

GUYANA

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Country/regional report series on the political ecology of mercury within the artisanal and small-scale gold sector

COORDINATED BY IUCN NL UNDER THE SHARED RESOURCES, JOINT SOLUTIONS (SRJS) PROGRAMME

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Ministry of Foreign Affairs



National Committee
of The Netherlands



The Political Ecology of Mercury within the Small-Scale Gold Sector

GUYANA REPORT - IAN GAULBERT SUTHERLAND

Shared Resources, Joint Solutions

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Abbreviations

ASGM	Artisanal and Small-Scale Gold Mining
ASM	Artisanal, Small, and Medium-scale
Au	Gold
BoS	Bureau of Statistics
CIF	Cost, Insurance and Freight
EPA	Environmental Protection Agency
GENCAPD	Guyana Environmental Capacity Development Mining Project
GGB	Guyana Gold Board
GGMC	Guyana Geology and Mines Commission
GRA	Guyana Revenue Authority
Hg	Mercury
MIA	Minamata Initial Assessment
MoF	Ministry of Finance
MoU	Memorandum of Understanding
MNR	Ministry of Natural Resources
PTCCB	Pesticide and Toxic Chemicals Control Board
VAT	Valued Added Tax

Table 1 – Guyana Facts and Figures

Indicator	Value
Land area	214,970 km ²
Population, 2018 estimate	779,004 (World Bank, 2019)
Economy	
GDP, 2018 figure	USD 3.61 billion (World Bank, 2019)
GDP growth, 2018 figure	4.1% (Ministry of Finance, 2019)
Per Capita Gross National Income	USD 4,760 (World Bank, 2019)
% of pop. living in poverty, 2006 data	36.3% (UNDP, 2019)
Extractive Industries	
Minerals mined	Gold, diamonds, bauxite
Large-scale gold mining firms	2 (Guyana Goldfields Inc; Troy Resources Ltd)
No. of ASM miners, 2017 figure	11,026 (Bureau of Statistics, 2018)
National gold production, 2018	19.1 tonnes (Ministry of Finance, 2019)
Gold & other minerals contribution to gov't revenues, 2017	7.8 % of total domestic revenue (Guyana EITI Report, 2019)
ASM gold production as percentage of total gold production, 2018	58.53% (Ministry of Finance, 2019)
Mercury	
Avg. amount of mercury imported/year 2008-2018	48,414 kg (Bureau of Statistics, 2019)
Status of Minamata Convention	Ratified September 2014

Executive Summary

Mercury is a pollutant of global concern and under the Minamata Convention, efforts are underway to reduce anthropogenic emissions of the toxic chemical and its compounds. Much of the effort is focused on artisanal and small-scale gold mining (ASGM) which accounts for a significant share of mercury use and emissions worldwide. In Guyana, an ASGM sector that has expanded over the past decade has been the main driver behind mercury importation and use.

Focusing on the mercury value chain as a critical aspect of reducing and eliminating mercury use, this research found that a generally permissive importation regime has facilitated significant imports of mercury into Guyana over the past decade. Interviews with importers, retailers and other stakeholders revealed that substantial profits are being made particularly for those who are able to source mercury directly from suppliers overseas, import, then resell in Guyana. Less, though still substantial profits are made by traders who purchase mercury from importers or other wholesalers of the chemical. Source countries for mercury in recent years include India, the Russian Federation and Turkey. Once cleared from Customs, circulation of mercury around the country is generally unrestricted.

Given the relatively permissive regime for mercury importation, it is believed that much of the mercury is brought into the country via legal means though there are indications of an illicit trade, the size of which is unclear. Official imports of mercury into Guyana earlier in the decade was many times over what is required for use in the ASGM sector and with no clear end-user, this contributed to a widespread belief in official circles that mercury is smuggled out of Guyana, mainly to Suriname, though the quantities are unknown. However, other mining sector operators have indicated that the mercury available in Suriname is of a much lower quality than in Guyana and hence, cheaper, and rather, there is an illicit flow of mercury from Suriname to Guyana. Law enforcement agents have further indicated that mercury from Guyana is also smuggled to Brazil.

In more recent years, official mercury imports into Guyana have dropped significantly and given the demand and the profits that can be made in Guyana, it suggests that there is less incentive to smuggle mercury out of Guyana. Further, calculations of mercury usage in the ASGM sector have generally been correlated to the quantity of gold declared but with officials indicating that approximately half of the gold produced in Guyana is smuggled out of the country, it would suggest that more mercury is utilised than officially reported.

There is concern at the environmental and health impacts of mercury use in Guyana though there is a paucity of recent research. Guyanese authorities have very recently moved to institute greater control of mercury importation into Guyana including capping mercury imports with the initial quota set at 1,000 flasks or 34,500 kg per year. However, a number of challenges still persist including a lack of human and financial resources and how the new requirements are implemented in practice remains to be seen.

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1.0 Introduction

1.1 Project background and objective

Mercury releases into the environment and its adverse impacts on ecosystem and human health have elicited worldwide concern. Though mercury is released into the environment by both natural and anthropogenic means, the latter is of major concern. In Guyana, mercury has an intrinsic role in artisanal and small-scale gold mining (ASGM) owing to its relative affordability and ease of application for extraction of gold. The ASGM sector is the main user of mercury and as mining operations increased over the past decade, so too have imports and use of mercury. Up to 2014, it was estimated that mercury imports into Guyana outstripped mercury usage in the ASGM sector by at least a factor of two. Though the quantity of mercury imported over the last five years has dropped, the amounts are still significant, and questions persist regarding what happens to the excess mercury imported over the years.

The answer proffered has been that the excess mercury has been stockpiled and/or smuggled out of the country. In the Guianas, Guyana is the only country where mercury can be imported relatively easily, according to the country's Minamata Initial Assessment (MIA). Suriname has established more restrictive rules that make it harder to import mercury into that country while French Guiana has prohibited the importation of mercury. Guyana has not recorded any official exports of mercury since 2003 and it is widely believed that some of the mercury imported into Guyana is smuggled, mainly to Suriname though the quantities are unclear. Law enforcement agents have also stated that mercury is smuggled to Brazil. It has been indicated too that some of the mercury imported in Guyana has been stockpiled and now that imports have dropped from previous highs, is being traded. This is further detailed in Chapter 3.

Guyana ratified the Minamata Convention in September 2014, committing to phasing out the use of mercury but a search for viable alternatives to mercury use in ASGM have not yet borne fruit. The ASGM sector makes a major contribution to Guyana's economy with gold being Guyana's main export over the past several years. The sector is also a significant employer and it has been estimated that over 11,000 persons are directly employed in the industry. In recent years, ASGM operations – both legal and illegal – have expanded to new areas and the government recently restarted the allocation of new lands to miners. Given the known adverse impacts of ASGM, this has major implications for ecosystem health in the new areas and particularly for indigenous peoples who have been identified as the group most affected by such impacts.

This study was commissioned by the International Union for Conservation of Nature, National Committee of the Netherlands (IUCN NL) under its Shared Resources, Joint Solutions (SRJS) programme, and as part of its commitment under the Dutch International Responsible Business Conduct agreement for the gold sector. The SRJS programme is a five-year strategic partnership between IUCN NL, the World Wide Fund for Nature (WWF) Netherlands and the Netherlands Ministry of Foreign Affairs, that works with non-governmental organisations (NGOs) and civil society organisations in 16 low and middle-income countries, and international partners, to safeguard healthy, biodiverse ecosystems in order to protect climate resilience, the water supply and food security.

Recognising that in order to eliminate mercury from ecosystems, it is crucial to know who drives the trade and how, IUCN NL is focusing on the governance of the gold related mercury value chain. As such, the main objective of this study is to provide a detailed description of the gold related mercury value chain in Guyana. The specific objectives of the study were to identify:

- The drivers of the mercury trade in Guyana
- The entrance points of mercury to the country
- The social and environmental impacts resulting from mercury trade and use
- Policy pitfalls that facilitate mercury trade and use.

This research fits tightly with the SRJS programme's mission of strengthening the lobby and advocacy capacities for mainstreaming an ecosystems approach to development scenarios.

1.2 Methodology

Data relating to the legal mercury trade including licences issued and actual imports is held by four different government agencies. The mercury value chain encompasses a range of stakeholders ranging from regulators, to importers, retailers and end-users, the miners. As such, information was collected through a desktop review of existing data and qualitative stakeholder interviews.

Desktop review – The Guyana Revenue Authority (GRA), the Guyana Geology and Mines Commission (GGMC), and the Pesticides and Toxic Chemicals Control Board (PTCCB) as the bodies responsible for regulating the import of mercury into Guyana, were contacted to obtain up-to-date statistics on import licences issued and actual imports. The Bureau of Statistics (BoS) was also contacted to obtain data for further cross-checking as there were anomalies in the data obtained from the other agencies. Studies on the mining industry and mercury trade as well as government, newspaper and other reports relating to the industry were also reviewed to gain a deeper understanding of the mercury value chain as well as the impacts of mercury use in Guyana.

Stakeholder interviews – Little literature exists on how the mercury trade including any illicit aspects, works in practice in Guyana. As a crucial question for this research related to where in the value chain money is made, it was critical to interview a range of stakeholders to answer this and other questions. Two different sets of stakeholders were interviewed utilising open-ended questions.

The first group included government and representatives of regulatory and other enforcement agencies who have oversight of the mercury trade. Given the sensitivity of the topic, much of the interviews were done in informal settings. This was important to get access to more sensitive information as the GRA, for example, is forbidden by law from revealing certain taxpayers' information such as data that can be used to identify mercury importers. Others interviewed included Customs officials who worked at and/or are based at the border, and representatives of other agencies that have roles in oversight of mercury and the mining industry.

The second group included those directly involved in the mercury trade. These included mercury importers, retailers, and miners. Others interviewed included representatives of the miners'

association and other miners' groups as well as miners. This was mostly done informally as this group is particularly sensitive about the mercury trade but are aware of details about the trade not usually known by state representatives.

1.3 Structure of the report

The remainder of this report is structured as follows:

- Chapter 2: Overview of Guyana's ASGM Sector
- Chapter 3: Importation and mercury trade
- Chapter 4: Mercury usage in Guyana's ASGM sector
- Chapter 5: Environmental and health impacts of mercury use in Guyana
- Chapter 6: Conclusion

2.0 Overview of Guyana's ASGM sector

2.1 Description of ASGM sector

Gold mining has been recorded in Guyana for well over a century with the first systematic gold production occurring in the Potaro area in 1884 (Thomas, 2009). The Mining Act 1989 subsequently provided the legal framework for the sector inclusive of ASGM. Mining operations are categorised based on factors outlined in the Act and associated regulations. Under the Act, the GGMC has the power to issue various licences to extract and/or prospect for precious minerals and quarry minerals. The licences to extract gold includes land and rivers claims as outlined below:

- I. **Small-scale** – mining claims covering an area of 27.58 acres for land claims and for river claims 1.6 km of navigable river
- II. **Medium-scale** – mining permits covering an area between 150 – 1,200 acres
- III. **Large-scale** – mining licences covering an area between 500 and 12,800 acres

Categories I and II are restricted to Guyanese but joint ventures with foreign partners are allowed.

Under the environmental mining regulations, claims are also classified by the volume of material excavated/processed where:

- I. **Small-scale** - means a mine which is the subject of a claim licence 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 24-hour period.
- II. **Medium-scale** - 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 24-hour period.
- III. **Large-scale** - 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 24-hour period.

ASGM operations generally fall within Categories I and II though it has been stated that artisanal and small-scale miners in Guyana do not generally fit the typical profile of such miners in other countries and are motivated more by profit than subsistence with the sector being more or less formalised. Over the last three decades, these categories of operations grew at a rapid pace. Particularly during the 2003-2013 '*super-commodity boom*' period - marked by increased demand and high prices for gold - new entrants flocked to Guyana's artisanal, small, and medium-scale (ASM) gold mining sector and by 2016, about 70% of Guyana's gold production was produced by ASM miners (Pasha et al, 2017).

The mining sector remains of major socioeconomic importance. In 2017, the mining sector contributed over a fifth of the country's Gross Domestic Product (GDP) and accounted for up to 65% of the total country exports (Guyana EITI Report, 2019). In 2018, out of a total of 613,073 troy ounces of gold officially declared for the year, ASM miners accounted for 358,851 troy ounces, or 58.53% of total production (Ministry of Finance, 2019).

Estimates of employment by the sector have varied widely and Thomas (2009) has noted that while various estimates have been made, no direct estimation of employment in the sector has been attempted. Nonetheless, Pasha et al (2017) estimated that in 2007, there were 7,662 persons employed in the ASGM sector and by 2013, this rose to 15,696 directly employed in the sector. The Inter-American Development Bank in 2017 estimated that the gold mining sector directly employs approximately 17–18,000 persons and indirectly benefits 69–70,000 persons. However, figures from Guyana’s statistics agency, which has only recently started recording such data, indicated that as at the fourth quarter of 2017, the mining and quarrying sector was responsible for 4.2% of total employment in Guyana amounting to 11,026 persons (BoS, 2018). It has been noted that over the years, the number of operations in the ASGM sector and thus the number of persons employed, have fluctuated owing to a number of factors such as falling gold prices and weather conditions, among others.

The ASGM sector is the main driver behind mercury importation and use and as activities in the industry increased, demand for mercury increased and importation rose. This peaked in 2012, when 100,380 kilogrammes of mercury were imported, according to BoS figures. There is official concern at the amounts of mercury being imported as prior to 2014, it was several times over the amount required by the ASGM sector.

Smuggling of mercury out of Guyana is a key concern that has been articulated over the years. In 15 years, Guyana has not recorded any official exports of mercury. However, mining sector officials and others including the Minister of Natural Resources, in recent times, have articulated that some of the chemical imported is being smuggled across the country’s borders with Suriname often indicated as the most likely destination (Guyana Times, 2018; Guyana Chronicle, 2019). There are no indications as to the quantities being smuggled but it is believed to be significant. In recent years, though Suriname has a sizeable ASGM sector, the country has not recorded any official imports of mercury. However, it has also been pointed out that in Suriname, mercury can be obtained for a cheaper price than in Guyana and some mining sector operators believe that operators in Suriname obtain mercury from a source other than Guyana.

2.2 Legal and Institutional Framework

Mercury importation, trade and use is governed by several laws and regulations which are administered by a mixture of State institutions. Legislation pertaining to regulating mercury in Guyana are:

- Mining Act 1989
- Environmental Protection Act 1996
- Pesticides and Toxic Chemicals Control Act 2000

The key institutions for the regulation of mercury in Guyana are the GGMC, the PTCCB and the Environmental Protection Agency (EPA).

Regulations made under the abovementioned Acts provide for oversight of mercury from the point of importation through to trade and governs the manner of use in the mining industry. These

Regulations include the Pesticides and Toxic Chemicals Control Regulations 2004, the Mining (Amendment) Regulations 2005 and the various Regulations made under the Environmental Protection Act.

Importation - Any person seeking to import mercury must obtain permission in the form of a ‘no-objection’ letter from the GGMC and an import licence from the PTCCB which must be presented to Customs before processing of the shipment for entry into the country can begin. The process is relatively uncomplicated and there was no restriction on how much mercury an importer could bring into the country. In 2019, however, additional criteria for importation was instituted which are described in detail in Chapter 3.

Trade – the trade of mercury is unlicensed and mercury generally moves freely around the country. The Pesticides and Toxic Chemicals Control Regulations 2004 mandates a lifecycle approach in the management of all pesticides and toxic chemicals including mercury. This covers the manufacturing, import, export, distribution, sale, use, transport and storage of all pesticides and toxic chemicals. Under ‘Registration and Licenses’, for example, the Regulations state that ‘no person shall import, advertise, sell, use, store or transport a toxic chemical unless such product is registered.’ In terms of storage of mercury, certain standards are required to be met. In practice, over the years, there has been little enforcement of regulations though retailers interviewed indicated that in recent times, the authorities have increased compliance checks. Guyana has not recorded any official exports of mercury since 2003 but it is believed that smuggling is done, mainly to Suriname.

Use – use of mercury in mining operations is governed by the Mining (Amendment) Regulations 2005 and its ten legally enforceable Codes of Practices. These Codes of Practices detail how the Regulations should be observed and apart from mercury use, the two instruments collectively cover an extensive range of environmental issues, inclusive of tailings management, mine reclamation and closure plans, mine effluent, waste management and disposal, and contingency and emergency response planning. Among the stipulations governing mercury use, for example, is that gold amalgam should never be burned in open air and a retort or any other GGMC-approved condensation or filtering system that allows mercury recovery should always be used.

The legal and regulatory framework for mercury has generally been seen as robust. According to Pasha et al (2017), the Mining (Amendment) Regulations 2005 and accompanying Codes of Practices conform to international best practices since they promote environmentally friendly mining activities. Guyana’s MIA states that Guyana has a robust legal and institutional framework for the management and use of toxic chemicals, including mercury and mercury compounds. However, the MIA also identifies a number of limitations relating to gaps in some of the regulations and the need for revision of others and highlights the consequent need for implementation of legislative and technical requirements to ensure effective mercury management. Moreover, with regards to importation, the report has recommended that more restrictive requirements should be introduced. As outlined in Chapter 3, the authorities have since moved to cap mercury imports.

It must be noted that despite the modern regulatory framework, it is widely held that enforcement capacity is weak (MIA, 2016; Pasha et al, 2017; Wenner, 2017). A range of studies have identified the various resources and other challenges faced in oversight of the gold mining sector. As encapsulated by Watson and Chin (2018), regulating and enforcing ASGM best practices is a major challenge for governmental agencies as it is costly, mining sites are difficult to access, and personnel and technical resources are limited.

In this regard, Wenner (2017) has noted that Guyana's ASGM operations are difficult to monitor as operations are numerous and widely dispersed and thus can easily evade regulations. Guyana's MIA has highlighted the high costs associated with enforcement and environmental compliance especially in Guyana's hinterland regions. It has noted too that Guyana has quite limited human/technical and funding resources. Consequently, with limited mine officers hampered by the lack of financial resources to monitor vast mining areas, regulations are under enforced. Further, Thomas (2009) has also cited regulatory flaws such as overlapping jurisdiction and the poor inter agency collaboration of oversight agencies as among the challenges being faced in the sector. More specifically, with regards to mercury, among the gaps highlighted by Guyana's MIA, is that 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.

At a broader level, despite the robust legal and regulatory framework, the absence of a clearly defined policy for the mining industry has been identified as a major shortcoming (Thomas, 2009; Pasha, 2017). Wenner (2017) has noted that within the current framework, Guyana needs a clearly defined mining policy that effectively considers both large scale and ASM miners and improve public sector institutional capacity to properly support the sector. The Ministry of Natural Resources has since produced a draft mining policy which is still to be finalised.

2.3 Status of the Minamata Convention

The Government of Guyana signed the Minamata Convention on October 10th, 2013 and ratified it the following year on September 24th, 2014. The government has established a National Working Group on the Minamata Convention and with funding from the Global Environment Facility (GEF) is developing a National Action Plan (NAP) for the ASGM sector. The project, which is being implemented by the United Nations Environment Programme (UNEP), will see the development of a strategy for the reduction, and where feasible, elimination of the use of mercury and mercury compounds in, and the emissions and releases to the environment of mercury from ASGM activities in the country.

Guyana has proposed a goal of a phased reduction in the use of mercury in artisanal, small and medium-scale gold mines to 75% of baseline consumption by 2027. Guyana aims to submit its NAP to the Secretariat of the Minamata Convention in the latter part of 2020.

3.0 Importation and Trade of Mercury

3.1 Mercury Importation

Guyana does not produce mercury and thus its mercury needs are met through importation from various countries. The process involves three public agencies:

- the Guyana Geology and Mines Commission
- the Pesticide and Toxic Chemicals Control Board
- the Guyana Revenue Authority – Customs and Excise Division

Over the years, the mercury importation process has been as follows:

Step 1: The importer obtains a permit referred to as a ‘no-objection letter’ from the GGMC. To obtain the letter, the importer has to supply information inclusive of the name of the business, business address, etc. This permit is not a licence. An import licence from the PTCCB also has to be obtained.

Step 2: The importer sources and purchases the mercury abroad.

Step 3: The importer approaches the GRA – Customs and Excise Division, for clearance to bring the mercury into the country. Before processing can begin, the importer has to supply Customs with the ‘no objection letter’ from the GGMC and the import licence from the PTCCB. Once these are supplied, Customs begins the process of clearing the shipment. The importer pays the various taxes. Import duty is charged at 5%, Value Added Tax (VAT) at 14% and stamp duty at 0.1%. After this is completed, the shipment is checked by Customs and the importer clears the goods.

In the weeks prior to the finalisation of this report, it was announced that from August 1, 2019, an Environmental Authorisation would be required from the EPA in order to import mercury. A joint announcement from the GGMC, EPA and PTCCB said, *‘Failure to obtain an Environmental Authorisation from the EPA will deem you ineligible to acquire a licence from the PTCCB to import, retail or distribute Mercury.’*

Subsequently, the three agencies, along with the Ministry of Natural Resources, signed a Memorandum of Understanding in August 2019, which detailed further requirements for mercury importation for mining. Essentially adhering to the steps outlined above, importers have to now meet a number of other requirements in relation to Step 1. The MoU states that to import mercury, importers, when applying for the ‘no-objection’ letter, have to:

- Produce a valid quotation from the supplier stating the amount and origin country of the mercury to be imported and submit same to the office of the Commissioner of the GGMC. The amount must be clearly stated with the type and number of containers as well as the quantity in each container. Further, every importer who resells mercury has to submit, along with their request letter to the GGMC, the names of the companies/miners to whom the mercury will be resold, their dredge licences number and provide one year’s worth of data on the previous quantities they have received or issued for the year and the balance of mercury stock on hand.

- Prior to the issuance of a ‘no objection’ letter, the person or company seeking to import and distribute mercury must have a valid registration from the PTCCB and a valid Environmental Authorisation from the EPA. Prior to the issuance of the letter, the PTCCB along with the GGMC and the EPA will be required to conduct inspections of the premises of the potential importers to assess whether their storage facilities are in compliance with standards.
- Having been satisfied that the requirements are met, the GGMC will then recommend to the Minister of Natural Resources that the ‘no objection’ letter for the applicant to be allowed to import mercury into Guyana be issued. The minister will either approve/disapprove the issuance of the letter.
- Once the minister’s approval is obtained, the GGMC will forward a copy of the ‘no objection’ letter issued to the PTCCB for its retention and action. The ‘no objection’ letter will cap the amount of mercury imported at 150 flasks (5,175 kg) of mercury and can only be used once. The PTCCB will also require a valid Environmental Authorisation by the EPA. Once the requirements are met, the import licence will be issued.

The MOU also provides that mercury imported into Guyana for use in the ASGM sector will be capped at 1,000 flasks or 34,500 kilogrammes per year. There had been no restriction previously though the new quota is well above the average amount of mercury imported annually into Guyana over the past five years which is 20,457.6 kg. The MOU further states that the quota will be gradually reduced, contingent on the projected gold declaration in the small and medium scale gold mining sector, the streamlining and implementation of alternative technologies and techniques to mercury use and as agreed by the ministry, the GGMC and the PTCCB.

Currently, one does not have to have a licence to trade in mercury within Guyana and it circulates freely within the country as further outlined below.

3.2 Sources of mercury

3.2.1 Official sources

Most of Guyana’s mercury needs are met through importation from different countries. Over the period 2008-2018, mercury was imported from 14 countries. Over the past five years, the United Kingdom has been the main supplier followed by India. The last shipment recorded from the United Kingdom was in 2016. European Union countries such as Spain, formerly among the major suppliers to Guyana, no longer do so as exports of mercury and certain mercury compounds from the EU has been banned since 15 March 2011 under Regulation (EC) No 1102/2008, which has since been repealed and replaced by Regulation (EU) 2017/852 of 17 May 2017 which entrenches the prohibition on the export of mercury from the EU. Table 2 provides a summary of the amount of mercury officially imported into Guyana over the period 2008-2018 and the countries of origin.

Table 2 – Mercury imports and origin countries 2008-2018

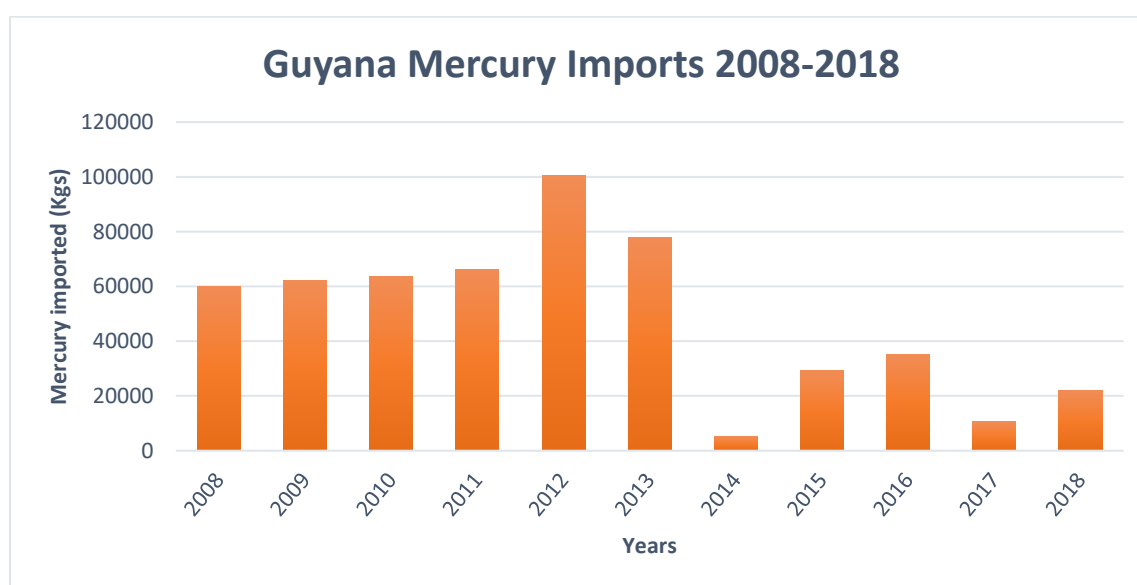
Year	Origin country	Quantity per country (kg)	Total (kg)
2008	United States	28,023	60,023
	Peru	32,000	
2009	United States	6,293	62,214
	Spain	30,250	
	Germany	863	
	United Kingdom	2,808	
	Peru	22,000	
2010	United States	18,369	63,488
	United Kingdom	10,619	
	Spain	34,500	
2011	United States	137,190	66,290
	Mexico	100	
	Spain	19,000	
2012	Mexico	13,504	100,380
	United States	30,231	
	China	2,760	
	Spain	37,000	
	United Kingdom	7,984	
	Turkey	8,901	
2013	United States	8,766	77,871
	China	57,728	
	Mexico	7,752	
	Curacao	1,900	
	Hong Kong	1,725	
2014	United Kingdom	3,450	5,313
	Hong Kong	1,700	
	Mexico	163	
2015	Indonesia	3,800	29,280
	United Kingdom	25,480	
2016	United Kingdom	17,100	35,290
	Singapore	7,000	
	India	11,190	
2017	India	10,506	10,506
2018	India	3,781	21,899
	Russian Federation	7,637	
	Turkey	7,700	
	United States	2,781	
TOTAL		532,554	532,554

Source – Guyana Bureau of Statistics

Table 2 provides data on the quantity and sources of mercury imported into Guyana for the period 2008-2018. For the 11-year period, a total of 532,554 kg of mercury was imported with the peak years being 2012 and 2013 with figures of 100,380 kg and 77,871 kg being imported respectively. Those years coincided with years of high gold prices and production.

Subsequently, importation declined as shown in Figure 1 below:

Figure 1 - Guyana mercury imports 2008-2018

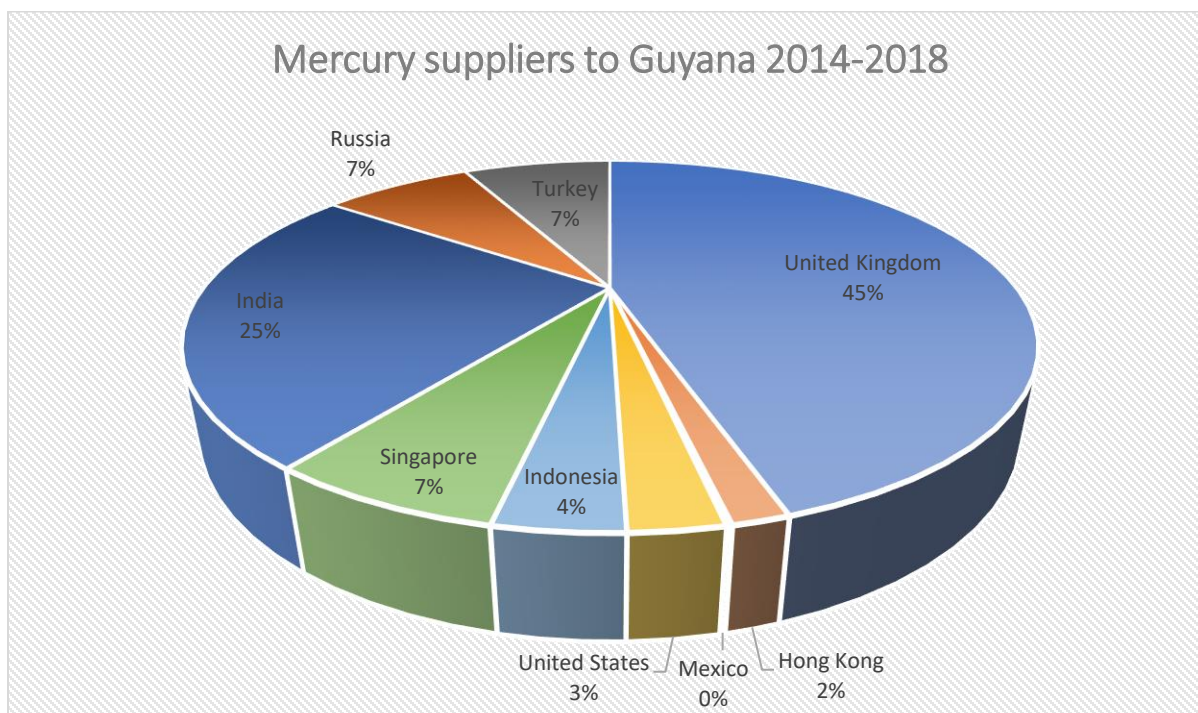


Source – Guyana Bureau of Statistics

Following the years of high importation in 2011 and 2012, mercury importation declined with 2014 being the year of lowest importation with 5,313 kg of mercury recorded. This has been attributed to several factors. McRae (2014) noted that prior to Guyana signing the Minamata Convention in October 2013, there was speculative importation of mercury given the pronouncements being made relative to its future availability. Consequently, some believed that major profits could be made and embarked on importation. However, some of the ventures were not successful. It was stated that many of those who sought to import mercury were debutants at international trade and a number of them were defrauded. One mining sector official related an anecdote of a would-be trader who, upon opening the flasks purported to be filled with mercury, found that it contained sand instead. It was indicated that similar experiences were not infrequent around that period. Combined with a glut in the local mercury market and a corresponding drop in price, the number of those seeking to import the chemical tumbled and imports crashed. It was indicated by one interviewee that around the period, advertisements appeared in local newspapers publicising mercury for sale at low prices.

Mercury imports have since risen but fluctuates with 2018 imports recorded at 21,898 kg. Over the past five years, the average amount of mercury imported annually stood at 20,457.6 kg.

Over the period 2014-2018, mercury has been sourced from nine countries as shown in Figure 2 below:

Figure 2 – Mercury suppliers to Guyana

Source- Guyana Bureau of Statistics

As shown in Figure 2 above, the United Kingdom was the single largest source of mercury imported into Guyana over the past five years, supplying 45% of the chemical imported during the period. The last shipment from the UK was in 2016 with India since emerging as a major supplier and over the period, accounted for 25% of mercury imported into Guyana. Mexico accounts for less than 1% of mercury imports though in 2018, the Minister of Natural Resources declined to approve the importation of 30,000 kg of mercury from that country citing limited information and details regarding what the mercury was going to be used for, how it was going to be stored and disposed of while there were also concerns about whether it was going to be carefully managed (Stabroek News, 2018). Had that shipment been cleared, Mexico would have displaced India as the second largest supplier to Guyana over the five-year period.

3.2.2 Other sources: Illicit importation

In the past, some amount of mercury was believed to be smuggled into the country, particularly at the areas bordering Venezuela. This was stated by miners at Port Kaituma and Customs officials though it was indicated that the amounts were small. Interviewees at Port Kaituma, however, indicated that this is no longer the case as mercury is easily obtainable from Georgetown and can be shipped with relative ease to Port Kaituma, where a number of retailers sell the chemical. Retailers interviewed indicated that they acquire their supplies in Georgetown then ship the chemical, usually still in the original flasks, to the mining town. It was indicated that obtaining

mercury in Georgetown is easy and as the mercury is usually transported to Port Kaituma by ship, the transport costs are low.

Some respondents have also expressed the belief that mercury is being brought into Guyana from China without being declared to Customs. In recent years, Chinese businesses have entered the mining sector both as miners and as retailers of mining supplies. In at least two Chinese-owned businesses in Georgetown, mercury can be obtained at a low price. However, when approached, the owners declined to speak. Nonetheless, one employee indicated that mercury was readily available there. *‘Everybody come here to buy,’* he said. One mercury importer interviewed complained that the Chinese have undercut his prices.

There is a belief in the business sector that Chinese-operated businesses are allowed to bring in containers of goods into the country unhindered. A newspaper report in 2017 alleged that this was being facilitated by the Chinese embassy with the containers not being subject to customs checks and there was under-invoicing and under-declarations and instances of outright fraud (Kaieteur News, 2017). The GRA refused to comment on the allegations while the Chinese Embassy said that the report was baseless and unsubstantiated (Stabroek News, 2017). Nonetheless, this belief persists, and one official indicated that this was a likely route for undeclared entry of mercury into Guyana.

Further, mercury can be obtained from traders in the city who do not appear in the GRA’s list of legal importers. The price at which the mercury is sold is the same as at other retailers, but discounts are offered and if required, large quantities can be obtained. Trade at these retailers is done surreptitiously as one has to enquire if mercury is available before any indication is given that it is obtainable there. Mining sector interviewees have indicated that if someone who appears to be an enforcement official asks whether mercury is sold at those stores, the response is usually in the negative. The source of the mercury sold at these traders is not clear though it has been suggested that it has been smuggled.

3.3 Ports of Entry

The main port of entry by which goods arrive in Guyana is the Georgetown seaport. Other ports are located at Moleson Creek on the border with Suriname and at Morawhanna close to the Venezuelan border. Other official ports of entry for goods are at the airports at Ogle and Timehri while some goods arrive overland from Brazil at Lethem.

It is common knowledge, however, that there are many crossing points at the borders with Brazil, Suriname and Venezuela through which good flow though these are not official ports of entry. For example, at Eteringbang on the Cuyuni River, miners utilise boats and aircraft to bring fuel and other goods from Venezuela into Guyana while on the Corentyne River on the border with Suriname, smuggling is said to be rampant. Among the goods brought over, for example, is liquor which can be obtained at some shops on the border town of Corriverton at a cheaper price than in Georgetown and which do not bear the GRA seal required for liquor imports. The absence of the required seal indicates that the liquor was not cleared by Customs and was likely smuggled.

Over the period 2008-2018, the major point of entry for legally imported mercury has been the Georgetown seaport. Amounts totalling 5,163 kg were brought into the country via the Cheddi Jagan International Airport at Timehri in 2010, 2011 and 2012. Another shipment amounting to just over 100 kg was brought via the CJIA in 2014, according to Customs records. The amounts were small compared to overall mercury imports for the respective years.

There are no records of mercury imported illicitly being identified and seized by the authorities at any port in Guyana. However, it has been indicated that mercury being brought into the country illicitly can be smuggled through the porous borders where there are no checks or via the Georgetown seaport. One official indicated that the scale of corruption within Guyana is well-known and one only has to know someone within Customs to have goods cleared without paying duty and other taxes. It has also been stated that not all shipments are checked, and some importers of goods have indicated on Customs forms the importation of one type of item while importing another while under invoicing has also been an issue with merchandise.

3.5 Mercury distribution

The majority of mercury legally imported into Guyana arrives at Port Georgetown. Georgetown is also the commercial capital and the place where the majority of mercury is traded. The distribution network spans a number of well-known mining companies, suppliers of mining equipment, general stores and gold dealers. Interviews with miners indicate that many purchase the mercury required for their operations in the city.

Trade of mercury is typically done openly but there are also some businesses in Georgetown where the selling of mercury is done more surreptitiously. It has been suggested that the latter traders have obtained their mercury supplies illicitly and/or do not want to subject themselves to scrutiny by the regulatory authorities. A few of these businesses are owned by major businesspersons with operations spanning a range of areas including gold mining. The price for mercury at these businesses are similar to those at other traders but discounts can be obtained even for small quantities. At other traders where mercury is sold openly, discounts are also available but typically only if a large quantity is being purchased. Typically, mercury at these secondary retailers is packaged into plastic bottles and sold.



Photo 1: Mercury packaged for sale in a plastic bottle.

Mercury purchased from the primary retailers in Georgetown then flows to mining areas across Guyana via land, water and air. For many miners, the quantity transported is small and the transport is done openly. Interviews with miners reveal that little attention is paid by the authorities as to the

source of the mercury. The packaging of mercury in plastic bottles also makes it difficult to trace its provenance. For bigger retailers in the mining towns, mercury is purchased in the original flasks and transported mainly by land and water. Given the quantities, these shipments can be subject to more scrutiny but are typically allowed to be transported unhindered.

Outside of Georgetown, mercury is available for sale in the main mining towns of Bartica, Port Kaituma and Mahdia. Interviews with retailers in Bartica and Port Kaituma, who are usually suppliers of mining equipment, indicate that they purchase their mercury in Georgetown and then ship it to the towns. Some smaller shop owners also have smaller quantities of mercury available for sale. Although indicating that they source their mercury in Georgetown, they were not open to disclosing the supplier.

Both Bartica and Port Kaituma are accessible via river transport which ensures that costs are kept almost comparable to prices in Georgetown. One retailer interviewed in Port Kaituma had the greatest mark-up recorded (US\$106/lb); nevertheless, he indicated that sales were steady, and he appeared to be the biggest retailer of mercury in the town even though his prices were the most expensive. It was indicated that miners had a preference for mercury contained in a ‘grey flask’ as opposed to that in a ‘greenish flask’ as based on their experiences, it was believed that the ‘grey flask’ mercury was of greater purity and consequently, they were able to use less in amalgamating gold.

Retailers interviewed indicated that over the past 3-4 years, while mercury demand levels had dropped from prior years, demand itself remains steady. This has been attributed to a decrease in miners with there being less operators in the sector now as compared to the heights of the gold rush in 2012/2013. The number of importers has also dropped. In fact, over the period 2015-2018, Customs only recorded three importers: one Georgetown-based businessman and miner, and two Corriverton-based businessmen, who are business partners. Corriverton is located close to Guyana’s border with Suriname. For the period 2016-2018, the only importers recorded were the two Corriverton-based businessmen. For 2017-2018, only one of the businessmen was recorded as having imported mercury.

Interviews with the Corriverton-based importers revealed that one had stopped importing due to new requirements by the PTCCB whereby the agency stopped granting licences unless the importer had facilities for storing the mercury that met a required standard. The importers indicated that they usually sold the mercury to miners and others, some of whom would purchase the

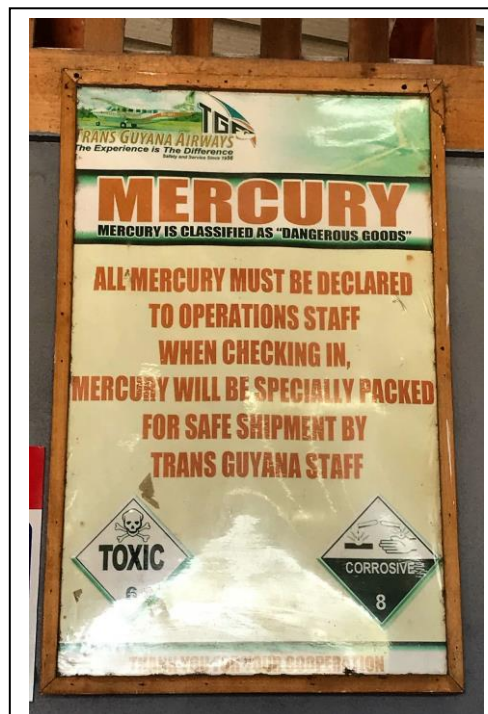


Photo 2: A sign at an airline advising on the transport of mercury.

mercury as soon as it came off the wharf. Otherwise, the mercury is taken to Corriverton where the remaining importer has a warehouse and it was indicated that miners would come there to buy.

As mercury imports have outstripped demand over the past years, particularly during the commodities boom, there have been questions regarding where the remaining mercury goes. Previous suggestions were that it was being stockpiled and/or smuggled to Suriname.

Stockpiling – In relation to stockpiling, the evidence suggests that this has indeed occurred. One Georgetown-based retailer and mining company was granted licences by the PTCCB to import 40,089 kg (approx. 40 tonnes) of mercury in 2012 while another city-based mining company was granted licences to import 22,977 kg (approx. 23 tonnes) in 2013. Since then, neither of these companies were granted import licences, according to PTCCB records.

However, to date, both of these entities continue to retail mercury and one in particular was identified as a major supplier to the mining industry and a competitor to a current importer. According to the importer, this company has the financial resources and capacity to ‘*hold for price*’ meaning that the company has the ability to store the mercury and wait to sell when prices are high. Other mining sector informants also concurred with this view. As the company continues to sell mercury and records do not indicate that it has been granted import licences since 2012, it is plausible that it is selling mercury stockpiled since 2012. Company officials did not subject themselves to be interviewed.

Smuggling - Over the period 2008-2018, Customs data revealed that there were no official exports of mercury from Guyana. In fact, the last time mercury was recorded as being exported/re-exported was in 2003. For that year, according to UN COMTRADE data, 915 kg respectively was recorded as being exported/re-exported, all to Suriname.

Interviews with mining sector officials – both government and non-government – revealed a strong belief that mercury is being smuggled to Suriname. This belief goes to the highest level of government as in August 2018, Guyana’s Minister of Natural Resources expressed the view that smuggling to Suriname was occurring. “We do believe that some of the mercury being imported into Guyana is crossing the border into Suriname. Because it is banned in Suriname, it is [being] smuggled [there], we believe,” the Guyana Times newspaper quoted him as saying. He had said that Guyana would be working with Suriname to confirm this (Guyana Times, 2018).

Customs officials based at the border area also believe that mercury is smuggled though there have not been any interceptions. In interviews, it was explained that apart from the main ferry port at Moleson Creek, customs, immigration, anti-narcotics, and police officials are stationed at the two ‘*backtrack*’ boat landings at Springlands, where small boats take passengers to and from Suriname daily. A visit to the two landings proved that this was indeed the case.

While all luggage is usually checked, much of the focus is placed on searching for narcotics and other contraband with one official indicating that mercury is not a priority item. However, it was stated that if any were found, questions would certainly be asked, and the mercury would be seized. The person could be charged, according to the official, with the offence being exporting without a licence.

Notwithstanding, the searches, smugglers can use different ways to smuggle items at the official ports. One interviewee indicated that gold is easily smuggled from Guyana to Suriname through the port at Moleson Creek, stashed in various parts of vehicles, without being detected by Customs agents. It is therefore not implausible that mercury can be smuggled through the port at Moleson Creek, particularly if vehicles are used and searches are not stringent. It is also likely that smaller quantities can be smuggled via the two boat landings at Springlands. However, officials have emphasised that the border is very porous and there are other landings where boats depart for and arrive from Suriname and these unmonitored sites are where the majority of smuggling of goods takes place. Regular patrols to these landings are not done by the authorities. *'We cannot cover the entire area and there are several smuggling points,'* one Customs official interviewed said.

It was stated that fishing and other vessels have been utilised to smuggle goods in the past, which continues to date, and some of these larger vessels would stop in the middle of the Corentyne River to transfer any items from one boat to the other. Smaller boats would go directly from one shore to the other. Quite apart from the limited manpower and resources which hinders regular checks at illegal landings, officials said that Guyana law enforcement does not patrol the Corentyne River as it is owned by Suriname. This state of affairs at the border area suggests that the smuggling of mercury from Guyana to Suriname could occur without major hindrance. In fact, smuggling is a big business in the border area as illustrated previously with the example of liquor. In relation to mercury, it was indicated that just over the border in Suriname, mercury could be purchased quite easily from taxi drivers who would approach persons, who appear to be heading to the goldfields. None of the interviewees could state with any certainty what quantities were likely to be smuggled.

It must be noted that some mining sector interviewees do not believe that mercury is smuggled from Guyana to Suriname. One source, who indicated that he smuggled gold to Suriname in the past, stated that mercury can be obtained for a cheaper price in Suriname than in Guyana and, as well, indicated that mercury sold in Suriname is typically in *'blackish'* flasks while in Guyana, the flasks are *'greyish'*. The source indicated that the cheaper price in Suriname is because the mercury is of a lower quality. In fact, the source indicated that some amount of mercury is smuggled into Guyana from Suriname.

Interviews with law enforcement officials also revealed that some mercury is smuggled to Brazil. The sources identified a well-known operator who transports the mercury in flasks via the Georgetown-Lethem road. One source recalled an incident where one shipment was stopped by policemen who demanded a bribe but after the intervention of a senior officer, the shipment was allowed to pass, a not uncommon practice particularly by bigger businesspersons who have cultivated close relationships with senior law enforcement agents. It was indicated that though there is a mining area in southern Guyana, the shipments by the operator were destined for Brazil.

3.4 Mercury cost

Over the 2016-2018 period, 67,695 kg of mercury was imported with a Cost, Insurance and Freight (CIF) value of US\$1,773,430. Interview with a Customs official indicate that Import Duty is charged at a rate of 5%, there is a 0.1% Stamp Duty (calculated on the CIF) and VAT is applied at

a rate of 14%. Table 3 below gives a breakdown of the costs attached to importing mercury for the period 2016-2018:

Table 3 – Mercury importation costs

Year	Hg imported (kg)	US\$		
		CIF value	Total taxes	Final cost
2016	35,290	1,140,000	248,520	1,388,520
2017	10,506	225,000	49,050	274,050
2018	21,899	408,430	80,461	488,891
TOTAL	67,695	1,773,430	378,031	2,151,461

Source: GRA – Customs and Trade Administration

Table 3 shows that final costs for the importation of 67,695 kg of mercury for the period 2016-2018 amounted to US\$2,151,461 inclusive of all taxes. Interviews with miners and retailers indicate that during that period to date, mercury prices locally were relatively stable ranging from US\$158.76/kg on the lower range to US\$233.73/kg on the upper range.

Multiplying the amount of mercury imported with the lower and upper range figures separately would give the range at which mercury was sold for the period. This is shown in Table 4 below:

Table 4 – Mercury trading prices

Year	Hg imported (kg)	US\$		
		Hg total cost (CIF + taxes)	Selling price lower range	Selling price upper range
2016	35,290	1,388,520	5,602,640	8,248,332
2017	10,506	274,050	1,667,933	2,455,567
2018	21,899	488,891	3,476,685	5,118,453
TOTAL	67,695	2,151,461	10,747,258	15,822,352

Source – GRA and Interviewees

Table 4 shows that even on the lower range of the selling price, mercury trading is a lucrative business and can be extremely lucrative when sold above the minimum price cited, which, it has been indicated, is the case. In fact, even with a selling price on the lower end, potential profits of at least three times the cost of importation could be realised.

One importer interviewed related that there is demand for the mercury he imports, and he sells by the flask (which the mercury is imported in) and sells about 300 flasks per year. Each flask contains 34.5 kg of mercury. It was related that mercury can be purchased overseas for between US\$450 to

US\$600 per flask but can be as high as US\$3,000 per flask. He related that he purchases mercury in the US\$450 to US\$600/flask price range and sells in Guyana at prices starting at US\$4,348/flask. Broken down to kilogrammes, this indicates a price of US\$126/kg for a flask purchased for US\$600, which is below the lower range price of US\$158.76/kg for which mercury is available from retailers in Georgetown and other parts of the country. This is summarised in Table 5 below:

Table 5 – Mercury purchase and selling price by flask

Buyers	US\$/flask		
	Purchase price	Selling price	Difference
Importer	600	4,348	3,748
Retailer	4,348	5,477	1,129

Source - Interviewees

Thus, as shown in Table 5 above, for the importer, even accounting for taxes and costs such as internal transport, the profit per flask is well over US\$3,000, in line with the range cited in Table 4 previously. Mercury purchased at the US\$450 price point would result in even more profit. A retailer who purchases from the importer, based on the figures cited, can realise a minimum profit of approximately US\$33/kg or US\$1,129/flask. As previously indicated, however, the prices at which mercury is retailed falls within a range, and for retailers who sell at prices above the lower end of the range, potentially greater profits could be realised. Further, in the goldfields, mercury is sold at even higher prices. The profits for the importers and retailers are significant even as importation continues to be driven by demand from the ASGM sector.

4.0 Mercury usage in ASGM

Dredging operations constitute the principal method of ASM gold mining in Guyana with sluice boxes the most dominant gold concentration technology utilised in the sector (Thomas, 2009; Pasha et al, 2017).

Dredging operations are of two principal types: land and river dredging. According to Thomas (2009), land dredging also referred to as hydraulic mining, is the most common type of dredge operation. It involves utilising jets of water under pressure to loosen the ore and form a slurry. Suction pumps are then used to move the slurry to the sluice box, which separates the lighter sand and clay from the heavier black sands and gravelly material associated with gold. Typically, at this stage, amalgamation, involving the use of mercury to separate out the gold, takes place.

In river dredging, suction pumps are used to vacuum material from the riverbed which is then passed through the sluice box. Amalgamation then takes place to remove the gold particles.

Other less common methods include the use of crushers or hammer milling and artisanal-type operators - referred to as porkknocker or punters - who utilise non-mechanised production methods. Both utilise mercury for gold separation.

Estimation of the amount of mercury used in the mining industry is difficult owing to the varied factors that affect its usage such as mining method, the type of gold or whether any recycling is done.

Guyana's MIA report estimated that mercury utilised by a single pork-knocker/punter could amount to 4kg/year which, estimating that there are about 5,000 or as much as 10,000 such operators, would amount to 20 tonnes mercury/year and 40 tonnes mercury/year respectively.

McRae (2014) utilised proxy indicators to estimate the amount of mercury used per year. In order to compute mercury consumption levels in the ASM sector, a model based on the delivery capacity of pumps was utilised. Suction pumps - whose primary function are to move fluidised material through the dredge where separation based on densities occur - are used in the majority of dredging operation with the dredge being calibrated to retain materials with densities slightly below and above that of gold.

It was reasoned that in an effort to achieve the best economic returns, miners would desire that all systems function in an optimised manner. The miner would thus seek to ensure that an optimum flow rate is maintained – too slow a rate would cause more of the less dense solids to be retained while too high a rate would cause some of the desired materials not to be retained. An optimum flow rate also impacts fuel economy as a pump operating above design characteristics such as load and engine speed would consume more fuel than one operating within its design characteristics (ibid).

According to McRae (2014), a model based on the delivery capacity of pumps would allow for comparison of suction/pumping units relative to one another i.e. a given size of pump can be

identified as a standard pump unit with all others being described in terms of equivalence to that standard pump unit.

Utilising the 4" pump size as the standard – referred to as a Dredging Unit (DU) – McRae (2014) calculated the DU equivalence as shown in Table 6 below:

Table 6 – Dredging Unit Equivalence

Item No	Pump Size	Conversion Factor	Equivalent Dredging Units
1	3"	$(3/4)^2$	0.5625
2	4"	1	1
3	5"	$(5/4)^2$	1.5625
4	6"	$(6/4)^2$	2.25
5	8"	$(8/4)^2$	4
6	10"	$(10/4)^2$	6.25
7	12"	$(12/4)^2$	9
8	14"	$(14/4)^2$	12.25
9	16"	$(16/4)^2$	16

Source – McRae (2014)

Table 6 shows how other pumps used in the AGSM sector measure alongside the 4" pump. An 8" pump, for example, would be equivalent to four 4" pumps.

Having established the DU equivalence for the various sizes of pumps relative to the 4" pump, McRae (2014), utilising consumption data from a sample of 52 randomly selected dredges, determined that the average monthly consumption of mercury per DU was 0.662003 lb.

GGMC provided data for the number of dredges licensed for operation for the period 2008-2015. More recent data was not supplied in a timely manner. Applying the method described above, i.e. converting the number of dredges licensed for 2015 to DUs, results in Table 7 below:

Table 7 - 2015 dredges converted to DUs

Size	No. of dredges	DU conversion factor	Total DUs
3"	1	0.5625	0.5625
4"	874	1	874
5"	243	1.5625	379.6875
6"	1816	2.25	4086
8"	267	4	1068
10"	18	6.25	112.5
12"	54	9	486
14"	49	12.25	600.25
16"	28	16	448
			8055

Source – GGMC with calculations adapted from McRae (2014)

However, it has been noted that illegal mining operations exist with the majority utilising 4” dredges. It has been estimated that the number of illegal 4” dredges are between 5-10% of licensed ones. (McRae, 2014)

Accounting for illegal operations at 5% of 4” dredges in 2015 would result in Table 8 below:

Table 8 – 2015 dredges accounting for 5% illegal dredges

Size	No. of dredges	DU Conversion factor	Total DUs
3"	1	0.5625	0.5625
4"	918	1	918
5"	243	1.5625	379.6875
6"	1816	2.25	4086
8"	267	4	1068
10"	18	6.25	112.5
12"	54	9	486
14"	49	12.25	600.25
16"	28	16	448
			8099

The annual mercury needs of the gold mining industry in Guyana for 2015 can then be calculated by:

$$\begin{aligned}
 \text{National requirement} &= \text{Monthly consumption per DU} \times \text{Number of DUs} \times 12 \\
 &= 0.662003 \times 8099 \times 12 \\
 &= 64,338.747 \text{ lbs} \\
 &= 29,183.565 \text{ kg}
 \end{aligned}$$

Applying the same reasoning, the annual mercury requirement can be calculated as done for the period 2008-2015 in Table 9 below:

Table 9 – Mercury needs 2008-2015

Year	2008	2009	2010	2011	2012	2013	2014	2015
Total DUs	4,524	5,322.4	6,697.5	8,164.5	10,255.7	9,953	8,112.3	8,098.7
Hg required (kg)	16,298.9	19,175.1	24,129.4	29,414.7	36,948.6	35,858.1	29,226.4	29,177.6
Hg imported (kg)	60,023	62,214	63,488	66,290	100,380	77,871	5,313	29,280
Import/consumption ratio	3.68	3.24	2.63	2.25	2.72	2.17	0.18	1.00

Table 9 shows that mercury importation over the period 2008-2015, with the exception of 2014, outstripped the requirements of the mining sector over the same period. The table also shows the ratio of imports to consumption over the same period. With the exception of the latter two years, the mercury imported was more than double what was required.

Figure 3 – Graph showing comparison of mercury imports to consumption for 2008-2015

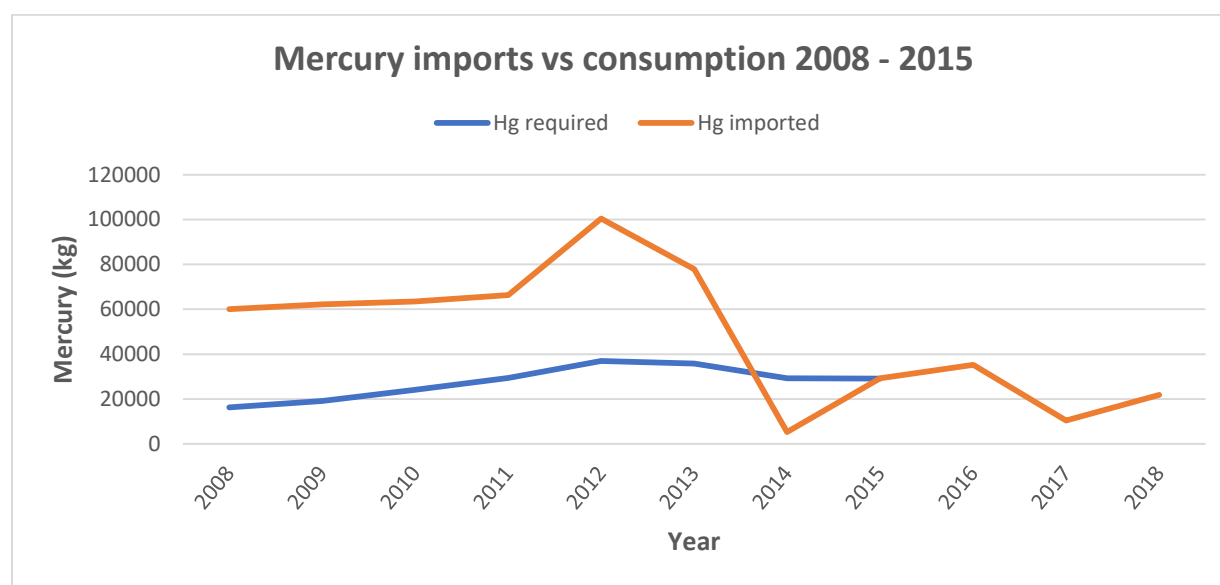


Figure 3 above shows that the level of mercury importation over the period 2008-2013 was not tied to the industry's needs; in fact, it is more than double what was necessary. After 2013, mercury importation levels reduced from the 2012 peak and fluctuated.

Prior studies have observed that there is difficulty in estimating the amount of mercury used per kg of gold extracted due to the multiple factors that influence how much is used at any one site.

Nonetheless, it has been indicated that the ratio of mercury used in gold production has risen over the years from 1.5:1 in 2008 to 3:1 in 2014 (Legg et al, 2015). That is, for every kg of gold produced, an estimated 3 kg of mercury is utilised. The reason for this is not clear. However, interviews with local miners have indicated that more mercury is utilised when the gold being mined is ‘power gold’ or ‘fine gold’ while if the gold is ‘chip gold’ which are bigger grains of gold, then less mercury is used.

Cross-checking the calculations for mercury required contained in Table 9 above with gold declared to the Guyana Gold Board (GGB), results in Table 10 below:

Table 10 – Ratio of gold declared/mercury consumed (based on calculations in Table 9)

Year	Au declared	Hg consumed	Hg/Au ratio
2008	8,098.88	16,298.9	2.01
2009	9,492.18	19,175.1	2.02
2010	9,593.42	24,129.4	2.52
2011	11,293.05	29,414.7	2.60
2012	13,643.28	36,948.6	2.71
2013	14,963.85	35,858.1	2.40
2014	12,052.73	29,226.4	2.42
2015	12,801.10	29,177.6	2.28
2016	15,010.82		
2017	13,051.49		
2018	11,160.48		

Table 10 indicates that the ratio of gold produced to mercury consumed ranged between 2.01 to 2.71 for the period 2008 to 2015, in line with the use estimates indicated by Legg et al (2015) above. The above can be taken as a minimum figure as it is likely that mercury usage is higher owing to a number of factors such as the scale of illegal mining, recycling of mercury, gold not entering the formal economy and gold smuggling. Necessarily, accounting for those factors would impact the gold/mercury ratio.

Over the years, there has been official concern that a significant portion of gold produced is not declared to the authorities. In 2012, for example, it was reported that not all the gold exported by Suriname is mined there as the 2.5 per cent royalty levied there as compared to the 5 per cent in Guyana and French Guiana makes it attractive to smuggle gold to Suriname.¹

In 2016, Guyana’s Minister of Natural Resources was reported as saying that approximately 15,000 ounces of gold is smuggled from Guyana each week and the country is losing as much as 60% of gold production to smuggling.² While the miners’ association accepted that smuggling

¹ <https://www.stabroeknews.com/2012/news/guyana/06/19/suriname-small-scale-miners-exported-us914m-of-gold-last-year/>

² <https://www.stabroeknews.com/2016/news/guyana/01/06/around-15000-ozs-gold-smuggled-week-trotman/>

occurs,³ it does not believe that it is at that level and the Director of Guyana's State Assets Recovery Agency (SARA), for example, has cited a figure of 30% of gold production being smuggled.⁴ Some interviewees indicate a belief that smuggling of gold goes hand-in-hand with mercury smuggling and it was also stated that the quantity of mercury used in ASGM in Guyana is higher than officially believed as approximately half of the gold produced is not officially declared

Further to the above, since artisanal miners have little or no access to formal credit, they often cancel their debts in gold, and their creditors may or may not enter the gold into the formal economy (Pasha et al, 2017) while mining operations close to border areas who obtain supplies from neighbouring countries such as Venezuela, would also purchase with gold. Miners interviewed have also indicated that Brazilians, who make up a significant part of the industry, would smuggle gold to Brazil.

Given the pervasive use of mercury in the ASGM industry to extract gold, this indicates that figures are underestimated when utilising official gold declarations as a proxy to calculate potential mercury usage.

³ <https://www.stabroeknews.com/2016/news/guyana/03/16/miners-group-rejects-claim-15000-ozs-gold-smuggled-weekly/>

⁴ <https://www.stabroeknews.com/2018/news/guyana/12/24/sara-seeking-to-curb-gold-smuggling/>

5.0 Environmental and Health Impacts of Mercury Use in Guyana

Guyana's MIA report estimates that 11,777.1 kg of mercury is released to the environment annually as a result of ASGM involving mercury amalgamation. A range of studies have highlighted the adverse consequences of ASGM in Guyana. Much of the literature have focused on the environmental impacts of mining with social and health consequences also considered. As it relates to mercury, there is a high level of concern about the extent of mercury contamination with this being a critical environmental issue and a pressing health concern in small and medium scale gold mining communities (Thomas, 2009; MIA, 2016).

In spite of this concern, research focusing specifically on mercury contamination remains limited. According to Watson and Chin (2018), the Guyana Environmental Capacity Development (GENCAPD) project 2002-2010 and the WWF Guyana Office have possibly been the only two organisations to extensively participate in data collection, targeting gold mining communities to learn about mercury contamination of the environment, fish and humans. The key message arising out of these studies is that mercury contamination is a major concern and it not only compromises the health of aquatic ecosystems and other biodiversity but also their human component (ibid). Guyana's MIA report (2016) has also highlighted the need for increased research efforts.

Thomas (2009) noted that mercury contamination arise at several points in the mining process, namely:

- the handling/storing/ distribution of mercury in the country
- the escape of mercury fumes in uncontrolled processing environments
- the discharge and spillage of mercury contaminated materials into waterways and
- the use of mercury as an amalgam massaged into concentrates in order to exploit them for their gold content.

5.1 Atmospheric contamination

Guyana's MIA report (2016) estimated that of the overall 11,777.1 kg of mercury released to the environment annually as a result of ASGM involving mercury amalgamation, 4,570 kg of mercury are released into the atmosphere, which is more than the amounts released to land and water ecosystems respectively. Breaking down this figure, the MIA stated further that without the use of retorts, the amalgamation process releases 4,416.4 kg of mercury to the atmosphere annually but when retorts are used, this figure amounts to 153.6 kg Hg/year. The report estimated that 60% of ASGM was done using retorts and 40% without use of retorts. Notwithstanding, Thomas (2009) reported that miners have resisted retorts purportedly because it has been found to prolong the process of separating the gold from the concentrates.

Aside from this, there is virtually no reference in the extant literature with specific regards to atmospheric mercury contamination in Guyana. Legg et al (2015) observed that significant knowledge gaps exist with regards to emissions in South America, and across the Guianas in particular. In fact, a site at Nieuw Nickerie, on Suriname's north-western coast provides the only

year-round recording of mercury levels within the tropics with the data suggesting that significant release of mercury may be occurring within the tropics (Müller et al, 2012 in Leggs et al, 2015).

Despite the paucity of research on atmospheric mercury contamination in Guyana, its impact on human health is of concern. The GGMC's Code of Practice on Mercury states that mine workers or goldsmiths who burn gold amalgam every day are greatly exposed to elemental mercury vapours, which jeopardise their health and, in the case of gold refining facilities, the health of people living in the vicinity (GGMC, 2010).

Consequently, the Code of Practice mandates the use of safety equipment in handling mercury, prohibits amalgamation in open systems where mercury can be discharged into the environment, requires the use of GGMC-certified retorts or any other GGMC-approved condensation or filtering system that allows mercury recovery when burning amalgam to recover gold, and for gold refining facilities, it mandates the implementation of mercury vapour abatement measures to prevent the release of mercury vapours into the atmosphere when burning residual mercury to purify gold. However, as mentioned previously in this report, enforcement capacity is weak.

The burning of gold amalgam to extract residual mercury and its impact on human health was the focus of extensive media attention in 2018 when blood tests showed that 60 GGMC and GGB workers had high levels of mercury.⁵ It was reported that a defective system at the GGB – at the time located in the same compound as the GGMC headquarters – had resulted in the escape of mercury vapour into the atmosphere during the burning of gold taken by miners for sale.⁶ Further, workers and their union believed that the deaths of two workers from kidney failure were linked to the high levels of mercury in the blood.⁷ The GGB's laboratory was subsequently shut and both the lab and office were then moved to a new location.⁸

5.2 Contamination of Soils

Guyana's MIA indicates that gold mining makes a significant contribution as it relates to mercury releases to land. It estimated that 3,394.9 kg of mercury are released to the soil annually as a result of gold extraction with mercury amalgamation. However, there is little information in the extant literature as it relates to ASGM-induced contamination of terrestrial soils. According to Legg et al (2015), data on the distribution and contamination of soil in the Guianas is sparse compared to data on freshwater sediments. Notwithstanding, it is not implausible that contamination of mining sites could be significant due to mining practices as miners have previously been documented adding mercury at the pre-processing and mid-processing stages i.e. adding mercury to the mining pits, ore heaps and sluice boxes (Thomas, 2009; McRae, 2014; Watson and Chin, 2018). Miners

⁵ <https://www.stabroeknews.com/2018/news/guyana/04/14/mercury-levels-at-gold-board-safe-analysis-finds/>

⁶ <https://nre.gov.gy/2018/06/21/paho-experts-inspecting-ggmc-for-mercury/>

⁷ <https://www.stabroeknews.com/2018/news/guyana/05/23/gold-board-asks-for-patience-as-it-finalises-new-amalgam-burning-arrangements/>

⁸ <https://www.stabroeknews.com/2018/news/guyana/07/21/trotman-says-refused-shipment-of-30000-kg-of-mercury/>

have also reported that when re-working formerly mined areas, they would find mercury in the soil (McRae, 2014).



Photo 3: Mercury on the ground at a mine in Guyana.

5.3 Freshwater ecosystems

Guyana's MIA (2016) stated that there is limited literature available that address freshwater contamination by mercury in Guyana, and the contamination of freshwater fish in Guyana with mercury with most of the data available being outdated. However, contamination of freshwater ecosystems is of significant concern as it represents a significant pathway through which mercury poses a potential serious risk for human health.

5.3.1 Freshwater

According to Guyana's MIA, gold mining with amalgamation process is responsible for the largest mercury releases to water, estimated at 3,812.2 kg Hg/year. Rivers and streams receive mercury from direct discharges and also from deforestation or land removal that oftentimes accompany mining activities (Watson and Chin, 2018).

However, from the viewpoint of human health, the importance of freshwater lies not in its mercury content as elemental mercury dissolves poorly in water, but because it acts as a significant route for the transport of freshly released mercury away from mining sites as well as being the major site of mercury methylation and biomagnification (Legg et al, 2015). Through the action of sulfate-reducing bacteria, elemental mercury is converted to the highly toxic methylmercury which, in turn, bioaccumulates in aquatic food webs affecting freshwater fishes (Watson and Chin, 2018).

As elemental mercury dissolves poorly in water, mercury content of freshwater is generally low and following methylation, mercury enters the food chain so rapidly that the concentration of methylmercury in sediments and water is very low (Legg et al, 2015; Watson and Chin, 2018).

5.3.2 Sediments

As previously indicated in this report, an estimated 3,812.2 kg of mercury per year enter freshwater ecosystems as a resulting of gold mining. In providing a summary of studies that assessed sediment samples for mercury contamination, Legg et al (2015) noted that in a study carried out between 2005 and 2009, samples from two areas where gold mining was the dominant economic activity were compared to two non-mining areas. Samples taken from both active and historically mined areas and the non-mining areas had mercury concentration levels above Canadian Council of Ministers of the Environment (CCME) quality guidelines.

Previous studies that tested samples from other rivers where mining was done also recorded mercury concentration levels above CCME guidelines. A study cited by Legg et al (2015) that undertook extensive sampling of sediments from the Mazaruni River, a major tributary of the Essequibo that is also significantly affected by mining, also recorded mercury concentration levels above the stated guidelines. While the authors expressed that a number of features of their results are indicative of deposition from recent human activity as evidenced by mercury concentrations within the channel bed, the sand bars, and surface floodplain sediments above local background values; the decreasing mercury concentration with core sample depth suggesting recent deposition; and local downstream increases in mercury concentrations attributable nearby mining operations, it was also stated that both addition of mercury during the mining process or mobilisation of naturally occurring mercury in the soil are equally plausible explanations for the above findings (Miller et al, 2003 in Legg et al, 2015).

Legg et al (2015) concluded that the various results indicate that mercury contamination is widespread in Guyana with mean concentrations consistently above safe guidelines for aquatic life. It was also observed that mercury concentrations are of concern not only in areas affected by historical or active mining in Guyana, but also in seemingly pristine areas (ibid).

As previously indicated in this report, much of the available data on mercury contamination in freshwater ecosystems has been done at least over a decade ago. The extant literature does not indicate whether more recent research, particularly over the last decade when there was a rapid expansion in ASGM mining, has been done.

5.3.3 Fish

As with sediments, there is limited information on the contamination of fish stocks in Guyana, with the majority of the available data out of date and/or spatially isolated (Legg et al, 2015). A survey in 2001 by the GGMC 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) in World Health Organization (WHO) guidelines (GGMC, 2001; Hay and Vieira, 2005 in Legg et al, 2015).

Legg et al (2015) concluded that in Guyana, as with data on mercury contamination in general, there is a need for large-scale studies to improve on the completeness of the current data. It was stated that given that there is no evidence of reduced mercury use, the sparse and outdated information available suggest that high levels of contamination are likely present.

5.4 Human health impacts of mercury use

People can be exposed to mercury in various ways from different sources. In the ASGM sector, miners, their families and those involved in processing gold are typically most at risk from inhalation of elemental mercury while for the general population, the risk typically comes from ingestion of fish contaminated with methylmercury (Legg et al, 2015).

As described earlier in this section, there is awareness of the risk of inhalation of mercury vapour and a recent case has received wide media and official attention. However, as in other areas, the paucity of research on the sections of society at risk from the inhalation of mercury vapour prevents a more complete understanding of the extent of this issue.

Some studies over the years have identified the consumption of fish as contributing to elevated mercury levels in humans. According to Watson and Chin (2018), the few studies carried out in Guyana that sought to understand the impact of mercury-contaminated diet and human bioaccumulation have demonstrated that there is a direct correlation between contamination in streams and river sediments, fish and people. It was stated that local communities, and more particularly indigenous communities, for whom fish constitutes a dietary mainstay, thus become an indirect target of ASGM activities.

A recent study by Watson and Chin (2018) in four indigenous communities, three close to where ASGM activities have increased over the past several years, found elevated mercury levels above WHO recommended limits with results in one community being of heightened concern. According to the report, *‘...the most vulnerable population...women of child-bearing age, had the highest mercury levels...At the current levels, if a woman in the community of Parabara should get*

pregnant, mercury would be able to pass to the developing foetus and cause severe and permanent neurological damage to the unborn child' (Watson and Chin, 2018, p. 36). The frequency of fish consumption was cited as one of the main factors contributing to the elevated mercury levels in the residents of that community. It was stated that the data from the study corroborated the findings of previous studies on indigenous communities located close to ASGM activities and that rely on locally sourced fish (ibid).

The results of this study were publicised in the media and reports handed over to relevant government agencies. However, despite initial expressions of concern,⁹ it has been indicated that there has been little follow-up, which one interviewee indicated is a persistent issue in relation to concerns arising out of the ASGM sector.

⁹ <https://guyanatimesgy.com/govt-to-look-into-high-mercury-levels-in-region-9/>

6.0 Conclusion

Mercury has been an integral part of Guyana's mining industry and is a preferred technique for processing gold in the ASGM sector owing to its relative cost effectiveness, the ease of its application and miners' knowledge of its application. The ASGM sector is the main driver behind mercury importation and use with demand remaining steady. In the region, Guyana is the only country where mercury can be legally imported relatively easily.

Over the past decade, importation has soared reaching a peak of 100,280 kg in 2012. Prior to 2014, a large gap existed between the amount of mercury imported and the amount used in gold mining. Officials at the highest levels of government have questioned where the excess mercury goes and it is believed that some is smuggled to Suriname which has not recorded official imports of mercury in recent years. However, there has been no reported case of significant quantities of mercury being intercepted while being transported to Suriname though officials have noted that given the porousness of the border and limited law enforcement capacity, there are no major hindrances to smuggling. It has also been indicated that given that mercury imports into Guyana have dropped significantly in recent years and given the demand and the profits that can be made in Guyana, there is less incentive to smuggle mercury out of the country and rather, the converse may be occurring. Guyana has not recorded any official exports of mercury since 2003.

It is also plausible that a significant amount of the mercury imported over the past decade has been stockpiled or partially hoarded as an anticipatory action in light of past statements about banning mercury and/or because some importers foresaw a business opportunity. This research found that at least two major importers who were last granted licences five and six years ago to import over five dozen tonnes of mercury, are currently major retailers of mercury.

This research also found that the mercury trade, particularly for importers, is an extremely lucrative one. Based on figures provided by current importers, potential profits amounting to millions of US dollars could be realised. The potential profit for retailers is much smaller though this depends on the price at which they retail.

Georgetown is the centre of the mercury trade and virtually all the mercury officially imported into Guyana arrives at Port Georgetown. Miners from all parts of the country obtain mercury in Georgetown which is readily available at stores throughout the city and at generally lower prices than in towns located in the mining districts. In the two of the three main mining towns visited, mercury is also readily available at stores that cater to the mining industry. Retailers reported that they purchased their mercury in Georgetown. They also reported that while mercury demand levels have dropped from its peak during the mining boom, demand remains steady.

The mercury trade is not currently licenced though over the past two years, the agency with responsibility for oversight of the trade in chemicals has begun to make attempts to ensure that mercury sellers conform to standards set out in Regulations.

Guyana's legal and institutional framework for the management and use of toxic chemicals, including mercury has been described as robust but some gaps remain and implementation and enforcement of the laws and regulations is weak. It has been recognised that regulating and

enforcing ASGM best practices including those relating to mercury is a major challenge for governmental agencies as it is costly, mining sites are difficult to access, and personnel and technical resources are limited.

Significant amounts of mercury are released into the environment with Guyana's Minamata Initial Assessment estimating that 11,777.1 kg of mercury is released to the environment annually as a result of ASGM involving mercury amalgamation. It has been acknowledged that this is likely an underestimate.

Owing to the practices in the mining industry and the known toxic effects of mercury, concerns persist about mercury impacts on the environment as well as the risks to human health. However, a paucity of recent research hinders a more complete understanding of the extent of mercury contamination.

Guyana is currently developing its National Action Plan for the implementation of the Minamata Convention and has committing to reducing the use of mercury. However, a number of challenges remain and as ASGM operations expand to new areas with no viable alternative yet to mercury for gold extraction in the sector and in the absence of robust enforcement of best practices already enshrined in law, it suggests that ecosystems will face continued risks from mercury contamination.

In light of the foregoing, how best to improve governance of mercury in Guyana remains a partially answered question. Restriction of mercury imports has been a recommendation made previously but until recently, not acted upon as the mining sector has stoutly resisted any such move. Against that backdrop, the MoU agreed between the MNR, the GGMC, the PTCCB and the EPA to institute additional requirements to be met by importers as well as the setting of a quota for mercury imported annually is a good first step towards improving mercury governance in Guyana.

It comes at a critical time as over the last several years, the number of persons importing mercury has dropped and over the last two years, only one businessman has been recorded as importing significant quantities of mercury into the country. Further, given the perennial issue of limited resources, the inter-agency cooperation envisioned in the MoU is critical, particularly as it relates to oversight of the management and usage of the chemical. It must be noted that several of the requirements mentioned in the MoU are already included in various regulations but largely unenforced thus the seriousness with which the MoU is treated and implemented can be a defining moment in Guyana's mercury governance regime.

Consequently, the major recommendations made herein for improved governance of mercury in Guyana are:

- Robust implementation of the provisions of the aforementioned MoU with regards to mercury importation with strict adherence to the annual quota and the amounts an individual/group/company can import at any one time.
- Further downward revision of the annual quota as it is still high and is above the requirements of the ASGM sector as recorded in 2015.

- Enforcement of the record-keeping requirement to enable tracing of mercury from the point of importation to how it is used by the end-users - miners. Given the handful of importers in recent years, regular checks of such a register that shows to whom mercury is sold as well as stock at hand, would not require additional resources and would moreover, potentially provide the insight lacking at the moment as it relates to the smuggling of mercury.
- In the medium term, licencing of the domestic trade should be considered such that retailers would require a licence to sell mercury.
- In the longer term, given the widespread use and known toxic effects of mercury, there is a need to ensure environmentally sound management of the chemical, particularly at the level of the end users.

As miners interviewed have emphasised, at the moment there is no readily available alternative to mercury and usage of the chemical in the ASGM sector will continue for the foreseeable future. The abovementioned recommendations covering both the short and longer terms, would go some way towards improving the governance of mercury in Guyana and enable the progress necessary to fulfil the country's obligations under the Minamata Convention.

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