Minamata Initial Assessment Report

Guyana

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Minamata Initial Assessment report

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National Mercury Profile, UNEP Level 1 Inventory Report, Hg Toolkit Inventory Level 1 Calculation Spreadsheet

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Analysis of Existing National Regulatory Framework and Strategies for the mainstreaming of national mercury priority interventions in national policies and plans

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Knowledge, Attitudes, and Practices Study

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Communication Strategy and Implementation Plan

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Report on Technical Training for Mercury Coordination Mechanism Members and Technical Personnel

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Report on the Meetings with Key Institutes, agencies and NGOs on Mercury use in Guyana

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Feature Film "Level of Awareness and Understanding of Mercury Use in the Gold Mining Sector and Surrounding Communities"

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About this document

Guyana, with funding provided by the GEF and technical assistance provided by UNDP, has developed this Minamata Initial Assessment (MIA) report, which aims to strengthen national decision-making toward implementation of the Minamata Convention on Mercury and build national capacity towards implementation of future obligations.

The MIA project provides an opportunity for the country to undertake a mercury inventory, determine and agree upon the measures it will take to implement the Convention, estimate associated costs and communicate this information in a concise and clear manner.

In order to support Government partners, national stakeholders, the project coordination team, national and international experts and consultants in preparing a MIA report that contains all the required components, Guyana has prepared the country's first MIA Report. In developing the report, the UNDP Guidance document was used, as well as the MCM to oversee the project and review the report.

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Foreword by Government Official

Executive Summary

1. Introduction

This MIA report was first prepared by Dr. Rodrigo Romero, Mercury Inventory Specialist, in April 2016. Data and information were then consolidated by Dr. Patrick Williams, Minamata Convention Analyst, and further revised and completed by UNDP Guyana on behalf of the Ministry of Natural Resources in March 2017.

The report presents a first overview of the Guyana's mercury baseline, based on the UNEP Toolkit published in April 2015 (Level 1[1]) with additional assessments, such as national mercury profile, policy regulatory and institutional assessment, knowledge, attitude and practice study, communication strategy and its implementation plan[2]. They have been produced under the contracts of the UNDP and the Ministry of Natural Resources (MNR), the National Focal Point for the Minamata Convention to the Government of Guyana.

Given that the Government of Guyana signed the Minamata Convention on October 10th 2013 and subsequently ratified it on September 24th 2014, it is now incumbent upon the state to accelerate activities to facilitate timely country implementation. Due to the growing awareness of the negative impacts of mercury use, this toxic chemical has been banned in many countries. However, mercury use remains active in Guyana like many other developing countries, but the Government aims to gradually phase-out its use by 2022 considering its danger human health

The primary objective of the Mercury Initial Assessment (MIA) Report is to provide a basis for further activities relevant to the implementation of the Convention. In this regard, the MIA report will assist Guyana in notifying the Convention in accordance with Article 7 and with respect to the development of its National Implementation Plan in accordance with Article 20. In addition, the MIA will enable the preparation of a National Plan to reduce mercury emissions as set out in Article 8.

Mercury release is a pivotal concern of major economic sectors, thus the results of the fFirst National Mercury Inventory, performed under the UNEP methodology, confirm some expected outcomes and provide important and useful information. The importance of these results also resides in the fact that, for the first time, they repreent , a widely and internationally recognized emission estimation methodology using the UNEP Toolkit which estimated national mercury releases in Guyana based on significant importation of the substance particularly in the last decade.

2. Results of the Mercury Inventory

This mercury release inventory was developed in *2016* using 2015 data. For some data types, data for 2015 were unavailable. Data sets and corresponding years are noted in the relevant sections of this report.

[1] United Nations Environmental Programme – UNEP. Toolkit for Identification and Quantification of Mercury Releases. Guideline for Inventory Level 1. Version 1.3, April 2015.

[2] The name of the authors are stated in Page 2 and 3 of the report.

The inventory was prepared using "Toolkit for identification and quantification of mercury releases" made available by the Chemicals Branch of the United Nations Environment Programme (UNEP Chemicals). This inventory was developed on the Toolkit's Inventory Level 1.

The Toolkit is based on mass balances for each mercury release source type. Inventory Level 1 works with pre-determined factors used in the calculation of mercury inputs to society and releases the default input factors and default output distribution factors. These factors were derived from data on mercury inputs and releases from the relevant mercury source types from available literature and other relevant data sources. The Toolkit is available at UNEP Chemicals' website:http://www.unep.org/hazardoussubstances/Mercury/MercuryPublications/GuidanceTrainingMaterialToolkits/MercuryToolkit/tabid/4566/language/en-US/Default.aspx

See further description of these estimations in the relevant source type sections.

Results and discussion

An aggregated presentation of the results for main groups of mercury release sources is presented in [Figure 1.1 - 1.x and] Table 1.1 below.

Table 0-1 Summary of mercury inventory results

Source category	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y							Percent of total releases *3*4
		Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment /disposal	Total releases *3*4*5	
Coal combustion and other coal use	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Other fossil fuel and biomass combustion	41.6	41.6	0.0	0.0	0.0	0.0	0.0	42	0%
Oil and gas production	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Primary metal production (excl. gold production by amalgamation)	15,356.9	614.3	307.1	13,821.2	614.3	0.0	0.0	15,357	53%
Gold extraction with mercury amalgamation	11,777.1	4,570.0	3,812.2	3,394.9	0.0	0.0	0.0	11,777	41%
Other materials production	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0	0%
Chlor-alkali production with mercury-cells	-	-	-	-	-	-	-	0	0%
Other production of chemicals and polymers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Production of products with mercury content*1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Application, use and disposal of dental amalgam fillings	7.4	0.1	2.5	0.4	0.3	1.2	1.2	6	0%
Use and disposal of other products	1,498.6	370.7	20.7	379.1	0.0	717.9	10.3	1,499	5%
Production of recycled metals	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Waste incineration and open waste burning*2	1.2	1.1	0.0	0.0	0.0	0.0	0.1	1	0%
Waste deposition*2	500.0	5.0	0.1	0.0	-	-	-	5	0%
Informal dumping of general waste *2*3	500.0	50.0	50.0	400.0	-	-	-	100	0%
Waste water system/treatment *4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Crematoria and cemeteries	7.2	2.2	0.0	4.9	0.0	0.0	0.0	7	0%
TOTALS (rounded) *1*2*3*4*5	**28,790**	**5,660**	**4,190**	**17,600**	**610**	**720**	**10**	**28,790**	**100%**

As shown in the table, the following source groups contribute with the major mercury inputs:

- Primary metal production excluding gold production by amalgamation
- Gold extraction with mercury amalgamation

The individual mercury release sub-categories contributing the highest mercury inputs were:

- Gold extraction with mercury amalgamation – without use of retorts (11,0009 Kg Hg/y)
- Gold extraction by methods other than mercury amalgamation (15,357 Kg Hg/y)
- Gold extraction with mercury amalgamation – with use of retorts (768 Kg Hg/y)

The individual mercury release sub-categories contributing the highest mercury emissions to the atmosphere was Gold extraction with mercury amalgamation – without use of retorts (4,416 Kg Hg/y). The individual mercury release sub-categories contributing the highest mercury releases

to water was Gold extraction with mercury amalgamation – without use of retorts (3,505 Kg Hg/y).

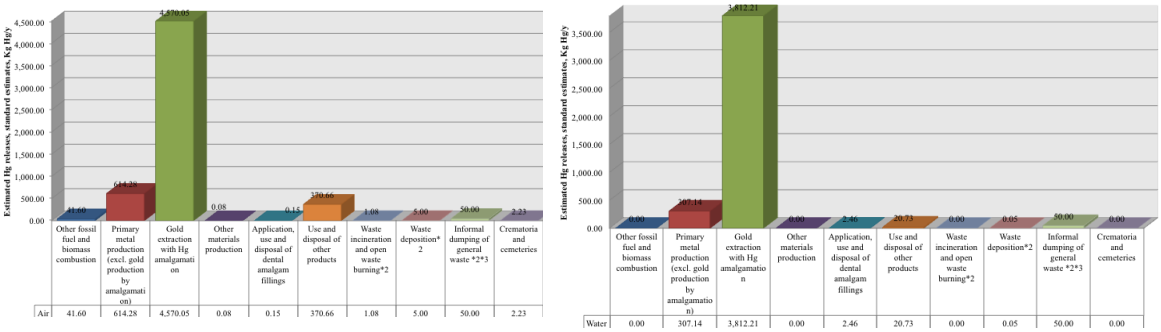


Figure ES-1. Total estimated emissions to air of mercury (left) and total estimated mercury releases to water (right)

For mercury releases to land, gold mining remains a source of the largest releases. Note that the main contribution corresponds with gold extraction without mercury amalgamation, which is performed by large-scale gold mining using other methods than mercury amalgamation (Figure ES-4).

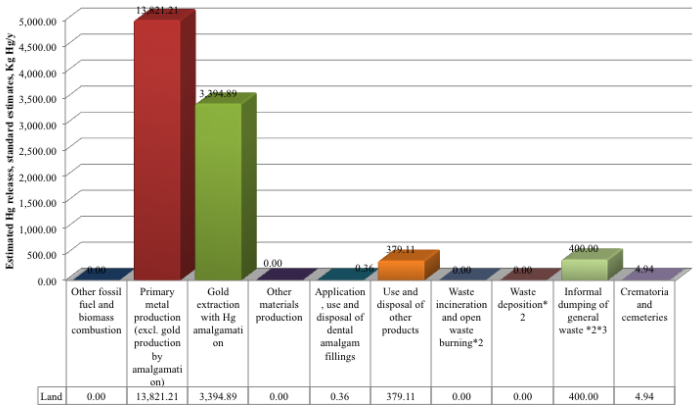


Figure ES-2. Total estimated mercury releases to Land from anthropogenic sources.

In this inventory, default input factors were used for the estimation of mercury releases from primary metal production. The default factors were based on available data of mercury contents in primary metal production from developed countries. The calculations indicate that the default input factors for primary metal production may over-estimate the mercury releases from these sources (see the section on primary metal production data in this report). This may be of priority in follow-up work, as feasible.] Detailed presentation of mercury inputs and releases for

all mercury release source types present in the country are shown in the following report sections. The Toolkit spread sheets used in the development of this inventory is posted along with this report, or can be submitted upon request.

3. Data gaps

Major data gaps identified were as follows:

- Waste treatment, waste management and waste disposal. There is a lack of data from water treatment area: open fire waste burning, better estimation of amount of waste disposal in controlled landfill, and especially in the informal dumping of waste.

- Qualitative assessment of the percentage of gold mining with mercury amalgamation: using retorts and without using retorts. A systematic approach should be adopted to get the best possible picture of this area. This issue is of paramount importance in order to better understand the mercury flow (pathways) of the huge amount of legally imported metal mercury into the country.

  The assumed percentage of mercury importation, emissions and releases from gold mining remains too low. In this regard, data collection over a longer period will be necessary to incorporate findings from national mercury importers, distributors, retailers, vendors and miners willing to help, thereby facilitating a refined version of this inventory.

Main priorities for further assessment:

It is important to understand the profile of "Pork-knockers/Punters" who manually extract gold individually or in small groups (for female punters), using relatively large amounts of mercury. The remaining task is therefore to conduct a field survey to ascertain the actual number of Pork-knockers and to obtain a better understanding of mercury use in Guyana, to identify users/practises and minimize the gap between mercury consumption and mercury importation.

The flow chart below (Figure 1-5) provides an interesting overview of the mercury flow within the country. Unquestionably, 60.000 kilogrammes of mercury imported into Guyana is the main source of anthropogenic mercury. Since no products are produced with mercury content, only 11 kg extra might be added (from fuel importation) at the top left box.

The domestic activities contribute another 27.764.2 kilogrammes of mercury as a result of mining and to a lesser extent, fuel, biomass and energy combustion.

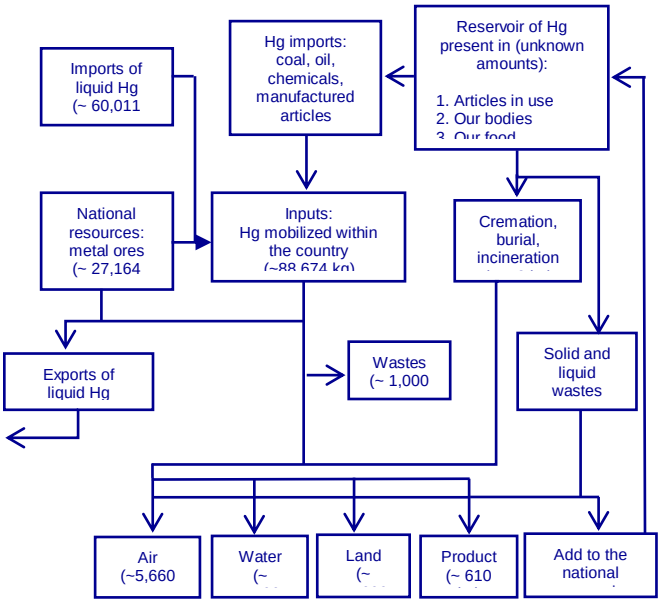


Figure Nº 1-5 Overview of mercury flows into and within the country. Source "Mercury Inventory for New Zealand: 2012".

Article Nº 7 of the Minamata Convention directly references the amount of mercury from the mining sector and specifically establishes a number of requirements to ASGM. Since Guyana has signed and ratified the Convention, these results become relevant to defining a well balanced approach to the most efficient way tof dealing with ASGM, to control emissions and releases, to promote best mining practises for ASGM, and formalising this relevant to Guyana's economy. In addition, the results will also facilitate a risk assessment survey targeting those who reside in the vicinity of mining areas with special focus on small children and pregnant women due to potential effects of mercury.

In line with the challenges described above, a well-structured approach must be defined in terms of the human and technical requirements and the corresponding funding, required to undertake these challenges. A number of technical proposals to address these tasks are described in the MIA report.

4. Major findings of the policy and regulatory assessments

The current legal framework provides a foundation for Convention implementation. There is no need to develop a mercury specific law or a law directly incorporating the Convention into the Laws of Guyana. There are no specific barriers to implementation with a few exceptions.

While Guyana has a robust legal and institutional framework for the management and use of toxic chemicals, including mercury and mercury compounds, there are a number of limitations of the framework. These relate to gaps in some of the regulations and the need for revision of others. For instance, Section 47:3 of the Mining Act makes reference to mercury mining only on a large scale but does not consider small-scale mining.

The limitation that presently exists is that mercury and mercury compounds are not explicitly addressed in many areas directly covered by the Convention. In the implementation process actions plans, strategies and applicable timelines must be considered. In this regard, Table 2 which reproduces in part extracts from MEAs implementation in the Caribbean: Report and guidelines prepared by Dr. Winston Anderson JCCJ (2000) is instructive.

Action Plans are specifically required by Article 7 (Annex C), and to a lesser extent Article 8, Article 9 and Article 20, and the guidance provided regarding the content of the action plans should be noted. In implementing Convention obligations, timelines should be carefully managed as there are different times for compliance applicable to several articles of the Convention. The timelines commence from three years, extends to five years, continues for ten years, and in some instances, conclude within fifteen years. The focus on appropriate and

effective measures will achieve and realise both Constitutional obligations as well as Convention commitments.

5. Major findings of the institutional assessment

The main institutional bodies with responsibility for the regulation of mercury in Guyana are the Guyana Geology and Mines Commission (GGMC), the Environmental Protection Agency (EPA) and the Pesticides and Toxic Chemicals Control Board (PTCCB) of the Ministry of Agriculture. In addition, there a number of other institutions and associations whose roles and functions complement the work of the three key institutions mentioned. Such agencies include the Guyana Revenue Authority (GRA), Guyana National Beareau of Statistics (GNBS), the Ministry of Social Protection (MoSP), the Ministry of Communities (MoC), the Ministry of Public Health (MoPH), the Guyana Gold and Diamond Miners Associations (GGDMA), the Guyana Women Miners' Organisation (GWMO) and the Institute of Applied Science and Technology (IAST), among others.

The current structure of public agencies dealing with environmental matters requires strengthening, with special focus on human resources (professional support, economic incentives, capacity building), including the following elements:

- Clarification and and/or re-defining of functions through the MoU mechanism, e.g. Pesticide and Toxic Chemical Control Board (PTCCB) and GGMC regarding mercury importation institutional scope;
- Establishment of collaborative agreements among public environmental agencies dealing with environmental matters. Such collaboration will mitigate high costs associated with enforcement and environmental compliance especially in Guyana's Hinterland regions, the country's limited human/technical and financial resources and activate a new mandate focused on the Minamata Convention. Improved enforcement capacity and modification to relevant legislative instruments to include mercury with standard guidelines.
    - e.g. EPA Environmental Protection (Water Quality) Regulation 2000 & Environmental Protection (Air Quality) Regulation 2000 to mainstream mercury as a target compounds under these legislations.

Support for the development of local technical capacities related to waste management (municipal, industrial and hazardous waste) is also recommended as one of the environmental imperatives.

6. Summary of the measures the country has prioritized in order to implement the Convention

In Guyana, the primary focus needs to be on the gold mining industry as ASGM is the main driver behind mercury importation and use. Following are the identified national priorities consistent with the Article of the Conventions:

- *1st Priority*
  Article №7. Artisanal and small-scale gold mining.

- *2nd Priority*
  Article Nº8. Emissions.
  Article Nº9. Releases.
- *3rd Priority*
  Article Nº3. *Mercury supply sources and trade.*
- *4th Priority*
  Article Nº10. Environmentally sound interim storage of mercury, other than waste mercury.

The suggested priority actions are:

1. **Restriction to mercury Importation**

   a. Initial reduction of imported mercury
   b. More restricted requirement at GGMC level

2. **Formalization of artisanal miners**

   a. Through implementing low-budget "Mercury Recycling Centres" (see below)
   b. Develop of a register of artisanal miners
   c. Conduct systematic risk assessment control
   d. Include social economic survey
   e. To include occupational exposure monitoring

3. **Contaminated sites**

   a. Include in the National Action Plan a systematic approach to address contamination and monitor the level of progress corrective action and activities.
   b. Start evaluation of human population located in the vicinity of artisanal gold mining sectors, through mercury field measurement campaigns defined as "Pilot scale."
   c. Conduct low budget mercury field evaluation using "passive sampler devices" to identify zones impacted significantly by mercury.
   d. Include the IAST at the University of Guyana to improve the understanding of Mercury contamination over time.

4. **To establish a National Reference Laboratory (NRL**) that can provide analytical services ***fully dedicated within the framework of the Minamata Implementation process***

   a. To define the critical pathway to NRL through international accreditation (ISO/EIC 17025)
   b. To establish the mechanism to ensure NRL capability to conduct mercury characterization in the entire relevant mercury environmental matrix (e.g. mercury in water, sediments, soils, air, particulate matters, liquid and solid waste, among others).
   c. Likewise, to establish the mechanism to ensure regular training of human and technical capabilities and to include within the spectra of analytical services the bio-samples (mercury analysis in urine, in blood, in hair) as part of its expertise.

5. **Regulatory amendment**

    a. To improve enforcement capacity through modification of some of the legislative instruments to include mercury with standard guidelines (e.g. EPA Environmental Protection (Water Quality) Regulation 2000, Environmental Protection (Air Quality) Regulation 2000 and other relevant regulations, in order to mainstream mercury as a target compound under these legislations.

6. **Strengthening of institutional structure and capacity**

    a. To strengthen the present environmental structure, with special focus on human resources (professional encouragements, economic incentives, capacity building), including the following elements:

    - Clarify and/or re-define functions through the MoU mechanism (e.g. Pesticide and Toxic Chemical Control Board (PTCCB) and GGMC concerning mercury importation institutional scope);
    - Establish consensus inter-agency prior to accomplish new mandate. Enforcement and compliance is rather expensive, especially in the Hinterland and Guyana has quite limited human/technical and funding resources, as the rest of South American countries.

7. **Institutional assessment**

    a. Support and development of new and/or complementary technical local capacities, urgent need to the present implementation phase of Minamata Convention. Specially related to waste management (municipal, industrial and hazardous wastes).

8. **Use of mercury**

    Guyana's economy is the critical element within the Minamata Implementation phase.

In summary, the current infrastructure in Guyana appears to provide the basis for sound management of mercury, due to the already existing infrastructure for management of chemicals as a whole. However, a number of gaps and needs were identified. Therefore, there is need for implementation of legislative and technical requirements to ensure effective mercury management . With respect to the implementation of the Minamata Convention and the future Mercury National Action Plan, it is recommended that a number of priority actions highlighted in this report be taken on board.

Finally, another key elementthat should be emphasised is the need for a welldefined Mercury National Action Planthat can lead the decision making process properly. The Mercury NAP will establish the baseline for actions that must be carried out during the implementation phase of the Convention. Likewise, it will serve to monitor the level of progress and actions and activities.

Within the framework of a Mercury National Action Plan, another recommendation is the inclusion of a comprehensive screening of mercury obsolete stockpile that might remain (old

equipment with mercury content at government properties) to get an overall quantitative data base of mercury concentration levels at potentially contaminated old mining sites (historical gold mines); former agricultural sites, include pesticide storage.

Introduction

Mercury is emitted and released into the environment globally, by both natural and anthropogenic points and diffuse sources. Mercury is an element that is extremely persistent and continues to cycle between the air, water (ocean and freshwater) and land (UNEP 2013). Legget al (2015) states that in the Guianas, both anthropogenic releases through Artisanal and Small Gold Mining (ASGM) and natural sources of mercury, which are stored in the ocean and sediment, are likely to contribute the total amount of mercury in the region. Nonetheless, the availability of viable alternative sources to mercury for anthropogenic releases remains limited.

The Minamata Convention is a UN agreement reached in January 2013 for the establishment of a globally binding Convention on Mercury. It was adopted and opened for signature on October 10, 2013 at a Diplomatic Conference in Kumamoto, Japan. The treaty was designed to protect human health and the natural environment from the adverse effects of mercury. The major elements of the Minamata Convention include a ban on new mercury mines, the phase out of existing ones, control measures on air emissions, and the international regulation of the informal sector for artisanal and small-scale gold mining. The Government of Guyana signed the Convention in October 2013 and ratified it in September 2014. The Convention will enter into force 90 days after it has been ratified by 50 nations.

The expected outcomes of this report are to undertake a mercury inventory, based on the UNEP Mercury Toolkit Level I, and a legislative and institutional assessment, as well as to identify national priorities that need to be achieved in order to meet future obligations under the Minamata Convention. This will facilitate an evidence-based Implementation Plan/National Action Plan to address these priorities.

The approach used in compiling the MIA report included a review and analysis of references listed in ANNEX XXX, prepared by national and international experts, based on the national legal and regulatory and institutional framework, education and awareness/training programmes, such as mercury- free mining techniques and other aspects in the context of applicability to each pertinent article of the Convention. Two consultations with key stakeholders and Mercury Coordination Mechanism (MCM) in the form of workshops were held to finalize the document. Stakeholders were drawn from the government, private sector, non-governmental organizations (NGO's), semi-autonomous agencies and international orgnisations that have direct and indirect links to the importation, distribution, use and control of mercury and related substances (Refer to ANNEX 1 –List of MCM members).

Chapter I: National Background Information

This chapter presents a brief profile of Guyana in order to contextualize the MIA strategies and action plans. It summarizes information on the country's geography and population, membership in regional and sub-regional organizations, the country's political, institutional, legal and economic profile, profiles of potentially important economic sectors in the context of mercury issues and overall environmental conditions and priorities in the country.

1.1 COUNTRY PROFILE

1.1.1 Geography and population

Guyana stretches over a landmass of 214,999 square kilometres or about 83,000 square miles [3] and has 778,100 inhabitants.[4] It is delimited by Venezuela on the west, Brazil on the west/south, and Suriname on the east and is situated between 1° and 9° North Latitude and 57° and 61° West Longitude[5].

Table I-3. Guyana Official Statistics (GNBS, 2010)

Population	778,100 (Census 2010)
Size	214,970 km^2
Location	Between 1° & 9° North Latitude and 57° & 61° West Longitude
Time Zone	GMT - 04:00
Currency	Guyana Dollar (G$)
Per capita GDP 2011 (rebased series)	US$2,869.00
Nominal GDP 2011 (rebased series)	G$ 460,108 million
Real GDP 2011 (rebased series)	G$ 326,194 million
Inflation Rate	Dec '14 - Oct '15:-1.9
Average Exchange Rate (Mid Rate)	Aug '15: G$206.85 to US $1 Sept '15: G$207.12 to US $1 Oct '15: G$207.48 to US $1

Population

The population of Guyana, based on the information provided by the Census of 15th September 2012, recorded a marginal reduction of 3,339 persons from the population count of 751,223 at previous Census 15th September 2002, to represent a Census count of 747,884 persons at September 15th 2012, recording a negative growth rate of 0.04%[6].

The number of persons per square kilometre remains the same 3.5 persons per square kilometre, registered under the previous Census of 2002. The density varies from the coastland regions (9.6 persons per square kilometre); the hinterland regions remain largely

[3] GNBS, 2002. Guyana Official Statistics, 2002 Census, chapter III.
[4] GNBS, 2012, Guyana preliminary Statistics, 2012 Census.
[5] Ibid.
[6] Ibid.

unoccupied (more than two-thirds of the total land area) and Georgetown city with 140.4 persons per square kilometre[7].

Guyana's population is located along ten regions (Administrative divisions); Barima-Waini, Cuyuni-Mazaruni, Demerara-Mahaica, East Berbice-Corentyne, Essequibo Islands-West Demerara, Mahaica-Berbice, Pomeroon-Supenaam, Potaro-Siparuni, Upper Demerara-Berbice, Upper Takutu-Upper Essequibo[8].

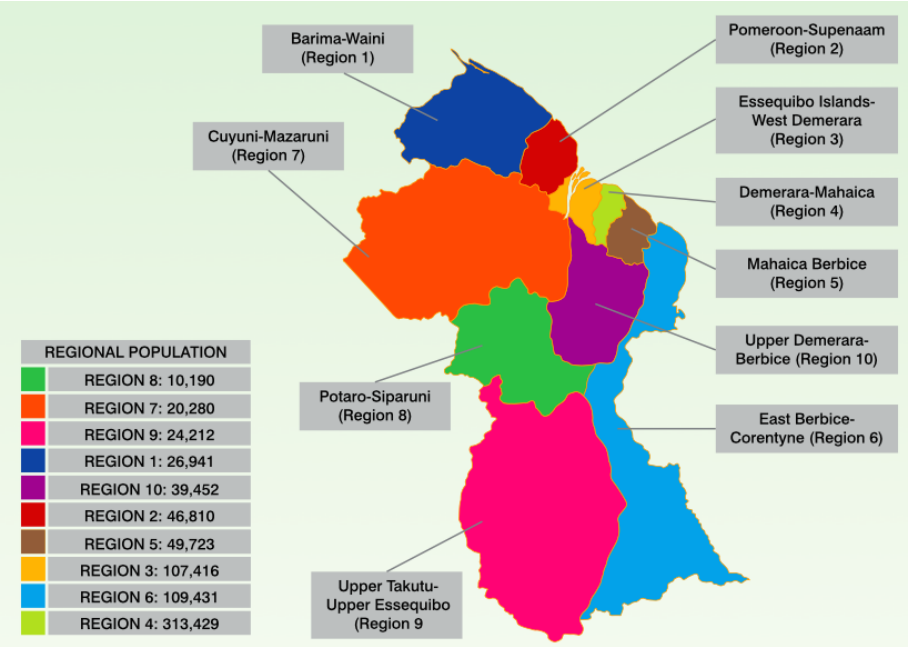


Figure I-9. Regional Population Distribution, Guyana 2012, (GNBS, 2012)

As seen in Figure I-9, the hinterland's extremely low population is distributed in the larger part of Guyana's territory. Possible explanations for this distribution have been found on the geographical conditions, accessibility and generally poor infrastructure and deplorable conditions of interior roads which deteriorate seasonally with the wet season. This is made worse by the absence of road-specific interior road management. However, an interesting remark to be drawn from the Census 2012 and directly linked with the results of the Mercury National Inventory is the steady increase of the Hinterland population during the last decades in Guyana.

In fact, we can observe that regions 1, 7, 8 and 9; (Barima-Waini, Cuyuni-Mazaruni, Potaro-Siparuni and the Upper Takutu Essequibo regions respectively) have experienced a population growth trend which is well reflected in Figure I-10. On the other hand, the Mercury National Inventory demonstrates, by far, the largest emission and releases of mercury from anthropogenic sources in Guyana correspond to gold miningwhich is fairly developed inthese regions.

[7] Ibid.

[8] Guyana government 2004. Source: 2004 CIA World Fact book. Immigration USA. http://www.immigration-usa.com/wfb2004/guyana/guyana_geography.html

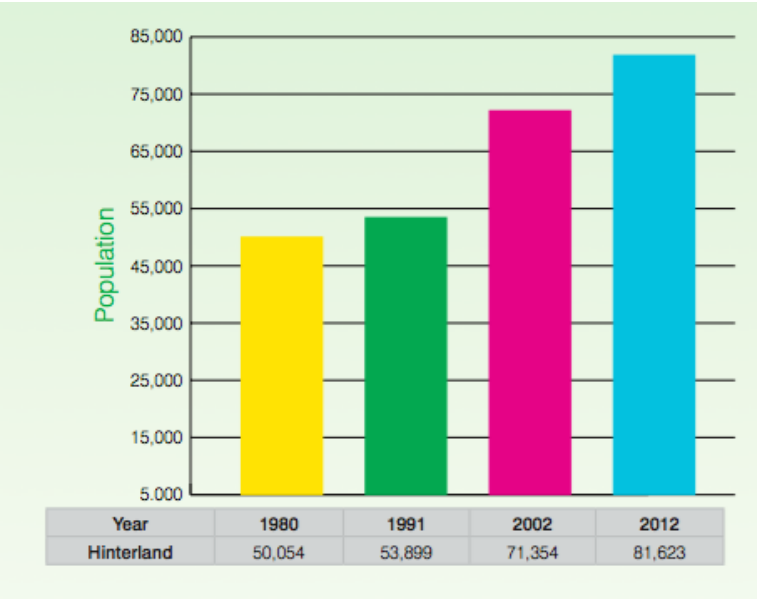


Figure I-10. Population trends of the Hinterlands regions (GNBS, 2012)

Gender distribution

Guyana's current gender/sex ratio is estimated at 99 males per every 100 females (372,547 males versus 375,337 females)[9].

Average household size

The average household size has decreased from 4.1 to 3.6 persons per household[10].

Building and development

During the last two decades, the number of dwelling units has increased by 16,624 (205,117 to 221,741 respectively). Dwelling unit as a subset of building (Construction sector), gives a good indicator to assess the economy's performance[11].

Urban & rural population

As far as the common understanding goes, urban refers to segments of the population that are found within the urban centers and settlements. However, there is no precise size to uniformly set a condition for an urban center and the definition differs from one country to another Urban settlements are generally characterized by the diversities of their socio-economic activities and the dynamics of their administrative functionaries. According to Guyana definition, there are six areas that are officially classified as urban townships inclusive Georgetown and its suburbs[12].

Table I-4. Urban and rural distribution of Guyana's population (GNBS, 2012).

Guyana's population

[9] Ibid.
[10] Ibid.
[11] Ibid.
[12] Ibid.

	Year 2002	%	Year 2012	%
Urban	209,992	28.4	191,810	26.4
Rural	528,323	71.6	535,193	

1.1.2 Political, legal and economic profile

Political Profile

Guyana has ten Administrative Regions and some of them are divided into sub-regions, while others are divided into Neighbourhood Democratic Councils (NDCs) to facilitate local governance. As a former colony, Guyana attained its independence from Britain in 1966 and in 1970 became a Cooperative Republic. Under the Constitution of October 6, 1980, executive power is vested in the President, who leads the majority party in the unicameral National Assembly, and who holds office for the assembly's duration. The president appoints the Cabinet which is responsible to the National Assembly. The minority members of the Assembly elect an Opposition Leader. The Assembly comprises members who are elected in keeping with conditions associated with universal adult suffrage, for a term of five years. Except for each municipality which is headed by the Mayor, local government is administered principally through the Regional Democratic Councils (RDCs) each led by a Chairman. The RDCs are elected for terms of up to five years and four months in each of the country's ten Regions. The NDCs are responsible for the local communities or village council level. To date, there are nine municipalities in the country with Georgetown being the largest and capital city.

Legal Profile

Guyana has a common law system based on the English model and some Roman-Dutch civil law influence. The constitution was last promulgated October 6, 1980 and amended several times. The unicameral National Assembly comprises 65 seats and its members are directly elected in multi-seat constituencies and a single nationwide constituency by proportional representation vote. Members serve a 5-year term. The Cabinet of Ministers is appointed by the president. The cabinet is responsible to the National Assembly. The highest court, Supreme Court of Judicature, consists of the Court of Appeal with a chief justice and three (3) justices while the High Court has a chief justice and ten (10) justices organized into three- or five-judge panels. In 2009, Guyana ceased final appeals in civil and criminal cases to the Judicial Committee of the Privy Council (in London) replacing it with the Caribbean Court of Justice which is the judicial organ of the Caribbean Community. The Court of Appeal and High Court chief justices are appointed by the president and other judges of both courts are appointed by the Judicial Service Commission, a body appointed by the president. The Land Court and the Magistrates' Courts are subordinate courts.

Economic profile

Between 2006 and 2013, Guyana's economic performance has significantly stabilized, expanding

by an average of 4.7 percent per annum. This can be partly explained by the commodity boom, favouring its base of extractive industries along with significant Foreign Direct Investment. The timely introduction of a Value Added Tax (VAT) and the implementation of debt relief agreements, under the Heavily Indebted Poor Countries Initiative along with the Multilateral Debt Relief Agreements Initiative have contributed to Guyana's macro-economic resurgence. Between 2005 and 2013, the economy grew by 4.7 per cent per year on average but Real Gross Domestic Product (GDP) growth decelerated to 3.8 per cent in 2014 and to 3.0 per cent in 2015 reflecting the reduction in global commodity prices including gold. There were, however, notable improvements in the services and manufacturing sectors. Real GDP growth is projected to fluctuate within the range of 3 per cent to 5 per cent during 2016-2018. Economic activities are expected to be driven by continued investments in primary industries, rapid growth of gold production and rebounding performance in construction as well as the wholesale and retail trade industries. Potential offshore and hydro-energy projects may also attract foreign investment and further boost growth. Nominal GDP is G$653,836 million and inflation (estimated at -0.3 in 2016) is expected to remain relatively subdued (GNBS, 2016). Nonetheless, volatile commodity prices represent a significant risk[13].

The economy of Guyana rests on five main industries: rice, sugar, timber, bauxite and gold. The rapid growth of the gold industry has accounted for gold output rising from 489 kilogrammes in 1989 to 11,668 kilogrammes (from small- and medium-scale mining only) in 2015. These commodities contribute more than 50 per cent of the country's GDP and are highly susceptible to adverse weather conditions and fluctuations in commodity prices. Guyana's economy improved in 2013; real GDP increased by 5.2 per cent compared with that of 2012. This increase was attributed to positive economic performances in the services sector (which accounted for 65.2 per cent of the GDP), agriculture sector (22.1 per cent of the GDP), and mining sector (12.1 per cent of the GDP). The value of Guyana's exports was estimated to be about $1.376 billion in 2013 compared with $1.416 billion in 2012. The leading mineral commodity exports in 2013 were, in order of value, gold ($648.5 million compared with $716.9 million in 2012), bauxite ($134.6 million compared with $150.8 million in 2012), and diamond ($12.2 million compared with $8.2 million in 2012). The decrease in the value of gold exports was attributed to the drop-in world gold prices. The decrease in the value of bauxite shipments was attributed to an 18.5 per cent decrease in the volume of metal-grade bauxite exports (Bank of Guyana, 2014; Kitco Metals Inc., 2014). Imports were valued at $1.847 billion in 2013 compared with $1.997 billion in 2012, and included such products as, in order of value, petroleum products (about $575 million compared with a revised $638 million in 2012) and mining equipment (about $22.6 million in 2013 compared with $38.1 million in 2012) (Bank of Guyana, 2014).

Industrial, agricultural, and other key economic sectors

The economy of Guyana has traditionally rested on three main industries: rice, sugar and bauxite mining[14]. Since the 1980s, the bauxite industry has declined significantly. The rapid growth of the gold industry, however, has compensated for this decline, with gold output rising

[13] www.worldbank.org/en/country/guyana/overview

[14] Lowe S. 2006, Situation Analysis of Au mining in Guyana, WORLD WILDLIFE FUND Guianas Regional Program September 2006.

from 17,244 ounces in 1989 to 411,568 ounces (from small and medium scale mining only) in 2015[15].

Real GDP growth slowed in 2014 (3.8 percent) reflecting the softening in global commodity prices including gold and bauxite[16]. There were, however notable improvements in the services and manufacturing sectors[17]. Real GDP growth is projected to fluctuate within the range of 3 percent to 5 percent during 2015-2018. Economic activities will be driven by continued investments in primary industries. The discovery of oil has also attracted foreign investment and further boost growth in the next years. Inflation is expected to remain relatively subdued. Nonetheless, volatile commodity prices represent a significant risk[18].

Mining

Guyana is well known as a major producer of Bauxite with export over 2 million of tonnes during the last five years, a contribution of 9.3% of total country Export US$ 87,873.70 (US$'000)[19]. However, the larger portion of the export percentage corresponds to gold mining with a 41.3% contribution to the total export of the country. Official data suggests that in 2015, the small and medium-scale gold mining sector produced 11.7 tonnes of gold.

Environmental overview

Mercury releases by major economic sectors

The results of the Guyana's mercury inventory confirm some expected results and provide important and useful information that Guyana's gold mining is by far the dominant source of anthropogenic emissions and releases of mercury. Waste disposal and informal dumping of wastes are additional sources of mercury emissions and releases, however the amounts of these emissions are, by large, significantly lower than gold mining sector.

Freshwater contamination

There is limited literature available thataddress freshwater contamination by mercury in Guyana, and the contamination of freshwater fish in Guyana with. Most of the available data are outdated. According to UNDP Consultant, Dr. Rodrigo Romero, standardised methodologies, sample size and data samplings with laboratory analysis by accredited laboratories would be crucial for the reliability of data.

In this context, Legg *et al* (2015) note that a survey conducted by GGMC in 2001, in the Potaro River, indicated that 57% of carnivorous fish sampled in the river contained mercury levels exceeding the maximum concentration (0.5 µg/g) by WHO Guideline[20]. Mercury concentration per species in Kurupung revealed that the highest concentration was found from *Cynodon gibbus*, whereas in Isseneru, *Platynematichthys notatus* contained the highest (Singh *et al*,

[15] Official communication with Guyana Geology & Mines Commission GGMC, January 2016.
[16] Ibid.
[17] Ibid.
[18] Ibid.
[19] Guyana National Bureau of Statistic. "Export by Items Customs Average R.O.E for January - Oct, 2015".
[20] GGMC, 2001

2000)[21]. The study also highlights that concentration of methylmercury was found in *H. aimara* with 0.24–0.928 µg/g in Kurupung.

Air Quality

There are significant gaps in data and available information to understand mercury emissions to the atmosphere in Guyana. However, across the Guianas, reports state that background levels of atmospheric mercury of the Atlantic coast, which is remote from ASGM sites and gold retailers, as well as around Paramaribo, were in live with global averages (Müller *et al*, 2012 in Leggs *et al.*, 2015). In Chapter VII, the present MIA report will suggest environmental assessment and measurement campaigns of mercury concentrations in freshwater and air quality.

Chapter II: Mercury Inventory and Identification of Emissions and Resources

This chapter presents information directly from the UNEP Level 1 Mercury Inventory Report conducted by Dr. Rodrigo Romero, Mercury Inventory Specialist, between November 2015 and April 2016.

During the elaboration of the MIA Project, the UNEP Toolkit for Identification and Quantification of Mercury Releases, Level 1, was used. The performance of a first mercury national inventory was part of the requirements needed to implement the Minamata Convention on mercury in Guyana.

The work to develop the Inventory Level 1 (version 1,3 April 2015), was done following the Guidelines and calculation spreadsheet produced by UNEP Division of Technology, Industry and Economics. This publication is intended to serve as a guide. However, the relevant information to feed the Toolkit to estimate the mercury releases, was collected through a collaborative approach conducted in coordination with the UNEP MIA project coordination team.

Indeed, through the MIA project coordination team, a number of meetings with public officers and relevant mercury stakeholders were coordinated in order to discuss the on-going Mercury Initial Assessment Project and to explain the need to conduct a mercury national inventory in Guyana.

These meetings incorporated the governmental structure (e.g. ministries and relevant public agencies and Guyana National Bureau of Statistics (GNBS); Guyana Revenue Authority (GRA), Pesticide and Toxic Chemical Control Board (PTCCB) from Ministry of Agriculture; Environmental Protection Agency (EPA), Guyana Geology and Mines Commission (GGMC) and Guyana Gold Board from Ministry of Natural Resources (MNR) and Ministry of Public Health (MoPH).

[21] Leggs *et al.* (2015) noted that the sample size of this study was too small (with a total of 32 species) with only one or two individual species, without any records of length of fish/age.

Other institutions from the private sector incorporated in the development of the mercury national inventory were the Guyana Gold and Diamond Mining Association (GGDMA), one of the most relevant institutions within Guyana's gold mining sector.

Several stakeholders were interviewed from non-governmental organizations such as the World Wildlife Fund (WWF) – Guianas, the Guyana Women Miners Organization (GWMO) and the Amerindian Peoples Association (APA). These NGOs are linked to mercury issues in Guyana from the social and environmental perspective and they provided useful comments and a general overview from the social and environmental viewpoint.

To fulfil the request to perform a first mercury national inventory using the Toolkit, all data with the base year of 2015 were used to estimate the mercury releases provided by public agencies. In this regard, it should be stressed that the Toolkit suggests two levels of inventory development, a simplified standard methodology (Level 1), and a more detailed Inventory level 2. The present inventory was done using the mentioned methodology Level 1 due to the limited availability of official data.

The original methodology of the Pilot Draft version of the Toolkit published in November 2005 has undergone several revisions. Default input and output distribution factors have been developed for more mercury sources categories, making it simpler to use the Toolkit. On inventory Level 1, the calculations of releases are automatic, based on default input factors and default output distribution factors which are already entered in the electronic calculation spreadsheet.

The current structure and existing institutions to perform the first national inventory, considering the restrictive timeframe to conduct it, was satisfactory in terms of getting official information required by the UNEP Toolkit as Input data or activity rate (e.g. amount of raw material, fuel or products containing mercury). In this regard, the main mercury sources of concern are the importation of metallic mercury from abroad (data provided by the GRA, GNBS and PTCCB) the use of different type of coals and fuels (Guyana National Energy Agency (GEA)) and gold production (GGMC).

There are a number of miscellaneous sources of mercury (dental amalgam, electrical switches, lamps, batteries, equipment with mercury content as blood pressure gauges, thermometers, etc.) that were included in the present inventory using the official data from GNBS. Further refined versions of the inventory can be developed (Toolkit, Level 2), including data from end-users, distributors and sellers in order to improve the estimations of releases.

The information (data) on the use of mercury to the 8 categories and sub-categories has been therefore collected from official sources. The information was supplemented by data rate estimations, which were calculated based on field visits to gold mining districts in Guyana (Essequibo and Potaro rivers; Itaballi - Takatu region, and at Port Kaituma and Matthew's Ridge in the northern Guyana). During these visits, extensive interviews were conducted with mining managers, owners, and medium, small-scale and artisanal gold miners to provide additional evidence to back the estimated data. The tables linked to each Step in Chapter 2 are directly generated from the Level 1 Excel Calculation Spreadsheet.

Table 2-1: Step 1 Country Data

MERCURY INVENTORY FOR (INSERT COUNTRY NAME):	GOVERNMENT OF GUYANA
General population data	
Population (select country below to find population)	778.100
Year and reference for population data	2012
GDP (Gross Domestic product)	US $ 2,869.00 per capita
Year and reference for GDP data	2011
Main sectors in the economy of country (list)	Bauxite and gold mining, rice, sugarcane, timber, among other.
Contact point responsible for inventory	
Full name of institution	Ministry of Natural Resources and the Environment (MNRE) - United Nations Development Program
Contact person	Mrs. Eulienne Watson (MNRE) & Mrs. Chika Ohashi (UNDP)
E-mail address	Eulienne Watson <ewatson@nre.gov.gy> - Chika Ohashi <chika.ohashi@undp.org>
Telephone number	
Fax number	
Website of institution	http://nre.gov.gy - http://www.gy.undp.org

An aggregated presentation of the results for main groups of mercury release sources is presented in Table 1-2 below.

Table 0-2 Summary of mercury inventory results

INVENTORY LEVEL 1 - EXECUTIVE SUMMARY

Source category	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y							Percent of total releases *3*4
		Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment /disposal	Total releases *3*4*5	
Coal combustion and other coal use	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Other fossil fuel and biomass combustion	41.6	41.6	0.0	0.0	0.0	0.0	0.0	42	0%
Oil and gas production	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Primary metal production (excl. gold production by amalgamation)	15,356.9	614.3	307.1	13,821.2	614.3	0.0	0.0	15,357	53%
Gold extraction with mercury amalgamation	11,777.1	4,570.0	3,812.2	3,394.9	0.0	0.0	0.0	11,777	41%
Other materials production	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0	0%
Chlor-alkali production with mercury-cells	-	-	-	-	-	-	-	0	0%
Other production of chemicals and polymers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Production of products with mercury content*1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Application, use and disposal of dental amalgam fillings	7.4	0.1	2.5	0.4	0.3	1.2	1.2	6	0%
Use and disposal of other products	1,498.6	370.7	20.7	379.1	0.0	717.9	10.3	1,499	5%
Production of recycled metals	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Waste incineration and open waste burning*2	1.2	1.1	0.0	0.0	0.0	0.0	0.1	1	0%
Waste deposition*2	500.0	5.0	0.1	0.0	-	-	-	5	0%
Informal dumping of general waste *2*3	500.0	50.0	50.0	400.0	-	-	-	100	0%
Waste water system/treatment *4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Crematoria and cemeteries	7.2	2.2	0.0	4.9	0.0	0.0	0.0	7	0%
TOTALS (rounded) *1*2*3*4*5	**28,790**	**5,660**	**4,190**	**17,600**	**610**	**720**	**10**	**28,790**	**100%**

The estimated total amount of anthropogenic emissions and releases of mercury correspond to 28,790 kg Hg/y (Table ES-1). The main source of these emissions and releases comes from gold mining. Indeed, an amount of 27,134 kg Hg/year was estimated as mercury emissions to air and releases to water and land as the results of gold mining activities, corresponding to 94% of the total emissions and releases (Figure ES-1). From these results, it should be stressed that all other mercury sources, defined as categories/subcategories (UNEP, Toolkit) reported as existing sources in Guyana, reported mercury emissions and releases far behind the gold mining emissions/releases. Undoubtedly, these results already provide the needed evidence and the starting point to define monitoring and strategies for a mercury management programme.

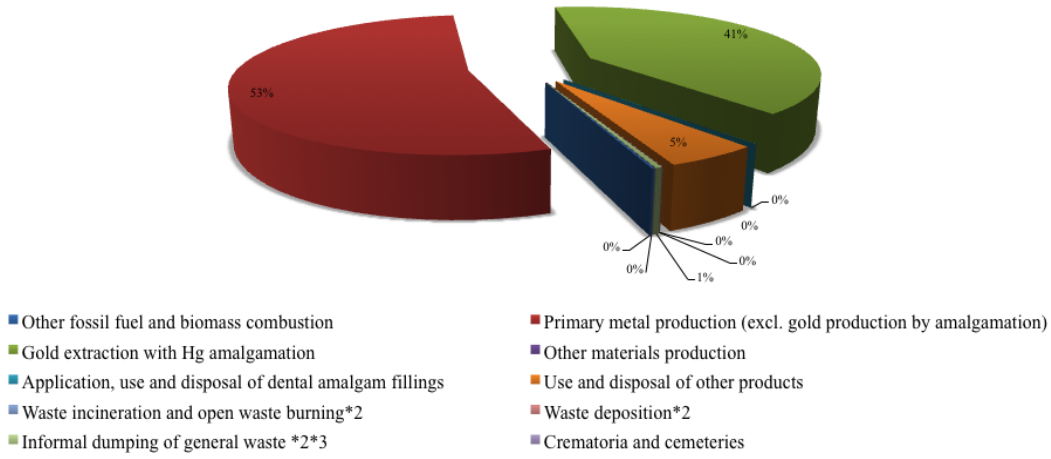


Figure ES-1. Total estimated emissions and releases of mercury from Guyana's anthropogenic sources.

2.1 Mercury release source types present

Table 2-1 shows which mercury release sources were identified as present or absent in the country. Only source types positively identified as present are included in the quantitative assessment.

It should be noted however, that the presumably minor mercury release source types shown in Table 2-2 were not included in the detailed source identification and quantification work. These may however be present in some countries.

Table 0-1 Identification of mercury release sources in the country; sources present (Y), absent (N), and possible but not positively identified (?). [Overleaf]

Source category	**Source present?**
	Y/N/?
Energy consumption	
Coal combustion in large power plants	N
Other coal uses	N
Combustion/use of petroleum coke and heavy oil	Y
Combustion/use of diesel, gasoil, petroleum, kerosene	Y
Biomass fired power and heat production	Y
Charcoal combustion	Y
Fuel production	
Oil extraction	N
Oil refining	N
Extraction and processing of natural gas	N
Primary metal production	
Mercury (primary) extraction and initial processing	N
Production of zinc from concentrates	N
Production of copper from concentrates	N
Production of lead from concentrates	N
Gold extraction by methods other than mercury amalgamation	Y
Alumina production from bauxite (aluminium production)	N

Primary ferrous metal production (iron, steel production)	N
Gold extraction with mercury amalgamation - without use of retort	Y
Gold extraction with mercury amalgamation - with use of retorts	Y
Other materials production	
Cement production	N
Pulp and paper production	Y
Production of chemicals and polymers	
Chlor-alkali production with mercury-cells	N
VCM production with mercury catalyst	N
Acetaldehyde production with mercury catalyst	N
Production of products with mercury content	
Hg thermometers (medical, air, lab, industrial etc.)	N
Electrical switches and relays with mercury	N
Light sources with mercury (fluorescent, compact, others: see guideline)	N
Batteries with mercury	N
Manometers and gauges with mercury	N
Biocides and pesticides with mercury	N
Paints with mercury	N
Skin lightening creams and soaps with mercury chemicals	N
Use and disposal of products with mercury content	
Dental amalgam fillings ("silver" fillings)	Y
Thermometers	Y
Electrical switches and relays with mercury	Y
Light sources with mercury	Y
Batteries with mercury	Y
Polyurethane (PU, PUR) produced with mercury catalyst	N
Paints with mercury preservatives	?
Skin lightening creams and soaps with mercury chemicals	?
Medical blood pressure gauges (mercury sphygmomanometers)	N
Other manometers and gauges with mercury	Y
Laboratory chemicals	Y
Other laboratory and medical equipment with mercury	Y
Production of recycled of metals	
Production of recycled mercury ("secondary production")	N
Production of recycled ferrous metals (iron and steel)	N
Waste incineration	
Incineration of municipal/general waste	Y
Incineration of hazardous waste	Y
Incineration of medical waste	Y
Sewage sludge incineration	Y
Open fire waste burning (on landfills and informally)	Y
Waste deposition/landfilling and waste water treatment	
Controlled landfills/deposits	Y
Informal dumping of general waste *1	Y
Waste water system/treatment	Y
Crematoria and cemeteries	
Crematoria	Y
Cemeteries	Y

As was pointed out above, Table 2-2 shows sources that were not included in the detailed source identification and quantification work. Some of these sources are identified in Guyana.

Table 0-2 Miscellaneous potential mercury sources not included in the quantitative inventory; with preliminary indication of possible presence in the country.

Source category	Source present?
	Y/N/?
Combustion of oil shale	N
Combustion of peat	N
Geothermal power production	N
Production of other recycled metals	Y
Production of lime	N
Production of light weight aggregates (burnt clay nuts for building purposes)	N
Chloride and potassium hydroxide produced from mercury-cell technology	N
Polyurethane production with mercury catalysts	N
Seed dressing with mercury chemicals	N
Infra red detection semiconductors	N
Bougie tubes and Cantor tubes (medical)	N
Educational uses	Y
Gyroscopes with mercury	N
Vacuum pumps with mercury	N
Mercury used in religious rituals (amulets and other uses)	Y
Mercury used in traditional medicines (ayurvedic and others) and homeopathic medicine	Y
Use of mercury as a refrigerant in certain cooling systems	N
Light houses (levelling bearings in marine navigation lights)	Y
Mercury in large bearings of rotating mechanic parts in for example older waste water treatment plants	N
Tanning	N
Pigments	N
Products for browning and etching steel	N
Certain colour photograph paper types	N
Recoil softeners in rifles	N
Explosives (mercury-fulminate a.o.)	Y
Fireworks	Y
Executive toys	N

1 Summary of mercury inputs to society

Mercury inputs to society should be understood here as the mercury amounts made available for potential releases through economic activity in the country. This includes mercury intentionally used in products such as thermometers, blood pressure gauges, fluorescent light bulbs, etc. It also includes mercury mobilised via extraction and use of raw materials, which contain mercury in trace concentrations.

Table 1-1 Summary of mercury inputs to society

Source category	Source present? Y/N/?	Activity rate	Unit	Estimated Hg input, kg Hg/y Standard estimate
Energy consumption				
Coal combustion in large power plants	N		Coal combusted, t/y	
Other coal uses	N		Coal used, t/y	
Combustion/use of petroleum coke and heavy oil	Y	159,414	Oil product combusted, t/y	9
Combustion/use of diesel, gasoil, petroleum, kerosene	Y	432,317	Oil product combusted, t/y	2
Biomass fired power and heat production	Y	1,008,411	Biomass combusted, t/y	30
Charcoal combustion	Y	1,690	Charcoal combusted, t/y	0
Fuel production				
Oil extraction	N		Crude oil produced, t/y	
Oil refining	N		Oil refined, t/y	
Extraction and processing of natural gas	N		Produced gas, Nm3/y	
Primary metal production				
Mercury (primary) extraction and initial processing	N		Mercury produced, kg/y	
Production of zinc from concentrates	N		Concentrate used, t/y	
Production of copper from concentrates	N		Concentrate used, t/y	
Production of lead from concentrates	N		Concentrate used, t/y	
Gold extraction by methods other than mercury amalgamation	Y	1,023,793	Gold ore used, t/y	15,357
Alumina production from bauxite (aluminium production)	N		Bauxite processed, t/y	
Primary ferrous metal production (iron, steel production)	N		Pig iron produced, t/y	
Gold extraction with mercury amalgamation - without use of retort	Y	5,121	Gold produced, kg/y	11,009
Gold extraction with mercury amalgamation - with use of retorts	Y	7,681	Gold produced, kg/y	768
Other materials production				
Cement production	N		t cement produced, t/y	

Source category	Source present? Y/N/?	Activity rate	Unit	Estimated Hg input, kg Hg/y Standard estimate
Pulp and paper production	Y	2,513	t biomass used in production, t/y	0
Production of chemicals				
Chlor-alkali production with mercury-cells	N		Cl2 produced, t/y	
VCM production with mercury catalyst	N		VCM produced, t/y	
Acetaldehyde production with mercury catalyst	N		Acetaldehyde produced, t/y	
Production of products with mercury content				
Hg thermometers (medical, air, lab, industrial etc.)	N		Mercury used for production, kg/y	
Electrical switches and relays with mercury	N		Mercury used for production, kg/y	
Light sources with mercury (fluorescent, compact, others: see guideline)	N		Mercury used for production, kg/y	
Batteries with mercury	N		Mercury used for production, kg/y	
Manometers and gauges with mercury	N		Mercury used for production, kg/y	
Biocides and pesticides with mercury	N		Mercury used for production, kg/y	
Paints with mercury	N		Mercury used for production, kg/y	
Skin lightening creams and soaps with mercury chemicals	N		Mercury used for production, kg/y	
Use and disposal of products with mercury content				
Dental amalgam fillings ("silver" fillings)	Y	778,100	number of inhabitants	7
Thermometers	Y	2,110	items sold/y	33
Electrical switches and relays with mercury	Y	778,100	number of inhabitants	84
Light sources with mercury	Y	1,287,270	items sold/y	23
Batteries with mercury	Y	5	t batteries sold/y	1,325
Polyurethane (PU, PUR) produced with mercury catalyst	N		number of inhabitants	
Paints with mercury preservatives	?		Paint sold, t/y	
Skin lightening creams and soaps with mercury chemicals	?		Cream and soap sold, t/y	
Medical blood pressure gauges (mercury sphygmomanometers)	Y		items sold/y	
Other manometers and gauges with mercury	Y	778,100	number of inhabitants	3
Laboratory chemicals	Y	778,100	number of inhabitants	6
Other laboratory and medical equipment with mercury	Y	778,100	number of inhabitants	24
Production of recycled of metals				
Production of recycled mercury ("secondary production")	N		mercury recycled, kg/y	

Source category	Source present? Y/N/?	Activity rate	Unit	Estimated Hg input, kg Hg/y Standard estimate
Production of recycled ferrous metals (iron and steel)	N		Number of vehicles recycled/y	
Waste incineration				
Incineration of municipal / general waste	Y		Waste incinerated, t/y	
Incineration of hazardous waste	Y		Waste incinerated, t/y	
Incineration of medical waste	Y	50	Waste incinerated, t/y	1
Sewage sludge incineration	N		Waste incinerated, t/y	
Open fire waste burning (on landfills and informally)	Y		Waste burned, t/y	
Waste deposition / landfilling and waste water treatment				
Controlled landfills/deposits	Y	100,000	Waste landfilled, t/y	500
Informal dumping of general waste *1	Y	100,000	Waste dumped, t/y	500
Waste water system/treatment	Y		Waste water, m3/y	
Crematoria and cemeteries				
Crematoria	Y	890	Corpses cremated/y	2
Cemeteries	Y	1,977	Corpses buried/y	5
TOTAL of quantified releases		**21**		

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

- Gold extraction by methods other than mercury amalgamation (15,357 kg Hg/y)
- Gold extraction with mercury amalgamation - without use of retort (11,009 kg Hg/y)
- Batteries with mercury (1,325 kg Hg/y)
- Gold extraction with mercury amalgamation - with use of retorts (768 kg Hg/y)
- Controlled landfills/deposits (500 kg Hg/y)
- Informal dumping of general waste (500 kg Hg/y)

2 Summary of mercury releases

Table 4-1 below provides , a summary of mercury releases from all source categories present. The key mercury releases here are releases to air (the atmosphere), to water (marine and freshwater bodies, including via waste water systems), to land, to general waste, and to sectors specific waste treatment. An additional output pathway is "by-products and impurities" which designate mercury flows back into the market with by-products and products where mercury does not play an intentional role. See Table 4-2 below for a more detailed description and definition of the output pathways.

Table 2-1 Summary of mercury releases

Source category	Estimated Hg releases, standard estimates, kg Hg/y					
	Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment / disposal
Energy consumption						
Combustion / use of petroleum coke and heavy oil	8.8	0.0	0.0	0.0	0.0	0.0
Combustion / use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates	2.4	0.0	0.0	0.0	0.0	0.0
Biomass fired power and heat production	30.3	0.0	0.0	0.0	0.0	0.0
Charcoal combustion	0.2	0.0	0.0	0.0	0.0	0.0
Primary metal production						
Gold extraction by methods other than mercury amalgamation	614.3	307.1	13,821.2	614.3	0.0	0.0
Gold extraction with mercury amalgamation - without use of retort	4,416.4	3,505.0	3,087.7	0.0	0.0	0.0
Gold extraction with mercury amalgamation - with use of retorts	153.6	307.2	307.2	0.0	0.0	0.0
Other materials production						
Pulp and paper production	0.1	0.0	0.0	0.0	0.0	0.0
Use and disposal of products with mercury content						
Dental amalgam fillings ("silver" fillings)	0.1	2.5	0.4	0.3	1.2	1.2
Thermometers	6.6	9.9	6.6	0.0	9.9	0.0
Electrical switches and relays with mercury	25.3	0.0	33.8	0.0	25.3	0.0
Light sources with mercury	6.8	0.0	6.8	0.0	9.0	0.0
Batteries with mercury	331.4	0.0	331.4	0.0	662.8	0.0
Paints with mercury preservatives	?	?	?	?	?	?
Skin lightening creams and soaps with mercury chemicals	?	?	?	?	?	?
Medical blood pressure gauges (mercury sphygmomanometers)	0.0	0.0	0.0	0.0	0.0	0.0

Other manometers and gauges with mercury	0.6	0.9	0.6	0.0	0.9	0.0
Laboratory chemicals	0.0	2.0	0.0	0.0	2.0	2.1
Other laboratory and medical equipment with mercury	0.0	8.0	0.0	0.0	8.0	8.2
Waste incineration						
Incineration of municipal / general waste	0.0	0.0	0.0	0.0	0.0	0.0
Incineration of hazardous waste	0.0	0.0	0.0	0.0	0.0	0.0
Incineration and open burning of medical waste	1.1	0.0	0.0	0.0	0.0	0.1
Open fire waste burning (on landfills and informally)	0.0	0.0	0.0	0.0	0.0	0.0
Waste deposition / landfilling and waste water treatment						
Controlled landfills / deposits	5.0	0.1	0.0	-	-	-
Informal dumping of general waste ***1**	50.0	50.0	400.0	-	-	-
Waste water system/treatment ***2**	0.0	0.0	0.0	0.0	0.0	0.0
Crematoria and cemeteries						
Crematoria	2.2	0.0	0.0	-	0.0	0.0
Cemeteries	0.0	0.0	4.9	-	0.0	0.0
TOTAL of quantified releases *1*2	**5,660.0**	**4,190.0**	**17,600.0**	**610.0**	**720.0**	**10.0**

Notes:

*1:The estimated quantities include mercury in products which has also been accounted for under each product category. To avoid double counting, the release to land from informal dumping of general waste has been subtracted automatically in the TOTALS.

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

Note that the following source sub-categories made the largest contributions to mercury releases to the atmosphere:

- Gold extraction with mercury amalgamation - without use of retort (4,416.4 kg Hg/y)
- Gold extraction by methods other than mercury amalgamation (614.3 kg Hg/y)
- Gold extraction with mercury amalgamation - with use of retorts (153.6 kg Hg/y)
- Batteries with mercury (331.4 kg Hg/y)
- Informal dumping of general waste (50 kg Hg/y)

The following information provides ***a*** description of the types of results:

With respect to mercury emissions to air, gold mining with amalgamation process is responsible for the larger emissions, with 4,570 kg Hg/year (Figure ES-2), equivalent to 80.7% of total

emission to air. Gold mining with amalgamation process still remain responsible for the largest mercury releases to water, with 3,812.2 kg Hg/year (Figure ES-3), equivalent to 91.0% of total releases to water.

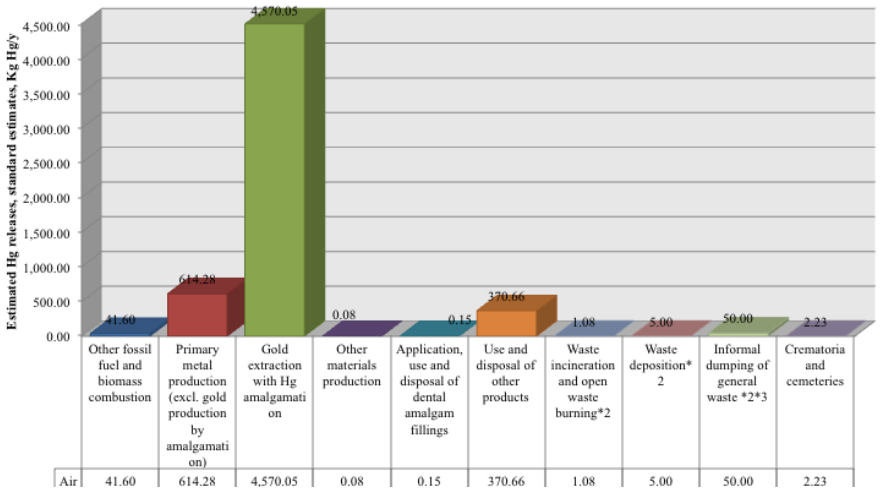


Figure ES-2. Total estimated emissions to air of mercury from anthropogenic sources

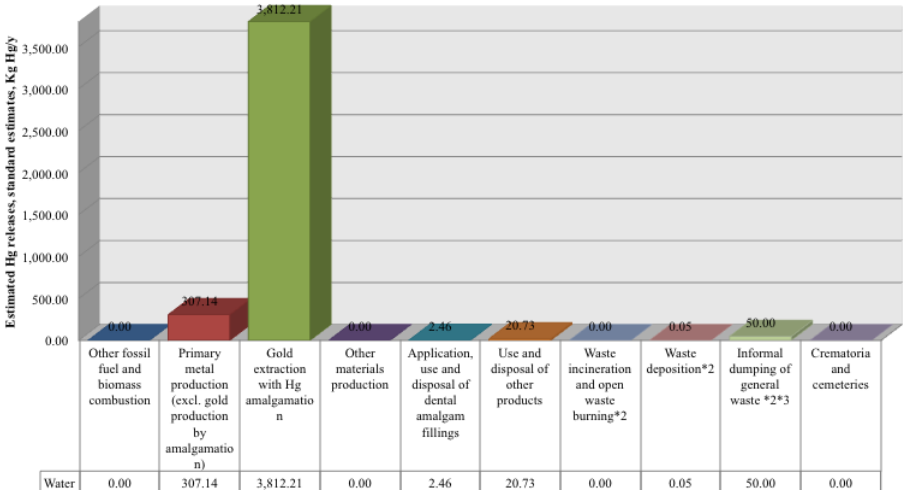


Figure ES-3. Total estimated mercury releases to Water from anthropogenic sources

For mercury releases to land, gold mining remains a source of the largest releases. Note that the main contribution corresponds to gold extraction without mercury amalgamation, which is performed by large-scale gold mining using other methods than mercury amalgamation (Figure ES-4).

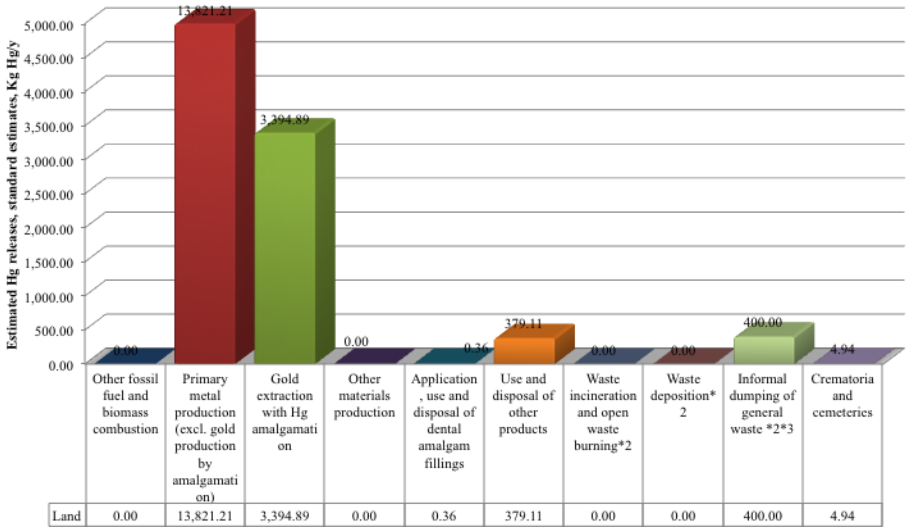


Figure ES-4. Total estimated mercury releases to Land from anthropogenic sources.

3 Step 2 - Data and inventory on energy consumption and fuel production

Table : Energy Consumption and Fuel Production

Source category	Source present?	Activity rate		Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y						
Energy consumption	**Y/N/?**	Annual consumption/production	Unit	Standard estimate	Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment /disposal	Cat. no.
Coal combustion in large power plants	N		Coal combusted, t/y	-	-	-	-	-	-	-	5.1.1
Other coal uses	N		Coal used, t/y	-	-	-	-	-	-	-	5.1.2
Combustion/use of petroleum coke and heavy oil	Y	159,414	Oil product combusted, t/y	9	8.8	0.0	0.0	0.0	0.0	0.0	5.1.3
Combustion/use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates	Y	432,317	Oil product combusted, t/y	2	2.4	0.0	0.0	0.0	0.0	0.0	5.1.3
Use of raw or pre-cleaned natural gas	N		Gas used, Nm³/y	-	-	-	-	-	-	-	5.1.4
Use of pipeline gas (consumer quality)	N		Gas used, Nm³/y	-	-	-	-	-	-	-	5.1.4
Biomass fired power and heat production	Y	1,008,411	Biomass combusted, t/y	30	30.3	0.0	0.0	0.0	0.0	0.0	5.1.6
Charcoal combustion	Y	1,690	Charcoal combusted, t/y	0	0.2	0.0	0.0	0.0	0.0	0.0	5.1.6
Fuel production											
Oil extraction	N		Crude oil produced, t/y	-	-	-	-	-	-	-	5.1.3
Oil refining	N		Crude oil refined, t/y	-	-	-	-	-	-	-	5.1.3
Extraction and processing of natural gas	N		Gas produced, Nm³/y	-	-	-	-	-	-	-	5.1.4

3.1 Sub-category Combustion/use of petroleum coke and heavy oil

The data for this category was provided by the Guyana National Energy Agency on January 14th 2016, which is in the Annex 1-1.

The calculations were made based on the average on heavy fuel oil (HFO) consumption (tonnes/year), from years 2010 to 2014.

The certainty assessment to this subcategory was:

Activity rate: *High*, due to the data obtained from the Guyana National Energy Agency, (Shevon Wood) on 14th January 2016.

Input estimates: High based on companies reported data.

Output estimates: Medium due to the output distribution Toolkit default factors.

Data gaps and priorities for potential follow up

There were no data gaps.

3.2 Combustion/use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates Sub-category

The data for this category was provided by the Guyana National Energy Agency on January 14th 2016, which is in the Annex 1-1.

The calculations were made based on the average consumption on the yearly amount (tonnes/year) of diesel, gasoil, petroleum, kerosene, LPG, and other light to medium distillates for energy production used during the last five years (2010 - 2014).

Data gaps and priorities for potential follow up

There were no data gaps.

3.3Sub-category Biomass fired power and heat production

The data for this category was provided by the Guyana National Energy Agency on January 14th 2016, which is in the Annex 1-1.

The calculations were made based on the average consumption (tonnes/year) of bagasse (from sugar cane) plus firewood used during the last five years (2010 - 2014).

The certainty assessment to this subcategory was:

Activity rate: High, based on the data obtained from the Guyana National Energy Agency (Mr. Shevon Wood) on 14th January 2016.

Input estimates: High based on companies reported data.

Output estimates: Medium due to the output distribution Toolkit default factors.

Data gaps and priorities for potential follow up

There were no data gaps.

4 Step 3 - Data and inventory on domestic production of metals and raw materials

Table: domestic production of metals and raw materials

The Estimated Hg input (or equivalent inserted IL2 results) marked in red colour is very high compared to previous observations. Data may be correct, but please confirm your activity rate data (or inserted IL2 data).											
Source category	Source present?	Activity rate		Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y						
	Y/N/?	Annual consumption/production	Unit	Standard estimate	Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment /disposal	Cat. no.
Primary metal production											
Mercury (primary) extraction and initial processing	N		Mercury produced, t/y	-	-	-	-	-	-	-	5.2.1
Production of zinc from concentrates	N		Concentrate used, t/y	-	-	-	-	-	-	-	5.2.3
Production of copper from concentrates	N		Concentrate used, t/y	-	-	-	-	-	-	-	5.2.4
Production of lead from concentrates	N		Concentrate used, t/y	-	-	-	-	-	-	-	5.2.5
Gold extraction by methods other than mercury amalgamation	Y	1,023,793	Gold ore used, t/y	15,357	614.3	307.1	13,821.2	614.3	0.0	0.0	5.2.6
Alumina production from bauxite (aluminium production)	N		Bauxit processed, t/y	-	-	-	-	-	-	-	5.2.7
Primary ferrous metal production (pig iron production)	N		Pig iron produced, t/y	-	-	-	-	-	-	-	5.2.9
Gold extraction with mercury amalgamation - without use of retort	Y	5,121	Gold produced, kg/y	11,009	4,416.4	3,505.0	3,087.7	0.0	0.0	0.0	5.2.2
Gold extraction with mercury amalgamation - with use of retorts	Y	7,681	Gold produced, kg/y	768	153.6	307.2	307.2	0.0	0.0	0.0	5.2.2
Other materials production											
Cement production	N		Cement produced, t/y	-	-	-	-	-	-	-	5.3.1
Pulp and paper production	Y	2,513	Biomass used for production, t/y	0	0.1	0.0	0.0	0.0	0.0	0.0	5.3.2

4.1 Sub-category gold extraction by methods other than mercury amalgamation

The calculations were made based on the amount of gold ore processed for year 2015 by Troy's Resources Limited Mine, one of the two large scale gold mines in Guyana using other methods than amalgamation[22]. The amount was 737,543 tonnes ore (data reported Troy's Resources Limited).

The certainty assessment to this subcategory is High,

The certainty assessment to this subcategory was:

Activity rate: High, based on the data officially reported by Troy's Resources Limited and provided by the Guyana Geology and Mines Commission (Ms. Diane McDonald)on 15th January 2016.

Input estimates: High based on companies reported data.

Output estimates: Medium due to the output distribution Toolkit default factors.

The second source of Guyana´s gold extraction by methods other than mercury amalgamation, was provided by Guyana Gold Field Inc., through GGMC, as amount of gold production (approximately 1.1 tonnes of gold).

Using conversion factor from UNEP/AMAP 2012 (250,000 tonnes ore used per ton gold produced) for gold extraction by methods other than mercury amalgamation. This amount was converted into amount of ore, to be added with Troy data as input data from this category.

[22] The Guyana Geology and Mines Commission provided the data for this category on January 15th 2016, which is in the Annex 2-1.

Data gaps and priorities for potential follow up

These large-scale mining companies have recently started their activities, so more comprehensive information will be provided in the future to refine the estimations of releases and emissions of mercury.

4.2 Sub-category Gold extraction with mercury amalgamation - without use of retort

The GGMC submitted the total amount of gold produced by mercury amalgamation process[23], corresponding to the official gold produced by small and medium scale mining in Guyana (which is the input data to this sub-category).

However, they did not indicate the amount of gold produced with or without using retort. Therefore, based on the intensive week of field visits to the gold mining regions and extensive interviews with managers, miners and artisanal ("*pork-knockers*") the assumption was made that 60% of ASGM was done using retort and 40% without use of retort, to the corresponding total amount of gold informed within this sub-category.

Figure 6-1 Type of retorts found at Potaro river dredges. Evidently with scarce use. (Photo Credit: Left: R. Romero, Right: C. Ohashi)

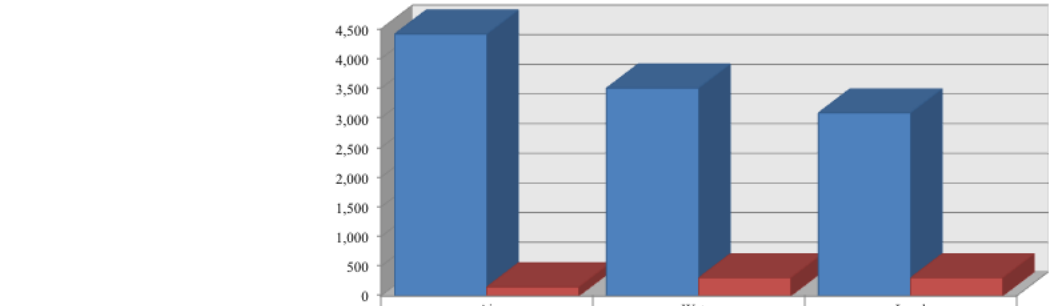
During the field visits to mining areas, at river dredges (along the Essequibo and Potaro rivers) and dry dredges at the Itaballi region or Port Kaituma and Matthew's Ridge in the northern Guyana, miners were interviewed. One of the mandatory issues that were discussing everywhere was concerning the use and conditions of use of retorts. The information received from these interviews gave the fundament to assume such proportion, taking additionally into account the worse conditions of mining, in areas, where is impossible to verify in the field whether they use properly or not retorts.

It is important to highlight the key role of retorts in gold mining with mercury amalgamation (to burn amalgam). Indeed, considering a gold amalgamation process, with similar ratio (60% to 40% with and without using retort, respectively), the mercury emissions are 28 times higher

[23] The Guyana Geology and Mines Commission (GGMC) provided the data for this category on January 15th 2016, which is in Annex 2-2.

when the amalgam burning is done without the use of retorts, using the input factors from Toolkit Level 1 and assuming a ratio of 50:50, mercury used on whole ore and on ore concentrates, (Figure ES-5). Similarly, mercury releases to land and water from this subcategory are still 10 times higher (without the use of retort).

In Arakaka, North-West, an individual was observed with a mercury recycling instrument, a sort of retort that is currently used for mercury amalgam burning. This device represents a typical artisanal retort normally used indoor for gold recovery using the amalgamation process. The indoor use of mercury contraption presents risks to the health of the owner and other occupants of the dwelling as there is a possibility that a leak could occur leading to high indoor pollution levels.



	Air	Water	Land
Gold extraction with mercury amalgamation - without use of retort	4,416	3,505	3,088
Gold extraction with mercury amalgamation - with use of retorts	154	307	307

Figure ES-5. Estimated emissions of mercury from gold mining, with and without retort.

The calculations were made as follows:

- Approximately 11.7 tonnes produced by medium and small scale mines
- 5,121 kg gold to this sub-category (40% of 12,801 kg total amount of gold produced)

The certainty assessment to this subcategory was:

Activity rate: High, due to the data officially reported by the Guyana Geology and Mines Commission (Ms. Diane McDonald)on 15th January 2016.

Input estimates: Medium based on on survey and interview responses.

Output estimates: Medium due to the output distribution Toolkit default factors.

Data gaps and priorities for potential follow up

Quite relevant information that was outlined before (Chapter 2), is related to the need to know the amount of artisanal miners “Pork-knocker” or “Punters” (very artisanal miners) that are currently working across the whole country. At every region that was visited, they were found in significant quantities. In addition, they use exclusively mercury for gold recovery, as the most, so far, inexpensive way to get gold and they are directly linked to mercury emission sources into air compartment, - one of the main concerns within the Minamata Convention.

4.3Sub-category Gold extraction with mercury amalgamation - with use of retorts

The GGMC submitted[24] the total amount of gold produced by mercury amalgamation process, corresponding to the official gold produced by small and medium scale mining in Guyana (which is the input data to this sub-category). However, they did not indicate the amount of gold produced with or without using retort. Therefore, based on the intensive week of field visits at the gold mining regions and extensive interviews with managers, miners and artisanal ("*pork-knockers*"), this consultant has made the assumption of 60% using retort and 40% without use of retort, to the corresponding total amount of gold informed within this sub-category (as the previous category).

The calculations were made as follows:

- 11.7 tonnes produced by medium and small scale mines
- 7,681 kg gold to this sub-category (60% of 12,801 kg total amount of gold produced)

The certainty assessment to this subcategory was:

Activity rate: High, based on the data officially reported by the Guyana Geology and Mines Commission (Ms. Diane McDonald) on 15th January 2016.
Input estimates: Medium based on survey and interview responses.
Output estimates: Medium based on the output distribution Toolkit default factors.

Data gaps and priorities for potential follow up

Please refer to the above mentioned data gaps and priorities.

4.4Sub-category Pulp and Paper production

The data for this category was extracted from the input data used in the Toolkit within the "National Implementation Plan of Guyana under the Stockholm Convention on Persistent Organic Pollutants" (March 2013, Pesticide and Chemicals Control Board, Ministry of Agriculture), under category 7 of PCDD/PCDF estimates, "Production and uses of chemical substances and consumer goods (ton/year)", where production of pulp and paper was expressed as recycling of cardboard from contaminated waste (2,513 ton/year).

The certainty assessment to this sub-category was:

Activity rate: High, based on the data officially published.
Input estimates: High based on data officially published.
Output estimates: Medium due to the output distribution Toolkit default factors.

Data gaps and priorities for potential follow up

Due to the restricted timeframe of this inventory, a limited number of stakeholders were contacted. Therefore, a potential follow up is highly recommended to extendthe time for data

[24] The Guyana Geology and Mines Commission (GGMC) provided the data for this category on January 15th 2016, which is in Annex 2-1 & 2-2.

collection to enable contact with end users (in many categories or sub-categories).Thus, bottom up verification can be conducted increase to quality of the data collected.

5 Step 4 - Data and inventory on domestic production and processing with intentional mercury use

Table 2-XX: Domestic Production and Processing with Intentional Mercury Use

Source category	Source present?	Activity rate		Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y						
Production of chemicals	**Y/N/?**	Annual consumption/production	Unit	Standard estimate	Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment /disposal	Cat. no.
Chlor-alkali production with mercury-cells	N		Cl_2 produced, t/y	-	-	-	-	-	-	-	5.4.1
VCM production with mercury catalyst	N		VCM produced, t/y	-	-	-	-	-	-	-	5.4.2
Acetaldehyde production with mercury catalyst	N		Acetaldehyde produced, t/y	-	-	-	-	-	-	-	5.4.3
Production of products with mercury content											
Hg thermometers (medical, air, lab, industrial etc.)	N		Mercury used for production, kg/y	-	-	-	-	-	-	-	5.5.1
Electrical switches and relays with mercury	N		Mercury used for production, kg/y	-	-	-	-	-	-	-	5.5.2
Light sources with mercury (fluorescent, compact, others: see guideline)	N		Mercury used for production, kg/y	-	-	-	-	-	-	-	5.5.3
Batteries with mercury	N		Mercury used for production, kg/y	-	-	-	-	-	-	-	5.5.4
Manometers and gauges with mercury	N		Mercury used for production, kg/y	-	-	-	-	-	-	-	5.6.2
Biocides and pesticides with mercury	N		Mercury used for production, kg/y	-	-	-	-	-	-	-	5.5.5
Paints with mercury	N		Mercury used for production, kg/y	-	-	-	-	-	-	-	5.5.6
Skin lightening creams and soaps with mercury chemicals	N		Mercury used for production, kg/y	-	-	-	-	-	-	-	5.5.7

5.1 Sub-categories Production of chemicals and Production of products with mercury content

No mercury related chemicals or products are produced or processed in Guyana.

Data gaps and priorities for potential follow up

Not applicable.

6 Data and inventory on waste handling and recycling

Table 2-XX: General waste management set-up in the country

How much of the waste is collected and treated under controlled conditions?	Y/N	Answer according to your best estimate (you may revise once you have more specific data)							
Is more than 2/3 (two thirds; 67%) of the general waste collected and deposited on lined landfills or incinerated with pollution abatement?	N								

WASTE HANDLING AND RECYCLING

Source category	Source present?	Activity rate		Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y						
Production of recycled of metals	**Y/N/?**	Annual production /waste disposal	Unit	Standard estimate	Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment /disposal	Cat. no.
Production of recycled mercury ("secondary production")	N		Mercury produced, kg/y	-	-	-	-	-	-	-	5.7.1
Production of recycled ferrous metals (iron and steel)	N		Number of vehicles recycled/y	-	-	-	-	-	-	-	5.7.2
Waste incineration											
Incineration of municipal/general waste	Y		Waste incinerated, t/y	0	0.0	0.0	0.0	0.0	0.0	0.0	5.8.1
Incineration of hazardous waste	Y		Waste incinerated, t/y	0	0.0	0.0	0.0	0.0	0.0	0.0	5.8.2
Incineration and open burning of medical waste	Y	50	Waste incinerated, t/y	1	1.1	0.0	0.0	0.0	0.0	0.1	5.8.3
Sewage sludge incineration	N		Waste incinerated, t/y	-	-	-	-	-	-	-	5.8.4
Open fire waste burning (on landfills and informally)	Y		Waste burned, t/y	0	0.0	0.0	0.0	0.0	0.0	0.0	5.8.5
Waste deposition/landfilling and waste water treatment											
Controlled landfills/deposits	Y	100,000	Waste landfilled, t/y	500	5.0	0.1	0.0	-	-	-	5.9.1
Informal dumping of general waste *1	Y	100,000	Waste dumped, t/y	500	50.0	50.0	400.0	-	-	-	5.9.4
Waste water system/treatment	Y		Waste water, m^3/y	0	0.0	0.0	0.0	0.0	0.0	0.0	5.9.5

6.1 Sub-category Incineration and open burning of medical waste

The Head of Solid Waste Management Project, of the Ministry of Communities provided the data for this category on January 11th 2016, which is in the Annex 3-1.

Data gaps and priorities for potential follow up

In general terms, the official information provided indicates that only one controlled landfill exists in Guyana and approximately half of the waste generated nationally goes to that landfill. The data provided by this sub-category is an estimate from the Ministry of Communities (50 tonnes/year).

The certainty assessment to this subcategory was:

Activity rate: High, due to the data officially reported by the Ministry of Communities, Head of Solid Waste Management, 11th January 2016

Input estimates: Medium based on officially reported data.

Output estimates: Medium due to the output distribution Toolkit default factors.

6.2 Sub-category Controlled landfills/deposits

The Head of Solid Waste Management Project of the Ministry of Communities provided the data for this category on January 11th 2016, which appear in Annex 3-1.

The certainty assessment to this subcategory was:
Same source, as previous

Data gaps and priorities for potential follow up

Please refer to the above mentioned data gaps and priorities.

6.3Sub-category Informal dumping of general waste

The Head of Solid Waste Management Project of the Ministry of Communities, provided the data for this category on January 11th 2016, which is in the Annex 3-1.

The certainty assessment to this subcategory was:
- The same as previous

Data gaps and priorities for potential follow up

Please refer to the above mentioned data gaps and priorities.

6.4Test of waste and wastewater default factors

Due to the lack of waste water treatment data under the inventory, this test was not performed.

7 Data and inventory on general consumption of mercury in products, as metal mercury and as mercury containing substances

Table 2-XX: general consumption of mercury in products, as metal mercury and as mercury containing substances

Source category	Source present?	Activity rate		Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y						
	Y/N/?	Annual consumption/population	Unit	Standard estimate	Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment /disposal	Cat. no.
			NOTE: Selection regarding waste management:		Less than 2/3 (two thirds; 67%) of the general waste is collected and deposited on					lined landfills or incinerated w	
Use and disposal of products with mercury content											
Dental amalgam fillings ("silver" fillings)	***Y***			7	***0.1***	***2.5***	***0.4***	***0.3***	***1.2***	***1.2***	5.6.1
Preparations of fillings at dentist clinics		778,100	Number of inhabitants		0.1	1.0	0.0	0.0	0.9	0.9	
Use - from fillings already in the mouth		778,100	Number of inhabitants		0.0	0.1	0.0	0.0	0.0	0.0	
Disposal (lost and extracted teeth)		778,100	Number of inhabitants		0.0	1.3	0.4	0.3	0.4	0.4	
		0.040	Number of dental personnel per 1000 inhab.								
Thermometers	***Y***	***2,110***		33	***6.6***	***9.9***	***6.6***	***0.0***	***9.9***	***0.0***	5.5.1
Medical Hg thermometers	Y	1,055	Items sold/y	1							
Other glass Hg thermometers (air, laboratory, dairy, etc.)	Y	844	Items sold/y	10							
Engine control Hg thermometers and other large industrial/speciality Hg thermometers	Y	211	Items sold/y	22							5.5.1
Electrical switches and relays with mercury	Y	778,100	Number of inhabitants	84	25.3	0.0	33.8	0.0	25.3	0.0	5.5.2
		78	electricification rate, %								
Light sources with mercury	***Y***	*1,287,270*	Items sold/y	23	***6.8***	***0.0***	***6.8***	***0.0***	***9.0***	***0.0***	5.5.3
Fluorescent tubes (double end)	Y	643,585	Items sold/y	16							
Compact fluorescent lamp (CFL single end)	Y	643,685	Items sold/y	6							
Other Hg containing light sources (see guideline)	Y		Items sold/y	0							
Batteries with mercury	***Y***	***5***	***t batteries sold/y***	1,326	***331.4***	***0.0***	***331.4***	***0.0***	***662.8***	***0.0***	5.5.4
Mercury oxide (button cells and other sizes); also called mercury-zinc cells	Y	4	Batteries sold, t/y	1,320							
Other button cells (zinc-air, alkaline button cells, silver-oxide)	Y	1	Batteries sold, t/y	6							
Other batteries with mercury (plain cylindrical alkaline, permanganate, etc., see guideline)	Y	0	Batteries sold, t/y	0							
Polyurethane (PU, PUR) produced with mercury catalyst	N	778,100	Number of inhabitants	-	-	-	-	-	-	-	5.5.5.
		78	Electricification rate, %								
Paints with mercury preservatives	?		Paint sold, t/y	?	?	?	?	?	?	?	5.5.7
Skin lightening creams and soaps with mercury chemicals	?		Cream or soap sold, t/y	?	?	?	?	?	?	?	5.5.8
Medical blood pressure gauges (mercury sphygmomanometers)	Y		Items sold/y	0	0.0	0.0	0.0	0.0	0.0	0.0	5.6.2
Other manometers and gauges with mercury	Y	778,100	Number of inhabitants	3	0.6	0.9	0.6	0.0	0.9	0.0	5.6.2
		78	Electricification rate, %								
Laboratory chemicals	Y	778,100	Number of inhabitants	6	0.0	2.0	0.0	0.0	2.0	2.1	5.6.3
		78	Electricification rate, %								
Other laboratory and medical equipment with mercury	Y	778,100	Number of inhabitants	24	0.0	8.0	0.0	0.0	8.0	8.2	5.6.3, 5.6.5
		78	Electricification rate, %								

7.1 General background data

Background calculations for the product groups listed below were based on the data on population, electrification rate and dental personnel density shown in Table 9-1.

Sub-category	Data types used as activity rates
Dental amalgam fillings ("silver" fillings)	Population: 778,100 Density of dental personnel: 0.040 dental personnel per 1000 inhabitants
Electrical switches and relays with mercury	Population: 778,100 Electrification rate (percent of population with access to electricity): 78%
Polyurethane (PU, PUR) produced with mercury catalyst	Population: 778,100 Electrification rate (percent of population with access to electricity): 78%
Other manometers and gauges with mercury	Population: 778,100 Electrification rate (percent of population with access to electricity): 78%
Laboratory chemicals	Population: 778,100 Electrification rate (percent of population with access to electricity): 78%
Other laboratory equipment with mercury	Population: 778,100 Electrification rate (percent of population with access to electricity): 78%

Table 7-1 Background data for default calculations for dental amalgam and certain other product types.

BACKGROUND DATA FOR DEFAULT CALCULATIONS AND RANGE TEST			
Country	Population in 2010 (or as recent as available data allow; UNSD, 2012)	Dental personnel per 1000 inhabitants	Electrification rate, % of population with access to electricity
Guyana *6	778,100	0.040	78

The data in Table 9-1 are provided as part of the Toolkit. For most countries they are based on authoritative international data sources (population data: UNSD; Dental data: WHO; Electrification data: IEA). For a few countries, data from these sources have not been available and other sources were used as described in the Toolkit Reference Report's Annex 8.4.

7.2 Sub-category Use and disposal of products with mercury content

The toolkit spreadsheet provides automatically the estimated releases for the following sources:

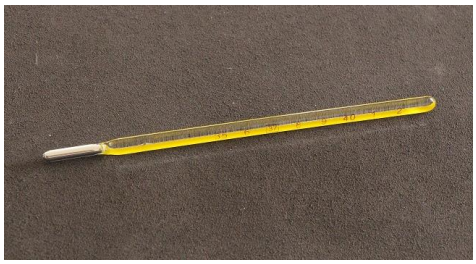
- Dental amalgam fillings ("silver" fillings)
- Polyurethane (PU, PUR) produced with mercury catalyst
- Other manometers and gauges with mercury
- Laboratory chemicals
- Other laboratory and medical equipment with mercury

The other sources, for which the toolkit requires input data, are the following ones:

Mercury Thermometers

The data for this category was provided on January 14th 2016, by the GNBS, which is found in Annex 4-1, and includes amounts imported from 2010 to 2015.

Since the Custom data does not differentiate thermometers by types (e.g. mercury, digital) which is required by the Toolkit, it was assumed that the main part (50%) of the reported thermometers (liquid filled) corresponds to medical ones; 40% to other glass Hg thermometers (air, laboratory, etc.) and finally a 10% for engine control mercury thermometers.



Clinical mercury thermometers used in hospital (photography: Chika Ohashi)

Even under this item, as explained the Head of GNBS, these thermometers are combined of two different categories: filled with mercury and other liquids (as alcohol). It was assumed as criteria, the worse condition and for risk prevention that all thermometers are filled with Hg.

The certainty assessment to this subcategory was:

Activity rate: High, based on the data officially provided by the GNBS (Ms Maxine Bentt) on 14th January 2016.

Input estimates: Medium based on the import statistics and assumed estimation
Output estimates: Medium due to the output distribution Toolkit default factors.

Lamps

The GNBS, which is in the Annex 4-2, provided the data for this category on January 14th 2016, and included amounts imported from 2010 to 2015.

For calculation, was taken the average of five years for one category. It was assumed that all lamps imported contained mercury. From them, 50% belongs to fluorescence tubes with one end and the other 50% belongs to those with two ends. Additionally, the following relationship was assumed: 4 individuals per household and according to an average of 6-7 lamps per household is assume in the country.

The certainty assessment to this subcategory was:
Activity rate: High, based on the data officially provided by GNBS (Ms Maxine Bentt) on 14th January 2016.
Input estimates: Medium based on the import statistics and assumed estimation.
Output estimates: Medium due to output distribution Toolkit default factors.

Batteries

The GNBS, which is in the Annex 4-3, provided the data for this category on January 14th 2016, and included amounts imported from 2010 to 2015.

For calculation, the average of five years was taken for two categories: batteries with Mercury oxide and the sum of zinc-air and silver-oxide batteries. In this regard, it was assumed that all batteries reported contain mercury.

The certainty assessment to this subcategory was:
Activity rate: High, due to the data officially provided by the GNBS (Ms Maxine Bentt) on 14th January 2016.
Input estimates: Medium based on the import statistics and assumed estimation.
Output estimates: Medium due to the output distribution Toolkit default factors.

Data gaps and priorities for potential follow up

Due to the lack of specifications from the data received in the above-mentioned sources, it was assumed that all products imported contain mercury (assuming the worst scenario, as a precautionary principle).

Discussions pertaining to the possibility of developing specific work at the Tariff Heading of Guyana's HS level emerged during the interview with the Head of GRA Since Guyana has already ratified the Minamata Convention on Mercury it is possible to establish such a mechanism within the framework of this international agreement as a useful tool (as proven in other countries) for many different products with mercury content, which will be necessary to control, to identify and restrict importation in the future.

8 Step 7 - Data and inventory on crematoria and cemeteries

Table : Crematoria and Cemeteries

Source category	Source present?	Activity rate		Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y						
Crematoria and cemeteries	**Y/N/?**	Annual numbers dead	Unit	Standard estimate	Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment /disposal	Cat. no.
Crematoria	Y	890	Corpses cremated/y	2	2.2	0.0	0.0	-	0.0	0.0	5.10.1
Cemeteries	Y	1,977	Corpses buried/y	5	0.0	0.0	4.9	-	0.0	0.0	5.10.2

8.1 Sub-category Crematoria

The data for this category was automatically calculated by the Toolkit spreadsheet, based on Guyana's population.

Data gaps and priorities for potential follow up

There were no data gaps.

8.2 Sub-category Cemeteries

The data for this category was automatically calculated by the Toolkit spreadsheet, based on Guyana's population.

Data gaps and priorities for potential follow up

[Describe actual data gaps, how these data were attempted sought, and sub-categories identified as with high uncertainty or with potential for improved estimation on Inventory Level 2]

No data gaps in the subcategory, based on Toolkit Calculation Level 1.

9 Step 8 – Miscellaneous mercury sources

Table 9-1 Miscellaneous potential mercury sources not included in the quantitative inventory; with preliminary indication of possible presence in the country.

Source category	Source present?	
	Y/N/?	
Combustion of oil shale	N	
Combustion of peat	N	
Geothermal power production	N	
Production of other recycled metals	N	
Production of lime	N	
Production of light weight aggregates (burnt clay nuts for building purposes)	N	
Production of other chemicals (than chlorine and sodium hydroxide) in Chlor-alkali facilities with mercury-cell technology	N	
Polyurethane production with mercury catalysts	N	
Seed dressing with mercury chemicals	N	
Infra red detection semiconductors	N	
Bougie tubes and Cantor tubes (medical)	N	
Educational uses	Y	
Gyroscopes with mercury	N	
Vacuum pumps with mercury	N	
Mercury used in religious rituals (amulets and other uses)	Y	
Mercury used in traditional medicines (ayurvedic and others) and homeopathic medicine	Y	
Use of mercury as a refrigerant in certain cooling systems	N	
Light houses (levelling bearings in marine navigation lights)	Y	
Mercury in large bearings of rotating mechanic parts in for example older waste water treatment plants	N	
Tanning	N	
Pigments	N	
Products for browning and etching steel	N	
Certain colour photograph paper types	N	
Recoil softeners in rifles	N	
Explosives (mercury-fulminate a.o.)	Y	
Fireworks	Y	
Executive toys	N	

2.1.2 Summary of mercury inputs to society

Table 9-2 Summary of mercury inputs to society

Source category	Source present?			Estimated Hg input, Kg Hg/y
	Y/N/?	Activity rate	Unit	Standard estimate
Energy consumption				
Combustion/use of petroleum coke and heavy oil	Y	159,414	Oil product combusted, t/y	9
LPG and other light to medium distillates	Y	432,317	Oil product combusted, t/y	2
Biomass fired power and heat production	Y	1,008,411	Biomass combusted, t/y	30
Charcoal combustion	Y	1,690	Charcoal combusted, t/y	0
Primary metal production				
Gold extraction by methods other than mercury amalgamation	Y	1,023,793	Gold ore used, t/y	15,357
Gold extraction with mercury amalgamation - without use of retort	Y	5,121	Gold produced, kg/y	11,009
Gold extraction with mercury amalgamation - with use of retorts	Y	7,681	Gold produced, kg/y	768
Other materials production				
Pulp and paper production	Y	2,513	Biomass used for production, t/y	0
Use and disposal of products with mercury content				
Dental amalgam fillings ("silver" fillings)	Y	778,100	Number of inhabitants	7
Thermometers	Y	2,110	Items sold/y	33
Electrical switches and relays with mercury	Y	778,100	Number of inhabitants	84
Light sources with mercury	Y	1,287,270	Items sold/y	23
Batteries with mercury	Y	5	t batteries sold/y	1,326
Paints with mercury preservatives	?	0	Paint sold, t/y	?
Skin lightening creams and soaps with mercury chemicals	?	0	Cream or soap sold, t/y	?
Medical blood pressure gauges (mercury sphygmomanometers)	Y	0	Items sold/y	0
Other manometers and gauges with mercury	Y	778,100	Number of inhabitants	3
Laboratory chemicals	Y	778,100	Number of inhabitants	6
Other laboratory and medical equipment with mercury	Y	778,100	Number of inhabitants	24
Waste incineration				
Incineration of municipal/general waste	Y	0	Waste incinerated, t/y	0
Incineration of hazardous waste	Y	0	Waste incinerated, t/y	0
Incineration and open burning of medical waste	Y	50	Waste incinerated, t/y	1
Open fire waste burning (on landfills and informally)	Y	0	Waste burned, t/y	0
Waste deposition/landfilling and waste water treatment				
Controlled landfills/deposits	Y	100,000	Waste landfilled, t/y	500
Informal dumping of general waste *1	Y	100,000	Waste dumped, t/y	500
Waste water system/treatment	Y	0	Waste water, m3/y	0
Crematoria and cemeteries				
Crematoria	Y	890	Corpses cremated/y	2
Cemeteries	Y	1,977	Corpses buried/y	5
TOTAL of quantified inputs*1*2*3				**28,790**

2.1.3 Summary of mercury releases

In the Table 4-1 below, a summary of mercury releases from all source categories present is given. The key mercury releases here are releases to air (the atmosphere), to water (marine and freshwater bodies,

Table 9-3 Summary of mercury releases

Source category	Estimated Hg releases, standard estimates, Kg Hg/y					
	Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment /disposal
Energy consumption						
Combustion/use of petroleum coke and heavy oil	8.8	0.0	0.0	0.0	0.0	0.0
LPG and other light to medium distillates	2.4	0.0	0.0	0.0	0.0	0.0
Biomass fired power and heat production	30.3	0.0	0.0	0.0	0.0	0.0
Charcoal combustion	0.2	0.0	0.0	0.0	0.0	0.0
Primary metal production						
Gold extraction by methods other than mercury amalgamation	614.3	307.1	13,821.2	614.3	0.0	0.0
Gold extraction with mercury amalgamation - without use of retort	4,416.4	3,505.0	3,087.7	0.0	0.0	0.0
Gold extraction with mercury amalgamation - with use of retorts	153.6	307.2	307.2	0.0	0.0	0.0
Other materials production						
Pulp and paper production	0.1	0.0	0.0	0.0	0.0	0.0
Use and disposal of products with mercury content						
Dental amalgam fillings ("silver" fillings)	0.1	2.5	0.4	0.3	1.2	1.2
Thermometers	6.6	9.9	6.6	0.0	9.9	0.0
Electrical switches and relays with mercury	25.3	0.0	33.8	0.0	25.3	0.0
Light sources with mercury	6.8	0.0	6.8	0.0	9.0	0.0
Batteries with mercury	331.4	0.0	331.4	0.0	662.8	0.0
Paints with mercury preservatives	?	?	?	?	?	?
Skin lightening creams and soaps with mercury chemicals	?	?	?	?	?	?
Medical blood pressure gauges (mercury sphygmomanometers)	0.0	0.0	0.0	0.0	0.0	0.0
Other manometers and gauges with mercury	0.6	0.9	0.6	0.0	0.9	0.0
Laboratory chemicals	0.0	2.0	0.0	0.0	2.0	2.1
Other laboratory and medical equipment with mercury	0.0	8.0	0.0	0.0	8.0	8.2
Waste incineration						
Incineration and open burning of medical waste	1.1	0.0	0.0	0.0	0.0	0.1
Waste deposition/landfilling and waste water treatment						
Controlled landfills/deposits	5.0	0.1	0.0	-	-	-
Informal dumping of general waste *1	50.0	50.0	400.0	-	-	-
Crematoria and cemeteries						
Crematoria	2.2	0.0	0.0	-	0.0	0.0
Cemeteries	0.0	0.0	4.9	-	0.0	0.0
TOTAL of quantified releases*1*2	**5,660.0**	**4,190.0**	**17,600.0**	**610.0**	**720.0**	**10.0**

INVENTORY LEVEL 1 - SUMMARY OF RELEASES

Source category	Estimated Hg releases, standard estimates, Kg Hg/y					
	Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment /disposal
Energy consumption						
Coal combustion in large power plants	-	-	-	-	-	-
Other coal uses	-	-	-	-	-	-
Combustion/use of petroleum coke and heavy oil	8.8	0.0	0.0	0.0	0.0	0.0
LPG and other light to medium distillates	2.4	0.0	0.0	0.0	0.0	0.0
Use of raw or pre-cleaned natural gas	-	-	-	-	-	-
Use of pipeline gas (consumer quality)	-	-	-	-	-	-
Biomass fired power and heat production	30.3	0.0	0.0	0.0	0.0	0.0
Charcoal combustion	0.2	0.0	0.0	0.0	0.0	0.0
Fuel production						
Oil extraction	-	-	-	-	-	-
Oil refining	-	-	-	-	-	-
Extraction and processing of natural gas	-	-	-	-	-	-
Primary metal production						
Mercury (primary) extraction and initial processing	-	-	-	-	-	-
Production of zinc from concentrates	-	-	-	-	-	-
Production of copper from concentrates	-	-	-	-	-	-
Production of lead from concentrates	-	-	-	-	-	-
Gold extraction by methods other than mercury amalgamation	614.3	307.1	13,821.2	614.3	0.0	0.0
Alumina production from bauxite (aluminium production)	-	-	-	-	-	-
Primary ferrous metal production (pig iron production)	-	-	-	-	-	-
Gold extraction with mercury amalgamation - without use of retort	4,416.4	3,505.0	3,087.7	0.0	0.0	0.0
Gold extraction with mercury amalgamation - with use of retorts	153.6	307.2	307.2	0.0	0.0	0.0
Other materials production						
Cement production	-	-	-	-	-	-
Pulp and paper production	0.1	0.0	0.0	0.0	0.0	0.0
Production of chemicals						
Chlor-alkali production with mercury-cells	-	-	-	-	-	-
VCM production with mercury catalyst	-	-	-	-	-	-
Acetaldehyde production with mercury catalyst	-	-	-	-	-	-
Production of products with mercury content						
Hg thermometers (medical, air, lab, industrial etc.)	-	-	-	-	-	-
Electrical switches and relays with mercury	-	-	-	-	-	-
Light sources with mercury (fluorescent, compact, others: see guideline)	-	-	-	-	-	-
Batteries with mercury	-	-	-	-	-	-
Manometers and gauges with mercury	-	-	-	-	-	-
Biocides and pesticides with mercury	-	-	-	-	-	-
Paints with mercury	-	-	-	-	-	-
Skin lightening creams and soaps with mercury chemicals	-	-	-	-	-	-
Use and disposal of products with mercury content						
Dental amalgam fillings ("silver" fillings)	0.1	2.5	0.4	0.3	1.2	1.2
Thermometers	6.6	9.9	6.6	0.0	9.9	0.0
Electrical switches and relays with mercury	25.3	0.0	33.8	0.0	25.3	0.0
Light sources with mercury	6.8	0.0	6.8	0.0	9.0	0.0
Batteries with mercury	331.4	0.0	331.4	0.0	662.8	0.0
Polyurethane (PU, PUR) produced with mercury catalyst	-	-	-	-	-	-
Paints with mercury preservatives	?	?	?	?	?	?
Skin lightening creams and soaps with mercury chemicals	?	?	?	?	?	?
Medical blood pressure gauges (mercury sphygmomanometers)	0.0	0.0	0.0	0.0	0.0	0.0
Other manometers and gauges with mercury	0.6	0.9	0.6	0.0	0.9	0.0
Laboratory chemicals	0.0	2.0	0.0	0.0	2.0	2.1
Other laboratory and medical equipment with mercury	0.0	8.0	0.0	0.0	8.0	8.2
Production of recycled of metals						
Production of recycled mercury ("secondary production")	-	-	-	-	-	-
Production of recycled ferrous metals (iron and steel)	-	-	-	-	-	-
Waste incineration						
Incineration of municipal/general waste	0.0	0.0	0.0	0.0	0.0	0.0
Incineration of hazardous waste	0.0	0.0	0.0	0.0	0.0	0.0
Incineration and open burning of medical waste	1.1	0.0	0.0	0.0	0.0	0.1
Sewage sludge incineration	-	-	-	-	-	-
Open fire waste burning (on landfills and informally)	0.0	0.0	0.0	0.0	0.0	0.0
Waste deposition/landfilling and waste water treatment						
Controlled landfills/deposits	5.0	0.1	0.0	-	-	-
Informal dumping of general waste *1	50.0	50.0	400.0	-	-	-
Waste water system/treatment *2	0.0	0.0	0.0	0.0	0.0	0.0
Crematoria and cemeteries						
Crematoria	2.2	0.0	0.0	-	0.0	0.0
Cemeteries	0.0	0.0	4.9	-	0.0	0.0
TOTAL of quantified releases*1*2	**5,660.0**	**4,190.0**	**17,600.0**	**610.0**	**720.0**	**10.0**

General background data

Background calculations for the product groups listed below were based on the data such as population, electrification rate and dental personnel density shown in Table 9.1.

Source category	Source present?		
	Y/N/?	Activity rate	Unit
Energy consumption			
Coal combustion in large power plants	N	0	Coal combusted, t/y
Other coal uses	N	0	Coal used, t/y
Combustion/use of petroleum coke and heavy oil	Y	159,414	Oil product combusted, t/y
LPG and other light to medium distillates	Y	432,317	Oil product combusted, t/y
Use of raw or pre-cleaned natural gas	N	0	Gas used, Nm^3/y
Use of pipeline gas (consumer quality)	N	0	Gas used, Nm^3/y
Biomass fired power and heat production	Y	1,008,411	Biomass combusted, t/y
Charcoal combustion	Y	1,690	Charcoal combusted, t/y
Fuel production			
Oil extraction	N	0	Crude oil produced, t/y
Oil refining	N	0	Crude oil refined, t/y
Extraction and processing of natural gas	N	0	Gas produced, Nm^3/y
Primary metal production			
Mercury (primary) extraction and initial processing	N	0	Mercury produced, t/y
Production of zinc from concentrates	N	0	Concentrate used, t/y
Production of copper from concentrates	N	0	Concentrate used, t/y
Production of lead from concentrates	N	0	Concentrate used, t/y
Gold extraction by methods other than mercury amalgamation	Y	1,023,793	Gold ore used, t/y
Alumina production from bauxite (aluminium production)	N	0	Bauxit processed, t/y
Primary ferrous metal production (pig iron production)	N	0	Pig iron produced, t/y
Gold extraction with mercury amalgamation - without use of retort	Y	5,121	Gold produced, kg/y
Gold extraction with mercury amalgamation - with use of retorts	Y	7,681	Gold produced, kg/y
Other materials production			
Cement production	N	0	Cement produced, t/y
Pulp and paper production	Y	2,513	Biomass used for production, t/y
Production of chemicals			
Chlor-alkali production with mercury-cells	N	0	Cl2 produced, t/y
VCM production with mercury catalyst	N	0	VCM produced, t/y
Acetaldehyde production with mercury catalyst	N	0	Acetaldehyde produced, t/y
Production of products with mercury content*4			
Hg thermometers (medical, air, lab, industrial etc.)	N	0	Mercury used for production, kg/y
Electrical switches and relays with mercury	N	0	Mercury used for production, kg/y
Light sources with mercury (fluorescent, compact, others: see guideline)	N	0	Mercury used for production, kg/y
Batteries with mercury	N	0	Mercury used for production, kg/y
Manometers and gauges with mercury	N	0	Mercury used for production, kg/y
Biocides and pesticides with mercury	N	0	Mercury used for production, kg/y
Paints with mercury	N	0	Mercury used for production, kg/y
Skin lightening creams and soaps with mercury chemicals	N	0	Mercury used for production, kg/y
Use and disposal of products with mercury content			
Dental amalgam fillings ("silver" fillings)	Y	778,100	Number of inhabitants
Thermometers	Y	2,110	Items sold/y
Electrical switches and relays with mercury	Y	778,100	Number of inhabitants
Light sources with mercury	Y	1,287,270	Items sold/y
Batteries with mercury	Y	5	t batteries sold/y
Polyurethane (PU, PUR) produced with mercury catalyst	N	778,100	Number of inhabitants
Paints with mercury preservatives	?	0	Paint sold, t/y
Skin lightening creams and soaps with mercury chemicals	?	0	Cream or soap sold, t/y
Medical blood pressure gauges (mercury sphygmomanometers)	Y	0	Items sold/y
Other manometers and gauges with mercury	Y	778,100	Number of inhabitants
Laboratory chemicals	Y	778,100	Number of inhabitants
Other laboratory and medical equipment with mercury	Y	778,100	Number of inhabitants
Production of recycled of metals			
Production of recycled mercury ("secondary production")	N	0	Mercury produced, kg/y
Production of recycled ferrous metals (iron and steel)	N	0	Number of vehicles recycled/y
Waste incineration			
Incineration of municipal/general waste*1	Y	0	Waste incinerated, t/y
Incineration of hazardous waste*1	Y	0	Waste incinerated, t/y
Incineration and open burning of medical waste*1	Y	50	Waste incinerated, t/y
Sewage sludge incineration*1	N	0	Waste incinerated, t/y
Open fire waste burning (on landfills and informally)*1	Y	0	Waste burned, t/y
Waste deposition/landfilling and waste water treatment			
Controlled landfils/deposits *1	Y	100,000	Waste landfilled, t/y
Informal dumping of general waste *1*2	Y	100,000	Waste dumped, t/y
Waste water system/treatment *3	Y	0	Waste water, m3/y
Crematoria and cemeteries			
Crematoria	Y	890	Corpses cremated/y
Cemeteries	Y	1,977	Corpses buried/y

Table 9-4 Background data for default calculations for dental amalgam and certain other product types.

BACKGROUND DATA NEEDED FOR DEFAULT CALCULATIONS AND RANGE TEST			
Compulsory: Click cell below and select country from list	Population in 2010 (or as recent as available data allow; UNSD, 2012)	Dental personnel per 1000 inhabitants	Electrification rate, % of population with access to electricity
Guyana*6	778,100	0.040	78

The data in Table 9.1 are provided as part of the Toolkit. For Guyana, they are based on authoritative international data source.

[Sub-category - Primary Metal Production]

As shown in the table and figures below, the following source groups of primary metal production contribute to the major mercury inputs, as can be observed in the next figures and tables, with the percentage distribution within the subcategory:

- Primary metal production, excluding gold production by amalgamation, with 55.4% of total inputs; and,
- Gold extraction with mercury amalgamation (with and without use of retort), with 42.5% of total inputs.

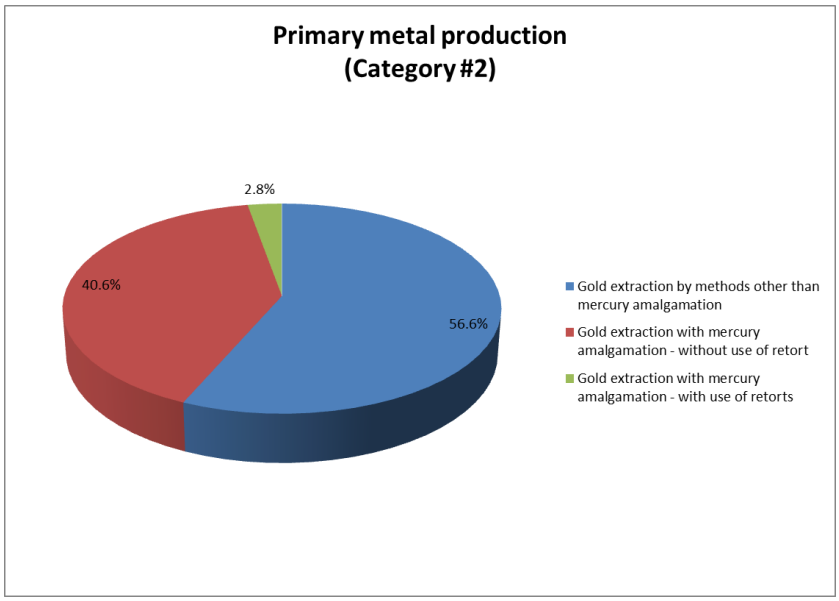


Figure 9-8 Primary metal production estimated inputs by sub-categories, percentages.

Table 9-3 Primary metal production estimated inputs by sub-categories

Source category	Source CATEGORY / subcategory	Estimated Hg input, Kg Hg/y	Estimated Hg input, %
Primary metal production	Gold extraction by methods other than mercury amalgamation	*15,356.90*	*56.6%*
	Gold extraction with mercury amalgamation - without use of retort	11,009.08	40.6%
	Gold extraction with mercury amalgamation - with use of retorts	768.07	2.8%
	Total	27,134.04	100.0%

Decreasing Hg inputs correspond to (excluding waste deposition and informal dumping of general waste) the following:

- Use and disposal of other products (5.21%);
- Other fossil fuel and biomass combustion (0.14%);
- Application, use and disposal of dental amalgam fillings and crematoria & cemeteries (0.02% each).

The individual mercury release sub-categories contributing to the highest mercury inputs were the following, listed by category and its sub-category, which are detailed in the table below:

Table 9-4 Individual mercury release sub-categories contributing with the highest mercury inputs

Source CATEGORY / subcategory	Estimated Hg input, Kg Hg/y	Estimated highest Hg releases, standard estimates, Kg Hg/y	
2. DOMESTIC PRODUCTION OF METALS AND RAW MATERIALS		Air	Land
Gold extraction by methods other than mercury amalgamation	15,357		13,821.2
Gold extraction with mercury amalgamation - without use of retort	11,009	4,416.4	
Gold extraction with mercury amalgamation - with use of retorts	768	307.2	

The individual mercury release sub-categories contributing with the highest mercury releases to the atmosphere were gold extraction with mercury amalgamation –without use of retort- and gold extraction with mercury amalgamation -with use of retorts-, as shown below:

Table 9-5 Individual mercury release sub-categories contributing with the highest mercury releases to the atmosphere

Source CATEGORY / subcategory	Estimated Hg input, Kg Hg/y	Estimated highest Hg releases, standard estimates, Kg Hg/y
2. DOMESTIC PRODUCTION OF METALS AND RAW MATERIALS		Air
Gold extraction with mercury amalgamation - without use of retort	11,009	4,416.43
Gold extraction with mercury amalgamation - with use of retorts	768	307.23

The origin of mercury in waste and wastewater produced in the country is mercury in products and materials. Waste fractions and wastewater therefore do not represent original mercury inputs to society (except imported waste). Waste and wastewater may however represent substantial flows of mercury through society. The following were found to be the major flows of mercury with waste and wastewater:

Table 9-6 Mercury waste release sub-categories contributing with the highest releases

Source CATEGORY / subcategory	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y		
4. GENERAL WASTE MANAGEMENT SET-UP IN THE COUNTRY		Air	Water	Land
Incineration and open burning of medical waste	1	1.1	0.0	0.0
Controlled landfills/deposits	500	5.0	0.1	0.0
Informal dumping of general waste *1	500	50.0	50.0	400.0

Detailed presentation of mercury inputs and releases for all mercury release source types present in the country are shown in the following report sections.

The Toolkit spread sheets used in the development of this inventory are posted along with this report, or can be submitted upon request.

Data gaps

One of the important data gaps is related to waste treatment and waste management and waste disposal. Additionally, there is a lack of data from water treatment area: open fire waste burning, better estimation of amount of waste disposal in controlled landfill, and especially in the informal dumping of waste.

Another quite important need for further improvement of this inventory is to qualitatively assess the percentage of gold mining with mercury amalgamation: using retorts and without using retorts. A systematic approach should be adopted to get the best possible picture of this area. This issue is of paramount importance in order to better understand the mercury flow (pathways) of the huge amount of legally imported metal mercury into the country.

So far, the percentage of mercury emission and releases from gold mining that might be assumed imported from abroad is still too low. In this regard, to the refined version of this inventory, a larger period of time to the data collection will be necessary, in order to be able to contact at national scale mercury importers, distributors, retailers, vendors and of course miners that may be willing to help.

Priorities for potential follow up

The number of Pork-knocker or Punters (artisanal miners) are currently working across the whole country, and due to their use of mercury, which is directly linked to mercury emission to air, a major concern is posed to achieve effective implementing the Minamata Convention. It is of significant importance to understand the profile of “Pork-knockers/Punters” who manually extract gold usually working individually or in small group (for female punters), using relatively large amount of mercury. The GGMC’s “Check List” used for environmental compliance on field-work, defined these artisanal miners as “*Punters*”[25].

In Guyana’s case, a KAP study in 2016 highlighted that artisanal mining is formal and legal, since the country’s Mining Regulations cover all scales of mining. This form of gold mining may take the form of the ordinary Pork Knocker or so called Punter in Guyana using Spade and Batels to

[25] Annex Nº 2, Check List for GGMC; Inspection ID: 3. PARTICULARS - Lessees, Registered Labourers, Tributors. 3.9. Nº of Small Miners (“Punters”).

as large as using Excavators, Backhoe, Wash Plant and Crushers. Notably, the Mining Regulations for Guyana state the following:

- **Large-scale mine** means a mine which is the subject of a Mining License and from which a minimum volume in excess of 1000 cubic metres of material, inclusive of overburden, is excavated or processed as an aggregate in any continuous twenty-four hour period.

- **Medium-scale mine** means a mine which is the subject of a Mining Permit and from which a volume in excess of 200 cubic metres but less than 1000 cubic metres of material, inclusive of overburden, is excavated or processed as an aggregate in any continuous twenty-four hour period.

- **Small-scale mine** means a mine which is the subject of a claim license and from which a volume in excess of 20 cubic metres, but less than 200 cubic metres of material, inclusive of overburden, is excavated or processed as an aggregate in any continuous twenty-four hour period.

During the field visits, these Punters were found along river dredges (along Essequibo and Potaro Rivers) and at dry dredges (Port Kaituma and Matthews Ridge) in the northern part of the country. The estimated amount of mercury used by the Punters could be calculated as follows:

- According to UNEP Toolkit Level 1, a thermometer contains approx. 2-4 gr. of mercury.
- At the gold panning used by Pork-Knockers/Punters (Figure 14, below) it can be easily estimated the existence of 20-25 gr mercury, based on the interviews conducted with Punters during the field visits.

Estimated amount of mercury used by a single Pork-Knocker/Punter per year could therefore be calculated at:

- **20** gr Hg /day
- **5** days /week = (20 gr Hg/day x 5 days x 4 weeks/month x 10 months/year)
- **4** weeks / month
- **10** months /year

= **4 kg Hg**/ pork-knocker/year (calculated under 200 working days only[26]).

The exact number of Pork-knockers/Punters currently in gold mining in the country is unknown. Based on the field, one can assume that there are around 5,000 and 10,000 Pork-knockers across the country:

- **5,000** x **4** kg/Hg/year = **20** tonnes mercury/year
- **10,000** x **4** kg/Hg/year = **40** tonnes mercury/year

[26] The "Developing Baseline Estimates of Mercury Use in Artisanal and Small- Scale Gold in Mining Communities. Version 1.0; AGC, UNIDO, UNEP, NRDC; 2015. It's defined 270 working days for artisanal miners.

Hypothetically assuming the presence of this high number of Pork-knockers/Punters in the mining districts in Guyana, and assuming gold recovery without using retort and a gold to mercury ratio of 1:3 and 1:1.3 respectively[27], mercury emission to the air could be added and increased up to:

- **5,000** Pork-knockers = 20,000 kg Hg/y input = **8,023 kg** Hg/year emission to air
- **10,000** Pork-knockers = 40,000 kg Hg/y input = **16,046 kg** Hg/year emission to air

The most critical task therefore resides in conducting a field survey to ascertain the real number of Pork-knockers to derive , in order to have a better understanding of mercury use in Guyana; to identify users/practises and minimize the gap between mercury consumption and mercury imported.

Considering the proposal to reduce the amount of imported mercury due to the large existence of mercury circulating within the country, a reduction of mercury supply in the market could directly affectthis subpopulation. Therefore, according with article 7, annex C of the Minamata Convention and considering the vulnerability of this subpopulation, including children and women, a proposal to address this issue is included in the list of priorities in the current report.

Additionally, a recommendation is provided in Chapter VII: Conclusions and Recommendations.

A number of Pork knockers were interviewed at the Essequibo River (December 12th, 2015) while they were amalgamating gold with their gold panning.

Figure III-14. Pork-knockers and their mercury use in working in the gold mining areas
(Photography: Rodrigo Romero)

[Summary of mercury stockpiles, and supply and trade]

Notwithstanding that Guyana has never produced mercury, mercury trade has played an historical role within the country's economy since the gold industry has always utilised this

[27] In accordance with the UNEP Mercury Toolkit Level 1, input factor "Source category – Gold extraction with mercury amalgamation – without use of retort.

chemical element to produces gold through amalgamation[28]. In this context, small and medium scale gold mining have been the main drivers behind mercury importation into the country.

2.2 Chemical production, import, and export

As previously mentioned, without production of the metal, most of the local mercury needs (national requirement) are met through importation from different countries. Table Nº 4 provides a summary of the amount of mercury officially imported into Guyana and the various countries of origin.

Table 2.2 provides data on the sources from which mercury is imported into Guyana for the period 2010-2014. In 2010, three countries (Spain, United States and the United Kingdom) were the primary suppliers of mercury to Guyana. However, by 2012 other producers such as China, Mexico, and Turkey joined the supply chain. The table also shows that the annual average importation of the chemical is 80,668 kilogrammes/annum with the peak years being 2011 and 2012 with figures of 156,290 kilogrammes and 100,380 kilogrammescoinciding with the years of high gold price and corresponding production.

Table 4. Total mercury imports by origin country, 2010 to September 2015 (kg) (GNBS, 2015)

Description: Mercury **Tariff Code: 2805 4000 00**						
Country of Origin / Year	2010	2011	2012	2013	2014	2015 (Jan.-Sep)
China			2,760	57,728		
Hong Kong				1,725	1,700	
Mexico		100	13,504	7,752	163	
Netherlands Antilles, Curacao				1,900		
Spain	34,500	19,000	37,000			
Turkey			8,901			
United States	18,369	137,190	30,231	8,766		
United Kingdom	10,619		7,984		3,450	25,480
Total (kg)	63,488	156,290	100,380	77,871	5,313	25,480
Average import 2010 -2014	**80,668 kg/year**					

In the importation process, there is a mixed participation of different public bodies. Namely, GRA; GGMC and PTCCB. According to the information provided by GRA[29], the current process to import mercury to Guyana is as follows:

[28] See generally, "Small-Scale Gold Mining Related Mercury Contamination in the Guianas: A Review", prepared to WWF Guianas, June 2015.
[29] Interview, Mr. Patrick Hyman, Head Deputy, Guyana Revenue Authority (GRA), Georgetown, December and January (2015-2016 respectively).

Step A.
The importer must obtain a permit from GGMC. This is a permit and not a licence that might be referred as a "no objection letter". Currently GGMC reviews and grants a "No-objection letters" if the application is deemed valid.

Step B.
The importer identifies the source and purchases the mercury amount required abroad. The GRA's Deputy Head stressed that as a recent procedure, some importers conduct the whole process abroad (buying the metal properly);however, the shipment they import into Guyana contain no mercury at all.

Step C.
The importer approaches GRA, Customs and Excise Division for clearance to bring the mercury into the country. The GRA approves clearance to import mercury based on the GGMC's approval.

- ✓ GRA refers the importer to PTCCB for a certificate, assuming that PTCCB is the monitoring (by default) monitoring agency.
- ✓ The importer pays duties and related fees.
- ✓ The importer clears goods.

Based on these procedures, mercury can be legally being imported into Guyana. Legg *et al.* (2015) reports that there is a large gap between the amount of mercury imported and the amount of mercury used in gold mining. In the region, Guyana is the only country where mercury can be imported relatively easy. The neighbouring country Suriname has prohibited the importation of Mercury (with legal consequences for trespass this norm) and French Guiana has established more restrictive rules that make it harder to import mercury into the country.

Storage of mercury and related issues

In Guyana, there is no bulk chemical storage or warehouse facility of chemicals, with the exception of some holding facilities owned by major pesticide's importers[30]. In the case of mercury, there is no information about the existence of facilities for storage purposes only. Thus, the considerable amount of metal mercury imported into Guyana might be partially hoarded as an anticipatory action and/or business opportunity from some experienced importers.

Based on the information provided by the Customs (GRA), the importation is currently done in standard flasks of 34.5 kilogrammes. Sellers then can generally purchase in the UN approved flask from importers and decant varying quantities between 1 and 10 pounds into plastic bottles. Due to the lack of knowledge, the use of gloves and respirators when handling mercury is not widely recognized as a current practice.

[30] Ibid.

It should be noted from the field visit to mining areas carried out within the framework of the present MIA Project, that mercury could be found in various tyoes of containers, pet, plastic bottles (Coke), as seen in the pictures below.

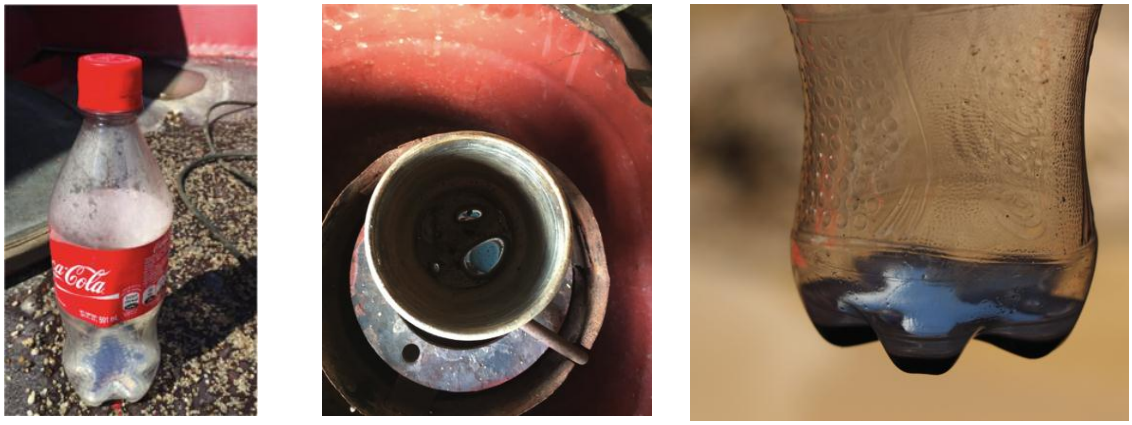


Figure 1. At gold mining sites, everywhere mercury was found without any special requirements of safety. (Photography: left-Rodrigo Romero, centre and right – Chika Ohashi)

2.5 Transport of mercury and related issues

According to GRA the transport of mercury is currently done through or via seaport such as the Georgetown harbour and Morawana. Nevertheless, the same source mentioned that there are a number of crossing points of entry along Guyana's border with Venezuela, Brazil and Suriname, which are impossible to track and to control properly.

2.8 Stocks of mercury and/or mercury compounds, and storage conditions

2.8.1 Overview of stocks of mercury and/or mercury compounds

There is no official information related to mercury stockpiles that could be collected from the interviewed stakeholders. According to the Customs Department, as soon as a shipment with mercury imported into the country is released from GRA, there is no capacity to track it. According to Romero (2016), the Georgetown Waste Management authority at the Ministry of Communities was interviewed in order to obtain relevant information on mercury waste management and current procedures used by public agencies and private entities involved in waste management. The available data suggests that stocks of mercury in excess of 50 metric tonnes are not available in Guyana.

2.8.2 Assessment of current storage conditions

There is no known centralized facility for the storage of mercury in Guyana. According to the GRA, when imports of mercury arrive in the UN approved flasks and are uplifted from the GRA, storage is left entirely to the Licensee. However, when the commodity reaches the miners and

mining camps it is often kept in small soft drink bottles or in larger plastic containers for the purpose of transportation and storage on work grounds.

2.8.3 Evaluation of potential storage needs in the future once the Convention is implemented.

Guyana is currently not a producer or excessively large importer of mercury. The commodity is imported into the country in quantities by a small number of individuals and companies. However, since mercury will be available for use in the ASGM which is its largest user during the phase-out period as stipulated in the Convention, the National Mercury Profile (2016) suggests that a secure centralized storage facility be erected from which the procurement and distribution of the commodity will be monitored and documented.

2.6 Mercury waste management

2.6.1 Obsolete mercury stockpiles and mercury contaminated sites

There is no official information related to obsolete mercury stockpiles that could be collected from the interviewed stakeholders. According to the Customs department, as soon as a shipment with mercury imported into the country is released from GRA, there is no capacity to track it. In this regard, the Georgetown Waste Management responsible at the Ministry of Communities was interviewed[31] in order to obtain relevant information on mercury waste management and current procedures used by public agencies and private entities involved in waste management. From the interview, no mercury stockpiles were identified. Neverthelessthe existence of residual contamination associated with mercury contained in discarded products or from unintentional releases is possible, but this falls outside the current scope of the Georgetown Solid Waste Management Project.

Within the framework of a Mercury National Action Plan, the inclusion of a comprehensive screening of mercury obsolete stockpile is highly recommended. This Plan should be focused both identifying any mercury stockpiles that might remain (old equipment with mercury content at government properties) but also to get an overall quantitative data base of mercury concentration levels at potentially contaminated old mining sites (historical gold mines); former agricultural sites, include pesticide storage.

In that regard, the definition of a National Reference Laboratory (NRL) that can provide analytical services *fully dedicated within the framework of the Minamata Implementation*

[31] Interview with Mr. Gordon Gilkes, Head of Georgetown Solid Waste Management Project, Georgetown, December, 2015.

process in Guyana, become a key important step. Namely this laboratory should be internationally accredited (ISO/IEC 17025) and available to conduct mercury characterization in the entire relevant mercury environmental matrix (e.g. mercury in water, sediments, soils, air, particulate matters, waste, among other). Likewise, this NRL should be trained with human and technical capabilities to include within the spectra of analytical services the bio-samples (mercury analysis in urine, in blood, in hair) as part of its expertise.

In this context, due to the large amount of mercury imported in the past, the work should be started with generation of a list of potential relevant mercury holders. This list should include persons/organizations who might potentially have or have had obsolete mercury equipment, or may have knowledge of such stockpiles. It includes mercury importers, distributors, retailers (vendors) and miners that may be willing to collaborate providing geographic references.

It is also suggested that a comprehensive screening of mercury obsolete stockpile be conducted under the National Action Plan. This Plan should be focused on both identifying any mercury stockpiles that might remain (old equipment with mercury content at government properties) and obtaining an overall quantitative data base of mercury concentration levels at potentially contaminated old mining sites (historical gold mines); former agricultural sites, include pesticide storage.

Contaminated sites

A systematic approach is necessary for the identification and treatment of hot spots in Guyana that may be contaminated by mercury. Target areas must be prioritized in terms of expected mercury concentration levels. In addition, research and literature review must be conducted to determine the best treatment methods for mercury hotspots.

There are a large number of studies[32], papers and surveys conducted in the region that highlight levels of concern in terms of mercury concentration. These results indicate that mercury contamination is widespread in Guyana. However, some of these reports show discrepancy when analyses were conducted within external laboratories. It also indicates or even recognizes the lack of accuracy of their analytical results. A very comprehensive review was done by Legg *et al*[33](2015), in the Guianas. that articulated *"the purpose to summarize the large body of existing information into a single document for easy reference"*. Additionally, a relevant technical recommendation from Legg's review needs to be stressed: "Initiate a systematic and regular monitoring programme"; "increase research efforts to assess mercury levels in marine environment" and "undertake research to improve the understanding Mercury contamination over time". These technical recommendations should be translated to systematic mercury monitoring under a priority list of potential risk, firstly linked to human exposure of communities in the vicinity to ASGM areas.

At the northern part of Guyana (Port Kaituma and Mathews' Ridge) some areas of concern were identified. At these sites, potential risk of mercury-contaminated sites could be detected based on the information collected. A meeting with a group of Venezuelan miners at Mathews' Ridge

[32] Situation analysis of the small-scale gold mining sector in Guyana. Sherwood Lowe, WWF September 2006.
[33] Small-Scale Gold Mining Related Mercury Contamination in the Guianas: A Review prepared to WWF Guianas, June 2015.

provided some additional information on this topic. Particular focus on health problems in the area was reported. However, these are just preliminary hypothesis that should be validated by mercury extensive field measurement campaigns. These hypothesis are detailed and discussed further, together with a proposal to implement field sampling and measurement survey using mercury passive sampler (diffuse sampling devices) to establish zone of major impact, among possible activities to be performed.

Chapter III: Policy, Regulatory and Institutional Framework Assessment

3.1 POLICY AND REGULATORY ASSESSMENT

In this section of the study, emphasis is placed on a survey of the Articles of the Minamata Convention and an assessment of the existing National Regulations with respect to their compliance with the Articles and the gaps that need to be addressed. It also addresses issues pertaining to the national capacity to implement the regulations identified to support compliance.

Table 3.1 *Policy and Regulatory Measures in Place and Remaining Gaps*

Article 3 on supply sources and trade	
Description of Article:	**Summary assessment of existing national policies and regulatory measures, their scope and extent to which they already meet the requirements as stipulated in the provisions of the Minamata Convention**
Article 3(1) of the Convention establishes the meaning of mercury for the purposes of the Convention in the following language: *(a) References to "mercury" include mixtures of mercury with other substances, including alloys of mercury, with a mercury concentration of at least 95 per cent by weight; and* *(b) "Mercury compounds" means mercury (I) chloride (known also as calomel), mercury (II) oxide, mercury (II)*	Provisions related to mercury can be found in the 2001 standards, specifically, GYS 203:2001 - Code of Safety for Mercury (Code of Safety) which describes the properties of mercury, the nature of hazards associated with it and, essential information on its storage, handling, packaging, labelling, disposal of waste, and personal preventive measures. Code was adapted from the Indian Standard, IS 7812: 1975 "Code of Safety for mercury" by the Technical Committee for Standards, convened under the Guyana National Bureau of Standards Act - in 2001 and approved by the National Standards Council. The properties of mercury are defined by section 3.1 of the Code of Safety to include: *Atomic mass: 200.61* *Melting point: - 38.9°C Boiling point: 356.6°C* *Density: 13.546 g/cm3 at 20°C* *Vapour pressure: l mm at 126.2 °C* *Description: Silvery white liquid metal* *Solubility:* *(i) In water Practically insoluble* *(ii) In organic solvents Insoluble* *(iii) In acids Insoluble in dilute hydrochloric or sulphuric acids. Soluble*

sulphate, mercury (II) nitrate, cinnabar and mercury sulphide.	*in dilute nitric acid* *(iv) Reactivity - Readily reacts with halogens, sulphur, concentrated hydrochloric acid, concentrated sulphuric acid, hydrogen sulphide, etc.* Article 3(3) provides that each Party shall not allow primary mercury mining that was not being conducted within its territory at the date of entry into force of the Convention. Article 3(4) further provides that each Party shall only allow primary mercury mining that was being conducted within its territory at the date of entry into force of the Convention for a period of up to fifteen years after that date. At present, there is no primary mercury mining being conducted in Guyana. Article 3(4) further provides that *"During this period, mercury from such mining shall only be used in manufacturing of mercury-added products in accordance with Article 4, in manufacturing processes in accordance with Article 5, or be disposed in accordance with Article 11, using operations which do not lead to recovery, recycling, reclamation, direct re-use or alternative uses"*. The regulation and management of primary mining activities can be achieved through an application of the provisions of the Mining Act Cap 65:01, specifically the provisions relating to the conditions under which permits and licences can be issued. Section 47(3) of the Mining Act, which speaks to the contents of mining licences provides that there may be included in a mining licence conditions with respect to the processing, disposal or sale of minerals, which may be mined. Article 3(5) contains commitments regarding stocks of mercury and requires that "Each Party shall: (a*) Endeavour to identify individual stocks of mercury or mercury compounds exceeding 50 metric tons, as well as sources of mercury supply generating stocks exceeding 10 metric tons per year, that are located within its territory;* *(b) Take measures to ensure that, where the Party determines that excess mercury from the decommissioning of chlor-alkali facilities is available, such mercury is disposed of in accordance with the guidelines for environmentally sound management referred to in paragraph 3 (a) of Article 11, using operations that do not lead to recovery, recycling, reclamation, direct re-use or alternative uses."* It would be important for the information to be gathered in a timely manner and thereafter utilised. Information from prior and ongoing work regarding stocks of mercury would inform the implementation

	of this provision of the Convention. The objectives of Article 3(6) regarding the export of mercury can be realised through an appropriate order and procedures under the **Trade Act** and the **Customs Act**. Similar prior informed consent procedures are utilised for other types of exports, for example wildlife. Articles 3(7) and 3(8) provide details regarding notifications and consents which can be incorporated into the appropriate and intended export and import procedures in the event that import, export and re-export activities occur in Guyana.

Analysis of existing gaps that would need to be addressed to ensure compliance with the Convention

- GYS 203:2001 - Code of safety for Mercury should be reviewed and updated. The Code was enacted prior to Guyana's commitments under the Convention, the suitability of the content when compared to the Convention should be explored.
- Minerals are defined by section 2 of the Mining Act to include ore or compound of any mineral, any metal and precious stone, and includes any radio-active mineral, but does not include water or petroleum.
- Section 47 (3) can be utilised to achieve Convention objectives with regard to mining of mercury if ever conducted or sought to be conducted on a large scale but may not be achieved for small-scale operations. However, Section 61 of the **Mining Act** would be applicable in the case of medium-scale and small-scale mining of minerals. This is due to the fact that by virtue of the provisions of section 55(1) the part of the Mining Act under which section 61 occurs indicates that the Part shall apply to prospecting or mining operations with respect to any mineral on a medium or small scale.
- Need for mercury specific guidelines to inform the content of the procedures developed.
- Environmental Guidelines – Transportation, Storage and Occupational Handling of Chemical/industrial Hazardous Waste need to be reviewed.
- GYS 50: 2010 - Specifications for Gold Articles need to be reviewed.
- Pesticides And Toxic Chemicals Control (Prohibited Pesticides) Order need to be reviewed.

Relevant national stakeholder:

1. Name of institution/ stakeholder:	**Role with respect to the above listed provisions:**
GGMC	• Development of strategies to prevent the diversion of mercury or mercury compounds for use in artisanal and small-scale gold mining and processing • Education, outreach and capacity-building initiatives • Promotion of research into sustainable non-mercury alternative practices

	• Provision of technical and financial assistance • Use of existing information exchange mechanisms to promote knowledge, best environmental practices and alternative technologies that are environmentally, technically, socially and economically viable • Partnerships to assist in the implementation of their commitments under this Article
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Geochemical Surveys Department and Chemical laboratory staff ▪ Technical committees ▪ Partnership with the Ministry of Natural Resources ▪ Capacity to undertake research ▪ Functional GIS Department
2. Name of institution/ stakeholder: GNBS	**Role with respect to the above listed provisions:** ▪ Promote standardization in industry and commerce ▪ Encourage or undertake educational work in connection with standardization ▪ Establish, form, furnish and maintain information systems and laboratories for the purpose of furthering the practice of standardization ▪ Provide for the testing, at the request of the Minister and on behalf of the Government, of locally manufactured and imported commodities for compliance with the provision of the Standards Act or any other law dealing with standards and quality ▪ Prepare, frame, modify or amend specifications and codes of practice ▪ Make arrangements and provide facilities for the testing and calibration of precision instruments gauges and scientific apparatus to determine their degree of accuracy
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ National Standards Council ▪ Collaborate with GGMC
3. Name of institution/ stakeholder: Department of Customs and Trade Administration ofthe GRA	**Role with respect to the above listed provisions:** ▪ Accept licenses issued by the other Agencies ▪ Conduct inspection process pertaining to the entry of mercury in Guyana
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Collaborative engagement with other relevant agencies
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ The Minister with responsibility for trade as well as the Guyana Revenue Authority would be integral in implementing this article of the Convention.	

▪ While no timeline has been established, the importance is appreciated by the Guyana Geology and Mines Commission and the current Ministry of Natural Resources. It would be important for the information to be gathered in a timely manner and thereafter utilised. Information from prior and ongoing work regarding stocks of mercury would inform the implementation of this provision of the Convention.

Article 4 on mercury-added products	
Description of Article:	**Summary assessment of existing national policies and regulatory measures, their scope and extent to which they already meet the requirements as stipulated in the provisions of the Minamata Convention**
Article 4(1) provides that *Each Party shall not allow, by taking appropriate measures, the manufacture, import or export of mercury-added products listed in Part I of Annex A after the phase-out date specified for those products, except where an exclusion is specified in Annex A or the Party has a registered exemption pursuant to Article 6.* Part I of Annex A lists mercury added products subject to Article 4(1) and establishes a date after which the manufacture, import or export of the product shall not be allowed. Article 4 (3) provides that each Party shall take measures for the mercury-added products listed in Part II of Annex A in accordance with the provisions set out therein. Part II of Annex A sets out provisions related to the use dental amalgam. Article 4(6) supports the use of a robust risk assessment framework. The importance of risk assessment should, as far as possible, be	Batteries - *Batteries, except for button zinc silver oxide batteries with a mercury content < 2% and button zinc air batteries with a mercury content < 2% by 2020.* Batteries can be addressed by the Guyana Revenue Authority acting pursuant to the Customs Act. *Switches and relays, except very high accuracy capacitance and loss measurement bridges and high frequency radio frequency switches and relays in monitoring and control instruments with a maximum mercury content of 20 mg per bridge, switch or relay 2020.* Switches and relays can be addressed by the Guyana Revenue Authority acting pursuant to the Customs Act. Fluorescent lamps are presently being addressed from an energy perspective under the provisions of the Guyana Energy Agency Act Cap. 56:04. Section 5(1) of the Guyana Energy Agency Act provides for several functions of the Guyana Energy Agency including advising and making recommendations to the Minister regarding any measures necessary to secure the efficient management of energy and the source of energy in the public interest and to develop and encourage the development and utilisation of sources of energy other than sources presently in use. The phase out date of 2020 is noted. Cosmetics (with mercury content above 1ppm), including skin lightening soaps and creams, and not including eye area cosmetics where mercury is used as a preservative and no effective and safe substitute preservatives are available (the intention is not to cover cosmetics, soaps or creams with trace contaminants of mercury). Cosmetics are partially regulated by the provisions of the Food and Drugs Act Cap. 34:03. Section 2 defines a cosmetic to include any substance ore mixture of substances manufactured, sold or represented for use in cleansing, improving or altering the complexion, skin, hair, fingernails, toenails, or teeth, and includes deodorants and

incorporated into the framework in Guyana. Article 4(6) provides that *Each Party shall discourage the manufacture and the distribution in commerce of mercury-added products not covered by any known use of mercury-added products prior to the date of entry into force of the Convention for it, unless an assessment of the risks and benefits of the product demonstrates environmental or human health benefits*.	perfumes. The general regulation power of the Minister contained in section 25 of the Food and Drugs Act can be utilised to achieve mercury-specific targets for cosmetics. Regulations can be made prescribing standards of composition, strength, potency, purity, quality or other property of any article of food, drug, cosmetic or device. The present Food and Drugs Regulations passed under the Food and Drugs Act can be utilised to address a number of the mercury related cosmetic requirements of the Convention. As a starting point the Food and Drugs Regulations cover labelling requirements for cosmetics. Additionally, the Food and Drugs Regulations in regulation 103 prohibits certain claims regarding cosmetics. With regard to **pesticides, biocides and topical antiseptics** 2020, pesticides are within the scope and content of the Pesticides and Toxic Chemicals Control Act Cap 68:09. **Antiseptics** are defined in the Pesticides and Toxic Chemicals Control Act Cap 68:09 at the same time as with pesticides Antiseptics are excluded from the definition of toxic chemical. Their phase out can therefore be achieved utilising the mechanisms under the Pesticides and Toxic Chemicals Control Act Cap 68:09. The limits of biocides are to be proscribed under the provisions of regulation 9, and the Second Schedule section (xvii) of the Environmental Protection (Water Quality) Regulations 2000. The following **non-electronic measuring devices** except non-electronic measuring devices installed in large-scale equipment or those used for high precision measurement, where no suitable mercury-free alternative is available including: (a) barometers; (b) hygrometers; (c) manometers; (d) thermometers; (e) sphygmomanometers are intended to be regulated. These devices can be examined in light of the provisions of the present Weights and Measures Act as well as the intended Metrology Bill. Addressing the use of mercury thermometers in health care can be considered as part of the implementation of the provisions under this heading. **Dental Amalgam**: The required measures can be achieved using the provisions contained in the Dental Registration Act Cap. 32:03. The empowering provisions include Section 4(b)(ii) regarding the establishment of a suitable training programme for persons to perform the services of dentists, extenders and dental technicians and for the maintenance of a good standard for those services. The use of mercury in fillings would be captured by the provisions of Section 21(c) the Dental Registration Act. Specifically, fillings not involving exposure of dental pulp, preparation for such fillings can be regulated through the Ministerial regulation making power conferred by

<table>
<tr><td></td><td>section 31(1) of the Dental Registration Act. Article 4(5) requires each party to take measures to prevent the incorporation into assembled products of mercury-added products the manufacture, import and export of which are not allowed for it under this Article. In this regard, it is useful to appreciate that there are varying regulatory frameworks which govern assembled products in Guyana. In Article 4(5) as well as under Article 3, the provisions of the Trade Act regarding the control of imports and exports can be utilised to achieve the objectives. This would involve the use of a Ministerial Order specific to mercury. This order would be supported by the provisions of sections 42 and 43 of the Customs Act regarding prohibited imports and exports. The provisions of the Guyana National Bureau of Standards Act can be utilised to address mercury in regulated products.</td></tr>
<tr><td colspan="2">Analysis of existing gaps that would need to be addressed to ensure compliance with the Convention
▪ In the context of mercury, the impacts from cosmetics on skin should be considered
▪ Guyana did not exercise the option to explore alternatives to non-electronic measuring devices, such as barometers, hygrometers, manometers, thermometers and sphygmomanometers provided by Article 4(2)
▪ Mercury specific risk assessment frameworks should be developed</td></tr>
<tr><td colspan="2">Relevant national stakeholder:</td></tr>
<tr><td rowspan="2">1. Name of institution/ stakeholder:

MNR</td><td>Role with respect to the above listed provisions:
▪ Management of petroleum and petroleum products</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ Collaborative engagement with other relevant agencies</td></tr>
<tr><td rowspan="2">2. Name of institution/ stakeholder:

Services of Dental Council and dentists and extenders</td><td>Role with respect to the above listed provisions:
▪ Establishment of a suitable training programme for persons to perform the services of dentist extenders and dental technicians for the maintenance of a good standard for those services.
▪ Fillings not involving exposure of dental pulp and preparation for such fillings</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
Collaborative engagement with other relevant agencies</td></tr>
<tr><td>4. Name of institution/ stakeholder:

EPA</td><td>Role with respect to the above listed provisions:
▪ Coordination of conservation programmes
▪ Oversee the effective management and improvement of the environment
▪ Prevent and control pollution
▪ Assessment of the impact of economic development on the environment
▪ Oversee the sustainable use of natural resources</td></tr>
</table>

	▪ Integrate appropriate environmental provisions into development planning
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Permitting Division ▪ Education and Awareness Division ▪ Policy Division
5. Name of institution/ stakeholder: GNBS	**Role with respect to the above listed provisions:** ▪ Promote standardisation in industry and commerce ▪ Encourage or undertake educational work in connection with standardisation ▪ Establish, form, furnish and maintain information systems and laboratories for the purpose of furthering the practice of standardisation ▪ Provide for the testing, at the request of the Minister and on behalf of the Government, of locally manufactured and imported commodities for compliance with the provision of the Standards Act or any other law dealing with standards and quality ▪ Prepare, frame, modify or amend specifications and codes of practice ▪ Make arrangements and provide facilities for the testing and calibration of precision instruments gauges and scientific apparatus to determine their degree of accuracy
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ National Standards Council ▪ Collaborate with GGMC
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
Trained and dedicated persons should be made available in key agencies such as the EPA, Ministry of Health and the Bureau of Standards to specifically address the issues related to mercury in products.	

Article 5 on manufacturing processes in which mercury or mercury compounds are used	
Description of Article:	**Summary assessment of existing national policies and regulatory measures, their scope and extent to which they already meet the requirements as stipulated in the provisions of the Minamata Convention**

Article 5 - Manufacturing processes in which mercury or mercury compounds are used Article 5 relates to manufacturing processes in which mercury or mercury compounds are used. The exclusion of mercury wastes contained in Article 5(1) is noted. Article 5(2) requires that each Party shall not allow, by taking appropriate measures, the use of mercury or mercury compounds in the manufacturing processes listed in Part I of Annex B after the phase-out date specified in that Annex for the individual processes, except where the Party has a registered exemption pursuant to Article 6. Article 5(3) provides that each Party shall take measures to restrict the use of mercury or mercury compounds in the processes listed in Part II of Annex B in accordance with the provisions set out therein. Article 5(6) provides that each Party shall not allow the use of mercury or mercury compounds in a facility that did not exist prior to the date of entry into force of the Convention for it using the manufacturing processes listed in Annex B. No exemptions shall apply to such facilities. Article 5(7) provides that each Party shall discourage the development of any facility using any other manufacturing process in which mercury or mercury compounds are intentionally used that did not exist prior to the date of entry into force of the Convention, except where the Party can demonstrate to the satisfaction of the Conference of the Parties that the manufacturing process	The operation of facilities in Guyana will depend on the classification of the facility particularly if the facility falls within the definition of a factory within the Factories (Hours and Holidays) Act 95:02. Additionally, scope for regulation would exist under the Occupational Safety and Health Act Cap. 99:06. Measures include orders of authority, regulating the use of new chemicals or biological agents, maintaining a hazardous materials inventory and utilising hazardous chemical identification and data sheets. Measures in this regard would be linked to the required health aspects commitments in Article 16 of the Convention. The requirements of Articles 5(3) and 5(5) can possibly be framed within the content of the Environmental Protection (Authorisation) regulations. It should be noted that mercury compounds in explosives are presently regulated through a combination of the Factories (Dangerous Trades Regulation) Act Cap 95:03 and the Explosives Act Cap 16:06.

<table>
<tr><td>provides significant environmental and health benefits and that there are no technically and economically feasible mercury-free alternatives available providing such benefits. Note that these particular industrial processes are not present in Guyana.</td><td></td></tr>
<tr><td colspan="2">Relevant national stakeholder:</td></tr>
<tr><td rowspan="2">1. Name of institution/ stakeholder:

MoSP</td><td>Role with respect to the above listed provisions:
▪ Regulate matters concerning health and safety in the workplace for workers</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ Collaborates with the Geology and Mines Commission which has an Occupation Health and Safety Unit and regulations pertaining to the operation of the unit</td></tr>
<tr><td rowspan="2">2. Name of institution/ stakeholder:

EPA</td><td>Role with respect to the above listed provisions:
▪ Coordination of conservation programmes
▪ Oversee the effective management and improvement of the environment
▪ Prevent and control pollution
▪ Assessment of the impact of economic development on the environment
▪ Oversee the sustainable use of natural resources
▪ Integrate appropriate environmental provisions into development planning</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ Permitting Division
▪ Education and Awareness Division
▪ Policy Division</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">▪ There are no specific laws governing the manufacturing processes identified in Annex B. Consideration could be given to whether the processes fall within the scope of environmental impact assessments under the Environmental Protection Act or the requirements for environmental authorisations.
▪ There are no mercury specific regulations of facilities as required by Articles 5(5), 5(6) and 5(7).
▪ Lack of mercury-specific protocols based on shared and common knowledge
▪ Use of mercury to be included in subsequent permissions under existing laws regarding facilities.
▪ Provisions and prohibitions regarding the use of mercury can be included in subsequent permissions under existing laws regarding facilities</td></tr>
</table>

Article 7 – Artisanal and Small-scale Gold Mining	
Description of Article:	**Summary assessment of existing national policies and regulatory measures, their scope and extent to which they already meet the requirements as stipulated in the provisions of the Minamata Convention**
Article 7(1) of the Convention provides that the measures in this Article and in Annex C shall apply to artisanal and small-scale gold mining and processing in which mercury amalgamation is used to extract gold from ore. It is an established fact that small-scale gold mining is present in Guyana and that mercury is used as part of the process of extracting ore (Legg *et al.*, 2015) and (EFFACE, 2015). Annex C of the Convention provides details of the content of a national action plan. The details include: 1. Each Party that is subject to the provisions of paragraph 3 of Article 7 shall include in its national action plan: (a) National objectives and reduction targets; (b) Actions to eliminate: (i) Whole ore amalgamation; (ii) Open burning of amalgam or processed amalgam; (iii) Burning of amalgam in residential areas; and (iv) Cyanide leaching in sediment, ore or tailings to which mercury has been added without first removing the mercury; (c) Steps to facilitate the formalization or regulation of the artisanal and small-scale gold mining sector; (d) Baseline estimates of the quantities of mercury used and the practices employed in artisanal and small-scale gold mining and processing within its territory; (e) Strategies for promoting the reduction of emissions and releases of, and exposure to, mercury in	The framework for the development of the national action plan required by Annex C exists in the current legislative framework of Guyana. It must be appreciated that there are existing provisions in Guyana's law which have sought to address the use of mercury in gold mining. These requirements can be found in the Guyana Geology and Mines Commission Act Cap. 66:02. With regards to the importance of mining in the context of Guyana, the existing requirements and measures are set out in full. It is noted that the existing regulations provide a basis for Guyana to include in the Action Plan contemplated by Annex C section 1(c) that steps have already been taken to formalise and regulate the artisanal and small-scale gold mining sector. General regulation of mining in the context of the environment can be found in the provisions of the Mining Environmental Regulations No. 3 of 2005. General provisions are contained in Regulation 127 (1) which provides that *No person shall use elemental mercury or any form of mercury, except in accordance with these Regulations*. Regulation 128(1) provides that in any process whereby the vaporisation of mercury is made possible, due care, as stated in regulation 127(4), shall be exercised to ensure that no person shall be exposed to the resultant fumes; and a warning shall be given to all persons in the vicinity that such process is in operation by way of a siren or notice. Under Regulation 128(2) a retort approved by the Commission shall be used at all times when there is burning of amalgam. Such retort shall be registered with the Commission. The provisions of Regulations 127 and 128(1) are permissive in nature and not prohibitive, the requirement in Annex C of the Convention is to set targets and actions for elimination of the use of mercury. In order to achieve the objective of elimination, permissive articles such regulation 128 would have to be amended or repealed. Regulation 223 specifies that the Commission, the Environmental Protection Agency, the mining associations and educational training institutions, shall in accordance

artisanal and small-scale gold mining and processing, including mercury-free methods; (f) Strategies for managing trade and preventing the diversion of mercury and mercury compounds from both foreign and domestic sources to use in artisanal and small scale gold mining and processing; (g) Strategies for involving stakeholders in the implementation and continuing development of the national action plan; (h) A public health strategy on the exposure of artisanal and small-scale gold miners and their communities to mercury. Such a strategy should include, inter alia, the gathering of health data, training for health-care workers and awareness-raising through health facilities; (i) Strategies to prevent the exposure of vulnerable populations, particularly children and women of child-bearing age, especially pregnant women, to mercury used in artisanal and small-scale gold mining; (j) Strategies for providing information to artisanal and small-scale gold miners and affected communities; and (k) A schedule for the implementation of the national action plan. 2. Each Party may include in its national action plan additional strategies to achieve its objectives, including the use or introduction of standards for mercury-free artisanal and small-scale gold mining and market-based mechanisms or marketing tools.	with the curricula approved by the Commission jointly or singularly, provide training and certification courses for miners on the proper use of mercury and cyanide and environmental hazards associated with such use in mining activities. This Regulation further supports the achievement of the objectives of Article 7(4) (b) of the Convention. Regulation 236 further supports the realisation of Convention Provisions Annex C section 1(h) as it makes provisions for the Commission, the Agency, **the Mining Associations and Educational Training Institutions** to be in accordance with curricula approved by the Commission together or individually to provide training and certification courses for miners on the proper use of mercury and cyanide, and environmental hazards associated with such use in mining activities. This Regulation further supports the achievement of the objectives of Article 7(4)(e) of the Convention, related to Partnerships to assist in the implementation of their commitments under Article 7(4)(e). A further opportunity to achieve Convention objectives would be through the utilisation of the provisions of the **Amerindian Act Cap. 29:01,** specifically in the implementation of mercury-related measures as part of the small-scale mining on lands within the content of the **Amerindian Act**. The relevant provisions of the **Amerindian Act** include sections 48, 49 and 52.
Analysis of existing gaps that would need to be addressed to ensure compliance with the Convention ▪ The provisions of Regulations 127 and 128(1) are permissive in nature and not prohibitive, the requirement in Annex C of the Convention is to set targets and actions for elimination of the use of mercury. In order to achieve the objective of elimination, permissive articles such as regulation 128 would have to amended or repealed.	

- With the main objective of Annex C and Article 7 of the Convention being the elimination of mercury use, the provisions of Regulation 135 may have to be amended to exclude mercury storage with a new provision regarding prohibition included in the Regulations
- The current regulations regarding mercury use will have to be reviewed and amended to meet Convention commitments, particularly the provisions which permit mercury use.
- Mercury specific information and knowledge sharing should inform stakeholder decisions.

Relevant national stakeholder:	
GGMC	**Role with respect to the above listed provisions:** ▪ Promote mineral development ▪ Provide technical assistance and advice in mining, mineral processing, mineral utilization and marketing of mineral resources ▪ Undertake mineral exploration ▪ Research in exploration, mining, and utilization of minerals and mineral products ▪ Enforce of the conditions of Mining Licences, Mining Permits, Mining Concessions, Prospecting Licences (for Large Scale Operations), Prospecting Permits (for Medium and Small Scale operations) and Quarry Licences ▪ Advise the government on appropriate mineral policy matters so that Guyana's mineral resources can be rationally developed and utilized
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Geochemical Surveys Department and Chemical laboratory staff ▪ Technical committees ▪ Partnership with the Ministry of Natural Resources ▪ Capacity to undertake research ▪ Functional GIS Department ▪ Operate with the Geology and Mines Commission which has an Occupation Health and Safety Unit and regulations pertaining to the operation of the unit
EPA	**Role with respect to the above listed provisions:** ▪ Coordination of conservation programmes ▪ Oversee the effective management and improvement of the environment ▪ Prevent and control pollution ▪ Assessment of the impact of economic development on the environment ▪ Oversee the sustainable use of natural resources ▪ Integrate appropriate environmental provisions into development planning

GL&SC	**Role with respect to the above listed provisions:** ▪ Initiate studies into and formulate policy on the development of public lands, including the feasibility of specific land development projects. ▪ Receive and evaluate offers to purchase or let public lands and to issue, for and on behalf of the President, grants, leases and permits to occupy such lands, in accordance with any law regulating the administration and disposition of public lands. ▪ Establish and maintain liaison between all the agencies involved in the registration and storage of records relating to public land in any tenure, including the registration of deeds and title to land.
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Technical committees ▪ Partnership with the Ministry of Natural Resources ▪ Capacity to undertake research ▪ Committees in place to make policies on land allocation and land management ▪ Functional Cadastral Division
National Toushao Council (NTC)	**Role with respect to the above listed provisions:** ▪ Promote good governance in Villages ▪ Prepare strategies & plans for reducing poverty and improving access to health and education in Villages. ▪ Prepare strategies and plans for the protection, conservation and sustainable management of Village lands and natural resources. ▪ Examine the impact of legislation or policy on Villages and any changes that should be made to such legislation or policy.
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Technical committees ▪ Membership on the National Commission ▪ Partnership with the Ministry of Indigenous Peoples' Affairs
GWMO	**Role with respect to the above listed provisions:** ▪ Train or empower women and children ▪ Collaborate with women's organization
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Partnerships with national women's associations

GGDMA	**Role with respect to the above listed provisions:** ▪ Promote and protect the rights, interest and welfare of miners ▪ Enter into negotiations with the relevant authorities for the improvement of the mining industry and for reasonable and adequate prices paid to miners for gold ▪ Make binding agreements on behalf of and for the benefit of its members ▪ Promote legislation in the interest of the members of the Association and the mining industry ▪ Ensure that miners operate within the Mining Law Act 2011989 and its regulations
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Collaboration with other agencies e.g WWF, GGMC, GLSC and EPA to provide capacity building among miners; Capacity to negotiate with the Ministry of the Environment for tax exemptions and concessions for improved conditions for miners.
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ There should therefore be technical capacity and resources (including human and technological) for the stakeholders such as the GGMC and the EPA to effectively carry out the monitoring role	

Article 8 – Emissions	
Description of Article:	**Summary assessment of existing national policies and regulatory measures, their scope and extent to which they already meet the requirements as stipulated in the provisions of the Minamata Convention**
Article 8(1) concerns controlling and, where feasible, reducing emissions of mercury and mercury compounds, often expressed as "total mercury", to the atmosphere through measures to control emissions from the point of sources falling within the source categories listed in Annex D. Annex D lists the following sources and categories List of point sources of emissions of mercury and mercury compounds to the atmosphere: Point source category:	Incinerator is defined in the Environmental Protection (Air Quality) Regulations 2000 to mean equipment used for burning waste. With the similarity in definition, the content of Article 8 of the Convention is within the scope of existing Guyanese laws. Section 2(t) of the Environmental Protection Act provides that the "release" of a substance into any environmental medium whenever it is released directly or indirectly into that medium, includes - (a) in relation to air, any emission of the substance into the air. The scope of Article 8 can be framed within the scope of the Environmental Protection Act. The Environmental Protection (Air Quality) Regulations 2000 defines source in section 2 to mean any public, institutional, commercial or industrial structure, installation, plant, building or facility that emits or

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- *Coal-fired power plants;*
- *Coal-fired industrial boilers;*
- *Smelting and roasting processes used in the production of non-ferrous metals;*
- *Waste incineration facilities;*
- *Cement clinker production facilities*

</td><td>has the potential to emit any regulated air pollutant from any process. The provisions of Article (2) regarding sources can be seen to be within the ambit of the Environmental Protection (Air Quality) Regulations. The conceptual limitation would be that mercury and mercury compounds do not fall within the list of contaminants, the parameter limits of which are to be specified in the first schedule of the Environmental Protection (Air Quality) Regulations. In this regard consideration could be given to including mercury compounds and contaminants in the existing lists.

Article 8(4) requires parties with respect to new sources to use the best available techniques and best environmental practices to control and, where feasible, reduce emissions, as soon as practicable but no later than five years after the date of entry into force of the Convention for that Party. A Party may use emission limit values that are consistent with the application of best available techniques. Scope for implementation of the provisions of Article 8(4) of the Convention is within the functions of the Environmental Protection Agency under the section 4(2)(g) of the Environmental Protection Act which provides under Section 4(2)(2) that in the exercise of its functions the Agency may (g) formulate standards and codes of practice to be observed for the improvement and maintenance of the quality of the environment and limits on the release of contaminants into the environment.</td></tr>
<tr><td colspan="2">Analysis of existing gaps that would need to be addressed to ensure compliance with the Convention
▪ Article 8(2) makes provisions, which are also present in the content of Guyanese laws. However, the provisions are of general as opposed to specific applicability to mercury.
▪ Guidance on the content of the national plan should be taken from Article 8(5) when dealing with Article 8(4).
▪ Mercury-specific obligations can be added to the existing framework.
▪ Review and update and amend the Environmental Protection (Air Quality) Regulations.</td></tr>
<tr><td colspan="2">Relevant national stakeholder:</td></tr>
<tr><td>1. Name of institution/ stakeholder:

Department of Environment (EPA)</td><td>Role with respect to the above listed provisions:
• A quantified goal for controlling and, where feasible, reducing emissions from relevant sources
• Emission limit values for controlling and, where feasible, reducing emissions from relevant sources
• The use of best available techniques and best environmental practices to control emissions from relevant sources
• A multi-pollutant control strategy that would deliver co-benefits for control of mercury emissions
• Alternative measures to reduce emissions from relevant sources.</td></tr>
<tr><td></td><td>Relevant institutional capacity in place to comply with the above listed provisions:</td></tr>
</table>

	▪ Trained personnel in place to carry out surveys and inspections ▪ Equipment (air quality testing meters) are in place to conduct air quality testing for toxic substances
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ There is no specific officer designated to address mercury related activities which presently fall within the responsibilities of the Compliance and Enforcement Division of the EPA. ▪ The need exists for continuous training and enhancement of the knowledge of officers of the EPA ▪ There is however awareness of the potential for mercury to be addressed under the Environmental Protection (Authorisation) Regulations.	

Article 9 on releases	
Description of Article:	**Summary assessment of existing national policies and regulatory measures, their scope and extent to which they already meet the requirements as stipulated in the provisions of the Minamata Convention**
Article 9 of the Convention makes provisions for measures to be taken by parties regarding releases. Releases are defined in Article 9(2)(a) to mean “releases of mercury or mercury compounds to land or water”.	The Environmental Protection Act Cap 20:05 contains a definition which addresses releases both on land and water. Section 2(t) Environmental Protection Act provides that the "release" of a substance into any environmental medium whenever it is released directly or indirectly into that medium includes - (a) in relation to air, any emission of the substance into the air; (b) in relation to water, any entry (including any discharge) of the substance into water; (c) in relation to land, any deposit, keeping or disposal of the substance in or on land. The notion of release into water is further captured in regulations made under the Environmental Protection Act, specifically the Environmental Protection (Water Quality) Regulations 2000, in section 2 in the definition of discharge. A discharge is defined in the Environmental Protection (Water Quality) Regulations to mean to release, drain, deposit, spray, inject, abandon, spill, leak, pour, throw, dump, place, emit or cause the seepage of, and includes any entry of a water contaminant. It is observed that release is included in the definition of discharge. Provisions can be found in the Environmental Protection (Water Quality) Regulations which address the manner in which sources are treated as required by the additional provisions of Article 9, Regulation 12 regarding the manner in which new sources of effluent are treated. Effluent is defined by section 2(g) of Environmental Protection Act to mean any liquid, including particles of matter and other substances in suspension in the liquid, and "trade effluent"

	includes any effluent which is discharged from premises used for carrying on any trade or industry; and for the purposes of this definition premises wholly or mainly used (whether for profit or not) for agricultural purposes or for scientific research or experiment shall be deemed to be premises used for carrying on a trade or industry. Article 9(3) provides that "Each Party shall, no later than three years after the date of entry into force of the Convention for it and on a regular basis thereafter, identify the relevant point source categories". It is noted that the scope of the Environmental Protection (Water Quality) Regulations defines facilities to include - (a) any office, room or building, and any place, spot or land, whether open or enclosed; (b) any aircraft, hovercraft, ship, boat, pleasure craft or other vessel whether afloat or not, and any vehicle; (c) any electrical installation, subterranean installation or installation on land including the foreshore and other land intermittently covered by water; (d) any offshore installation and any other installation, whether floating or resting on the seabed or the subsoil thereof or resting on other land covered with water or the subsoil thereof; and (e) any dam or other installation designed to hold liquid or store it on a long-term basis. The requirements of Articles 9(4) regarding the preparation of a national plan and Article 9(5) regarding additional measures should be considered in planning future Convention related actions. Article 9(6) requires that each Party shall establish, as soon as practicable and no later than five years after the date of entry into force of the Convention for it, and maintain thereafter, an inventory of releases from relevant sources. It is noted that provision already exists in PART VI of the Environmental Protection (Water Quality) Regulations under the heading Sampling, Records and Reports for the basis of an inventory to be created.
Analysis of existing gaps that would need to be addressed to ensure compliance with the Convention ▪ While substance is not defined by the **Environmental Protection Act** it is suggested that mercury and mercury compounds are included in the scope of substance. Provision for inclusion of mercury and mercury compounds with regard to discharges into water is found in the Second Schedule, this Schedule allows for a list of substances, the limits of which are to be specified in part (xix) which allows for a listing to be made for a substance that either by itself or in combination with other waste or refuse may give rise to any gas, fume or odour or substance which causes or is likely to cause pollution ▪ The water release framework can be refined to make specific provisions for mercury	

<table>
<tr><td colspan="2">and mercury compound release.
▪ The framework does not specifically address releases on land.
▪ A framework for mercury and mercury compound releases on land could be implemented.
▪ Article 9(4) allows for future action regarding preparation of a national plan setting out the measures to be taken to control releases and its expected targets, goals and outcomes. The national plan should contain the information indicated in Article 9(5).</td></tr>
<tr><td colspan="2">Relevant national stakeholder:</td></tr>
<tr><td>1. Name of institution/ stakeholder:

Department of Environment (EPA), Ministry of the Presidency</td><td>Role with respect to the above listed provisions:
▪ Determine the manner in which sources are treated
▪ Plan future Convention related actions
▪ Sample, record and report for the creation of an inventory
▪ Maintain inventory of releases from relevant sources
Relevant institutional capacity in place to comply with the above listed provisions:
▪ Trained personnel available to conduct tests for mercury and mercury compounds
▪ Equipment available to conduct tests
▪ Collaboration with the PTCCB</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">▪ Additional trained personnel to conduct field tests identify contaminated sites and affected miners for the protection of their health and safety.
▪ Personnel to provide support to communities with respect to providing health outreach activities to affected persons and in particular, women and children who are more vulnerable.</td></tr>
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Article 10 on environmentally sound interim storage of mercury, other than waste mercury	
Description of Article:	**Summary assessment of existing national policies and regulatory measures, their scope and extent to which they already meet the requirements as stipulated in the provisions of the Minamata Convention**
Article 10 of the Convention seeks to establish commitments regarding environmentally sound interim storage of mercury, other than waste mercury. It is first observed that Article 10(1) is an exclusionary provision with regard to mercury wastes, which are governed by Article 11 of the Convention. Article 10(1) provides that this Article shall apply to the interim	A measure to be noted is the absolute prohibition on certain mercury compounds in the realm of pesticides. This measure has already been established utilising the provisions of the Pesticides and Toxic Chemicals Control Act Cap. 68:09 specifically Section 19, under the heading prohibited pesticides which provides that (1) The Minister may, by order made after consultation with the Board, specify either or both of following for the purposes of the Pesticides and Toxic Chemicals Control Act Cap. 68:09 (a) pesticides that shall not be imported into or used in Guyana; and (b) pesticides that shall not be exported from Guyana. At present under the Pesticides and Toxic Chemicals Control

<table>
<tr><td>storage of mercury and mercury compounds as defined in Article 3 that do not fall within the meaning of the definition of mercury wastes set out in Article 11.

The principle article to be considered in the present context is Article 10(2), which provides that Each Party shall take measures to ensure that the interim storage of such mercury and mercury compounds intended for a use allowed to a Party under this Convention is undertaken in an environmentally sound manner, taking into account any guidelines, and in accordance with a requirement, adopted pursuant to paragraph 3.</td><td>(Prohibited Pesticides) Order made under section 19(1), Section 2(m) provides that Mercuric Chloride shall not be imported into or used in Guyana. Additionally, since the GYS 203:2001 - Code of Safety for Mercury was enacted prior to Guyana's commitments under the Convention, the suitability of the content when compared to the Convention should be explored. Section 5.1 of the GYS 203:2001 - Code of Safety for Mercury in relation to Storage provides that:
"Mercury shall be stored in bottles and containers made of plastics and glass. While it shall be stored away from contact with chemicals with which it easily reacts, the containers shall be properly closed to reduce formation of vapours. The storage areas shall be properly ventilated to avoid a build-up of the vapour concentration. The flooring shall be of an impervious smooth surface with adequate slope leading to drains via traps at several points and arrangement for washing away any spillage with water. The containers shall be clearly labelled."</td></tr>
<tr><td colspan="2">Analysis of existing gaps that would need to be addressed to ensure compliance with the Convention
▪ There is a need to extend the provision beyond pesticides to other storage circumstances.
▪ The GYS 203:2001 - Code of Safety for Mercury should be reviewed and updated.
▪ Review and revise Environmental Protection Agency - Environmental Guidelines for Transportation, Storage and Occupational Handling of Chemical/Industrial Hazardous Waste Environmental Protection Agency.
▪ Develop national standards/guidelines as stipulated in the Convention for the interim storage of elemental mercury.</td></tr>
<tr><td colspan="2">Relevant national stakeholder:</td></tr>
<tr><td>1. Name of institution/ stakeholder:

PTCCB</td><td>Role with respect to the above listed provisions:
▪ Prohibit the use of certain mercury compounds in the realm of pesticides
▪ Consult with the Board</td></tr>
<tr><td></td><td>Relevant institutional capacity in place to comply with the above listed provisions:
▪ Trained persons in place at the PTCCB
▪ Collaboration between the EPA, PTCCB and other agencies e.g. GUYSUCO and Ministry of Health</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 and deployment of officers to the National Bureau of Standards and other collaborating partners</td></tr>
</table>

Article 11 on mercury wastes	
Description of Article:	**Summary assessment of existing national policies and regulatory measures, their scope and extent to which they already meet the requirements as stipulated in the provisions of the Minamata Convention**
Article 11(1) is linked to the approach to Basel Convention implementation. Article 11(2) indicates mercury wastes to mean substances or objects: *(a) Consisting of mercury or mercury compounds;* *(b) Containing mercury or mercury compounds; or* *(c) Contaminated with mercury or mercury compounds, in a quantity above the relevant thresholds defined by the Conference of the Parties, in collaboration with the relevant bodies of the Basel Convention in a harmonized manner, that are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law or this Convention.*	The Environmental Protection Agency and the Pesticides and Toxic Chemical Controls Board use the Article for the implementation of the Stockholm Convention on Persistent Organic Pollutants (PTCCB, 2013, p.70). In addition to the existing framework, there are other laws which provide a framework for wastes to be treated. Appropriate measures are currently possible using the provisions of the Environmental Protection (Hazardous Wastes Management) Regulations 2000. Specifically, Schedule I provides a list of hazardous waste to be controlled, including waste having as constituents of mercury and mercury compounds. The term 'hazardous wastes are defined in the Environmental Protection (Hazardous Wastes Management) Regulations to mean a waste or combination of wastes which, because of its quantity, concentration or physical, chemical or infectious characteristics, may pose a substantial hazard to human health, and belong to any category contained in Schedule I unless they do not contain any of the characteristics contained in Schedule II and includes waste that is: *(a) hazardous industrial waste;* *(b) acute hazardous waste chemical;* *(c) hazardous waste chemical;* *(d) severely toxic waste;* *(e) flammable waste;* *(f) corrosive waste;* *(g) reactive waste;* *(h) radioactive waste;* *(i) clinical waste or* *(j) leachate toxic waste, or polychlorinated biphenyl waste, and includes a mixture of acute hazardous waste chemical, hazardous waste chemical, pathological waste, radioactive waste or severely toxic wastes and any other waste or hazardous material.* Section 35 of the Environmental Protection (Hazardous Wastes Management) Regulations under the heading savings of laws allows an opportunity for implementation measures to be taken. The Environmental Protection (Hazardous Wastes Management) Regulations shall be read and

	construed as being in addition to, and not in derogation of any provisions of - (a) *the Customs Act;* *(b) the Pesticides and Toxic Chemicals Act;* *(c) any other law.* Provisions regarding mercury waste can also be found in GYS 203:2001 - Code of Safety for Mercury, Section 7.4 under the heading Waste disposal
Analysis of existing gaps that would need to be addressed to ensure compliance with the Convention ▪ With the designation of mercury and mercury compounds the provisions of **Environmental Protection (Hazardous Wastes Management) Regulations 2000** can be an appropriate measure to support the implementation of Article 11 of the Convention. ▪ The measures under the Environmental Protection (Hazardous Wastes Management) Regulations can be combined with measures under the Customs Act and the Pesticides and Toxic Chemicals Act. ▪ A review of the GYS 203:2001 - Code of Safety for Mercury Environmental Guidelines as well as the Transportation, Storage and Occupational Handling of Chemical/Industrial Hazardous Waste can be conducted.	
Relevant national stakeholder:	
1. Name of institution/ stakeholder: EPA	**Role with respect to the above listed provisions:** ▪ Prepare Environmental Guidelines for Transportation, Storage and Occupational Handling of Chemical/Industrial Hazardous Waste ▪ Develop national standards/guidelines as stipulated in the Convention for the interim transportation, storage and occupational handling of chemical/industrial hazardous waste
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Environmental Permitting Unit at EPA in place
2. Name of institution/ stakeholder: PTCCB	**Role with respect to the above listed provisions:** ▪ Control the importation, storage and handling of mercury ▪ Collaborate with the Environmental Protection Agency
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Capacity to prepare guidelines for storage and handling of mercury ▪ Collaborate with other agencies e.g. Customs and Trade Division
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Capacity to prepare guidelines for transportation of mercury	

Article 12 on contaminated sites

Description of Article:	**Summary assessment of existing national policies and regulatory measures, their scope and extent to which they already meet the requirements as stipulated in the provisions of the Minamata Convention**
Article 12 of the Convention makes provisions regarding contaminated sites requiring in Article 12(1) each Party to endeavour to develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds.	Section 2(e) of the Environmental Protection Act defines a "contaminant" to mean any solid, liquid, gas, odour, sound, vibration, radiation, heat or combination of any of them resulting directly or indirectly from human activities that may cause an adverse effect; Mercury and mercury compounds can fall within the definition of a contaminant. The Environmental Protection Act further provides in section 68(1)(n) for regulations to be developed governing the location of waste disposal sites, establishing classes of waste disposal sites, and designating parts of Guyana where no waste disposal sites, or any class thereof, shall be established or operated. In this regard, the management of contaminated sites can be supported by the provisions of the Environmental Protection (Hazardous Wastes Management) Regulations 2000. The framework commences with an appreciation of Regulation 26 which addresses the contamination of any place in the following language: *Every person who wilfully or negligently and with the knowledge that serious environmental harm will or might result causes the contamination of any place, except a declared hazardous waste disposal site, shall be guilty of an offence and shall be liable on summary conviction to a fine of not less than eight hundred thousand dollars nor more than two million dollars and to imprisonment for five years"*. Additionally, there is a provision in Regulation 32(1) of the Environmental Protection (Hazardous Wastes Management) Regulations 2000 which allows the Minister at his discretion to declare any area or part of an area to be a hazardous waste disposal site and may alter or revoke any such declaration. Regulation 32(2) of the Environmental Protection (Hazardous Wastes Management) Regulations further prohibits persons from depositing or causing to be deposited, any hazardous waste in any place except at a declared hazardous waste disposal site. Article 12(2) of the Convention provides that "Any actions to reduce the risks posed by such sites shall be performed in an environmentally sound manner incorporating, where appropriate, an assessment of the risks to human health and the environment from the mercury or mercury compounds they contain."

	It is noted that provisions for risk assessment have been included in the draft laws regarding Biosafety in Guyana. The elements of a framework include risk analysis, risk communication and risk management. This assessment of risks to the environment is supported by the environmental impact assessment process, (Section 11(5)(f) of the Environmental Protection Act) as well as the general functions of the Environmental Protection Agency (Section 4(2)(h) of the Environmental Protection Act).
Analysis of existing gaps that would need to be addressed to ensure compliance with the Convention ▪ Develop an appropriate risk assessment framework to utilise existing provisions in the Environmental Protection Act. This can be supported by appropriate regulations developed under the Environmental Protection Act. • Explore the preparation of Regulations under 68(1)(n) of the Environmental Protection Act governing the location of waste disposal sites, establishing classes of waste disposal sites, and designating parts of Guyana in which no waste disposal sites, or any class thereof, shall be established or operated. This should be done in line with other strategies governing solid waste disposal.	
Relevant national stakeholder:	
1. Name of institution/ stakeholder: EPA	**Role with respect to the above listed provisions:** ▪ Develop framework including risk analysis, risk communication and risk management. ▪ Prepare Regulations **Relevant institutional capacity in place to comply with the above listed provisions:** ▪ Capacity to collaborate with other agencies to identify sites
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Limited technical capacity and equipment	

Article 16 on health aspects	
Description of Article:	**Summary assessment of existing national policies and regulatory measures, their scope and extent to which they already meet the requirements as stipulated in the provisions of the Minamata Convention**
Pursuant to Article 16 regarding health aspects, parties are encouraged to: *(a) Promote the development and implementation of strategies and programmes to identify and protect populations at risk, particularly vulnerable populations, and which may*	There are several laws in Guyana which provide for both a general as well as targeted implementation of several of the measures identified in Article 16. Mercury is not identified as a specific target. However, it is the effects which should be considered. One of the first areas of intervention would be in the context of occupational health and safety measures related to using mercury. Several provisions of the Occupational Health and Safety Act provide the basis for intervention. These include:

include adopting science-based health guidelines relating to the exposure to mercury and mercury compounds, setting targets for mercury exposure reduction, where appropriate, and public education, with the participation of public health and other involved sectors; *(b) Promote the development and implementation of science-based educational and preventive programmes on occupational exposure to mercury and mercury compounds;* *(c) Promote appropriate health-care services for prevention, treatment and care for populations affected by the exposure to mercury or mercury compounds; and* *(d) Establish and strengthen, as appropriate, the institutional and health professional capacities for the prevention, diagnosis, treatment and monitoring of health risks related to the exposure to mercury and mercury compounds.*	Section 47 – *Additional Duties of Employers*, Section 51 - *Duties of occupier to protect safety and health of public,* Section 59 - *Orders of Authority,* Section 60 - *New Chemicals or Biological Agents*, Section 61 - *Hazardous materials inventory*, Section 62 - Hazardous chemical identification and data sheets. Section 65 - *Hazardous physical agents* - Section 59 regarding *Orders of Authority* (1) Where a chemical, physical agent or biological agent or a combination of such chemical and agents is used or intended to be used in the workplace and its presence in the workplace or the manner of its use is in the opinion of the Authority likely to endanger the health of a worker, the Authority shall by notice in writing to the employer order that the use, intended use, presence or manner of use be - a. prohibited; b. limited or restricted in such manner as the Authority specifies; or c. subject to such conditions regarding administrative control, work practices, engineering control and time limits for compliance as the Authority specifies. As regards Article 16(b) by virtue of the provisions of section 5.2 of the GYS 203:2001 - Code of Safety for Mercury measures exist to address the handling of mercury. The provisions are in the following language: *5.2 Handling* *Mercury shall be handled in enclosed systems as far as possible. If mercury is to be drained out of equipment such as pumps and meters, it shall be immediately covered with a layer of water if permissible, otherwise the receiver shall be covered.* *5.2.1 Since spillage of mercury is practically unavoidable, the spilled material shall be washed away to drains and collected in water sealed traps. Where it is suspected that small tiny droplets of mercury may remain over after adequate washing with water, such flooring/other areas may be sprinkled with lime sulphur spray and swept away after some time as an additional decontamination measure.* *5.2.2 It shall be explained to the personnel handling mercury that even a small package of mercury is very heavy and shall be carefully handled avoiding a sudden shift in its centre of gravity. A sudden shift in the centre of gravity may cause it to destabilise the package containing the liquid metal.* *5.2.3 Mercury is transported usually in bottles*
Analysis of existing gaps that would need to be addressed to ensure compliance with the Convention	

<table>
<tr><td colspan="2">▪ Establish mercury related interventions in the area of occupational health and safety through Orders of Authority, hazardous materials inventory, hazardous chemical identification and data sheets and hazardous physical agents.
▪ Review and update the GYS 203:2001 - Code of Safety for Mercury.</td></tr>
<tr><td colspan="2">Relevant national stakeholder:</td></tr>
<tr><td>1. Name of institution/ stakeholder:

MoSP</td><td>Role with respect to the above listed provisions:
▪ Protect safety and health of public
Order the use, intended use, presence or manner of use of mercury
Relevant institutional capacity in place to comply with the above listed provisions:
Collaborate with GGMC and other agencies</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">▪ Insufficient personnel to address occupational safety and health emergencies</td></tr>
</table>

3.2 INSTITUTIONAL ASSESSMENT

<table>
<tr><td colspan="2">Article 3 - Mercury supply sources and trade</td></tr>
<tr><td colspan="2">Description of Article: Refer to the description of the article in the previous chapter</td></tr>
<tr><td colspan="2">Relevant national stakeholder:</td></tr>
<tr><td rowspan="2">1. Name of institution/ stakeholder:

GGMC</td><td>Anticipated Role identified with respect to the above listed provisions:
Development of strategies to prevent the diversion of mercury or mercury compounds for use in artisanal and small-scale gold mining and processing
Education, outreach and capacity-building initiatives
Promotion of research into sustainable non-mercury alternative practices
Provision of technical and financial assistance
Use of existing information exchange mechanisms to promote knowledge, best environmental practices and alternative technologies that are environmentally, technically, socially and economically viable
Partnerships to assist in the implementation of their commitments under this Article</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:
Geochemical Surveys Department and Chemical laboratory staff
Technical committees
Partnership with the Ministry of Natural Resources
Capacity to undertake research
Functional GIS Department</td></tr>
<tr><td rowspan="2">2. Name of institution/ stakeholder:

GNBS</td><td>Role with respect to the above listed provisions:
Promote standardization in industry and commerce
Encourage or undertake educational work in connection with standardization
Establish, form, furnish and maintain information systems and laboratories for the purpose of furthering the practice of standardization
Provide for the testing, at the request of the Minister and on behalf of the Government, of locally manufactured and imported commodities for compliance with the provision of the Standards Act or any other law dealing with standards and quality
Prepare, frame, modify or amend specifications and codes of practice
Make arrangements and provide facilities for the testing and calibration of precision instruments gauges and scientific apparatus to determine their degree of accuracy</td></tr>
<tr><td>Relevant institutional capacity in place to comply with the above listed provisions:</td></tr>
</table>

	▪ National Standards Council ▪ Collaborate with GGMC
3. Name of institution/ stakeholder: Department of Customs and Trade Administration of the GRA	**Role with respect to the above listed provisions:** ▪ Accept licenses issued by the other Agencies ▪ Conduct inspection process pertaining to the entry of mercury in Guyana
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Collaborative engagement with other relevant agencies
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Improve information sharing frameworks between the PTCCB and the GGMC regarding the actual demand for and use of mercury in the mining sector prior to importation; ▪ Ensure that there is proper storage of mercury when it is being transferred and transported from the place of storage to the place of use; ▪ Improve the data collection framework regarding the use of mercury in mining; ▪ Where necessary review and update Environmental Management Plans; ▪ Give consideration to integrating mercury related issues as part of the new conditions for renewals of existing authorisations; ▪ Continue preparation of the National Action Plan as required by the Convention; and, ▪ Promote and develop incentives for adoption of non-mercury technologies.	

Article 4 on mercury-added products	
Description of Article: Refer to the description of the article in the previous chapter	
Relevant national stakeholder:	
1. Name of institution/ stakeholder: GEA	**Role with respect to the above listed provisions:** ▪ Management of petroleum and petroleum products
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Collaborative engagement with other relevant agencies
2. Name of institution/ stakeholder: Department of Customs and Trade Administration of GRA	**Role with respect to the above listed provisions:** ▪ Accept licenses issued by the other Agencies ▪ Conduct inspection process pertaining to the entry of mercury and mercury containing products in Guyana ensure the quality, safety and efficacy of such articles
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Collaborative engagement with other relevant agencies
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Limited technical personnel to monitor and control (il)legal movement and usage of mercury and mercury-added products	

Article 5 on manufacturing processes in which mercury or mercury compounds are used:
Description of Article: Refer to the description of the article in the previous chapter

Relevant national stakeholder:	
1. Name of institution/ stakeholder: MoSP	**Role with respect to the above listed provisions:** ▪ Regulate matters concerning health and safety in the workplace for workers
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Collaboration with the Geology and Mines Commission which has an Occupation Health and Safety Unit and regulations pertaining to the operation of the unit ▪
2. Name of institution/ stakeholder: EPA	**Role with respect to the above listed provisions:** ▪ Coordination of conservation programmes ▪ Oversee the effective management and improvement of the environment ▪ Prevent and control pollution ▪ Assessment of the impact of economic development on the environment ▪ Oversee the sustainable use of natural resources ▪ Integrate appropriate environmental provisions into development planning
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Permitting Division ▪ Education and Awareness Division ▪ Policy Division
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Technical personnel to provide guidance and policy ▪ Technical personnel to advise and provide guidance and compliance with national regulation	

Article 7 – Artisanal and Small-scale Gold Mining	
Description of Article: Refer to the description of the article in the previous chapter	
Relevant national stakeholder:	
GGMC	**Role with respect to the above listed provisions:** ▪ Promote mineral development ▪ Provide technical assistance and advice in mining, mineral processing, mineral utilization and marketing of mineral resources ▪ Undertake mineral exploration ▪ Research in exploration, mining, and utilization of minerals and mineral products ▪ Enforce of the conditions of Mining Licences, Mining Permits, Mining Concessions, Prospecting Licences (for Large Scale Operations), Prospecting Permits (for Medium and Small Scale

	operations) and Quarry Licences ▪ Advice the government on appropriate mineral policy matters so that Guyana's mineral resources can be rationally developed and utilized
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Geochemical Surveys Department and Chemical laboratory staff ▪ Technical committees ▪ Partnership with the Ministry of Natural Resources ▪ Capacity to undertake research ▪ Functional GIS Department ▪ Collaborate the Geology and Mines Commission which has an Occupation Healthy and Safety Unit and regulations pertaining to the operation of the unit
EPA	**Role with respect to the above listed provisions:** ▪ Coordination of conservation programmes ▪ Oversee the effective management and improvement of the environment ▪ Prevent and control pollution ▪ Assessment of the impact of economic development on the environment ▪ Oversee the sustainable use of natural resources ▪ Integrate appropriate environmental provisions into development planning
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Investigation of complaints of mercury contamination in waterways and villages in the vicinity of mining operations ▪ Activities are done in cloase collaboration with GGMC ▪ Assessment and reporting of the level of mercury contamination in the reportedly affected area ▪ Further collaboration with the GNBS in the context of the industrial effluent discharges guidelines ▪ There are officers of the EPA who have been trained in several aspects of the Convention.
GL&SC	**Role with respect to the above listed provisions:** ▪ Initiate studies into and formulate policy on the development of public lands, including the feasibility of specific land development projects. ▪ Receive and evaluate offers to purchase or let public lands and to issue, for and on behalf of the President, grants, leases and permits to occupy such lands, in accordance with any law regulating the administration and disposition of public lands. ▪ Establish and maintain liaison between all the agencies involved in the registration and storage of records relating to public land in any tenure, including the registration of deeds

	and title to land.
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Technical committees ▪ Partnership with the Ministry of Natural Resources ▪ Capacity to undertake research ▪ Committees in place to make policies on land allocation and land management ▪ Functional Cadastral Division
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Strengthened institutional collaboration mechanisms. ▪ No specific officer designated to address mercury related activities which presently fall within the responsibilities of the Compliance and Enforcement Division of the EPA. ▪ The increased activities would require financial resources as well as the enhancement of the technical equipment utilised for monitoring and reporting on technical levels. ▪ All stakeholders to efficiently discharge their respective responsibilities. There should therefore be technical capacity and resources for the stakeholders such as the GGMC and the EPA to effectively carry out the monitoring role.	

Article 8 – Emissions	
Description of Article: Refer to the description of the article in the previous chapter	
Relevant national stakeholder:	
1. Name of institution/ stakeholder: EPA	**Role with respect to the above listed provisions:** • Carrying out of environmental impact assessment (EIA) in relation to potential environmentally harmful activities • Assessment and reporting of the level of mercury contamination in the reportedly affected area by mercury • Monitoring and reporting on technical levels of mercury • Public Awareness Unit responsible for public dissemination of information
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Availability of air quality control instruments and personnel ▪ Collaboration with other agencies
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ There is no specific officer designated to address mercury related activities which presently fall within the responsibilities of the Compliance and Enforcement Division of the EPA	

Article 9 on releases	
Description of Article: Refer to the description of the article in the previous chapter	
Relevant national stakeholder:	
1. Name of institution/ stakeholder:	**Role with respect to the above listed provisions:** ▪ Determine the manner in which sources are treated

EPA	▪ Plan future Convention related actions ▪ Sample, record and report for the creation of an inventory ▪ Maintain inventory of releases from relevant sources
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Trained personnel available to conduct tests for mercury and mercury compounds ▪ Equipment available to conduct tests ▪ Collaboration with the PTCCB
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Additional trained personnel to conduct field tests identifying contaminated sites and affected miners for the protection of their health and safety ▪ Personnel to provide support to communities with respect to providing assistance to affected persons and in particular, women and children who are more vulnerable	

Article 10 on environmentally sound interim storage of mercury, other than waste mercury	
Description of Article: Refer to the description of the article in the previous chapter	
Relevant national stakeholder:	
1. Name of institution/ stakeholder: PTCCB	**Role with respect to the above listed provisions:** ▪ Prohibit the use of certain mercury compounds in the realm of pesticides ▪ Consult with the Board
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Trained persons in place at the PTCCB ▪ Collaboration between the EPA, PTCCB and other agencies e.g. GUYSUCO and Ministry of Health
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Training and deployment of officers to the National Bureau of Standards and other collaborating partners	

Article 11 on mercury wastes	
Description of Article: Refer to the description of the article in the previous chapter	
Relevant national stakeholder:	
1. Name of institution/ stakeholder: EPA	**Role with respect to the above listed provisions:** ▪ Environmental Guidelines for Transportation, Storage and Occupational Handling of Chemical/Industrial Hazardous Waste ▪ Develop national standards/guidelines as stipulated in the Convention for the interim transportation, storage and occupational handling of chemical/industrial hazardous waste

	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Collaborate with other agencies
2. Name of institution/ stakeholder: PTCCB	**Role with respect to the above listed provisions:** ▪ Control the importation, storage and handling of mercury ▪ Collaboration with the Environmental Protection Agency
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Capacity to prepare guidelines for storage and handling of mercury ▪ Work in collaboration with other agencies e.g. Customs and Trade Division
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Capacity to prepare guidelines for transportation of mercury ▪ Absence of a decentralized structure to monitor activities and enforce regulations within mining areas	

Article 12 on contaminated sites	
Description of Article: Refer to the description of the article in the previous chapter	
Relevant national stakeholder:	
1. Name of institution/ stakeholder: Department of Environment-Environmental Protection Agency	**Role with respect to the above listed provisions:** ▪ Develop framework including risks analysis, risk communication and risk management. ▪ Prepare Regulations
	Relevant institutional capacity in place to comply with the above listed provisions: ▪ Collaboration with other agencies
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Specialized training ▪ Personnel to be station in mining areas in cases of emergencies	

Article 16 on health aspects	
Description of Article: Refer to the description of the article in the previous chapter	
Relevant national stakeholder:	
1. Name of institution/ stakeholder: Ministry of Labour	**Role with respect to the above listed provisions:** ▪ Protect the safety and health of the public ▪ Order the use, intended use, presence or manner of use of mercury
	Relevant institutional capacity in place to comply with the above listed provisions:

	▪ Some key personnel eg. Chief Labour Officer are in place ▪ Mechanisms in place for engagement in case of labour dispute
Remaining Capacity Gaps at National Level that need to be addressed before provisions can be met:	
▪ Capacity for quick response in cases of toxic chemical spillage, for example ▪ Limited technical personnel to deal with emergency cases	

Recommendations

VII.3.1 Adequate institutional structure

The current institutional structure appears to be adequate to the Minamata Convention's requirements. However, certain steps need to be undertaken to improve the capacities of the present structure. Namely, primarily at the Guyana Revenue Authority; Ministry of Agriculture (Pesticides and Toxic Chemical Control Board); Ministry of Natural Resources and the Environment (Guyana Geology and Mines Commission and Environmental Protection Agency) Ministries of Communities and Ministry of Health.

A number of gaps and needs were clearly identified. Nevertheless, it doesn't necessarily mean the creation of a new structure. These steps have to consider strengthening human capacity and capacity building.

The Minamata implementation process provides a good opportunity to improve some specific areas, related to toxic chemicals, not only mercury and other toxic compounds (e.g. PCBs, PAHs and other relevant organic pollutants, present in solid and liquid waste streams). In this regards, waste management capacity should be a target area (including municipal, solid and liquid wastes, industrial and hazardous waste). Another relevant target area should be the analytical infrastructure dedicated to human exposure evaluation and risk assessment of communities near ASGM sites.

VII.3.2 Adequate technical capacity

The review of the consulted sources provides a wide perspective over the current technical capacities existing in Guyana.

a. Related to Minamata and mercury managements, Guyana's waste management capacity require some strengthening, since the official information that 50% of the national waste generation has not landfilled disposal, represent a clear challenge to overcome.

b. Another, more specific challenge represents the need to establish a National Reference Laboratory (NRL).

In this regard, the challenge is to define the NRL, again not essentially related to capital investments in a new lab with state of the art equipment. It is also much more important to, define a comprehensive approach to implement Minamata Convention in Guyana.

Moreover, the Mercury National Committee (Mercury Coordination Mechanism) has to take into consideration the legislative and legal modifications needed and to mainstreaming mercury into the current environmental agenda. Doing this, the requirements to NRL will be enough to assure its long-term sustainability, in terms of cash flow, funding required and the number of analytical services provided, in order to maintain and further develop its analytical expertise.

c. Finally, a third important challenge is to define the strategy to develop free mercury technology to replace mercury use in 6 years from now. The IAST Laboratory at the University of Guyana appears to be able to collaborate in this effort, therefore, the necessary steps need to be taken.

Specific Recommendations to Guyana Revenue Authority

Actions to be developed at the Guyana Customs level (GRA) need to be undertaken in order to minimize (as feasible) the illegal traffic of gold, directly linked with mercury importing in Guyana.

In this regard, the proposal to a first step, might be accomplished by opening the Tariff Heading of mercury (the specific technical description of each one sub-heading), in order to improve control over the import of mercury and products with mercury content.

A common approach of the Guianas should be reached (Guyana, Suriname and French Guiana) and the CARICOM framework appears to be the right level to develop such approach (to harmonize the custom system), where Guyana should play a central role as one of the first nations ratifying Minamata Convention.

Specific Recommendations to the Minamata Convention's National Focal Point

a. Spread the outcomes of the MIA exercise to Guyana's stakeholders to promote and incentivize involvement of Guyana's society in the Minamata Convention issues. Additionally, transparency of information should be promoted.

b. Establish a working coordination mechanism with Stockholm Convention and Montreal Protocol National Focal Points, to learn from other experience and joint efforts in related matters, namely:

i. Creation of Centres to regenerate ozone-depleting substances under restriction,
ii. Chemical management of toxic substances
iii. Identification of Hot spots
iv. Analytical characterization of Toxic Chemical
v. Awareness raising programmes
vi. Strengthening the local/national capacity to identity and characterize new toxic chemicals related to POPs and Mercury compounds (chemical speciation)

c. To do efforts to recognize Pork-knocker dimension, as Guyana's subpopulation at health risk.

This relevant aspect related to ASGM, represents a high risk due to:

I. Pork-knocker and their families represent a subpopulation of high risk due to its social & economic status, highlighted in Article 7, Annex C,
II. Mismanagement of mercury represent direct risks to human in the vicinity of this subpopulation,
III. Emissions generated by Pork-knocker's activities represent the highest concern from the global perspective (special article on emission Minamata Convention, paragraph 1and 2 (a) of Article 8)

A positive effect to recognize this subpopulation will be appreciated at the Minamata Secretariat level thus leading to promoting funding sources to Guyana's implementation process, since the official recognition of this type of issue (subpopulations) has been controversial for a number of countries.

Implicitly, this is a political decision. However, it is totally technical based, on "managements of chemicals "(Chapter 19, Agenda 21) and "ASGM & environmental sound management" (Minamata Convention, article 7 paragraph 1 (c) (e) (h) (i) & (j); paragraph 3 (a) and 5 of Article 11; paragraph 2 of Article 12).

Chapter IV: Identification of Populations at Risk and Gender Dimensions

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

The degree of risk associated with mercury varies depending on several factors including: 1) the quantity of mercury to which a person is exposed, 2) the form of mercury, 3) the frequency of exposure, 4) the person's stage of life, and 5) individual sensitivity to mercury.

Artisanal and Small- scale gold miners

Pork-knockers / Punters

Despite its potential risks, mercury continues to be used in a variety of products and processes all over the world.[34] In Guyana, metal mercury plays a critical role in gold mining conducted by artisanal miners known as pork knockers. These workers are found across the country and they represent an unknown number of persons. A *Hundred years ago, these small artisanal operators (pork-knockers) formed the bulk of the domestic contribution to national output. However, these workers suffered from several critical constraints/weaknesses including those listed below[35]:*

- *Manual Labour (low or non-existent mechanisation)*
- *No enforced health and safety standards*
- *Lack of training*
- *Poor pay (where labour employed)*
- *Poor productivity*
- *Capital deficient*
- *Insecure property rights*
- *Environmental damage (pollution, land and water degradation, mercury use)*
- *Weak, poorly organised markets (inputs and output)*
- *Security*
- *Poor infrastructure*
- *High dependency ratio*
- *Weak/non-existent basic services*
- *Weak/non-existent economic support institutions (especially credit)*

Since the hey-day of the pork-knockers, efforts have been made to address these constraints starting in the 1970s and focussed on in the Mining Act of 1989[36].

Pork-knockers have their own families, which represent a subpopulation of poor peoples. For them, mercury as a toxic chemical is the key-driver to get gold, therefore there is a clear concern in terms of human and environmental risk related to this subpopulation. This is particularly notable if we consider that there is an established link between poverty and increased risk of

[34] UNEP DTIE Chemicals Branch and WHO Department of Food Safety, Zoonoses and Foodborne Diseases, 2008. Guidance for identifying populations at risk from mercury exposure, UNEP GENEVA, Switzerland.

[35] Clive Thomas, 2009, "Too big to fail: A Scoping Study of the Small and Medium Scale Gold and Diamond Mining Industry in Guyana". Faculty of Social Sciences, University of Guyana, Draft for discussion only.

[36] Ibid.

exposure to toxic chemicals[37]. Legally the term miner covers three broad categories of persons. First, property or licence holders who have legal property to the mining area. Second, "tributors" or persons working for the owner(s) for a share of mineral output. And, thirdly, any person(s) employed to work on the mine[38]. However, these pork-knockers normally are working as individuals or in small groups using basic tools and equipment and employing traditional technology in gold recovery from near surface or soil deposits[39].

Pork-knockers burn the gold-mercury amalgam to vaporize the mercury and recover the gold; thus they, and most probably their families and neighbours, can be exposed to mercury vapours. Mercury concentrations in air as high as 60 mg/m^3 have been associated with amalgam burning at a mining site[40]. In addition, metallic mercury wastes are usually dumped into or near watercourses. These discharges can lead to elevated methyl mercury concentrations in the fish of these water bodies.

From field visits to gold mining districts, specifically at the northern part of Guyana (Port Kaituma and Mathews' Ridge), some areas of potential concern were identified based on interviews with mining communities. At these sites, some potential risk of mercury-contaminated sites might be detected based on the data collected.

A meeting with a group of Venezuelan miners at Mathews' Ridge provided some additional information on this matter and the large presence of Pork-knockers. The miner communities reported particular focus on health problems in the area. Specifically, they reported lack of medical supply for malaria diseases and lack of primary health care centers within the area. Notably, at Mathew's Ridge, over 80% of residents from a community of 200 persons present signs of malaria illness. From the field visits to mining districts this was the single community expressing such concern.

A Knowledge, Attitudes and Practices (KAP) Study (2016) supports the above findings. The study, conducted in the mining districts of Potaro, Mazaruni, Cuyuni, North West and Rupununi revealed that 27% of the 200 respondents indicated that their families resided with them in the mining district. This trend was also observed across all the mining districts, but the Mazaruni district had the largest proportion of families residing with the miners according to the study.

These miners expressed that they are at risk from two main sources of their operations, namely the amalgamation process, and mercury handling. In addition, burning the amalgamated gold to rid it of impurities, of which mercury is predominantly being burnt off also poses a health and safety risk as no retort or devices are used to avoid the inhalation of mercury vapour and emission of mercury to the air due to habitual and economic reasons. During the KAP study, interviewees also noted that that their economic gains are too small to use retorts as retorts may require more gas, and/or purchase from the GGMC or where available.

[37] UNDP. Chemical Management. Gender Mainstreaming-4. A key driver of development in Environment & Energy, 2007. Gender Mainstreaming Guidelines Series, UNDP.
http://www.undp.org/content/dam/aplaws/publication/en/publications/environment-energy/www-ee-library/chemicals-management/chemicals-management-the-why-and-how-of-mainstreaming-gender/Chemicals%20Management%20and%20Gender%20Mainstreaming.pdf?download
[38] Ibid.
[39] Ibid.
[40] Ibid.

Burning off the mercury also affects families living with miners, especially in the indigenous communities in the mining districts. A majority of the miners and community members interviewed during the KAP study are aware that inhaling of mercury vapour affects their health, and the family members will not enter ventilated kitchens or backyards where they are likely burn the amalgamated gold in their house. For miners, they are likely to burn amalgam in their mining camps.

It is also important to note that not only are miners and their families exposed to harmful effects of mercury use, but shop owners (both male and female) who were observed in the mining districts also burning amalgam often in an open pan after buying gold from miners.,. Shop keepers and owners also handle mercury to sell in small flasks or soft drink bottles (Figure XX).

Nevertheless, it is important to note that both miners and community members interviewed do not necessarily know the accurate risks associated with the use and inhalation of mercury, as well as its releases to the land and waterways[41].

- Indigenous communities located especially in gold mining districts

In the indigenous communities around mining areas, miners are predominantly involved in artisanal to small scale gold mining. In addition to the foregoing risks associated with mercury inhalation and handling, mercury releases to land and water sources are of significant concern to all indigenous communities studied during the KAP assessment. Fish (especially catfish (siluriformes) and aimara (hoplias aimara) are staple diets for the indigenous residents as their main source of protein. Both species are predatory fish which feed on small bottom feeders and bioaccumulates mercury in this process. The consumption of these species is the primary concern.

Other indigenous communities were approached in Regions 1 and 7 where there exists a high dependency on gold mining. Communities such as Baramita, where Caribu is the prime language, the vast majority of community members were unaware of the effects of mercury or any mercury impacts in their surrounding environment.

- Gold Smith and Gold Jewellery Manufacturers

Small-scale gold jewellers are also at risks due to their working environment that poses high risks of mercury contamination by poorly ventilated workshops and limited use of protective gear (respirators and gloves). Mercury inhalation from the burning of gold with open flames to remove impurities is a frequent occurrence. Evidence from a survey conducted by Bynoe (2012) revealed that at least 25 per cent of jewellers surveyed indicated that they suffered from a variety of illnesses, including persistent coughing, shortness of breath, fatigue, burning of the eyes and visual impairment among others. Based on interviews, many of the gold jewellers who responded in Georgetown are aware of the Minamata Convention and raised concerns over the health issues associated with mercury use in the gold mining sector, based on their experiences. Some state that asthma and migraine may be the possible consequences of mercury exposure

[41] See the feature film: URL

over the years.

Dentists and assistants Mercury exposure to the dentists and assistants are of primary concern due to the handling (mixing) of the amalgam in their dental practices. This needs to be further assessed, in collaboration with the Ministry of Public Health and PAHO,to evaluate the level and extent of exposure. General Public
This group of the population is at risk due to exposure of mercury from medical equipment, such as mercury contained thermometers, and mercury contained fluorescent lamps, mercury vapour lamps, batteries, and when these products break in the presence of the users. This includes general public as well as medical practitioners.

- Waste workers & waste pickers

Mercury is released at the landfill/waste dump site through broken products containing mercury described above. Waste pickers and workers are most exposed to these broken products. This problem is also compounded by open burning at illegal dumpsites. Together, they contribute to air pollution which affects surrounding communities that are down-wind from the sites, since for instance, the landfill in Georgetown is situated in close proximity to residential areas.

4.2 Assessment of gender dimensions related to the management of mercury.

In this section, the report focuses heavily in the ASGM sector since ASGM has been identified in the Mercury Inventory as the most mercury dependent sector that utilises, emits and releases to waterways by the largest amount of mercury.

Several factors, including differences in occupational roles, household responsibilities, and biological susceptibility, impact gender differences in exposure to toxic chemicals and the resulting health impacts[42]. The National Mercury Profile (2016) assumes that the level and kind of chemical exposures at the workplace often differs by gender because women and men generally perform different duties and responsibilities. However, in the particular case of the subpopulation of miners described above, there is a certain risk that amalgam burning can be performed at home, spreading the mercury risk exposure to the pork-knocker's whole family. At Port Kaituma and Essequibo River it was observed that women and children are around these miners (Figure X). The Guyana Women Miners Organization (GWMO) has commented that women in ASGM come to work in mining sites after sending kids to school, and even kids come join their parents in mining activities after school**.**

Figure : Girl accompanying her mother (Photography: Chika Ohashi)

In ASGM, the study team observed that male miners are more likely to be involved in medium and small-scale mining and work average of 5 days a week, whereas, for many indigenous communities in the mining districts, female members of the communities where mining activities are

[42] Ibid.

predominantly the source of their livelihoods, tend to work as punters on the average of 3 days a week, or when they are available from household tasks and child bearing. For female miners from the coast, they migrate with their partners to work in mining, usually at small-scale operations. At small to medium scale mining camps, women are usually present to cook and take care of the environment. They are often the partners, relatives or mothers of a miner in the camp sites.

The representative of the Guyana Women's Mining Organisation states that there are not differentiated tasks between men and women in ASGM. This could be further elaborated in the National Action Plan or future projects to implement the Convention.

Many female interviewees from the mining towns in Region 1, 7 and 8 responded that it is the task of male members of their families to burn mercury amalgamated gold in open areas or well ventilated rooms. However, shop owners (male and female) in the mining districts often buy gold from miners. A few female shop owner interviewed stated that when they usually burn gold, when she travels, her female employees do the same. There is no official data suggesting estimated number of female artisanal miners in Guyana. Nevertheless, they are often observed punting or going to mine as a group of females or with children.

Figure : women and children found "punting"
(Photography: Chika Ohashi)

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

5.1 Institutional awareness/understanding of Mercury handling

In the process of developing the Mercury Initial Assessment, (e.g. development of the Mercury National Inventory and Mercury National Profile and the present MIA Report), field interviews were conducted with a wide range of stakeholders, including public officials, Non-governmental organizations and industry representatives in Georgetown. Based on these interviews, the limited understanding of issues and impacts associated with mercury were verified.

Some stakeholders such as PTCCB, GGDMA and WWF, known perfectly well the scope of the Minamata Convention and the current implication with this toxic chemical. However, to a lesser extent, some stakeholders such as the CEO of Georgetown public hospital were modestly acquainted with the issue. Based on the information provided by the Customs Department (GRA), the importation is currently done in a standard flask of 34.5 kg. Sellers then can generally

purchase mercury in the UN approved flask from importers and decant varying quantities between 1 and 10 pounds into plastic bottles. Due to the lack of knowledge and awareness of the dangers of mercury, the use of gloves and respirators when handling mercury is not widely recognized as a current practice. Mercury could be found in all kind of containers, PET, plastic bottles and old tin cans among others. According to the GRA, there is no tracking system for mercury once a shipment is released to its consignee.

The understanding of mercury impacts by miners especially in ASGM sector is still limited. Nonetheless, the results of the field visits while conducting the inventory indicate that they were rather familiar with the issues associated with mercury. Nearly 70% of miners interviewed are worried about the future of mining activity and the ban of mercury use.

5.2 Awareness/understanding of miners and surrounding mining communities (Indigenous communities)

In gold mining, mercury is generally stored in plastic bottles which may be placed with water, a hole or a plastic bucket. The largest average quantity stored per location was 15.86 ounces at Karrau. There is a common trend of knowledge and understanding among the miners and community members in mining districts. Both groups are aware that mercury negatively affects them either directly from inhaling or through the environment or consumption of fish. Miners surveyed expressed that mercury is also dangerous to the environment in which they work as well as to their health. Most of the miners interviewed are aware of the negative impacts of mercury use in their or their family's mining practices through their past experience in inhaling mercury. Community members on the other hand are aware of potential negative impacts in the environment (waterways, land and fish) or directly inhaling the substance. Nonetheless, a majority of interviewees do not have correct knowledge of mercury impacts. Some of the respondents highlighted skin cancer and tuberculosis as the impact of mercury.

Miners surveyed felt that mercury is dangerous to their health. The amalgamation of gold with mercury away from the campsite, the maintenance of a clean environment and proper waste disposal were cited as the main actions to protect the immediate environment of miners. Most miners agreed that protective gear should always be worn during mining operations, even though in practice the majority do not use them. The KAP study found und that those engaged in mining for a longer period tend not to use protective gear. Furthermore, despite their concerns about health risks, two thirds of the miners surveyed have knowledge of retort but do not use a retort.

In reality, miners cited the lack of skills and resources, no priority or necessity to protect environment and being unaware of protective measures as the main reasons for not protecting their immediate environment. One respondent stated that their boss does not see the benefits of using retort if gold in small quantity required its use due to the cost of gas for operating the device.

In communities, overall knowledge of the purpose of mercury in ASGM was more prominent among men and youths. The women, a majority of the youths and a few men acknowledged the risks mercury can pose to the community, such as water contamination and consumption of fish. Skin rashes,; birth defects,; damaged lungs and death via inhalation of mercury vapour,; and

respiratory illnesses were some of the human risks noted by the focus groups. A large majority of the males (more than 75%), and about half of the youths (40% to 60%) were involved in ASGM but some of the participants from these two groups were unaware of any associated human risks. With respect to the effects of mercury on the environment, many focus group participants from communities were unaware of any significant effects that mercury poses on the environment.

Artisanal and Small Scale miners and communities' perception of the possible consequences of Mercury-ban in the country and their solutions to zero-Mercury use in ASGM

The findings from the KAP study suggest that about 63% of the miners would not recommend that ASGM be mercury-free. Unemployment was perceived as the main implication of a mercury-ban. However, the majority of the female miners indicated that they would support the recommendation that artisanal and small-scale gold mining be mercury-free.

A majority of female miners and females in the surrounding mining communities showed concerns over the environmental impacts associated with mercury and the necessity to protect the environment. This largely corresponds with sustaining their livelihoods and living, as well as preservation of the environment for future generations. For male miners, it was noted that the principal concern of the mercury impact is the perceived health issues, such as erectile dysfunction and damaged organs. In fact, erectile dysfunction was the most cited risk in the Potaro and Cuyuni districts while damaged organs was the most identified risk by interviewees in the North West district.

In communities, approximately 60% of the pregnant women and women with children do not support mercury use in ASGM, while the majority of the men and more than half of the youths who were involved in ASGM deem mercury as a necessity. However, many of the respondents believe that banning mercury will incur negative impacts for the miners, the mining sector and the country as a whole. The main implication is that if there is an introduction of an alternative the Artisanal and Small Scale Miners will not be able to afford them.

5.3 Training and education opportunities

Article 18(1) (b) of the Convention particularly indicates that signatory States should try to facilitate and promote 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.

Komolo (2016) points out that inadequate training and capacity building of existing technical staff relevant to mercury profiling and enforcement including under inter-agency working arrangements are identified as barriers to implementation of the convention in Guyana.

A training needs assessment was highlighted by Komolo (2016) to improve the detection of chemicals/mercury and support their inspections mandate under the MoU by the Customs Department, GRA. In this regard, GRA does not of itself have licensing or permitting powers over chemicals includingmercury, but the agency is responsible for accepting licenses issued by the other agencies and carries out the first activity of the inspection process pertaining to the entry of chemicals into Guyana. GRA only handles imports at designated/gazetted points of entry into the country with its officers undertaking inter-agency functions for the PTCCB with respect to inspection of chemicals including mercury.

Mining and surrounding communities (ASGM sector)

The KAP study indicates that 99% of the respondents had never benefitted from training on mercury alternatives, however most (90%) would like such an opportunity.

Training in the past has not particularly focused on mercury-free mining techniques among artisanal and small-scale miners. As such a collaborative effort should be made to elevate training programmes as well as education and awareness campaigns as a priority.

The recommendations highlighted from the KAP study were proposed to assist in creating an evidence-based Communication Strategy on a comprehensive education and awareness campaign, targeting populations at risks, with heavy focus on miners and mining communities to disseminate correct and influential information on risks associated with the use of mercury in ASGM. Equally, capacity building, provision of information and guidance should be priorities for the GGMC in respect of aligning ASGM with sustainability.

Recommendations highlighted in the KAP study are:

- A series of training programmes should be organised for specific mining locations, using a phased approach. Topics such as mercury free techniques, health and safety issues related to gold mining, mining regulations related to mercury, and use of retorts should be discussed and demonstrations should form part of the curriculum.
- An awareness seminar on The Minamata Convention is urgently required and should target GGMC and EPA officials, health care workers in the community, and any other group deemed relevant. This would improve their own awareness and knowledge of mercury related issues and would indirectly strengthen their monitoring capacity.
- Posters with simple language and very clear illustrations on the health effects of mercury use and exposure should be produced and mounted at all health care centres in the mining communities.
- Capacity building, provision of information and guidance should be priorities for the GGMC in respect of aligning ASGM with sustainability. Further, adequate training in the use of alternative technology to recover gold should be given urgent attention.

In promoting education and awareness, a Communication Strategy was developed to propose communication interventions that are relevant to, and meet the needs of, specific target groups, in a manner that is culturally sensitive and suitable for low-literacy populations. The , strategy was developed in 2016 to achieve the above overarching goal while providing the best possible value-for-money and greatest impact within a feasible national budget and timeframe.

Based on the findings from the past documents under the MIA project, the Communication Strategy proposes the following goals:

- To deliver education about the Minamata Convention, in order to build public support for the Convention and specifically, for the goal of reducing the use of mercury in small and artisanal mining, including by raising awareness of how the use of mercury in small and artisanal mining contributes to exposure, use, release and disposal;

- To deliver education on the health and environmental effects of mercury. In addition to clearly articulating the impacts on human health, this will include how human and environmental health are interconnected, underscoring the importance of a clean and safe environment as the basis for a clean and safe life.

- To promote civic responsibility and support behaviour change towards improved mercury use practices in order to reduce the use of mercury and to minimize its health and environmental impacts. This will include the reduction and sound management of mercury waste; promote the use of best available techniques (BAT) and best environmental practices (BEP) to minimize emissions and unintentional releases of mercury to the environment; and promote the use of protective measures to minimize or eliminate exposure to mercury among workers and vulnerable populations.

- To promote feasible alternative gold extraction practices for small and artisanal miners which are accessible and relevant to target audiences. Options selected for promotion must be practical and be implemented quickly and without significant resource expenditure. These may include the use of concentration methods that rely on gravity such as panning, sluicing, shaking tables, spiral and vortex concentrators and centrifuges; the use of other concentration methods such as magnets and flotation; the use of gold recovery methods such as direct smelting and chemical leaching (EPA, 2016).

- To generate widespread interest and support among a national audience for the Minamata Convention and the goal of controlling the use of mercury.

- To orient officials towards the needs of the target mining population, generating information on how regulatory and technical assistance systems can meet the needs of populations to support reduced use of mercury.

The strategy proposes two interventions to achieve the above goals:

- Behaviour Change through a Social Marketing Approach
- The Information, Education and Communications (IEC) Campaign

The Communication Strategy includes a number of proposed training and campaigns with

estimated budget, one of which is to have community "champions" to train and educate other community members. In so doing, identification, training and supporting of community champions (up to 12 persons) per community is recommended.

Both the KAP study and the communication strategy suggest that there is a need for the collection of additional baseline data on health issues targeting miners and mining communities. The methodology should include medical tests. Additionally, a feasibility study that focuses on the use of alternative technology in ASGM in Guyana should be conducted, using participatory rural appraisal methods to produce the type of evidence that could reliably inform policy making within the sector.

Chapter VI: Implementation Plan & Priorities for Action

This section describes Guyana's priorities for action.

Priority 1: Artisanal and small-scale gold mining
This is a significant priority in Guyana having regard to the prevalence of gold mining. The primary institutional stakeholder is the Guyana Geology and Mines Commission (GGMC). 'Actions and interventions in this area would have to be supported from a policy perspective, by the Ministry of Natural Resources and the Ministry of the Presidency. The supporting stakeholders would include the Pesticides and Toxic Chemicals Control Board (PTCCB), Environmental Protection Agency (EPA), educational training Institutions, the Guyana National Bureau of Standards (GNBS) as well as mining associations. In Amerindian villages, village councils will have to be primary stakeholders. Appreciating that mercury is imported into Guyana, the GRA is a critical supporting stakeholder who should be included in mining related actions.

Responsible Party: GGMC, Ministry of Natural Resources

Time line: Continuous, National Action Plan (NAP) to be submitted to the Secretariat no later than three years after entry into force of the Convention.

Actions and Interventions

- Improve information sharing frameworks between the PTCCB and the GGMC regarding the actual demand for and use of mercury in the mining sector prior to importation;
- Ensure that there is proper storage of mercury when it is being transferred and transported from the place of storage to the place of use;
- Improve the data collection framework regarding the use of mercury in mining;
- Where necessary review and update Environmental Management Plans;
- Give consideration to integrating mercury related issues as part of the new conditions for renewals of existing authorisations;
- Continue preparation of the National Action Plan as required by the Convention;

- Promote and develop incentives for adoption of non-mercury technologies;
- Promote training and capacity building on the reduced use of mercury, use of retorts, technologies and techniques that require less mercury;
- Promote learning of ASGM miners rehabilitation of old mining sites;
- Explore and where feasible promote the recycling of mercury in mining; and,
- Increase assessing, monitoring and reporting of the mercury captured by the retort system used in the mining process, which will determine that actual levels of mercury released, thereby supporting stakeholder perspectives, and allowing for evidence based decisions.

Priority 2: Reduce release of mercury compounds to the soil and water from point sources

There is a need for releases of mercury and mercury compounds on land from all sources to be specifically addressed. It was observed by the members of the GGMC Environmental Division that the system of retorts employed in the process of gold mining has served to manage the release of mercury compounds to the soil and water from mining. The primary stakeholders from a legislative perspective would be the GGMC and the EPA. The instrument would be the **Environmental Protection (Water Quality) Regulations 2000.** In areas where other stakeholders possess and exercise powers, there would be a need for collaboration and an integrated approach to addressing mercury releases both on land and water.

Responsible Party: GGMC and EPA.

Time lines: 2017 onwards.

Actions and Interventions

- Improve the technology utilised by the stakeholders to monitor and measure the technical levels of mercury releases from all sources;
- Increase financial resources available to monitor and measure mercury releases;
- Improve the technical and human resource capacity of the EPA and GGMC to address mercury release related complaints;
- Strengthen the institutional collaboration between the EPA and the GGMC in addressing cases of releases of mercury to land and water;
- Review and if necessary update and amend the Environmental Protection (Water Quality) Regulations including the setting of standards and guidelines for releases into the water;
- Conduct awareness raising and training on existing and amended regulations;
- Maintain an inventory of releases from relevant sources; and,

- Develop national standards/guidelines as stipulated in the Convention for the maximum releases to water and soil.

Priority 3: Reduce emissions of mercury compounds to the atmosphere, soil and water from point sources

The EPA and the GGMC would be the lead stakeholders in implementing the Convention objectives regarding emissions. The empowering instruments for the EPA include the **Environmental Protection Act** and the **Environmental Protection (Air Quality) Regulations 2000.** The GGMC would be empowered under the Mining Regulations. The realisation of these objectives cannot, however, be achieved without a determination of the sectors of industry which generate mercury emissions. Emissions inventories are therefore a critical input for the execution of this priority. Collaboration and partnerships which include the GGMC, gold miners and other producers of emissions are further necessary to realize this priority.

Responsible Party: EPA and GGMC

Time line: 2017 onwards.

Actions and Interventions

- Establish incentives for adoption of technological solutions;
- Apply emission control technologies to limit emissions of mercury;
- Review and if necessary update and amend the Environmental Protection (Air Quality) Regulations;
- Conduct awareness raising and training on existing and amended regulations;
- Prepare a national plan setting out the measures to be taken to control releases from point sources and the plan's expected targets, goals and outcomes to air;
- Support the introduction of best available techniques and best environmental practices to control emissions from relevant sources;
- Improve monitoring and reporting capacity on mercury levels in air; and,
- Develop national standards/guidelines as stipulated in the Convention for the maximum emissions to air.

Priority 4: Undertake awareness raising among priority groups and build capacity through training on mercury management

Training and awareness is considered to be a cost effective best practice methodology to achieve mercury management objectives. Article 18(1)(b) of the Convention particularly indicates that signatory States should within capabilities, facilitate and promote 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 Ministries, such MoPH and EPA, Department of the Environment, intergovernmental and non-

governmental organizations and vulnerable populations, as appropriate. In Guyana it has been observed that there is a need for capacity building and training as a priority.

Responsible Party: GGMC and the Ministry of Natural Resources.

Time line: 2017 onwards.

Actions and Interventions

- Conduct training on the management of elemental mercury, as well as mercury containing products and wastes for institutions and entities that have responsibilities pertaining to mercury management;
- Conduct tailored training on mercury management for at risk groups;
- Conduct awareness raising among the larger public on the human health and environmental effects of mercury and mercury compounds;
- Share the results and outcomes of assessments and studies pertaining to mercury with stakeholders and the larger public through the creation of a repository for all relevant studies;
- Promote the development and implementation of science-based educational and preventive programmes on occupational exposure to mercury and mercury compounds; and,
- Where appropriate, build on existing monitoring networks and research programmes.

Priority 5: Improve framework for sound Interim Storage of Mercury

The primary stakeholders are the GGMC, PTCCB, GNBS and EPA. The Ministerial Responsibilities are shared among the Ministry of Agriculture, the Ministry of Natural Resources, the Ministry of the Presidency and the Ministry of Business. Measures for the interim storage of mercury and mercury compounds can be achieved utilising the provisions of several existing laws. This priority can be addressed through mechanisms of institutional collaboration and coordination.

Responsible Party: GGMC, PTCCB, GNBS and EPA.

Time line: 2017 onwards.

Actions and Interventions

- Develop national standards/guidelines as stipulated in the Convention for the interim storage of elemental mercury particularly, storage and transportation from the point of importation to the point of use;
- Ensure that persons handling mercury are properly informed of the requirements for the safe handling of mercury as well as the health-related consequences of improper storage, handling and transportation;
- Review and revise the EPA - Environmental Guidelines for Transportation, Storage and Occupational Handling of Chemical/Industrial Hazardous Waste; and,

- Conduct awareness raising and training on existing and amended codes and guidelines; and Review and update the GYS 203:2001 - Code of Safety for Mercury.

Priority 6: Advance and promote health related aspects

Article 16 of the Convention requires several actions and initiatives regarding health aspects. Because they are so toxic, mercury and mercury compounds can harm both people and animals. There are several measures which can be taken by multiple stakeholders to realise the implementation strategies and guidelines desired by the Convention. It is generally observed both nationally and internationally that the health-related consequences of mercury related activities are neither understood nor appreciated. It is further noted that the Convention is based on health concerns, especially in developing countries, resulting from exposure to mercury of vulnerable populations, especially women, children, and, through them, future generations, as well as, that one of the objectives of the Convention is to protect the human health from anthropogenic emissions and releases of mercury and mercury compounds. In this context, the advancement and promotion of health-related aspects should be a priority.

Responsible Party: MoPH and MoSP.

Time line: 2017 onwards.

Actions and Interventions

- Promote the development, and implementation of strategies and programmes to identify and protect populations at risk, particularly vulnerable populations, and which may include adopting science-based health guidelines relating to the exposure to mercury, and mercury compounds, setting targets for mercury exposure reduction, where appropriate, and public education, with the participation of the public health and other involved sectors;

- Encourage the development and implementation of science-based educational and preventive programmes on occupational exposure to mercury and mercury compounds;

- Advance appropriate health-care services for prevention, treatment and care for populations affected by the exposure to mercury or mercury compounds;

- Establish and strengthen, as appropriate, the institutional and health professional capacities for the prevention, diagnosis, treatment and monitoring of health risks related to the exposure to mercury and mercury compounds;

- Establish mercury related interventions in the area of occupational health and safety through hazardous materials inventory, hazardous chemical identification and data sheets; and,
- Improve monitoring and reporting capacity on mercury levels in food.

Priority 7: Enhancement of the scope and basis of interventions through Regulatory Framework

Clear and concise definitions of mercury and mercury compounds are required. The definitions will allow stakeholders to determine the scope and basis of interventions. The GGMC would be responsible for addressing Convention measures related to mining. The GNBS would be responsible for the scope and content of existing standards and the GRA would be responsible for customs and trade measures.

Responsible Party: GGMC and GNBS.

Time line: The timeline of fifteen years established by the Convention. 2017 onwards.

Actions and Interventions

- Review and where necessary revise the GYS 203:2001 in light of Convention requirements and definition of mercury;
- Develop and implement a scheme of prior informed consent procedures;
- Drafting, approving and adopting import limitations on mercury containing products controlled under the Convention and transpose requirements for the prior written consent of mercury import/export into national legislation; and,
- Developing national standards/guidelines as stipulated in the Convention for the import and export of mercury.

Priority 8: Improve waste management practices for mercury and mercury containing wastes

Having regard to the provisions of Article 11, collaboration in implementation could be led by the EPA and linked to the PTCCB, with policy and strategy guidance from the Ministry of Agriculture.

Responsible Party: EPA and PTCCB.

Time line: 2017 onwards.

Actions and Interventions

- Take into account any guidelines already developed under the Basel Convention;
- Review and where necessary revise the **Environmental Protection (Hazardous Waste) Regulations**;
- Conduct awareness raising and training on existing and amended regulations;
- Develop national standards/guidelines as stipulated in the Convention for the improvement of waste management for mercury;
- Introduce and promote economic and financial incentives; and,
- Implement technological measures to treat mercury wastes.

Priority 9: Contaminated sites

The EPA in collaboration with the GGMC would be the lead stakeholders in the implementation of the Convention framework regarding contaminated sites.

Responsible Party: EPA and GGMC.

Time line: 2017 onwards.

Actions and Interventions

- Establish mechanisms for the identification of mercury contaminated sites.
- Develop an appropriate risk assessment framework, including: risk analysis, risk communication and risk management;
- Explore the preparation of regulations under section 68(1)(n) of the **Environmental Protection Act** which governs the location of waste disposal sites, establishing classes of waste disposal sites, and designating parts of Guyana in which no waste disposal sites, or any class thereof, shall be established or operated; and,
- Ensure that regulations and frameworks are linked to other strategies and plans governing solid waste disposal.

Chapter VII: Mainstreaming of Mercury Priorities

There are several factors which contribute to determining priorities for mainstreaming actions. These factors include actual mercury use in a Guyanese context, existing national policies and priorities, inputs from stakeholders, international experiences with local adaptations as well as emerging general and specific best practices.

Mercury use in Guyana allows priorities for mainstreaming action to be based on that use and the chain of activities related to mercury use in Guyana. A useful technical perspective which supports the approach to establishing mercury-related priorities would be to examine the life cycle of mercury use. At present in Guyana, mercury is primarily used in the field of ASGM.

Mercury interventions and actions can be supported by legislative review, and amendment of laws, regulations and orders in which mercury is defined. The effect of such legal interventions would provide certainty and predictability in the scope and basis of mercury related interventions. Two further options which provide a basis for intervention would relate to associated health aspects, and manufacturing processes in which mercury compounds are used provision for which is made in the Convention.

The summary of observations in the Legal and Regulatory Review Report (Housty, 2016) identified national policies and plans where mercury priorities will be included in are:

- There are no significant barriers to implementation.
- The provisions of the Guyana Geology and Mines Commission Act, the Mining Act and the Amerindian Act can be utilised to achieve the commitments contained in Article 7.
- The current regulations regarding mercury use will have to be reviewed and amended to

meet Convention commitments, particularly the provisions which permit mercury use.

National Action Plan on Elimination of Mercury Use

National Action Plan (NAP) on Elimination of Mercury Use was first drafted by GGMC funded by WWF in 2015. The draft NAP is currently being reviewed to reflect findings, data and recommendations of the MIA report to develop an evidence based NAP. The Mercury NAP will play a significant role in establishing the baseline for actions that must be carried out during the implementation phase of the convention. Likewise, it will serve to monitor the level of progress of actions and activities.

In developing the action plan, it would be important to appreciate that there are several measures which exist in mining regulations which already address the use of mercury. The effect of these measures is that Guyana can be seen as being ahead of the schedule of implementation of Convention measures, thereby supporting elements the notification requirements of Article 7(3).

The framework for the development of the national action plan required by Annex C exists in the current legislative framework of Guyana. The legal framework for achieving the objectives of Article 7 is supported by the provisions of the Guyana Geology and Mines Commission Act Cap. 66:02, which governs the Guyana Geology and Mines Commission, the institutional stakeholder responsible for administering the Mining Act. The relevant functions of the Guyana Geology and Mines Commission included under section 4(1) of the Guyana Geology and Mines Commission Act Cap. 66:02.

In considering the provisions of Article 7(2) which requires that: “Each Party that has artisanal and small-scale gold mining and processing subject to this Article within its territory shall take steps to reduce, and where feasible eliminate, the use of mercury and mercury compounds in, and the emissions and releases to the environment of mercury from, such mining and processing”, it must be appreciated that there are existing provisions in Guyana’s law which have sought to address the use of mercury in gold mining. These requirements can be found in the Guyana Geology and Mines Commission Act Cap. 66:02. Having regard to the importance of mining in the context of Guyana, the existing requirements and measures are set out in full. It is noted that the existing regulations provide a basis for Guyana to include in the Action Plan contemplated by Annex C section 1(c) that steps have already been taken to formalise and regulate the artisanal and small-scale gold mining sector.

General regulation of mining in the context of the environment can be found in the provisions of the Mining Environmental Regulations No. 3 of 2005. General provisions are contained in Regulation 127 (1) which provides that No person shall use elemental mercury or any form of mercury, except in accordance with these Regulations.

Regulation 128(1) provides that in any process whereby the vaporisation of mercury is made possible, due care, as stated in regulation 127(4), shall be exercised to ensure that no person shall be exposed to the resultant fumes; and a warning shall be given to all persons in the vicinity that such process is in operation by way of a siren or notice. Under Regulation 128(2) A retort approved by the Commission shall be used at all times when there is burning of amalgam. Such retort shall be registered with the Commission. The provisions of Regulations 127 and 128(1) are permissive in nature and not prohibitive, the requirement in Annex C of the

Convention is to set targets and actions for elimination of the use of mercury. In order to achieve the objective of elimination, permissive articles such regulation 128 would have to amended or repealed.

There are existing provisions relating to storage contained in Regulation 135. This regulation provides that mercury, cyanide or other poisonous substances used in any mining or milling process shall be kept in a separate compartment specially set aside for the storage of such poisonous substances. The compartment shall be locked and shall be in the care of a person duly authorised by the manager. With the main objective of Annex C and Article 7 of the Convention being the elimination of mercury use, the provisions of Regulation 135 may have to be amended to exclude mercury storage with a new provision regarding prohibition included in the Regulations.

Regulation 223 specifies that the Commission, the Environmental Protection Agency, the mining associations and educational training institutions, shall in accordance with the curricula approved by the Commission jointly or singularly, provide training and certification courses for miners on the proper use of mercury and cyanide and environmental hazards associated with such use in mining activities. This Regulation further supports the achievement of the objectives of Article 7(4)(b) of the Convention.

Regulation 224 provides that the Commission shall prepare a Code of Practice that will provide further guidance on practices involving mercury use, cyanide use and disposal of effluent which shall form part of these Regulations. It would be important to determine the status and content of the Code of Practice. The Code of Practice would specifically inform the commitments in Annex C section 1(d) regarding baseline estimates of the quantities of mercury used and the practices employed in artisanal and small-scale gold mining and processing within its territory.

Regulation 236 further supports the realisation of Convention Provisions Annex C section 1(h) as it makes provisions for the Commission, the Agency, the Mining Associations and Educational Training Institutions to be in accordance with curricula approved by the Commission together or individually to provide training and certification courses for miners on the proper use of mercury and cyanide, and environmental hazards associated with such use in mining activities. This Regulation further supports the achievement of the objectives of Article 7(4)(e) of the Convention, related to Partnerships to assist in the implementation of their commitments under Article 7(4)(e).

Regulation 237 requires that the Commission prepare a Code of Practice that will provide further guidance on practices involving mercury use, cyanide use and disposal of effluent which shall form part of these Regulations.

Regulation 252(1) mandates that three years after the commencement of these Regulations, save and except for small scale mines, environmental effects monitoring shall be conducted for every mine, including new mines and (2) that two years after the commencement of these Regulations, each environmental effects monitoring programme shall be required to be submitted to the Commission for approval as part of the Environmental Management Plan referred to in regulation 248.

A further opportunity to achieve Convention objectives would be through the utilisation of the

provisions of the Amerindian Act Cap. 29:01, specifically in the implementation of mercury-related measures as part of the small-scale mining on lands within the content of the Amerindian Act. The relevant provisions of the Amerindian Act include sections 48, 49 and 52. Section 48 of the Amerindian Act deals with pre-mining activities allows for in information to be obtained under the following areas (b) make available to the Village any information which the Village Council or Village reasonably requests; (c) give the Village Council a written summary of the proposed mining activities including information on- (ii) a non-technical summary of the mining activities; (iii) the site where the mining activities will be carried out; (iv) the length of time the mining activities are expected to take; (v) likely impact of the activities on the Village and the Village lands (vi)- any other matters which the Village Council on behalf of the Village requests and which are reasonably relevant.

A further opportunity to address the use of mercury can be seen in the contents of the negotiated agreement under section 49 of the Amerindian Act. Specifically, the expressed content of the agreement required by Section 49(3), which include: (3)- If the Village so requires, the miner and the Village shall include in the Agreement - (b) requirements for reporting to the Village Council; (c) an environmental protection programme; (d) a waste disposal plan; and (g) a health programme including providing medical supplies to health workers for use by the village.

Recommendations

To summarise, the national priorities were highlighted in the report. The most relevant priorities and proposed future actions for the implementation of the Minamata Convention are directly linked to ASGM. In this section, principle recommendations are listed in the area of mercury trade, contaminated sites, regulatory amendment, institutional strengthening and collaboration, and mercury use.

Mercury trade

As a first step, the Guyana Geology & Mines Commission (GGMC) should introduce more restrictive requirements to approve a permit to import mercury instead of a “no objection letter for the importer”. Secondly, according to the mercury inventory results, an initial reduction by 10-20% of the current baseline (80.668 ton/y), might be a consistent step to immediately start improving mercury management in Guyana.

Thirdly, the Guyana Revenue Authority (GRA) should open the Tariff Heading of mercury (the specific technical description of each one sub-heading), to improve control over the import of mercury and products with mercury content. It is highly suggested that this component be developed at the CARICOM level with Guyana playing a central role as one of the first nations ratifying the Minamata Convention.

Contaminated sites

Regarding contaminated sites, the National Mercury Profile promotes a comprehensive proposal to address this issue, where a number of complementary priority matters could be addressed as: risk assessment, occupational exposure and even research to improve the understanding of mercury contamination over time.

All these technical recommendations should be translated into systematic/regular analytical monitoring surveys, under a priority list of potential risk, linked to human exposure (communities in the vicinity to ASGM areas).

Therefore, it is relevant to define a National Action Plan (NAP) for mercury, which can lead the decision-making process properly. The NAP will establish the baseline for actions that must be carried out during the Minamata implementation phase. Likewise, it will serve to monitor the level of progress of taken actions and activities.

Within the framework of the NAP, it is suggested to undertake a comprehensive screening of mercury obsolete stockpiles. This NAP should be focused both identifying any mercury stockpiles that might remain (old equipment with mercury content at government properties) but also to get an overall quantitative data base of mercury concentration levels at potentially contaminated old mining sites (historical gold mines).

In that regard, the definition of a National Reference Laboratory (NRL) that can provide analytical services fully dedicated within the framework of the Minamata Implementation process, becomes a key important step. Namely this NRL should be internationally accredited (ISO/EIC 17025) and to be available to conduct mercury characterization in all relevant environmental matrix (e.g. mercury in water, sediments, soils, air, particulate matters, liquid and solid wastes, among others).

Likewise, this NRL should be trained with human and technical capabilities to include biomonitoring within the spectra of analytical services, the – biosamples (mercury analysis in urine, in blood, in hair) as part of its expertise.

Regulatory amendment

Modify some of the legislative instruments in order to include mercury in standard guidelines (e.g. EPA Environmental Protection (Water Quality) Regulation 2000, Environmental Protection (Air Quality) Regulation 2000 and other relevant regulations, in order to mainstreaming mercury as target compounds, under these legislations.

Institutional strengthening and collaboration

Strengthen the current structure of public agencies dealing with environmental matters, with special focus on human resources (professional support, economic incentives, capacity building), including the following elements:

- Clarify and/or re-define functions through the MoU mechanism, e.g. Pesticide and Toxic Chemical Control Board (PTCCB) and GGMC concerning mercury importation institutional scope;
- Establish collaborative agreements among public environmental agencies dealing with environmental matters to mitigate high costs associated with enforcement and environmental compliance in Guyana's Hinterland regions. This will address human and technical resource needs while accomplishing a new mandate focused on the Minamata Convention.

It is suggested that support be provided for the development of local technical capacities related to waste management (municipal, industrial and hazardous waste) as one of the environmental compartments to address the mercury concern.

Use of mercury

Finally, from the technical perspective and experience in environmental matters, the following proposal, is perhaps one of the critical elements within the Minamata Implementation phase; addressed to the most sensible issue - Guyana's economy.

The use of mercury in gold mining is a matter of national scale as unrestricted and officially authorised miners are using mercury. It is widely acknowledged that mercury usage is a preferred technique for miners in Guyana, largely because of 1) their accumulated knowledge of its application 2) the ease of its application and, 3) its relative cost effectiveness. Traditional use of mercury in gold mining for a number of modest people in the Hinterland irrefutable. Therefore, a gradual phase-down, probably in a longer period in terms of time, but in an environmentally sound manner might be the best way to carry out the transition phase, until full phase out.

These tasks are incorporated into a "Mercury Priority Program" (MPP), which describes and interrelates the tasks, for a better understanding and to facilitate its implementation process. Likewise, due to their different nature, these tasks are grouped into two components (I and II), which are defined as follow:

COMPONENT I. Tasks related to mercury management

In order to fulfil the implementation of Minamata Convention and the total ban of mercury use in mining by 2025 committed by the Guyana government, the following priority tasks are identified below:

At customs level:
Freeze of mercury import → Gradual reduction of mercury import → Mercury open tariff heading at GRA.

Mercury trade:
GGMC increases requirements to importers → Implementation of Mercury Recycling Centres (MRC) in mining district.

Environmental sound management of mercury:
Awareness raising programs → Improve safety measures in gold mining.

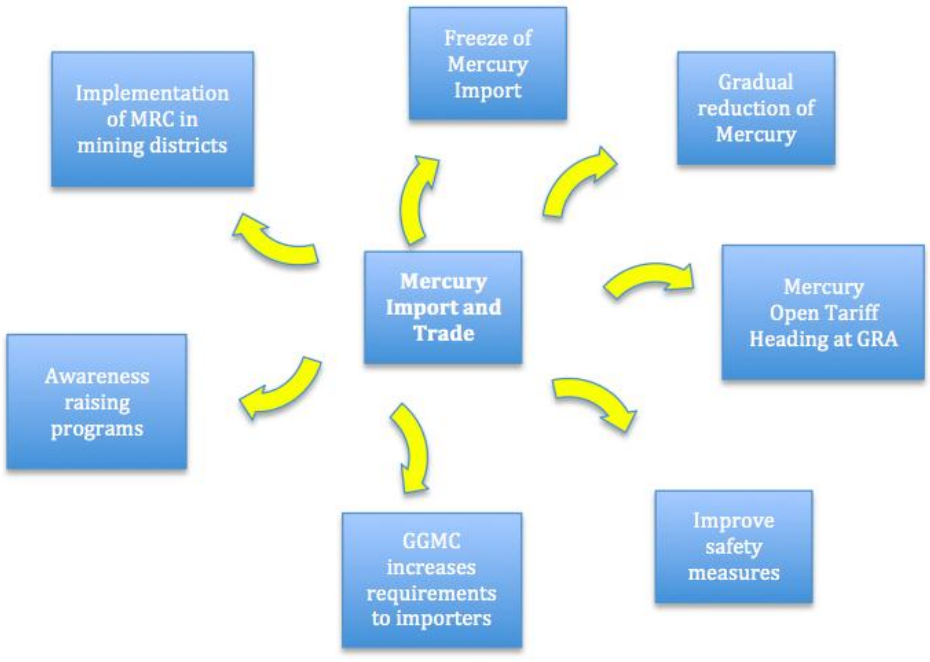
These tasks are related to "import and trade of mercury" as key drivers (Figure), due to the excessive amount of mercury circulating in the country as a result of the free import from abroad. Therefore, restrictions to mercury import must be urgently implemented.

Given that most of the gold production in Guyana uses mercury as a gold amalgamation method, and employ large quantities of workers / miners (artisanal, small-scale and medium-scale), it is essential that restrictions are carried out in a manner that mitigates adverse effects on miners' economic situation in the Hinterland, especially on the livelihoods of pork-knockers/punters.

Hence, it is necessary to identify a "transition phase" toward the total ban of mercury use (Table VI-6) and establish the scope of this phase, identifying risks, opportunities and benefits that represent the proposed tasks.

Table VI-6. *Transition Phase toward total ban of mercury use in Guyana.*

Transition Phase (years)									
2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Freeze of mercury imports		Gradual reduction of mercury imports, starting off at a baseline level							Phase out



Scheme VI-1. Component I – Tasks related to mercury management.

The "transition phase" is understood as the period established from the date of freezing mercury imports until the total ban of mercury use in Guyana. This period includes the free mercury technologies' introduction, in gold mining. According to the commitment of the Government of Guyana, this period should last 8 years, starting from 2017.

This phase covers the whole mercury gradual reduction period, where it is assumed that restrictions on the availability of metal could have a negative economic impact on the artisanal and small-scale miners' communities. The biggest impact is expected at the beginning, due to the implementation of the measure, assuming the market will adapt a more rational use of mercury than before. Therefore, it is proposed that government develops an intervention within the MPP to minimize the potential economic and social effects of restricting availability of mercury on the market.
The implementation of mercury recycling/recovery centres in the vicinity of mining communities (MRC) is proposedto compensate the reduced supply of metal, through efficient recycling/recovery, developed under internationally recognized quality standards. These recycling/recovery centres will help to maintain the necessary amount of mercury required in the country and at the same time, reducing losses and emissions to the environment as a result of inadequate handling of mercury amalgam. Finally, the reduction in mercury imports will be compensated while the implementation of mercury-free technologies is consolidated.

The benefits of this measure are:

- Development ofrecycling of mercury under high quality standards;
- Improved scontrol measures on the use of mercury and practices in the use or non-use of the retorts;
- Decreased amalgam burning under inadequate conditions;
- Increased control over the most exposed and vulnerable populations to bad practices in burning of mercury amalgam;
- Awareness Raising of communities in the vicinity to the mining centres, about the harmful effects of mercury; and,
- Increaseds control (health, social and environmental) of small, artisanal miners (pork-knockers) populations and their environmental practices.

Operation of MRC

These centres are based on the model proposed by the Montreal Protocol, comparing measures restricting imports of Ozone Depleting Substances (ODS). However, this is not a compulsory action but a measure that a country can apply to address the reduction of imports, in this case mercury during a transition period. Private operators should operate these centres, implemented by tender,subsidies or another modality. Once in operation, these centres could also be operated by public agencies (e.g. GGMC)upon Nnational Aauthority .. To encourage and promote the use of these centres, the government can establish incentives to the purchase price of gold recovered from burned amalgam.

From the field visit to the mining districts, it was possible to verify the existence of facilities for burning mercury amalgam. It is thus presumed that it is an informal practice already operating

in the country. Therefore, the challenge is to establish a formal operating procedure, under the required quality standards.

Additionally, the implementation of MRC demands low Capex (capital investment) and it is a measure for commencing s the transition phase in less than three years while mercury-free technologies are introduced in gold mining. Therefore, the implementation of MRC is conceived as a temporary measure to help overcome possible negative effects of unavailable metal in communities, particularly for poor families (pork- knockers/punters). Especially in the beginning of the transition process.
A brief description of each of the suggested tasks is given below:

Tasks in Component I.

1. Open Tariff Heading at GRA.

This is an important component at GRA. Open the Tariff Heading of mercury (the specific technical description of each sub-heading), in order to improve control over the import of mercury and specially products with mercury content. It is suggested that this component be developed at the CARICOM level with Guyana playing a central role as one of the first nations to ratify the Minamata Convention.

2. Freeze of mercury import.

Initial freeze of mercury import is critical to initiate the required control over mercury circulating within the country. This step should be followed by a reduction (import) measure of the current baseline (80 ton/y).

3. GGMC increased of requirements for importers.

The GGMC should introduce additional requirements to approve a permit for importation of mercury. The current requirement from the GGMC in terms of providing a “no objection letter” should be replaced by more restrictive requirements to the mercury importers. It is suggested that mandatory requirements be defined for each mercury importer to have a better control and traceability of the mercury circulating in the country. In addition, these restrictions should provide useful information about the use and final destination of the imported metal.

4. Gradual reduction of mercury import.

This reduction measure can be done in a similar manner as the reduction measures applied within the Montreal Protocol. In this regard, considering the historical mercury consumption, it should be defined as a baseline and a calendar with an initial reduction of 10%-20%, for a period of 6-9 years of systematic reductions, to be evaluated by the MCM upon the development of the National Action Plan.

5. Improve safety measures in mining districts.

The need to support miners implementing safety procedures emerged as a major concern based

on field observations (see Figure VI-16, 17).

Figure VI-16. Equipment and electrical devices currently used at a gold mining site.

The field interviews also revealed that safety procedures are poorly implemented (Figure VI-17). Note: a dredge camp (the majority) is already a precarious "facility" (normally a tent or a shelter).

An integrating approach might be used, perhaps including public agencies dealing with Occupational Health and Safety and the Ministry of Social Protection. An important point is to have a battery of elements previously defined within the National Action Plan, to address health and safety issues in artisanal and small-scale gold mining, thus avoiding a follow up with reactive responses (under the Minamata implementation phase).

Figure VI-17. Electrical panel at a gold mining site.

A lack of safety procedures is commonly seen.

6. Awareness raising programs

, Over 80% of approximately 25 miners interviewed during the field visit understood the mercury threat and the need for global action within the Minamata Convention particularly when the issue was focused on the potential effects of mercury on their children and future generations.

Most of miners are also willing to adapt mercury free gold mining technologies.

A transition period will be mandatory as well as intensive awareness raising programmes in the Hinterland Implementation Mercury Recycling Centres MRC.

The task considers the implementation of low-budget Mercury Recycling Centres (MRC) at a national scale in Guyana. The main purpose of MRC is, to provide service to miners in mercury amalgam burning under high quality standard procedures.

The cost of implementing such MRC should be under US $ 5,000. The target of this task is similar to the massive distribution of retorts to small-scale miners developed several years ago by the Gold Board in conjunction with the Guyana Geology and Mines Commission GGMC although this initiative did not have the expected results possibly due to limited field control in the use of retorts. This time the reduction of mercury importation should be the main driver to promotes and facilitate the use of recycling and MRC. The proposed business model is already implemented in Guyana (in an informal manner).

Additional advantages:

Formalizing ASGM sector, complying with article 7 of the Minamata Convention, specifically under its paragraph 4 a) and f) will facilitate:

1. Implementation of sound management of mercury used in the country; Notably, the mercury baseline is 80,668 kg and the estimated mercury emission is 28,790 kg Hg. The gap is significant and likely to be artisanal; illegal produced gold might be addressed (at least partially) through such Centres;
2. Improved control measures of mercury (use, distribution) within the country;
3. Increased legal gold declarations;
4. Safer recovery procedures (far from children, good ventilation during amalgam burning, etc.);
5. Increased mercury awareness within communities with specific emphasis on mercury wastes;
6. Conduct of regular health monitoring control and social economical profile (survey) over this sector;
7. , The application of mid-term environmental and economic policies through a social/economic and environmental survey of informal workers over this sector. This will enable better control over the transition period to mercury-phase out in Guyana.

Risks:

1. Unknown size of the sector which is using the model today (the model already operates informally);
2. Effects from illegal gold mining (12 US$ millions in gold smuggling from Guyana to Curacao[43]).

[43] http://curacaochronicle.com/columns/the-silence-on-the-curacao-gold-smuggling-case-is-deafening/

In regards to the technical infrastructure for recovery of mercury, during the field visit, an individual was found with a “recycling device”, a sort of retort that is currently used for mercury amalgam burning (see Figure VI-18). A small trader was identified at Arakaka with this “artisanal mercury distillation device, a typical artisanal retort normally used for amalgam burning.

Figure VI-18. Retort adapted for indoor burning amalgam at Arakaka.

The challenge therefore resides in ensuring environmentally sound implementation of this model during the transition period.

COMPONENT II. Technical tasks related to mercury

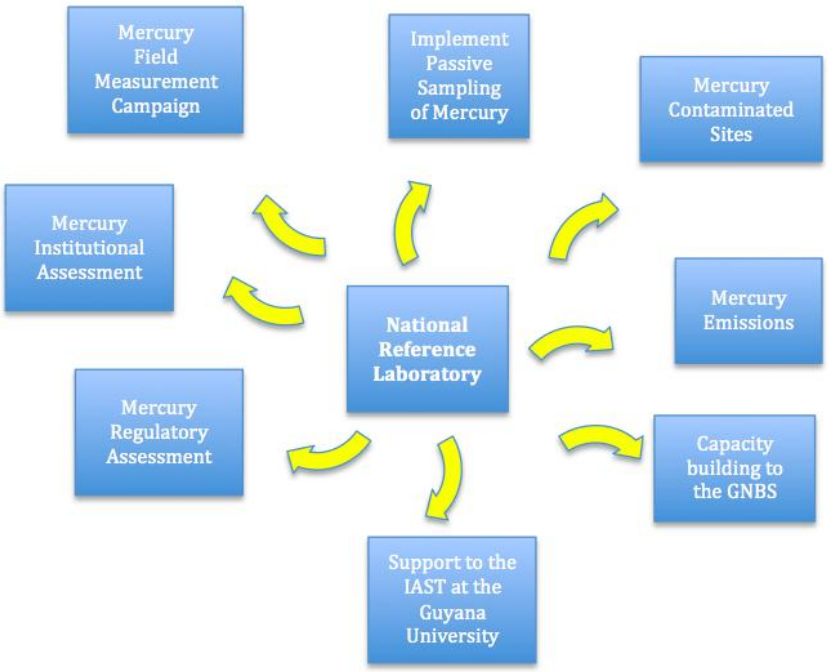
Within the MPP, a number of technical priorities related to mercurywere identified. These are presented below:

Mercury field activities:
Mercury Field Measurement Campaign → Passive Sampling of Mercury → Mercury Contaminated Sites / Risk Exposure of communities in the vicinity of mining areas.

Mercury technical support:
National Reference Laboratory (development of analytical methods) → Mercury Emissions → Mercury Contaminated Sites.

Mercury capacity building:
National Reference Laboratory (ISO accreditation; 17.025 & 17.043) → Mercury Regulatory Assessment → Mercury Emissions.

These tasks, as in Component I, are radiated from the key driver (mercury import and trade), in Component II, with the National Reference Laboratory proposed as the key driver (Figure VI-2).



Scheme VI-2. Component II – Technical tasks related to mercury.

The NRL is part of recommendations the consultant aims to develop within the MPP to ensure proper implementation of Minamata Convention in Guyana. This is due to the many measures required for monitoring and environmental compliance that Guyana needs to develop to meet the requirements of the Minamata Convention's Secretariat (including reporting), that are related to technical capabilities. Thus, at least one national laboratory should meet those capabilities. Since there is no such institution to develop an important part of the analytical methodologies needed to characterize mercury in various priority environmental matrices in the country (at the required quality standard level), it is suggested that a training program be established for strengthening technical and analytical skills consistent with national needs.

A brief description of each suggested task is given below:

Tasks in Component II.

1. Establishment of a National Reference Laboratory (NRL).

The National Reference Laboratory (NRL should be ***fully dedicated within the framework of the Minamata Implementation process*** in Guyana and be internationally accredited (ISO/EIC 17025) to classify mercury in different matrices (e.g. mercury in water, sediments, soils, air, particulate matters, liquid and solid waste, among others).

The NRL's staff should be trained in a full range of analytical techniques, including analytical services, biomonitoring and bio-samples (mercury analysis in urine, in blood, in hair) as part of its expertise.

2. Implementation of a Passive Sampling of Mercury.

Characterization of miners and population suspected of being under risk of mercury contamination and specific zones, where preliminary evidence suggests high concentration levels of mercury, impacting these zones. This can be carried out using diffusion sampling technique as a tool for screening or preliminary assessment.

Since Guyana is subject to the provisions of paragraph 3 of Article 7, in its National Action Plan shall include (related to this topic):

> *(c) small-scale gold mining sector;*
>
> *(d) Baseline estimates of the quantities of mercury used and the practices employed in artisanal and small-scale gold mining and processing within its territory;*
>
> *e) Strategies for promoting the reduction of emissions and releases of, and exposure to, mercury in artisanal and small-scale gold mining and processing, including mercury-free methods;*
>
> *(h) A public health strategy on the exposure of artisanal and small-scale gold miners and their communities to mercury. Such a strategy should include, inter alia, the gathering of health data, training for health-care workers and awareness raising through health facilities;*
>
> *(i) Strategies to prevent the exposure of vulnerable populations, particularly children and women of child-bearing age, especially pregnant women, to mercury used in artisanal and small-scale gold mining;*
>
> *(j) Strategies for providing information to artisanal and small-scale gold miners and affected communities; and*

Development of such analytical tools will provide the basic elements to address the above-mentioned topics especially in relation "*to human exposure to mercury used in artisanal and small-scale gold mining, particularly children and women of child-bearing age, especially pregnant women" (see Figure VI-19).*

Figure VI-19. Observed residents, in the vicinity to mining dredges at the Northern Guyana (Photography: Rodrigo Romero)

3. Mercury Contaminated Sites.

Systematic analytical monitoring focused on human exposure of communities (in the vicinity to ASGM areas) in order to identify potential mercury-contaminated sites.

Within the Mercury National Action Plan, this systematic analytical approach should be included in order to lead the decision making process properly. The inclusion of such systematic analytical approach will also serve to monitor the level of progress of actions taken and activities.

4. Mercury Emissions.

    1. In agreement with the Convention since emissions from Guyana's large-scale gold mines (paragraph 1; 2 (b) and 3, and 5 Article 8) correspond to point sources from production of "non-ferrous metals", the National Action Plan should undertake measures as requirements of monitoring /reporting. Proposal C.

    2. In addition, these requirements should be defined and applied to any new large-scale gold mining project (under Environmental Agency's mandate).

5. Capacity building of the Guyana National Bureau of Standards (GNBS).

The proposal is to provide the Guyana National Bureau of Standards with the necessary tools to be accredited by the Standard Council of Canada as "Proficiency Testing Provider" according to the ISO/IEC 17.043.

This procedure should be performed in agreement with the Centre d'expertise en Analyse Environmental de Quebec, to allow the Guyana National Bureau of Standards to verify the performance of the local laboratories at national scale. This is a key step in terms of national capacity building within the Minamata framework.

6. Support to IAST at the Guyana University.

The support to IAST Laboratory at the University of Guyana in the free mercury technology

implementation process is one of most relevant activity that should be conducted during the transition period.

This is not one of the highest priorities related to the health impact of mercury. However, in a global perspective, it is an issue of paramount importance since the free mercury technology in gold mining will play a central role within the Minamata scope in Guyana. Therefore, a coordinating mechanism should be elaborated to establish a collaborative approach with the IAST at the University of Guyana.

7. Mercury Regulatory Amendment.

Modify some legislative instruments (e.g. EPA Environmental Protection (Water Quality) Regulation 2000, Environmental Protection (Air Quality) Regulation 2000 and other relevant regulations, to allow mainstreaming of mercury as a target compound under these legislations.

8. Mercury Institutional Structure and Capacity Strengthening and Collaboration.

Strengthen the present institutional environmental structure, with special focus on human resources (professional and economic incentives, capacity building).

Development of complementary technical local capacities. The Minamata Convention gives Guyana the possibility to improve an important area of environmental concern related to mercury with special focus on mercury waste management (municipal, industrial and hazardous waste). This issue could be also be included within the National Action Plan as an area of concern.

9. Mercury Field Measurement Campaigns.

Mercury field measurement campaigns at Matthew's Ridge and Port Kaituma.

The proposal is to conduct a pilot measurement campaign in coordination with a Canadian international accredited laboratory that will include the necessary elements of quality control and quality assurance (QC/QA), in order to provide unquestionable results. Then, the model can be further replicated in other locations as part of the preliminary field survey which is required as part of the Minamata implementation strategy.

This pilot measurement campaign should also include a capacity building component in order to transfer specific knowledge related to mercury expertise.

During the visit to Port Kaituma, the formation of several water reservoirs from the dredge's operation was observed. resulting. From surrounding areas, several factors might be promoting the formation of methyl-mercury; therefore, a screening survey can be undertaken in the form of a "pilot mercury measurement campaign".

The field visit to Port Kaituma and Mathews' Ridge also revealed areas of potential concern based on interviews with mining communities. A group of Venezuelan miners at Mathews' Ridge reported particular concern over health problems in the area related to the lack of medical

supplies for malaria and a lack of primary health care centres. This preliminary hypothesis might be validated by mercury field measurement campaigns. Thus, the need to implement a field sampling and measurement campaign to establish the zone of major impact and biomonitoring to evaluate mercury exposure of mining communities.

Figure VI-19. Water reservoirs in gold mining sites.

VII.1 Identification of technical and financial needs for implementation of the Convention

Guyana's effective implementation of the Minamata Convention require both technical and financial resources that must be integrated into a National Action Plan.
The Global Environmental Facility (GEF) serves as a financial mechanism for a number of Multilateral Environmental Agreements including the Minamata Convention. In this regard, the GEF is currently serving on an interim basis until the Convention comes into force.

The GEF is the largest public funder of projects worldwide aimed at generating global environmental benefits. The implementation process can be conducted through the GEF agencies which are the operational arm in project implementation. In case of Guyana, the Inter-American Development Bank (IDB) is currently one of the GEF Agencies actively supporting activities to identify the main challenges within the mining sector and the strategy to gradually reduce mercury importation. Another agency supporting activities within the mining sector is UNDP Guyana.

In terms of the GEF's support of activities related to mercury, the GEF-5 replenishment period funded 17 projects in 21 countries with US $ 34 million GEF funding, leveraging nearly US $ 254 million. These projects include a) Reducing mercury emission from artisanal and small-scale gold mining; b) reducing atmospheric emissions in health care; c) development of mercury inventory; d) delivering the transition to energy efficiency lighting through collection; and recycling of spent lamps containing Mercury.

The present GEF-6 replenishment period presents an interesting funding opportunity for Guyana according to its national reality related to toxic chemical issues (mercury in this case) and the Scope of the GEF-6 Strategy on Chemicals and Waste.

Indeed, the GEF-6 promotes an integrated approach for financing chemicals and waste. Based on the results from the Guyana's mercury inventory, priority actions should be undertaken in artisanal gold mining, with special focus on assessments of emissions and releases from ASGM. In addition, and, a waste management integrated approach can be developed to improve the overall waste management in Guyana, together with developing a strategy to prevent the exposure of humans (miners and communities in the vicinity areas) to harmful chemicals and waste of global importance including mercury. This approach could be achieved through a collaborative and sustainable investment in partnership with relevant stakeholders including the private and the public sectors represented by the GGMC; GGB; GGDMA; WWF Guiana and other potential partners.

The GEF-6 chemicals and waste strategy targets harmful chemicals and waste regulated under legally binding MEAs for which the GEF is the financial mechanism for the Minamata Convention.

VII.2 Overview of the costs to the Government in meeting its obligations under the Minamata Convention

Based on the lessons learned from the performance of the present MIA exercise, the preparation of a middle size project for 500,000USD is recommended to address the main priority issues identified under a National Action Plan. This will provide appropriate and sufficient baseline data, assessment and more detailed inventory, and serve as the starting point for Guyana to undertake the basic technical challenges of the implementation phase of the Minamata Convention.

VII.3 Conclusion

The current infrastructure in Guyana provides the basis for sound management of mercury and chemicals as a whole. However, a number of gaps and needs were identified, thus, the need for legislative and technical requirements in order to secure and sustain the management of mercury. A number of Priority Actions are recommended and highlighted in this report to address and properly undertake the implementation of the Minamata Convention.

Another key element identified is the need for a well-defined Mercury National Action Plan that can lead the decision-making process effectively. The Mercury NAP will establish the baseline for actions that must be carried out during the implementation phase of the Convention. Likewise, it will serve to monitor the level of progress of actions and activities.

Within the framework of a Mercury National Action Plan, it is recommended that a comprehensive screening of mercury obsolete stockpile be undertaken. This Plan should focus on identifying any mercury stockpiles that might remain (old equipment with mercury content at government properties) and obtaining an overall quantitative database of mercury concentration levels at potentially contaminated old mining sites (historical gold mines); former agricultural sites, including pesticide storage.

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Notes

1. References to "mercury" include mixtures of mercury with other substances, including alloys of mercury, with a mercury concentration of at least 95 per cent by weight.

2. Mercury compounds" means mercury (I) chloride (known also as calomel), mercury (II) oxide, mercury (II) sulphate, mercury (II) nitrate, cinnabar and mercury sulphide.

3. "Mercury compounds" means mercury (I) chloride (known also as calomel), mercury (II) oxide, mercury (II) sulphate, mercury (II) nitrate, cinnabar and mercury sulphide.

4. Annex Nº 2, Check List for GGMC; Inspection ID: 3. PARTICULARS - Lessees, Registered Labourers, Tributors. 3.9. Nº of Small Miners ("Punters").

5. The "Developing Baseline Estimates of Mercury Use in Artisanal and Small- Scale Gold in Mining Communities. Version 1.0; AGC, UNIDO, UNEP, NRDC; 2015. It's defined 270 working days for artisanal miners.

ANNEX I: Stakeholder Engagement process

CONTACT LIST (all institutions and persons interviewed and engaged during the preparation of the MIA Report, Mercury Inventory and other aspects of the MIA project).

Members of Mercury Coordination Mechanism
Ministry of Natural Resources (MNR)
Ministry of Public Health (MoPH)
Ministry of Social Protection (MoSP)
Guyana Geology and Mines Commission (GGMC)
Pesticides and Toxic Chemicals Control Board (PTCCB)
Guyana Revenue Authority (GRA)
Environmental Protection Agency (EPA)
Guyana Gold & Diamond Miners Association (GGDMA)
Guyana Women Miners Organisation (GWMO)
World Wildlife Fund - Guiana (WWF)
United Nations Development Programme (UNDP)

Stakeholders interviewed

- Mr Wendell Alleyne, Head of Environmental Division. Guyana Geology & Mines Commission.
- Mr Darcy Walrond, Senior Environmental Officer. Guyana Geology & Mines Commission.
- Ms Soyini McPherson, Environmental Officer, Guyana Geology & Mines Commission.
- Dr. Inderjeet Ramdass CEO Environmental Protection Agencyn
- Prof Mr Suresh Narine, Director and Professor at Trent University in Canada and Director IAST Guyana University
- Mr Patrick Hyman, Deputy Head of Customs Excise and Trade Operations. Guyana Revenue Authority (GRA)
- Mr Gordon Gilkes, Head of Georgetown Solid Waste Management Project, Ministry of Communities
- Ms Abigail Liverpool, Principal Environmental Health Officer. Ministry of Public Health
- Ms Euliene Watson, Technical Officer Mining. Ministry of Natural Resources and the Environment (MNRE)
- Mr Veetal Rajkumar, Head of Policy Planning and Coordination Unit. Ministry of Natural Resources and the Environment (MNRE)
- Ms Trecia David, Registrar. Pesticides and Toxic Chemicals Pesticides and Toxic Chemicals Control Board NARI
- Ms Suresh Amichand, Senior Inspector. Pesticides and Toxic Chemicals Pesticides and Toxic Chemicals Control Board NARI
- Mrs Candelle Walcott-Bostwick, Head Conformity Assessment. Guyana National Bureau of Standards
- Mr Al Donovan Fraser, Technical Officer II. Guyana National Bureau of Standards
- Dr Indarjit Ramdass, Executive Director. Environmental Protection Agency
- Mr Vibert Welch, Permanent Secretary. Ministry of Indigenous People's Affairs (MIPA)

- Ms Vivette Wellington, Management Development Officer. Ministry of Indigenous People's Affairs (MIPA)
- Mr Alan Mentis, Economic and Financial Analist II. Ministry of Finance
- Mr Alan Johnson, CEO. Georgetown Public Hospital
- Ms Maxine Bentt, Head of Trade and Prices Department. National Bureau of Statistics
- Mr Colin Sparman, Administrative Coordinator & Director of Press. Guyana Gold & Diamond Miners Association (GGDMA)
- Mr William Woolford, Technical Adviser. Guyana Gold & Diamond Miners Association (GGDMA)
- Ms Lisaveta Ramotar, General Manager. Guyana Gold Board (GGB)
- Mr Arvindu Sukhram, Manager. NIKO's Gold Jeweller
- Ms Aiesha Williams, Head of Office. World Wildlife Fund Guiana's
- Ms Urika Primus, President. Guyana Women Miners Organization (GWMO)
- Mr Michael McGarrell. Amerindian Peoples Association (APA)

Meeting with stakeholders from the public and private sector

Objective: To Explain the implications of the Minamata Convention and the Mercury Initial Assessment in an effort , to identify the national Mercury challenges and the extent to which legal, policy and regulatory framework will facilitate Guyana's implementation of future obligations under the Convention.

AGENCY/ORGANISATION	PERSONS & DESIGNATION	DATE, TIME, VENUE
Ministry of Social Protection (MOSP)- Occupational Health and Safety	Charles Ogle-Chief Labor Officer; Karen Vansluytman- Corbin- Assistant Chief Labor Officer (ag); Lydia Greene-Assistant Chief Labor Officer & OSH Officer; Francis Carryl- Consultant	30th Nov. 15:30-17:00. MOSP's office
Guyana Gold and Diamond Miners Association	Colin Sparman, Administrative Coordinator; William Woolford, Consultant	1st Dec. 09:00-11:00. GGDMA's office
	Aminah Damon-Legal Officer, EPA and Project Liaison	

AGENCY/ORGANISATION	PERSONS & DESIGNATION	DATE, TIME, VENUE
Amerindian Peoples Association (APA)	Jean La Rose, President Michael McGarrell, Executive Member	2nd Dec. 10:30-12:00 APA's Office
Guyana Women Miners Organisation	Urica Primus, President Marina Charles, Secretary and Coordinator-TIP Unit	3rd Dec. 1:00-2:30pm. GWMO's Office
Ministry of Education NCERD	Sandra Persaud, Head	3rd Dec. 3:00-4:30. MOE's office (Kingston)
WWF	Aiesha Williams, Country Manager	4th Dec 9:00-10:45. WWF's Office
Ministry of Indigenous People's Affairs	Martin Cheong- Special Assistant to the Minister on Projects and Community Development, David James- Special Assistant to the Minister on Legal Issues	4th Dec 11:00-11:45. MIPA's Office
Guyana Bar Association	Christopher Ram, President	4th Dec. 12:00-1:00 (Waterloo Street).
National Toshaos Council	Joel Fredricks, Chairman; Lennox Schuman, Executive Member	4th Dec. 2:00-3:00. UNDP
UG- School of Earth and Environmental Studies Faculty of Law	Dr. Paulette Bynoe, Director Teni Housty, Lecturer Environmental Law (MA programme)	Dec 7 UG, Turkeyen Campus
Ministry of Public Health	Abigail Liverpool, Principal Environmental Health Officer	Dec 7 MOPH

AGENCY/ORGANISATION	PERSONS & DESIGNATION	DATE, TIME, VENUE
Ministry of Agriculture Pesticide, Toxic and Chemical Control Board	Trecia David, Registrar Suresh Amichand, Senior Inspector	Dec 8 MOA, Mon Repos
GNBS	Handel Walcott- Bostwick, Head – Conformity Assessment Al Fraser-Technical Officer 2	Dec 8 GNBS

ANNEX II: UNEP TOOLKIT Calculation Spreadsheet

Attached as a separate Excel file.