REPUBLIC OF SEYCHELLES

MINAMATA INITIAL ASSESSMENT REPORT 2016



Document title	Minamata Initial Assessment Report 2016
Document short title	MIA Report
Date	15th Mar 2017
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Acknowledgements
We would like to thank everyone who participated in the development of this document, including experts at the UNDP. Cover page photos by Mr. Cliff Gonzalves and the late Mr. Terrence Lafortune.

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ACRONYMS

ASGM	Artisanal Small scale Gold mining
BERI	Blue Economy Research Institute (of UniSey)
BRI	Biodiversity Research Institute
CBD	Convention on Biological Diversity
CFL	Compact Fluorescent Lamp
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COMESA	Common Market for Eastern and Southern Africa
CMS	Convention on Migratory Species
DOE	Department of Environment
EEZ	Economic Exclusive Zone
EPA	Environment Protection Act
EU	European Union
GDP	Gross Domestic Product
GEF	Global Environment Facility
HDI	Human Development Index
Hg	Mercury
HS	Harmonized System (Harmonized commodity description and coding systems)
IPIECA	International Petroleum Industry Environment Conservation Association
IMF	International Monetary Fund
IPPC	International Plant Protection Convention
LED	Light Emitting Diode
LPG	Liquefied Petroleum Gas
MEA	Multilateral Environment Agreement
MEECC	Ministry of Environment and Energy & Climate Change
M&E	Monitoring and Evaluation
MIA	Minamata Initial Assessment
MOH	Ministry of Health
MT	Metric Ton
NAP	National Action Plan
NIP	National Implementation Plan
NGO	Non-Governmental Organization
NMP	National Mercury Profile
NRDC	National Resources Defense Council
PECO	Public Education, Communication and Outreach (Section of MEECC)
PET	Polyethylene Terephthalate
PCU	Project Coordination Unit (of MEECC)
POPs	Persistent Organic Pollutants
PU	Polyurethane
SAICM	Strategic Approach to International Chemicals Management
SADC	Southern Africa Development Community
SBS	Seychelles Bureau of Standards
SCCI	Seychelles Chamber of Commerce and Industry
SEPEC	Seychelles Petroleum Company
SFA	Seychelles Fishing Authority
SIDS	Small Island Developing States
SRC	Seychelles Revenue Commission
SSDS	Seychelles Sustainable Development Strategy
STAR	Societe Traitement D'Assainessment Regionale

STC	Seychelles Trading Company
TOR	Terms of Reference
UNCCD	United Nations Convention to Combat Disertification
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UniSey	University of Seychelles
VCM	Vinyl Chloride Monomer
WEP	Division of Waste, Enforcement and Permits (of MEECC)
WHO	World Health Organisation
WTO	World Trade Organisation

Foreword



Seychelles was one of the first countries that has signed and ratified the Minamata Convention on Mercury. The Minamata Convention on Mercury is a very important convention for Seychelles as it seeks to protect human health and the environment from the adverse effects of mercury. We understand and acknowledge the threat that mercury and mercury compounds poses to human health and the environment.

Evidently, as a Small Island Developing State (SIDS), Seychelles is not a producer of mercury, but nonetheless we are exposed and remain vulnerable to impacts of anthropogenic release of mercury, particularly from other countries that are involved in mercury related manufacturing and trade.

We must also focus our attention at national level and explore the means for reducing our mercury emission. We still at the moment very much rely upon and use mercury-containing devices. Positive and active partnerships are necessary between government and the private sector, in variety of sectors ranging from health to cosmetics.

The safe disposal of mercury-containing products also presents some of the greatest challenges for Small Island Developing States like Seychelles. It is where partnerships are required between states to facilitate transfer of this waste to areas where it can be recycled or rendered safe.

At the national level, we will continue to put in place proper disposal facilities and systems to deal with mercury waste. However, the responsibility lies on every stakeholder involved with, using or trading mercury or products and items containing mercury to make the switch to the alternatives.

As a nation, we depend a lot on fish for protein and our tuna industry underpins our economy. The issue of mercury in fish is an important issue for Seychelles; steps towards reduction of global emission will impact positively in reducing mercury risk within our marine species.

In order to transit to a mercury-free society, there is a pressing need for education and sensitization on the subject of mercury as an element, its uses but most importantly the alternatives to it. Equally, there is a need for strengthening of capacity of the relevant authorities so as to better monitor and manage the use of Mercury.

The government commits itself fully towards the implementation of the national action plan and all the other obligations under the Convention.

Alain de Commarmond
Principal Secretary
Department of Environment
Ministry of Environment, Energy and Climate Change

Executive Summary

The Minamata Initial Assessment (MIA) is intended to facilitate countries to ratify and implement the Minamata Convention on Mercury. Seychelles ratified the Convention on the 13th January 2015. The MIA project had three main project outputs including: 1) a national inventory for mercury, 2) a policy, legal and institutional gap analysis, 3) and the development of a national implementation plan on mercury. In this report we summarize the results of the MIA project including a summary of the three major outputs. In addition we provide a review of potential future intervention plans that target major sectors responsible for mercury emissions and releases in Seychelles.

I. Results of the national mercury Inventory

The inventory for mercury in Seychelles is presented through four different output pathways: 1.) emissions to air, 2.) direct releases to water, 3.) direct releases to land, and 4.) others (Table 1). The "others" category includes output pathways for "products", "general waste" and "sector-specific waste treatment". These pathways are included in the inventory, even though the final receiving media may ultimately be land, air, and water. Examples of "products" (or "by products") are items that contain mercury, which are sent back to the market and cannot directly be allocated to environmental releases. The "general waste" category would include consumer products that contain mercury, which is not collected or treated in separate systems, whereas "sector specific waste treatment" would encompass waste from industry or consumers that is collected and treated in separate systems, and in some cases recycled. Among other output pathways, this would include hazardous industrial waste with high mercury content and hazardous consumer waste with mercury content. See guidance document[1] for full characterization of this category.

As expected, most of the mercury identified in Seychelles comes from mercury containing devices, such as compact fluorescent lamps (CFL), sphygmomanometers, thermometers and dental amalgam. These are released mostly though air, water and general waste. There are no mercury mines or industries that use mercury or its compounds.

Contaminated sites
Although not strictly a requirement of the MIA, it was noted that mercury-containing wastes have been deposited in unlined landfills at Providence I and other closed landfills, and is currently being deposited in the sanitary landfill II. In the absence of rehabilitation of Providence I and leachate treatment in Providence II, mercury can contaminate the surrounding marine ecosystems.

Emissions to air
The calculated mercury emission to air was 16 kg.year^{-1}; the main source being incineration of medical waste and uncontrolled burning of landfill fires (9 kg.year^{-1}) (Figure 1).

Releases to water
The estimated mercury releases to water was 10 kg.year^{-1}; the main source is wastewater coming from dental practices under the heading of "other product / process use", but also the treatment of sewage and landfill leachate (Figure 2).

Releases to land
The estimated mercury releases to land was 6 kg.year^{-1}. Releases to land come from diffuse releases from uncollected waste products that contain mercury. This estimate includes cemeteries, which account

[1] http://www.unep.org/chemicalsandwaste/Portals/9/Mercury/Toolkit/Hg-Toolkit-Reference-Report-April2015.pdf

for dental amalgams found in the deceased, and other land applications, such as pesticides, disposal of sewage sludge and incinerator ash (Figure 3).

Others

Mercury present in the "general waste" category was calculated at 18 kg.year^{-1}. Mercury in "byproducts and impurities" was 1 kg.year^{-1} and 5 kg.year^{-1} from sector specific treatment / disposal.

The total calculated releases of mercury for Seychelles in 2015 was **55kg.**

Figure 1: Pie chart illustration of sources of mercury emissions to air

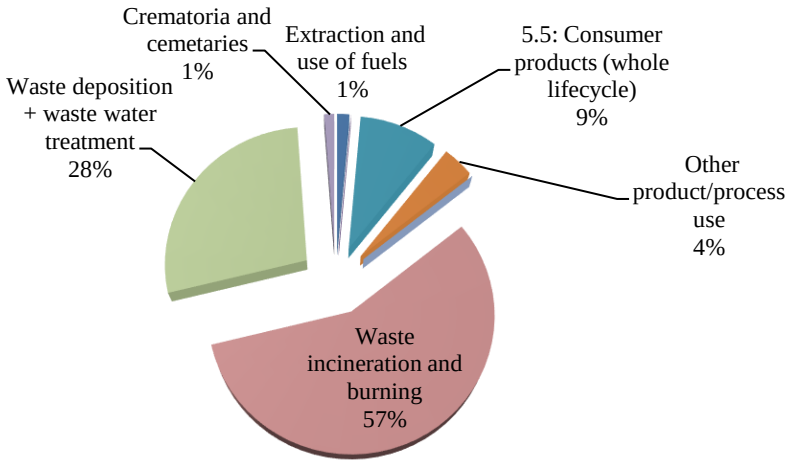


Figure 2: Pie chart illustration of sources of mercury emissions to water

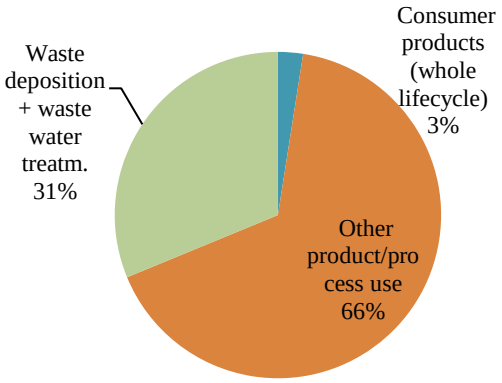
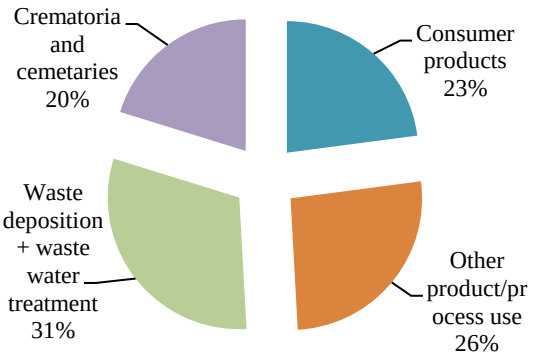


Figure 3: Pie chart illustration of sources of mercury emissions to land



II. Policy, regulatory and institutional assessment

Although Seychelles has ratified the Minamata Convention on Mercury and has shown commitment towards its implementation, an assessment of the regulatory framework has revealed systemic gaps that would hinder the implementation of the Convention at a national level. Consequently, regulations will be developed and enacted to meet and adhere to Convention requirements. This chapter summarizes the key policy, regulatory and institutional findings as follows:

- For Seychelles, several articles of the Convention are not applicable and will not be included as part of the country's implementation plan, although these would be addressed in the legislation. The stated articles are with respect to: (1) supply/mining of mercury (Article 3), (2) manufacturing processes, such as production of non-ferrous metals and other processes (Article 5), and (3) artisanal and small scale gold mining (Article 7). For the point source categories listed in Annex D of the Convention, only waste incineration is relevant. Besides those listed above, the other articles of the Convention are quite applicable to Seychelles.

- National legislation is currently insufficient to meet the Convention requirements and will require updates and revisions for implementation. In particular, there is a need to include the phase-out period and list of mercury-added products listed under Annex A of the Convention. The legislative framework with regards to chemicals is generally not compliant with other chemical conventions, such as the Stockholm Convention. The approach to resolve the shortcomings of the Stockholm Convention (by enacting a Hazardous Chemical Act or by regulation of the Environment Protection Act) can be equally adapted for the Minamata Convention. Similarly, Codes of Practices with regards to chemicals (published by Seychelles Bureau of Standards) are outdated and will require revision.

- In terms of institutional and technical capacity, there is currently limited experienced staff in Government to oversee the effective implementation of a mercury programme, although such capacity exists in the private sector. There is currently no storage facility for hazardous waste, including mercury-containing waste, and no activity targeting this waste stream.

- Institutions involved in monitoring mercury, such as SFA and SBS, are involved at a level where fish can be deemed safe to be exported (e.g., through testing of fish to determine muscle mercury concentrations). The result of these tests is not made public nor are they transmitted to the Ministry of Environment, Energy and Climate Change.

- Feedback from the mercury workshops and past exercises, notably under SAICM and the Stockholm NIP update processes, have revealed generally limited awareness amongst stakeholders and the public on chemical related issues. This is in part related to the level of education and interest in this topic in Seychelles. Such constraints translate into operational impediments when national plans involving chemicals are to be executed.

III. The National Implementation Plan for mercury

Seychelles National Implementation Plan (NIP) for mercury aims to address gaps in legislative and technical aspects as highlighted in the National Mercury Profile and legislative review. This is a four-pronged programme consisting of a total of 13 main actions. Component 1 covers the legal and institutional framework - being the result and recommendations of the policy, regulatory and institutional assessment. Component 2 includes provisions for storage and disposal facilities for mercury containing devices. Component 3 incorporates capacity building education and awareness. Component 4 deals with research, monitoring and reporting. As is the case for other NIP's involving chemicals, the approach has been to make the NIP as simple and easy to understand as possible (Table 1) whilst drawing on activities that deliver the most impact.

Table 1: National Action plan for mercury for Seychelles

Activity	Responsibility	Budget (USD)	Timeframe
1. Legal and institutional		**21,500**	
1.1 Develop regulation to comply to the Minamata Convention under EPA	MEECC	20,000	2017
1.2 Update SBS Codes and Practices SS36:1994	SBS	1,500	2018
2. Storage and disposal		**175,000**	
2.1 Construction of interim storage facility for mercury containing equipment	MEECC	90,000	2018
2.1 Programme for phase out of mercury containing products in Part I, Annex A	MOH	55,000	2018
2.2 Programme for phase out of amalgams from dental clinics/ provision of mercury bins	MEECC + Energy Commission	30,000	2018
3. Capacity building, Education & Awareness		**25,500**	
3.1 Technical training on Minamata Convention and proposed regulations for Officers of MEECC	MEECC	7,500	2017 - 2021
3.2 Training for Customs Officers, first responders	MEECC	5,000	2017-2021
3.3 Mainstreaming mercury in the work programme of PECO		10,000	
3.4 Publication of mercury assessment in fish in Seychelles	SFA	3,000	2017
4. Research, monitoring and reporting		**70,000**	
4.1 Develop mechanism for technical cooperation and technology transfer between local and overseas institutions			
4.2 Updating the national inventory on mercury	MEECC	15,000	2018-2021 every 2 years
4.3 Convention reporting	MEECC	15,000	2018-2021 every 2 years
4.4 Pollution monitoring (seawater, sediment, organisms)	MEECC	40,000	2018-2021
TOTAL		**292,000**	

IV. Data Gaps and recommendations

Data gaps

As expected, there were shortcomings in the data for some categories, which necessitated estimations. These are detailed in the report under the respective categories. The main gap was with respect to import data. This is principally because Customs use it to calculate tariffs not for inventory of items entering the country. Therefore for some items the type e.g. batteries, fluorescent lights, mercury gauges and thermometers are not exclusively detailed into its different types.

Estimates from the Landscape & Waste Management Agency (LWMA), were used for solid waste generation on Praslin and La Digue since there are no landfill weighbridges on these islands despite the presence of a small sanitary landfill on La Digue and notable increase in development on the island of Praslin.

Local production for some categories is particularly daunting to quantify for lack of specific studies or production figures. This is especially the case for local charcoal production, which is as yet a relatively small and obscure business

The main source of waste incineration in Seychelles comes from processing of medical waste. The hospital has specialized medical waste incinerators, however there is no system to weigh the waste and get precise information on the amount being incinerated. Recourse was made to estimates provided by the Environmental Health Division during inventory under Stockholm convention.

Finally there were gaps for information on chemicals such as lab chemicals and cosmetics. For the inventory, estimate based on population was made and market search was carried out for cosmetics that are known to contain mercury.

Recommendations

The following recommendations aims to strengthen subsequent reporting on Mercury

1. Improve imports data collection by having more detailed entries to the various products listed. Perhaps a sub classification within the HS code to capture subcategories.,
2. The MEECC should ideally implement a system to capture charcoal production figures for permits issued.
3. LWMA should improve data collection on flytipping by weighing the flytipped waste that is collected from illegal dumpsites.
4. LWMA and the Ministry of Health can develop system to weigh the medical wastes that are incinerated and receive information on smaller incinerators located in the outer smaller islands.
5. Cosmetic sector need to be better regulated in terms of imports and targeting products that may contain harmful substances including mercury

Chapter I - Introduction

1.1 Minamata Convention on Mercury

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

At the local level, exposure to mercury is due to point sources of emissions (largely due to certain occupational activities, such as gold mining, mineral processing, waste processing, production of mercury containing products, etc.). At the global level, mercury is released primarily from burning coal for electricity generation and from natural phenomena, such as volcanic activity and the natural erosion of parent material. Even in the absence of local point sources, populations worldwide are exposed to mercury because it circulates in the atmosphere and is deposited in bodies of water, where it is converted to its methylated organic form. In view of the risks that mercury poses to human health and the environment, the global community agreed in 2009 to start intergovernmental negotiations with the objective of developing a legally binding treaty to limit global mercury emissions. The treaty known as the Minamata Convention was opened for signature on 10th October 2013 and will take effect after the ratification of 50 member States. Seychelles signed and ratified the Minamata Convention on 27 May 2014 and 13 January 2015, respectively. As of February 2017, there are 128 signatories and 37 ratifications[2].

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

1.2 The Minamata Initial Assessment (MIA) process

To strengthen national capacity towards implementation of future obligations under the Convention, the Global Environment Facility (GEF), as the Financial Mechanism of the Minamata Convention on Mercury, upon entry into force, provides financing to eligible countries to undertake their Minamata Initial Assessment (MIA).

The MIA is intended to facilitate the ratification and early implementation of the Minamata Convention once it comes into force through three primary steps:

- Establishment of a national steering committee to coordinate activities related to the Convention;
- Review and identification of gaps in existing national legislation related to mercury;

[2] www.mercuryconvention.org

- Development of a national mercury profile that includes major sectors that use mercury as well as a summary of major emission and release source types.

Additionally, countries can complement the MIA with an action plan to address the findings of the technical and institutional assessments.

1.3 Seychelles MIA

Seychelles MIA was initiated under the GEF funded project entitled, '*Strengthen national decision making towards ratification of the Minamata Convention and build capacity towards implementation of future provisions'*. The key outcomes being: 1.) an enabling environment for decision-making on the ratification and implementation of the Minamata Convention, and 2.) Development of a National Mercury Profile (inventory) and the Minamata Initial Assessment (MIA) Report. The activities in Seychelles was developed in line with the strategic outcomes, namely development of: 1.) Communications and Information plan, 2.) legal and institutional assessment, 3.) developing the national mercury profile, and 4.) compiling the MIA.

Under the strategic direction of a multi-stakeholder project steering committee, the project was managed within the Programme Coordination Unit (PCU) of the Department of Environment by a Project Manager, who was overseen by the Project Director,. The project recruited local consultancy firms to undertake the main key assignments: 1.) communications plan, 2.) the legal and institutional review, and 3.) national mercury profile. The legal and institutional assessment was started in May 2015 and completed in October 2015.

The mercury profile was undertaken by a team of consultants that were managed by a lead consultant from within the field of chemicals and waste. The team was comprised of four individuals with corresponding backgrounds in the health sector and imports division of Seychelles Revenue Commission (SRC). The mercury profile, based on the UNEP toolkit (Level 1), provided a simplified country overview of mercury sources and quantities. During the inventory process, regular exchanges were conducted between the national team and experts from the Biodiversity Research Institute (BRI), who contributed relevant scientific knowledge and data relating to global mercury assessments and assisted with the communications and information exchange programme.

The Level 1 inventory was started on the 1st November 2015 and completed in February 2016. The results of the National Mercury Inventory were presented to stakeholders, together with the legal and institutional assessment on 16th February 2016, at the STC conference room. In view of the relatively high estimates of mercury obtained from the Level 1 inventory (420kg Hg/year), stakeholders requested that a more detailed Level 2 assessment be carried out. The Level 2 assessments were carried out in July 2016 and together with a preliminary draft of the Minamata Initial Assessment, were presented to stakeholders at a Validation Workshop on the 20th September 2016 (Annex I).

Chapter II: Country Profile

2.1. Geography and population

Seychelles is an archipelagic democratic Republic consisting of 125 islands located in the Western Indian Ocean, 55.6 degrees east of Greenwich meridian and 5 degrees south of the equator. The total land area is 451km^2 and the Economic Exclusion Zone (EEZ) comprises of 1.3 million km^2 of ocean. Ninety percent of the population lives on the mainland of Mahe, which consists of a number of reclaimed artificial islands along its eastern coast. The new islands are intended to meet further development needs of the country and currently used for human settlements, higher end tourism accommodations and renewable energy projects hosting seven wind turbines. Previous reclamations have been used to extend the width of the coast of Mahe allowing for a host of economic activity such as port infrastructure and industrial development zones. The population is 91,400[3], the smallest population in Africa and twelfth[4] smallest in the world. The population is multilingual in creole (native), English and French and is composed of a racial mix of Europeans, Asians and Africans. The islands were previously uninhabited and the human population is due to migration from other countries.

2.2 Political, legal and economic profile

The populace elects a president, who is head of state and Government, for a period of 5 years and is constitutionally restricted to two terms in office. Seychelles parliament comprises of 34 members of which 25 are elected by popular vote with nine seats appointed proportionally on votes received by each party. The other component of Government, namely the judiciary, functions separately from the executive and legislative branches. Seychelles is ranked 5th on the Mo Ibrahim Index of African Governance[5], out of 54 African countries (2015), and 64th world wide for human development, with an HDI rating of 0.772[6] (2014), being the second highest in Africa behind Mauritius (HDI of 0.777). The country has the highest GDP per capita in Africa at ($15,476 in 2015[7]), but is still under an extended IMF programme started in 2008 with the purpose of economic restructuring after several decades of economic stagnation and high debt servicing. At the end of 2015, economic growth was 4.3% of GDP, a 30.6% reduction from the previous year, with 4% inflation, representing 65% increase over the previous year. The country's current account deficit is 17% of GDP (2015) representing 22% reduction from 2014 figures and inflation is 4%. Debt in December 2015 was 60% GDP representing 7% reduction over same period in 2014[8].The country has committed itself to reducing debt to 50% of GDP by 2018 having successfully negotiated two important debt-restructuring agreements in 2012 and engaged in the first debt to adaptation swap involving a debt buy back of $30 million to the Paris club for conservation projects in 2015. Seychelles is party to regional economic organizations including the South African Development Community (SADC) and Common Market for Eastern and Southern Africa (COMESA). On 26th April 2015, Seychelles became a fully-fledged member of the World Trade Organization (WTO).

[3] Seychelles in figures 2015; http://www.nsb.gov.sc/wp-content/uploads/2015/12/Seychelles-In-Figures-2015-Edition1.pdf Accessed 05.12.16

[4] http://www.worldatlas.com/aatlas/populations/ctypopls.htm#.UaiDZFHd6JU Accessed 05.12.16

[5] http://s.mo.ibrahim.foundation/u/2016/10/01184917/2016-Index-Report.pdf?_ga=1.235968710.697221968.1480922988 Accessed 05.12.16

[6] http://hdr.undp.org/sites/default/files/hdr15_standalone_overview_en.pdf Accessed 05.12.16

[7] http://www.worldbank.org/en/country/seychelles/overview. Accessed 05.12.16

[8] http://www.cbs.sc/Downloads/publications/Annual%20Report%202015.pdf; Accessed 05.12.16

2.3 Profiles of economic sectors

Seychelles economy depends on the service industry, which accounts for 80% of GDP[9], followed by industry and manufacturing at 14.6% GDP, and agriculture at 3%. The main economic activities stem from tourism and fisheries. Below is a brief description of these sectors intended to outline the main economic activities and relevance, if any, to the Minamata Convention on mercury.

2.3.1 Tourism

Tourism is a key industry and the contribution of travel and tourism in Seychelles represented 21.3% of the GDP in 2014. Visitor arrivals in 2015 were 276,233, representing a 19% increase over the previous year and a new annual record. Tourism arrivals have been increasing over the past four years at an average rate of 14% annually. Europe is the principal market representing 66% of arrivals; however there has been increases in the Asian market, which now accounts for 18.2% of total arrivals. Several large hotels have opened in the last few years and bed occupancy currently stands at 59% (2015). The annual earnings from tourism industry stand at $393 million for 2015, continually decreasing from $398 million in 2014 and $430 million in 2013.

2.3.2 Fisheries

The fisheries sector currently accounts for a similar share of Seychelles economy with the presence of a tuna-canning factory located on the island of Mahe. In addition, there are several companies involved in the exportation of fish and other marine species to Europe and the Far East. The Fisheries Partnership Protocol with the European Union (2014) provides for harvest of the country's marine resources by 40 purse seiners and 6 long liners for a period of six years. Tuna catch for 2014 was 32,210 metric tons (MT), being a slight decrease over 2013 at 36,826 MT. Revenue from the export of fish accounts for SCR 4.5 billion per year[10] ($346 million; 2013) with canned tuna accounting for 98.6% in value. This is comparable, and has been at times superior, to total tourism earnings. In compliance to legal requirements for export, Seychelles undertakes the testing of heavy metals in fish for all fish destined for overseas market. Seychelles Fishing Authority (SFA) and Seychelles Bureau of Standards (SBS) are directly involved in these tests, however the results are not made public and are transmitted directly to the exporting companies.

2.3.3 Manufacturing

The manufacturing sector in 2015 accounted for 6.4% of GDP, representing a decline from 2014 (6.5% GDP). Product growth in 2015 was recorded for production of beer (14%), stout (2.7%), soft drinks (28%) and production of mineral water (14%). Production of cigarettes has decreased slightly (-9.2%) compared to previous years. Food production has increased (2%) following two years of double-digit contractions. With regards to other manufacturing activities, paint and paint products grew by 4.6% in 2015, production of toilet paper by 20%, whilst soap production declined by 40%. Besides the aforementioned sectors, there is limited primary manufacturing in the country and no chemical manufacturing industry. The country does not have minerals or mines, and therefore do not have chlor-alkali facilities or other manufacturing processes that use mercury.

[9] http://www.cbs.sc/Downloads/publications/Annual%20Report%202015.pdf

[10] http://www.sfa.sc/Downloads/Publications/AnnualReport/SFA%20Annual%20Report%202013.pdf

2.4 Environmental overview

2.4.1 Policy and Strategy

Seychelles is known globally for its pro-environmental stance, with over 50% of its land territory designated as protected areas by law. In 2010, an additional 93% of Silhouette Island, the third biggest island in Seychelles archipelago, was dedicated towards conservation. The country has exceeded the Aichi biodiversity targets for protected areas (for terrestrial territory). Seychelles' overall environment policy is enshrined in its Sustainable Development Strategy (SSDS 2011-2021), which aims to harmonize the country's development with that of its unique environment. The country is a party to and has ratified a number of Multilateral Environment Agreements (MEAs) (Table 2).

Table 2: List of MEAs Seychelles is party to

Convention	Signed	Ratified
Basel	11.05.93	11.05.93
Rotterdam	11.09.98	Not yet
Stockholm	25.03.02	03.06.08
Minamata	27.05.14	13.1.15
CBD	10.06.92	22.09.92
Kyoto Protocol	20.03.98	22.07.02
Cartagena Protocol	23.01.01	13.05.04
Nagoya Protocol	15.04.11	20.04.12
London Convention	29.10.84	29.11.84
UNCCD	14.10.94	26.06.97
CMS	26.05.05	1.08.05
CITES	8.02.77	9.05.77
Ramsar	22.11.04	22.03.05
Montreal Protocol	06.01.93	06.04.93
Marpol	28.11.90	18.03.91
IPPC	31.10.96	31.10.96
UNFCCC	10.06.92	22.08. 92.

2.4.2 Waste management

Seychelles generates approximately 68,000 tons of solid waste per year and a per capita production similar to developed countries. Waste is expected to increase by 40% in the next 10 years due to the heavy consumption of imported products by the local population and tourists. In terms of waste disposal, there are three engineered sanitary landfills; one on La Digue Island and two on Mahe. On Praslin, the landfill is not engineered, but heavy machinery is available for compaction and cover. Purpose built incinerators, operated by the main hospital on Mahe, incinerates all medical wastes and the ash is sent for landfilling. Recycling initiatives developed in the last 10 years for the baling and exportation of ferrous and non-ferrous materials, in addition to a Government programme for collection, exportation and recycling of polyethylene terephthalate (PET) plastic and aluminium beverage can products. There is at least one company involved in recycling paper and carton. All the remaining solid waste goes to designated landfills. Since 2015, the majority of waste is disposed of at the Providence II sanitary landfill, which is lined and offers the possibility for leachate treatment. A portion of the green wastes is composted at a central facility but most are landfilled. There is a small waste fraction of inert glass being sent to a specialised landfill at Anse Royale.

Chapter III: Mercury Inventory

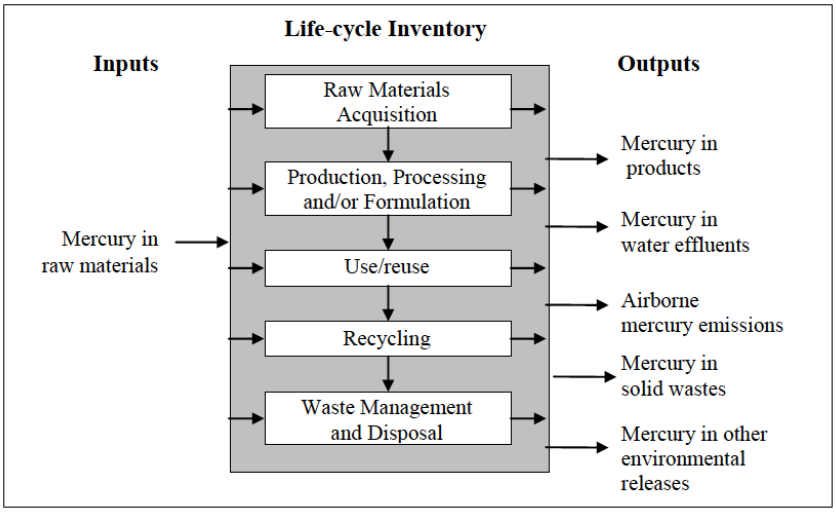
This chapter presents the results of the mercury inventory for Seychelles in 2015. For some data types, data from 2014, or earlier, was used whenever 2015 data was not available. The year for all data given is noted in the relevant sections of this report.

3.1 Methodology

This mercury release inventory was made with the use of the "Toolkit for Identification and Quantification of Mercury Releases" made available by the Chemicals Branch of the United Nations Environment Programme (UNEP Chemicals). The Toolkit is available at http://www.unep.org/hazardoussubstances/Mercury/MercuryPublications/GuidanceTrainingMaterialToolkits/MercuryToolkit/tabid/4566/language/en-US/Default.aspx.

The inventory for Seychelles was developed using the Toolkit and reporting guidelines for both Inventory Level 1 and Level 2. The Toolkit methodology is based on the mass balance principle for each mercury release source type, which incorporates and accounts for inputs, life cycle inventory and outputs (Figure 4). The outputs are characterized with respect to emissions for air, land, water, and others (waste, products and other releases). See further description of these estimations in the relevant Toolkit Guidelines and source type sections.

Figure 4: Illustration of life cycle inventory used in the toolkit



The inventory involved a four-step process[11]:

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

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

Step 3: Quantitative inventory was developed,

[11] http://www.unep.org/chemicalsandwaste/Portals/9/Mercury/Toolkit/Hg-Toolkit-Reference-Report-April2015.pdf

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

In order to better understand the results, chapter III is presented using the Level I reporting guidelines (which best fit the complexity level of Seychelles mercury inventory) and using Level I and Level II data and tables (to reach the best resolution of the mercury inventory as possible):

I. Section 3.2 "Summary of mercury releases, stockpiles, supply and trade"

This is effectively the Executive Summary of the inventory report, comprising Step 1 and Step 2, which reflects the presence of national sources categories for mercury (Table 3). Step 3 and 4 provide a method for the quantitative summary of mercury inputs to society (Table 4), and standardised reporting of the main release types, including: a.) emissions to air, b.) releases to land and c.) releases to water, and d.) others, which are presented in Table 5, as well as graphically under each pathway (Figures 5-8).

II. Section 3.3 – 3.8

The other sections provide further description and detailed calculations on mercury production/release under each source category identified in Table 3. The information is presented under main headings e.g. "energy production" (Step1), which is then further described into subcategories e.g. mineral oil, charcoal, etc. (Step 2). Under each of these subcategories, the analysis is carried out in three steps consisting of:

a.) a brief introduction,
b.) data on mercury emission through production processes, and
c.) data on mercury emission arising out of the use and disposal.

For Seychelles, there are very little production processes, if any, involving mercury, so therefore most of the information will be for use and disposal. The information is displayed in a table, as reproduced from the toolkit (Table 6), containing the following lines:

Activity Rate: Calculated input to phase

This is the amount of mercury ($kg.year^{-1}$), which is being produced, and therefore available to enter the system. The value is calculated from multiplying the input factor (i.e. the concentration of mercury e.g. in a product e.g. g/item) and the activity rate (e.g. the amount of the product manufactured in tons/year e.g. items/year). This is calculated in the first row of the table. The output value is given as $kg.year^{-1}$.

Output distribution factors for phase

Based on the calculation of mercury that is being produced (calculated input to phase), one can assume that this entire amount, by mass balance, will be transferred into the environment. The "output phases" are categorised as "Air", "water", "land", and "others". The latter categories are comprised of "products", "general waste" and "specific waste treatments". The relative separation of mercury into the different output phases is represented by "output distribution factors". Each phase has a default distribution factor for each subcategory, which can be adjusted based on more applicable or relevant scientific data. For Seychelles, the default value was used for lack of precise scientific information.

Calculated outputs/releases to phase

The calculated output/releases gives the amount of mercury that is released to the particular phase in $kg.year^{-1}$.

The value for each phase for production, use and disposal is tallied together into a final value under the last column, "**Sum of releases to pathway from assessed part of life-cycle".** The sum of this column gives the final output value.

3.2 Summary of mercury releases, stockpiles, supply and trade.

3.2.1 Sources of mercury

Table 3 gives the sources of mercury for Seychelles. If the source is present, it is labelled "Yes" (Y) and if absent a "No" (N) (Table 3). Note that only the main source categories, which are present in Seychelles are displayed. See the Toolkit Reference Report Category number for additional information about source categories.

Table 3: Presence of mercury release source types

Cat.	Source category	Source presence
5.1	**Main category - Extraction and use of fuels/energy sources**	
5.1.3	Extraction, refining and use of mineral oil	Y
5.1.4	Extraction, refining and use of natural gas	N
5.1.5	Extraction and use of other fossil fuels	Y
5.1.6	Biomass fired power and heat production	N
5.1.7	Geothermal power production	N
5.5	**Main category - Consumer products with intentional use of mercury**	
5.5.1	Thermometers with mercury	Y
5.5.2	Electrical and electronic switches, contacts and relays with mercury	Y
5.5.3	Light sources with mercury	Y
5.5.4	Batteries containing mercury	Y
5.6	**Main category - Other intentional products/process uses**	
5.6.1	Dental mercury-amalgam fillings	Y
5.6.2	Manometers and gauges	Y
5.6.3	Laboratory chemicals and equipment	Y
5.6.4	Mercury metal use in religious rituals and folklore medicine	N
5.8	**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**	
5.9.1	Controlled landfills/deposits	Y
5.9.2	Diffuse deposition under some control	Y
5.9.4	Informal dumping of general waste	Y
5.9.5	Waste water system/treatment	Y
5.10	**Main category - Cremation and cemeteries**	
5.10.	Crematoria	Y
5.10.	Cemeteries	Y

3.2.2 Mercury inputs to society

The mercury inputs to society represent the main input pathway for mercury in Seychelles. Table 4 indicates that in the absence of production industry, the main input of mercury into the country is through the use and disposal of dental amalgam fillings and mercury added consumer products. See the Toolkit Reference Report Category number for additional information about source categories.

Table 4: Summary of mercury inputs to society

Category no.	Source category	Estimated Hg input, Kg Hg/y, by life cycle phase (as relevant)	
		Production phase*1	**Use + disposal phase**
5.1	**Main category - Extraction and use of fuels/energy sources**		
5.1.3	Extraction, refining and use of mineral oil	**0**	**0**
5.1.4	Extraction, refining and use of natural gas	**0**	**0**
5.1.5	Extraction and use of other fossil fuels	**0**	**0**
5.2	**Main category - Primary (virgin) metal production**	**0**	**0**
5.3	**Main category - Production of other minerals and materials with mercury impurities**	**0**	**0**
5.4	**Main category – Intentional use of mercury as an auxiliary material in industrial processes**	**0**	**0**
5.5	**Main category - Consumer products with intentional use of**		
5.5.1	Thermometers with mercury	**0**	**1**
5.5.2	Electrical and electronic switches, contacts and relays with	**0**	**13**
5.5.3	Light sources with mercury	**0**	**1**
5.5.4	Batteries containing mercury	**0**	**0**
5.6	**Main category - Other intentional products/process uses**		
5.6.1	Dental mercury-amalgam fillings	**0**	**19**
5.6.2	Manometers and gauges	**0**	**2**
5.6.3	Laboratory chemicals and equipment	**0**	**0**
5.7	**Main category - Production of recycled metals**	**0**	**0**
5.8	**Main category – Waste incineration**		
5.8.3	Incineration of medical waste	**0**	**1**
5.8.5	Informal waste burning	**0**	**8**
5.9	**Main category - Waste deposition/landfilling and waste water treatment**		
5.9.1	Controlled landfills/deposits	**0**	**4**
5.9.2	Diffuse deposition under some control	**0**	**0**
5.9.4	Informal dumping of general waste	**0**	**0**
5.9.5	Waste water system/treatment	**0**	**9**
5.10	**Main category - Cremation and cemeteries**		
5.10.1	Crematoria	**0**	**0.19**
5.10.2	Cemeteries	**0**	**1.15**

3.2.3 Summary of mercury releases

Table 5 indicates that the most important sources of mercury releases in Seychelles were in the source categories of "intentional products" and "consumer products", representing 65% of the total output. Considering the movement of these products in solid and liquid waste, the total eventual releases are likely to be much more. The information contained in Table 5 is also presented as bar graphs (Figures 5-8) with further descriptive summary. Note that totals have been rounded to the nearest whole number.

Table 5: Calculated quantities of mercury for Seychelles by output pathways

Source category	**Calculated Hg output, Kg/y**							
	Air	**Water**	**Land**	**By-products and impurities**	**General waste**	**Sector specific treatment /disposal**	**Total releases by source category**	**Percent of total releases** *3*4
5.1: Extraction and use of fuels/energy sources	0.2	-	-	-	-	-	0	0%
5.2: Primary (virgin) metal production	-	-	-	-	-	-	-	0%
5.3: Production of other minerals and materials with mercury impurities*1	-	-	-	-	-	-	-	0%
5.4: Intentional use of mercury in industrial processes	-	-	-	-	-	-	-	0%
5.5: Consumer products with intentional use of mercury (whole life cycle)	1.5	0.3	1.3	-	12.0	-	15	27%
5.6: Other intentional product/process use*2	0.6	9.2	1.5	1.1	5.0	3.7	21	38%
5.7: Production of recycled metals	-	-	-	-	-	-	-	0%
5.8: Waste incineration and burning	8.9	-	-	-	-	-	9	16%
5.9: Waste deposition/landfilling and waste water treatment*3*4	4.3	4.3	1.7	-	1.3	1.3	13	16%
5.10: Crematoria and cemeteries	0.2	-	1.2	-	-	-	1	2%
SUM OF QUANTIFIED RELEASES*3*4	**16**	**10**	**6**	**1**	**18**	**5**	**55**	**100%**

Nota

*1 Includes production of cement, pulp and paper, lime and light weight aggregates

*2 Includes dental amalgam fillings, manometers and gauges, lab chemicals and equipment, Hg use in religious rituals and folklore medicine, and miscellaneous product uses.

*3: The estimated quantities include mercury in products, which has also been accounted for under each product category.

To avoid double counting, the release to land from informal dumping of general waste has been subtracted automatically in the TOTALS.

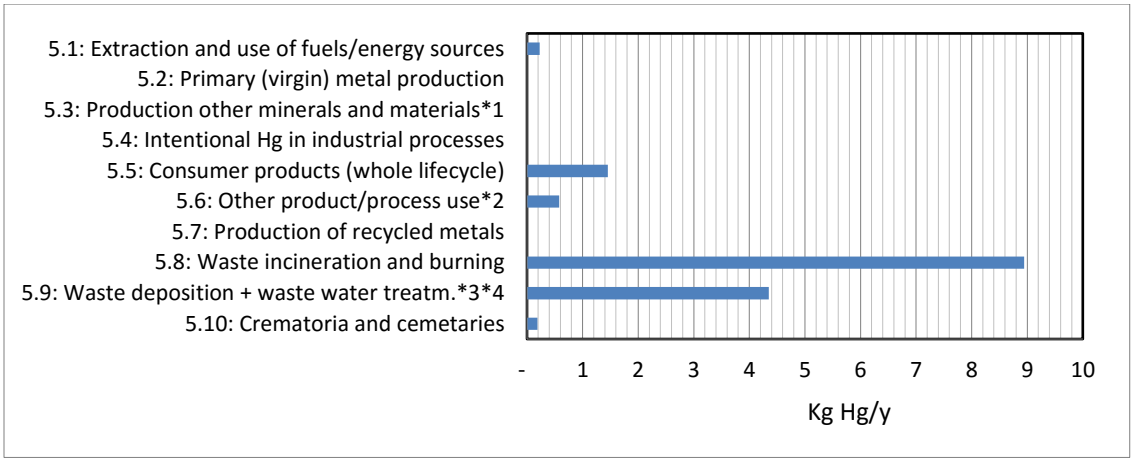
*4: The estimated input and release to water include mercury amounts, which have also been accounted for under each source category.

To avoid double counting, release to water from waste water system/treatment have been subtracted automatically in the TOTALS.

Releases to air

In total, **16 kg** of mercury is released to air in Seychelles on an annual basis. As expected, the incineration of medical waste and open burning, including landfill fires, accounted for the most significant releases of Hg to the atmosphere (9 kg.year^{-1}). Contributions from other source categories are presented in Figure 5.

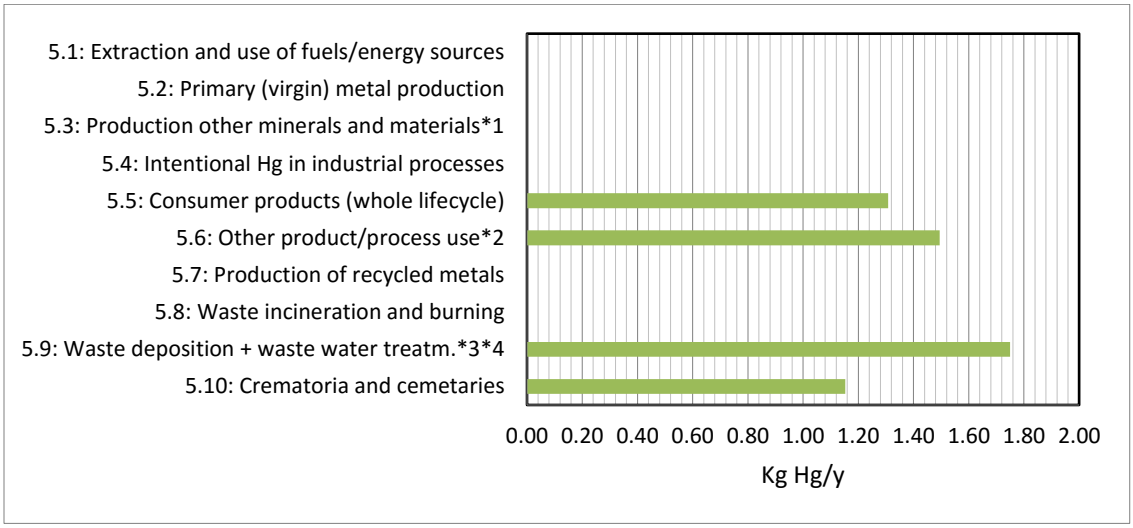
Figure 5: Graphical illustration of sources of mercury releases to air



Releases to land

In total, **6 kg Hg.year^{-1}** is released to land, with the main source types being consumer products, waste deposition and cemeteries/crematoria.

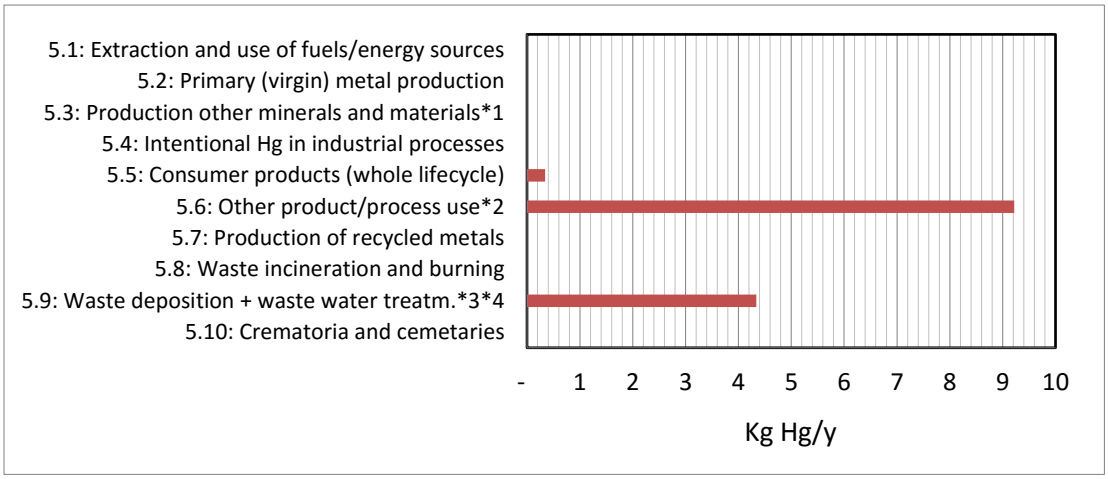
Figure 6: Graphical illustration of sources for mercury releases to land



Releases to water

The main releases to water (**10 kg.year^{-1}**) were "other product/process", which includes dental amalgam fillings, manometers and gauges, lab chemicals and equipment and miscellaneous product uses.

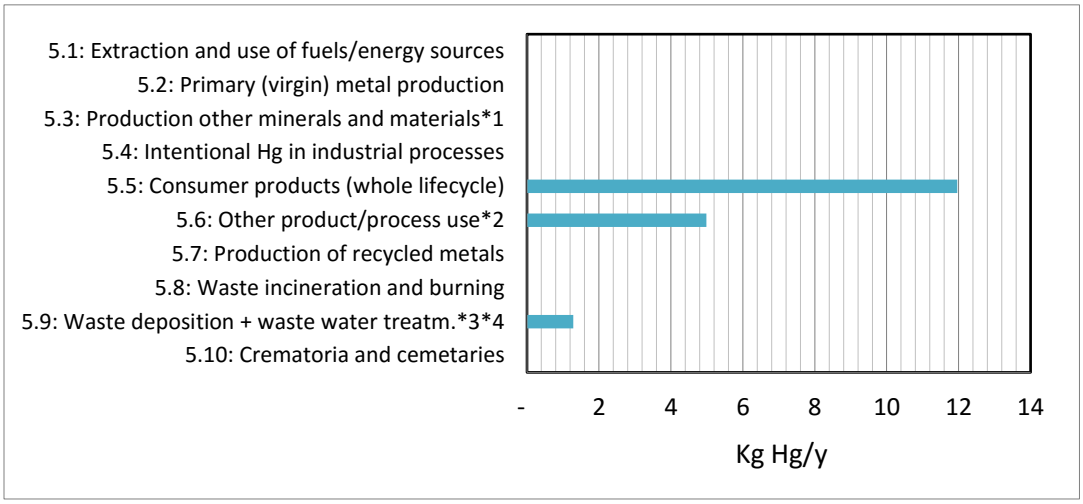
Figure 7: Graphical illustration of sources of mercury releases to water



Releases to general waste

The origin of mercury in waste and wastewater produced in the country is mercury in products and materials. Waste fractions and wastewater do not, therefore, represent original mercury inputs to society (except imported waste). Waste and wastewater may however represent substantial flows of mercury through society. The total mercury flow to general waste accounted for **18 kg.year^{-1},** with the main contributions coming from consumer products (Figure 6)

Figure 8: Graphical illustration of sources for mercury releases to general waste



Note; For this inventory, default input factors were used for the estimation of mercury releases from general waste treatment and wastewater treatment. The default factors were based on literature data of mercury content in waste and wastewater, and these data were only available from developed countries. The calculations made indicate that the default input factors for general waste and wastewater may over-estimate the mercury releases from these sources (see annex III for waste data). The Toolkit spread sheets used in the development of this inventory are posted along with this report.

3.2.4 Summary of mercury stockpiles, and supply and trade

Seychelles do not have mercury stockpiles and are not involved in supplying or trading mercury.

3.3 Data and inventory on energy consumption and fuel production

3.3.1 Mineral Oils

Oil is the remnant of organic life forms and, as such, is contaminated with traces of other elements including mercury. In 2012, the International Petroleum Industry Environment Conservation Association (IPIECA) published the largest publicly available dataset on mercury levels covering 446 crude oils and condensates. IPIECA data indicates the refining sector's contribution to global mercury emissions is 0.07% of the total global mercury releases to air, and less than 0.01% to water[12]. With traces present in final products, these can be released during combustion of petroleum product.

Production

Seychelles does not produce oil, gas or related extractive activities and, therefore, there has no contribution of mercury due to production processes.

Use and disposal

The inventory team contacted the only oil company in Seychelles, Seychelles Petroleum Oil Company (SEPEC), in order to get updated figures with regards to use of heavy oil for power generation and light fuel within the transportation industry. However, this was not successful for obtaining current values and recourse was made to utilize 2013 figures originally provided by Seychelles Energy Commission, which were also used in the POPS NIP review in 2014. A total of 11,175 tons of heavy oil was used in 2013 for electricity production (Table 6), 464 tons of light fuel was used within the transportation industry, and 213 tons of LPG used for cooking (Table 7). The data was inputted into the Toolkit, which calculated a total of 0.22kg Hg being produced and directly emitted to air (Table 6).

Table 6: Detailed results for power generation

Fuel **Oil combustion facilities**	**Unit**	**Use + Disposal**	**Sum of releases to pathway from assessed part of life-cycle**
Activity rate	t/y	11,175	-
Input factor for phase	mg Hg/t	20	-
Calculated input to phase	Kg Hg/y	**0.22**	-
Output distribution factors for phase:			
- Air		1	-
- Water		0.00	-
- Land		0.00	-
- Products		0.00	-
- General waste treatment		0.00	-
- Sector specific waste treatment		0.00	-
Calculated outputs/releases to:			
- Air	Kg/y	0.22	**0.22**
- Water	Kg/y	0.00	0.00
- Land	Kg/y	0.00	0.00
- Products	Kg/y	0.00	0.00
- General waste treatment	Kg/y	0.00	0.00

[12] http://www.ourenergypolicy.org/wp-content/uploads/2014/06/Mercury.pdf

Fuel Oil combustion facilities	Unit	Use + Disposal	Sum of releases to pathway from assessed part of life-cycle
- Sector specific waste treatment	Kg/y	0.00	0.00

Table 7: Detailed results for gasoline and light fuel

Fuel Use of gasoline, light fuel	Unit	Use + Disposal	Sum of releases to pathway from assessed part of life-cycle
Activity rate	t/y	677	-
Input factor for phase	mg Hg/t	2	-
Calculated input to phase	Kg Hg/y	0.0014	-
Output distribution factors for phase:			
- Air		1	-
- Water		0.00	-
- Land		0.00	-
- Products		0.00	-
- General waste treatment		0.00	-
- Sector specific waste treatment		0.00	-
Calculated outputs/releases to:			
- Air	Kg/y	0.00	0.00
- Water	Kg/y	0.00	0.00
- Land	Kg/y	0.00	0.00
- Products	Kg/y	0.00	0.00
- General waste treatment	Kg/y	0.00	0.00
- Sector specific waste treatment	Kg/y	0.00	0.00

With regards to transportation sector and domestic LPG usage, mercury production and release to air was found to be negligibly small (0.0014) (Table 7).

3.3.2 Charcoal Combustion

Charcoal production is a very old profession in Seychelles and people involved in this trade usually operate within forested areas using traditional techniques. These products are usually sold in plastic bags in a loose form and product demand frequently outstrips supply. More recently, people have started using imported charcoal.

Production

In 2013, there were only two applications for permits to burn wood for charcoal making. In the National Implementation plan for POPs, it was estimated that each applicant consumes two tons of wood per year for this activity.

Use and disposal

There is no study on the consumption of charcoal in Seychelles; hence it was difficult to obtain exact quantities for consumption estimates. Therefore, estimates were based on local manufacture and import data. Assuming no new applicants were forthcoming in the intervening years and that 8 tons of charcoal was imported in 2015, allows for an estimate of the total consumption at approximately 12 tons per year. When this was inputted in the Toolkit, we see from the production of Hg from this source was quite low (Table 8).

Table 8: Detailed results for charcoal combustion

Charcoal combustion	Unit	Use + Disposal	Sum of releases to pathway from assessed part of life-cycle
Activity rate	t/y	12	-
Input factor for phase	mg Hg/t	0.12	-
Calculated input to phase	Kg Hg/y	0.0014	-
Output distribution factors for phase:			
- Air		1	-
- Water		0.00	-
- Land		0.00	-
- Products		0.00	-
- General waste treatment		0.00	-
- Sector specific waste treatment		0.00	-
Calculated outputs/releases to:			
- Air	Kg/y	0.00	0.00
- Water	Kg/y	0.00	0.00
- Land	Kg/y	0.00	0.00
- Products	Kg/y	0.00	0.00
- General waste treatment	Kg/y	0.00	0.00
- Sector specific waste treatment	Kg/y	0.00	0.00

3.4 Data and inventory on domestic production of metals and raw materials

Seychelles do not have a primary metal production industry and, therefore, no contribution of mercury from this source category.

3.5 Data and inventory on domestic production and processing with intentional mercury use

There are no industrial uses of mercury in Seychelles and, therefore, no contribution of mercury from this source category.

3.6 Waste handling and recycling

3.6.1 Controlled landfills

Seychelles have three sanitary landfills (Providence II, La Digue and Anse Royale) and two dumping sites (Providence I and Amitie Praslin). The total waste collected and disposed of on Mahe Island in 2013, as recorded at the disposal site, was 65,706 tons. Growth is 6% per annum[13] and taking this into consideration, the estimated quantities for 2015 was 73,827 tons for Mahe. For Praslin and La Digue, there are no weighbridges and the results of waste generation is based on estimates from the number of trucks that dispose of waste per day.

In the calculation for the 2014 NIP review, conducted by an inventory team which included members from the Landscape and Waste Management Agency (the agency responsible for waste management in Seychelles), an estimate of 10,549 tons was made for Praslin and 1,097 tons for La Digue. Taking into account a 6% rise in 2014 and 2015, the final estimate for these two islands was estimated at 13,085 tons. Total waste generation on these three main islands of Seychelles is 86,912 tons/year (2015). The summary of the data and use of distribution factors is shown in Table 9.

Table 9: Identified point sources in this source category

Name of specific source	Location	Activity rate /tons	Input factor(s)	Pollution abatement systems	Output distribution factors
Providence landfill	Mahe	73,827	5	None	Default value
Amitie Landfill	Praslin	11,853	5	None	Default value
La Digue landfill	La Digue	1,232	5	None	Default value

The results in Table 10 shows that the landfill is a repository for total of 435kg Hg per year and that releases are primarily to air (4.35 kg/year) and water (0.04 kg/year).

Table 10: Detailed results for disposal by controlled landfills

Controlled Landfill	Unit	Production	Use	Disposal	Sum of releases to pathway from assessed part of life-cycle
Activity rate	t/y			86,912	-
Input factor for phase	g Hg/t			5	-
Calculated input to phase	Kg Hg/y			435	-
Output distribution factors for phase:					
- Air				0.01	-
- Water				0.0001	-
- Land				-	-
- Products				-	-
- General waste treatment				-	-
- Sector specific waste treatment				-	-
Calculated outputs/releases to:					
- Air				4.35	**4.35**

[13] Solid waste policy 2014-2018

Controlled Landfill	Unit	Production	Use	Disposal	Sum of releases to pathway from assessed part of life-cycle
- Water				0.04	**0.04**
- Land				0.00	0.00
- Products				0.00	0.00
- General waste treatment				0.00	0.00
- Sector specific waste treatment				0.00	0.00

3.6.2 Informal dumping of general waste

Informal dumping, also known locally as illegal dumping, is a relatively minor contributor to the waste stream because there are limited places to fly tip and such actions usually involve not more than five, half-filled, 3-ton truckloads per year. The estimate was calculated using 5 trucks x1.5tons/truck, or approximately 8 tons per year. There is a need for the Agency in charge of waste to weigh and categorise the informal dumping's at Providence landfill.

Table 11 indicates that the contribution of mercury to land for this category is negligibly small.

Table 11: Detailed results for informal dumping of general waste

Informal dumping	Unit	Production	Use	Disposal	Sum of releases to pathway from assessed part of life-cycle
Activity rate	t/y			8	-
Input factor for phase	g Hg/t			5	-
Calculated input to phase	Kg Hg/y			0.04	-
Output distribution factors for phase:					
- Air				0.1	-
- Water				0.1	-
- Land				0.8	-
- Products				-	-
- General waste treatment				-	-
- Sector specific waste treatment				-	-
Calculated outputs/releases to:					
- Air				0.00	0.00
- Water				0.00	0.00
- Land				0.03	**0.03**
- Products				-	
- General waste treatment				-	
- Sector specific waste treatment				-	

3.6.3 Waste incineration and burning

Only medical waste in Seychelles is subjected to incineration before discharging to the landfill. And there are very small incinerators located on other islands. The Toolkit proposed a default value of 24g/ton of Hg under this category with a range 8-40g. We decided to change this default value in view of the small amount of mercury that is thought to be present in this particular waste stream (see calculation below).

Calculation for change to default value

It was assumed that the majority of mercury would be originating from Hg containing devices, such as thermometers and sphygmomanometers. Data collected from those within the medical profession indicated a total of 1,094 Hg thermometers and 26 sphygmomanometers for the Seychelle islands. According to the Toolkit, , each sphygmomanometer contains approximately 80g Hg. It was assumed that there are 10% breakages every year, therefore a total of 136g Hg/ year was determined.

$$10\% \times 80\ g.unit^{-1} \times 26\ units.year^{-1} = 208g\ Hg.year^{-1}$$

For thermometers, it was assumed that 30% are broken every year and there is an estimated Hg content of 1g/unit, as per the toolkit. This yields a total of 328 g per year.

$$30\% \times 1\ g.unit^{-1} \times 1094\ units.year^{-1} = 328g\ Hg.year^{-1}$$

The total for sphygmomanometers and thermometers is 208 + 328 = 536 g Hg per year. It was further assumed that all are properly contained and brought to the incinerator for disposal.

Given that there is a total 64 tons of medical waste incinerated yearly, then the mercury concentration would be 536g/64 ton = 8.3 g/ton. This is the lower end of the range proposed by the toolkit (8-40g) and, therefore, a value of **8g** Hg /ton was used instead of the default 24g/ton value. Based on these calculations 0.51kg Hg per year is emitted to air from this source (Table 12).

Table 12: Detailed results for medical waste incineration

Medical waste incineration	**Unit**	**Production**	**Use**	**Disposal**	**Sum of releases to pathway from assessed part of life-cycle**
Activity rate	ton/y			64	-
Input factor for phase	g Hg/t			8	-
Calculated input to phase	Kg/y			1	-
Output distribution factors for phase:					
- Air	-			1	-
- Water	-			0.00	-
- Land	-			0.00	-
- Products	-			0.00	-
- General waste treatment	-			0.00	-
- Sector specific waste treatment	-			0.00	-
Calculated outputs/releases to:					
- Air	Kg/y			0.51	**0.51**

Medical waste incineration	Unit	Production	Use	Disposal	Sum of releases to pathway from assessed part of life-cycle
- Water	Kg/y			0.00	0.00
- Land	Kg/y			0.00	0.00
- Products	Kg/y			0.00	0.00
- General waste treatment	Kg/y			0.00	0.00
- Sector specific waste treatment	Kg/y			0.00	0.00

3.6.4 Informal waste burning

The inventory group that prepared the POPs NIP review calculated that 1,500 tons of domestic wastes are burned per year (open burning, including landfill fires; 2013), and additionally 2.5 tons per year of wood is burned, yielding a total of 1,502 tonnes. This figure is based on 126 applications that were received by the Department of Environment in 2013 for permits to burn household and other wastes. Adjusting this data to 2015, assuming 6% annual waste increase, leads to a result of 1,687 tons of waste burned each year.

Table 13 indicates that informal waste burning represents a relatively important contribution of mercury (8.44 kg) into the atmosphere. These estimates are higher than those calculated for the incineration of medical waste (0.51 kg) and emissions to the air from landfills (4.35 kg).

Table 13: Detailed results for informal waste burning

Informal waste burning	Unit	Production	Use	Disposal	Sum of releases to pathway from assessed part of life-cycle
Activity rate	ton/y			1687	-
Input factor for phase	g Hg/t			5	-
Calculated input to phase	Kg/y			8	-
Output distribution factors for phase:					
- Air	-			1	-
- Water	-			0.00	-
- Land	-			0.00	-
- Products	-			0.00	-
- General waste treatment	-			0.00	-
- Sector specific waste treatment	-			0.00	-
Calculated outputs/releases to:					
- Air	Kg/y			8.44	**8.44**
- Water	Kg/y			0.00	0.00
- Land	Kg/y			0.00	0.00
- Products	Kg/y			0.00	0.00
- General waste treatment	Kg/y			0.00	0.00
- Sector specific waste treatment	Kg/y			0.00	0.00

3.6.5 Wastewater treatment

There are two main wastewater treatment facilities in Seychelles: the Greater Victoria Sewage works, located at Providence Industrial Estate, and the Beau Vallon treatment works. Both consist of mechanical and biological treatment (activated sludge), with the final sludge being disposed of to the landfills. Wastewater from households and businesses that are connected to the sewers are treated at these two facilities, whilst areas not served by sewers use local treatment methods (septic tanks). The total estimated wastewater generated in the country is 7.4 million m^3/year based on the sale of freshwater, amounting to 20,400m^3 per day. Table 14 below shows the amount of wastewater that is treated in the centralised wastewater facilities in Seychelles.

Table 14: Wastewater production 2010-2013

Year	2010	2011	2012	2013
Beau Vallon	144,873	220,953	277,756	304,253
Providence	929,399	920,758	1,040,282	1,331,621
Total / kliters	1,074,272	1,141,711	1,318,038	1,635,874

The total sum of wastewater treated is 1,635 million m^3/year (2013) and with input factor at 5.25mg Hg/m^3. The total amount released is 9kg per year, most of which is released into water (Table 15).

Table 15: Detailed results for wastewater treatment

Wastewater	Unit	Production	Use	Disposal	Sum of releases to pathway from assessed part of life-cycle
Activity rate	m3/y			1,635,874	-
Input factor for phase	mg Hg/m3			5.25	-
Calculated input to phase	Kg Hg/y			9	-
Output distribution factors for phase:					
- Air				-	-
- Water				0.5	-
- Land				0.2	-
- Products				-	-
- General waste treatment				0.15	-
- Sector specific waste treatment				-	-
Calculated outputs/releases to:					
- Air				0.00	0.00
- Water				4.29	**4.29**
- Land				1.72	**1.72**
- Products				-	0.00
- General waste treatment				1.29	**1.29**
- Sector specific waste treatment				1.29	**1.29**

3.6.6 Test of waste and wastewater default factors

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

Using data from the Inventory Level 2 spreadsheet, the test made for general waste compares the calculated inputs from all four general waste sub-categories with the sum of general waste outputs, from intentional mercury uses in products, plus processes as follows:

In the unaltered IL2 spreadsheet (tab "Level 2-Summary"), the test was done as follows:

(E59+E63+E65+E68) > 2*(J23 + ∑(J36 to J53)). Our result gives ***13 < 34***

We found the inequality (E59+E63+E65+E68) > 2*(J23 + ∑(J36 to J53)) to be false.

The test made for wastewater compares the calculated inputs to wastewater treatment with the sum of outputs to water, from intentional mercury uses in products, plus processes, using data from the Inventory level 2 spreadsheet:

In the IL2 spreadsheet (tab "Level 2-Summary") the test was done as follows:

E69 > 2*(G23 + ∑(G36 to G53)). Our results showed that 9 <19.

Therefore, the second inequality was false.

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

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

3.7.1 Thermometers with Mercury

One of the most common applications of mercury within industry and in Seychelles is use in thermometers. Mercury is used because it is the only liquid metal at room temperature and since all metals expand with heat, when placed in a calibrated glass container, it can accurately measure the temperature.

Production

There is no production of Hg thermometers in Seychelles, as all thermometers are imported from overseas.

Use and disposal

The inventory conducted within the public and private medical centres in Seychelles found that 1,094 Hg thermometers were in use in the country at the time of the audit (Nov 2015). All clinics were aware of the dangers of mercury and are actively taking steps to replace Hg thermometers with updated digital versions. Import data failed to provide insight into better estimates of the number of thermometers imported and their availability. Ideally, the data for "number being used" is a better estimate than the "total number imported in the country" in view of current mercury stocks. However, in the absence of these data we have used the number of thermometers in the country as the activity rate, especially since the amount of Hg contributed per year within this category is not significant. It was determined that the contribution of thermometers was 1.15 kg per year, with most of the calculated output to water and general waste (Table 16).

Table 16: Detailed results for Hg thermometers

Hg thermometers	**Unit**	**Use + Disposal**	**Sum of releases to pathway from assessed part of life-cycle**
Activity rate	Items/y	1094	-
Input factor for phase	g Hg/item	1	-
Calculated input to phase	Kg Hg/y	**1.15**	-
Output distribution factors for phase:			
- Air		0.1	-
- Water		0.3	-
- Land		0.00	-
- Products			-
- General waste treatment		0.6	-
- Sector specific waste treatment		0.00	-
Calculated outputs/releases to:			
- Air	Kg/y	0.11	**0.11**
- Water	Kg/y	0.34	**0.35**
- Land			0.00
- Products			0.00
- General waste treatment	Kg/y	0.69	**0.69**
- Sector specific waste treatment			0.00

3.7.2 Electrical Switches and relays

Switches are devices that open or close an electrical circuit, or a liquid or gas valve. Mercury-added switches include: float switches, actuated by a change in liquid levels; tilt switches, actuated by a change in the switch position; pressure switches, actuated by a change in pressure; and temperature switches and flame sensors, actuated by a change in temperature. Mercury switches are used in a variety of consumer, commercial, and industrial products, including: appliances, space heaters, ovens, air handling units, security systems, leveling devices, and pumps.

Relays are products or devices that open or close electrical contacts to control the operation of other devices in the same or another electrical circuit. Relays are often used to turn on and off large current loads by supplying relatively small currents to a control circuit. Mercury-added relays include: mercury displacement relays, mercury wetted reed relays, and mercury contact relays. Relays have been used in telecommunication circuit boards, commercial/industrial electric ranges, and other cooking equipment[14].

Use and disposal

Due to uncertainty in the distribution of mercury switches and relays in Seychelles, the inventory used the default method specified in the Toolkit, which assumed 0.14 g mercury per inhabitant for this source category. Using this method provided the highest input of mercury at 13 kg per year, perhaps indicating a degree of over estimation. The majority of this mercury would be released to general waste treatment (Table 17).

Table 17: Detailed results for electrical switches and relays

Electrical switches and relays	**Unit**	**Use + disposal**	**Sum of releases to pathway from assessed part of life-cycle**
Activity rate	Inhabitants	93,419	-
Input factor for phase	g Hg/inhabitant	0.14	-
Calculated input to phase	Kg Hg/y	13	-
Output distribution factors for phase:			
- Air	-	0.1	-
- Water	-		-
- Land	-	0.1	-
- Products	-		-
- General waste treatment	-	0.8	-
- Sector specific waste treatment	-		-
Calculated outputs/releases to:			
- Air	Kg/y	1.31	**1.31**
- Water	Kg/y	0.00	0.00
- Land	Kg/y	1.31	**1.31**
- Products	Kg/y	0.00	0.00
- General waste treatment	Kg/y	10.46	**10.46**
- Sector specific waste treatment	Kg/y	0.00	0.00

[14] http://www.newmoa.org/prevention/mercury/imerc/factsheets/switches_relays_2014.pdf

3.7.3 Light sources with mercury

The most typical light source using mercury is known as the mercury vapour lamp, which is still common in street lighting in some parts of the world. This uses electricity to vaporise mercury and conduct electricity in gas (electric arc) to produce light. Other commonly used lighting includes fluorescent lamps. These lamps use electricity to excite mercury atoms, causing the release of UV light, which strikes a phosphor coating inside the glass, causing it to "fluoresce" and produce white light. Mercury is present in both the phosphor powder and in the vapour. The same technology can be found in compact fluorescent light (CFL) and other energy efficient bulbs (not LED).

Production

There is no production facility in Seychelles for light sources. All lights are imported from overseas.

Use and disposal

The imports data for HS code 85393110 makes no clear distinction between CFL and double end fluorescent tubes. Therefore, the category chosen for CFL was entitled "fluorescent, hot cathode, discharge lamps for the compact energy saving type". Data were collected for 2014 and contained the following sub headings: "Energy saving fluorescent lamp", "Energy saving bulb", "Energy saving/ saver light", "Compact fluorescent", "Compact fluorescent tube". A total of 1,050 CFL were imported in 2014.

For double end fluorescent tubes for the same year, the major entries were for the following subheadings: "Tube light": "Tube, tube light", "Tube, fluorescent tubes", "Tube, fluorescent tube daylight", "20 W to 36 W tube light", "Tube light rod", "4ft/2ft fitting tubes". It was found that 24,505 fluorescent tubes were captured under this heading.

The rest of the items under HS 85393110 related to LED lights and were, therefore, discarded.

The results show that CFL and fluorescent tube lights contribute 0.6 kg Hg per year and that nearly all of the mercury is being released to general waste treatment (Table 18).

Table 18: Detailed results for fluorescent tubes and CFLs

Light sources with mercury	**Unit**	**Use + disposal**	**Sum of releases to pathway from assessed part of life-cycle**
Activity rate Fluorescent tubes	Items/y	24,505	-
Input factor for phase	mg Hg/item	25	-
Calculated input to phase	Kg Hg/y	0.61	-
Activity rate CFL	Items/y	1,050	-
Input factor for phase	mg Hg/item	10	-
Calculated input to phase	Kg Hg/y	0.01	-
Output distribution factors for phase:			
- Air	-	0.05	-
- Water	-		-
- Land	-		-
- Products	-		-
- General waste treatment	-	0.95	-
- Sector specific waste treatment	-		-

Light sources with mercury	Unit	Use + disposal	Sum of releases to pathway from assessed part of life-cycle
Calculated outputs/releases to:			
- Air		0.03	**0.03**
- Water		0.00	0.00
- Land		0.00	0.00
- Products		0.00	0.00
- General waste treatment		0.59	**0.59**
- Sector specific waste treatment		0.00	0.00

3.7.4 Batteries with mercury

There are a variety of button-cell batteries that contain mercury, including zinc air, silver oxide, and alkaline manganese oxide batteries. Button-cell batteries are small, thin, energy cells that are not rechargeable. They are most commonly used in watches, toys, hearing aids, and other small and portable electronic devices. The creation of small electronic devices is possible due to the size of the button-cell batteries. Below is a brief description of the types of relevant batteries found on the market.

- **Zinc Air miniature batteries** are mostly used in hearing aids because of their high-energy concentration and their ability to continuously discharge energy. This type of battery uses oxygen from the air to produce electrochemical energy. A hole in the cell allows the surrounding air to enter the battery and react with the cathode. They are also used for small devices, such as wristwatch pagers and ear speech processors.
- **Silver Oxide button-cell batteries** are used in various devices, such as hearing aids, watches, cameras, and clocks. In these batteries, the silver oxide makes up the cathode, and powdered zinc provides the anode. Usually sodium hydroxide or potassium hydroxide is added as an alkaline electrolyte. Silver oxide batteries can come in a large size as well as the button-cell size; however, the manufacture of the larger batteries is limited due to the high price of silver.
- **Alkaline Manganese Oxide button-cell batteries** are used in toys, calculators, remote controls, and cameras. In these batteries, the cathode consists of manganese dioxide, which is produced through an electrolytic process, and the anode is made up of powdered zinc metal. The electrolyte typically used in this type of button-cell battery is potassium hydroxide. Gas can form in all of these types of button batteries due to the corrosion of zinc. Zinc in the battery gets corroded into the electrolyte as the battery is used. This corrosion can cause electrolysis and can cause the generation of hydrogen gas in the canister. Build-up of hydrogen gas can cause the battery to leak, limiting the ability of the battery to function. Mercury suppresses this zinc corrosion, which is why it is added to button-cell batteries. These batteries may contain mercury in the insulating paper surrounding the battery, or mercury may be mixed in the anode itself.
- **Mercuric Oxide batteries** contain mercury as the electrode and are useful in applications that require a high energy density and a flat voltage curve. In the past, mercuric oxide button-cell batteries were used in hearing aids, watches, calculators, electronic cameras, and other personal electronic items requiring a small battery.

- **Other batteries**, such as AAA, AA, C, and D alkaline, general purpose, and carbon-zinc; lead-acid; lithium-ion; and nickel metal halide and nickel-cadmium, do not contain mercury[15].

All of the different button-cell batteries can contain up to 0.005 grams (5 milligrams) of mercury in a single unit. Stacked button-cell batteries (i.e., units that contain multiple button-cells stacked on top of one another) may contain a larger amount of mercury.

Production

There is no production of batteries in Seychelles. All battery products are imported from overseas.

Use and disposal

The Level 1 assessment made no clear distinction relating to the designation of "zinc air batteries" within the source category and it was assumed to include the manganese zinc AA and AAA types. Alternatively, the Level 2 Toolkit specifies button cells, which enabled greater precision within this source category. However, the Imports data obtained from the Customs Office makes no reference to "Zinc air button cells", but identifies "Zinc Air", "Air carbon Zinc AA", "Lithium CR2032 button cell", "Lithium button cell battery", and "Lithium CR2450". Therefore, zinc air button cell batteries were not included as part of the inventory.

For alkaline button cells, the 2015 imports data shows 10 cartons of CR2016 and 10 of CR2025; assuming each carton contains 500 pcs, then we can estimate 10,000 pcs. For other types imported, the quantities for CR2450, CR 18650 and CR2032 are less clear. Based on the records, it was estimated that these products account for another 5,000 pcs. Therefore, a total of 15,000 pcs of alkaline button cell batteries, at 1.9g (https://en.wikipedia.org/wiki/Zinc–air_battery), is calculated at 0.0285 tons.

For the category "alkaline other than button cells", we included all carbon zinc air batteries in the imports database, which included 9,000 imports for 2009 and 21,600 in 2012. The heading category does not seem to have been consistently used in 2013, 2014 and 2015 data, which may lead to under reporting of products imported. Assuming each weighs 15g, the total amount calculated in tons imported in 2012 was 0.324 tons (Table 19).

Table 19: Detailed results for batteries with mercury

Batteries with mercury	**Unit**	**Use + disposal**	**Sum of releases to pathway from assessed part of life-cycle**
Activity rate Alkaline button cells	t/y	0.0285	-
Input factor for phase	kg Hg/t	5	-
Calculated input to phase	Kg Hg/y	0.14	-
Activity rate Alkaline other than button cells	t/y	0.324	-
Input factor for phase	kg Hg/t	0.25	-
Calculated input to phase	Kg Hg/y	0.08	-
Output distribution factors for phase:			
- Air	-	-	-

[15] http://www.newmoa.org/prevention/mercury/imerc/factsheets/batteries_2015.pdf

Batteries with mercury	**Unit**	**Use + disposal**	**Sum of releases to pathway from assessed part of life-cycle**
- Water	-	-	-
- Land	-	-	-
- Products	-	-	-
- General waste treatment	-	1	-
- Sector specific waste treatment	-		-
Calculated outputs/releases to:			
- Air		0.0	0.00
- Water		0.00	0.00
- Land		0.00	0.00
- Products		0.00	0.00
- General waste treatment		0.22	0.22
- Sector specific waste treatment		0.00	0.00

3.7.5 Paints with mercury

It is known that phenyl mercuric acetate (PMA) and similar mercury compounds were used as water-based paint additives. These additives work to extend shelf life by controlling bacterial fermentation in the can (biocides), as well as to retard fungus attacks on painted surfaces under damp conditions (fungicides). Inorganic mercury compounds possessing very low solubility have also been used as additives in marine coatings and paints to impede bacteria formation and to hinder the development of marine organisms[16].

Production

In Seychelles, there is limited manufacturing of paints and only two companies are currently involved in the production of paint, Penlac and Permakot. All other paint products are imported from overseas.

Use and disposal

Some available paint brands are Multilac; which originates from Sri Lanka's largest paint manufacturer and also claims Green Label Certification[17]. On its website, the Penlac company lists 92 products, including a fungicidal wash and fungicidal treatment product[18] that is a "low toxicity bactericide, fungicidal and algicide with spectrum activity". It is also stated that one of their products, PENTOP, complies with Seychelles Standard SS26. Chlorinated rubber based products are also manufactured for use as road markings and marine paints[19].

It was concluded that there are no mercury contributions from this source category.

[16] http://www.zeromercury.org/index.php?option=com_content&view=article&id=142&Itemid=91

[17] http://www.dailynews.lk/?q=2015/09/27/business/bodco-multilac-opens-colour-bank-showroom-seychelles

[18] http://www.penlacseychelles.com/downloads/Penlac_Products_list.pdf

[19] http://www.penlacseychelles.com/downloads/Technical_Details_Document.pdf

3.7.6 Cosmetics with mercury

Mercury is a common ingredient found in skin lightening soaps and creams. It is also found in other cosmetics, such as eye makeup, cleansing products, and mascara. Skin lightening soaps and creams are commonly used in certain African and Asian nations. They are also used among dark-skinned populations in Europe and North America. Mercury salts inhibit the formation of melanin, resulting in a lighter skin tone. Mercury in cosmetics exists in two forms: inorganic and organic. Inorganic mercury (e.g. ammoniated mercury) is used in skin lightening soaps and creams. Organic mercury compounds (thiomersal [ethyl mercury] and phenyl mercuric salts) are used as cosmetic preservatives in eye makeup, cleansing products, and mascara[20].

Production

There is no production of cosmetics in Seychelles and, therefore, no contribution of mercury from this source.

Use and disposal

Although there is a vibrant cosmetic trade in Seychelles, it is generally the case that cosmetics containing mercury are often not listed on the ingredients list. Therefore, for this component, a two-pronged approach was used consisting of: 1.) a market study to locate the main skin lightening products and active ingredients being sold on the local market, and 2.) conduct an internet review of all cosmetics known to contain mercury. The emphasis was not only on brand name but source countries and companies, so that any similar products would be considered potentially contaminated with mercury. The primary source of the Internet review was the EU Unsafe Products website and www.whiterskin.info , which features a comprehensive list (Annex IV).

It was found that daily use of skin lightening cosmetics is a relatively recent trend and is increasingly being used by the younger generation. In Seychelles, there are approximately 20 cosmetic shops, which includes several pharmacies on the main island of Mahe. The inventory team consulted with these local businesses to ascertain their skin lightening products and those cosmetics used to remove skin marks or pigmentation.

The results shown in Table 20highlight that hydroquinone as the key ingredient of several cosmetics being imported into Seychelles. Hydroquinone is banned in certain countries such as Japan, Australia and within the European Community and is tightly regulated in other cosmetic applications[21]. These regulations are not in place for other countries, such as the USA, where it is sold as an over-the-counter drug with concentrations not exceeding 2%. None of the cosmetic products listed in Table 20 are known to contain mercury. Therefore, it was concluded that there are no mercury contributions from this source category.

[20] http://www.who.int/ipcs/assessment/public_health/mercury_flyer.pdf
[21] Regulation No 1223/2009 on Cosmetic products

Table 20: Skin lightening products found in Seychelles

Skin lightening product	Suspected active ingredient[22]
Carro light	Hydroquinone
Clear Essence	Hydroquinone
Eldopaque	Hydroquinone
Melalight	Hydroquinone
Ukroma	Hydroquinone
Fade out	Niacinamide
Lamela Bio oil	Natural oils
Cidal Soap	Criticidal
No Marks	Turmeric, Lemon, Wheat germ oil, Neem, Aloe
Eraser Proless fair skin	Unknown
Milky way soap	Unknown
Bioclaire	Unknown
Dermabright	Unknown
Mouselight	Unknown

[22] As researched from products of the same name whose ingredients are listed on the internet

3.7.7 Polyurethane with mercury catalysts

Polyurethane (PUR) is a polymer obtained from the reaction between a multi-hydroxyl alcohol (polyol) and an isocyanate (R-NCO). The resulting bonds are carbamate (urethane) bonds and the polymerisation product is a "polyurethane". It is used in many applications, including automotive, to make suspension-bushing, seat padding etc. The production process uses organic mercury compounds as a catalyst[23].

Production

There is no production of polyurethane products in Seychelles.

Use and disposal

The Toolkit used electrification rates to calculate the proportion of PUR products in use within the country. For Seychelles, the electrification rate used was 100%. No changes were made to default factors. Table 21 shows that this source contributed 2.8 kg Hg per year and that most Hg is released to the general waste treatment category.

Table 21: Detailed results for polyurethane with mercury catalysts

Polyurethane with mercury catalysts	**Unit**	**Use + disposal**	**Sum of releases to pathway from assessed part of life-cycle**
Activity rate	inhabitants	93,419	-
Input factor for phase	g Hg/y.inhabitants	0.03	-
Calculated input to phase	Kg Hg/y	2.8	-
Output distribution factors for phase:			
- Air	-	0.1	-
- Water	-	0.05	-
- Land	-	-	-
- Products	-	-	-
- General waste treatment	-	0.85	-
- Sector specific waste treatment	-		-
Calculated outputs/releases to:			
- Air		0.28	**0.28**
- Water		0.14	**0.14**
- Land		0.00	0.00
- Products		0.00	0.00
- General waste treatment		2.38	**2.38**
- Sector specific waste treatment		0.00	0.00

[23] http://www.zeromercury.org/index.php?option=com_content&view=article&id=190&Itemid=117

3.7.8 Dental mercury amalgam fillings

Dental amalgam is a dental filling material used to fill cavities caused by tooth decay. It has been used for more than 150 years in hundreds of millions of patients around the world. Dental amalgam is a mixture of metals, consisting of liquid (elemental) mercury and a powdered alloy composed of silver, tin, and copper. Approximately 50% of dental amalgam is elemental mercury by weight. The chemical properties of elemental mercury allow it to react with and bind together the silver/copper/tin alloy particles to form an amalgam. Dental amalgam fillings are also known as "silver fillings" because of their silver-like appearance. Despite the name, "silver fillings" do contain elemental mercury[24].

Production

There is no production of mercury amalgams in the country, however as defined by the Toolkit, "production" in this context means in situ preparation at the dentist clinic.

Use and disposal

The Level l assessment was based on a ratio of dental personnel of 1.175 per 1000 inhabitants, whilst for the Level 2 assessment, the default ratio was 0.86 of dental personnel per 1000 inhabitants. This gives different results for the input of mercury for this subcategory. For this inventory, data was used from the Level 1 assessment based on questionnaire information collected from dental professionals and import data from Seychelles Revenue Commission. Table 22 illustrates that 19 kg of Hg is contributed by this source category and the greatest contribution is being released to water. If we disregard the input of landfills, then dental mercury amalgam fillings represent the highest input source of mercury for Seychelles.

Table 22: Detailed results for dental amalgam fillings

Dental Amalgam	**Unit**	**Production**	**Use**	**Disposal**	**Sum of releases to pathway from assessed part of life-cycle**
Activity rate	inhabitants	93,419	93,419	93,419	-
Input factor for phase	G Hg/inhabitants.y	0.2	0.2	0.2	-
Calculated input to phase	Kg Hg/y	19	19	19	-
Output distribution factors for phase:					
- Air		0.02			-
- Water		0.14	0.02	0.3	-
- Land				0.08	-
- Products				0.06	-
- General waste treatment		0.12		0.08	-
- Sector specific waste treatment		0.12		0.08	-
Calculated outputs/releases to:					
- Air	Kg/y	0.37	0.00	0.00	**0.37**
- Water	Kg/y	2.62	0.37	5.61	**8.59**

[24]http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/DentalProducts/DentalAmalgam/ucm171094.htm

Dental Amalgam	Unit	Production	Use	Disposal	Sum of releases to pathway from assessed part of life-cycle
- Land	Kg/y	0.00	0.00	1.49	**1.49**
- Products	Kg/y	0.00	0.00	1.12	**1.12**
- General waste treatment	Kg/y	2.24	0.00	1.49	**3.74**
- Sector specific waste treatment	Kg/y	2.24	0.00	1.49	**3.74**

3.7.9 Manometers and gauges with mercury

Mercury has a density of 13,600 kg/m^3 compared to water (1000 kg/m^3). Therefore, a column of mercury only 760mm high can balance atmospheric pressure; the equivalent of 10m column of water. This has resulted in mercury being used in manometers and gauges that measure pressure. The most widespread use in Seychelles concerns is in blood pressure monitors also known as sphygmomanometers.

Production

There is no production of manometers and gauges in Seychelles. All of these products are imported from overseas.

Use and disposal

Data collected for the Level 1 inventory confirmed that there are 17 sphygmomanometers in use within the 10 clinics and hospitals in Seychelles. These estimates represent an average of one to two sphygmomanometers per clinic, which are usually also equipped with digital meters.

The import data for 2014 was checked to validate this finding under HS 90262000 entitled. “Instruments and Apparatus for Measuring or Checking Pressure”, which used the following three categories: “blood pressure monitor”, “blood pressure meter” and “digital pressure meter” (which are no longer being used). It was found that 26 items were imported in 2014. Data for 2015 was also checked and 10 items were imported from January through November 2015, with another 10 units of digital meters (UA-651) that were appropriately labelled. This gives rise to the possibility that what was declared in the inventory might actually be incorrect. The consultancy decided to use a total of 26 (instead of 17), with the presumption that the imports data were more accurate. Table 23 highlights that this source category generates 2 kgof mercury, with the greatest calculated release to general waste treatment.

Table 23: Detailed results for manometers and gauges containing mercury

Manometers and gauges	Unit	Use + disposal	Sum of releases to pathway from assessed part of life-cycle
Activity rate	Items	26	-
Input factor for phase	g/item	80	-
Calculated input to phase	Kg Hg/y	2	-
Output distribution factors for phase:			
- Air		0.1	-

Manometers and gauges	**Unit**	**Use + disposal**	**Sum of releases to pathway from assessed part of life-cycle**
- Water		0.3	-
- Land			-
- Products			-
- General waste treatment		0.6	-
- Sector specific waste treatment			-
Calculated outputs/releases to:			
- Air	Kg/y	0.21	**0.21**
- Water	Kg/y	0.62	**0.62**
- Land	Kg/y	0.00	0.00
- Products	Kg/y	0.00	0.00
- General waste treatment	Kg/y	1.25	**1.25**
- Sector specific waste treatment	Kg/y	0.00	0.00

3.7.10 Laboratory chemicals

Mercury is used in demonstration or educational laboratories where investigations relating to density are conducted. Mercury has also been used as a preservative in reagents, buffers, stains and saline solutions. It is also common in analytical equipment, such as Atomic absorption spectrometry (AAS) and mercury electrode (calomel) as a reference electrode in electrochemistry applications.

Use and disposal

There are three types of laboratories in Seychelles, including educational, industrial and regulatory. Educational labs are found in secondary schools and use small amounts of mercury for educational purposes. Industrial labs conduct tests for quality standards of manufactured products and not expected to use mercury. Finally, regulatory labs, such as for the SBS and MOH, have specialised laboratories with equipment that likely contains mercury such as mercury electrodes and blood gas analysers. In view of the limited available data, estimates were made based on population.

The results show a total of 0.93 kg of Hg per year, with the primary outputs to water and general waste (Table 24).

Table 24: Detailed results for laboratory chemicals

Laboratory chemicals	**Unit**	**Use + disposal**	**Sum of releases to pathway from assessed part of life-cycle**
Activity rate	Inhabitants	93,419	-
Input factor for phase	g/inhabitant. Year	0.01	-
Calculated input to phase	Kg Hg/y	0.93	-
Output distribution factors for phase:			
- Air		-	-
- Water		0.33	-
- Land			-
- Products			-
- General waste treatment		0.33	-
- Sector specific waste treatment		0.34	-
Calculated outputs/releases to:			
- Air	Kg/y	0.00	0.00
- Water	Kg/y	0.31	**0.31**
- Land	Kg/y	0.00	0.00
- Products	Kg/y	0.00	0.00
- General waste treatment	Kg/y	0.31	**0.31**
- Sector specific waste treatment	Kg/y	0.00	0.00

The toolkit presented an additional calculation for “other laboratory equipment” which consisted of a list of mercury containing chemicals. These calculations were also based on population (Table

25). The result is 3.74 kg Hg per year from this source, which together with 0.93 for laboratory chemicals (Table 24), gives a total of 4.67 kg of Hg per year from laboratory equipment and chemicals.

Table 25: Detailed results for other laboratory equipment

Other laboratory equipment	Unit	Use + disposal	Sum of releases to pathway from assessed part of life-cycle
Activity rate	Inhabitants	93,419	-
Input factor for phase	g/inhabitants.year	0.04	-
Calculated input to phase	Kg Hg/y	3.74	-
Output distribution factors for phase:			
- Air		-	-
- Water		0.33	-
- Land			-
- Products			-
- General waste treatment		0.33	-
- Sector specific waste treatment		0.34	-
Calculated outputs/releases to:			
- Air		0.00	0.00
- Water		1.23	**1.23**
- Land		0.00	0.00
- Products		0.00	0.00
- General waste treatment		1.23	**1.23**
- Sector specific waste treatment		0.00	0.00

3.8 Data and inventory on crematoria and cemeteries

3.8.1 Crematoria

There is only one crematorium in Seychelles. According to the owner, there have been 100 cremations since opening in 2014 until December 2015. Therefore, a value of 100 was used as the activity rate for cremations. The calculated Hg output to air was found to be 0.19 kg.year^{-1}.

Table 26: Detailed results for crematoria

Crematoria	Unit	Production	Use	Disposal	Sum of releases to pathway from assessed part of life-cycle
Activity rate	Corpses /y		100		-
Input factor for phase	g Hg/corpse		1.86		-
Calculated input to phase	Kg Hg/y		0.186		-
Output distribution factors for phase:					
- Air	-		1		-
- Water	-		0.00		-
- Land	-		0.00		-
- Products	-		0.00		-
- General waste treatment	-		0.00		-
- Sector specific waste treatment	-		0.00		-
Calculated outputs/releases to:					
- Air	Kg/y		0.19		**0.19**
- Water	Kg/y		0.00		0.00
- Land	Kg/y		0.00		0.00
- Products	Kg/y		0.00		0.00
- General waste treatment	Kg/y		0.00		0.00
- Sector specific waste treatment	Kg/y		0.00		0.00

3.8.2 Cemeteries

Seychelles has one major cemetery at Mont Fleuri on Mahe and several smaller cemeteries in the surrounding districts. There are also cemeteries on Praslin and La Digue islands since burial was the principal way for disposing of human remains.

Data was collected from the national data on deaths (minus data for cremations) for the period 2014-2015. It was reported that from June 2014 to July 2015 a total of 720 deaths were recorded. Therefore, the activity rate entered for the number of people buried was 620 (720 minus 100 cremations). There is no calculated Hg output to air and only 1.15 kg.year^{-1} of Hg was found to transfer to land (Table 27).

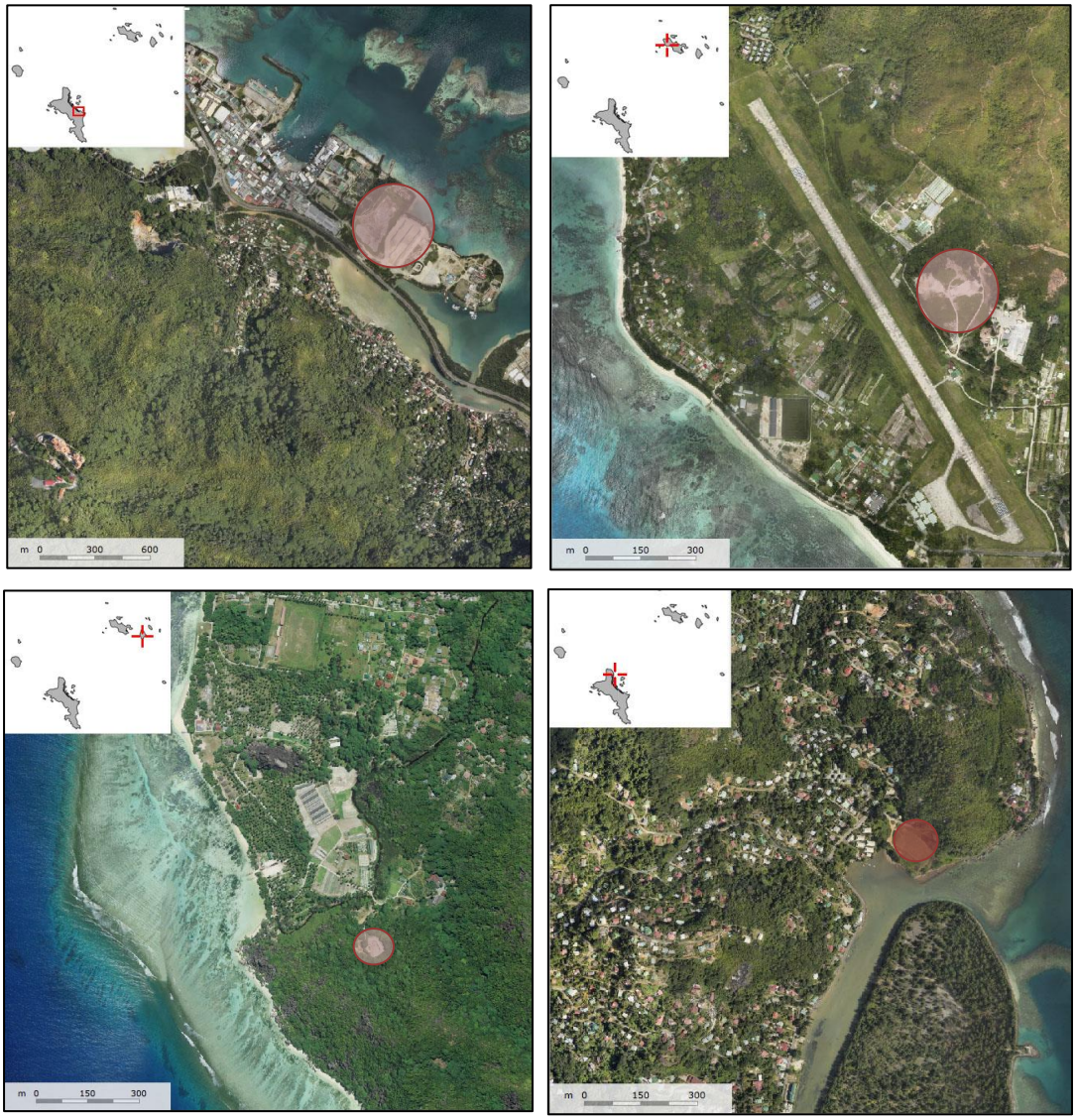
Table 27: Detailed results for cemeteries

Cemeteries	Unit	Production	Use	Disposal	Sum of releases to pathway from assessed part of life-cycle
Activity rate	Corpses /y		620		-
Input factor for phase	g Hg/corpse		1.86		-
Calculated input to phase	Kg Hg/y		1.1532		-
Output distribution factors for phase:					
- Air	-		0.00		-
- Water	-		0.00		-
- Land	-		1.00		-
- Products	-		0.00		-
- General waste treatment	-		0.00		-
- Sector specific waste treatment	-		0.00		-
Calculated outputs/releases to:					
- Air	Kg/y		0.00		0.00
- Water	Kg/y		0.00		0.00
- Land	Kg/y		1.15		**1.15**
- Products	Kg/y		0.00		0.00
- General waste treatment	Kg/y		0.00		0.00
- Sector specific waste treatment	Kg/y		0.00		0.00

3.9 Contaminated sites

The MIA process was not expected to identify contaminated sites, however the GEF "Initial Guidelines for Enabling Activities for the Minamata Convention on Mercury" (GEF/C.45/Inf.05/Rev.01) suggests that MIAs "Develop appropriate strategies for identifying and assessing mercury contaminated sites". During discussion with stakeholders, it was clear that there has not been any historical handling of large amounts of mercury in the country. The only sites that are certain to be contaminated with mercury are landfill disposal sites and cemeteries. There are three main landfills in operation in Seychelles, based on the main island of Mahe, Praslin and La Digue. There are at least two closed unlined waste landfills on Mahe (at NE point and Roche Caiman) that presumably is contaminated with mercury waste (Figure 9).

Figure 9: Operating landfill sites on east coast of Mahe (top left), Praslin (top right), La Digue (bottom right) and closed landfill at NE Point on Mahe (bottom right)



3.10 Impacts of mercury in human health and the environment[25]

All humans are exposed to some level of mercury. Most people are exposed to low levels of mercury, often through chronic exposure (continuous or intermittent long term contact). However, some people are exposed to high levels of mercury, including acute exposure (exposure occurring over a short period of time, often less than a day). An example of acute exposure would be mercury exposure due to an industrial accident.

Factors that determine whether health effects occur and their severity include:

the type of mercury concerned;
the dose;
the age or developmental stage of the person exposed (the foetus is most susceptible);
the duration of exposure;
the route of exposure (inhalation, ingestion or dermal contact).

Generally, two groups are more sensitive to the effects of mercury. Foetuses are most susceptible to developmental effects due to mercury. Methylmercury exposure in the womb can result from a mother's consumption of fish and shellfish. It can adversely affect a baby's growing brain and nervous system. The primary health effect of methylmercury is impaired neurological development. Therefore, cognitive thinking, memory, attention, language, and fine motor and visual spatial skills may be affected in children who were exposed to methylmercury as foetuses.

The second group is people who are regularly exposed (chronic exposure) to high levels of mercury (such as populations that rely on subsistence fishing or people who are occupationally exposed). Among selected subsistence fishing populations, between 1.5/1000 and 17/1000 children showed cognitive impairment (mild mental retardation) caused by the consumption of fish containing mercury. These included populations in Brazil, Canada, China, Columbia and Greenland.

Elemental and methylmercury are toxic to the central and peripheral nervous systems. The inhalation of mercury vapour can produce harmful effects on the nervous, digestive and immune systems, lungs and kidneys, and may be fatal. The inorganic salts of mercury are corrosive to the skin, eyes and gastrointestinal tract, and may induce kidney toxicity if ingested. Neurological and behavioural disorders may be observed after inhalation, ingestion or dermal exposure of different mercury compounds. Symptoms include tremors, insomnia, memory loss, neuromuscular effects, headaches and cognitive and motor dysfunction. Mild, subclinical signs of central nervous system toxicity can be seen in workers exposed to an elemental mercury level in the air of 20 µg/m3 or more for several years. Kidney effects have been reported, ranging from increased protein in the urine to kidney failure.

[25] Available at: http://www.who.int/ipcs/assessment/public_health/mercury/en/

Chapter IV: Policy, Regulatory and Institutional Framework Assessment

4.1 Policy and regulatory assessment

Ratification of the Minamata Convention by Seychelles legally binds it to the obligations of the Convention once it enters into force. Normally pre-ratification involves carrying out a national situation analysis, identifying existing relevant domestic legislation and identifying legal or administrative actions that may be needed. This chapter provides the analysis of the policy and regulatory framework pertaining to mercury and its management in Seychelles and identifies legal and administrative actions that are required in order to comply with the Minamata Convention.

Given the situation of Seychelles, in terms of reduced sources of mercury emissions, some of the provisions of the Minamata Convention are not particularly applicable.

The main environmental legislation in Seychelles is the **Environment Protection Act (EPA) 1994 updated in 2016**. In this instrument, mercury is implicitly classified as a "pollutant" and "hazardous substance" by virtue of its hazardous properties. Also, mercury wastes are classified as hazardous wastes. EPA regulates the discharge (releases/emissions) of all hazardous substances (including mercury) to the environment, the manner in which they are handled and their disposal. As such, the EPA meets some of the requirements of the Minamata Convention, relating to storage and disposal of mercury. Below is an extract from the EPA giving definitions that includes mercury as both a hazardous substance and hazardous waste.

Extract from EPA

1. *"Pollutant" means the presence in the environment of one or more pollutants and includes emissions of noise.*
2. *"Hazardous substance" means any substance or preparation which by reason of its chemical or physic-chemical properties or handling, is liable to cause harm to human beings, other living creatures, plants, microorganisms, property or the environment.*
3. *"Hazardous waste" means waste which is poisonous, corrosive, irritant, noxious, explosive, inflammable, radioactive, toxic or harmful to the environment or as defined by and International Convention to which Seychelles is party to.*

Other notable relevant legislations are:

Public Health (Water Examination) Regulations (updated in 2012), which specifies the limits for mercury in drinking water (1ug/l);

Export of Fishery Products Act (developed in 1996 and updated in 2012), which specifies the concentration of Mercury, acceptable in fish and fish processing and aquaculture activities. The Act specifies heavy metal limits in fish, potable water used in processing plants and for aquaculture activities and aquaculture feeds.

Schedule 10 of the Export of Fishery Products Act, specifies the limits of the concentration of heavy metals in fishery products, specifying for the various species the maximum limits for lead, cadmium and mercury. For mercury, the limit ranges from 0.5 ppm for crustaceans, molluscs and cephalopods to 1 ppm for tunas, marlin, sailfish, swordfish, rays and sharks.

Schedule 14 of the **Export of Fishery Products Act,** dictates the standard for potable water to be used in fish processing establishments. Remarkably the regulation provides exemption to the Public Health (Water Examination) Regulation 1994 under the Public Health Act, which is for domestic consumption. Nonetheless the limit for mercury under both regulations is set at 1 ug/l.

Article 12 (2) of the **Export of Fishery Products (Aquaculture) Regulations 2010** obliges the proponent to undertake monitoring programme that includes heavy metals.

Schedule 3 of the **Export of Fishery Products (Aquaculture feeds) Regulations, 2010** sets the maximum levels of heavy metal contaminants in aquaculture feeds to 0.5 mg/kg for mercury.

Summary of EPA provisions

Article 14 allows the Minister to "*prescribe stands for emissions of air pollutant from mobile and stationary sources"*, as well as "*effluent limitations for existing and new point sources*". These provisions could cover mercury emissions to air from medical waste incinerators, as well as releases to water.

Article 32, allows the Minister to develop regulations with regards to *"Standards and regulations for waste including hazardous waste"*

Article 39 makes the disposal, transportation and exports of hazardous waste an offence unless it is in accordance to authorisation of the Ministry. Article 40 is the same for hazardous substances ("*a person shall not handle or cause to be handled any hazardous **substance** except in accordance to procedures and in compliance to safeguards prescribed by the Minister*"). Here handling covers the manufacture, processing, treatment, packaging, storage, transportation, import, use collection, etc.

It can be concluded, therefore, that the EPA is the main instrument to operationalize the Minamata Convention on Mercury, as far as definition and management of hazardous substances and waste. However, it currently falls short of several Convention requirements, in particular to provisions relating to mercury containing products, supply and trade, and a ban on the mining of mercury.

In order to properly assess the Policies and Regulatory Measures in Place and Remaining Gaps, a comparative analysis was carried out in tabular form and presented in subsequent pages for each article of the Convention. A succinct summary of each article of the Convention is presented, based on the Natural Resource Defense Council (NRDC) checklist and the list of national policy, and or regulatory measure that seeks to address the concern of the Convention article is displayed. Where there are none existing, (legislative gaps), proposals were made in order to be compliant to the Convention article.

Article 3 - Mercury supply sources and trade	
Description of Article:	
Succinct summary of relevant provisions (source NRDC checklist[26])	▪ Not allow new primary mercury mining ▪ Phase out existing primary mercury mining within 15 years ▪ Prevent the import and use of mercury from primary mercury mining for artisanal and small-scale gold mining (ASGM) ▪ In accordance with Article 3.5(b), restrict the import and use of excess mercury from decommissioning chlor-alkali plants, and require environmentally sound disposal ▪ Obtain information on stocks of mercury or mercury compounds exceeding 50 metric tons (MT), and mercury supply generating stocks exceeding 10 MT/yr ▪ Not allow the export of mercury unless the importing country provides written consent, the mercury is for an allowed use or environmentally sound storage, and all other conditions of Article 3.6 are met ▪ Not allow the import of mercury without government consent, ensuring both the mercury source and proposed use are allowed under the Convention (and applicable domestic law)
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
None existing	None of the above provisions are relevant to Seychelles since it lacks mercury mines and there are no imports or exports of elemental mercury besides for laboratory demonstrations (<50 MT).
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ New legislation to ban primary mercury mining ▪ New legislation to ban the import of mercury for future ASGM activities ▪ Develop provisions relating to the export of Mercury to a country for disposal as per Convention requirements	

[26] http://docs.nrdc.org/international/files/int_15101301a.pdf

Article 4 - Mercury added products

Description of Article:	
Succinct summary of relevant provisions	▪ 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 ▪ Phase down the use of dental amalgam through two or more measures listed in Part II of Annex A ▪ Take measures to prevent the incorporation of products listed in Part I of Annex A (i.e., switches and relays, batteries) into larger, assembled products ▪ Discourage the manufacture and distribution of new mercury product types
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
None	None of the above provisions are currently being addressed by regulatory measures. The Ministry of Health has an unwritten policy, as reported by a representative in the validation workshop, to replace mercury thermometers and sphygmomanometers with digital counterparts.
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ New legislation to ban the import and export of products listed in Part I of Annex A according to phase out date listed ▪ New legislation to phase out the use of dental amalgams in accordance to Part II of Annex A	

Article 5 - Manufacturing processes in which mercury or mercury compounds are used	
Description of Article:	
Succinct summary of relevant provisions	▪ Not allow the use of mercury or mercury compounds in the manufacturing processes listed in Part I of Annex B ▪ Restrict (as specified in the Annex) the use of mercury in the processes listed in Part II of Annex B ▪ Not allow new facilities from using mercury in the processes listed in Annex B, except facilities using mercury catalysts to produce polyurethane ▪ For facilities with processes listed in Annex B, identify and obtain information on mercury or mercury compound use; and control mercury emissions to air, and releases to land and water ▪ Discourage new uses of mercury in industrial processes
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
None	Seychelles does not have any manufacturing processes that use mercury or mercury compounds. It is also unlikely to develop such industry in the future.
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ Ban on manufacturing processes that use mercury or mercury compounds.	

Article 6 – Exemptions available to a Party upon request	
Description of Article:	
Succinct summary of relevant provisions	▪ Any State or regional economic integration organization may register for one or more exemptions from the phase-out dates listed in Annex A and Annex B, hereafter referred to as an "exemption", by notifying the Secretariat in writing: (a) On becoming a Party to this Convention; or (b) In the case of any mercury-added product that is added by an amendment to Annex A or any manufacturing process in which mercury is used that is added by an amendment to Annex B, no later than the date upon which the applicable amendment enters into force for the Party
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
None	Seychelles has not filed any exemptions, but nonetheless reserves the right to apply this clause for future amendments to Annex A or B
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ None	

Article 7 - Artisanal and small-scale gold mining

Description of Article:	
Succinct summary of relevant provisions	▪ Take measures to reduce, and where feasible, eliminate mercury and mercury compound use, emissions (to air), and releases (to land and water) associated with ASGM ▪ Establish coordinating mechanism and delineate agency roles for development/implementation of an ASGM National Action Plan (NAP) ▪ Define and formalize or regulate ASGM consistent with the Convention ▪ Eliminate whole ore amalgamation, open burning of amalgam or processed amalgam, burning of amalgam in residential areas, and cyanide leaching of mercury-laden sediment, ore or tailings (the "worst practices") ▪ Set mercury use reduction goals or targets consistent with the timely elimination of the worst practices and other use reduction efforts ▪ Reduce mercury emissions, releases, and exposures associated with ASGM, and prevent mercury exposures of vulnerable populations (particularly women of child-bearing age and children) ▪ Prevent the diversion of mercury and mercury compounds from other sectors to ASGM, and manage mercury trade consistent with the NAP ▪ Implement a public health strategy to address mercury exposures to ASGM miners and communities
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
None	There is no artisanal and small scale gold mining in Seychelles
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ New legislation to ban artisanal and small scale gold mining in Seychelles	

Article 8 – Emissions

Description of Article:	
Succinct summary of relevant provisions	▪ Require best available techniques/best environmental practices (BAT/BEP) or associated emission limit values (ELVs) for new (as defined in Article 8.2(c)) sources listed in Annex D (coal-fired power plants, coal-fired industrial boilers, non-ferrous metal smelting and roasting processes, waste incineration, and cement production) ▪ Require one or more measures identified in Article 8.5 to control/reduce mercury emissions from existing sources listed in Annex D, which shall be operational at the source within 10 years ▪ Require monitoring/reporting and otherwise establish a mercury emissions inventory for sources listed in Annex D
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
Environmental Protection Act	*"The Minister may prescribe standards and safeguards for emissions of air pollutants from mobile or stationary sources"*. Such standards can include emissions of mercury from waste incinerators.
Solid waste policy 2014-2018	Government to enact legislation with regards to disposal of medical waste and consider legal instruments that regulate incineration of waste.
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ New standards prescribed for emissions limits/standards for waste incinerators, including medical waste incinerators under the Environment Protection Act (EPA) ▪ Application of best available techniques for medical waste incinerators	

Article 9 – Releases	
Description of Article:	
Succinct summary of relevant provisions	▪ Require reporting or otherwise obtain information as needed to identify significant sources of mercury/mercury compound releases to land or water, and to maintain an inventory of releases from the sources identified ▪ Take one or more measures specified in Article 9.5 to control/reduce mercury and mercury compound releases to land and water from significant sources it identifies
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
National mercury inventory	The Level I and Level II assessments have already established an inventory of sources of mercury releases to land and water
Minamata Initial Assessment	The MIA incorporates the National Implementation Plan for mercury, which addresses fully Article 9 and contains actions specified in Article 9.5
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ Periodic assessment as required for new sources and update to the inventory of releases	

Article 10 - Environmentally sound interim storage of mercury, other than waste mercury	
Description of Article:	
Succinct summary of relevant provisions	▪ 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)
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
Hazardous waste Notification Form	Seychelles already has in place a measure for hazardous waste that follows the Basel Convention classification and requires notification and approval for transportation, storage and disposal. This also covers mercury wastes.
SSDS 2012-2021	Policy action under waste management in the SSDS 2012-2021 to construct a storage facility for hazardous waste.
SAICM	Action under SAICM was to identify the area and secure funding to construct a storage facility for hazardous waste. This has, so far, not materialized.
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ Update the hazardous waste form to incorporate measures for mercury that are subsequently developed ▪ Minister to prescribe standards for the management of hazardous waste under the EPA ▪ Construction of hazardous waste storage facility that will include mercury wastes	

Article 11 – Mercury wastes	
Description of Article:	
Succinct summary of relevant provisions	▪ Use a definition of mercury waste consistent with Article 11.2 ▪ 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. ▪ 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 ▪ 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
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
Hazardous waste Notification Form	See above explanation (Article 10)
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ New legislation to be developed for mercury to include definition consistent with Article 11.2 ▪ Standards required under the EPA for trans-boundary movement of hazardous waste including mercury and mercury containing waste	

Article 12 – Contaminated Sites	
Description of Article:	
Succinct summary of relevant provisions	▪ Develop strategies for identifying and assessing mercury/mercury compound contaminated sites ▪ If risk reduction activities are taken at contaminated sites, they are taken in an environmentally sound manner, incorporating risk assessment where appropriate
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
None	No current or historical industrial use of mercury in Seychelles. The only contaminated sites being landfills active and closed, and cemeteries
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ Rehabilitation of non-sanitary landfills to reduce leaching of pollutants to the environment	

Article 13 – Financial Resources and Mechanism	
Description of Article:	
Succinct summary of relevant provisions	▪ Access domestic resources as may be needed to implement Convention obligations ▪ Access financial resources available under the Convention financial mechanism and other resources available from multilateral, regional, and bilateral funding sources
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
None	
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ National implementation plan for mercury must be mainstreamed in national budget planning processes ▪ To include the NIP for mercury for funding through bilateral, regional or multilateral instruments	

Article 14 – Capacity building, technical assistance and technology transfer	
Description of Article:	
Succinct summary of relevant provisions	▪ Cooperation for capacity building and technical assistance, in particular between developed countries and least developed countries and Small Island Developing States. ▪ Developed country parties to provide information on alternative technologies through the COP as they become available
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
None	No established platform for capacity building and technical assistance
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ Cooperation with developed countries in the area of mercury management	

Article 16 – Health Aspects	
Description of Article:	
Succinct summary of relevant provisions	▪ Promote the development and implementation of strategies to identify and protect populations at risk, such as developing fish consumption guidelines ▪ Promote occupational exposure educational and prevention programs ▪ Promote prevention, treatment, and care services for affected populations
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
Child Development Study (guiding policy)	Long-term study was done by Ministry of Health on Mercury in fish and its impact on child development. Study is ongoing. The action is in line with protecting populations at risk
Phase out of mercury appliances by MOH	Dental personnel using amalgams are usually well trained in the prevention of exposure. Mercury-containing medical devices are being phased out as a policy of the Ministry of Health
Export of Fishery Products Act	Provides maximum safe limits for mercury and obliges testing. SFA conducts tests as well as exporters of fish, but results are not made public
Export of Fishery Products (Aquaculture) Regulations 2010	Provides maximum safe limits for mercury and obliges testing for aquaculture industry. Currently there are no aquaculture farms in Seychelles.
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ Fish consumption information guidelines to be developed ▪ Results of tests on fish on the domestic market need to be made available to the public	

Article 17 – Information Exchange	
Description of Article:	
Succinct summary of relevant provisions	▪ Collect and disseminate information on annual quantities of mercury and mercury compounds emitted, released, or disposed; and other information specified in Article 18 ▪ Share information on the health and safety of humans and the environment as non-confidential, in accordance with Article 17.5 ▪ Report to the COP on progress in implementing Convention obligations under Article 21
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
None	
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ Legislative provision that oblige the MEECC to collect and disseminate information on quantities of mercury and mercury compounds emitted, released or disposed of, and the sharing of information on health and safety.	

Article 18 – Public Information, Awareness and Education	
Description of Article:	
Succinct summary of relevant provisions	▪ (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
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
PECO	Department of Environment have a section, the Public Education, Communication and Outreach (PECO) section that is dedicated to disseminating information on the environment.
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ Incorporate mercury in the working programme of PECO ▪ Outsource for expertise and information to the private sector where there are none in Government institutions	

Article 19 – Research Development and Monitoring

Description of Article:	
Succinct summary of relevant provisions	▪ Parties shall endeavour to cooperate to develop and improve, taking into account their respective circumstances and capabilities: (a) Inventories of use, consumption, and anthropogenic emissions to air and releases to water and land of mercury and mercury compounds; (b) Modelling and geographically representative monitoring of levels of mercury and mercury compounds in vulnerable populations and in environmental media, including biotic media such as fish, marine mammals, sea turtles and birds, as well as collaboration in the collection and exchange of relevant and appropriate samples; (c) Assessments of the impact of mercury and mercury compounds on human health and the environment, in addition to social, economic and cultural impacts, particularly in respect of vulnerable populations; (d) Harmonized methodologies for the activities undertaken under subparagraphs (a), (b) and (c); (e) Information on the environmental cycle, transport (including long-range transport and deposition), transformation and fate of mercury and mercury compounds in a range of ecosystems, taking appropriate account of the distinction between anthropogenic and natural emissions and releases of mercury and of remobilization of mercury from historic deposition (f) Information on commerce and trade in mercury and mercury compounds and mercury-added products; and (g) Information and research on the technical and economic availability of mercury-free products and processes and on best available techniques and best environmental practices to reduce and monitor emissions and releases of mercury and mercury compounds
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
Assessment on human health	Assessment of impact of mercury on human health in Seychelles is already being done by the Ministry of Health through a child development study
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ Currently limited capacity and resources in Seychelles to undertake research, development and monitoring of mercury. Policy action needed to focus on building this capacity in the first instance and collaborate with other international institutions to undertake such activities	

Article 21 – Reporting

Description of Article:	
Succinct summary of relevant provisions	▪ Each Party shall report to the Conference of the Parties, through the Secretariat, on the measures it has taken to implement the provisions of this Convention and on the effectiveness of such measures and the possible challenges in meeting the objectives of the Convention ▪ Each Party shall include in its reporting the information as called for in Articles 3, 5, 7, 8 and 9 of this Convention
Policy and regulatory measures in place that enable the country to comply with the above listed provisions:	
Relevant Policy and Regulatory Measure	**Explanation on what aspects of the above provisions are being addressed by policy/regulatory measure:**
None	The first COP for Minamata Convention has yet to be held and no reporting template as yet developed.
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions *(only in relation to binding provisions)***:**	
▪ The first national report will need to be developed taking into account information already collected	

4.2 Institutional assessment

National institutions and other stakeholders will implement the Minamata Convention on Mercury in Seychelles. For this to be successful, institutions must have capacity, in terms of human resources, technical expertise, and financial resources to be able to undertake these activities. As a pre-requisite to assessing capacity, a stakeholder assessment was carried out (Table 28) to identify the key stakeholders, which consist of Government Ministries, Agencies, as well as non-State entities, such as NGO's and private sector stakeholders. It was established that the MEECC is the focal institution for the Convention, as well as being responsible for various implementing activities.

Table 28: Stakeholder assessment matrix for mercury issues

Stakeholder	Relative Importance rating	Relevant Area
Ministry of Environment, Energy and Climate Change (MEECC)	High	Competent Authority for implementing the Minamata Convention
Medical professionals	High	Importing and using dental amalgams, which is an important source of mercury in Seychelles.
Ministry responsible for health	High	Health Aspects, Research and monitoring. Participation in the long-term child development study.
Landscape & Waste Management Agency (LWMA)	High	Interim storage and disposal of hazardous waste
STAR (Seychelles)	High	Main contractor for handling and disposal of waste
Seychelles Fishing Authority (SFA)	High	Research and monitoring for mercury in fish and other seafood
Seychelles Bureau of Standards	High	Undertakes testing for Mercury in fish
Seychelles Revenue Commission - Customs Officers	High	Port of entry for mercury and mercury-containing devices
Importers of Hg containing devices / cosmetics (through SCCI)	Medium	Awareness required to switch to Mercury free products
Fire & Rescue Services Agency	Medium	Important first responders for industrial accidents, chemical spills and fire
Media professionals including PECO of MEECC	Medium	Education and Awareness of mercury issues
Academic Institutions (UniSey)	Low	In a position to undertake research and monitoring for mercury
NGO's & private sector organisations	Low	Undertaking inventory programme and reporting.
General public	Low	Change of use of mercury containing devices

This report also assessed the institutional capacity gaps within these key stakeholders. In keeping with the standard developed for legislative measures, the assessment of institutional capacity is presented in tabular form, where the key stakeholder for each article is identified and an assessment is made to the existing capacity for implementation of the corresponding Article, as well as opportunity for capacity enhancement required.

<table>
<tr><td colspan="2">Article 3 - Mercury supply sources and trade</td></tr>
<tr><td colspan="2">Description of Article:</td></tr>
<tr><td>Succinct summary of relevant provisions</td><td>▪ Not allow new primary mercury mining
▪ Prevent the import and use of mercury from primary mercury mining for artisanal and small-scale gold mining (ASGM)
▪ In accordance with Article 3.5(b), restrict the import and use of excess mercury from decommissioning chlor-alkali plants, and require environmentally sound disposal
▪ Not allow the export of mercury unless the importing country provides written consent, the mercury is for an allowed use or environmentally sound storage, and all other conditions of Article 3.6 are met
▪ Not allow the import of mercury without government consent, ensuring both the mercury source and proposed use are allowed under the Convention (and applicable domestic law)</td></tr>
<tr><td colspan="2">Relevant national stakeholder:</td></tr>
<tr><td rowspan="2">1. Name of institution/ stakeholder:
Ministry of Environment, Energy and Climate Change (MEECC)</td><td>Role with respect to the above listed provisions:
▪ Legislative measures relating to ban on mercury mining
▪ Regulating the import and export of mercury</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ MEECC has a legal advisor that works in collaboration with the Attorney General’s (AG) office to update environmental laws, amongst other duties</td></tr>
<tr><td rowspan="2">2. Name of institution/ stakeholder:
Seychelles Revenue Commission (SRC)</td><td>Role with respect to the above listed provisions:
▪ Enforcing provisions relating to the import and export of mercury</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ SRC inspectors at the port of entry have been trained on key environmental conventions, most notably Basel and Stockholm. A project has been submitted under the special programme trust fund, which will cover training of SRC inspectors with regards to mercury.</td></tr>
<tr><td colspan="2">Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:</td></tr>
<tr><td colspan="2">▪ Training of SRC inspectors
▪ Legislative provisions required with regards to new mercury mines
▪ Legislative provisions required for import and export of mercury</td></tr>
</table>

<table>
<tr><td colspan="2">Article 4 – Mercury added products</td></tr>
<tr><td colspan="2">Description of Article:</td></tr>
<tr><td>Succinct summary of relevant provisions</td><td>▪ 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
▪ Phase down the use of dental amalgam through two or more measures listed in Part II of Annex A
▪ Discourage the manufacture and distribution of new mercury product types</td></tr>
<tr><td colspan="2">Relevant national stakeholder:</td></tr>
<tr><td rowspan="2">1. Name of institution/ stakeholder:
Ministry of Environment, Energy and Climate Change (MEECC)</td><td>Role with respect to the above listed provisions:
▪ Legislation to regulate Part I, Annex A products
▪ Legislation on the use of dental amalgams
▪ Legislation on the manufacture and distribution of new mercury product types</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ As in above table</td></tr>
<tr><td rowspan="2">2. Name of institution/ stakeholder:
Ministry of Finance</td><td>Role with respect to the above listed provisions:
▪ Enforcing provisions relating to ban on import and export of mercury added products under schedule of the Trades Tax Act</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ The Ministry of Finance have trained personnel to effect the ban</td></tr>
<tr><td rowspan="2">3. Name of institution/ stakeholder:
Seychelles Revenue Commission (SRC)</td><td>Role with respect to the above listed provisions:
▪ Enforcing provisions relating to import and export of mercury added products</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ As stated in above table for Article 3</td></tr>
<tr><td colspan="2">Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:</td></tr>
<tr><td colspan="2">▪ Legislative provisions required with regards to mercury added products
▪ Training of SRC inspectors</td></tr>
</table>

Article 5 – Manufacturing processes in which mercury or mercury compounds are used	
Description of Article:	
Succinct summary of relevant provisions	▪ Not allow the use of mercury or mercury compounds in the manufacturing processes listed in Part I of Annex B ▪ Restrict (as specified in the Annex) the use of mercury in the processes listed in Part II of Annex B ▪ Discourage new uses of mercury in industrial processes
Relevant national stakeholder:	
1. Name of institution/ stakeholder: Ministry of Environment, Energy and Climate Change (MEECC)	**Role with respect to the above listed provisions:** ▪ In view that manufacturing processes using mercury are not present in the country, the role of the MEECC would be to advise against new activity.
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ The MEECC already have existing capacity in the environmental assessment unit.
2. Name of institution/ stakeholder: Seychelles Chamber of Commerce and Industry (SCCI)	**Role with respect to the above listed provisions:** ▪ Inform businesses with regards to Article 5 requirements
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Capacity is present for notifying members, however minimal training must be given so that the right information is conveyed.
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Members of the SCCI to be involved in post project training so that they are aware of the Minamata Convention and the requirement of Article 5.	

Article 6 – Exemptions available to a Party upon request	
Description of Article:	
Succinct summary of relevant provisions	▪ Any State or regional economic integration organization may register for one or more exemptions from the phase-out dates listed in Annex A and Annex B, hereafter referred to as an "exemption", by notifying the Secretariat in writing: (a) On becoming a Party to this Convention; or ▪ (b) In the case of any mercury-added product that is added by an amendment to Annex A or any manufacturing process in which mercury is used that is added by an amendment to Annex B, no later than the date upon which the applicable amendment enters into force for the Party
Relevant national stakeholder:	
1. Name of institution/ stakeholder: Ministry of Environment, Energy and Climate Change (MEECC)	**Role with respect to the above listed provisions:** ▪ The MEECC is the technical Ministry to action under Article 6 through the Ministry of Foreign Affairs. Since no exemption was forwarded upon becoming a party to the Convention, Seychelles do not require exemption and reserves the right to apply for such under Article 6 (b).
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ The capacity for future exemption for mercury added product cannot be ascertained at this point and will depend on the type of mercury containing product that is added.
2. Name of institution/ stakeholder: Ministry of Foreign Affairs	**Role with respect to the above listed provisions:** ▪ To forward exemption to the Secretariat, if any
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Capacity existing for communication to Secretariat
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ No current capacity gaps, but may exist depending on type of mercury added product that are added to the Convention.	

Article 7 – Artisanal and small-scale gold mining	
Description of Article:	
Succinct summary of relevant provisions	▪ Establish coordinating mechanism and delineate agency roles for development/implementation of an ASGM National Action Plan (NAP) ▪ Reduce mercury emissions, releases, and exposures associated with ASGM, and prevent mercury exposures of vulnerable populations (particularly women of child-bearing age and children) ▪ Prevent the diversion of mercury and mercury compounds from other sectors to ASGM, and manage mercury trade consistent with the NAP ▪ Implement a public health strategy to address mercury exposures to ASGM miners and communities
▪ **Relevant national stakeholder:** ASGM is not applicable to Seychelles. Legislation would be implemented by the MEECC to ban such activity	

Article 8 – Emissions	
Description of Article:	
Succinct summary of relevant provisions	▪ Require best available techniques/best environmental practices (BAT/BEP) or associated emission limit values (ELVs) for new (as defined in Article 8.2(c)) sources listed in Annex D (waste incineration) ▪ Require one or more measures identified in Article 8.5 to control/reduce mercury emissions from existing sources listed in Annex D, which shall be operational at the source within 10 years ▪ Require monitoring/reporting and otherwise establish a mercury emissions inventory for sources listed in Annex D
Relevant national stakeholder:	
1. Name of institution/ stakeholder: Ministry of Environment, Energy and Climate Change (MEECC)	**Role with respect to the above listed provisions:** ▪ To apply BAT/BEP with regards to incineration of medical waste ▪ Monitoring of mercury emissions for medical waste incinerators
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Environmental health officers of the Ministry of Health have sufficient knowledge on the topic, but may not be consulted with regards to procurement of incinerators ▪ The newly created research unit within the Ministry of Health can undertake monitoring, but will require training and funding specifically for mercury emissions.
2. Name of institution/ stakeholder: Ministry of Environment, Energy and Climate Change (MEECC)	**Role with respect to the above listed provisions:** ▪ Measures as identified in Article 8.5 to reduce mercury emission from existing sources
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ The MEECC Waste, Enforcement and Permits Division (WEP) have capacity to advise on procurement of new waste incinerators
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ There is need for training on BAT/BEP for sources listed in Annex D and, more specifically, towards solid waste and medical waste incinerators ▪ Mechanism for BAT/BEP to be mainstreamed into the work programme for the Ministry of Health	

Article 9 – Releases	
Description of Article:	
Succinct summary of relevant provisions	▪ Require reporting or otherwise obtain information as needed to identify significant sources of mercury/mercury compound releases to land or water, and to maintain an inventory of releases from the sources identified ▪ Take one or more measures specified in Article 9.5 to control/reduce mercury and mercury compound releases to land and water from significant sources it identifies
Relevant national stakeholder:	
1. Name of institution/ stakeholder: Ministry of Environment, Energy and Climate Change (MEECC)	**Role with respect to the above listed provisions:** ▪ Identification of significant sources of mercury release ▪ Maintain inventory of releases ▪ Measures to reduce release of mercury and mercury compounds
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ There is currently no designated unit within MEECC to undertake these activities.
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ In view of the limited sources for Seychelles and the fact that staff and resources for the WEP, within the MEECC, are shared between various conventions, such activities would better be outsourced to private consultants.	

Article 10 – Environmentally sound interim storage of mercury, other than waste mercury	
Description of Article:	
Succinct summary of relevant provisions	▪ 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)
Relevant national stakeholder: Not applicable to Seychelles since there is no trade in Mercury and, therefore, no need for interim storage of elemental mercury, other than in waste mercury-containing devices.	

<table>
<tr><td colspan="2">Article 11 – Mercury wastes</td></tr>
<tr><td colspan="2">Description of Article:</td></tr>
<tr><td>Succinct summary of relevant provisions</td><td>▪ Use a definition of mercury waste consistent with Article 11.2
▪ 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.
▪ 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
▪ 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.</td></tr>
<tr><td colspan="2">Relevant national stakeholder:</td></tr>
<tr><td rowspan="2">1. Name of institution/ stakeholder:
Landscape & Waste Management Agency (LWMA)</td><td>Role with respect to the above listed provisions:
▪ Take measures to manage mercury wastes in an environmentally sound manner</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ LWMA currently does not have the capacity to manage mercury waste</td></tr>
<tr><td rowspan="2">2. Name of institution/ stakeholder:
Ministry of Environment, Energy and Climate Change (MEECC)</td><td>Role with respect to the above listed provisions:
▪ Definition of mercury waste consistent with Article 11.2
▪ Transport across international boundaries in accordance with the Basel Convention, and international rules, standards, and guidelines</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ Definition to be incorporated in the EPA
▪ MEECC have previously carried out trans-boundary movement of hazardous waste in accordance with the Basel Convention. Therefore, institutional capacity does exist.</td></tr>
<tr><td rowspan="2">3. Name of institution/ stakeholder:
STAR (Seychelles)</td><td>Role with respect to the above listed provisions:
▪ As the main solid waste contractor under the supervision of LWMA, the company needs to be instructed by LWMA of appropriate measures needed to manage mercury waste.</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ None existing</td></tr>
<tr><td colspan="2">Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:</td></tr>
<tr><td colspan="2">▪ LWMA officers and management to be trained on the environmentally sound management of mercury waste
▪ EPA definition of mercury waste to be consistent with Article 11.2
▪ New WEP staff of the MEECC to be given refresher training on Basel Convention requirements for trans-boundary movement of hazardous/mercury wastes
▪ STAR (Seychelles) and other solid waste contractors to be trained on environmentally sound management of mercury waste</td></tr>
</table>

Article 12 – Contaminated Sites	
Description of Article:	
Succinct summary of relevant provisions	▪ Develop strategies for identifying and assessing mercury/mercury compound contaminated sites ▪ If risk reduction activities are taken at contaminated sites, they are taken in an environmentally sound manner, incorporating risk assessment where appropriate
Relevant national stakeholder:	
1. Name of institution/ stakeholder: Ministry of Environment, Energy and Climate Change (MEECC)	**Role with respect to the above listed provisions:** ▪ Develop strategies for identifying and assessing mercury/mercury compound contaminated sites
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ In the absence of mercury mines, industrial activity using mercury and accidents sites, the main contaminated sites are the landfills on Mahe, Praslin and La Digue where mercury-containing products are interred. The MEECC have capacity to identify other potential sites or assess contaminated sites.
2. Name of institution/ stakeholder: Landscape & Waste Management Agency (LWMA)	**Role with respect to the above listed provisions:** ▪ If risk reduction activities are taken at contaminated sites, they are taken in an environmentally sound manner, incorporating risk assessment where appropriate
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Landfills in Seychelles are categorized as contaminated sites and all landfills are under management of the LWMA. LWMA would need to rehabilitate used landfills and currently there is no institutional capacity existing for rehabilitation of landfills and risk assessment. However, such capacity exists in the private sector.
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Contaminated sites, beyond landfills, do not seem present in Seychelles and focus should be on rehabilitation of used landfills, such as the Providence I landfill. At the moment, capacity for landfill rehabilitation and risk assessment exists only in the private sector.	

Article 13 – Financial Resources and Mechanism	
Description of Article:	
Succinct summary of relevant provisions	▪ Access domestic resources as may be needed to implement Convention obligations ▪ Access financial resources available under the Convention financial mechanism and other resources available from multilateral, regional, and bilateral funding sources
Relevant national stakeholder:	
1. Name of institution/ stakeholder: Ministry of Environment, Energy and Climate Change (MEECC)	**Role with respect to the above listed provisions:** ▪ All of the above
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Finance department of the MEECC have the capacity to mainstream mercury work programme into recurrent/capital budget ▪ Project Coordination Unit (PCU) within MEECC have capacity for accessing financial resources
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Staff of the Finance (accounts) Department of MEECC can be informed on the mercury action plan in order to better understand and allocate domestic resources towards implementing the Convention.	

<table>
<tr><td colspan="2">Article 14 – Capacity building, technical assistance and technology transfer</td></tr>
<tr><td colspan="2">Description of Article:</td></tr>
<tr><td>Succinct summary of relevant provisions</td><td>▪ Cooperation for capacity building and technical assistance, in particular between developed countries and least developed countries and Small Island Developing States.
▪ Developed country parties to provide information on alternative technologies through the COP as they become available</td></tr>
<tr><td colspan="2">Relevant national stakeholder:</td></tr>
<tr><td rowspan="2">1. Name of institution/ stakeholder:
Ministry of Environment, Energy and Climate Change (MEECC)</td><td>Role with respect to the above listed provisions:
▪ Cooperation for capacity building and technical assistance, in particular between developed countries, least developed countries, and Small Island Developing States</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ The MEECC have notable linkages with institutions from developed countries as well as other SIDS. However, mechanisms for cooperation on mercury is currently limited and will need to be developed.</td></tr>
<tr><td rowspan="2">2. Name of institution/ stakeholder:

University of Seychelles (UniSey)</td><td>Role with respect to the above listed provisions:
▪ Cooperation for capacity building and technical assistance, in particular between developed countries, least developed countries, and Small Island Developing States</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ UniSey have links with institutions from developed countries and SIDS. However, mechanisms for cooperation on mercury need to be developed.</td></tr>
<tr><td colspan="2">Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:</td></tr>
<tr><td colspan="2">▪ Mechanism for technical cooperation needs to be developed by MEECC and integrate the UniSey, MOH and other relevant institutions.</td></tr>
</table>

Article 16 – Health Aspects	
Description of Article:	
Succinct summary of relevant provisions	▪ Promote the development and implementation of strategies to identify and protect populations at risk, such as developing fish consumption guidelines ▪ Promote occupational exposure educational and prevention programs ▪ Promote prevention, treatment, and care services for affected populations
Relevant national stakeholder:	
1. Name of institution/ stakeholder: Ministry of Health	**Role with respect to the above listed provisions:** ▪ Promote the development and implementation of strategies to identify and protect populations at risk, such as developing fish consumption guidelines ▪ Promote occupational exposure educational and prevention programs ▪ Promote prevention, treatment, and care services for affected populations
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ MOH have the capacity to develop fish consumption guidelines and occupational exposure education and prevention programmes, although this would be limited to accidental exposure involving broken mercury containing devices ▪ MOH have the capacity for treatment and care of affected populations
2. Name of institution/ stakeholder: Seychelles Fishing Authority	**Role with respect to the above listed provisions:** ▪ Promote the development and implementation of strategies to identify and protect populations at risk, such as developing fish consumption guidelines
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ SFA currently have information on mercury levels in different fish species that can be used to better inform the population
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Better information dissemination to the public by MOH and SFA with regards to scientific information for mercury in fish and guidelines to reduce consumption of high risk species	

Article 17 – Information Exchange	
Description of Article:	
Succinct summary of relevant provisions	▪ Collect and disseminate information on annual quantities of mercury and mercury compounds emitted, released, or disposed; and other information specified in Article 18 ▪ Share information on the health and safety of humans and the environment as non-confidential, in accordance with Article 17.5 ▪ Report to the COP on progress in implementing Convention obligations under Article 21
Relevant national stakeholder:	
1. Name of institution/ stakeholder: Ministry of Environment, Energy and Climate Change (MEECC)	**Role with respect to the above listed provisions:** ▪ All of the above
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ No dedicated section within MEECC to directly undertake these activities. Will need to be outsourced as part of the update of the national mercury profile.
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Financial resources for annual data collection and dissemination	

<table>
<tr><td colspan="2">Article 18 – Public information, awareness and education</td></tr>
<tr><td colspan="2">Description of Article:</td></tr>
<tr><td>Succinct summary of relevant provisions</td><td>▪ (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</td></tr>
<tr><td colspan="2">Relevant national stakeholder:</td></tr>
<tr><td rowspan="2">1. Name of institution/ stakeholder:
Ministry of Environment, Energy and Climate Change (MEECC)</td><td>Role with respect to the above listed provisions:
▪ All of the above</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ The MEECC already have a dedicated section, the Public Education, Communication and Outreach section (PECO), for awareness and information dissemination on environmental topics.</td></tr>
<tr><td rowspan="2">2. Name of institution/ stakeholder:
University of Seychelles; Blue Economy Research Institute (BERI)</td><td>Role with respect to the above listed provisions:
▪ Education and training; publishing information on research and monitoring, and possibly suggesting alternatives to mercury and mercury compounds</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ The research arm of the University, the Blue Economy Research Institute (BERI), is still in its infancy and would require strengthening</td></tr>
<tr><td rowspan="2">3. Name of institution/ stakeholder:
Ministry of Health (MOH)
Seychelles Fishing Authority</td><td>Role with respect to the above listed provisions:
▪ Publication of information with regards to health and effects of mercury and mercury compounds</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ MOH and SFA researchers are experienced in the study of mercury in fish and some studies have been published</td></tr>
<tr><td colspan="2">Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:</td></tr>
<tr><td colspan="2">▪ PECO officers would require familiarization with the Minamata Convention on Mercury in order to disseminate mercury related information.
▪ UniSey researchers would require training, not only to create the right information dissemination framework, but also to conduct research and monitoring.
▪ MOH and SFA need to make their research available to the public</td></tr>
</table>

<table>
<tr><td colspan="2">Article 19 – Research development and monitoring</td></tr>
<tr><td colspan="2">Description of Article:</td></tr>
<tr><td>Succinct summary of relevant provisions</td><td>▪ Parties shall endeavour to cooperate to develop and improve, taking into account their respective circumstances and capabilities:
(a) Inventories of use, consumption, and anthropogenic emissions to air and releases to water and land of mercury and mercury compounds;
(b) Modelling and geographically representative monitoring of levels of mercury and mercury compounds in vulnerable populations and in environmental media, including biotic media such as fish, marine mammals, sea turtles and birds, as well as collaboration in the collection and exchange of relevant and appropriate samples;
(c) Assessments of the impact of mercury and mercury compounds on human health and the environment, in addition to social, economic and cultural impacts, particularly in respect of vulnerable populations;
(d) Harmonized methodologies for the activities undertaken under subparagraphs (a), (b) and (c);
(e) Information on the environmental cycle, transport (including long-range transport and deposition), transformation and fate of mercury and mercury compounds in a range of ecosystems, taking appropriate account of the distinction between anthropogenic and natural emissions and releases of mercury and of remobilization of mercury from historic deposition
(f) Information on commerce and trade in mercury and mercury compounds and mercury-added products; and
(g) Information and research on the technical and economic availability of mercury-free products and processes and on best available techniques and best environmental practices to reduce and monitor emissions and releases of mercury and mercury compounds</td></tr>
<tr><td colspan="2">Relevant national stakeholder:</td></tr>
<tr><td rowspan="2">1. Name of institution/ stakeholder:
Ministry of Environment, Energy and Climate Change (MEECC)</td><td>Role with respect to the above listed provisions:
▪ Inventories of mercury and mercury compounds
▪ Commerce and trade in mercury and mercury products
▪ Information on mercury free products and processes and BAT/BEP</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ None existing, but able to outsource expertise</td></tr>
<tr><td rowspan="2">2. Name of institution/ stakeholder:

Ministry of Health (MOH)</td><td>Role with respect to the above listed provisions:
▪ Assessments of the impact of mercury and mercury compounds on human health and the environment</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ Already existing as the research unit within MOH</td></tr>
<tr><td colspan="2">Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:</td></tr>
<tr><td colspan="2">▪ Need to outsource inventory related activities since capacity is stretched within national institutions</td></tr>
</table>

<table>
<tr><td colspan="2">Article 21 – Reporting</td></tr>
<tr><td colspan="2">Description of Article:</td></tr>
<tr><td>Succinct summary of relevant provisions</td><td>▪ Each Party shall report to the Conference of the Parties, through the Secretariat, on the measures it has taken to implement the provisions of this Convention and on the effectiveness of such measures and the possible challenges in meeting the objectives of the Convention
▪ Each Party shall include in its reporting the information as called for in Articles 3, 5, 7, 8 and 9 of this Convention</td></tr>
<tr><td colspan="2">Relevant national stakeholder:</td></tr>
<tr><td rowspan="2">1. Name of institution/ stakeholder:
Ministry of Environment, Energy and Climate Change (MEECC)</td><td>Role with respect to the above listed provisions:
▪ All of the above</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ MEECC already has a framework for reporting to Conventions</td></tr>
<tr><td colspan="2">Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:</td></tr>
<tr><td colspan="2">▪ Reporting to the Minamata Convention must be mainstreamed into the national work programme of the MEECC</td></tr>
</table>

Chapter V: Identification of Populations at Risks and Gender Dimensions

5.1 Preliminary review of potential populations at risk and potential health risks

In general, there are group of people susceptible to mercury, namely those who are more sensitive to the effects of mercury and those who are exposed to higher levels of mercury. As mentioned earlier the foetus, new-borns and children are especially susceptible to mercury exposure because of the sensitivity of the developing nervous system. In addition to in utero exposure, neonates can be further exposed through mercury contaminated breast milk, although only a small percentage of maternal mercury is excreted in breast milk. Individuals with preconditions, such as diseases of the liver, kidney, nervous system, and lung are at higher risk of suffering from the toxic effects of mercury.

The other group are those individuals exposed to higher levels of mercury, either through occupational, mercury-added products or environmental exposure. This group includes those who regularly consume a regular diet of fish and other seafood, particularly larger predatory fish. Pregnant women, and women who might become pregnant are generally the populations considered to be potential high risk groups because of potential exposure to the foetus. Young children could be exposed through their direct consumption of fish. There are many studies on the impacts of methyl mercury toxicity to the neurological, cardiovascular, and immune systems within humans. For example, the neurological impacts are often measured through lowered IQ levels that can also be economized (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 2010; Downer et al. 2017). However, the relative impacts from methyl mercury's toxic effects can vary across human populations, whereas some may be sensitive others may have more of an ability to not be as impacted.

5.2 Assessment of potential gender dimensions related to the management of mercury

This section presents the differing roles of gender with regards to management of mercury in the country. The aim is to ensure that gender considerations are effectively mainstreamed into the national action plan for mercury. It is to be noted that the consultant did not undertake an extensive assessment of gender issues for mercury principally due to the lack of significant source of mercury in the country and the high representation of women in Seychelles society. Nonetheless a descriptive summary is provided below that shows clear differences in gender within various areas where mercury contamination is likely to occur.

5.2.1 Occupational Exposure

Normally men are at greater risk of occupational exposure. In the absence of a national mercury-oriented industry, the main work groups identified for occupational exposure are

- Waste collectors, medical waste incinerator workers and landfill workers: These groups comprise mostly men who are at greater risk of exposure due to waste mercury containing devices.
- Dental professionals; During the inventory, it was noted that in the private dentistry, there were more male dentists than females but all of them were supported exclusively by female assistants. So, in this case, male dentists would be more prone to contact with dental amalgam but assisting females may also be affected.
- Medical professionals: it is the case in Seychelles that a woman is more likely to be called upon to clean up accidents involving mercury containing equipment such as sphygmomanometers or thermometers. They are also more likely to handle medical waste.
- Gas station attendants: People in this profession are almost exclusively men, although some gas stations in the country hire only females.
- Environmental/enforcement officers: This group is called upon to investigate environmental pollution cases and are generally gender balanced.
- Firemen and first responders to chemical accidents: This group is primarily males.

It can be concluded that in terms of occupational exposure, men are at greater risk than women.

5.2.2 Mercury in fish

With respect to mercury in fish, the issue is cross gender as both sexes generally eat the same quantities of fish, however the adverse health impacts due to exposure of mercury are more predominant in cases of children, pregnant women and women in child-bearing years. This is because the developing organ systems (such as the foetal nervous system) are the most sensitive to toxic effects of mercury. Recent studies also demonstrate that there may be increased risk for cardiovascular disease in adults (Downer et al. 2017), which may be particularly important for individuals either sensitive to methyl mercury or those with elevated levels. Men may be more prone to cardiovascular disease than women.

5.2.3 In households

Within households, women and children are more likely to be exposed to mercury from broken thermometers, since women primarily use them, especially mothers.

5.2.4 Mercury in cosmetics

Women are more susceptible to exposure by mercury added cosmetics and personal products such as soaps, creams and shampoos. The use of skin lightening creams in Seychelles is quite relevant due to prevailing beauty perception, with particular preferences for lighter coloured, unblemished skin, however this issue is less significant as found on mainland Africa or the Far East. Nonetheless local women do use skin lightening creams to remove blemishes due to excessive sun damage and the fact that the population is of mixed Eurasian and African descent. It was found that local women generally have limited knowledge of the use of harmful chemicals in cosmetics.

In summary, it is clear from the above consideration that men should be principally targeted for occupational exposure, especially in the field of waste management and first responders, such as firemen and disaster risk managers. However, in the medical profession, both gender are equally susceptible to mercury contamination. Women are a more important target group in regard to mercury in cosmetics. These trends are useful when considering training and also education and awareness on safe handling of mercury as they allows for more gender-sensitive communication strategies that can target the sexes differently to achieve maximum benefit.

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

Due to the absence of specific studies looking at awareness and understanding of mercury issues in Seychelles; the level of understanding and awareness amongst stakeholders was assessed by the quality of exchanges held during the various workshops conducted, interviews, and feedback received during the Level 1 inventory and interviews with local media houses. As such, the level of awareness and priority for sensitization and training is provided in Table 29.

6.1 Stakeholder awareness

Table 29: Stakeholder awareness matrix

Target group	Awareness rating	Comments
Ministry of Environment, Energy and Climate Change (MEECC)	High	Competent Authority for implementing the Minamata Convention
Medical professionals	High	Have indicated through questionnaires a high level of understanding of the issues.
Ministry responsible for health	High	Participant in the long-term study examining any potential impacts of mercury in the population
Seychelles Fishing Authority (SFA)	High	Actively testing for mercury and other metals in fish
Seychelles Bureau of Standards	High	Actively testing for mercury and other metals in fish
Private enterprises exporters fish	High	Required by certain markets to test for mercury and other heavy metals prior to export
Media professionals	Medium	Has been involved with the project and increased awareness has been achieved
Academic Institutions (UniSey)	Low	Stated that they would need training to undertake a monitoring programme
Fire & Rescue Services Agency	Low	Training required in containment and disposal
Customs Officers	Low	Training required in Convention requirements and identification of Hg containing devices
Landscape & Waste Management Agency (LWMA)	Low	Training required in safe handling and disposal
STAR (Seychelles)	Low	Training required in safe handling and disposal
Importers of Hg containing devices	Low	Awareness required to switch to mercury-free products
Importers of cosmetics	Low	Very few importers knew about mercury in cosmetics
NGO's	Low	Limited interests by NGO's in chemicals management.
General public	Low	General sensitization required

There is sufficiently high awareness of mercury issues within the medical profession including dentistry. All dentists contacted during the inventory process showed a high level of awareness relating to mercury issues. This was also observed for individuals within the technical Ministries, such as the Ministry of Environment and Climate Change and Energy, a leading authority for many pollution-related Conventions. Outside these sectors, the other stakeholders, including the general public, had limited awareness.

6.2 Training and education opportunities

It is recommended that emphasis for training be directed towards the primary national stakeholders for mercury. This would include the MEECC as the Convention focal point and main implementing agency. It should also include front line agencies, such as Seychelles Fire & Rescue Services Agency (SFRSA) and Seychelles Revenue Commission – Customs department.

Of similar importance are Ministerial departments and parastatal involved in waste management and resource utilization, as well as importers of mercury containing equipment and cosmetics. In view of the large number of businesses, Seychelles Chamber of Commerce and Industry (SCCI) can represent the latter two groups. Of note, is the clear need to train media personnel to better inform the public on the issue, with particular respect toward buying choices and consumption of fish and other seafood (Table 30).

Table 30: Opportunity for training and education

Target group	Priority	Specific Areas of training
Ministry responsible for Environment	High	Strengthen national capacity in all areas covered by the Convention
Seychelles Fire & Rescue Services Agency	High	Identification, containment and disposal of Hg and Hg containing devices; handling Hg accidents including fires
Customs Officers	High	Convention requirements (phase-out date), identification of Hg containing devices
Media professionals	High	Convention requirements, action of Hg in humans and the environment, national priorities/implementation plan on Hg
Academic Institutions (UniSey)	High	Monitoring and research
Landscape & Waste Management Agency	High	Identification, safe handling and disposal of Hg and Hg containing devices
STAR (Seychelles)	High	Identification, safe handling and disposal of Hg and Hg containing devices
Importers of Hg containing devices	High	Awareness of Convention and need to switch to Mercury free products
Importers of cosmetics	High	Awareness of dangers of Hg in cosmetics
NGO's	High	General awareness
General public	High	General awareness
Ministry responsible for health	Medium	Monitoring and research
Seychelles Bureau of Standards	Medium	Monitoring and research
Ministry responsible for Fisheries	Low	Dissemination of information collected for the various fish species
Medical professionals	Low	Already well trained with regards to mercury
Private enterprises exporters fish	Low	Would not be interested, as they do not determine the presence of mercury in fish and are guided by market forces

Chapter VII: Implementation Plan & Priorities for Action

Seychelles has developed a host of national implementation plans, which incorporate national priorities, including Convention related activities. These actions are collected into a master 10-year environmental strategy and action plan, called Seychelles Sustainable Development Strategy (SSDS). In the evaluation of previous strategies, it transpired that action plans that were simpler and succinct were more likely to be well understood, and implemented by senior officials. This was observed during the review of the national implementation on POPs, where a national plan that followed standardized international templates and proved quite useful to an international audience, was not particularly effective at a national level. Therefore, a balance must be struck between the need to harmonize international reporting with the differing culture of nations, which may not be best suited to technical presentations that us lengthy tables and texts. It is in this spirit, as is the case for the revised national plan for POPS, that the National Implementation Plan for mercury is being conceived. The NIP is designed to be a strategic programme to accompany the MIA and should be able to be imported into the SSDS mechanism, as well as the work programme of the MEECC.

A. Goals

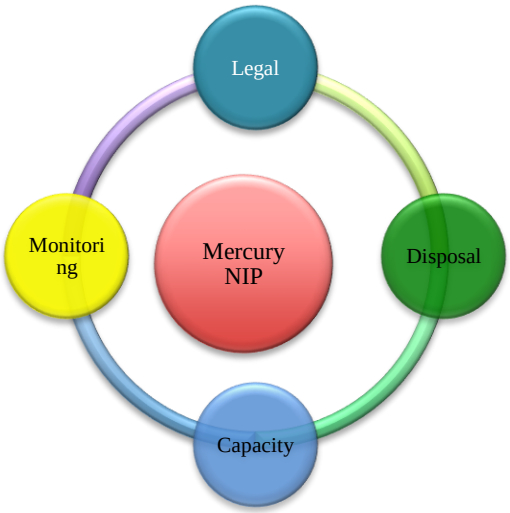
The overall goal of Seychelles National Implementation Plan for mercury is to "reduce, with the aim of completely eliminating, national mercury release to the environment and reducing health impacts of anthropogenic release of mercury".

B. Areas of Intervention

In achieving the overall goal, the NIP considers four key areas of intervention. These being:

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

Figure 10: Components of the National Implementation Plan for mercury



Strengthening legal framework

Objective 1 - Strengthening the legal framework

The legal framework is currently outdated with regards to mercury, despite the EPA having undergone a major revision in 2016. Key recommendations from the policy and regulatory report were that the NIP should include provisions for mercury during development of legislative framework for the Stockholm Convention, through the Hazardous Chemicals Bill, or by regulations to the existing Environment Protection Act. Key features of new legislation are:

- Legislative ban on mercury mining, ASGM activities, import and export of products listed in Part I, Annex A of the Convention.
- Phase down of dental amalgams in accordance to Part II of Annex A of the Convention
- Legislative ban on manufacturing processes that use mercury
- Other provisions related to collection and dissemination of information on mercury and application of BAT and BEP to existing practices listed in Annex D of the Convention
- Update to Codes of Practices and standards produced by SBS especially SS36: 1994.

Activities, budget, timeframe and responsibility

1. Strengthening the legal framework	Responsibility	Budget (USD)	Timeframe
1.1 Develop regulations to comply with the Minamata Convention under EPA	MEECC	20,000	2017
1.1.1 Legislative ban on primary mercury mining	*MEECC*		
1.1.2 Legislative ban on ASGM related activities	*MEECC*		
1.1.3 Legislative ban on the import and export of products listed in Part I, Annex A of the Convention	*MEECC*		
1.1.4 Phase out of dental amalgams in accordance to Part II of Annex A of the Convention	*MOH + MEECC*	-	
1.1.5 Legislative ban on manufacturing processes using Hg	*MEECC + Ministry of Industry*		
1.16 Obligation to collect and disseminate information on Hg emitted, released or disposed	*MEECC*		
1.17 Standards developed under EPA for management of hazardous waste that includes mercury	*MECC*		
1.2 Update SBS Codes and Practices SS36:1994	SBS	1,500	2018
Sub total		**21,500**	

Storage & Disposal

Objective 2 – Developing capacity for storage and disposal of mercury containing waste

The major source of mercury in the country is in mercury-containing equipment, and replacement of these items with non-mercury containing alternatives will generate a waste stream that would need to be managed. There are two main waste streams to consider, namely: 1.) waste equipment from the medical sector including dental amalgams, thermometers and sphygmomanometers, and 2.) from other products such as compact fluorescent lights and batteries. It is advisable that the waste not be landfilled, but rather sent to specialized facilities abroad for safe disposal of mercury. The main reason for this is linked to economy of scale, as the country would not be able to produce sufficient amounts for viable export. Interim storage will be required to enable the stock to accumulate over months and years. The same is true under other chemical action plan most notably for POPs. Therefore, it will require the construction of a facility where these products could be safely contained until export for processing at specialized facilities. In this regard, the NIP for mercury cross-links with similar action under POPS and SAICM as storage facilities can be shared.

Linkages can be made with the energy efficiency project for disposal of CFLs, since the project is promoting energy efficient devices that contain mercury over conventional filament bulbs.

With regards to contaminated sites, the POPS NIP provides for rehabilitation of used landfill sites, so this has not been incorporated in the NIP for mercury.

Activities, budget, timeframe and responsibility

2. Storage and disposal	Responsibility	Budget	Timeframe
2.1 Construction of Interim storage / disposal facilities for mercury containing equipment	MEECC	90,000	2018
2.2 Programme for phase out of mercury containing products in Part I, Annex A	MEECC	55,000	2018
2.2.1 Educational campaign and materials targeting importers of Part I, Annex A products		*5000*	
2.2.2 Purchase of receptacles for mercury containing waste products		*8,000*	
2.2.3 Training of waste collectors		*2000*	
2.2.4 Collection, storage and disposal of mercury containing waste products		*40,000*	
2.3 Programme for phase out of amalgams from dental clinics/provision of mercury bins	MEECC + MOH	30,000	2018
2.3.1 Development of education campaign and materials		*5000*	
2.3.2 Provision of specialized collecting bins		*5000*	
2.3.3 Training of dental amalgam collectors		*5000*	
2.3.4 Collection, storage and disposal of dental amalgams		*15,000*	
2.4 Linkages with actions under the energy efficiency project for CFL	MEECC + Energy Commission	-	2019
Sub total		**175,000**	

Capacity Building & Awareness

Objective 3 – Enhancing institutional capacity for the management of mercury

A key aspect of all national action plans is the need for education, awareness and capacity building. This is even more relevant since certain key technical ministries lack specialists with chemistry knowledge and decision makers have limited background knowledge with the subject. The same is true for the general public. The main challenges identified for Seychelles are:

- Increasing capacity of the focal institutions with regards to mercury issues. The main proposal is to formalize a Technical Committee on Mercury, which would support and also include the focal point to the Convention on Mercury and BRS Conventions. The other representatives could include the Ministry of Health, Ministry of Industry, Ministry of finance/Customs, Seychelles Bureau of Standards (SBS) and private sector organization and experts. Ideally, the technical committee should be constituted under the SSDS mechanism to deal with all chemicals, however in the interim, the Mercury project Steering Committee may assume some of these responsibilities.
- Strengthening the knowledge and technical capacity of stakeholders for project implementation. Training will be required for familiarization with the Convention, identification and characterization, safe handling, interim storage and disposal of mercury and its compounds.
- Developing targeted technical information in a simple, accessible, and relevant format for decision makers, senior officers and members of the general public.
- Increasing awareness of Seychelles with regards to the Minamata Convention, mercury in fish, and in cosmetics. Such awareness-raising would include gender considerations in order to develop targeted campaigns.

Activities, budget, timeframe and responsibility

3. Education, Awareness and capacity building	Responsibility	Budget	Timeframe
3.1 Technical training on Minamata Convention and proposed regulations for Government Officers	MEECC	7500	2017 - 2021
3.2 Training for Customs Officers and first responders	MEECC	5000	2017-2021
3.3 Mainstreaming mercury in the work programme of PECO	MEECC	10,000	2017-2021
3.3.1 Awareness programme for mercury in cosmetics; targeting local importers and users of cosmetics	*PECO*	*5000*	*2017*
3.3.2 Awareness programme for decision makers		*2500*	
3.3.3 General awareness programme for the public	*PECO*	*2500*	*2017*
3.4 Publication of mercury assessment in fish in Seychelles e.g. as part of SFA annual report	SFA	3000	2017
Sub total		**25,500**	

Research, monitoring and reporting

Objective 4 – Improving research, monitoring and reporting

Unlike most countries in the region, Seychelles currently has the technical and physical capacity to undertake testing of mercury in fish and the environment. However, the scientific and personnel resources are limited within the national laboratories. Hence, a dedicated programme for monitoring is required to support the recruitment of additional staff that can focus solely on this project. Objective 4 proposes to establish a monitoring programme that would build capacity within existing institutions (UniSey, MOH, SBS) that are actively involved in both in-country and regional monitoring and research. Under this component, it is expected that there will be enhanced collaboration, and information sharing between regional and international scientific institutions.

This component also allows for the update of the baseline mercury inventory, to facilitate reporting to the Convention. These activities can be outsourced to the private sector consultants so that the key Ministries are not burdened with further assessments.

Activities, budget, timeframe and responsibility

4. Research, monitoring and reporting	Responsibility	Budget	Timeframe
4.1 Develop mechanism for technical cooperation and technology transfer between local and overseas institutions	MOF UniSey MOH	-	2017
4.2 Updating the national inventory on mercury release	MEECC	15,000	2018-2021 every 2 years
4.3 Convention reporting	MEECC	15,000	2018-2021 every 2 years
4.4 Pollution monitoring for seawater and sediment	MEECC	40,000	2018-2021
Sub total		**70,000**	

D. Summary (Activities, budget, timeframe and responsibility)

Table 31: Total budget, implementing responsibility and timeframe

Activity	Responsibility	Budget (USD)	Timeframe
1. Legal and institutional		**21,500**	
1.1 Develop regulations to comply to the Minamata Convention under EPA	MEECC	20,000	2017
1.2 Update SBS Codes and Practices SS36:1994	SBS	1,500	2018
2. Storage and disposal		**175,000**	
2.1 Construction of interim storage facility for mercury containing equipment	MEECC	90,000	2018
2.1 Programme for phase out of mercury containing products in Part I, Annex A	MOH	55,000	2018
2.2 Programme for phase out of amalgams from dental clinics/provision of mercury bins	MEECC + Energy Commission	30,000	2018
3. Capacity building, Education & Awareness		**25,500**	
3.1 Technical training on Minamata Convention and proposed regulations for Officers of MEECC	MEECC	7,500	2017 - 2021
3.2 Training for Customs Officers, first responders	MEECC	5,000	2017-2021
3.3 Mainstreaming mercury in the work programme of PECO		10,000	
3.4 Publication of mercury assessment in fish in Seychelles	SFA	3,000	2017
4. Research, monitoring and reporting		**70,000**	
4.1 Develop mechanism for technical cooperation and technology transfer between local and overseas institutions			
4.2 Updating the national inventory on mercury	MEECC	15,000	2018-2021 every 2 years
4.3 Convention reporting	MEECC	15,000	2018-2021 every 2 years
4.4 Pollution monitoring (seawater, sediment & organisms)	MEECC	40,000	2018-2021
TOTAL		**292,000**	

Chapter VIII: Mainstreaming of Mercury Priorities

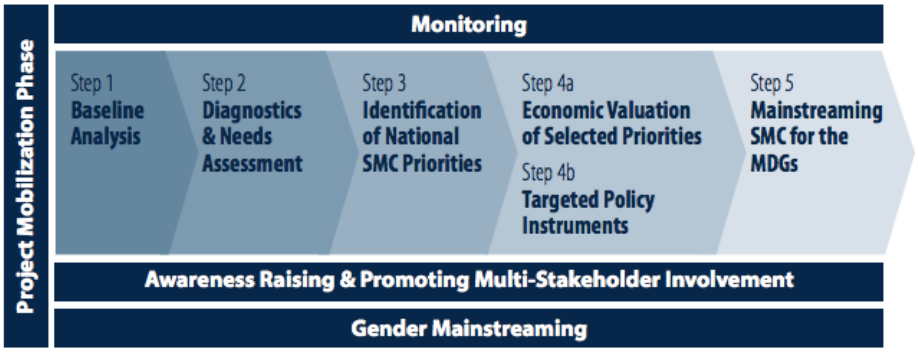
MIA projects supported by the United Nations Development Programme (UNDP) contain an additional Outcome and Output that are not contained in MIA projects supported by other GEF or UN agencies.

Outcome 1.4: Importance of Hg priority interventions at the national level raised through mainstreaming in relevant policies/plans

The continuation of meetings by multiple ministries that are involved in meeting the obligations of the Minamata Convention will greatly assist the connectively needed for long-term changes and commitments needed to reduce the use, releases and waste of mercury to protect human health and the environment.

Output 1.4.1: National Hg priority interventions mainstreaming in national policies/plans.

Generally, the process for mainstreaming SMC related priorities follows the following steps (see figure below).



Since the steps 1 - 4b have already been completed throughout the implementation of the MIA project and the preparation of the MIA report, the only remaining step is *Step 5: Mainstreaming Hg for achievement of the SDGs* will be presented in this chapter.

8.1 Mainstreaming mercury into sustainable development plan

For Seychelles the mainstreaming of mercury issues will be achieved through the national implementation plan on mercury developed within this MIA. The NIP (chapter VII) has been produced to be a standalone, coherent and compatible document with the SSDS framework for effective inclusion during the mid-term review of the strategy. It also aligns closely with the annual work programme of the Ministry of Environment Energy and Climate Change.

ANNEXES

ANNEX I: Stakeholder Engagement process

List of participants in the Workshop: Legislative Review and Capacity Barriers and Seychelles Mercury Profile held on 16 February 2016

Name	Organisation	Email	Office/Mobile
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ANNEX II: UNEP TOOLKIT Calculation Spreadsheet

See separate Excel file

ANNEX III: Description of types of results

Calculation result type	Description
Estimated Hg input, Kg Hg/y	The standard estimate of the amount of mercury entering this source category with input materials, for example calculated mercury amount in coal used annually in the country for combustion in large power plants.
Air	Mercury emissions to the atmosphere from point sources and diffuse sources from which mercury may be spread locally or over long distances with air masses; e.g., from • Point sources such as coal fired power plants, metal smelter, waste incineration; • Diffuse sources such as small-scale gold mining, informal burning of waste with fluorescent lamps, batteries, thermometers.
Water	Mercury releases to aquatic environments and to waste water systems; point sources and diffuse sources from which mercury will be spread to marine environments (oceans), and freshwaters (rivers, lakes, etc.). for example, releases from: • Wet flue gas cleaning systems on coal fired power plants; • Industry, households, etc. to aquatic environments; Surface run-off and leachate from mercury contaminated soil and waste dumps
Land	Mercury releases to the terrestrial environment: General soil and ground water. For example, releases from: • Solid residues from flue gas cleaning on coal fired power plants used for gravel road construction. • Uncollected waste products dumped or buried informally • Local un-confined releases from industry such as on site hazardous waste storage/burial • Spreading of sewage sludge with mercury content on agricultural land (sludge used as fertilizer) Application on land, seeds or seedlings of pesticides with mercury compounds
By-products and impurities	By-products that contain mercury, which are sent back into the market and cannot be directly allocated to environmental releases, for example: • Gypsum wallboard produced from solid residues from flue gas cleaning on coal fired power plants. • Sulphuric acid produced from desulphurization of flue gas (flue gas cleaning) in non-ferrous metal plants with mercury trace concentrations • Chlorine and sodium hydroxide produced with mercury-based chlor-alkali technology; with mercury trace concentrations Metal mercury or calomel as by-product from non-ferrous metal mining (high mercury concentrations)
General waste	General waste: Also called municipal waste in some countries. Typically household and institution waste where the waste undergoes a general treatment, such as incineration, landfilling or informal dumping. The mercury sources to waste are consumer products with intentional mercury content (batteries, thermometers, fluorescent tubes, etc.) as well as high volume waste like printed paper, plastic, etc., with small trace concentrations of mercury.
Sector specific waste treatment /disposal	Waste from industry and consumers which is collected and treated in separate systems, and in some cases recycled; for example: • Confined deposition of solid residues from flue gas cleaning on coal fired power plants on dedicated sites. • Hazardous industrial waste with high mercury content which is deposited in dedicated, safe sites • Hazardous consumer waste with mercury content, mainly separately collected and safely treated batteries, thermometers, mercury switches, lost teeth with amalgam fillings, etc. Confined deposition of tailings and high volume rock/waste from extraction of non-ferrous metals

ANNEX IV: Cosmetics known to contain mercury

Name	Brand	Country of Origin	Mercury concentration (mg/kg)	Detected in Seychelles?
Brite Face Cream	Brite Face	Pakistan	15000	No
Due whitening cream	Kreative Cosmetics (Pvt)	Pakistan	11700	No
Face Fresh Beauty Cream	Shaheen cosmetics	Pakistan	4620	No
Faimess cream	Arche Gold	Pakistan		No
Faiza Beauty Cream	Poonia Brothers	Pakistan	5940	No
Faiza No.1 Beauty Cream	Poonia Brothers	Pakistan	5430	No
Freckle cream	Stillmans	Pakistan	12000	No
Garlic whitening spot removing set	Facing you [translation from Arabic]	China	4000	No
Ginseng	Qian Mei	China	4,300	No
Golden Pearl	Golden Pearl	China	4750	No
Goree Whitening Cream	H Pharmacy	Pakistan	9870	No
Green Tea Quickacting Whitener & Speckle Remover	Pan Yu	Unknown	3300	No
Herbal cream	Fasco	Philippines	440	No
JAMBO 1st choice	Jambo	UK	7400	No
Pearl Face	Pearl Face	Pakistan	15,000	No
Qianli cream	Qianli	Unknown	2500	No
RICO the powerful germicidal soap	Rico skin care limited	UK	7200	No
Round montclaire powerful germicidal soap	Montclaire	Malaysia	5.76	No
Soap Jaribu Le Vrai Savon Antiseptique	Jaribu/Anglo Fabrics	UK	9.100	No
Whitening Cream with Blackberry extract	White Gold	Pakistan	9720	No
Whitening spot removing cream	E`Yôute	China	6900	No
Wiana Whitening Beauty Cream	SKH International	Pakistan	11400	No
Wrinkle De Crease	CPHL - Seven Herbal	Pakistan	820	No
Yimei Cream	Yimei	China	1800	No

Cosmetics suspected of containing Mercury (Source: www.whiterskin.info)

Name of Product	Detected in Seychelles?
Angel Placenta Whitening Cream (link to article)	No
Angela Placenta Whitening Cream (Tender Skin & Whitening)	No
Aroma Magic Fairy Lotion (link to article)	No
Bai Li Tou Hong (has 46,700 ppm of mercury)	No
BG Ginseng and Ganoderma Lucidum 6 Days Specific Eliminating Freckle Whitening Sun Block Cream	No
BG Sea Pearl and Papaya Natural Essence 6 days Specific Eliminating Freckle Whitening Sun Block Cream (link to article)	No
Brite Face Cream (link to article)	No
Caike Red Ginseng (link to article)	No
Care Skin Strong Whitening and Spot Removing pack	No
Cellnex Anti-Sensitive Essence Treatment (contains betamethasone and mercury; link to article)	No
Collagen Night Cream (link to article)	No
Due Whitening Cream	No
Erna Whitening Cream (link to article)	No
Esther Bleaching Cream (A) and (B) (link to article with photos)	No
Face Fresh Beauty Cream (4,620 mg/kg mg/kg of mercury; link to RAPEX notification)	No
Fair and Lovely Forever Glow / Fair and Lovely Anti Marks Cream	No
Faiza Beauty Cream / Faiza No 1 Beauty Cream	No
Feique Golden Aloe Whitening Anti-Scar, Anti-Freckle Set	No
Feique Green Tea Vital Whitening Freckle Removing Cream	No
Feique Whitening Anti-Freckle Cream (link to article)	No
Formula AA Arched Pearl Crème	No
Fresh Look Ultra Whitening Fairness Cream (3,500mg/kg mg/kg of mercury; link to RAPEX notification)	No
Gakadi freckle removing cream	No
Gipsey Amazing Cream	No
Golden Pearl Beauty Cream (4,750 mg/kg of mercury; link to RAPEX notification)	No
Goree Whitening Cream	No
Hengxueqian Whitening Set	No
Huayuenong 12 Days Whitening and Speckle Removing set	No
LiLiki Whitening Day Cream / Cream 911 (link to article)	No
LMSER Cream	No
LMSER Whitening Cream	No
Maidaifu Herbal Moisturizing and Whitening Cream (60,800 ppm of mercury)	No
Meiyong Super Whitening (link to article with photos)	No
Melati UV – Whitening Vit. E Cream (link to article with photos)	No
Mifton 7 Days Beauty Freckle Whitening Repair Set (link to article)	No

Monsepa Bleaching Express Peeling (link to article)	No
Natural Orange Whitening and Anti-Aging Package	No
Olay Natural White (made by Procter and Gamble India, link to article)	No
Olivia Crème for Unwanted Hair	No
Pai Mei whitening spot cream (30,167 ppm of mercury link to article 1 / 2)	No
Ponds White Beauty (made by Hindustan Unilever, link to article)	No
Raj Beauty Cream (470 mg/kg of mercury; link to RAPEX notification)	No
Roopamrit (link to article)	No
Sanli Eliminating Freckle Cream	No
Sanli Eliminating Freckle Cream Plus Complex Vitamin C & E	No
Santen cosmetic cream (link to article)	No
Seven Herbal Ubtan (620 mg/kg of mercury; link to RAPEX notification)	No
Seven Herbal Ubtan (link to UK product recalls + alternative pdf download, OAS alert with pictures, link to article)	No
Seven Herbal Wrinkle de Crease	No
SF Beauty Night Cream (Facial) and SF Beauty Day Cream (Facial) (contains betamethasone and mercury)	No
Top Shirley Nourishing Cream (link to article)	No
White Advance Hydroxytyrosol L-Glutathione Whitening and Antiaging Cream	No
White Magnolia Intensive Repair Essence Powerful Spot Remover	No
Wiana Whitening Beauty Cream (source for this and the next 11 creams: Buckinghamshire County Council — opens a pdf with photos of the creams and their mercury levels / alternate link)	No
Wiana Whitening Cream	No
Xuefujiaolan Herbal Whitening and Embellish Classic Set (link to article)	No
Yin Ni Whitener Repair Cream (link to article)	No
Yinni Green Tea Quickacting Whitener and Speckle Remover Package	No
Youngrace Age Defying Essence (link to article)	No
Yu Dan	No
Yunxi New skin whitening 4 in 1 Suit (link to press release)	No
Yunxi New skin whitening Night Cream (16,000 mg/kg of mercury detected)	No
Yunxi New skin whitening Pearl Cream (9,200 mg/kg of mercury detected)	No
Zhjren 7-Day beauty elegant moisturizing and whitening day cream	No
Zhjren Whitening Ruddy Combination Suit	No

Soap containing mercury banned in Kenya

Soap Name	*Detected in Seychelles?*
Movate	No
Mekako	No
Jaribu	No
Tura	No
Acura	No
Rico	No
Fair Lady	No
Elegance	No
Miki	No
Jambo	No

Skin lightening creams banned for containing Mercury and its compounds (Kenya)

NAME	Detected in Seychelles?
Pimplex Medicated Cream	No
New Shirley Medicated Cream	No
Movate Cream, Skin success gel	No
Hot Movate gel	No
Amira-C	No
Neu Clear Gel	No
Tenovate	No
Body Clear Cream Spot remover	No
Top gel plus	No
Soft and Beautiful cream	No
Lemonvate cream, Secret gel	No
TCB gel plus	No
UNIC clear super cream	No
TOPIFRAM cream	No
Skin balance lemon cream	No
Peau Claire gel plus	No
Dark & Lovely gel	No
Dermo Gel Plus	No
Peau Claire cream	No
Fashion fair gel plus	No
Hot prosone gel	No
Visible difference gel	No
Sivoclaire cream	No
Action demovate cream	No
Regge Lemon gel	No

Ultimate Lady gel	No
TOPIFRAM gel plus	No
Age renewal cream	No
Fair and White Gel plus	No
Fashion fair cream	No
First class lady cream	No
Skin success cream	No
NEU clear cream plus	No
JARIBU Beta - β cream	No
Body treat cream spot remover	No
Clair & Lovely gel	No
Soft & beautiful gel	No
Action Demovate gel plus	No
Prosone gel	No
Skin balance gel wrinkle remover	No
Ultra gel plus	No
Pro one gel MCA	No
Betalemon cream	No
Skin balance cream wrinkle remover	No
Dark and lovely cream	No

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