ais/pluginfile.php/ 378/mod_page/content/144/ST._KITTS.pdf.

Clarkson, et. al. 2003. "The Toxicology of Mercury—Current Exposures and Clinical Manifestations". The New England J. Medicine, 349:1731–1737.

CMA Ecocycle, Australia. 2015. “How Fluorescent Tubes are Recovered by a Lamp Recycler”. Blog. [online] Available at: http://www.cmaecocycle.net/blog/how-fluorescent-tubes-recovered-by-lamp-recycler/.

Copan, L., Fowles, J., Barreau, T., McGee, N. 2015. “Mercury toxicity and contamination of households from the use of skin creams adulterated with mercurous chloride (Calomel)”. International journal of environmental research and public health,12(9):10943-54.

Downer, M.K., Martínez-González, M.A., Gea, A., Stampfer, M., Warnberg, J., Ruiz-Canela, M., Salas-Salvadó, J., Corella, D., Ros, E., Fitó, M. and Estruch, R. 2017. "Mercury Exposure and Risk of Cardiovascular Disease: A Nested Case-Control Study in the PREDIMED (PREvention with MEDiterranean Diet) Study". BMC cardiovascular disorders 17(1):9.

Edmond, J.D. 2014. “The Promotion of Skin-Bleaching Products in Jamaica: Media Representation and Cultural Impact”. Research Papers. Paper 520. [online] Available at: http://opensiuc.lib.siu.edu/gs_rp/520.

Emmanuel, J. 2010. Guidance on the Cleanup, Temporary or Intermediate Storage, and Transport of Mercury Waste from Healthcare Facilities”. UNDP GEF Global Healthcare Waste Project. [online] Available at: https://noharm-global.org/sites/default/files/documents-files/1030/GEF_Guidance_Cleanup_Storage_Transport_Mercury.pdf.

Ford, Martin and Dewailly, Eric. 2012. “Prenatal Exposure to Persistent Organic Pollutants, Pesticides, and Heavy Metals in the CARICOM Region: National Report for Barbuda”. Caribbean Eco-Health Programme.

Government of Saint Kitts and Nevis. “Medium Term Economic Strategy 2003-2005”. [online] Available at: http://www.sice.oas.org/ctyindex/KNA/MTESP2003_05_e.pdf.

Government of Saint Kitts and Nevis. 2011. “National Energy Policy”. Ministry of Public Works, Utilities, Energy and Housing. [online] Available at: http://www.oas.org/en/sedi/dsd/Energy/Doc/NationalEnergyPolicyStKittsandNevis.pdf.

Grandjean, P., Pichery, C., Bellanger, M., Budtz-Jorgensen, E. 2012. "Calculation of Mercury’s Effects on Neurodevelopment". Environ Health Perspect 120:a452–a452.

Grandjean, P., Weihe, P., White, R., Debes F. 1998. "Cognitive Performance of Children Prenatally Exposed to “Safe” Levels of Methylmercury". Environmental Research. 77. 165-72. 10.1006/enrs.1997.3804.

Hamann, C.R., Boonchai, W., Wen,L., Sakanashi E.N., Chu, C-Y, Hamann, K. 2014. “Spectrometric analysis of mercury content in 549 skin-lightening products: Is mercury toxicity a hidden global health hazard?” Journal of the American Academy of Dermatology. 2014;70(2):281-7. e3.

Inter-American Development Bank (IADB). 2013. “Private Sector Assessment of St Kitts And Nevis”. [online] Available at: http://www.caribank.org/uploads/2014/11/2014-St.-Kitts-and-Nevis-PSAR.pdf.

International Monetary Fund (IMF). 2013. “Energy Subsidy Reform: Lessons and Implications”.

Kamande, Rachel. 2017. “Replacing Mercury-added Products with Convention Compliant Products”. PowerPoint Presentation, Zero Mercury Working Group, Nairobi, Kenya.

Lane, Oksana. 2017. “Rapid Assessment of Fish Mercury Concentrations in St. Kitts and Nevis”. Biodiversity Research Institute. Portland, Maine.

Lennett, David and Gutierrez, Richard, JD, LI.M. 2016. “Minamata Convention on Mercury Ratification and Implementation Manual”. Zero Mercury Working Group.

Lumex Instruments. 2017. “Mercury Analyzer RA-915M”. [online] Available at: http://www.lumexinstruments.com/catalog/atomic-absorption-spectrometry/ra-915m.php.

Lymberidi and Lemoine. 2007. “Dental Sector as a Source of Mercury Contamination”. European Environmental Bureau. [online] Available at: http://www.zeromercury.org/phocadownload/Developments_at_EU_level/Dental_Conference_Report_May07.pdf.

McCalla, Winston. 2018. "Assessment of, and Recommendations for, the Legislative and Institutional Framework in Relation to the Implementation of the Minamata Convention on Mercury in Jamaica, Saint Kitts and Nevis, Saint Lucia and Trinidad and Tobago".

Milestone. 2013. “DMA-80”. [online] Available at: http://www.milestonesrl.com/en/mercury/dma-80.html?view=featured.

Minister of Public Infrastructure, the Honourable Ian “Patches’ Liburd. 2017. Ministerial Address. [online]. Available at: http://timescaribbeanonline.com/st-kitts-nevis-observes-world-water-day-2017-theme-waste-water/.

Mohammed, T., Mohammed, E., Bascombe, S. 2017. “The Evaluation of Total Mercury and Arsenic in Skin Bleaching Creams Commonly Used in Trinidad and Tobago and Their Potential Risk to the People of the Caribbean”. Journal of Public Health Research; doi: 10.4081/jphr.2017.1097.

Nevis Blog. 2012. “St. Kitts – Nevis To Use Green Monkeys for Drug Research”. [online]. Available at: http://nevisblog.com/st-kitts-nevis-to-use-green-monkeys-for-drug-research.html.

Nriagu, Jerome, and Christian Becker. 2003. "Volcanic Emissions of Mercury to the Atmosphere: Global and Regional Inventories". Science of the Total Environment 304 (1-3): 3-12. doi:10.1016/s0048-9697(02)00552-1.

Palmer, M. 2016. “Mercury in Healthcare” [Powerpoint Presentation]. Available at: http://www.paho.org/hq/index.php?option=com_content&view=article&id=12807%3Ahealth-sector-minamata-convention-mercury-workshop&catid=4716%3Ageneral&Itemid=42223&lang=en.

Spadaro, J., Rabl, A. 2008. "Global Health Impacts and Costs Due to Mercury Emissions". Risk Analysis, Vol. 28, No. 3, 2008.

Sweet, L., and Zelikoff, J. 2001. "The Toxicology and Immunotoxicology of Mercury: A Comparative Review in Fish and Humans". Journal of Toxicology and Environmental Health-B 4:161-205.

UNDP. 2007. “Chemicals Management: The Why and How of Mainstreaming Gender”. [online] Available at: http://www.undp.org/content/undp/en/home/librarypage/environment-energy/chemicals_management/chemicals-management-the-why-and-how-of-mainstreaming-gender.html.

UNEP. 2013. “Concept Note: Development of a ‘Practical Sourcebook on Mercury Storage and Disposal”. UN Environment S3-6. [online] Available at: https://wedocs.unep.org/bitstream/handle/20.500.11822/12882/[3-6]Sourcebookconceptnote.pdf?sequence=1&isAllowed=y.

UNEP. 2017a. “Toolkit for Identification and Quantification of Mercury Sources, Reference Report and Guideline for Inventory Level 2, Version 1.4, December 2017”. UN Environment Chemicals Branch, Geneva, Switzerland.

UNEP. 2017b. “Draft Interim Storage Guidelines”. Conference of the Parties to the Minamata Convention on Mercury: First meeting. [online] Available at: http://unepmercurycop1.mediafrontier.ch/wp-content/uploads/2017/08/1_25_e_storage.pdf.

UNIDO. 2017. "Independent Terminal Evaluation: Reduce Exposure of Mercury to Human Health and the Environment by Promoting Sound Chemical Management in Mongolia". UNIDO Project No.: 120097. [online] Available at: https://www.unido.org/fileadmin/user_media_upgrade/Resources/Evaluation/GFMON-120097_Eval_Report-vs_TE-2016.pdf.

US EPA. 2016a. “Mercury in Dental Amalgam”. [online] Available at: https://www.epa.gov/mercury/mercury-dental-amalgam.

US EPA. 2016b. “Cleaning Up a Broken CFL: Recommendations for When a CFL or Other Mercury-containing Bulb Breaks”. [online] Available at: https://www.epa.gov/cfl/cleaning-broken-cfl.

Valera, B., Dewailly, E., and Poirier, P. 2011. "Impact of Mercury Exposure on Blood Pressure and Cardiac Autonomic Activity among Cree Adults (James Bay, Quebec, Canada)". Environ. Res. 111: 1265–70.

Vassell, Linette. 2014. “Country Gender Assessment St. Kitts & Nevis (Vol. 1)”. Caribbean Development Bank. [online] Available at: http://www.caribank.org/uploads/2014/12/CGA-St-Kitts-Nevis_Vol-I_JULY2014_FINAL.pdf.

World Bank. Date unknown. “Data: Saint Kitts and Nevis.” [online] Available at: https://data.worldbank.org/country/st-kitts-and-nevis.

World Health Organization. 2014. “Environmental Health Criteria 242. Dermal Exposure”. [online] Available at: http://www.inchem.org/documents/ehc/ehc/ehc242.pdf.

World Health Organization. 2017. “Mercury and Health.” [online] Available at http://www.who.int/mediacentre/factsheets/fs361/en/.

Zero Mercury Working Group. 2010. “FACT SHEET: Mercury in Skin Lightening Cosmetics”. [online]. Available at: http://www.mercurypolicy.org/wp-content/uploads/2010/06/skincreamhgfactsheet_may31_final.pdf.

Annex I: Project Stakeholder List

National Project Workshops' Stakeholder List

Department	Name	Phone Number [+869]	E-Mail
BCRC-Caribbean	Ali Shah, Tahlia	1-868-628-8369	tahlia.alishah@bcrc-caribbean.org
	Batchasingh, Jewel	1-868-628-8369	jewel.batchasingh@bcrc-caribbean.org
BRI- MIA Report Consultant	Evers, David		david.evers@briloon.org
Bureau of Standards	Jefferson, Dorothy	465-5279	dorotheamills@gmail.com
	Sweemey, Avicia	465-5279	aviciasweeney@hotmail.com
	Jermine Mike	465-5279	jermine.mike@gov.kn
	Sutton, Javier	465-5279	javier1016@hotmail.com
	Connor, Franklyn	465-5279	f.connor89@gmail.com
	William, Hiram	465-5279	mplbos@gmail.com
C&C Trading, Ltd.	Solomom, Osbert	465-4081	solnail@yahoo.com
CARDI	Knight, Lawrence	465-2846	skn_cardi@sisterisles.kn
Clarency Fitzroy Bryant College /HERC	Edwards, Quincy	465-2856	quincyedwards24@gmail.com
Consumer Affairs	Queeley, Paul	467-1550	pqueeley@yahoo.com
Customs and Excise Department	Fyfield, Roger	465-5221 x 6385	rfyfield@hotmail.com
	Huggins, Janesia	466-7227	janessahuggins@skncustoms.com
Department of Agriculture	Bart, Quincy	465-5521	bartquincy@gmail.com
	Jeffers, Kevin	467-1828	kevinjeffers22@gmail.com
Department of Cooperatives	Myers, Joalyn Alsette	469-5521 x 2124	alsette-myers@niagov.com
Department of Environment	Belle, Sylvester	466-8535	sylbelle44@gmail.com
Department of Fisheries	Morton, Randy	469-5521	morton.t.randy@gmail.com
	Arthurton, Althea L.	469-4421 x 2088/2161	econplanning@yahoo.com
Department of Physical Planning, Natural Resources and Environment	Ward, Thema	469-5521 x 6302	thema.ward@niagov.com
Environmental Health Services Division	Ottley, Javier	469-9323	javier.ottley@niagov.com
Fahies Agricultural Women Co-operative Society Company Ltd.	Leader, Natasha	664-2793	fahieswomen@gmail.com
Fire and Rescue Service	Samuel, Abdias	469-8525/8526	samuel3279@gmail.com
Foreign Affairs	Penny, Michael	467-1160	michaelpennyska@gmail.com
H2O Plus	Lewis, Alexa	764-6441	alexalewis@gmail.com
Hotel and Tourism Association	Hendrickson, Tara	465-5304	tara.hendrickson@stkittsnevishta.org
Inter-Serv Ltd.	Williams, Harjadier	465-3406	sales@inter-servln.com

Jacobs Air Conditioning Service	Mussenden, Stanley	662-2944	
Jaro Electronics, Ltd.	Archibald, Doris	465-9624	dorisjaro@phasetronics.com
Legal Consultant	Mc Calla, Winston	1-876-926-7681	winstonconsult@yahoo.com
Liamuiga Funeral Home	Pemberton, Eudelier	466-1225	liauigafuneralhome@gmail.com
Lutron Liamiga. Ltd	Wilson, Damion	465-8825	dwilson@hotmail.com
Ministry of Education	Crawford, Kimberly	465-2332	kimberlyjacrawford@gmail.com
Ministry of Health, Health Promotion Unit	Matthew-Duncan, Latoya	467-1236	latoyamduncan@gmail.com
Ministry of International Trade; Chamber of Industry and Commerce	O'Flaherty, Joseph	763-6623	joseph269@gmail.com
Ministry of Public Infrastructure, Urban Development Unit	Boddie, Rhon	467-1465	rhonboddie@gmail.com
Ministry of Tourism - Nevis	Bailey, Niola	469-5521	nyoka.bailey@niagov.com
National Drug Council	Nital,Newrish	466-4496	newrishnital@yahoo.com
National Emergency Management Agency	Langley-Stevens, Claricia	467-1151	lady.langleystevens@gmail.com
National Project Coordinator- Inventory	Douglas, Helen	465-2787	genesis738@yahoo.com
Nevis Air and Sea Port Authority	Weekes, Shelly	469-2001	shellyweekes@hotmail.com
Nevis Electricity Company, Ltd.	Swanston, Jervan	469-7243	jerva.swanston@nevlec.com
Nevis Water Department	Liburd, Kelron	469-5292	minuzz337@gmailcom
Premier Dental/SKANDIS/ Liamuiga FH	Jones, Dorett	466-2030	dorj52@hotmail.com
Retired -Social Security	Lescott, Edez	660-4833	edezfloe@gmail.com
RLB Iional Airportnternat	Caines, Kester	466-5598	kester.caines@scaspa.com
St. Kitts Met. Service / SCASPA	Burke, Elmo	465-2749	elmo.burke@scaspa.com
Sugar's Development Rental Management	Meinze, Caroline	466-5050	cmeinze@hotmail.com
TDC	Maynard, Sherman	469-5430	sherman.maynard@tdcgroupltd.com
Willett's Photo Studio	Willett, Lesroy	465-2593	willetts465@yahoo.com

Annex II: Stakeholder Questionnaires

A. Questionnaire for Power Station

B. Questionnaire for Fuels

C. Questionnaire for Customs Division

D. Questionnaire for Dental Sector

E. Questionnaire for Waste Incineration

F. Questionnaire for Waste Deposition

G. Questionnaire for Waste Water Treatment

H. Questionnaire for Funeral Homes

A. Questionnaire for Power Station

Minamata Initial Assessment Project

NAME			
COMPANY NAME (IF APPLICABLE)			
ADDRESS			
CONTACT INFORMATION	PHONE	MOBILE	EMAIL

Please provide current and accurate information in the spaces provided below.

Power from refined oil

Concentration of mercury (mg mercury/tonne)	Oil used (tonnes/year) (2014)	Mercury release to air, land, water, etc is dependent on the type of emissions controls present. Output Scenario
	-Heavy Fuel Oil -Diesel	1. Oil Combustion Facility with no emissions controls ☐ 2. Oil Combustion Facility with PM control using an ESP or scrubber ☐ 3. Power plants with cESP and FGD ☐
		Other:

Abbreviations: PM – Particulate Matter (dust), ESP – Electrostatic Precipitators, cESP – (coldside) Electrostatic Precipitators, FGD – Flue Gas Desulfurization

Power from natural gas

Is natural gas refined? Yes ☐ No ☐

Natural gas used raw ☐ or pre-cleaned ☐ or both ☐

Concentration of mercury (µg mercury/Nm^3 gas)	Gas (Nm^3/year) (projection)	Mercury release to air, land, water, etc
		100 % air

Thank you for taking the time to complete this survey

B. Questionnaire for Fuels

Minamata Initial Assessment Project

NAME			
COMPANY NAME (IF APPLICABLE)			
ADDRESS			
CONTACT INFORMATION	PHONE	MOBILE	EMAIL

Please provide current and accurate information in the spaces provided below.

Crude oil refining

Origin of crude oil	Concentration of mercury (mg mercury/tonne)	Crude oil (tonnes/year)	Year	Mercury release to air, land, water, etc
				25 % air, 1 % water, 15 % sector specific treatment/disposal

Asphalt

Concentration of mercury (mg mercury/tonne)	Oil (tonnes/year)	Year	Mercury release to air, land, water, etc
			100 % air

Refined oil used for transportation

Number of gasoline retailers	Concentration of mercury (mg mercury/tonne)	Gasoline and Diesel (tonnes/year)	Year	Mercury release to air, land, water, etc
		-Gasoline -Diesel		25 % air, 1 % water, 15 % sector specific treatment/disposal

Liquified Petroleum Gases

Concentration of mercury (mg mercury/tonne)	LPG (tonnes/year)	Year	Mercury release to air, land, water, etc
			100 % air

Thank you for taking the time to complete this survey

C. Questionnaire for Customs Division

Minamata Initial Assessment Project

NAME			
COMPANY NAME (IF APPLICABLE)			
ADDRESS			
CONTACT INFORMATION	PHONE	MOBILE	EMAIL

Please submit this data within two (2) weeks of receipt of this correspondence.

Thank you for taking the time to complete this survey.

Please fill in the table below with the required details on the categories of measuring devices imported in 2015 and 2016, where applicable:

	Item	Relevant HS Codes	Country of Origin, if available	g Hg/item, if available	Units imported in 2015	Units imported in 2016
1	Mercury in flasks of a net content of 34,5 kg "standard weight", of a fob value per flask of <= € 224	2805 40 10				
2	Mercury (excl. in flasks of a net content of 34,5 kg "standard weight", of a fob value per flask of <= € 224)	2805 40 90				
3	Amalgams of precious metals	2843 90 10				
4	Compounds, inorganic or organic, of mercury (excl. amalgams)	2852 00 00				
5	Inorganic compounds, n.e.s.; amalgams (excl. of precious metals)	2853 00 90				
6	Clinical thermometer containing mercury	9025 1120				
7	Clinical thermometer mercury free	9025 1920				
8	Ambient air thermometer containing mercury	9025 1180				
9	Ambient air thermometer mercury free	9025 1920				
10	Industrial and special application thermometers containing mercury	9025 1180				
11	Glass thermometers with Hg for laboratories	9025 1180				
12	Glass thermometers Hg free for laboratories	9025 1920				
13	Barometers/manometers containing mercury	9025 8020				
14	Barometers/manometers mercury free	9025 8020				

15	Hydrometers, pyrometers, hygrometers, etc., containing mercury and combinations excl. 9025 1120 and 9025 1180	9025 8080				
16	Hydrometers, pyrometers, hygrometers, etc., mercury free and combinations excl. 9025 1920	9025 8040				
17	Instrument/apparatus to measure or check the pressure of liquids/gases mercury free	9026 2000				
18	Instrument/apparatus to measure or check the pressure of liquids/gases containing mercury	9026 2000				
19	Spectrometers, spectrophotometers and spectrographs using optical radiations, such as UV, visible, IR	9027 30 00				
20	Instruments and apparatus for physical or chemical analysis, using UV, visible or IR optical radiations (exlc. spectrometers, spectrophotometers, spectrographs and gas or smoke analysis apparatus)	9027 50 00				
21	Sphygmomanometers mercury free (medical blood pressure gauges)	9025 8020				
22	Sphygmomanometers containing mercury (medical blood pressure gauges)	9025 8020				
23	Thermostats mercury free	9032 1000				
24	Thermostats containing mercury	9032 1000				
25	Discharge lamps, fluorescent, hot cathode with double ended cap	8539 3110				
26	Discharge lamps, fluorescent, hot cathode excluding with double ended cap	8539 3190				
27	Mercury or sodium vapour lamps; metal halide lamps	8539 3200				
28	Low energy consumption lamps	8539 3910				

29	Discharge lamps, other than ultra-violet, low energy and fluorescent lamps	8539 3990				
30	Ultra-violet or infra-red lamps excl. arc lamps	8539 4900				
31	Manganese dioxide primary cells or batteries	8506 1000				
32	Mercuric oxide primary cells or batteries	8506 3000				
33	Silver oxide primary cells or batteries	8506 4000				
34	Lithium primary cells or batteries	8506 5000				
35	Air-zinc primary cells or batteries	8506 6000				
36	Other primary cells/batteries	8506 8000				
37	Laptops	847 130				
38	Cell Phones	851 712				
39	LCD Screens	8528 5900				
40	LC Screens	8528 7390				
41	Cosmetics containing mercury					
42	Paint containing mercury					
43	Pesticides and biocides containing mercury					
44	Pharmaceuticals containing mercury					

D. Questionnaire for Dental Sector

Minamata Initial Assessment Project

NAME			
COMPANY NAME (IF APPLICABLE)			
ADDRESS			
CONTACT INFORMATION	PHONE:	MOBILE:	EMAIL:

1. **Which do you use in your dental practice?**

   ☐ Elemental mercury (from a dispenser)

   ☐ Pre-capsulated mercury

   ☐ None

2. **Can you indicate the dental amalgam supplier to your dental practice?**

_____

3. **For the past year (1), kindly indicate the following information where applicable:**

Years	Number of Old Amalgams Removed	Number of New Amalgams Placed
2016		

4. **What type of chair side trap filter do you use?**

- ☐ Reusable
- ☐ Disposable

5. **How do you manage your waste from chair side traps? (please tick all that are applicable)**

- ☐ Recycle
- ☐ General garbage
- ☐ Biohazard Waste
- ☐ Wash down sink
- ☐ Don't know
- ☐ Other (please explain)_____

_____

<u>Please submit this data within two (2) weeks of receipt of this correspondence.</u>

Thank you for taking the time to complete this survey.

E. Questionnaire for Waste Incineration

Minamata Initial Assessment Project

NAME			
COMPANY NAME (IF APPLICABLE)			
ADDRESS			
CONTACT INFORMATION	PHONE	MOBILE	EMAIL

Please provide current and accurate information in the spaces provided below (or tick the appropriate boxes).

Municipal/general waste is incinerated?	Yes ☐	No ☐
Hazardous waste is incinerated?	Yes ☐	No ☐
Medical waste is incinerated?	Yes ☐	No ☐
Sewage sludge is incinerated?	Yes ☐	No ☐

Types of waste incinerated	**Concentration of mercury in incinerated waste (g mercury/tonne)**	**Waste incinerated (tonnes/year)**	**Mercury release to air, land, water, etc is dependent on the type of emissions controls present.** **<u>Output scenario</u>**
			1. No emission reduction devices ☐ 2. PM reduc, simple ESP, or similar ☐ 3. Acid gas control with limestone (or similar acid gas absorbent) and downstream high efficiency FF or ESP PM retention ☐ 4. Mercury specific absorbents and downstream FF ☐

Abbreviations: ESP – Electrostatic precipitator; FF - Fabric filter (or "bag filter"); PM – Particulate matter (or PM fil-ter).

Thank you for taking the time to complete this survey

F. Questionnaire for Waste Deposition

Minamata Initial Assessment Project

NAME			
COMPANY NAME (IF APPLICABLE)			
ADDRESS			
CONTACT INFORMATION	PHONE	MOBILE	EMAIL

Please provide current and accurate information in the spaces provided below (or tick the appropriate boxes).

Are there controlled landfills/deposits? Yes ☐ No ☐

Is there informal dumping of general waste? Yes ☐ No ☐

Concentration of mercury in waste (g mercury/tonne)	Waste landfilled/dumped (tonnes/year)	Year	Mercury release to air, land, water, etc is dependent on the type of emissions controls present.
			Controlled landfill 1 % air, 0.01 % water Informal dumping 10 % air, 10 % water, 80% land

Thank you for taking the time to complete this survey

G. Questionnaire for Waste Water Treatment

Minamata Initial Assessment Project

NAME			
COMPANY NAME (IF APPLICABLE)			
ADDRESS			
CONTACT INFORMATION	PHONE	MOBILE	EMAIL

Please provide current and accurate information in the spaces provided below (or tick the appropriate boxes).

Origin of waste water	**Concentration of mercury in waste water (mg mercury/m^3)**	**Waste water (m^3/year)**	**Mercury release to air, land, water, etc is dependent on the type of emissions controls present. <u>Output scenario</u>**
			1. No treatment; direct release from sewage pipe ☐ 2. Mechanical treatment only ☐ 3. Mechanical and biological (activated sludge) treatment; no land application of sludge ☐ 4. Mechanical and biological (activated sludge) treatment; 40% of sludge used for land application ☐

Thank you for taking the time to complete this survey

H. Questionnaire for Funeral Homes

Minamata Initial Assessment Project

NAME			
COMPANY NAME (IF APPLICABLE)			
ADDRESS			
CONTACT INFORMATION	PHONE	MOBILE	EMAIL

Please provide current and accurate information in the spaces provided below.

Concentration of mercury (g mercury/corpse)	Corpse buried/year	Corpse cremated/year

Thank you for taking the time to complete this survey

Annex III: Inventory Spreadsheet

The UNEP Toolkit Calculation Spreadsheet is available online at the following link:

http://www.bcrc-caribbean.org/what-we-do/minamata-convention-on-mercury/saint-kitts-and-nevis-minamata-initial-assessment/

If any issues arise in accessing link, please contact the BCRC-Caribbean via e-mail at: info@bcrc-caribbean.org