

MINISTRY OF ENVIRONMENT
AND WATER MALAYSIA

Minamata Convention Initial Assessment Report Malaysia

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Minamata Convention Initial Assessment Report Malaysia

Table of Contents

LIST OF ACRONYMS v
LIST OF TABLES vi
LIST OF FIGURES vii
EXECUTIVE SUMMARY 1

CHAPTER 1 :
OVERVIEW 3
1.1 Global Concerns on Mercury 4
1.2 Minamata Convention on Mercury 6
1.3 Minamata Convention Initial Assessment (MIA) 8
1.3.1 Objectives 8
1.3.2 Duties and Responsibilities 8

CHAPTER 2 :
NATIONAL PROFILE 9
2.1 Geography and Population 10
2.2 Governmental Structure and Economic Sector 10
2.3 Key Agencies for the Implementation of Minamata Convention in Malaysia 11
2.3.1 Ministry of Energy, Science, Technology, Environment & Climate Change (MESTECC) 12
2.3.2 Ministry of Health (MOH) 12
2.3.3 Ministry of International Trade and Industry (MITI) 12
2.3.4 Ministry of Domestic Trade and Consumer Affairs (KPDNHEP) 12
2.3.5 Department of Environment (DOE) 13
2.3.6 Department of Occupational Safety and Health (DOSH) 13
2.3.7 Department of Agriculture (DOA) 13
2.3.8 Department of Mineral and Geoscience (JMG) 13
2.3.9 Royal Malaysian Customs Department (CUSTOMS) 14

CHAPTER 3
NATIONAL MERCURY INVENTORY 15
3.0 Overview 16
3.1 STEP 1 – Country Profile 17
3.1.1 General Summary 17
3.1.2 Inventory Summary 17

3.2 STEP 2 – Energy Consumption & Fuel Production 18
3.2.1 General Summary 18
3.2.2 Inventory Summary 18
3.2.3 Data Gaps 19

3.3 STEP 3 – Domestic Production of Metals and Raw Materials 20
3.3.1 General Summary 20
3.3.2 Inventory Summary 20
3.3.3 Data Gaps 21

3.4 STEP 4 – Domestic Production and Processing with Intentional Mercury Use 22
3.4.1 General Summary 22
3.4.2 Inventory Summary 22
3.4.3 Data Gaps 23

3.5 STEP 5 – Data and Inventory on Waste Handling and Recycling 24
3.5.1 General Summary 24
3.5.2 Inventory Summary 24
3.5.3 Data Gaps 25

3.6 STEP 6 – General Consumption of Mercury in Products, as Metal Mercury and as Mercury Containing Substances 26
3.6.1 General Summary 26
3.6.2 Inventory Summary 26
3.6.3 Data Gaps 27

3.7 STEP 7 – Data and Inventory on Crematoria and Cemeteries 28
3.7.1 General Summary 28
3.7.2 Inventory Summary 28
3.7.3 Data Gaps 28

3.8 STEP 8 – Miscellaneous Mercury Release Sources Not Quantified on Inventory Level 1 29
3.8.1 General Summary 29
3.8.2 Inventory Summary 29

3.9 Control Measures 30
3.9.1 General Summary 30
3.9.2 Inventory Summary 30

3.10 Conclusion 32

CHAPTER 4 :
LEGAL FRAMEWORK & OPERATIONAL FRAMEWORK ASSESSMENT 33
4.1 Introduction 34
4.2 Regulatory Framework Assessment 34
4.2.1 The Legally Binding Minamata Convention on Mercury 34
4.2.2 An Overview of the Provisions of the Minamata Convention on Mercury 36
4.2.3 A Holistic Approach in the Implementation of the Minamata Convention 38
4.2.4 An Overview of the Domestic Regulatory Framework that Enables the Implementation of the Minamata Convention 41
4.2.5 Conclusion 53

4.3 Operational Framework Assessment 54
4.3.1 Article 3: Mercury supply and trade 54
4.3.2 Article 4: Mercury-added products 56
4.3.3 Article 5: Manufacturing processes in which mercury or mercury compounds are used 68
4.3.4 Article 7: Artisanal and small-scale gold mining 70
4.3.5 Article 8: Emissions 70
4.3.6 Article 9: Releases 73
4.3.7 Article 10: Environmentally sound interim storage of mercury, other than waste mercury 73
4.3.8 Article 11: Mercury waste 74
4.3.9 Article 12: Contaminated sites 74
4.3.10 Article 17: Information exchange 74
4.3.11 Article 18: Public information, awareness and education 75
4.3.12 Article 19: Research, development and monitoring 75
4.3.13 Conclusion 75

CHAPTER 5 :
PROPOSED ACTION PLANS 77
5.1 Introduction 78
5.2 AP1: Prohibition of any future primary mercury mining activities 79
5.3 AP2: Strengthening the procedures of mercury import and export 80
5.4 AP3 Establishing legal and operational framework for mercury-added products 82
5.5 AP4: Gazettement of MDA order based on MDA Circular 2 (2017) 85
5.6 AP5: Addressing illegal and false notification of cosmetic products 86
5.7 AP6: Prioritization and implementation of measures to reduce dental amalgam 87
5.8 AP7: Establishing data collection mechanism and system for mercury-involved manufacturing processes 89
5.9 AP8: Establish mercury emission inventory 90
5.10 AP9: Revision of DOE's BAT to incorporate Convention's Guidance 91
5.11 AP10: Establish mercury release inventory 92
5.12 AP11: Establish new guideline or revise existing guideline to incorporate environmentally sound interim storage of mercury 93
5.13 AP12: Readiness on the definition of mercury waste adopted by COP 94
5.14 AP13: Develop strategies for identifying, assessing and remedying sites contaminated by mercury 95
5.15 AP14: Obtain, compile and consolidate information related to Minamata Convention 96
5.16 Conclusion 100

References 101
Annex I – Assessment of the legal and regulatory framework implementing the Minamata Convention 105
Annex II – Mercury Inventory Report 173

LIST OF ACRONYMS

Art	Article
ASEAN	Association of Southeast Asian Nations
ASGM	Artisanal and Small-Scale Gold Mining
BAT	Best Available Techniques
BEP	Best Environmental Practices
BPASPI	Environmental Management and Climate Change Division
CIMS	Chemical Information Management System
COP	Conference of the Parties
CUSTOMS	Royal Malaysian Customs Department
DCA	Drug Control Authority
DG	Director General
DOA	Department of Agriculture
DOE	Department of Environment
DOSH	Department of Occupational Safety and Health
EHS	Environmentally Hazardous Substances
EHSNR	Environmentally Hazardous Substances Notification and Registration
EQA	Environmental Quality Act
FDA	U.S. Food and Drug Administration
GC	Governing Council
GEF	Global Environment Facility
GDP	Gross Domestic Product
GMEF	Global Ministerial Environmental Forum
HS Code	Harmonized Commodity Description and Coding System
INC	Intergovernmental Negotiating Committee
JMG	Department of Mineral and Geoscience
KATS	Ministry of Water, Land and Natural Resources
KPDNHEP	Ministry of Domestic Trade and Consumer Affairs
KPM	Ministry of Education
MAPs	Mercury-Added Products
MDA	Medical Device Authority
MEAs	Multilateral Environmental Agreements
MESTECC	Ministry of Energy, Science, Technology, Environment & Climate Change
MIA	Minamata Convention Initial Assessment
MIDA	Malaysian Investment Development Authority
MITI	Ministry of International Trade and Industry
MOH	Ministry of Health
MOHR	Ministry of Human Resources
NIPMC	National Implementation Plan for Minamata Convention
NRE	Ministry of Natural Resources and Environment
NSCMC	National Steering Committee on Minamata Convention
OSHA	Occupational Safety and Health Act
Para	Paragraph
Pt	Part
RM	Ringgit Malaysia (Malaysia Ringgit)
Regs	Regulations
SAICM	Strategic Approach to International Chemicals Management
Sch	Schedule
S/s	Section
Ss/ss	Sections
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme

LIST OF TABLES

Table	Title	Page
Table 1.1	Articles of Minamata Convention	7
Table 2.1	Malaysia's top five export and import products in 2017	11
Table 3.1	General Data on Malaysia	17
Table 3.2	Background data for default calculation (Toolkit and real data)	17
Table 3.3	Summary STEP 2 - Data and inventory on energy consumption and fuel production	18
Table 3.4	Summary STEP 3 - Data and inventory on domestic production of metals and raw materials	20
Table 3.5	Summary STEP 4 - Domestic production and processing with intentional mercury use	22
Table 3.6	Summary STEP 5 - Data and inventory on waste handling and recycling	24
Table 3.7	Summary STEP 6 - Data and inventory on general consumption of mercury in products, as metal mercury and as mercury containing substances	26
Table 3.8	Summary STEP 7 - Data and inventory on crematoria and cemeteries	28
Table 3.9	Summary STEP 8 - Miscellaneous mercury release sources not quantified in Inventory Level 1	29
Table 3.10	Summary of mercury release reduction according to level of control measures	30
Table 4.1	The science-policy linkages forged between substantive and procedural obligations, with particular emphasis on the production of scientific information, and the corresponding domestic legislations and lead agency	45
Table 4.2	HS codes for mercury and its preparation	54
Table 4.3	Product categories for Part I and Part II of Annex A	56
Table 4.4	Status of mercury-added products – batteries in Malaysia	57
Table 4.5	Status of mercury-added products – switches and relays in Malaysia	58
Table 4.6	Status of mercury-added products – fluorescent lamps and mercury vapour lamps in Malaysia	59
Table 4.7	Status of mercury-added products – cosmetics in Malaysia	62
Table 4.8	Status of mercury-added products – pesticides in Malaysia	63
Table 4.9	Status of mercury-added products – non-electronic measuring devices in Malaysia	64
Table 4.10	Measures to phase down the use of dental amalgam and corresponding actions taken by Malaysia	66
Table 4.11	Manufacturing processes using mercury or mercury compounds listed in Annex B	68
Table 4.12	The roles of mercury and manufactured chemicals in manufacturing process listed in Annex B	68
Table 4.13	Limit value and monitoring frequency for mercury emission stipulated in CAR 2014	72
Table 5.1	Obligation for import and export of mercury under Minamata Convention	80
Table 5.2	The forms (for import and export of mercury) endorsed by COP	80
Table 5.3	Annex A (Part I) of the Minamata Convention	82
Table 5.4	Prioritization of measures to phase down dental amalgam	87
Table 5.5	Relevant authorities that might related to Article 17, 18 and 19	97
Table 5.6	Legislations and institutions relevant to the implementation of the Convention	98

LIST OF FIGURES

Table	Title	Page
Figure 1.1	Bioaccumulation and biomagnification of methylmercury	5
Figure 1.2	Release categories of mercury with main types of possible control mechanisms	6
Figure 2.1	Map of Malaysia	10
Figure 4.1	A life cycle approach in understanding the implementation of obligations stipulated under the Minamata Convention	39
Figure 4.2	Mercury supply sources and trade in Malaysia	55
Figure 4.3	Different processes that manufacture the same chemical	69
Figure 4.4	Manufacturing data captured by the relevant entities in Malaysia	70
Figure 4.5	Definitions and relations among 'source category', 'relevant source', 'new source' and exiting source in Art 8	70
Figure 5.1	Relationship between Article 17, 18 and 19	96
Figure 5.2	The proposed inter-agencies coordinating committee	100



EXECUTIVE SUMMARY

The Minamata tragedy which occurred in Japan in the 1950s is still considered one of the most severe episodes of mercury poisoning the world has ever seen, having affected thousands of people with a severe neurological disease and claiming many human and animal lives in the process. The events that consequently followed have not only become a sombre reminder on the importance of responsible management and disposal of mercury and harmful chemicals in general, but also eventually led to the establishment of the Minamata Convention on Mercury that entered into force in August 2017. Malaysia signed the treaty on 24 September 2014, and in preparation towards ratification conducted a Minamata Convention Initial Assessment (MIA) which aims to establish a national mercury inventory and to assess the readiness of Malaysia's current legal, policy and regulatory framework, with support from the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC) and the United Nations Development Programme (UNDP). In addition to a preliminary assessment of mercury emissions and releases in Malaysia (which adopts the UNEP's Toolkit for Identification and Quantification of Mercury Releases), the MIA also evaluates and identifies relevant regulatory and operational frameworks that can potentially fulfil the obligations stipulated under the Convention. In summary, this report proposes 14 specific action plans which, if implemented, will support Malaysia's preparation towards ratification of the Minamata Convention on Mercury.



CHAPTER 1 :
OVERVIEW

1.1 Global Concerns on Mercury

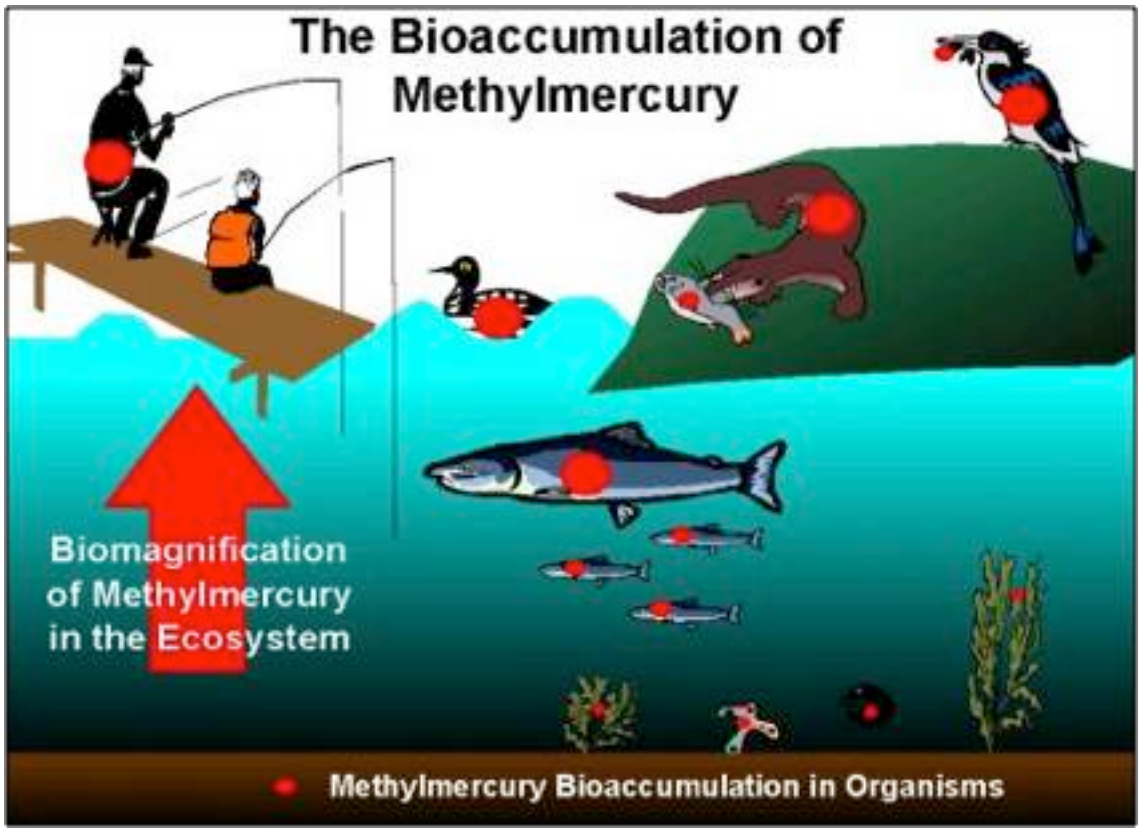
Mercury occurs naturally in the environment. However, it is rarely found in nature as pure, liquid metal, but rather, within compounds and inorganic salts (UNEP 2002). Mercury in mercury compounds can be found in the form of monovalent (Hg^{+}) or divalent (Hg^{2+}). According to UNEP (2002), mercury exists in the following main states under natural conditions:

a) As metallic vapour and liquid/elemental mercury;
b) Bound in mercury containing minerals (solid);
c) As ions in solutions or bound in ionic compounds (inorganic and organic salts);
d) As soluble ion complexes;
e) As gaseous or dissolved non-ionic organic compounds; and
f) Bound to inorganic or organic particles/matters by ionic, electrophilic or lipophilic adsorption.

Mercury's unique characteristics have been vital in various applications in human civilizations. Approximately one million tonnes of mercury were produced over the last 500 years and had evolved from basic use such as ink to advanced measuring equipment including sphygmomanometer and hygrometer (Hylander & Meili, 2003). Main industries that are still utilising and releasing mercury include mining, cement production, vinyl chloride monomer production, chlor-alkali production and consumer products manufacturing (UNEP, 2013a).

However, mercury and its compounds pose significant risks on human and environmental health. For example, methylmercury ($Hg\text{-}CH_3$) is a well-documented neurotoxicant and it was the culprit in the Minamata tragedy that occurred in Minamata Bay, Japan between 1950 and 1960s, causing massive environment pollution and human health deterioration. The incident led to the discovery of Minamata disease, a disease caused by mercury poisoning that killed more than 1,784 individuals (National Institute for Minamata Disease, 2014). The source of the contamination was mercury-contaminated effluent discharged by the company at Minamata Bay that used mercury as a catalyst in the production of acetaldehyde (a component of plastic). The discharged mercury underwent biotic and abiotic processes, and then formed methylmercury.

Bioaccumulation and biomagnification of methylmercury were the two main factors that lead to Minamata Diseases. The term bioaccumulation refers to the net accumulation over time of metals within an organism from both biotic (other organisms) and abiotic (soil, air, and water) sources, whereas the term biomagnification refers to the progressive build-up of some heavy metals (and some other persistent substances) by successive trophic levels – meaning that it relates to the concentration ratio in a tissue of a predator organism as compared to that in its prey (AMAP, 1998). This also causes deposition of mercury in edible fishes and became one of the major sources of mercury exposure to human through fish consumption (Coelho et al., 2010; Hajeb et al., 2009). Figure 1.1 illustrates the bioaccumulation and biomagnification of methylmercury. Due to the persistence of mercury, even almost half a century after Minamata tragedy, there are still 10,072 individuals found with conditions who are eligible for medical expenses allowance in 2001 (National Institute for Minamata Disease, 2014).



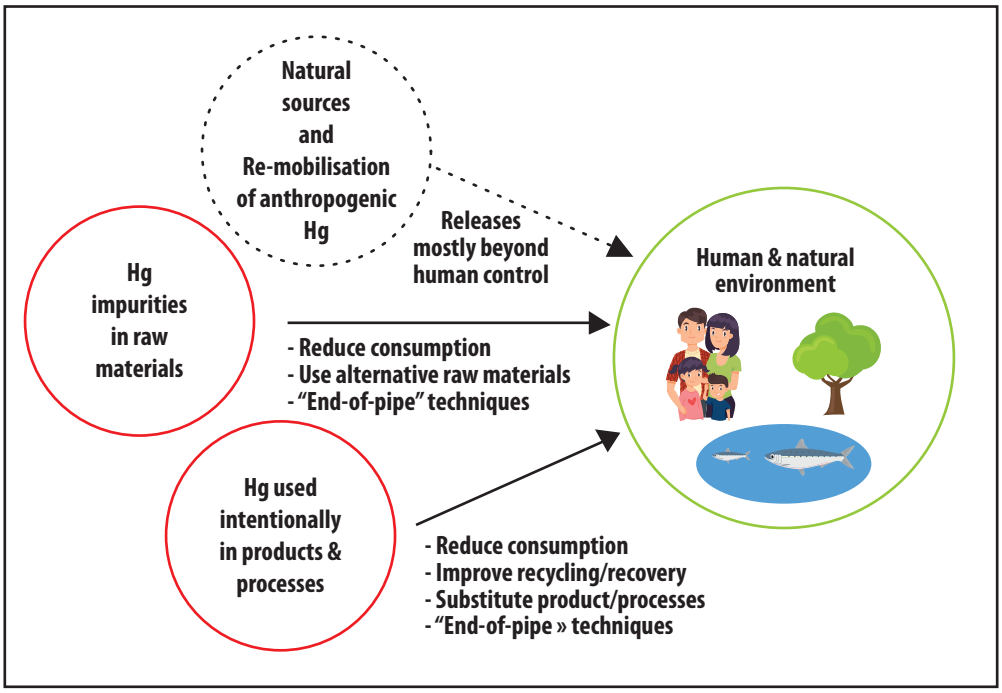
Source: http://www.csa.com/discoveryguides/mercury/images/bioaccumulation.jpg

Figure 1.1 Bioaccumulation and biomagnification of methylmercury

Mercury is also very dangerous in the environment because it is a transboundary pollutant. This is due to the fact that the biogeochemical cycle is a global phenomenon and factors including wind, ocean current and fish migration can contribute to a spreading of mercury far from the original release area. This is evident in the Arctic, where despite its remote location, it still has high mercury concentration predicted to originate mainly from Oceania and East Asia through wind and ocean currents (AMAP 2011). These findings drew international concerns since mercury is capable of causing damaging effects globally even if the use or releases are localised in specific areas or regions. Since the release of mercury into the environment is a global concern, UNEP (2002) has grouped releases of mercury to the biosphere into four categories, namely:

a) Natural sources - releases due to natural mobilisation of naturally occurring mercury from the Earth's crust, such as volcanic activities and the weathering of rocks;
b) Current anthropogenic (associated with human activities) releases from the mobilisation of mercury impurities in raw materials such as fossil fuels – particularly coal, and to a lesser extent gas and oil – and other extracted, treated and recycled minerals;
c) Current anthropogenic releases resulting from mercury used intentionally in products and processes, due to releases during manufacturing, leaks, disposal or incineration of spent products or other releases; and
d) Re-mobilisation of historic anthropogenic mercury releases previously deposited in soils, sediments, water bodies, landfills and waste/tailings piles.

At the same time, UNEP (2002) identified the release categories of mercury and suggested possible control mechanisms that address these release categories (Figure 1.2).



Source: UNEP 2002

Figure 1.2 Release categories of mercury with main types of possible control mechanisms

The Minamata incident became another unfortnate landmark in human history that manifested the importance of chemical management in general, and in particular, the management of mercury. Following the incident, studies were vigorously conducted where more information on mercury hazards and risks particular to human health and the environment is revealed. The heightened awareness on the environmental and health concerns over mercury usage has an impact on primary mercury mining where production dropped from recorded annual average between 5500-7100 metric tons (between 1981 and 1985) to 1800 metric tons in 2000 (UNEP 2002). However there are still significant amount of mercury in the market especially through recycling in order to meet the needs of certain industries including artisanal gold mining, cement production and the medical industry.

1.2 Minamata Convention on Mercury

Acknowledging the dangers of mercury, various efforts had been conducted to promote better management of mercury. These efforts had been conducted across sectors at all levels, including local, national, regional, and even global. In February 2009, the Governing Council of UNEP adopted Decision 25/5 on the development of a global legally binding instrument on Mercury. After the conduct of five sessions of intergovernmental negotiating committee (INC), the INC concluded its fifth session in January 2013 by agreeing on the text of the Minamata Convention on Mercury which was later opened for signature on 10 October 2013. The Minamata Convention on Mercury entered into force on 17 August 2017, and as of 31 December 2018, there are 101 parties and 128 signatories for the Minamata Convention on Mercury. Malaysia signed the Minamata Convention on 24 September 2014 in New York (UNEP, 2014). Table 1.1 shows the articles of Minamata Convention.

Table 1.1 Articles of Minamata Convention

Article 1	Objective
Article 2	Definitions
Article 3	Mercury supply and trade
Article 4	Mercury-added product
Article 5	Manufacturing processes in which mercury or mercury compounds are used
Article 6	Exemptions available to a Party upon request
Article 7	Artisanal and small-scale gold mining
Article 8	Emissions
Article 9	Releases
Article 10	Environmentally sound interim storage of mercury, other than waste mercury
Article 11	Mercury waste
Article 12	Contaminated sites
Article 13	Financial resources and mechanism
Article 14	Capacity-building, technical assistance and technology transfer
Article 15	Implementation and Compliance Committee
Article 16	Health aspects
Article 17	Information exchange
Article 18	Public information, awareness and education
Article 19	Research, development and monitoring
Article 20	Implementation plans
Article 21	Reporting
Article 22	Effectiveness evaluation
Article 23	Conference of the Parties
Article 24	Secretariat
Article 25	Settlement of disputes
Article 26	Amendments to the Convention
Article 27	Adoption and amendment of annexes
Article 28	Right to vote
Article 29	Signature
Article 30	Ratification, acceptance, approval or accession
Article 31	Entry into force
Article 32	Reservations
Article 33	Withdrawal
Article 34	Depositary
Article 35	Authentic texts

Source: UNEP 2013b

1.3 Minamata Convention Initial Assessment (MIA)

The Minamata Convention is a global treaty to protect human health and the environment from adverse effects of mercury. The major highlights of the Minamata Convention on Mercury include a ban on new mercury mines, the phaseout of existing ones, control measures on air emissions, and the international regulation of the informal sector for artisanal and small-scale gold mining. In order to facilitate the early entry into force of the Convention, a Minamata Convention Initial Assessment (MIA) will be conducted to allow a country to collect information to determine what is needed in order to ratify the Convention and, subsequently, to provide a basis for any further work towards implementation.

As far as MIA is concerned, the Global Environment Facility (GEF), via United Nations Development Programme (UNDP), has provided financial assistance to the Malaysian Government to conduct MIA. The Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC) is the national focal for the MIA. Other countries that had obtained similar supports include India, Ghana, Kazakhstan and Albania.

1.3.1 Objectives

The objective of MIA is to identify national mercury challenges and the extent to which the current legal, policy and regulatory framework is capable of enabling Malaysia to implement future obligations under the Minamata Convention.

1.3.2 Duties and Responsibilities

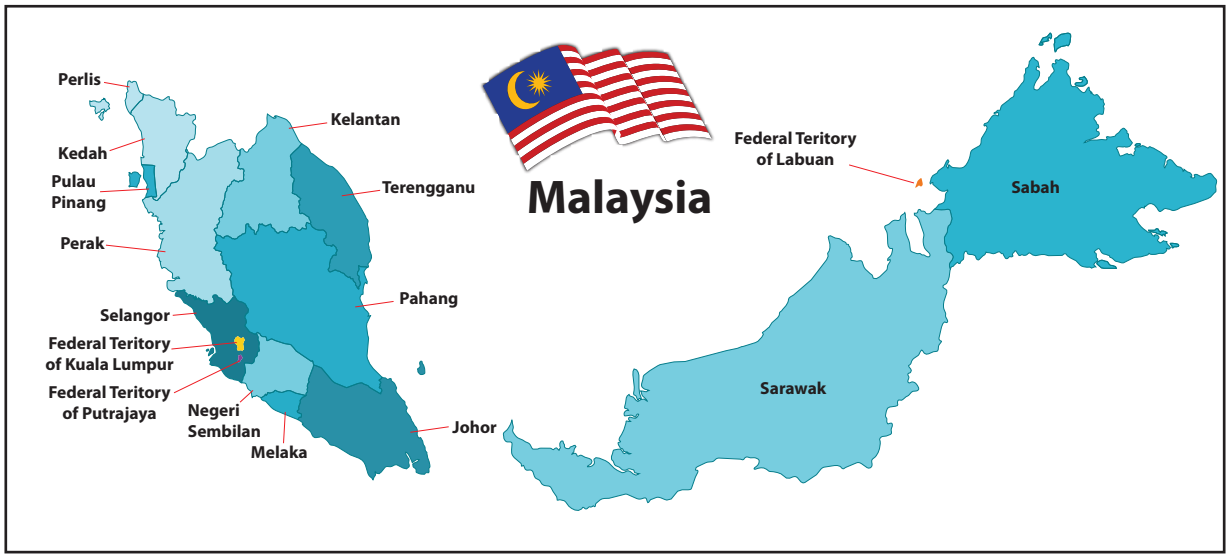
UKM Pakarunding was awarded the MIA project and the duties and responsibilities are as below:

- Prepare, write and develop the Inception Report for approval by Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC) based on the discussions and meetings with stakeholders;
- Provide review and analysis on existing regulations/ guidelines/reports in Malaysia related to Mercury;
- Undertake a Mercury Inventory exercise and prepare the National Mercury Profile making use of the UNEP "Toolkit for Identification and Quantification of Mercury Releases" that was intended to assist countries to develop a national mercury releases inventory;
- The inventory exercise will also include: a. Identification and assessment of the amounts of emission sources of mercury and release sources of mercury to land and water; b. Identification of old, historical sources of mercury contamination (such as abandoned mining sites); and c. Identification of key sectors, municipalities, communities and other stakeholders affected by or involved with important Mercury sources and/or emissions.
- Based on the data gathered, to prepare a National Mercury Profile for review, approval and adoption by the National Steering Committee on Minamata Convention (NSCMC) during a national stakeholder workshop.
- Prepare the National MIA Report for review of the NSCMC.
- Undertake a capacity assessment of government agencies
- Conduct training sessions (at least 2) on mercury for stakeholders working on Mercury.
- In consultation with implementing partners, to prepare the National Implementation Plan.

CHAPTER 2 :
NATIONAL PROFILE

2.1 Geography and Population

Malaysia consists of 13 states (i.e., Johor, Kedah, Kelantan, Melaka, Negeri Sembilan, Pahang, Penang, Perak, Perlis, Sabah, Sarawak, Selangor and Terengganu) and 3 federal territories (i.e., Kuala Lumpur, Labuan and Putrajaya) (Figure 1.1). These states and federal territories are located in 2 separated regions, namely peninsular Malaysia and island of Borneo, and these 2 regions are separated by 640 km (or 400 miles) of the South China Sea.



Source: Department of Statistics Malaysia 2018a

Figure 2.1: Map of Malaysia

According to Department of Statistics Malaysia, the population of Malaysia is estimated to reach 32.4 million in 2018, with the increase of 0.4 million as compared to 2017 (Department of Statistics Malaysia, 2018b). From the total estimated population, the gender ratio (female:male) for citizen is 1:1. The age distribution group for the estimated population in 2018 is 7.71 million for the age group 0-14 years; 22.58 million for the age group 15-64 years; and 2.10 million for the age group above 65 years. The life expectancy for male is 72.7 years whereas for female is 77.6 years (Department of Statistics Malaysia, 2018b).

In 2016, Department of Statistics Malaysia has projected Malaysia population in year 2040 (Department of Statistics Malaysia, 2016). The estimated Malaysia population in 2040 is 41.5 million, with an increase of 12.9 million compared to 2010. It is also estimated that the median age will rise to 38.3 years (in 2040) compared to 26.3 years in 2010. The median age is the age that divides the population into two, such as half of the population is below this age and another half is above (Department of Statistics Malaysia, 2016). In line with this, the percentage of age group that is above 65 years will also increase significantly.

2.2 Governmental Structure and Economic Sector

Malaysia is a parliamentary democracy with a federal constitutional monarch. The Yang di-Pertuan Agong is the King or head of the state of Malaysia, where Yang di-Pertuan Agong is chosen for a five-year term from the nine hereditary states in Malaysia.

The legislative power in Malaysia is divided between the federal and state legislatures. The federal legislative branch of the government gives power to form the parliament that consists of two houses, i.e., the senate (Dewan Negara) and the Hall of the People (Dewan Rakyat). Art 43 of the Federal Constitution of Malaysia provides for the appointment of the cabinet (Jemaah Menteri), presides over by the prime minister, to advise the Yang di-Pertuan Agong in the exercise of His Royal Highness' (Kebawah Duli Yang Maha Mulia Seri Paduka Baginda) functions. The prime minister is appointed by Yang di-Pertuan Agong, who also appoints the cabinet based on the prime minister's advice. For the states, each state has an executive council that is led by the chief minister to deal with matters at the state level.

According to the Central Bank of Malaysia, Malaysia's Gross Domestic Product (GDP) increased from 4.2% (in 2016) to 5.9% (in 2017) (Central Bank of Malaysia, 2018). Most sectors registered higher growth in 2017, where construction, services and manufacturing sectors grow at 6.7%, 6.2% and 6.0%, respectively. The labour force has recorded 15.0 million persons in 2017 compared to 14.7 million persons in 2016 (Central Bank of Malaysia, 2018).

The Ministry of International Trade and Industry (MITI), by referring to the WTO database (updated April 2018), indicates that Malaysia's ranking in the World Merchandise Trade in 2017 is as followed: Malaysia is the 25th largest exporter, 26th largest importer and 25th largest trading nation (MITI, 2018). Table 2.1 shows Malaysia's top five export and import products in 2017.

Table 2.1 Malaysia's top five export and import products in 2017

Exported products	
Products	**RM billion**
Electric and electronic products	343.02
Petroleum products	71.99
Chemicals and chemical products	68.58
Palm Oil and Palm Oil-based Agriculture products	53.85
LNG	40.46

Imported products	
Products	**RM billion**
Electric and electronic products	252.91
Chemicals and chemical products	79.88
Machinery, Equipment and Parts	78.59
Petroleum products	75.52
Manufactures and Metal	43.64

Source: MITI, 2018

2.3 Key Agencies for the Implementation of Minamata Convention in Malaysia

In February 2009, the Governing Council of UNEP adopted Decision 25/5 on the development of a global legally binding instrument on mercury. Subsequent to the adoption of Decision 25/5, the intergovernmental negotiating committee (INC) met over five sessions from June 2010 to January 2013 where the INC concluded its fifth session in 2013 by agreeing on the text of the Minamata Convention on Mercury, which was later opened for signature on 10 October 2013. The Minamata Convention on Mercury entered into force on 17 August 2017. The 1st Conference of the Parties (COP) took place from 24th to 29th September 2017 in Geneva, Switzerland, followed by the 2nd COP, which was held from 19 to 23 November 2018 in Geneva, Switzerland. The COP will meet yearly for the first three years. As of 31 December 2018, there are 101 parties and 128 signatories for the Minamata Convention on Mercury. Malaysia signed the Minamata Convention on 24 September 2014 in New York (UNEP, 2014).

Similar to other countries, Malaysia does not have a single entity for mercury management, nor does it have a single entity for chemicals management in general. The responsibilities for mercury management (or chemicals management) falls under the jurisdictions of different entities in Malaysia. The following section outlines key agencies in Malaysia that play a part in mercury management (or chemicals management), either directly or indirectly.

2.3.1 Ministry of Energy, Science, Technology, Environment & Climate Change (MESTECC)

The Ministry of Energy, Science, Technology, Environment & Climate Change (MESTECC) declared in its official website that, its main focuses are:

a) Green and efficient energy sector;
b) Environmental pollution-free and resistance to climate change; and
c) Wealth creation through science and technology;

A division known as Environmental Management and Climate Change Division (BPASPI) was established under the former Ministry of Natural Resources and Environment (NRE) to deal with matters pertaining to climate change and the enhancement of environmental protection, which includes issues concerning chemicals management. The Division is now operating under MESTECC. MESTECC, with the support of BPASPI, is the national focal point for Rotterdam Convention, Stockholm Convention and Strategic Approach to International Chemicals Management (SAICM). As far as Minamata Convention is concerned, Malaysia had established a National Steering Committee in response to the call of the international community to ratify the Convention (NSCMC), where BPASPI served as the secretariat for this committee. The NSCMC reviews the status of mercury management in Malaysia, and coordinates stakeholders' involvement in determining the national stand for Minamata Convention.

2.3.2 Ministry of Health (MOH)

The Ministry of Health (MOH) aims to assist individuals in achieving and sustaining good health, and further facilitates them in leading a productive lifestyle. Under MOH, there are four entities that are relevant to mercury management, namely Pharmacy Enforcement Division, Disease Control Division, Oral Health Division and the Medical Device Authority.

The Pharmacy Enforcement Division ensures all pharmaceutical and health products in the market are of an acceptable quality, safe and effective. One of the legislations enforced by the Pharmacy Enforcement Division is the Poisons Act 1952, where mercury and mercury compounds are listed as poisons in Sch 1 of Poisons Act 1952. On the other hand, the Disease Control Division is concerned of the health effects caused by mercury exposure via environment.

As far as oral health is concerned, the Oral Health Division aims to improve the oral health status of the population through the provision of preventive, promotive, curative and rehabilitative dental services. Dental amalgam is one of the areas covered by Oral Health Division. For medical devices in Malaysia, Medical Device Authority (MDA) was established in 2012 with the objective to provide regulatory control of medical device industry in Malaysia by ensuring medical devices in Malaysia are of high quality, effective and safe. MDA regulates manufacturer, importer or distributer who is responsible for placing any medical device in the market, where the medical device includes those that contain mercury, such as thermometer and sphygmomanometer.

2.3.3 Ministry of International Trade and Industry (MITI)

The vision of Ministry of International Trade and Industry (MITI) is to make Malaysia one of the most globally competitive trading nation and a preferred investment destination amongst foreign and local investors alike, by 2020. MITI plans, legislates and implements international trade and industrial policies, and generates and maintains economic momentum that can create high value and high income employment opportunities for Malaysia's fast growing, innovative and talented workforce. According to MITI Report 2017, chemicals and chemical products were recorded as second highest imported products and third highest exported products (MITI, 2018).

Chemical and chemical products served as an important area for Malaysia's economic growth and it was identified as one of the priority subsectors in the Malaysia Productivity Blueprint – Driving Productivity of the Nation. The prioritisation of subsector is based on: (i) contribution to GDP; (ii) share of workforce; (iii) opportunity for productivity improvement; (iv) high multiplier effect; and (v) readiness to implement productivity improvement (EPU, 2017).

2.3.4 Ministry of Domestic Trade and Consumer Affairs (KPDNHEP)

The Ministry of Domestic Trade and Consumer Affairs (KPDNHEP) aims to promote the development of viable, competitive and sustainable domestic economy, and committed in protecting the interest and rights of consumers. In Malaysia, the Consumer Protection Act 1999 is under the purview of KPDNHEP. Part III of the Act on safety of goods and services stipulated that, the Minister may by regulations prescribe the safety standards in respect of any goods or class or goods, and any services or class of services. He may also prescribe different safety standards for different goods or services, or classes of goods and services. The safety standards in relation to goods and services may relate to the performance, composition, contents,

manufacture, processing, design, construction, finish, testing or packaging and the form and content of markings, warnings or instruction to accompany any goods or services.

2.3.5 Department of Environment (DOE)

The main function of the Department of Environment (DOE) is to prevent, eliminate, control pollution, and to sustain and enhance quality of the environment, consistent with the jurisdiction stipulated under Environmental Quality Act 1974. As far as mercury management is concerned, there are several divisions under DOE that regulate mercury emission, discharge and disposal. These divisions are Air Division, Water and Marine Division, and Hazardous Substances Division.

The main function of the Air Division is to ensure good air quality and that the air quality do not deteriorate over time. The Environmental Quality (Clean Air) Regulations 2014, that replaced Environmental Quality (Clean Air) Regulations 1978, has stipulated requirements for the conduct of periodic monitoring of mercury for boilers, non-metallic (mineral) industry, waste incinerators, and the chemical and petrochemical industry. In general, Environmental Quality (Clean Air) Regulations 2014 emphasises that owner or occupier of a premise shall use best practicable means to prevent emission of hazardous substances and to render harmless and inoffensive those substances necessarily discharged.

The Water and Marine Division regulates and monitors water quality related to inland and marine waters. The Environmental Quality (Industrial Effluent) Regulations 2009 (replacing Environmental Quality (Industrial Effluent) Regulations 1979) stipulate the acceptable conditions for the discharge of industrial effluent that contains various parameters, including mercury. In addition, the Hazardous Substances Division regulates the disposal of scheduled wastes that contain mercury via the provisions of Environmental Quality (Scheduled Waste) Regulations 2005.

2.3.6 Department of Occupational Safety and Health (DOSH)

The Department of Occupational Safety and Health (DOSH) is responsible in ensuring the safety, health and welfare of people at work, as well as protecting other people from hazards arising from the activities at work. The Chemical Management Division under DOSH plays an important role in overseeing the overall management of chemicals at the workplace. This includes chemical health risk assessment, determination of exposure standards, chemical classifications and hazard communication. The relevant legislations related to chemicals management are enforced by DOSH, which include Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013, Occupational Safety and Health (Use and Standards of Exposure of Chemicals Hazardous to Health) Regulations 2000, Occupational Safety and Health (Control of Industrial Major Accident Hazards) Regulations 1996 and Occupational Safety and Health (Prohibition of Use of Substance) Order 1999. Under the provisions of these legislations, mercury must be classified based on its hazardous properties, where it is stipulated that the level of mercury exposure at the workplace must not exceed the permissible exposure limit. Moreover, medical surveillance for mercury exposure is required if mercury is being exposed at the workplace.

2.3.7 Department of Agriculture (DOA)

The Department of Agriculture (DOA) provides quality and efficient services to agricultural entrepreneurs through the application of advance technologies and agricultural regulatory services to boost production capability and to safeguard the safety of the country's agriculture sector. DOA regulates and enforces agriculture-related legislations that protect the nation's agriculture industry, food safety and quality from the threat of pests and foreign diseases. In this regard, one of the legislations enforced by DOA is the Pesticides Act 1974. Manufactures and importers of pesticides must register their products with the Pesticide and Fertiliser Control Division under DOA. Under Pesticides Act 1974, pesticide means any substance that contains an active ingredient; or any preparation, mixture or material that contains any one or more of the active ingredients as one of its constituents. The list of active ingredients can be found in the 1st Sch of Pesticides Act 1974, where some of the mercury compounds are listed in the Sch.

2.3.8 Department of Mineral and Geoscience (JMG)

The Department of Mineral and Geoscience (JMG) aims to enhance the contribution of mineral and geoscience sectors towards socio-economic development for the promotion of social well-being. Under the provisions of Mineral Development Act 1994, as well as the respective State Mineral Enactments, JMG and State Authorities regulate matters pertaining to mineral exploration, mining and other related issues. Mineral Development Act 1994 defines 'mineral' as any substance whether in solid, liquid or gaseous form occurring naturally; or as a result of mining or on the earth; or as a result of mining in or under the sea or sea-bed, formed by or subject to a geological process, but excludes water, rock material (as defined under the National Land Code) and petroleum (as defined under the Petroleum Mining Act).

2.3.9 Royal Malaysian Customs Department (CUSTOMS)

One of the functions of the Royal Malaysian Customs Department (CUSTOMS) is to implement policies and procedures related to industries established by CUSTOMS and other government agencies in Malaysia with regards to import, export and border control. The CUSTOMS was given the mandates under Customs Act 1967 to regulate goods imported to and exported from Malaysia. In this regard, CUSTOMS always collaborate with other government agencies to make explicit decisions on imported and exported goods. For example, after consultation with other government agencies, CUSTOMS gazetted the Customs (Prohibition of Imports) Order 2017 to prohibit and control certain goods to be imported to Malaysia. As far as import of mercury and mercury compounds are concerned, after consultation with MOH, CUSTOMS has listed mercury and mercury compounds in the Custom (Prohibition of Imports) Order 2017.

CHAPTER 3 :
NATIONAL MERCURY INVENTORY

3.0 Overview

Minamata Convention on Mercury was established with the objective to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds (UNEP, 2013b). From the objective, it can be easily understood that mercury emissions and releases will cause environmental contamination which leads to exposure of mercury to human and animals. Therefore, quantifying mercury releases will help in establishing a better understanding of mercury flow in the environment and assist in the overall mercury management and planning. A comprehensive and detailed mercury inventory will assist a country in the identification of significant mercury releasing activities and plan accordingly in preparation for ratification of the Convention. This will help in establishing adequate baseline data that will contribute towards a better understanding of the issues, which strengthens the mercury management system.

Quantifying mercury releases requires expertise in various fields and demands high technical capability that will be the main obstacle in many parts of the world. In assisting Developing Country and Country in Economic Transition, United Nations Environment Programme (UNEP) had developed an instrument called *"Toolkit for Identification and Quantification of Mercury Releases"* aiming to assist these countries to develop part of the required knowledge through the development of mercury inventory that identifies sources of mercury releases in their country and quantifies their releases (UNEP, 2017). UNEP's Toolkit for Identification and Quantification of Mercury Releases was built as a Microsoft Excel's spreadsheet containing predetermined calculation of mercury releases quantification based on the activity rate identified by the country. The Toolkit utilises the mass balance principle that states, the sum of inputs will be equal to the total sums of output. In a mercury-involved system, the total mercury introduced into the system will be equal to the total releases of mercury via various release pathways including air, water, land, or as by-products and impurities. This MIA utilised the Toolkit Level 1 (Version 2.0) that uses the input and output factors determined by UNEP, which also enables the entry of control measures in the calculation.

This MIA chose the year 2014 as the assessment year after evaluating the availability of data for a period from 2013 to 2016, where 2014 is the year with most data available. This MIA also had agreed to only consider data from competent national authorities to ensure validity and reliability of the data that are representative of the national scenario. Data collection process was conducted according to the guideline where data collected includes source availability, source quantification and the contact person that currently have the data. The data is collected according to the format required by the Toolkit and then used for the analysis.

The detailed full technical report of the mercury inventory is attached together with this report covering the entire process of data collection, analysis and discussion. The following is the summary of the results according to the steps of the Toolkit.

3.1 STEP 1 – Country Profile

3.1.1 General Summary

Step 1 in using the Toolkit is to report the basic country profile data. Most of the data is for reporting purposes while only a few will be used for calculation. General data required in this part are country name, population, assessment year, Gross Domestic Product (GDP) and main economic sectors. This step also indicates three preloaded data that will be used as baselines in the analysis, which include population, dental personnel per 1000 inhabitants and electrification rate. Only the preloaded population data was allowed to be amended according to the actual population of the assessment year.

3.1.2 Inventory Summary

Table 3.1 General Data on Malaysia

General Data	
Country	Malaysia
Population	30,708,500
Year and reference for population data	2014
GDP (Gross Domestic product)	RM 1,012,400,000,000 (RM 1012.4 Billion)
Year and reference for GDP data	2014
Main sectors in the economy of country (list)	1. Construction 2. Services 3. Manufacturing 4. Mining 5. Agriculture, Forestry and Fishing

Table 3.2 Background data for default calculation (Toolkit and real data)

Indicator	Toolkit's Value	Real Value
Population in 2010 (or as recent as available data allow; UNSD, 2012)	28,250,458	30,708,500 (Department of Statistics, 2017)
Dental personnel per 1000 inhabitants	0.093	0.19*
Electrification rate, % of population with access to electricity	99	99.985 (World Bank 2018)

**According to Social Statistics Bulletin 2017, there are 1:5215 dentists to population ratio in 2014. Using the population data (30,708,500) the ratio of dental personnel per 1000 inhabitants can be calculated.*

3.2 STEP 2 – Energy Consumption & Fuel Production

3.2.1 General Summary

Step 2 of the Toolkit focused on energy sector and is divided into two subcategories namely energy consumption and fuel production. Fossil fuels and biomass naturally contain trace concentrations of mercury that will be released to the atmosphere when burned (UNEP, 2017). The Toolkit covers the consumption of coal, petroleum coke, heavy oil, natural gas, biomass, charcoal, diesel, gasoil, petroleum and kerosene in producing energy. Mercury may also be released to the environment during the process of fuel production including extraction, refining and treatment processes (UNEP, 2017). The fuel production subcategory of this Toolkit covers the process of extraction, refining and processing of oil and natural gas.

For this step, this MIA found that the required data are reported in Malaysia Energy Statistics 2016 and mainly in the unit of kilotonne of oil equivalent (ktoe) instead of in metric mass (tonne, t). Therefore, this MIA had decided to use the given conversion factors in getting the data in the format suitable for the Toolkit. Conversion factors from National Energy Balance 2015 will be used to convert the ktoe data into terajoule (TJ), and then to metric tonne. This process will create some uncertainty due to the conversion process but this MIA decided to adopt real data provided by competent national authorities. The analysis found that the estimated input for energy consumption and fuel production in 2014 is 10,355 kg of mercury and the releases are shown in Table 3.3.

3.2.2 Inventory Summary

Summary of the results generated by the analysis:

Table 3.3 Summary STEP 2 - Data and inventory on energy consumption and fuel production

Source category	Estimated Hg input, Kg Hg/y	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	2,924	2,573.2	0.0	0.0	0.0	0.0	350.9
Coal combustion in coal fired industrial boilers	325	325.3	0.0	0.0	0.0	0.0	0.0
Other coal uses	?	?	?	?	?	?	?
Combustion/use of petroleum coke and heavy oil	14	13.6	0.0	0.0	0.0	0.0	0.0
Combustion/use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates	150	150.1	0.0	0.0	0.0	0.0	0.0
Use of raw or pre-cleaned natural gas	?	?	?	?	?	?	?

Source category	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
		Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment / disposal
Energy Consumption							
Use of pipeline gas (consumer quality)	2	2.3	0.0	0.0	0.0	0.0	0.0
Biomass fired power and heat production	?	?	?	?	?	?	?
Charcoal combustion	?	?	?	?	?	?	?
Fuel Production							
Oil extraction	97	0.0	19.4	0.0	0.0	0.0	0.0
Oil refining	87	21.7	0.9	0.0	0.0	0.0	13.0
Extraction and processing of natural gas	6,758	1,013.7	1,351.5	0.0	2,027.3	0.0	2,365.2

(-): The source is absent in the country and therefore no release.

(?): No data available on this source

3.2.3 Data Gaps

There were several gaps identified during the analysis of this step:

1. Most of the data is available from National Energy Balance Report. However, the latest version of the report (National Energy Balance 2016) only reported data up until the year of 2014. Another source of data is from International Energy Agency (IEA). However this data is not validated as Malaysia is not a member of IEA.
2. For local reporting, the data usually is presented in the unit of kilotonne of oil equivalent (ktoe). However, the Toolkit usually requested the data in metric unit (tonne). It is possible to convert the data from energy (ktoe) to mass (tonne) with the use of conversion factors. However, the conversion entails a degree of uncertainty as different fuel types actually carries different conversion factors. Therefore, the generalisation of the conversion factors for the different fuel types compounded the uncertainty of converted data.
3. Some data are not available or accessible and this produced some gaps in the quantification process. Evidence of scenarios (e.g., use of biomass) shows the potential of availability of sources but there is a lack of data (as required by the Toolkit), which masked the real magnitude of the contribution to mercury release and quantification.
4. A lack of data on the quality of natural gas had forced this MIA to assume that the natural gas consumed is of a higher grade meant for consumers. The use of pre-cleaned natural gas might produce a different amount in the quantification of mercury release.
5. The Toolkit uses a general mix of coal types relevant to developing countries in estimating the release. A better understanding of the types of coal used will give more accurate estimations in mercury release.

3.3 STEP 3 – Domestic Production of Metals and Raw Materials

3.3.1 General Summary

Step 3 of the Toolkit focuses on the domestic production of metals and raw materials with two sub-categories including primary metal production and other materials production. The Toolkit focused on the mining of various metals since mercury is present in trace amount in ore materials including the ore for other metals (UNEP, 2017). The sources that covered under this metal mining including mercury, zinc, copper, gold, lead, alumina and primary ferrous metal production. Besides this, the Toolkit also emphasises gold extraction from small scale gold mining that uses mercury amalgamation, both with and without retorts (UNEP, 2017). Other than these metal productions, the Toolkit also gives special emphasis to high volume production that releases mercury including the cement, pulp and paper production. These productions use raw materials that contain traces of mercury and may be released to the environment (UNEP, 2017).

The analysis found that most of the metal mining listed in the Toolkit are absent in Malaysia except for gold and primary ferrous metal production. For the other materials production, there is a significant input of mercury through cement production. However, there is no relevant data available for pulp and paper production. Overall, the total mercury input in Step 3 is 19,405 kg of mercury in 2014 and the release distribution is shown in Table 3.4.

3.3.2 Inventory Summary

Summary of the result generated by the analysis:

Table 3.4 Summary STEP 3 - Data and inventory on domestic production of metals and raw materials

Source category	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
		Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment / disposal
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	16,125	645.0	322.5	14,512.5	645.0	0.0	0.0
Alumina production from bauxite (aluminium production)	-	-	-	-	-	-	-

Source category	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
		Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment / disposal
Primary metal production							
Primary ferrous metal production (pig iron production)	216	205.2	0.0	0.0	0.0	0.0	10.8
Gold extraction with mercury amalgamation – from whole ore	-	-	-	-	-	-	-
Gold extraction with mercury amalgamation – from concentrate	-	-	-	-	-	-	-
Other materials production							
Cement production	3,064	2,298.3	0.0	0.0	766.1	0.0	0.0
Pulp and paper production	?	?	?	?	?	?	?

(-): The source is absent in the country and therefore no release.

(?): No data available on this source

3.3.3 Data Gaps

There were several gaps identified during the analysis of this step:

1. Lack of data custodian and no data available for the amount of biomass used for production in pulp and paper production. This may provide some uncertainty in the final quantity of mercury release estimated by this Toolkit. Based on our observation, there are many paper mills in Malaysia and therefore, further study and data collection are needed on this matter.
2. The concentration of mercury in ores usually varies due to various factors and leading to a different amount of mercury release. This Toolkit only estimates based on the average input factor agreed by UNEP's experts and may differ from the specific ores used in the country.
3. The amount of release from cement production will largely depend on the type of fuels used in the production. This Toolkit will estimate the mercury released based on average of normal process. The release can be refined with the establishment of its own factors and the identification of the type of fuels used in local cement industries.

3.4 STEP 4 – Domestic Production and Processing with Intentional Mercury Use

3.4.1 General Summary

Step 4 in the Toolkit focused on the domestic production and processing with intentional mercury use in the production of chemicals and mercury-added products. Production of certain chemicals like chlorine, caustic soda and potassium in chlor-alkali facilities may use mercury-cells for electrolytic process (UNEP, 2017). Mercury catalyst also may be used in production of vinyl chloride monomer (VCM) and acetaldehyde which may causes mercury release. The Toolkit also covers production of products with mercury content including thermometers, switches, relays, light sources, batteries, manometers, biocides, pesticides, paints and skin lightening cream.

The analysis found that there is no production of the mentioned chemicals using mercury or mercury catalysts in 2014. However, there are significant data gaps in data relating to production of mercury-added products in 2014. Table 3.5 below shows the distribution of mercury releases through domestic production and processing with intentional use of mercury.

3.4.2 Inventory Summary

Summary of the result generated by the analysis:

Table 3.5 Summary STEP 4 - Domestic production and processing with intentional mercury use

Source category	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
		Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment / disposal
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 (fluores-cent, compact, others: see guideline)	?	?	?	?	?	?	?

Source category	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
		Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment / disposal
Production of products with mercury content							
Batteries with mercury	?	?	?	?	?	?	?
Manometers and gauges with mercury	?	?	?	?	?	?	?
Biocides and pesticides with mercury	-	-	-	-	-	-	-
Paints with mercury	?	?	?	?	?	?	?
Skin lightening creams and soaps with mercury chemicals	-	-	-	-	-	-	-

(-): The source is absent in the country and therefore no release.

(?): No data available on this source

3.4.3 Data Gaps

There were several gaps identified during the analysis of this step:

1. Currently, there is a big gap in data availability for domestic processing and production with intentional mercury use. Most data on mercury use for the purpose of production is lacking and therefore it is hard to estimate mercury releases from production and manufacturing sectors. It is also hard to estimate the dependency of industries on mercury which will be crucial in planning for the phasing out of mercury.

3.5 STEP 5 – Data and Inventory on Waste Handling and Recycling

3.5.1 General Summary

Step 5 in the Toolkit focuses on waste treatment and recycling activities. This step covered all types of waste treatment, landfilling, incineration, dumping, open burning and recycling activities (UNEP, 2017). Prior to the conduct of the analysis on Step 5, there are two scenario-setting questions that needed to be answered in order to establish the situation of the country in term of waste handling and recycling. Overall, estimated mercury input for this step is 1,972 kg mercury in 2014 and the release pathway distribution is shown in Table 3.6.

3.5.2 Inventory Summary

Summary of the result generated by the analysis:

Table 3.6 Summary STEP 5 - Data and inventory on waste handling and recycling

Source category	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
		Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment / disposal
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	-	-	-	-	-	-	-
Incineration of hazardous waste	1,262	1,136.2	0.0	0.0	0.0	0.0	126.2
Incineration and open burning of medical waste	527	527.4	0.0	0.0	0.0	0.0	0.0
Sewage sludge incineration	?	?	?	?	?	?	?
Open fire waste burning (on landfills and informally)	?	?	?	?	?	?	?
Waste deposition/landfilling and waste water treatment							
Controlled landfills/deposits	183	1.8	0.0	0.0	-	-	-
Informal dumping of general waste	?	?	?	?	?	?	?
Waste water system/treatment	?	?	?	?	?	?	?

(-): The source is absent in the country and therefore no release.

(?): No data available on this source

3.5.3 Data Gaps

There were several gaps identified during the analysis of this step:

1. The Toolkit generates an error for the combination of answer provided in the general scenario-setting questions on waste management setup in Malaysia. This is based on the assumption that it is rare for a country to have a collection rate of mercury waste more than 33%. However, due to the availability of a legally binding regulation for hazardous waste disposal in which mercury waste is listed as one of the scheduled waste categories, this enables the country to exceed the assumption with regards to mercury waste disposal. The impact of this error to the calculation is unknown and there is a need to be explored further.
2. A majority of the data needed for the quantification of mercury from waste handling and recycling is not available. This becomes a major limitation in estimating the quantification of mercury releases especially from this source.
3. Some of the data are not mercury specific (hazardous waste), which led to high estimation of releases because of high activity rate. Understanding the processes and materials involve in hazardous waste incineration will assist in getting more accurate estimation of mercury release.
4. The mercury release from waste is estimated from the available data from other countries and will differ from Malaysia due to variances in consumption patterns and the amount of mercury presence in waste. The use of certain pollution control technology in incineration and waste treatment systems will help in reducing the amount of mercury released.

3.6 STEP 6 – General Consumption of Mercury in Products, as Metal Mercury and as Mercury Containing Substances

3.6.1 General Summary

Step 6 in the Toolkit is related to the general consumption of mercury in products, both as a metal and mercury-added products. This step focused on the consumption rather than production as in Section 3.4. This step covered various products including dental amalgams, thermometers, switches, relays, light sources, batteries, polyurethane, paints, skin lightening cream, sphygmomanometers, manometers and laboratory chemicals. Releases from products occur at the disposal phase of the products' life cycle and often by the consumers (UNEP, 2017). The toolkit also had addressed the double counting of mercury release estimated for waste treatment (UNEP, 2017).

In this step, several sources are estimated automatically (if present) based on the general data established in Table 3.2. These parameters include consumption of dental amalgams, electrical switches, relays, polyurethane, manometers, laboratory chemicals and laboratory equipment containing mercury. Even though the Toolkit automatically estimate this value, this MIA had proactively put effort in the collection of actual data, which is then presented in the full inventory report (Annex II). For Step 6, it is estimated that 2,450 kg of mercury was used as input and the release distribution is shown in Table 3.7.

3.6.2 Inventory Summary

Summary of the results generated by the analysis:

Table 3.7 Summary STEP 6 - Data and inventory on general consumption of mercury in products, as metal mercury and as mercury containing substances

Source category	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
		Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment / disposal
Use and disposal of products with mercury content							
Dental amalgam fillings ("silver" fillings)	690	13.8	303.8	55.2	41.4	138.1	138.1
Thermometers	58	11.6	17.4	11.6	0.0	17.4	0.0
Electrical switches and relays with mercury	?	?	?	?	?	?	?
Light sources with mercury	?	?	?	?	?	?	?
Batteries with mercury	?	?	?	?	?	?	?
Polyurethane (PU, PUR) produced with mercury catalyst	-	-	-	-	-	-	-
Paints with mercury preservatives	?	?	?	?	?	?	?
Skin lightening creams and soaps with mercury chemicals	?	?	?	?	?	?	?

Source category	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
		Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment / disposal
Use and disposal of products with mercury content							
Medical blood pressure gauges (mercury sphygmomanometers)	176	35.2	52.8	35.2	0.0	52.8	0.0
Other manometers and gauges with mercury	?	?	?	?	?	?	?
Laboratory chemicals	305	0.0	100.7	0.0	0.0	100.7	103.8
Other laboratory and medical equipment with mercury	1,221	0.0	402.9	0.0	0.0	402.9	415.1

(-): The source is absent in the country and therefore no release.

(?): No data available on this source

3.6.3 Data Gaps

There were several gaps identified during the analysis of this step:

1. Data on national annual consumption of mercury-added products is not available. There is no data on the amount of usage and consumption of mercury-added product and this might have been due to a limited information of products contain mercury.
2. For some products (thermometer and medical sphygmomanometer), available data may not be representative of the whole country scenario where in the present case, only the amount of products purchased by public medical facilities is known. This excluded the number of devices purchased by private institutions that may contribute to higher mercury release.
3. Data on the use of mercury-added products could not be directly gathered by using CUSTOMS' HS-code due to the nature of categorisation, classification and a lack of specificity of ingredients contained within an imported product. Therefore, it is hard to filter the mercury-added products compared to the other products.

3.7 STEP 7 – Data and Inventory on Crematoria and Cemeteries

3.7.1 General Summary

Step 7 of Toolkit focused on crematoria and cemeteries activities. The relevance of these activities in this analysis is the release of mercury from installed dental amalgam fillings in a deceased body that may be released to the environment once buried or cremated (UNEP, 2017). Therefore, the data required for this Step is the number of cremated and buried individuals for the assessment year.

For this Step, this MIA had estimated the number of corpses based on a ratio established in an earlier study. This ratio had been used together with the numbers of death in the assessment year to calculate the numbers of estimated corpses buried or cremated. Based on this analysis, the total amount of mercury input is estimated to be 376 kg of mercury in year 2014. The mercury release distribution is shown in Table 3.8.

3.7.2 Inventory Summary

Summary of the result generated by the analysis:

Table 3.8 Summary STEP 7 - Data and inventory on crematoria and cemeteries

Source category	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
		Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment / disposal
Crematoria and cemeteries							
Crematoria	94	94.0	0.0	0.0	-	0.0	0.0
Cemeteries	282	0.0	0.0	281.8	-	0.0	0.0

(-): The source is absent in the country and therefore no release.

(?): No data available on this source

3.7.3 Data Gaps

There were several gaps identified during the analysis of this step:

1. Data on the real value of the corpses buried and cremated are not available. The current value is based on the assumption that 20-30% of deceased were cremated. This value carries some uncertainty and may alter the quantification of the mercury release. This study has used the average value of 25% to estimate the number of bodies being cremated.

3.8 STEP 8 – Miscellaneous Mercury Release Sources Not Quantified on Inventory Level 1

3.8.1 General Summary

The Toolkit acknowledges that there are various other sources that contribute to mercury releases and were not quantified in this Toolkit Level 1 Inventory. These sources are listed in this Step 8 with the requirement of only the quantitative data indicating whether the source is present or absent in the assessment. There are 18 sources that have been listed in this Step, covering energy production, production, mercury-added products and others. The following Table 3.9 indicates the results of the assessment of these not quantified sources. Additional relevant data and findings are elaborated in the full report of the inventory (Annex II).

3.8.2 Inventory Summary

Table 3.9 indicates the results for Step 8 analysis:

Table 3.9 Summary STEP 8 - Miscellaneous mercury release sources not quantified in Inventory Level 1

Source category	Source present? Y/N/?*
Combustion of oil shale	Unknown
Combustion of peat	Unknown
Geothermal power production	No
Production of other recycled metals	Yes
Production of lime	Yes
Production of light weight aggregates (burnt clay nuts for building purposes)	Unknown
Production of other chemicals (than chlorine and sodium hydroxide) in Chlor-alkali facilities with mercury-cell technology	Unknown
Polyurethane production with mercury catalysts	No
Seed dressing with mercury chemicals	No
Infra-red detection semiconductors	Unknown
Bougie tubes and Cantor tubes (medical)	Unknown
Educational uses	Unknown
Gyroscopes with mercury	Unknown
Vacuum pumps with mercury	Unknown
Mercury used in religious rituals (amulets and other uses)	Unknown
Mercury used in traditional medicines (ayurvedic and others) and homeopathic medicine	Unknown
Use of mercury as a refrigerant in certain cooling systems	Unknown
Light houses (levelling bearings in marine navigation lights)	Yes
Mercury in large bearings of rotating mechanic parts in for example older waste water treatment plants	Unknown
Tanning	Unknown
Pigments	Unknown
Products for browning and etching steel	Unknown
Certain colour photograph paper types	Unknown
Recoil softeners in rifles	No
Explosives (mercury-fulminate a.o.)	No
Fireworks	Unknown
Executive toys	Unknown

*Yes – Source is present

No – Source is absent

Unknown – Unknown / no data

3.9 Control Measures

3.9.1 General Summary

The updated version of the Toolkit used in the MIA enables the entry of data on existing mercury control so the estimation of mercury releases is more reflective of the real situation. Most countries had implemented some forms of mercury release controls to reduce the amount of mercury release. This factor is important as the Toolkit utilises a mass balance principle that assumed the amount of mercury input is similar to the amount of release. Therefore, control measures data is important in producing a more accurate release quantification rather than assuming that there is no control measure applied as in the previous version of the Toolkit. In order to include control measures, data on the types of control measures used (provided in the Toolkit Guideline) and the percentage of the total national activity rate that adopted these technologies are required.

In the context of Malaysia, there are data gaps on the control measures available and applied in the various sources mentioned in the system, especially when there is a wide range of control measure options available in the market at different cost and efficiency. There is also no requirement for industries to declare the type of control measures adopted in their processes to the authorities. This is because in Malaysia, controls are being monitored through release limits rather than the application of certain technologies. This situation leads to the challenge in populating the applied control measures in the identified sources and a bigger challenge in estimating the percentage of activity rate relevant to those control measures. Therefore, this MIA had adopted a more predictive approach where the total release estimation will be simulated in three scenarios, namely the default (where there is no control measure), the lowest, and the highest levels of control measure categories, based on the calculated releases and emissions of mercury.

This MIA assesses the efficacy of the prescribed control measures by comparing scenarios where a total application of the lowest level control measures with the highest level control measures, as well as with scenarios where no control measure is applied. The prescribed control measures herewith referred to the prescribed measures identified in the Toolkit. The summary of the control measures analysis is shown in Table 3.10.

3.9.2 Inventory Summary

Table 3.10 indicates the summary of the control measure analysis:

Table 3.10 Summary of mercury release reduction according to level of control measures

Summary of Mercury Release Reduction According Control Measure Categories			
STEP 2 – Energy Consumption & Fuel Production			
Parameter	Mercury Release Kg/year*	Lowest control (Reduction %)	Highest control (Reduction %)
Coal combustion in large power plants	2573.2	0%	37.5%
Coal combustion in coal fired industrial boilers	325.3	12%	82%
Combustion/use of petroleum coke and heavy oil	13.6	9.6%	50%
Combustion/use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates	150.1	10%	50%
Extraction and processing of natural gas	6758	N/P**	N/P

Summary of Mercury Release Reduction According Control Measure Categories			
STEP 3 – Domestic Production of Metals and Raw Materials			
Parameter	Mercury Release Kg/year*	Lowest control (Reduction %)	Highest control (Reduction %)
Production of zinc from concentrates	-	-	-
Production of copper from concentrates	-	-	-
Production of lead from concentrates	-	-	-
Gold extraction with mercury amalgamation - from concentrate	-	-	-
Cement production 1) WITH WASTE USED as fuel (>3% of energy) / Cement production 2) WITH NO/LOW WASTE use as fuel	3064.4	**14.3%**	**38.3%**
Pulp and paper production	?	?	?
STEP 5 – Data and Inventory on Waste Handling and Recycling			
Parameter	Mercury Release Kg/year*	Lowest control (Reduction %)	Highest control (Reduction %)
Incineration of municipal/general waste	-	-	-
Incineration of hazardous waste	1136.2	**0%**	**88.9%**
Incineration and open burning of medical waste	527.4	**10%**	**90%**
Waste water system/treatment	?	?	?
STEP 6 – General Consumption of Mercury in Products, As Metal Mercury and As Mercury Containing Substances			
Parameter	Mercury Release Kg/year*	Lowest control (Reduction %)	Highest control (Reduction %)
Dental amalgam fillings ("silver" fillings)	552.3	**0%**	**21.2%**

*The amount of mercury release (kg/year) is the amount of release without any control measures.

**(N/P) is used to show not possible in which the toolkit do not allow modification of control measures

Steps 1, 4, 7 & 8 are excluded from this table because there is no control measures element in these steps.

(-) is used to show the source is not present in the country.

(?) is used to show the quantity of the source is unknown.

Legend: 0% 1-25% 26-50% 51-75% 76-100%

3.10 Conclusion

This MIA had developed a national mercury release inventory based on the latest version of UNEP's Toolkit for Identification and Quantification of Mercury Releases which helped in quantifying the amount of mercury input and releases in Malaysia. From this MIA, it is estimated that the number of mercury input in Malaysia for the year 2014 was 32,500 kg (equivalent to 32.5 tonne of mercury). This amount of mercury input was calculated by using the activity rate established from available data and the default input factor. Meanwhile the total mercury released in 2014 was estimated to be 34,090 kg (34.1 tonne).

This MIA also found that 8,950 kg of mercury is released to the air, 2,570 kg of mercury to water bodies and 14,900 kg mercury to land. There are also releases as by products and impurities (3,440 kg mercury), general waste (710 kg mercury) and to sector specific waste disposal (3,520 kg mercury). Overall, majority of mercury is released or emitted to land and air, or be treated as sector specific waste. Primary source categories that had contributed to mercury releases are primary metal production (48%), oil and gas production (20%) and coal combustion (9%). Primary metal production is the main source of mercury releases and emissions due to the contribution of gold extraction by methods other than amalgamation.

In this updated version, the Toolkit enables the entry of mercury control measures that can influence the amount of mercury releases. These control measures are able to trap and reduce the amount of mercury that is being released into the environment and hence, reducing the negative impacts associated with it. However, there is a lack of database on the application of control measures in the country. This is most probably due to the monitoring methods that primarily depend on limits rather than means. This becomes a challenge in inputting the control measure data as needed by the Toolkit, which requires data on percentage of coverage of specific control measures. This MIA then proceeded to conduct a predictive test using the estimated amount of releases and the maximum (highest) and minimum (lowest) levels of control measures. This MIA found that the application of control measures in general will reduce the amount of mercury releases. However, there are areas where the application of the lowest level of control measures do not invoke any changes to the mercury released. Hence, it will require a higher level of control. Through this exercise, the percentage of reduction can provide more information on the sources that can be reduced by applying a specific control measure. This preliminary predictive exercise also enables the country to plan the immediate short-term action plan by adopting a lower-level control measure categories if needed in order to reduce the mercury released.

The discussion in this chapter is the summary of the national mercury inventory report. The full report of the national mercury inventory can be found in Annex II of this report.

CHAPTER 4 :
LEGAL FRAMEWORK & OPERATIONAL FRAMEWORK ASSESSMENT

4.1 Introduction

The Minamata Convention on Mercury aims to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. By taking into account adverse effects caused by mercury exposure, the Minamata Convention has restricted the use of mercury, mercury compounds and mercury-added products, and ultimately eliminate them worldwide. In this regard, involvement in the Minamata Convention, particularly by becoming a member upon the ratification of the Convention will enhance protection of human health and the environment against the adverse effects caused by mercury. Nevertheless, as the Minamata Convention is an international legally binding instrument, before ratifying the Convention, it is appropriate and timely for Malaysia to assess its existing legal and operational frameworks by analysing the requirement stated in the text of the Convention. In this Chapter, the assessment of the regulatory and operational frameworks in Malaysia were conducted based on the relevant articles of Minamata Convention.

4.2 Regulatory Framework Assessment

4.2.1 The Legally Binding Minamata Convention on Mercury

Cinnabar was mined for mercury for millennia where some of the first known uses of mercury could be traced back to more than 3,500 years (Kanie, 2007; Zürn & Faude, 2013; Selin, 2014).[1] The industrial revolution has maximised the versatility of mercury; from its earlier uses in traditional medicines, or in mining processes for the separation of gold from ore, the use of mercury has extended to a multitude of products and manufacturing processes.

The adverse effects of mercury emissions and releases into the environment on public health and the environment had gone considerably unnoticed until high-dose mercury exposure where many people had died, and many more suffered serious neurological damaged due to the consumption of contaminated seafood, had brought the adverse effects of mercury exposure to public health and the environment to the limelight (Arctic Monitoring and Assessment Programme, 2011).[2]

Despite relatively conclusive scientific evidences, presented in the Global Mercury Assessment to the 22nd UNEP Governing Council (GC) in 2003 that identified mercury as a significant international problem, which warrants political action to prevent further adverse impact to human health and the environment (UNEP GC, 2003),[3] consensus was finally reached at the 25th session of the UNEP GC/Global Ministerial Environmental Forum (GMEF) to negotiate a legally binding international instrument on mercury even though the risks surrounding mercury pollution has caught massive domestic political attention since the 1950s, which was then elevated to international policy-making platforms in the 1970s (Andresen, Rosendal & Skjærseth, 2013; Selin & Selin, 2006).[4] After almost a decade since the need for a global regulatory regime governing mercury was raised for discussion at the United Nations Environment Programme (UNEP) in 2003, a legally binding treaty armed with the objective of protecting human health and the environment from the anthropogenic emission and releases of mercury and mercury compounds was finally adopted in 2013 (Bender, Lymberidi-Settimo & Growth, 2014; Eriksen & Perrez, 2014).[5]

The preamble to the Minamata Convention on Mercury firmly recognised that mercury is a global concern due to its long-range transport, its persistence in the environment once it enters the environment, and

[1] Kanie, N., 2007. Governance and multilateral environmental agreements: A healthy or ill-equipped fragmentation. In Swart, L., and Perry, E., Global environmental governance: Perspectives on the current debate. New York: Centre for UN Reform Education; Zürn, M., and Faude, B., 2013. On fragmentation, differentiation, and co-ordination. Global Environmental Politics. 13(3): 119-130; Selin, H., 2014. The Minamata Convention and Mercury Abatement. Global Environmental Politics, 14: 1-19. DOI:10.1162/GLEP_a_00208

[2] Arctic Monitoring and Assessment Programme, 2011. AMAP Assessment 2011: Artic Pollution. Oslo: Arctic Monitoring and Assessment Programme. https://www.amap.no/documents/download/1155/inline

[3] UNEP GC, Decision 22/4. Chemicals (7 February 2003), paras 61, and 70-71, and Section V of Annex I, operative paragraphs 1 and 4. In Governing Council of the United Nations Environment Programme, Proceedings of the Governing Council/Global Environment Ministerial Forum at Its Twenty-Second Session, Nairobi, 3-7 February 2003 (21 February 2003) UNEP/GC.22/11.

[4] Andresen, S, Rosendal, K., and Skjærseth, J.B., 2013. Why negotiate a legally binding mercury convention? Int. Environ Agreements, 13: 425-440; Selin, N.E., and Selin, H., 2006. Global politics of mercury pollution: The need for multi-scale governance. RECIEL, 15(3): 258-269.

[5] Bender, M., Lymberidi-Settimo, E., and Growth, Edward, III, 2014. Journal of Public Health, 35: 1-13; Eriksen, H.H., and Perrez, F.X., 2014. The Minamata Convention: A comprehensive response to a global problem. RECIEL, 23(2): 195-210.

its ability to bioaccumulate in the ecosystem. Such characteristics compounded the risk of adverse impact on human health and the environment when mercury has proven to produce significant adverse neurological and other health effects on both children and adult, where unborn children and infants are particularly vulnerable (Bender, Lymberidi-Settimo & Growth, 2014; UNEP, 2013).[6] Art 1 of the Convention explicitly stated that the objective of the Convention is to protect the human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. The Convention adopts a similar approach to the Stockholm Convention whereby Art 1 of the Stockholm Convention on Persistent Organic Pollutants firmly established that the objective of the Stockholm Convention is to 'protect human health and the environment' from persistent organic pollutants.

The similarity between persistent organic pollutants and mercury could be observed where 1 form of mercury, namely methylmercury is an organic substance. Besides, mercury also shares many of the properties exhibited by persistent organic pollutants, namely persistence, long-range transport, and bioaccumulative.[7] As such, Stockholm Convention was initially discussed as a possible platform for the regulation of mercury when the legally-binding option was considered, even though the option was dismissed later because mercury is not singularly an organic pollutant (Andresen, Rosendal & Skjærseth, 2013). The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal 1989 was also raised as an alternative arena for the regulation of mercury. However, the suggestion was shelved when it is realised that the usefulness of the Basel Convention would be limited in regulating mercury waste, as the Basel Convention would only be able to regulate mercury as a waste, and it would not be able to cover the complete production line of mercury, and throughout its lifecycle, especially the recycling of mercury (Eriksen & Perrez, 2014).

When a country plans to ratify the Convention after it has entered into force, the country will be bound by the obligations stipulated under the Convention 90 days after the date the instrument of ratification is submitted (Art 31.2). If a specific Convention obligation has a deadline for compliance, the country that ratifies after the deadline had passed, the deadline in the Convention would still apply. The country would have to be prepared to be able to be in compliance with the obligations stipulated under the Convention when it enters into force for the country. Hence, it would be pertinent for a country planning to ratify the Minamata Convention, to initiate an evaluation process to assess how the country would implement its obligation if it was to be a party to the Convention, as preparation prior to the ratification of the Convention.

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[6] UNEP, 2013. Minamata Convention on Mercury.

[7] The first preambular paragraph of the Stockholm Convention on Persistent Organic Pollutants recognises that "persistent organic pollutants possess toxic properties, resist degradation, bioaccumulate and are transported, through air, water and migratory species, across international boundaries and deposited far from their place of release, where they accumulate in terrestrial and aquatic ecosystems".

4.2.2 An Overview of the Provisions of the Minamata Convention on Mercury

The focus of the Convention is only on mercury, although the seemingly limited scope of such a focus belies the range of control that the Convention exerted over the life cycle of mercury (Lennett & Gutierrez, 2016)[8]. A Party may take additional and more stringent control over all matters relating to mercury as envisioned in the Convention and other international law. However, the Minamata Convention on Mercury places emphasis on the areas listed below and identified them as primary obligations that Parties are legally bound to implement –

- Mercury supply-sources and trade (Art 3);
- Mercury-added products (Art 4);
- Manufacturing processes in which mercury or mercury compounds are used (Art 5);
- Artisanal and small-scale gold mining (ASGM) (Art 7);
- Emissions (to air) (Art 8);
- Releases (to land and water) (Art 9);
- Environmentally sound interim storage of mercury, other than mercury waste (Art 10);
- Mercury wastes (Art 11); and
- Contaminated sites (Art 12).

Although the concern over the health aspect of mercury exposure underpins the establishment of the Convention, where the countries, in particular the Latin American countries had made it very clear that the inclusion of health provisions was important in reaching a final agreement (Eriksen & Perrez, 2014), the imposition of Art 16[9] on the countries, couched in the language of 'Parties are encouraged to', clearly indicated that the Parties have no intention to make this obligation mandatory. The Convention has also outlined the procedural obligations that enable the compliance of countries with the obligations stipulated under the Convention, including –

- Financial resources and mechanism (Art 13);
- Capacity-building, technical assistance, and technology transfer (Art 14);
- Information exchange (Art 17);
- Public information, awareness, and education (Art 18);
- Research, development, and monitoring (Art 19);
- Implementation plans (Art 20); and
- Reporting (Art 21)

With the only exception of Art 20's optional obligation imposed on the development and execution of an implementation plan, following an initial assessment and taking into account its domestic circumstances, in order to enable the country to meet its obligations under the Convention, the other procedural obligations are mandatory. Parties to which the Convention is binding on them, are mandatorily obliged to –

- provide resources to fund national activities for the purpose of implementing the Convention (Art 13);
- co-operate to provide capacity-building and technical assistance to developing country, subject to their respective capabilities (Art 14);
- facilitate the exchange of the necessary information (Art 17);
- promote and facilitate, within its capabilities, the dissemination of information to the public, raising public awareness, and public education and training regarding the health and environmental effects of mercury and mercury compounds exposure, and other matters (Art 18);
- develop, improve and monitor anthropogenic emissions and releases of mercury and mercury compounds and the assessment of the health and environmental impacts of such emissions and releases, and all other information salient to the attainment of the objective of the Convention (Art 19); and to
- report to the COP, through the Secretariat, of measures that the Party have taken to implement the provisions of this Convention, the effectiveness of such measures, and the possible challenges in meeting the objectives of the Convention (Art 21).

[8] Lennett, D., and Gutierrez, R., 2016. Minamata Convention on Mercury. Ratification and Implementation Manual.

[9] Art 16 intends to promote the development and implementation of strategies and programmes to identify and protect populations; the provision of health-care services for prevention, treatment and care for populations affected by the occupational exposure to mercury and mercury compounds; or for the prevention, treatment and care for populations who are affected by the exposure to mercury or mercury compounds; and in general, the establishment and strengthening of 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.

Apart from the substantive and procedural obligations laid out above, the other standard provisions that establish the institutional mechanisms governing the treaty regime on mercury, such as the establishment of the treaty bodies (both the COP and the Secretariat), the settlement of disputes, the amendment of the Convention and its annexes, and other matters that deal with the operation of the Convention, including its entry into force, specification that reservation is not allowed, withdrawal, the Depository, and authentic texts (Arts 23-35) have been negotiated and agreed upon without much difficulties.

The multiplicity of sources of mercury emissions, coupled with the expansive long-range transport potential, are the main reasons that drive the international community to identify mercury as a global risk that necessitates collective action at the international level, which warrants cross-scale governance that covers all stages of the life cycle of mercury, from mining to waste management. As evident from the negotiating process prior to the conclusion of the Convention, it is apparent that in choosing a legally-binding approach, it follows the model of the previous multilateral environmental agreements pertaining to chemicals, most notably the Basel, Rotterdam and Stockholm Conventions of which are frequently referred to during the negotiation process. As such, similar to these MEAs, the Minamata Convention sets out similar substantive provisions pertaining to the prohibition and control of the subject matter at hand, and other standard provisions relating to the procedures and institutional arrangements common to most multilateral treaty regimes. What differentiates the Minamata Convention with the other Conventions was the structurisation of primary substantive provisions to cover all stages of mercury's life cycle.

4.2.3 A Holistic Approach in the Implementation of the Minamata Convention

Therefore, a holistic understanding of the Convention, taking into account the interconnections between different articles, is crucial to the assessment of the readiness and preparedness of the country's domestic regulatory framework in enabling the implementation of the Convention, where the option of developing a National Implementation Plan under Art 20 could be explored. A holistic approach, translated into a National Implementation Plan that adopts an integrated pollution control approach, could possibly prevent the shifting of mercury from one environmental medium to another, and ultimately address overall reduction and alleviation of risk due to mercury pollution and exposure (Lin *et al*, 2017)[10].

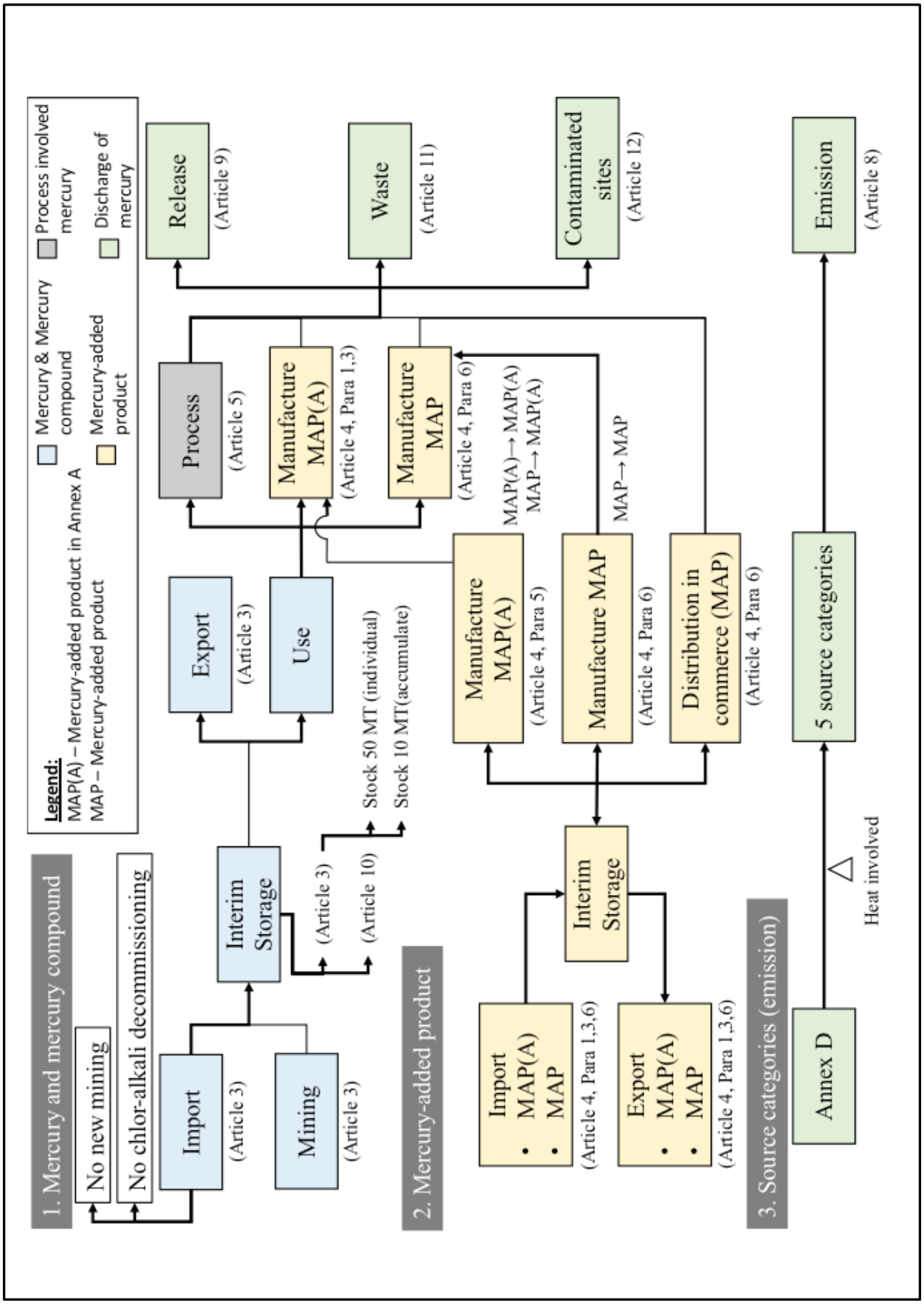
Bearing in mind that a holistic approach in the understanding and also in the implementation of the Convention is paramount in the effective implementation of the Convention, and recognising the versatility of mercury and mercury compounds, which, although exist naturally, is a chemical element that is intentionally mined, used in products and industrial processes, and emitted and released into the environment as a by-product of anthropogenic activities (Selin *et al*, 2018),[11] a life cycle approach of the mercury, from its source to its final disposal as waste, would have to be adopted. The life cycle of mercury is categorised into three main stages, namely –

- the **source** of mercury and mercury compounds as raw materials, supplied through primary mercury mining, trading, existing stockpiles, or recycled from excess mercury derived from the decommissioning of chlor-alkali plants.
- the **uses** of mercury and mercury compounds in **products or industrial processes**, including the **interim storage** of these mercury and mercury compounds that are not immediately used, but are intended for allowed uses in the future; and
- the **discharge** of mercury and mercury compounds that are no longer allowed to be used, and any substances or objects consisting of, containing, and contaminated with mercury and mercury compounds falling within the definition of mercury **wastes** under Art 11, which might lead to the **contamination of sites** by mercury or mercury compounds emitted or released into the environment **(pollution)** as a result of the anthropogenic activities undertaken on the site, or mercury or mercury compounds that are transported through different environmental mediums and end up deposited on these sites (emphasis in **bold** by the author).

A holistic and comprehensive understanding of the flow of mercury throughout its life cycle, which the Convention seeks to capture, would be instrumental in the determination of the necessary regulatory framework that the country would need to be equipped with, in the effective implementation of the Minamata Convention. In order to provide further clarity on the matter, the obligations stipulated under the Convention that takes into account the flow of mercury throughout the various stages of its life cycle, is represented in Figure 4.1. Figure 4.1 shows the processes through which mercury and mercury compounds travel down the chains of production in anticipation of the invocation of relevant provisions of the Convention that are applicable to each stages of the life cycle.

[10] Lin, Y., Wang, S., Steindal, E.H., Wang, Z., Braaten, H.F.V., Wu, Q., and Larssen, T., 2017. A holistic perspective is needed to ensure success of Minamata Convention on Mercury. Environmental Science & Technology: 1070-1071. DOI: 10.1021/acs.est.6b06309

[11] Selin H., Keane, S.E., Wang, S. Selin, N., Davis, K., and Bally D., 2018. Linking science and policy to support the implementation of the Minamata Convention on Mercury. Ambio, 47: 198-215.



Source: Goh et al. (2019)

Figure 4.1: A life cycle approach in understanding the implementation of obligations stipulated under the Minamata Convention

Figure 4.1 articulates from the outset that there was no primary mercury mining, no artisanal and small-scale gold mining and processing in which mercury amalgamation is used to extract gold from ores, nor was there any excess mercury derived from the decommissioning of chlor-alkali plant. Taking these main sources of mercury and mercury compounds supply away from the picture, the supply of mercury and mercury compounds into the country could only come from import, of which Art 3.8 of the Convention applies. The mercury and mercury compounds imported would possibly be kept temporarily in interim storage, where Arts 3.5.a and 10 would be applicable; be exported out of the country (Art 3.6); or be directed to the operation of industrial processes where it could either be manufactured into mercury-added products falling within the purview of Art 4, or be used in manufacturing processes that involve mercury and mercury compounds, which would be subject to the requirements under Art 5, to the exclusion of processes that use mercury-added products, processes for manufacturing mercury-added products or processes that process mercury-containing waste, which would be addressed in the other provisions of the Convention.

As to mercury and mercury compounds that have been manufactured into mercury-added products where Art 4 has provided for the phasing out and phasing down of specified products listed in Parts I and II of Annex A, the sources of these products could either be imported, or manufactured in the country, after which, would either be distributed in commerce within the country, or be exported out of the country. The Convention does not only provide for the control over mercury-added products listed in Annex A, it also prohibits, in Art 4.5 the incorporation of mercury-added products of which manufacture, import and export thereof, is not allowed by virtue of Art 4.1, into assembled products. Apart from the listed products in Annex A, Art 4.6 discourages the manufacture and the trading of mercury-added products that are not yet covered by any known use of mercury-added products prior to the date of the entry into force of the Convention, which sets out the possible prohibition of mercury-added products if such products do not demonstrate environmental or human health benefits after a risk and benefit assessment is conducted.

It must be borne in mind that at all stages of the life cycle of mercury, there is a risk that mercury, in its elemental form, would be emitted into the atmosphere, which would fall under the purview of Art 8, with particular concern over source categories identified in Annex D; be released into land and water, which would be subjected to controls under Art 9; or be transported long distances after its emission and releases, before being deposited in ecosystems, which might lead to the contamination of sites (Art 12) (Selin, 2014; Selin, 2009).[12] As such, the Convention deals at length and in depth with the prevention of the risks to public health and environment due to mercury pollution and exposure by taking all measures to prevent, control and reduce exposure risks and mercury pollution by imposing restrictions and control over the emission of mercury and mercury compounds (known in the Convention as 'total mercury') into the atmosphere in Art 8, with particular concern raised on the five source categories of manufacturing processes listed in Annex D, probably where heat is involved in the processes; the releases of total mercury onto land and water in Art 9; the deposit of these mercury and mercury compounds into the environment which might lead to the contamination of sites (Art 12); and the disposal of mercury and mercury compounds, or substances or objects that consist of, containing, or contaminated with mercury or mercury compounds exceeding the threshold that would be determined by the COP, throughout the stages of the life cycle of mercury (Art 11).

A broad categorisation according to the different stages of the life cycle of mercury and mercury compounds, with reference to the relevant provisions of the Convention that apply to mercury and mercury compounds intentionally used in anthropogenic activities, as represented in Figure 4.1 facilitates the identification of the possible legislations that will have the relevant jurisdiction and mandate in effecting and executing the implementation of the Convention. The stages of the life cycle of mercury involved and used in anthropogenic activities are broadly categorised as –

- Supply source, which could have come from, primary mercury mining, import, pre-existing individual stockpiles or supply that is capable of generating a significant number of stockpiles, and

[12] Selin, H., 2014. The Minamata Convention and Mercury Abatement. Global Environmental Politics, 14: 1-19. DOI:10.1162/GLEP_a_00208; Selin, N.E., 2009. Global biogeochemical cycling of mercury: A review. Annual Review of Environment and Resources, 34: 43-63.

the recovery, recycling, reclamation, direct re-use or alternative uses of excess mercury from the decommissioning of chlor-alkali plants;
- Uses and trade (distribution in commerce within and beyond the country), either directly through incorporation into mercury-added products, or indirectly, in manufacturing processes in which mercury or mercury compounds are used, and the interim storage of which intended for allowed use in the immediate future;
- Discharge, intentionally, as wastes, or unintentionally through anthropogenic uses of mercury and its compounds via emission to the atmosphere and the releases into land and water, which could also lead to the contamination of sites.

The various procedural obligations and institutional mechanisms imposed under the Convention to facilitate the attainment of the objective of the Convention would need to be considered and operationalised in order to effectuate cross-scale governance of mercury as it traverses through the different stages of its life cycle. The procedural obligations and institutional mechanisms suggested in implementing the primary and substantive obligations of the Convention are –

- Import and export, of mercury and mercury compounds (Art 3), mercury-added products (Art 4), and mercury wastes (Art 11);
- Inventory, of supply sources (Art 3), mercury-added products (Art 4), manufacturing processes involving mercury and mercury products (Art 5), interim storage (Art 10),[13] emissions (Art 8), releases (Art 9), wastes (Art 11), and contaminated sites (Art 12);
- Research, development and monitoring (Art 19) that are capable of meeting the obligations imposed on information exchange (Art 17), information dissemination to the public, the raising of public awareness, education and training (Art 18), and reporting (Art 21); and
- National Implementation Plans (Art 20),[14] which institutionalise and galvanise concurrent efforts undertaken across multiple legislative mandates and administrative scales towards meeting the obligations under the Convention.

By applying a holistic approach in understanding the life cycle of mercury in the analysis of the legal obligations, be it substantive, procedural or institutional, imposed by the provisions of the Convention would facilitate the country to ascertain the relevant domestic regulatory framework that could be relevant and applicable in meeting the requirements set forth under the Convention.

4.2.4 An Overview of the Domestic Regulatory Framework that Enables the Implementation of the Minamata Convention

The broad categorisation of mercury into its different stages in its life cycle would be a useful starting point in ascertaining the relevant domestic regulatory framework applicable in implementing the Convention. As such, the relevant legislations would be identified in accordance with the substantive, procedural and institutional obligations imposed under the Convention applicable to mercury and its compounds at different stages of mercury's life cycle. As such, the relevant laws structuring the regulatory framework that implements the Minamata Convention at the national level will be identified pursuant to the categories broadly laid out with reference to the different stages of mercury in its life cycle, and subsequently analysed, in accordance with the provisions stipulated under the Convention. In general, the overview of the domestic regulatory framework that enables the implementation of the Minamata Convention will be structured upon –

- Source and supply of mercury compounds, from mining, stockpiles, and trade (import and export), interim storage of mercury and mercury compounds, and the inventory (Art 3);
- Uses for manufacturing and in products, including the trade and distribution in commerce of mercury-added products, and the inventories (Art 4 and 5);
- Interim storage (Art 10);
- Discharge, as mercury wastes, or be emitted into the atmosphere, or released into land and water, which could be environmentally hazardous to, contaminate, and/or pollute the environment, and adversely affect public health (Arts 8, 9, 11, 12); and the
- Procedural and institutional obligations to obtain, compile and consolidate information relevant to the implementation of the Minamata Convention (Arts 17, 18, 19 and 21).

[13] It is noted that the obligation imposed on the interim storage of mercury and mercury compounds (which is narrowly defined to only include the six mercury compounds listed in Art 3.1.b) under Art 10 does not apply to mercury-added products (Lennett & Gutierrez, 2016, at p 50).

[14] In addition, the Convention further provides that a regional (transnational) plan would be useful to tackle issues that are transboundary in nature, such as supply and trade, storage, and waste management (Art 20.4).

Mercury and Mercury Compounds (Art 3)

It was determined from the outset that there is no primary mercury mining in the country. It would be pertinent for the Federal Government, to whom jurisdiction in the development of mineral resources, mines, mining, minerals and mineral ores; purchase, sale, import and export of minerals and mineral ores, to expressly prohibit primary mercury mining in the country pursuant to Art 74 of the Federal Constitution, and to legislate for States for the purpose of implementing the Minamata Convention, when the country had decided to ratify the Convention, to prohibit any issuance of permits and licences for the prospecting for mercury mines by the State Authority by virtue of Art 76(1)(a) of the Constitution. Art 91(5) of the Federal Constitution could possibly be an aperture through which the duty of the National Land Council is exercised in order to formulate, in consultation with the Federal Government, the State Governments and the National Finance Council a national policy for the promotion and control of the utilisation of land throughout the Federation for the prohibition of primary mercury mining and the administration of any laws relating thereto where the Federal and State Governments shall follow the policy so formulated. In addition, a broad-based control over mercury and mercury compounds as a chemical is governed under the Poisons Act 1952, including the importation of mercury and mercury compounds into the country, or exportation of mercury and mercury compounds out of the country, albeit with some sectoral exceptions. The requirements to identify mercury stockpiles, such as the facilities that supply mercury or mercury compounds, mercury-added product manufacturing plants, sites with industrial processes using mercury, and other designated interim storage locations, would fall under the jurisdiction of the Occupational Safety and Health Act 1994. Other than that, the ascertainment of whether there is any excess mercury from the decommissioning of chlor-alkali plants would necessitate a recourse to the Department of Environment (DOE) as excess mercury is deemed a scheduled waste and is treated as scheduled waste, which falls under the jurisdiction of the Environmental Quality Act (EQA) 1974. Similarly, the obligation imposed for mercury and mercury compounds that are temporarily stored away for future allowed uses, in interim storage (Art 10), would falls within the jurisdiction of the Occupational Safety and Health Act (OSHA) 1994, as the Act deals specifically with the safety and health at the workplace, where these interim storage facilities are deemed as such.

Mercury-Added Products (Art 4)

For mercury-added products that are listed in Part I Annex A, which are set for phasing out, depending on the products listed, and dental amalgam listed in Part II Annex A, which is set for phasing down, would fall under different regulatory bodies and be subjected to different legislations. The control imposed over the manufacture, import, export and the distribution in commerce of listed mercury-added products would be executed through the relevant legislations, for example –

- cosmetics and topical antiseptic, which would fall under the jurisdiction of the Sales of Drugs Act 1952 and the Control of Drugs and Cosmetic Regulations 1984;
- pesticides and biocides would be within the purview of Pesticides Act 1974;
- dental amalgam, which falls within the jurisdiction of the Medical Device Authority as governed by the Medical Device Act 2012; and
- measuring devices that are used as medical device falling within the definition of the Medical Device Act 2012, such as sphygmomanometers.

For products intended for uses by 'consumers' falling within the definition of 'consumers' of the Consumer Protection Act 1999, the Act would be applicable in ensuring that the manufacture, import, export and the distribution in commerce of these products are conducted in a manner consistent with the Minamata Convention. For other mercury-added products that do not seem to have any caretakers, the DOE, executing the duty, functions and powers of the Director General (DG) of Environmental Quality and his or her officers pursuant to EQA 1974, would assume the responsibility to ensure that the obligations imposed under the Convention, would be met.

Manufacturing Activities Involving Mercury and Mercury Compounds (Art 5)

OSHA 1994 has specific provisions that deal with the prohibition from use, of certain plant or substance as published in the *Gazette*, where the mandate to prohibit is found under s 35. However, the mandate vested with the Department for Occupational Safety and Health (DOSH) is not sufficiently comprehensive to exercise control over the types of manufacturing activities that might have involved mercury and mercury compounds. In this regard, with reference to the expansive objective of the EQA 1974, as evident in its long title setting out that the Act relates to the prevention, abatement, control of pollution and enhancement of the environment, and for purposes connected therewith, the Act is earmarked as a suitable fulcrum upon which the manufacturing activities involving mercury and mercury compounds, regardless whether such facilities fall under Annex B of the Convention (Art 5.2 of processes that should be phased out and 5.3 of processes that should be phased down) or not (Art 5.7 were 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 is discouraged unless the Party can demonstrate to the satisfaction of the COP that the manufacturing process provides significant environmental and health benefits and that there are no technically and economically feasible mercury-free alternatives available providing such benefits), could be regulated. The duty, power and functions of the DG of Environmental Quality in regulating manufacturing activities, whether it is the phasing out of processes listed under Part I of Annex B, the phasing down of processes listed under Part II of Annex B, or the discouragement of facilities not otherwise listed, but involve mercury and mercury compounds in their processes, are provided for under the EQA 1974. In order to cater to the specificities of the Minamata Convention, the principal legislation and the relevant subsidiary legislations could be accordingly amended to fulfil the obligations stipulated under the Convention, where the DG and his officers are appropriately empowered to oversee the operation of facilities that undertakes manufacturing activities involving the use of mercury and mercury compounds in order to ensure that their operations are conducted in manners that are consistent with the Minamata Convention. In addition, the Industrial Co-Ordination Act 1975 could be invoked to prohibit, monitor, or control facilities that might involve the use of mercury and mercury compounds in its manufacturing processes.

Interim Storage (Art 10)

The concern over interim storage of mercury and mercury compounds intended for future usage allowed by the Convention would be the risk of improper or inadequate care in the collection, handling, transport and storage of mercury and mercury compounds, running the risk of emission and releases of total mercury in the environment, and posing risk to human and environmental health. Therefore, Art 10 imposes the obligation on the Parties to take measures to ensure that the interim storage of mercury is conducted in an environmentally sound manner in order to prevent and abate the possible adverse effects of mercury exposure and pollution as it is kept in various locations prior to its intended use. It is noted that Art 10 obligation only extends to the interim or temporary storage of mercury and mercury compounds that are associated with an allowed use under the Convention. Since the place in which mercury and mercury compounds are stored in interim, such place would certainly be deemed a workplace, where the primary responsibility to which the obligation to ensure an environmentally sound management or mercury and mercury compounds in interim storage pending an allowed use would be falling under the jurisdiction of OSHA 1994, whereby DOSH would be vested with the duty, functions and power necessary to execute this responsibility. It is also noted that s 18 of the EQA 1974 also provides for the power of the Minister to prescribe a premise or conveyance where the occupation or use of such premise or conveyance would be prohibited unless the person is a holder of a licence issued in respect of the premise/conveyance. It would come within the jurisdiction of the EQA 1974 if a premise/conveyance is handling mercury and mercury compounds, be it in manufacturing processes or for interim storage (especially where mercury and mercury compounds are concerned as they would definitely fall within the definition of an environmentally hazardous substances capable of causing pollution to the environment), a licence would be required. Impositions on the manner in which mercury and mercury compounds should be handled in interim storage could be prescribed into the conditions attached with the licence issued under s 18 as a means of enforcing control over the management of mercury and mercury compounds in interim storage in the prescribed premise or conveyance that is consistent with the obligations imposed with regards to an environmentally sound management of mercury and mercury compounds as stipulated under the Convention.

Mercury Wastes (Art 11), Emissions into the Atmosphere (Art 8), Release to Land and Water (Art 9), and Contaminated Sites (Art 12)

Since the big basket of wastes, environmentally hazardous substances and pollutants falls within the jurisdiction of the EQA 1974, in particular, Parts IV and IVA of the EQA 1974, and other relevant provisions of the Act, in addition to the subsidiary legislations and guidance documents enacted in furtherance of the objectives of the principal legislation, such as the Scheduled Wastes Regulations (Reg) 2005, and the Contaminated Land Management and Control Guidelines Nos 1-3, the regime of environmental protection and environmental quality enhancement established by the EQA 1974 would be capable of addressing the obligations stipulated under Arts 11, 8, 9 and 12 of the Convention, including –

- the level of control and measures necessary to regulate mercury wastes, emissions and releases of total mercury to the atmosphere, water and land;
- the development of inventories for mercury wastes, emissions and releases;
- the identification, assessment and remediation of sites contaminated with mercury and mercury compounds; and
- the design of measures for the abatement and reduction of risks due to pollution and exposure to the anthropogenic emissions and releases of mercury and mercury compounds into the environment as envisioned by the Convention.

Procedural Obligation to Obtain, Compile and Consolidate Information Relevant to the Implementation of the Substantive Provisions of the Minamata Convention, Namely, Obligations on Information Exchange (Art 17), Public Information, Awareness and Education (Art 18) and Research, Development and Monitoring (Art 19), and Reporting (Art 21)

These procedural and institutional obligations are devised primarily for capacity building, where all information related to mercury and the consequential impacts of mercury exposure to human health and environment could be collected, compiled, analysed and synthesised in order to inform better decision making with regards to the use of mercury and mercury compounds in the country, and consequently, seeks to enable a more effective implementation of the Convention. Currently, there is no such centralised institution in place in galvanising and coordinating all contemporaneous, but fragmented efforts undertaken within different institutions and authorities, which, in their isolated spheres restricted by their mandates, implement the obligations set forth in the Convention. In particular, information (limited, or at least different in scope and breadth as it is) that is and has already been collected in their respective day-to-day operation as mandated by the respective laws establishing and governing their operations is kept and maintained separately, and in isolation, within the existing institutions, with scant attention paid to facilitate information exchange and transfer inter-institutions. A fragmented approach in the collection of information, of which, without the establishment of an overarching institution exercising oversight over the manner, method, procedures and techniques in data collection, could encumber the meeting of requirement stipulated under Art 21 of the Convention to report to the COP through the Secretariat, the measures it has taken to implement the provisions of the Convention, and on the effectiveness of such measures and the possible challenges in meeting the objectives of the Convention, and possibly hinder a comprehensive implementation of the Minamata Convention.

In order to illustrate the fragmentary nature of the current regulatory framework implementing the Minamata Convention, the corresponding domestic legislations and the mandated authorities tasked with the obligation to collect data and information for the purpose of establishing inventories, reporting, information exchange, dissemination of knowledge, awareness raising, education and training, research, development, monitoring, and other ancillary activities intended under the Convention, all of which contribute towards the fulfilment of the substantive obligations (namely Arts 3, 4, 5, 8, 9, 10, 11, 12 and the objective of the Convention stated in Art 1), are summarily presented in Table 4.1.

Table 4.1 The science-policy linkages forged between substantive and procedural obligations, with particular emphasis on the production of scientific information, and the corresponding domestic legislations and lead agency.

Minamata Convention on Mercury		Relevant Domestic Legislations	Responsible Authorities
Substantive Provisions	**Procedural Provisions (Information)**		
Art 3: Mercury and Mercury Compounds	Art 17.1.a: exchange of scientific, technical, economic and legal information concerning mercury and mercury compounds, including toxicological, ecotoxicological and safety information; and the provision of such information to the public (Art 18.1.a(iii))	EQA 1974 (s 3(1)(m))	DOE, MESTECC
	Art 17.1.b: exchange of information on the reduction or elimination of the production, use, trade, emission and releases of mercury and mercury compounds; and the provision of such information to the public (Art 18.1.a(iii))		
Alternatives	Art 18.1.a(ii): promote and facilitate provision to the public of available information on alternatives to mercury and mercury compounds		
Inventories of use and consumption[15]	Art 19.1.a: develop and improve inventories of use, consumption, and anthropogenic emissions to air and releases to water and land of mercury and mercury compounds, while building on existing monitoring networks and research programmes (Art 19.2); and the provision of the results of its research, development and monitoring activities to the public (Art 18.1.a(iv))		
Commerce and trade	Art 19.1.f: develop and improve information on commerce and trade in mercury and mercury compounds and mercury-added products, while building on existing monitoring networks and research programmes (Art 19.2); and the provision of the results of its research, development and monitoring activities to the public (Art 18.1.a(iv))		
Information on Stockpiles		OSHA 1994 (s 21) (USECHH Regs 2000; CLASS Regs 2013)	DOSH, MOHR
		EQA 1974 (ss 3, 18)	DOE, MESTECC
If the stocks are supplied for the manufacturing of pesticides[16]		Pesticides Act 1974 (s 17-licence)	Pesticides Board, MOA

[15] According to the Ratification and Implementation Manual (Lennett & Gutierrez, 2016), the COP, in the interim, must also determine whether the trade restrictions should be extended to additional mercury compounds (Art 3.13), which may include consideration of those compounds that can be readily converted to elemental mercury. The COP may also receive information form the Implementation and Compliance Committee as to how the import restriction waiver has be utilised, presumably to determine whether the Convention text should be modified in this regard.

[16] It came to our knowledge that there is no mercury or mercury compounds used as an active ingredient in pesticides in Malaysia. However, there is no legal instrument found, to the best of our knowledge, declaring that the use of mercury and mercury compounds in pesticides is prohibited.

Art 4: MAPs			
Alternatives, including information on the health and environmental risks and economic and social costs and benefits of such alternatives[17]	Art 17.1.c(i): exchange of information on technically and economically viable alternatives to MAPs; and the provision of such information to the public (Art 18.1.a(iii))		
Mercury-free products	Art 19.1.g: develop and improve information and research on the technical and economic availability of mercury-free products, while building on existing monitoring networks and research programmes (Art 19.2); and the provision of the results of its research, development and monitoring activities to the public (Art 18.1.a(iv))		
Inventories of use and consumption of mercury and mercury compounds	Art 19.1.a: develop and improve inventories of use, consumption, and anthropogenic emissions to air and releases to water and land of mercury and mercury compounds, while building on existing monitoring networks and research programmes (Art 19.2); and the provision of the results of its research, development and monitoring activities to the public (Art 18.1.a(iv))		
Commerce and trade	Art 19.1.f: develop and improve information on commerce and trade in mercury and mercury compounds and mercury-added products, while building on existing monitoring networks and research programmes (Art 19.2); and the provision of the results of its research, development and monitoring activities to the public (Art 18.1.a(iv))		
Whether manufacture, import, and export of a Pt 1 Annex A products is already reduced to a *de minimis* level (MAP-specific)		Poisons Act 1952 (products subject to 1st Sch, Poisons List)	Pharmacy Enforcement Division, Pharmaceutical Services Division, MOH
		Sales of Drugs Act 1952 and the Control of Drugs and Cosmetics Regulations 1984	Drug Control Authority, Pharmaceutical Services Division, MOH

[17] The information collected is crucial in satisfying the requirements impose under Art 4.4 where it is stipulated that the Secretariat shall, on the basis of information provided by Parties, collect and maintain information on mercury-added products and their alternatives, and shall make such information publicly available.

		Medical Device Act 2012 (ss 5, 15, 26, 27, 37, 45)	Medical Device Authority, MOH
		Pesticides Act 1974 (s 17-licence)	Pesticides Board, MOA
		Consumer Protection Act 1999 (ss 19, 20, 23, 24)	KPDNHEP[18]
		OSHA 1994 (s 35)	DOSH, MOHR
		EQA 1974 (unless otherwise provided, ss 30, 30A)	DOE, MESTECC
Art 5: Manufacturing Processes			
Alternatives, including information on the health and environmental risks and economic and social costs and benefits of such alternatives	Art 17.1.c(ii): exchange of information on technically and economically viable alternatives to manufacturing processes in which mercury or mercury compounds are used; and the provision of such information to the public (Art 18.1.a(iii)) Art 17.1.c(iii): exchange of information on technically and economically viable alternatives to activities and processes that emit or release mercury or mercury compounds; and the provision of such information to the public (Art 18.1.a(iii))		
Mercury-free processes	Art 19.1.g: develop and improve information and research on the technical and economic availability of mercury-free products, while building on existing monitoring networks and research programmes (Art 19.2); and the provision of the results of its research, development and monitoring activities to the public (Art 18.1.a(iv))		
Inventories of use and consumption of mercury and mercury compounds	Art 19.1.a: develop and improve inventories of use, consumption, and anthropogenic emissions to air and releases to water and land of mercury and mercury compounds, while building on existing monitoring networks and research programmes (Art 19.2); and the provision of the results of its research, development and monitoring activities to the public (Art 18.1.a(iv))		

[18] Ministry of Domestic Trade and Consumer Affairs

Identify facilities that uses mercury or mercury compounds, the number and types of such facilities and the estimated annual amount used[19]		EQA 1974 (ss 30, 30A, 33)	DOE, MESTECC
Art 8: Emission	Art 19.1.a: develop and improve inventories of use, consumption, and anthropogenic emissions to air and releases to water and land of mercury and mercury compounds, while building on existing monitoring networks and research programmes (Art 19.2); and the provision of the results of its research, development and monitoring activities to the public (Art 18.1.a(iv))	EQA 1974, (Clean Air Regs 2014)	DOE, MESTECC
Reduce and monitor emissions	Art 19.1.g: develop and improve information and research on best available techniques and best environmental practices to reduce and monitor emissions of mercury and mercury compounds, while building on existing monitoring networks and research programmes (Art 19.2); and the provision of the results of its research, development and monitoring activities to the public (Art 18.1.a(iv))		
Establish and maintain an inventory of emissions from relevant sources	Art 18.2: each Party shall use existing mechanisms or give consideration to the development of mechanisms, such as pollutant release and transfer registers where applicable, for the collection of information on estimates of its annual quantities of mercury and mercury compounds that are emitted, released or disposed of through human activities		
Art 9: Releases	Art 19.1.a: develop and improve inventories of use, consumption, and anthropogenic emissions to air and releases to water and land of mercury and mercury compounds, while building on existing monitoring networks and research programmes (Art 19.2); and the provision of the results of its research, development and monitoring activities to the public (Art 18.1.a(iv))	EQA 1974 (Industrial Effluent Regs 2009; Control of Pollution from Solid Waste Transfer Station and Landfill 2009)	DOE, MESTECC

[19] Although OSHA 1994 does not request for information on the manufacturing processes being operated at the workplace, it does maintain information on the substance used at the workplace, from which information on the types of facilities that might use mercury and mercury compounds at the workplace could be identified. This information that DOSH would have, would also be useful in identifying facilities that are using any other manufacturing process in which mercury or mercury compounds are intentionally used and did not exist prior to the date of entry into force of the Convention stipulated under Art 5.7 if information regarding the types of substances used in a workplace/facility is obtained.

Reduce and monitor releases	Art 19.1.g: develop and improve information and research on best available techniques and best environmental practices to reduce and monitor releases of mercury and mercury compounds; and the provision of the results of its research, development and monitoring activities to the public (Art 18.1.a(iv))		
Establish and maintain an inventory of releases from relevant sources	Art 18.2: each Party shall use existing mechanisms or give consideration to the development of mechanisms, such as pollutant release and transfer registers where applicable, for the collection of information on estimates of its annual quantities of mercury and mercury compounds that are emitted, released or disposed of through human activities		
Art 10: Interim Storage			
What are the facilities that may store mercury or mercury compounds in the country		EQA 1974 (prescribed premise/ conveyance under s 18)	DOE, MESTECC
Capacity building for the environmentally sound interim storage of mercury and mercury compounds		OSHA 1994 (CLASS Regs 2013; USECHH Regs 2000; Control of Industrial Major Accident Hazards Regs 1996)	DOSH, Ministry of HR
Capacity building		EQA 1974 (s 3(1)(l),(m))	DOE, MESTECC
Art 11: Mercury Waste			
Defining 'waste' in accordance with the threshold level to be decided by the COP		EQA 1974 (Scheduled Wastes Regs 2005)	DOE, MESTECC
The potential sources and types of mercury wastes generated in the country		EQA 1974 (Scheduled Wastes Regs 2005)	DOE, MESTECC
Art 12: Contaminated Sites			

Contaminated sites identification and character-isation; public engagement; human health and environ-mental risk assessments; options for risks management; and cost benefits evaluation		EQA 1974 (Contaminated Land Management and Control Guidelines Nos 1-3)	DOE, MESTECC
Art 16: Health Aspects			
Development of sci-ence-based education and preventive programmes; promote health care services; and strengthen institutional and health professional capacities	Art 17.1.d: exchange of epidemiological information concerning health impacts associated with exposure to mercury and mercury compounds, in close cooperation with the WHO and other relevant organisations, as appropriate; and the provision of such information to the public (Art 18.1.a(iii)) 18.1.a(iii)) Art 18.1.a(i): promote and facilitate provision to the public of available information on the health and environmental effects of mercury and mercury compounds Art 18.1.b: promote and facilitate 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 organisations and vulnerable populations Art 19.1.b: develop and improve modelling and geographically representative monitoring of levels of mercury and mercury compounds in vulnerable populations and in environmental media, including biotic media such as fish, marine mammals, sea turtles and birds, as well as collaboration in the collection and exchange of relevant and appropriate samples, while building on existing monitoring networks and research programmes (Art 19.2); and the provision of the results of its research, development and monitoring activities to the public (Art 18.1.a(iv)) Art 19.1.c: develop and improve the assessment of the impact of mercury and mercury compounds on human health and the environment, in addition to social, economic and cultural impacts, particularly in respect of vulnerable populations, while building on existing monitoring networks and research programmes (Art 19.2); and the provision of the results of its research, development and monitoring activities to the public (Art 18.1.a(iv))	Public health: (Ministerial Functions Act 1969)	MOH
		Environmental health: EQA 1974	DOE, MESTECC

Looking back at the historical context in which the Minamata Convention was negotiated and concluded, it is undeniable that the extensive body of scientific knowledge on mercury was the main driving force in putting the need for a legally-binding global convention governing mercury on the international agenda. Science played a key role in getting the international community to recognise that mercury is a global pollutant; it exposes the worrying level of mercury's global distribution, and the adverse implications of mercury exposure to human and environmental health; it reveals how the natural and anthropogenic perturbations change the environmental cycling of mercury by mobilising mercury from sites and alter the formation of monomethylmercury, a bioaccumulative form of mercury for humans and wildlife, which render seafood-consuming populations more vulnerable to a higher risk of mercury exposure (Selin *et al*, 2018; Hsu-Kim *et al*, 2018[20]). The understanding of the changing cycling of mercury due to perturbations could be the single motivating factor that drives the policy decision to enable the Convention to adopt a life-cycle's approach to addressing the production, use, emissions, releases, handling, and disposal of mercury highlights the importance of science-policy linkages in the implementation of the Minamata Convention.

The important role that science plays in the continued implementation of the Convention is apparent in the imposition on the Parties, under Art 19.1.e to cooperate to develop and improve, "information on the environmental cycle, transport (including long-range transport and deposition), transformation and fate of mercury and mercury compounds in a range of ecosystem, taking appropriate account of the distinction between anthropogenic and natural emissions and releases of mercury and of remobilisation of mercury from historic deposition". In fact, Art 17.1.a requires the Parties to facilitate the exchange of information on the scientific, technical, economic and legal aspects of mercury and mercury compounds, including toxicological, ecotoxicological and safety information. The availability of information is crucial in the satisfaction of the obligations stipulated under Art 18 where Parties are required to provide a list of information to the public [21]. Even education, training, public awareness raising, and capacity building related activities provided to the public,

[20] Hsu-Kim, H., Eckley, C.S., Acha´, D. , Feng, X., Gilmour, C.C., Jonsson, S,. and Mitchell, C.P.J., 2018. Challenges and opportunities for managing aquatic mercury pollution in altered landscapes. Ambio, 47(2): 141-169. https://doi.org/10.1007/s13280-017-1006-7.

[21] Art 18.1 provides that each Party shall, within its capabilities, promote and facilitate:

(a) Provision to the public of available information on

(i) The health and environmental effects of mercury and mercury compounds;

(ii) Alternatives to mercury and mercury compounds;

(iii) The relevant topics identified in Art 17.1, of which Parties are obliged to facilitate the exchange of information;

(iv) The results of its research, development and monitoring activities under Art 19; and

(v) Activities to meet its obligations under this Convention;

Art 17.1 provides that, each Party shall facilitate the exchange of –

(a) Scientific, technical, economic and legal information concerning mercury and mercury compounds, including toxicological, ecotoxicological and safety information;

(b) Information on the reduction or elimination of the production, use, trade, emissions and releases of mercury and mercury compounds;

(c) Information on technically and economically viable alternatives to:

(i) Mercury-added products;

(ii) Manufacturing processes in which mercury or mercury compounds are used; and

(iii) Activities and processes that emit or release mercury or mercury compounds;

including information on the health and environmental risks and economic and social costs and benefits of such alternatives; and

(d) Epidemiological information concerning health impacts associated with exposure to mercury and mercury compounds, in close cooperation with the World Health Organisation and other relevant organisations, as appropriate.

The research, development and monitoring activities conducted under Art 19.1, the results of which the Parties shall promote and facilitate the dissemination to the public as required under Art 18.1.a.iv are –

(a) Inventories of use, consumption, and anthropogenic, emissions to air and releases to water and land of mercury and mercury compounds;

(b) Modelling and geographically representative monitoring of levels of mercury and mercury compounds in vulnerable populations and in environmental media, including biotic media such as fish, marine mammals, sea turtles and birds, as well as collaboration in the collection and exchange of relevant and appropriate samples;

(c) Assessments of impact of mercury and mercury compounds on human health and the environment, in addition to social, economic and cultural impacts, particularly in respect of vulnerable populations;

(d) Harmonised methodologies for the activities undertaken under subparas (a), (b) and (c);

(e) Information on the environmental cycle, transport (including long-range transport and deposition), transformation and fate of mercury and mercury compounds in a range of ecosystems, taking appropriate account of the distinction between anthropogenic and natural emissions and releases of mercury and of remobilisation of mercury from historic deposition;

(f) Information on commerce and trade in mercury and mercury compounds and mercury-added products; and

(g) Information and research on the technical and economic availability of mercury-free products and processes and on best available techniques and best environmental practices to reduce and monitor emissions and releases of mercury and mercury compounds.

2. Parties should, where appropriate, build on existing monitoring networks and research programmes in undertaking activities identified in para 1.

especially vulnerable populations in collaboration with relevant intergovernmental and non-governmental organisations in connection with the effects of exposure to mercury and mercury compounds on human health and the environment, forming part of the obligations under Art 18.1.b, are heavily science-driven.

The 'scientific - information - centric' procedural obligations imposed under Arts 17, 18 and 19 bolster the science-policy linkages, where decisions made pursuant to the implementation of the obligations stipulated under the Convention would be based on science and evidence. Although a science-based decision-making does not guarantee better policy-making and outcome (Shackley & Wynne, 1995)[22], but, if the scientific information provided is deemed credible, policy-relevant and politically-legitimate by the intended users, the science-policy linkages would be mobilised more effectively in promoting the making of, at the very least, informed decisions (Cash et al, 2003)[23].

Therefore, the application of scientific information in decision-making within a wider and possibly competing context comprising legal, political, economic, social and cultural concerns and interests would not be possible without consistent, credible, reliable, and most important of all, relevant data and information. In furtherance of the argument in favour of a formal institution for the implementation of most, if not all Multilateral Environmental Agreements (MEAs), but particularly in the context of the implementation of the Minamata Convention (and also the Basel, Rotterdam and Stockholm Conventions) where demands for science-policy linkages are high, a legal authority that could enable and facilitate information collection, knowledge generation and dissemination, capacity building through education and training, monitoring and effectiveness assessment, as well as reporting to the relevant Secretariat of the plethora of MEAs that Malaysia had, or intended to be committed, such as the Minamata Convention, would be a timely and appropriate option to be explored.

Henceforth, the ability of the country in meeting the obligations of the Convention, in particular, the obligations stipulated under Arts 17, 18, 19 and 21 is contingent on the means and mechanisms through which data and information are collected, compiled, analysed and synthesised. Even though the obligation to develop and execute a National Implementation Plan to meet the obligations under the Convention prescribed under Art 20 is not mandatory, by having a National Implementation Plan, it would in fact synergise and galvanise all fragmented efforts undertaken under the relevant authorities, and perhaps, effectuate a holistic and comprehensive implementation of the Convention that is capable of achieving, effectively, the objectives of the Convention.

As such, this overview of existing domestic regulatory framework meant to present an analysis of current governance architecture consisting various institutional bodies structured and established by a multitude of legislations addressing different aspects of mercury governance at different stages of the life cycle of mercury, and to set the scene for a discussion of how the current framework could be improved in order to implement the Convention in a holistic and comprehensive manner, and effectively, achieve the objectives laid out by the Convention. A detailed analysis of the legislations that formalise the regulatory framework, and the assessment of the readiness and ability of such framework in implementing the Minamata Convention in accordance with the obligations stipulated under the salient substantive and procedural provisions of the Minamata Convention, is presented in the form of a schedule and labelled as Annex I in this report.

[22] Shackley, S., and Wynne, B., 1995. Global climate change: The mutual construction of an emergent science-policy domain. Science and Public Policy, 22: 218–230.

[23] Cash, D.W., Clark, W.C., Alcock, F., Dickson, N.M., Eckley, N., Guston, D.H., Jäger, J., and Mitchell, R.B., 2003. Knowledge systems for sustainable development. Proceedings of the National Academy of Sciences, 100: 8086–8091.

4.2.5 Conclusion

The conclusion of the Minamata Convention on Mercury, and its subsequent entry into force on 16 August 2017 was deemed a landmark achievement which gave recognition to the collective actions of the international community to prevent and abate the risk to human health and the environment from mercury exposure and pollution. The effectiveness of this treaty regime will not only depend on the effective implementation of the obligations under the Convention by the parties to the Convention, it will also depend on the extent to which non-Party, observes the objectives and spirits of the Convention. In order to prepare for the ratification of the Minamata Convention, where the Convention shall enter into force on the 90th day after the date of deposit by the country its instrument of ratification pursuant to Art 31 of the Convention, there is a need to conduct an assessment of the regulatory framework of the country in order to ascertain the extent to which the country would be ready to be bound by the obligations stipulated under the Convention, and the extent to which the country is capable of implementing, and complying with, the obligations stipulated under the Convention.

The assessment revealed that the country has in place the necessary regulatory framework in enabling the implementation of the Minamata Convention, although the provisions under the relevant laws need to be further elaborated and be made more prescriptive to answer to the specificities of the Minamata Convention. In order to do so, there is a need to strengthen science-policy linkages within the relevant institution in order to ensure that decisions made with a view of meeting the objectives of the Minamata Convention are based on credible and reliable evidences that are effectively collected, properly analysed and reasonably applied in the implementation of the Convention. An institution capable of handling and coordinating the various authorities equipped with the mandate of fulfilling a certain aspect of the Convention would be crucial to the implementation of the obligations of the Convention, and would ultimately, facilitate the achieving of the objectives of the Convention, in a synergistic, holistic, comprehensive, integrative, and effective manner.

It is also observed that there is a lack of an overarching chemicals management policy that guides and directs all efforts taken for the prevention of pollution from environmentally hazardous substances, pollutants, and wastes from all point and non-point sources, which is, or would be regulated by the multitude of legally-binding MEAs to which Malaysia is subjected to. The *ad hoc* basis in which the regulatory framework is restructured in meeting the requirements of a particular MEAs each time the country is considering the ratification of, would lead to a phenomenon known as fragmentation and congestion (of laws) at the national level[24], which will impair, in the long run, the effective and efficient implementation of all obligations imposed, individually and collectively, under these international agreements.

[24] The phenomenon of treaty congestion in international environmental law has been highlighted by Edith Brown Weiss in 1993. See Weiss, E.B., 1993. International environmental law: Contemporary issues and the emergence of a new world order. Georgetown Law Journal, 81: 675-710

4.3 Operational Framework Assessment

4.3.1 Article 3: Mercury supply and trade

Para 3 of Art 3 of the Minamata Convention indicates that party shall not allow primary mercury mining that was not being conducted after the date of entry into force of the convention, i.e., on 17 August 2017. According to the information provided by Department of Mineral and Geoscience (JMG), there is no primary mercury mining in Malaysia. Furthermore, JMG also reported that mercury was never being mined in Malaysia. Hence mercury mining is not relevant for Malaysia in the context of Minamata Convention. Nonetheless, the challenge now is how to ensure prohibition of mercury mining in the future (if mercury ores are discovered), as the mining permit falls under the jurisdiction of both State and Federal Governments.

The mercury import permission falls under the responsibility of the Ministry of Health (MOH) as mercury and its preparations are listed in First Schedule of Poisons Act 1952. Although Royal Malaysian Customs Department (CUSTOMS) has listed mercury and its preparations in Second Schedule of Customs (Prohibition of Imports) Order 2017, the import permit must be obtained from Pharmacy Enforcement Division, MOH before the custom clearance. In order to allow import of mercury, MOH requires licence and the import permit.

Licence to import mercury and mercury compounds can be applied by any fit and proper person or company that fulfil the requirements stipulated under Poisons Act 1952, where the licence is required to import and wholesale Group D poisons (including mercury and its preparations). In 2017, there were 250 licences issued by MOH where mercury and its preparations are listed as one of the poisons in the licences. However, MOH discovered that not all licensees have imported or wholesale mercury and its preparations. In this regard, starting in 2018, upon the annual renewal of relevant license, the applicant must provide evidence of import or wholesale transactions related to mercury and its preparations in the past 3 years. Without the evidence of such transactions, the listing of mercury and its preparations will be omitted from the license. This requirement is applicable to all other poisons listed in the 1st Sch of Poisons Act 1952.

For the import of mercury and its preparations, besides the license, it also requires an import permit issued by MOH. The import permit is based on the HS Code (Harmonized Commodity Description and Coding System), and the 5 HS codes related to mercury and its preparation are shown in Table 4.2. The import permit is required for every import and each permit is valid for 3 months. In 2017, a total number of 93 import permits were issued by MOH, with the total amount of 501 kg of mercury and its preparations stated in these import permits. However, the actual amount of mercury and its preparations imported might be lesser compared with the total amount stated in the import permits. The reason is, it is not necessary that all import permits are being used by the importers, as some purchase orders might be cancelled by their clients, or some of the import permits have expired. Besides, there are also cases that the approved quantity in the permit represent the total weight of the product, but not the weight of mercury. For example, weight of 8.8 kg of dental alloy approved in the permit might contains only 4.8 kg mercury. Although Poisons Act 1952 has the provision to record the amount of permitted mercury and its preparations stated in the import permit, the Poisons Act 1952 does not have provisions that require stakeholders to submit a report on purchasing, importing, selling or use of mercury to MOH.

Table 4.2 HS codes for mercury and its preparation

No.	Item	Hs Code
1	Mercury	2805.40 000
2	Amalgam	2843.90 000
3	Inorganic and organic compounds of mercury (exclude amalgam)	2852.10 000, 2852.90 000
4	Organo-mercury compounds	2852.10 000, 2852.90 000
5	Dental alloy containing mercury	3006.40 110

Although Poisons Act 1952 does not capture the actual amount of mercury imported, the chemical inventory system known as Chemical Information Management System (CIMS) developed by DOSH will capture data on hazardous chemicals (including mercury, mercury compounds and mixture containing mercury) that are more than 1 metric tonne per year, which have been imported and manufactured in Malaysia. However, CIMS does not capture the stock of hazardous chemicals (including mercury, mercury compounds and mixture containing mercury) kept at the premise. Figure 4.2 shows the mercury supply sources and trade in Malaysia.

It is important to highlight that Art 3 shall not apply to:

- Quantities of mercury or mercury compounds to be used for laboratory-scale research or as a reference standard;
- Naturally occurring trace quantities of mercury or mercury compounds present in such products as non-mercury metals, ores, or mineral products, including coal, or products derived these materials, and unintentional trace quantities in chemical products; or
- Mercury added-products.

Besides that, the excess mercury from decommissioning chlor-alkali facilities and the mercury waste under Article 3 will be discussed in Art 5 and Art 11, respectively.

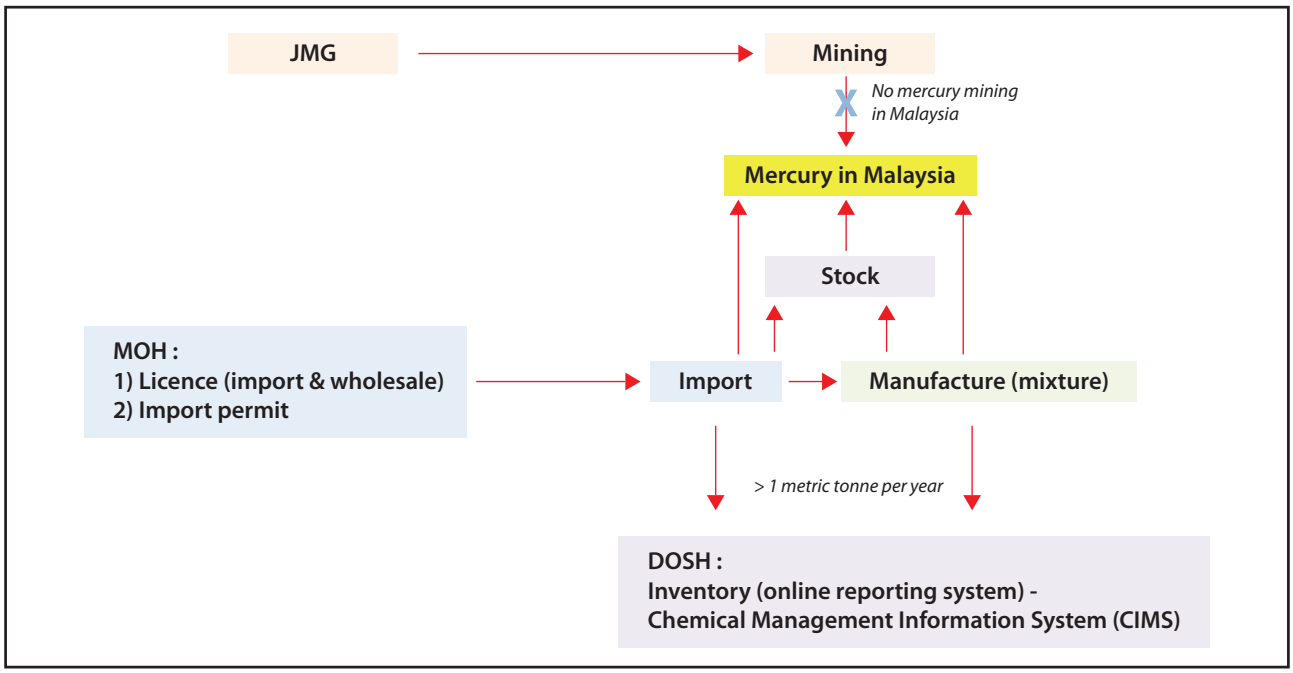


Figure 4.2 Mercury supply sources and trade in Malaysia

4.3.2 Article 4: Mercury-added products

The Minamata Convention defines 'mercury-added product' as a product component that contains mercury or mercury compound that was intentionally added. Mercury-added products are listed in Annex A of the Minamata Convention, where Annex A consist of Part I (products subjected to Art 4, para 1) and Part II (products subjected to Art 4, para 3). The main difference between Part I and Part II is the mode of action, where mercury-added products listed in Part I are to be phased out, whereas mercury-added products listed in Part II are to be phased down. Table 4.3 shows the product categories of Part I and Part II of Annex A of the Convention.

Table 4.3 Product categories for Part I and Part II of Annex A

	Part I (products subjected to Art 4, para 1)	Part II (products subjected to Art 4, para 3)
Mode of action	Phase out	Phase down
Timeline	Phase out date: 2020	Take action on 2 or more measures from the 9 measures listed in Part II, Annex A.
Product category	1) Batteries 2) Switches and relays 3) Fluorescent lamps and mercury vapour lamps 4) Cosmetics 5) Pesticides 6) Non-electronic measuring devices	1) Dental amalgam

Art 4 indicates that Party shall not allow, by taking appropriate measures, the manufacture, import and export of mercury-added products listed in Part I of Annex A after the phase out date, except if the Party has a registered exemption pursuant to Art 6. Nonetheless, upon ratification or entry into force of an amendment to Annex A, a Party may, as alternative to para 1 of Annex A, implement different measures or strategies to address products listed in Part I of Annex A. A party may only choose this alternative if it can meet the following conditions:

- Demonstrate that it has already reduced to a *de minimis* level the manufacture, import, and export of large majority of the products listed in Part I of Annex A, and
- The country has implemented measures or strategies to reduce the use of mercury in additional products not listed in Part I of Annex A, at the time it notifies Secretariat of its decision to use the alternative.

A Party that has chosen the alternative is not eligible to claim exemptions pursuant to Art 6 of the Minamata Convention.

Batteries

The Minamata Convention prohibits the use of mercury in batteries, except button zinc silver oxide batteries and button zinc air batteries, where mercury content in both types of batteries are < 2%. Table 4.4 shows the description of the mercury-added products – batteries covered by Minamata Convention, and the current situation in Malaysia corresponding to the mercury-added products.

Table 4.4 Status of mercury-added products – batteries in Malaysia

Mercury-added product covered by Minamata Convention	Description / examples*	Situation in Malaysia
Batteries, except for button zinc silver oxide batteries with a mercury content < 2% and button zinc air batteries with a mercury content < 2%.	• The intentional use of mercury in batteries will be prohibited except for two types of button cell batteries. These two button cells types are typically used in hearing aids (zinc air), and watches or cameras (silver oxide). • Other button cell types, such as alkaline manganese button cells typically used in toys or cheaper electronics, and mercury oxide button cells (which can contain 40% mercury by weight) are covered by the prohibition. • The 2% mercury content limit for the zinc air and silver oxide button cell batteries corresponds to the mercury amount now typically used by manufacturers to inhibit battery corrosion.	• There is no legal framework that regulates the manufacture, import and export of batteries containing mercury in Malaysia. Hence, related operational framework is also not available in Malaysia. Besides, there are no existing measure to prevent incorporation of mercury-added products into assembled products in Malaysia. • The Ministry of Domestic Trade and Consumer Affairs (KPDNHEP) has gazetted Consumer Protection (Safety Standards for Primary Batteries) Regulations 2013, where safety standards for primary batteries are prescribed in the regulations. These safety standards are MS IEC 60086-1, MS IEC 60086-2, MS IEC 60086-4 and MS IEC 60086-5. None of the safety standards prohibits the use of mercury in batteries.

* adopted from Lennett & Gutierrez, 2014

Switches and relays

The Minamata Convention prohibits the use of mercury in switches and relays, with some exemptions. Table 4.5 shows the description of the mercury-added products – switches and relays covered by Minamata Convention, and the current situation in Malaysia corresponding to the mercury-added products.

Table 4.5 Status of mercury-added products – switches and relays in Malaysia

Mercury-added product covered by Minamata Convention	Description / examples*	Situation in Malaysia
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.	• Switches are devices used to open or close an electrical circuit, or a liquid or gas valve. Examples of switches are float switches triggered by a change in liquid levels, tilt switches activated by a change in position, and flame sensors activated by a change in temperature. These switches can be found in pumps, appliances, ranges/ovens, and a variety of machinery. • Relays are devices used to open or close electrical contacts to control another device in the same circuit. They are often used to turn off large electrical currents by supplying a small amount of electricity to a control circuit. They can be found in telecommunication circuit boards, and industrial ovens.	• There is no legal framework that regulates the manufacture, import and export of switches and relays in Malaysia. Hence, the related operational framework is also not available in Malaysia. Besides, there are no existing measures to prevent the incorporation of mercury-added products into assembled products in Malaysia.

* adopted from Lennett & Gutierrez, 2014

Fluorescent lamps and mercury vapour lamps

The Minamata Convention prohibits the use of mercury in certain types of fluorescent lamps and mercury vapour lamps with some exemptions. Table 4.6 shows the description of the mercury-added products – fluorescent lamps and mercury vapour lamps covered by Minamata Convention, and the current situation in Malaysia corresponding to the mercury-added products.

Table 4.6 Status of mercury-added products – fluorescent lamps and mercury vapour lamps in Malaysia

Mercury-added product covered by Minamata Convention	Description / examples*	Situation in Malaysia
Compact fluorescent lamps (CFLs) for general lighting purposes that are ≤ 30 watts with a mercury content exceeding 5 mg per lamp burner.	• CFLs are the smaller lamps often used in residential settings as an energy efficient substitute for incandescent lamps.	• There is no legal framework that regulates the manufacture, import and export of CFLs in Malaysia. Hence related operational framework is not available in Malaysia. Besides, there are no existing measures to prevent the incorporation of mercury-added products into assembled products in Malaysia. • Before Malaysia signed the Minamata Convention in 2014, the Ministry of International Trade and Industry (MITI) has a dialogue with key manufacturers and the feedback obtained was the mercury content in CFLs is less than 5 mg per lamp burner. According to key manufacturers, such initiatives are market-driven, especially for CFLs that are exported to other countries. For example, the EU RoHS Directive (Restriction of the use of certain hazardous substances in electrical and electronic equipment) have a more stringent control of the content of mercury in electrical and electronic equipment. Besides, the emerging of Light Emitting Diodes (LEDs) are expected to replace mercury lamps over time.

Linear fluorescent lamps (LFLs) for general lighting purposes: (a) Triband phosphor < 60 watts with a mercury content exceeding 5 mg per lamp; (b) Halophosphate phosphor ≤ 40 watts with a mercury content exceeding 10 mg per lamp.	• Linear lamps (i.e., T5s, T8s) are frequently found in commercial and industrial buildings.	• There is no legal framework that regulates the manufacture, import and export of LFLs in Malaysia. Hence, related operational framework is not available in Malaysia. Besides, there are no existing measures to prevent the incorporation of mercury-added products into assembled products in Malaysia. • Before Malaysia signed the Minamata Convention in 2014, the Ministry of International Trade and Industry (MITI) has a dialogue with key manufacturers and the feedback was that the mercury content in LFLs is less than 5 mg per lamp. According to key manufacturers, such initiatives are market-driven, especially when LFLs are exported to other countries. For example, the EU RoHS Directive (Restriction of the use of certain hazardous substances in electrical and electronic equipment) have a more stringent control of the content of mercury in electrical and electronic equipment. Besides, the emerging of Light Emitting Diodes (LEDs) are expected to replace mercury lamps over time.
High pressure mercury vapour lamps (HPMV) for general lighting purposes	• HPMV lamps are generally used for large area overhead lighting, such as in factories, warehouses, sports arenas and streetlights.	• There is no legal framework that regulates the manufacture, import and export of HPMV in Malaysia. Hence, the related operational framework is not available in Malaysia. Besides, there are no existing measures to prevent the incorporation of mercury-added products into assembled products in Malaysia.

Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays: (a) short length (≤ 500 mm) with mercury content exceeding 3.5 mg per lamp (b) medium length (> 500 mm and ≤ 1500 mm) with mercury content exceeding 5 mg per lamp (c) long length (> 1500 mm) with mercury content exceeding 13 mg per lamp	• CCFLs and EEFLs are generally used in the backlighting of Liquid Crystal Displays (LCDs), such as computer monitors and television screens.	• There is no legal framework that regulates the manufacture, import and export of CCFL and EEFL in Malaysia. Hence, the related operational framework is not available in Malaysia. Besides, there are no existing measures to prevent the incorporation of mercury-added products into assembled products in Malaysia.

* adopted from Lennett & Gutierrez, 2014

Cosmetics

The Minamata Convention prohibits the use of mercury in cosmetics, with some exemptions. Table 4.7 shows the description of the mercury-added products – cosmetics covered by Minamata Convention, and the current situation in Malaysia corresponding to mercury-added products.

Table 4.7 Status of mercury-added products – cosmetics in Malaysia

Mercury-added product covered by Minamata Convention	Description / examples*	Situation in Malaysia
Cosmetics (with mercury content above 1 ppm), 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.**	• Includes skin lightening cosmetics, which come in the form of soap, cream, or lotion that use mercury as a common pharmacological compound to lighten skin. Products where mercury is intentionally added will typically have a concentration above 1 ppm. • The exception for mercury used as a preservative in the eye area appears to track the exception issued by the U.S. Food and Drug Administration (FDA), where the mercury content limit adopted by FDA for this purpose is 65 ppm.***	• Mercury and its preparations are listed as poisons in 1st Sch of Poisons Act 1952. • As far as cosmetic is concerned, Poisons Act 1952 exempts cosmetic, which is notified under the Control of Drugs and Cosmetics Regulation 1984 containing not more than 1 ppm of mercury calculate as the metal, as well as products which is notified under the Control of Drugs and Cosmetics Regulation 1984 containing not more than 0.5 ppm of mercury calculate as the metal, from the application of the Act. • According to MOH, none of the cosmetic notification received by Drug Control Authority (DCA) contains mercury. In addition, as of 7 December 2018, there are 240 manufactures in Malaysia that adhere to the ASEAN Guidelines for Cosmetic Good Manufacturing Practice.

* Adopted from Lennett & Gutierrez, 2014
** The intention is not to cover cosmetics, soaps or creams with trace contaminants of mercury
*** https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/cfrsearch.cfm?fr=700.13

Pesticides

The Minamata Convention prohibits the use of mercury in pesticides. Table 4.8 shows the description of the mercury-added products – pesticides covered by Minamata Convention, and the current situation in Malaysia corresponding to mercury-added products.

Table 4.8 Status of mercury-added products – pesticides in Malaysia

Mercury-added product covered by Minamata Convention	Description / examples*	Situation in Malaysia
Pesticides, biocides and topical antiseptics	• Biocide is a substance or microorganism that kills or controls growth of living organisms. In this context, the term biocide includes the principal way mercury has been used to manufacture paints. Historically, mercury was used in paints in very large quantities as a biocide to prevent bacteria from growing in the paint while stored, and to prevent algae and fungi from growing on the applied paint. • Topical antiseptics are products with antimicrobial activity designed for use on skin or other superficial tissues. Examples of these products are mercuro-chrome or merthiolate.	• Several mercury compounds are listed as active ingredients in the 1st Sch of Pesticides Act 1974. • According to Department of Agriculture (DOA), pesticides containing mercury compounds (as active ingredients) have never been registered in Malaysia. • The topical antiseptic is being covered by Drug Control Authority (DCA) under the Control of Drugs and Cosmetics Regulation1984, where DCA regulates pharmaceutical products, traditional medicines and cosmetics.

* Adopted from Lennett & Gutierrez, 2014

Non-electronic measuring devices

The Minamata Convention prohibits the use of mercury in non-electronic measuring devices, with some exemptions. Table 4.9 shows the description of the mercury-added products – non-electronic measuring devices covered by Minamata Convention, and the current situation in Malaysia corresponding to mercury-added products.

Table 4.9 Status of mercury-added products – non-electronic measuring devices in Malaysia

Mercury-added product covered by Minamata Convention	Description / examples*	Situation in Malaysia
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: (a) barometers; (b) hygrometers; (c) manometers; (d) thermometers; (e) sphygmomanometers.	• Barometers – instruments for measuring atmospheric pressure used especially in forecasting the weather and determining altitude. • Hygrometers – instruments for measuring the humidity of the air or a gas. • Manometers – instruments used to measure gas pressures. • Thermometers – instruments used to measure temperature. The most common types are fever thermometers to determine if someone is ill, but thermometers are also used in industrial processes, such as food processing. • Sphygmomanometers – instruments used to measure blood pressure, otherwise known as blood pressure cuffs.	• There is no legal framework that regulates the manufacture, import and export of barometers, hygrometers, manometers, thermometers and sphygmomanometers in Malaysia. Hence, the related operational framework is also not available in Malaysia. Besides, there are no existing measures to prevent the incorporation of mercury-added products into assembled products in Malaysia. • However, if these non-electronic measuring devices (such as thermometers and sphygmomanometers) are used as medical device, then the import, manufacture, and distribution (except retail) of these devices will be regulated by Medical Device Act 2012. • In 2016, the MOH has issued a circular on the procurement, replacement and disposal of thermometer and sphygmomanometer, where all the government hospitals (including university and army hospitals) are advised to: a) ensure that the procurement of new medical devices such as thermometer and sphygmomanometer do not contain mercury;

		b) ensure that the replacement of existing medical devices such as thermometer and sphygmomanometer do not contain mercury; and c) ensure that the medical devices and wastes containing mercury are disposed according to proper procedures (MOH, 2016). This circular is only applicable to government, university, and army hospitals. ● In 2017, the Medical Device Authority (MDA) has issued a circular to set out the implementation and enforcement of the policy to stop the use of thermometer and sphygmomanometer that contain mercury as follows: a) Importation, exportation and manufacture of medical device which contains mercury need to be phased out by 2020; b) Medical device to be placed in the Malaysian market/imported will not be registered; c) Assessment of the application for registration of existing products will be discontinued; d) Not permitted for import, transit, special access, customs made, education and demonstration; e) Establishment shall inform the Authority of any remaining stock of medical devices containing mercury. This circular is implemented administratively before the order is published in the Gazette (MDA, 2017)

* Adopted from Lennett & Gutierrez, 2014

Dental amalgam

Part II of Annex A of the Minamata Convention has listed 9 measures to phase down the use of dental amalgam. A Party shall include 2 or more measures of the 9 listed measures as efforts to phase down the use of dental amalgam. Table 4.10 shows the measures to phase down the use of dental amalgam and the corresponding actions taken by Malaysia.

Table 4.10 Measures to phase down the use of dental amalgam and corresponding actions taken by Malaysia

No.	Measures to phase down the use of dental amalgam	Corresponding actions taken by Malaysia
1	Setting national objectives aiming at dental caries prevention and health promotion, thereby minimizing the need for dental restoration	• The dental health programme under MOH has set the objective to improve the oral health status of the population through the provision of preventive, promotive, curative and rehabilitative dental services, with special emphasis given to identified priority groups in such a way that the oral health status of the nation will continually be in conformity with the socio-economic progress of the country. • Nonetheless, the objective above is not considered as the national objective because it is the objective for a programme under MOH.
2	Setting national objectives aiming at minimizing its use	• The Oral Health Programme, MOH has set target to reduce the usage of dental amalgam as filling materials to 15% by year 2020 (referred to the Dental Public Health Specialist Meeting that was held on 11-12 May 2018). • Nonetheless, the objective above is not considered as the national objective because it is the objective for a programme under MOH.
3	Promoting the use of cost-effective and clinically effective mercury-free alternatives for dental restoration	• The promotion of mercury-free alternatives for dental restoration is done by different entities, such as the respective dental clinics and hospitals. However, no effort at the national level has been undertaken to consolidate such activities. • Besides, no official brochure that provide information and options for cost-effective and clinically effective mercury-free alternatives is available. • The promotion of mercury-free dental restoration alternatives should take into account current practices in dental clinic (both government and private) for dental restoration.
4	Promoting research and development of quality mercury-free materials for dental restoration	• The research and development of quality mercury-free materials for dental restoration might be conducted by private sector / universities.

		• The promotion of research and development of quality mercury-free materials for dental restoration is not yet conducted by any government entities. • Besides, additional financial and human resources are required for the research and development of quality mercury-free materials for dental restoration.
5	Encouraging representative professional organisations and dental schools to educate and train dental professionals and students on the use of mercury-free dental restoration alternatives and on promoting best management practices	• The dental health programme under MOH promote oral health to ensure a continual improvement of the oral health among the population. • The promotion of mercury-free dental restoration alternatives should take into account current practices in dental clinic (both government and private) for dental restoration.
6	Discouraging insurance policies and programmes that favour dental amalgam use over mercury-free dental restoration	• Not relevant for Malaysia.
7	Encouraging insurance policies and programmes that favour the use of quality alternatives to dental amalgam for dental restoration	• Not relevant for Malaysia.
8	Restricting the use of dental amalgam to its encapsulated form	• Malaysia has eliminated use of bulk elemental mercury and use only pre-capsulated dental amalgam for amalgam restorations (referred to the Position Statement on the Use of Dental Amalgam 2013 by Malaysian Dental Council). • For private practitioner, the use of capsulated dental amalgam is a mandatory, where this is stated in the Checklist for Monitoring/ Enforcement Inspection of Private Dental Clinics – Private Healthcare Facilities and Services Act 1998 and Regulations 2006.
9	Promoting the use of best environmental practices in dental facilities to reduce releases of mercury and mercury compounds to water and land	• The dental clinics must comply with the relevant regulations for the releases of mercury and mercury compounds to water and land. • All dental units (government or private) must have traps or filters installed to catch shavings and drilling waste from restoration procedures. The traps / filters should be ISO certified or equivalent and maintained according to the manufacturer's instruction (referred to the Position Statement on the Use of Dental Amalgam 2013 by Malaysian Dental Council).

4.3.3 Article 5: Manufacturing processes in which mercury or mercury compounds are used

Art 5 of Minamata Convention emphasises manufacturing processes in which mercury and mercury compounds are used, but exclude processes using mercury-added products, processes for the manufacturing mercury-added products, or processes that process mercury-containing waste. Manufacturing processes using mercury or mercury compounds are listed in Annex B of the Minamata Convention, where Annex B consist of Part I (processes subjected to Art 5, para 2) and Part II (processes subjected to Art 5, para 3). The main difference between Part I and Part II is the mode of action, where manufacturing processes listed in Part I are to be phased out, whereas manufacturing processes listed in Part II are to be phased down, although some of the processes in Part II are aiming to be phase out. Table 4.11 shows the manufacturing processes using mercury or mercury compounds listed in Annex B.

Table 4.11 Manufacturing processes using mercury or mercury compounds listed in Annex B

	Part I (processes subjected to Art 5, para 2)	Part II (processes subjected to Art 5, para 3)
Mode of action	Phase out	Phase down (with some processes aiming to be phased out)
Manufacturing processes using mercury or mercury compounds	1) Chlor-alkali production (phase out by 2025) 2) Acetaldehyde production in which mercury or mercury compounds are used as a catalyst (phase out by 2018)	1) Vinyl chloride monomer production 2) Sodium or potassium methylate or ethylate 3) Production of polyurethane using mercury containing catalysts

Art 5 focuses on mercury used in the manufacturing processes, where the roles of mercury is either as catalyst, mercury amalgamation and mercury cell, as shown in Table 4.12. The chemicals produced from mercury processes are also indicated in the table.

Table 4.12 The roles of mercury and manufactured chemicals in manufacturing process listed in Annex B

Process using mercury	Roles of mercury	Manufactured chemicals
Chlor-alkali production	Mercury cell	• Chlorine (Cl_2) • Caustic soda (NaOH)
Acetaldehyde production	Catalyst	• Acetaldehyde (CH_3CHO)
Vinyl chloride monomer production	Mercury cell	• Vinyl chloride (C_2H_3Cl)
Production of sodium or potassium methylate or ethylate	Mercury amalgamation	• Sodium methylate ($CH_3O^-Na^+$) • Potassium methylate ($CH_3O^-Na^+$) • Sodium ethylate ($C_2H_5O^-Na^+$) • Potassium ethylate ($C_2H_5O^-K^+$)
Production of polyurethane	Catalyst	• Polymer that contains monomer urethane.

Art 5 only focuses on the manufacturing process that uses mercury, and not the manufactured chemicals. This is because the same manufactured chemical might be produced via different processes, which include both processes with mercury and without mercury (Figure 4.3). For example, chlorine can be produced via chlor-alkali process (using mercury cell), or via membrane cell (mercury-free).

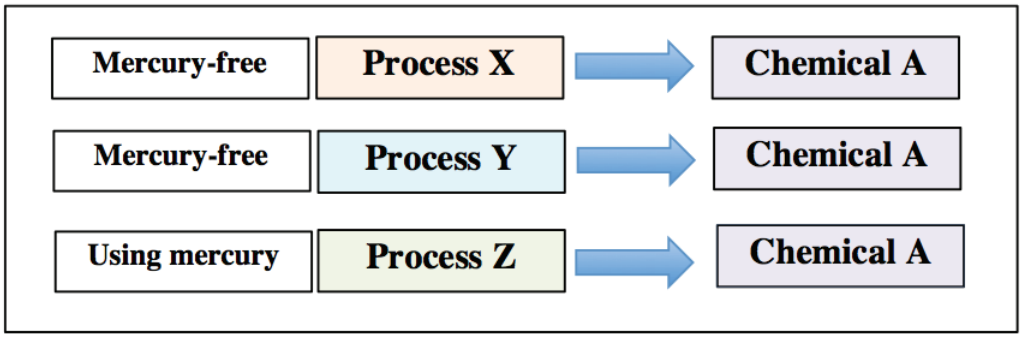


Figure 4.3 Different processes that manufacture the same chemical

As far as Art 5 is concerned, a Party must have data and information on the number and types of facilities that use processes in Annex B, as well as the estimated annual amount of mercury or mercury compounds used in those facilities. A Party shall not allow the use of mercury and mercury compounds in a facility that did not exist prior to the date of entry into force of Minamata Convention for the country that uses manufacturing processes listed in Annex B, except for the manufacturing of polyurethane. Besides, a Party should also discourage the development of any mercury-involved facility using any other manufacturing process that are not listed in Annex B, except where the Party can demonstrate that the manufacturing process provides significant environmental and health benefits and that there are no technically and economically feasible mercury-free alternatives available providing such benefits.

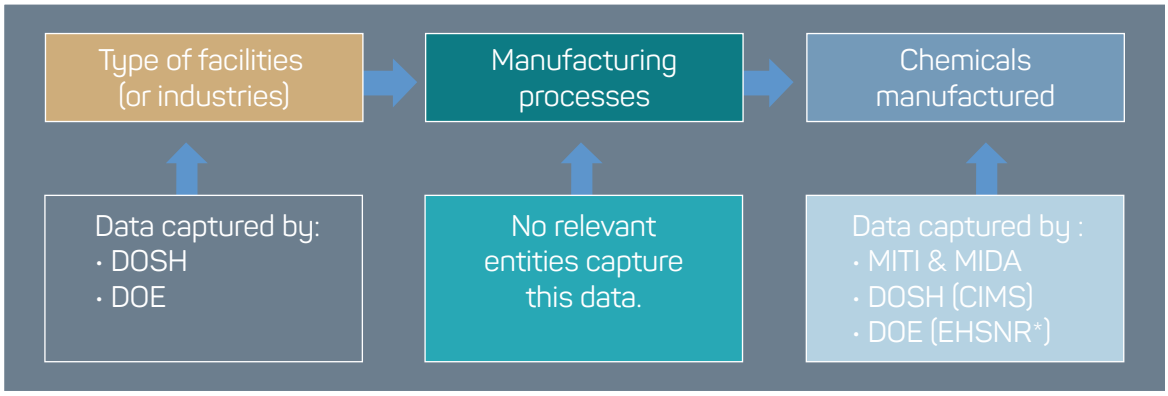
In Malaysia, the data on the types of facilities (or industries) are captured by different entities, namely Department of Occupational Safety and Health (DOSH) and Department of Environment (DOE). At the same time, DOSH and DOE also captured data on chemicals manufactured and imported into Malaysia, where DOSH established the mandatory chemical inventory known as Chemical Information Management System (CIMS), whereas DOE established the voluntary Environmentally Hazardous Substances Notification and Registration (EHSNR) system [note: the EHSNR system has been put on hold pending the finalisation of the EHS regulations]. In the stakeholders consultation workshop, the Ministry of International Trade and Industry (MITI) and Malaysian Investment Development Authority (MIDA) informed that, a guideline on the application for manufacturing licences was issued by MIDA requiring that,

- any persons engaging in any manufacturing activity with shareholders' funds of RM 2.5 million and above; or
- employing 75 or more full-time paid employees,

would have to apply for a manufacturing licence.

The guideline also outlined the information required for the application of manufacturing licence, among others, the information on raw material as well as manufactured products. Such information is required for new manufacturing projects, or expansion and/or diversification projects by a licensed manufacturer or by an existing non-licensed manufacturer.

The data on the types of facilities and chemicals manufactured in Malaysia is available, however the data on manufacturing processes is limited. Figure 4.4 shows the manufacturing data captured by the relevant entities in Malaysia. Although some manufacturing process such as newly established facilities might need to submit their manufacturing processes to relevant entities, but these data do not cover existing facilities or facilities that have changed their processes.



* the EHSNR system is put on hold pending the finalisation of the EHS Regs

Figure 4.4 Manufacturing data captured by the relevant entities in Malaysia

4.3.4 Article 7: Artisanal and small-scale gold mining

'Artisanal and small scale gold mining (ASGM)' means gold mining conducted by individual miners or small enterprises with limited capital investment and production. Para 1 of Art 7 indicates that Art 7 and Annex C of the Minamata Convention shall apply to ASGM and processing in which mercury amalgamation is used to extract gold from ores. It means that if the ASGM activities does not use mercury, Art 7 does not apply. By referring to the inputs from JMG, ASGM activities in Malaysia are free from mercury.

4.3.5 Article 8: Emissions

Art 8 concerns controlling and, where feasible, reducing emissions of mercury and mercury compounds. The definitions and relations among 'source category', 'relevant source', 'new source' and 'exiting source' are shown in Figure 4.5. A Party with relevant sources shall take measures to control emissions and may prepare a national plan setting out the measures to be taken to control emissions and its expected targets, goals and outcomes.

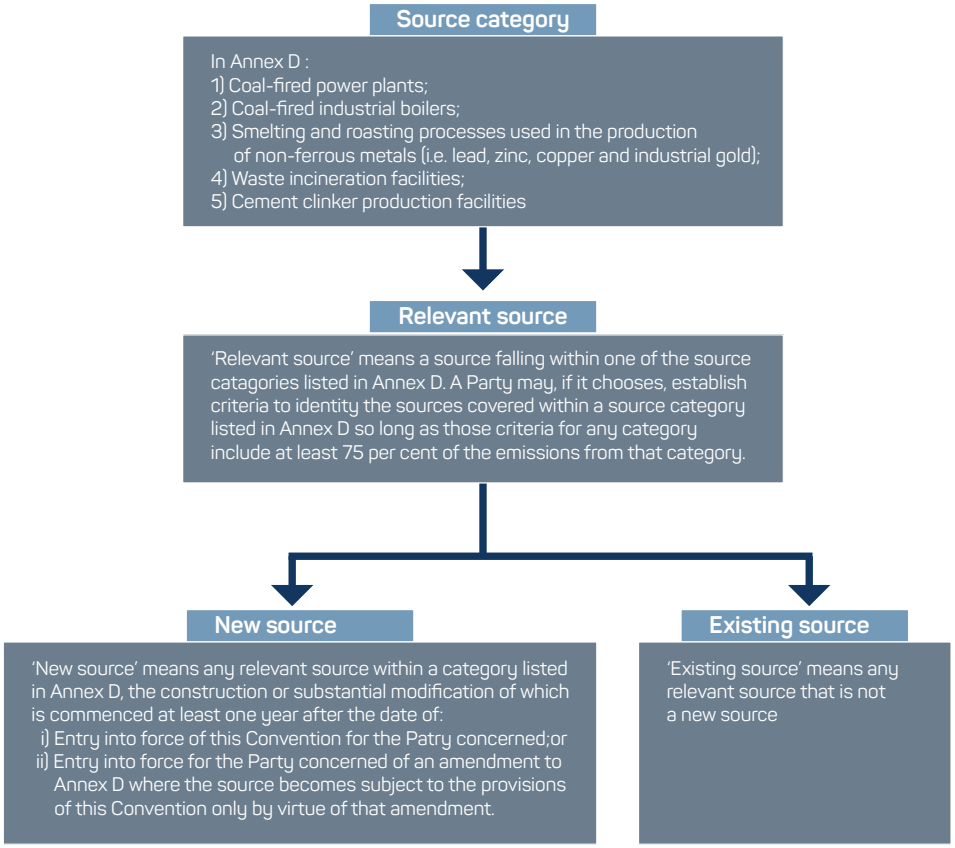


Figure 4.5 Definitions and relations among 'source category', 'relevant source', 'new source' and existing source in Art 8.

For new sources, Party shall require the use of best available techniques (BAT) and best environmental practices (BEP) to control and, where feasible, reduce emissions, as soon as practicable but no later than 5 years after the date of entry into force of the Minamata Convention for the Party. The recent COP has adopted numerous BAT/BEP guidelines, as below (these guidelines can be downloaded at http://www.mercuryconvention.org/):

1. BAT/BEP – Introduction
2. BAT/BEP – Common techniques
3. BAT/BEP – Monitoring
4. BAT/BEP – Coal-fired power plants and coal-fired industrial boilers
5. BAT/BEP – Melting and roasting processes used in the production of non-ferrous metals (lead, zinc, copper and industrial goal)
6. BAT/BEP – Waste incineration facilities
7. BAT/BEP – Cement clinker production facilities
8. BAT/BEP – New and emerging techniques

The use of BAT/BEP for new sources should be implemented as soon as practicable but no later than 5 years after the date of entry into force of the Minamata Convention of the Party. A Party may use emission limit values that are consistent with the application of BATs.

In Malaysia, the Environmental Quality (Clean Air) Regulations 2014 (known as CAR 2014) regulates any of the industrial plant and fuel burning equipment in Malaysia. The CAR 2014 has determined the limit values and technical standards for the following activity and industry:

1. Heat and power generation
2. Production and processing of ferrous metals (iron and steel mills)
3. Ferrous metal foundries with capacity ≥ 1 tonne molten metal per day
4. Production and processing of non-ferrous metals with capacity ≥ 0.5 tonne per day for lead or cadmium or capacity ≥ 2 tonne per day for other metals.
5. Oil and gas industries (all sizes)
6. Non-metallic (mineral) industry
7. Asphalt mixing plant (stationary installations)
8. Pulp and paper industry (all sizes)
9. Chemical and petrochemical industry (all sizes)
10. Solvent use in industry
11. Waste incinerators (all sizes)

In order to assist industries in Malaysia to reduce emission of air pollutants, the DOE has established best available techniques guidance documents to be used by relevant industries in Malaysia. These guidance documents are as below and can be accessed via https://www.doe.gov.my :

1. Best available techniques guidance document on iron and steel industry
2. Best available techniques guidance document on non-ferrous metal industry
3. Best available techniques guidance document on non-metallic mineral industry
4. Best available techniques guidance document on oil and gas industry
5. Best available techniques guidance document on power generation
6. Best available techniques guidance document on petrochemicals
7. Best available techniques guidance document on pulp and paper industry
8. Best available techniques guidance document on storage and handling of petroleum products
9. Best available techniques guidance document on waste incinerator

As far as the emission of mercury is concerned, Table 4.13 shows the limit value and monitoring frequency for mercury emission stipulated in CAR 2014. DOE has provided a 5-year grace period (until 5th June 2019) for existing facilities to comply with CAR 2014. Some of the existing industry already submitted their air pollutant emission monitoring data to DOE but only selected parameters are compiled by DOE to reflect the status of air pollution at the national level.

Table 4.13 Limit value and monitoring frequency for mercury emission stipulated in CAR 2014

Activity/Industry	Limit value for Mercury	Monitoring frequency for Mercury
Heat and power generation (boilers) with the capacity > 10MW$_e$: Fuel type – solid and liquid	0.03 mg/m^3	Periodic
Non-metallic (mineral) industry: Cement kilns	0.05 mg/m^3	Periodic
Non-metallic (mineral) industry: rotary furnaces for the manufacture of hard quicklime or sintering dolomite	0.03 mg/m^3	Periodic
Chemical and petrochemical industry (all sizes)	0.05 mg/m^3	Periodic
Waste incinerators (all sizes)	0.05 mg/m^3	Periodic

Beside new sources, the Minamata Convention also indicates that a Party shall implement one or more of the following measures, taking into account its national circumstances, and the economic and technical feasibility and affordability of the measures, as soon as practicable but no more than 10 years after the date of entry into force of the Minamata Convention for the Party:

1. A quantified goal for controlling and, where feasible, reducing emissions from relevant sources;
2. Emission limit values for controlling, and where feasible, reducing emissions from relevant sources;
3. The use of best available techniques and best environmental practices to control emissions from relevant sources;
4. A multi-pollutant control strategy that would deliver co-benefits for control of mercury emissions;
5. Alternative measures to reduce emissions from relevant sources.

As far as Malaysia is concerned, Malaysia has implemented 1 of the measures above, i.e., setting emission limit values for relevant source. The Minamata Convention define 'emission limit value' as a limit on the concentration, mass or emission rate of mercury or mercury compound, often expressed as 'total mercury', emitted from a point source. In the CAR 2014, limit values (in concentration) for mercury emission from different sources have been identified, as shown in Table 4.12 above. For other measures, although DOE has released the BAT guidance documents, where mercury emissions is one of the parameters considered by some of the BAT guidance documents, however these BAT guidance documents established by DOE did not take into account the BAT guidance documents that are endorsed by the COP of Minamata Convention.

4.3.6 Article 9: Releases

Art 9 concerns the controlling and the reducing of releases of mercury and mercury compounds to land and water from relevant point sources that are not addressed in other provisions of Minamata Convention. The 'relevant source' means any significant anthropogenic point source of release as identified by a Party that is not addressed in other provisions of Minamata Convention. So far, the Minamata Convention has not identified relevant point source categories. However, para 3 of Art 9 indicates that each party shall, no later than 3 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. A decision was made during COP-2 (in November 2018), where an intersessional process to identify relevant point source categories of releases of mercury and mercury compounds to land and water will be established, and this includes the establishment of a group of technical experts on point source categories guidance in relation to mercury releases.

In Malaysia, the Environmental Quality (Industrial Effluent) Regulations 2009 is gazetted to regulate any premises which discharge or release industrial effluent or mixed effluent, onto or into any soil, or into inland waters or Malaysian waters, other than the premises as specified in the 1st Sch (e.g., mining activities). These regulations repealed the Environmental Quality (Industrial Effluent) Regulations 1979. The Environmental Quality (Industrial Effluent) Regulations 2009 stipulated for a notification requirement for new or altered sources of discharge of industrial effluent, where the information required includes concentration of mercury (in mg/L) in raw effluent and treat effluent. Besides, acceptable conditions for discharge of industrial effluent or mixed effluent are also stipulated in the regulations, where the acceptable condition for discharge of mercury is 0.005 mg/L (for inland waters within the catchment areas, where the catchment areas referred to the areas upstream of surface or above subsurface water supply intakes, for the purpose of human consumption including drinking waters) and 0.05 mg/L (for any other inland waters), respectively. Industries that discharge effluent containing mercury have submitted the relevant data to DOE, but these data has not yet been compiled by DOE to represent mercury discharges at the national level. Nevertheless, DOE monitors the quality of rivers in Malaysia, where mercury is 1 of the monitoring parameters. As of 2018, there are 1,353 (manual) and 30 (automatic) monitoring stations located at 635 rivers throughout Malaysia. In addition, DOE also enforces the Environmental Quality (Control of Pollution from Solid Waste Transfer Station and Landfill) Regulations 2009, where these regulations shall apply to solid waste transfer stations and landfills which discharge or release leachate. The acceptable condition for discharge of mercury (from leachate) under these regulations is 0.005 mg/L.

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

Art 10 shall apply to the interim storage of mercury and mercury compounds as defined in the Art, which does not fall within the meaning of the definition of mercury wastes set out in Art 11 of the Minamata Convention. Each Party shall take measures to ensure that interim storage of mercury and mercury compounds is undertaken in an environmentally sound manner, taking into account any guidelines, including the guidelines adopted by COP applicable to the interim storage of mercury and mercury compounds. During the COP2 in November 2018, the "Guidelines on the Environmentally Sound Interim Storage of Mercury other than Waste Mercury" was adopted, where the scope of environmentally sound interim storage includes location, construction of interim storage facilities, containers for mercury storage, movement of mercury and mercury compounds, education and training, timetables for repair testing and maintenance, and emergency measures. In Malaysia, no guidance on mercury environmentally sound interim storage of mercury has been established. However, DOSH has published 3 relevant guidelines related to this Art, namely "Guidelines on Storage of Hazardous Chemicals: A Guide for Safe Warehousing of Packaged Hazardous Chemicals" (in year 2005), "Guidelines on the Control of Chemicals Hazardous to Health" (in year 2001) and "Guidelines on Mercury Management in Oil and Gas Industry" (in year 2011).

4.3.8 Article 11: Mercury waste

Under para 2, Art 11 of Minamata Convention, mercury wastes 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 threshold defined by COP. As of the COP2 of Minamata Convention (in November 2018), COP2 have not clarified and refined the coverage of the three categories of mercury wastes listed above. Hence, COP2 had decided to establish an intersessional process to develop thresholds for mercury waste, which include a comprehensive list of mercury waste that consist of mercury or mercury compounds, as well as an indicative list of mercury waste that contained and contaminated by mercury or mercury compounds.

As far as Malaysia is concerned, Malaysia had ratified Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal on 8 October 1992. In this regard, DOE has gazetted Environmental Quality (Scheduled Wastes) Regulations 2005 to regulate hazardous/scheduled wastes in order to fulfil its obligation as a Party under the Basel Convention. The scheduled wastes that can be considered as mercury wastes are as below:

SW 109	Waste containing mercury or its compound
SW110	Waste from electrical and electronic assemblies containing components such as accumulators, mercury-switches, glass from cathode-ray tubes and other activated glass or polychlorinated biphenyl-capacitors, or contaminated with cadmium,mercury, lead, nickel, chromium, copper, lithium, silver, manganese or polychlorinated biphenyl.

In line with the regulations, DOE has established an online system, known as eSWIS (Electronic Scheduled Waste Information System) to capture scheduled waste information. This information is provided by scheduled waste generators. The URL for eSWIS is https://eswis.doe.gov.my/.

4.3.9 Article 12: Contaminated sites

As far as contaminated sites are concerned, the current approach to determine contaminated sites is based on reports/complaints received by DOE. At the same time, DOE has drafted regulations to enhance identification, assessment and remediation of contaminated sites. Whilst waiting for the gazettement of the regulations, DOE has published 3 guidelines related to contaminated land, as below:

a) Contaminated Land Management and Control Guidelines No. 1: Malaysian Recommended Site Screening Levels for Contaminated Land;
b) Contaminated Land Management and Control Guidelines No. 2: Assessing and Reporting Contaminated Sites; and
c) Contaminated Land Management and Control Guidelines No. 3: Remediation of Contaminated Sites

4.3.10 Article 17: Information exchange

Art 17 indicates that Party shall facilitate exchange of information related to mercury and mercury compounds, and the Party shall also designate a national focal point for the exchange of information (note: this national focal point should also be responsible over the import and export of mercury as required under Art 3). The information includes:

a) Scientific, technical, economic and legal information concerning mercury and mercury compounds, including toxicological, ecotoxicological and safety information;
b) Information on the reduction or elimination of the production, use, trade, emissions and releases of mercury and mercury compounds;
c) Information on technically and economically viable alternatives to:
   (i) Mercury-added products;
   (ii) Manufacturing processes in which mercury or mercury compounds are used; and
   (iii) Activities and processes that emit or release mercury or mercury compounds; including information on the health and environmental risks and economic and social costs and benefits of such alternatives; and
(d) Epidemiological information concerning health impacts associated with exposure to mercury and mercury compounds, inclose cooperation with the World Health Organisation and other relevant organisations, as appropriate.

As far as Malaysia is concerned, the information required under Art 17 might be available in Malaysia. However, none of the entities in Malaysia is obtaining, compiling and consolidating this information.

4.3.11 Article 18: Public information, awareness and education

Art 18 indicates the needs for public information, awareness and education related to the health and environmental effects of mercury and mercury compounds, alternatives to mercury, and other activities that are related to the implementation of the Minamata Convention. Some of the entities have already conducted relevant activities, such as seminars and workshops related to mercury exposure in Malaysia. However, there is no single entity (i.e., one stop centre) that records activities that aim to raise the awareness of mercury (including health and environmental effects of mercury, alternatives etc) in Malaysia.

4.3.12 Article 19: Research, development and monitoring

Art 19 indicates the needs for research, development and monitoring under the Minamata Convention. The current approach for research, development and monitoring is based on the needs and resources of relevant agencies (such as government and private entities), or the expertise and strengths of relevant groups (such as research groups from universities). Almost all the research, development and monitoring activities in Malaysia are not Minamata Convention oriented.

4.3.13 Conclusion

After conducting the operational framework assessment, it was noticed that prior to the establishment of the Minamata Convention on Mercury, Malaysia had already have measures in place to control the import of mercury, as well as emissions and releases of mercury from anthropogenic activities. For example, only license B holders with a valid permit can import mercury and mercury compounds, and the industries that emit and release mercury into the environment must conduct periodic monitoring and submit the monitoring report to DOE. Besides, DOE has also developed guidelines for the identification, assessment and remediation of contaminated sites, where these guidelines cover numerous contaminants, including mercury. As a Party to the Basel Convention, Malaysia has established legal frameworks and operational tools to regulate and manage scheduled waste, including waste containing mercury or its compound.

When the text of Minamata Convention on Mercury is made available to the public, several entities in Malaysia have taken the initiatives to control the use of mercury in products, particularly the use of mercury in thermometer and sphygmomanometer. MOH has issued a circular on the procurement, replacement and disposal of thermometer and sphygmomanometer, where the circular covers all government hospital (including university and army hospitals). Besides, MDA has issued a circular to implement and enforce the policy to stop the use of thermometer and sphygmomanometer that contain mercury in all the new medical devices, where the registration existing products will be discontinued.

In the operational framework assessment, it was found that the management of mercury-added products is one of the challenges faced by Malaysia in the fulfilment of the obligations under the Minamata Convention. The absence of a relevant legal framework for mercury-added products has impeded the efforts to phase out and phase down mercury-added products listed in Annex A of the Minamata Convention. Besides mercury-added products, the information on manufacturing processes that are using mercury is also limited. Data might be available in different entities, hence, efforts are needed to collect and compile those data.

CHAPTER 5 :
PROPOSED ACTION PLANS

5.1 Introduction

The Minamata Convention on Mercury is one of the important international legally binding instruments that will facilitate reduction and elimination of chemical risk, particularly the risks associated with mercury. The Minamata Convention covers the lifecycle of mercury, which includes mining, import, export, product, process, storage, emissions, releases, wastes and contaminated sites. Hence, by ratifying the Minamata Convention, it is expected that the health and environmental effects caused by mercury via anthropogenic emissions and releases will be reduced and eliminated.

As of 31 December 2018, there are 101 parties and 128 signatories for the Minamata Convention. Malaysia signed the Minamata Convention on 24 September 2014 in New York but has not ratified the Convention. Nevertheless, various efforts at the local and national levels have been carried out, and these include the initiative of conducting the Minamata Convention Initial Assessment (MIA), with the financial support from UNDP.

The MIA results have been discussed throughout this report, and the gaps to be filled in order to implement the obligations of the Minamata Convention have also been identified. Hence, this chapter places emphasis on the proposed action plans to close those gaps. A total number of 14 action plans (APs) have been proposed.

5.2 AP1: Prohibition of any future primary mercury mining activities

Description:

Parties to the Minamata Convention are obligated to prohibit any new primary mercury mining activities that was not conducted at the date of entry of the Convention (Art 3, para 3). While any primary mercury mining activities conducted before the date of entry into force are allowed for a period up to fifteen years after the date of entry into force (Art 3, para 3). According to JMG, currently there is no primary mercury mining activity in Malaysia. However, it is important for Malaysia to also ensure prohibition of any possible mercury mining activities in the future (even if a significant amount of mercury deposit is discovered).

Operational:

Prohibition of any future primary mercury mining activity is important as mining permits fall under the jurisdiction of both state and federal governments. This can be achieved by adopting a total ban on any activities relating to mercury primary mining. This eliminates any possibilities of any related exploration for the purpose of mercury mining in the country and ensures the obligations under the Minamata Convention are met.

Domestic regulatory framework:

The development of mineral resources; mines, mining, minerals and mineral ores; and the purchase, sale, and the import and export of minerals and mineral ores fall within the jurisdiction of the federal government even though the property of these minerals, forming part of land, is vested with the State (Art 74 Federal Constitution, Lists I and II of the 9th Schedule). It is explicitly provided in s 40 of the National Land Code 1965, and the State Mineral Enactments, for example, s 3 of the Selangor State Mineral Enactment 2000, where

the provision provides, "that there is and shall be vested solely in the State Government all minerals within or upon any land … if they have not been specifically disposed of by the State Government …" The power to prohibit the development of any future primary mercury mining activities lies within the jurisdiction of the Federal government. In addition, Art 76(1)(a) of the Federal Constitution provides the power of Parliament to legislate for States in cases where parliament may make laws with respect to any matter enumerated in the State List for the purpose of implementing any treaty, agreement or convention between the Federation and any other country, or any decision of an international organisation of which the Federation is a member. Since primary mercury mining is prohibited under the Convention, the Federal government is empowered to legislate for the prohibition of such mining in accordance with the requirement of the Convention, even though the property of all minerals is vested solely in the State Authority. Therefore, the federal government agency charged with the mandate of regulating the development of primary mercury mining should initiate a prohibition of primary mercury mining in the country in accordance with the obligations stipulated under the Convention, pursuant to the power vested upon it vis-à-vis the Federal Constitution. Moreover, Art 91(5) of the Federal Constitution provides for the duty of the National Land Council to formulate national policy for the control of the utilisation of land throughout the Federation for, *inter alia*, mining, and for the administration of any laws relating thereto where both Federal and State Governments shall follow the policy so formulated. By virtue of Art 91(5), a national policy that prohibits primary mercury mining could be formulated, which shall be observed by both Federal and State Governments.[25]

Proposed lead agency:

The Ministry of Water, Land and Natural Resources (KATS)

[25] It came to our knowledge during the Stakeholder Workshop that decisions with regards to the prohibition of primary mercury mining had been arrived at by the National Land Council. Pending the formulation of a national policy pursuant to the decision made, it would be incumbent that existing legislations should be amended in accordance with the decision made in explicating the commitments of the country in the prohibition of primary mercury mining in accordance with the obligations imposed under the Minamata Convention.

5.3 AP2: Strengthening the procedures of mercury import and export

Description:

The process of importing and exporting mercury and mercury compounds is covered under the Minamata Convention. The Convention briefly explained the requirements for both the importing and exporting of mercury and mercury compounds. The summary of the requirements is shown in Table 5.1.

Table 5.1 Obligation for import and export of mercury under Minamata Convention

Process	With	Requirements
Export	A Party	Only allowed to a Party that has provided the exporting Party with its written consent, and only for the purpose of: a) A use allowed to the importing party under this Convention; or b) Environmentally sound interim storage as set out in Art 10
	Non Party	Only allowed to a non-Party that had provided the exporting Party with its written consent, including certification demonstrating that: a) The non-Party has measures in place to ensure protection of human health and the environment and to ensure Its compliance with the provisions of Arts 10 and 11; and b) Such mercury will be used only for a use allowed to a Party under this Convention or for environmentally sound interim storage as set out in Art 10.
Import	Non Party	A party shall not allow the import of mercury from a non-Party to whom it will provide its written consent unless the non-Party has provided certification that the mercury is not from sources identified as not allowed under the Convention.

In addressing this issue, Malaysia should strengthen the process of import and export that involves mercury and mercury compounds to ensure that it meets the obligations of the Convention. This can be done by emphasising on collecting the relevant information that will be used for informed decision making on mercury trade.

Operational:

In Malaysia, the trade of mercury is governed by the Poisons Act 1952 which required a license for both the import and export of mercury and mercury compounds, besides the requirement of permit under the Custom (Prohibition of Imports) Order 2017 and Custom (Prohibition of Exports) Order 2017 issued by the Pharmacy Enforcement Division, MOH. In strengthening the process of mercury trade, it is proposed that the guidance document by the Conference of the Parties (COP) is referred and adopted. According to the *Guidance on completing the forms required under article 3 related to trade in mercury* (2019), which was endorsed by the COP, there are 4 types of forms (A to D) that are used for specific scenarios as summarised in Table 5.2.

Table 5.2 The forms (for import and export of mercury) endorsed by COP

Forms	Purpose
Form A	Form for the provision of written consent by a Party to the import of mercury
Form B	Form for the provision of written consent by a non-Party to the import of mercury
Form C	Form for non-Party certification of the source of mercury to be exported to a Party (to be used in conjunction with form A and D, when required)
Form D	Form for general notification of consent of the import of mercury

These forms are applicable for mercury trade except for mercury as reference standards; products with naturally occurring trace quantities of mercury; mercury-added products; and mercury wastes. The information required to fill in the Forms should be adopted as mandatory requirements for permit application for mercury trade except for the abovementioned exceptions. The need for written consent and also a notification to the secretariat must also be included in the permit process to meet the obligations of the Convention.

Domestic regulatory framework:

It is observed that s 31 of the Customs Act 1967 provides the power of the Minister charged with the mandate to oversee the implementation of the Act to regulate the importation into, or the exportation from, Malaysia or any part thereof, either absolutely or conditionally, or from or to any specified country, territory or place outside Malaysia, or the removal from one place to another place in Malaysia of any goods or class of goods. Para 3 of the Customs (Prohibition of Exports) Order 2017 imposed a conditional prohibition of the export of mercury and mercury compounds (item No. 22 of the 2nd Sch) except under an export licence issued by the Pharmacy Enforcement Division, MOH. Similarly, for the import of mercury and mercury compounds, Para 3 of the Customs (Prohibition of Imports) Order 2017 imposed a conditional prohibition of the importation of mercury and mercury compounds listed in item 11 of the 2nd Sch, unless an import licence is issued by the Pharmacy Enforcement Division, MOH, as specified under column (5) of the 2nd Sch of the Import Order 2017. It is noted that the Pharmacy Enforcement Division of the MOH is charged with the mandate to regulate 'poisons', whereby all preparations of mercury are listed under Group D of Part I Poisons in the Poisons List under the Poisons Act 1952, including the import (s 8) and export of mercury (through the 'sale' of such poisons, either by way of wholesale or retail to purchasers outside of Malaysia, in accordance with ss 15 and 16). In addition, the Sales of Drugs Act 1952 provides the power of the Minister charged with responsibility for medical and health services (the MOH) to make regulations to prohibit or regulate, among others, the importation or exportation of mercury and mercury compounds used as articles of drugs (s 2, Sales of Drugs Act 1952), especially through import licences issued by the Director of Pharmaceutical Services, which is explicitly addressed through Reg 12 of the Control of Drugs and Cosmetics Regulations 1984.

It is noted that both the Poisons Act 1952 for the regulation of mercury and mercury compounds in general, and the Sales of Drugs Act 1952 and the Control of Drugs and Cosmetics Regulations 1984 for the regulation of mercury and mercury compounds used as an articles of drugs in particular, identified the Pharmacy Enforcement Division of the MOH as the relevant authority charged with the overall mandate of regulating matters pertaining to mercury and mercury compounds, including their import and export, either as poisons or articles of drugs. Therefore, it is appropriate to identify the Pharmacy Enforcement Division of MOH to act as the lead agency in leading the implementation of the obligation pertaining to the import and export of mercury and mercury compounds as stipulated under the Convention.

Proposed lead agency:

Ministry of Health (Pharmacy Enforcement Division)

5.4 AP3 Establishing legal and operational framework for mercury-added products

Description:

The management of mercury-added products has been given high emphasis in the Convention. The Convention aims to phase out mercury-added products listed in Annex A through the prohibition of manufacturing, import and exports (Art 4, para 1). Annex A includes items such as batteries, switches and relays, fluorescent lamps, mercury vapour lamps and non-electronic measuring devices. These items are aimed to be phased out by the year 2020 with certain exceptions particularly on the amount of mercury contained in an individual item for several products (Annex A Part I of Minamata Convention). However, this phased out only focused on the manufacturing, imports and exports of products. Currently, there is no legal framework covering batteries, switches and relays, fluorescent lamps, mercury vapour lamps, and non-electronic measuring devices. Hence, it could be said that the related operational framework is not available.

Operational:

Establishing a legal framework to cover batteries, switches and relays, fluorescent lamps, mercury vapour lamps, and non-electronic measuring devices is important in meeting the phase out obligations under the Convention. The legal framework shall correspond with the establishment of an operational framework that operationalises the obligations governing the manufacturing, import, and export of items that have been listed in Annex A, which takes into considerations the exceptions given by the Convention. This can be achieved by adding prohibitions, in the draft EHS regulation, to the import, export and the manufacturing of products that are listed in Annex A of the Minamata Convention. The operational framework must cover the exception as given by the Annex A (Part I) of the Convention (Table 5.3).

Table 5.3 Annex A (Part I) of the Minamata Convention

Mercury-added Products	Date after which the manufacture,import or export of the productshall not be allowed (phase-out date)
Batteries, except for button zinc silver oxide batteries with a mercury content < 2% and button zinc air batteries with a mercury content < 2%	2020
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
Compact fluorescent lamps (CFLs) for general lighting purposes that are ≤ 30 watts with a mercury content exceeding 5 mg per lamp burner	2020
Linear fluorescent lamps (LFLs) for general lighting purposes: a) Triband phosphor < 60 watts with a mercury content exceeding 5 mg per lamp; b) Halophosphate phosphor ≤ 40 watts with a mercury content exceeding 10 mg per lamp	2020
High pressure mercury vapour lamps (HPMV) for general lighting purposes	2020
Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) for electronic displays: a) short length (≤ 500 mm) with mercury content exceeding 3.5 mg per lamp b) medium length (> 500 mm and ≤ 1 500 mm) with mercury content exceeding 5 mg per lamp c) long length (> 1 500 mm) with mercury content exceeding 13 mg per lamp	2020

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: a) barometers; b) hygrometers; c) manometers; d) thermometers; e) sphygmomanometers.	2020

Domestic regulatory framework:

The regulation of Mercury-Added Products (MAPs) listed in both Parts I and II of Annex A, in terms of their manufacturing, import as well as export could be found in a piecemeal fashion in several pieces of legislations that are relevant to certain aspects of a listed product, as presented in Annex I of this report. In general, the regulation of all activities relating to the manufacturing of MAPs could be regulated via the Industrial Co-Ordination Act 1975 where s 3(1) could be invoked specifically to legislate for the prohibition of the manufacture of mercury-added products listed in Part I of Annex A (Art 4.1); or alternatively, imposes conditions for the manufacturing of MAPs listed in Part II of Annex A in accordance with the provisions set out under the said Part (in accordance with s 4(3) and (4), Industrial Co-Ordination Act 1975). For MAPs falling within the definition 'all preparations' of mercury falling under Part I, Group D Poisons set forth in 1st Sch of the Poisons List, which is not exempted, the imports (s 8), manufacture (s 11) and the sale of these 'poisons', for all preparations, would be governed by the Poisons Act 1952. For MAPs that fall within the definition of 'drugs', the Sale of Drugs Act 1952, and in particular, the Control of Drugs and Cosmetics Regulations 1984, such as certain cosmetics or topical antiseptics, Reg 7 of the 1984 Regs prohibits the manufacture, sale, supply, importation, possession and administration of any product unless the product is a registered product and the person so doing holds the appropriate licence required and issued under these Regs. However, exemptions from the prohibition stipulated under Reg 7 are provided under Reg 18A(3)(b) for the manufacturing of any cosmetics meant for the purpose of export only, or for assessing the market acceptance if written approvals had been issued by the Director of Pharmaceutical Services. It has to be noted that the written approval given by the Director of Pharmaceutical Services for such exemptions should take into account the obligations under the Minamata Convention. If the MAPs fall within the definition of consumer products, such as batteries, switches and relays, the group of articles of lightings such as the CFLs, LFLs, HPMVs, CCFLs, EEFLs, or measuring devices falling under Part I of Annex A intended for domestic use by consumers, Consumer Protection Act 1999 could be invoked to prohibit such products, deemed to be 'unsafe' under s 23, and the import thereof (s 24, although prohibition of exportation of these products is not provided for under the Consumer Protection Act 1999). For measuring devices falling under the Medical Device Act 2012, and dental amalgam, which is considered a 'medical device' under the Medical Device Act 2012, the 2012 Act could be invoked to regulate the manufacture (via the conformation to manufacturer's obligations under s 4); import, export and placing in the market of any MAPs (listed or otherwise), of MAPs that fall within the definition of the 2012 Act. For MAPs that are not otherwise provided under the legislations mentioned above, by virtue of s 30A of the EQA 1974 where it provides for the Minister to prescribe any substance as an environmentally substance which requires the substance to be reduced, recycled, recovered, or regulated in the manner as specified in an order published in the *Gazette* (s 30A(1)(a)), and to prescribe any **product** as a prescribed product for sale and that the product shall contain a minimum percentage of recycled substances and to carry an appropriate declaration on its recycled constituents, method of manufacture and disposal, there is an aperture through which MAPs (listed or otherwise under the Convention) could be regulated in accordance with the obligations imposed under the Convention. The manufacture of a product that could be considered an environmentally hazardous substance, could also be regulated by Regs made by the Minister pursuant to s 51(1)(u), although it is observed that the EQA 1974 has no provision that explicitly provides for the regulation of the import and export of MAPs. Therefore, the option to amend the EQA 1974 is explored. These options are –

1. Amendment to s 21 by inserting a s 21A that empowers the Minister, after consultation with the Environmental Quality Council, to specify the acceptable conditions for the receive or send, or cause or permit to be received or sent any environmentally hazardous substances, pollutants or wastes in or out of Malaysia. This suggestion for amendment refers to the legislative approach adopted by the Parliament in legislating for the insertion of Part IVB, and specifically, s 34B to enable the implementation of the obligations stipulated under the Basel Convention. The proposed amendment to the EQA 1974 to insert a s 21A would enhance the normative

scope of Part IV of the EQA 1974 to prohibit and control pollution where pollution as a result of the receiving and sending of environmentally hazardous substances, pollutants, or wastes in or out of Malaysia could be prevented in accordance with the obligations committed by the country in various international platforms and MEAs.

2. Bearing in mind that Environmentally Hazardous Substances Regs are currently being developed for the regulation of environmentally hazardous substances (and articles, including products), this regs could be used as an avenue to regulate the import and export of mercury added products listed in Pt I of Annex A when such products are prescribed as environmentally hazardous substance under s 30A of the EQA 1974. As such, s 51(1)(u) that provides for the regulation of environmentally hazardous substances should be amended to empower the Minister after consultation with the council to make regs for or with respect to – "(u) prohibiting or regulating the **[receive, send,]** manufacture, storage, transportation, or the application or use, emission, discharge, or deposit into the environment, of any environmentally hazardous substances". Such amendment would allow the prohibition or regulation of the import and export of mercury added products listed in Annex A, which should also be deemed an environmentally hazardous substances under the EQA 1974 and the proposed EHS Regs, in order to ensure that the obligations imposed under Art 4 could be implemented.
3. Amendment to s 30 by inserting the power of the Minister to prohibit the receiving and sending in and out of Malaysia, and the use of any materials for any process, trade or industry.
4. The control over the use of mercury-added products laid out in Pt I of Annex A of the Convention could be exercised if such products are prescribed by the Minister, after consultation with the Council, and by order published in the *Gazette*, to be an environmentally hazardous substances pursuant to s 30A. In order to enhance the scope of s 30A to enable the satisfaction of the obligations imposed under Art 4 of the Convention on mercury-added products (in particular, the products listed under Pt I of Annex A), s 30A could be amended by inserting into s 30A(1)(a), the power of the Minister to prescribe any substance as an environmentally hazardous substances which requires the substance to be **[receive and send in or out of Malaysia,]** reduced, recycled, recovered or regulated in the manner as specified in the order.

Other than the amendments proposed above [26], s 33 of EQA 1974 could also be invoked in regulating MAPs that are not covered by any known use of MAPs prior to the date of entry into force of the Convention for it, or MAPs which uses are known, but are below the specified threshold, but which accumulatively, would, or is likely to cause a worsening of condition in that segment or element of the environment.

Proposed lead agency:
Department of Environment (DOE)

[26] It is noted that the EQA 1974 is undergoing a complete revision whereby a new piece of legislation, tentatively known as the Environmental Protection Act 20XX is expected to supersede the current EQA 1974. Therefore, it is recommended that the amendment to the EQA 1974 as proposed, for all intents and purposes, and in line with the spirit in which the amendment is proposed, should be incorporated into the revised legislation, albeit with the necessary reconstruction of legal texts and structure without compromising the normative substance as proffered in order to ensure that the revised legislation is capable of meeting the obligations stipulated under the Convention.

5.5 AP4: Gazettement of MDA order based on MDA Circular 2 (2017)

Description:
The Minamata Convention has an obligation to phase out thermometers and sphygmomanometers by the year of 2020. The phasing out intended to cover all areas including the use of these devices for medical uses. In Malaysia, the Medical Device Authority had proactively circulated Order 2 in 2017 to set out the implementation and enforcement of the policy to stop the use of thermometer and sphygmomanometer that contain mercury, which fall under the purview of the Medical Devices Act 2012 to meet the obligations of the Convention. The policy provides:

a) The importation, exportation and manufacture of medical device which contains mercury need to be phased out by 2020.
b) Medical device to be placed in the Malaysian market/imported will not be registered.
c) Assessment of the application for registration of existing products will be discontinued.
d) Not permitted for import, transit, special access, custom made, education and demonstration.
e) Establishment shall inform the Authority of any remaining stocks of medical device containing mercury.

Operational:
The circular by MDA has sufficiently put a policy framework for the governance of medical devices particularly thermometers and sphygmomanometers that are also included as part of MAPs under the Minamata Convention. However, the circular is implemented administratively before the circular is published as an Order in the *Gazette*. It is proposed that the circular be gazetted as an Order with some proposed amendments. This MIA proposed the removal of item 6, which stated, "s 77 of Act 737 provides exemption of any person or medical devices from any provision of the Act or any regulation made under this Act by the Minister in the interests of public health and safety, by order published in the *Gazette*". The justification for this proposal is, it is not in accordance with the Minamata Convention. In the Convention, exemptions can only be given through application and approval by the Secretariat of the Convention as in Art 6.

Domestic regulatory framework:
The MDA 2012 laid down a general obligation on the manufacturer to ensure that a medical device does not only conform to the prescribed essential principles of safety and performance, it shall also be manufactured in accordance with good manufacturing practice, and any written directive issued by the Authority and is labelled, packaged and marked in accordance with the prescribed manner (Art 4). Control over the import, export, and placing in the market of a medical device is exercised via registration under the Act (s 5). The Minister may specify a medical device listed in Part I of Annex A to be a designated medical device by Order published in the *Gazette* pursuant to s 26 of the Medical Device Act 2012 where the import, export or place in the market of such device requires an establishment licence granted under s 16 by the Authority [27]; or the use or operation of which shall require a designated medical device permit granted under s 27 by the Authority. It would also be pertinent to make explicit the prohibition of the manufacture, import and export of such designated medical device by Order of the Minister published in the *Gazette* to ensure that no establishment licence and medical device permit are issued by the Authority pursuant to ss 16 and 27 of the MDA 2012.

It is noted that s 77 of the MDA 2012 laid out the power of the Minister to exempt any person or medical device from any of the provisions of this Act or any regulations made under this Act for such duration and subject to such conditions as the Minister may specify and he may alter or add the conditions so specified, by Order published in the *Gazette*, if he considers it consistent with the purposes of this Act or in the interest of public health and safety. However, for mercury-added products listed in Part I of Annex A, exemptions shall not be granted after the phase-out date specified for those products, except where exclusion is specified in Annex A or the Party has a registered exemption pursuant to Art 6 of the Convention. If the Order for such exemption is in place, the Order shall be revoked by Order published in the *Gazette* in order to be in accordance with Art 4.1 of the Convention.

Proposed lead agency:
Medical Device Authority (MDA)

[27] It is raised in the course of discussions during the Stakeholders Workshop that s 26 would be particularly pertinent in meeting the requirements of Art 4.6 where the Party is committed to discourage the manufacture and the distribution in commerce of mercury-added products not covered by any known use of MAPs prior to the date of entry into force of the Convention unless an assessment of the risks and benefits of the product demonstrates environmental or human health benefits.

5.6 AP5: Addressing illegal and false notification of cosmetic products

Description:
The Minamata Convention aims to phase out the use of cosmetics with mercury content above 1 ppm including skin lightening soaps and creams, and not including eye area cosmetics where no alternative other than mercury is available as preservatives (Annex A of the Minamata Convention). These items need to be phased out by prohibiting any manufacturing, import and export activities after the phase out date of 2020. In Malaysia, cosmetics containing mercury is well covered under the Control of Drugs and Cosmetics Regulation 1984. However, there might be issues of illegal import and false notification of cosmetics which might lead to possibilities of mercury-containing cosmetics entering the local market.

Operational:
The control over cosmetics in Malaysia is capable of meeting the obligations of Minamata Convention including the manufacture, import and export of mercury-containing cosmetics. However, there are possibilities that mercury-containing cosmetics might infiltrate the market due to false notification and illegal importation. This problem could be reduced and overcome by intensifying market surveillance to remove illegal products from the market. Actions towards false notification must also be taken to reduce the number of false notification or repeated false notification.

Domestic regulatory framework:
Cosmetics which are notified under the Control of Drugs and Cosmetics Regulations 1984 containing not more than 1 ppm of mercury calculated as the metal is deemed 'exempted preparation' as it comes within the description specified in the last column of the Poisons List entitled 'Exempted preparations', whereby the provisions of the Poisons Act 1952 shall be applicable by virtue of s 7(1)(a) of the Poisons Act. As such, the regulation of cosmetics containing not more than 1 ppm of mercury calculated as the metal falls fully within the jurisdiction of the control of Drugs and Cosmetics Regulations 1984 where Part IIIA of the Regs provides for the notification of cosmetics in general, and a prohibition to manufacture, sell, supply, import, possess or administer cosmetics unless the cosmetic is a notified cosmetic pursuant to s 18A(1)(a) of the Regs. However, it is noted that only cosmetics that contain no more than 1 ppm of mercury calculated as the metal are exempted from the application of Poisons Act 1952, as it falls within the jurisdictional scope of the Control of Drugs and Cosmetics Regulations 1984. Cosmetics that contain more than 1 ppm of mercury would be deemed to fall within the purview of the Poisons Act 1952, where the manufacture, import and export of these 'cosmetics' would be regulated under the Poisons Act (as these 'cosmetics' would be deemed to be a 'poison' where the exemptions under the Poisons List would no longer apply, but instead, be deemed a Part I, Group D Poison, and be governed as such). However, for a cosmetic that contain mercury calculated as the metal of less than 1 ppm, its manufacture and import are regulated under the 1984 Regs, with certain exemptions allowed for cosmetics that are meant to be exported out of the country (Reg 18A(3)(b)), or cosmetics that are imported into the country for the assessing of market acceptance; to be assembled, enclosed, packed or labelled for the sole purpose of re-exporting; in transit; or to be sold or supplied in the free-trade zone or international carriage by ships, aircrafts or other forms of international public transport entering or leaving Malaysia (Reg 18A(3)(c)). Even if exemptions from Reg 18A(1) for certain import and export of mercury-containing cosmetics under s 18A(3) of the 1984 Regs are given, since the mercury content of these cosmetics (falling under the jurisdiction of the 1984 Regs) would be not more than 1 ppm, the prohibition imposed on the manufacture, import and export of mercury-added products (especially cosmetic with mercury content above 1 ppm) under Art 5 of the Convention need not be invoked.

Proposed lead Agency:
Ministry of Health (MOH)

5.7 AP6: Prioritization and implementation of measures to reduce dental amalgam

Description:

The use of mercury in dental amalgam is addressed in the Convention through Part II of Annex A which corresponds to para 3 of Art 4. The Convention aims at phasing down the use of dental amalgam and requires Parties to include two or measures that were listed in Part II of Annex A as follows:

a) Setting national objectives aiming at dental caries prevention and health promotion, thereby minimising the need for dental restoration.
b) Setting national objectives aiming at minimising its use.
c) Promoting the use of cost-effective and clinically effective mercury-free alternatives for dental restoration.
d) Promoting research and development of quality mercury-free materials for dental restoration.
e) Encouraging representative professional organisations and dental schools to educate and train dental professionals and students on the use of mercury-free dental restoration alternatives and on promoting best management practices.
f) Discouraging insurance policies and programmes that favour dental amalgam use over mercury-free dental restoration.
g) Encouraging insurance policies and programmes that favour the use of quality alternatives to dental amalgam for dental restoration.
h) Restricting the use of dental amalgam to its encapsulated form.
i) Promoting the use of best environmental practices in dental facilities to reduce releases of mercury and mercury compounds to water and land.

Operational:

Since the obligations regarding dental amalgam require implementation of measures from a list of measures, it is important to prioritise the selection of the relevant measures. This MIA proposes a prioritisation process that involves 3 criteria as follows:

a) Practicality - It is important to prioritise practical measures in local context.
b) Resource Needed - The amount of resources needed for the implementation of a measure.
c) Impact - The impact of the measure on the reduction of dental amalgam.

The prioritisation process involved a scoring system in which numbers 1 to 9 is given to each measure under each criterion, with the lower number means the measure is more practical, cheaper or more impactful depending on the criterion. Finally, the sum of score for each measure is calculated to identify the priority of measures. The measure with the lowest sum will represent the most prioritised measures. The result of the prioritisation process conducted by this MIA is shown in Table 5.4.

No.	Item	Practicality	Resources	Impact	TOTAL SCORE	RANK
1	Setting national objectives aiming at dental caries prevention and health promotion, thereby minimizing the need for dental restoration;	1	2	1	4	1
2	Setting national objectives aiming at minimizing its use;	2	1	2	5	2
3	Promoting the use of cost-effective and clinically effective mercury free alternatives for dental restoration;	3	5	3	11	3
4	Promoting research and development of quality mercury-free materials for dental restoration;	9	8	5	22	8

5	Encouraging representative professional organisations and dental schools to educate and train dental professionals and students on the use of mercury-free dental restoration alternatives and on promoting best management practices;	4	7	4	15	4
6	Discouraging insurance policies and programmes that favour dental amalgam use over mercury free dental restoration;	7	4	7	18	6
7	Encouraging insurance policies and programmes that favour the use of quality alternatives to dental amalgam for dental restoration;	8	3	8	19	7
8	Restricting the use of dental amalgam to its encapsulated form;	6	9	9	24	9
9	Promoting the use of best environmental practices in dental facilities to reduce releases of mercury and mercury compounds to water and land.	5	6	6	17	5

Domestic regulatory framework:

Dental amalgam is deemed a material intended by the manufacturer to be used, alone or in combination, for human beings for purposes set out under s 2 of MDA 2012, which, by virtue of this definition, be considered a 'medical device' where the control of it is governed under the MDA 2012. Hence, all matters pertaining to the control of dental amalgam would be within the purview of the MDA 2012 whereby the step-wise prioritisation and the implementation of measures to reduce the use of dental amalgam by the Party, provided for under Part II of Annex A would fall within the jurisdiction of the Medical Device Authority implementing provisions of the MDA 2012. These measures could be implemented through –

- the requirements to register dental amalgam by establishments intending to import, export or place in the market the dental amalgam under ss 5 and 15; or
- if dental amalgam is specified by the Minister to be a designated medical device by Order published in the *Gazette*, the conditions attached with the application for the use or operation of dental amalgam under ss 26 and 27; and

be subjected to the requirements of any other relevant provision of the MDA 2012 in furthering the implementation of the stipulated measures for the phasing down of the use of dental amalgam.

Proposed lead agency:

Medical Device Authority, MOH

5.8 AP7: Establishing data collection mechanism and system for mercury-involved manufacturing processes

Description:

Processes involving mercury is thoroughly covered under the Minamata Convention. Certain processes are being identified through Art 5 which aimed to be phased out and phased down. It is clearly mentioned in Part I, Annex B that the phase out date for mercury use in chlor-alkali and acetaldehyde processes, whereas the measures for phasing down of mercury use in vinyl chloride monomer, sodium or potassium methylate or ethylate and polyurethane production including use of mercury as catalyst are mentioned in Part II, Annex B. In a bigger picture, the Convention also emphasises the identification of stocks and supply (Art 3, para 5) and also the imposition on the Parties to discourage any other manufacturing processes that use mercury other than the listed processes (Art 5, para 7). It is proposed that Malaysia should establish a data collection mechanism and system for all mercury-involved manufacturing processes.

Operational:

In meeting the relevant obligations, it is proposed that a thorough data collection on all mercury-involved processes to be established through the Environmental Quality Act 1974. The data collection should cover all mercury-involved processes as a step to understand and discourage all mercury-related processes beyond the listed processes in Annex B of the Convention. The data collection system should be able to cover all the needed information in meeting all relevant obligations in the Convention. This includes information regarding the use of mercury, and the estimated/actual amount used as:

a. Raw materials (e.g., mercury, mercury compounds, and *etc*., taking into consideration the Guidance on Identification of Individual Stocks of Mercury or Mercury Compounds Exceeding 50 Metric Tons and Sources of Mercury Supply Generating Stocks Exceeding 10 Metric Tons Per Year);
b. Intermediate (e.g., mercury amalgamation);
c. Catalyst;
d. Lab-scale research or reference standards;
e. Technology/ equipment using mercury (e.g., mercury cell).

Domestic regulatory framework:

The power, duties, and functions of the DG and other officers under s 3(e) to undertake surveys and investigations as to the causes, nature, extent of pollution could then allow the DG Office to investigate into the facilities that use mercury or mercury compounds for processes listed in Annex B, and the number and types of such facilities and the estimated annual amount of mercury or mercury compounds used in those facilities. The Minister could impose conditions in the licence issued under ss 18 and 19 that could enable the obligations stipulated under the Convention where the licenced holder would have to comply, such as, the imposition of the obligation to collect data regarding manufacturing processes that involved mercury on the occupier or owner of the prescribed premise or conveyance. The obligation imposed under s 31 of EQA on the owner or occupier to measure, take a sample of, analyse, record and report any environmentally hazardous substances, pollutants, wastes, effluents or emissions containing pollutants; conduct a study on any environmental risk; install, maintain and operate monitoring programme at the expense of the owner or occupier; or alternatively, to conduct an environmental audit pursuant to s 33A, would provide the basis to which facilities that use mercury or mercury compounds for processes listed in Annex B of the Minamata Convention could be identified, where the number and types of such facilities and the estimated annual amount of mercury or mercury compounds used in those facilities could be ascertained.

Proposed lead agency:

DOE (Hazardous Substances Division)

5.9 AP8: Establish mercury emission inventory

Description:
Under para 7 of Art 8, a Party of the Convention shall establish and maintain a mercury emission inventory as soon as practicable and no later than five years after the date of its entry into force. This inventory should cover emissions from relevant sources which is listed in Annex D including coal-fired power plants, coal-fired industrial boilers, waste incineration, cement clinker production facilities and smelting and roasting processes in the production of non-ferrous metals. Having an inventory will enable the quantification of emissions, and the monitoring of the progress of emission reduction. In Malaysia, there is a requirement under the Clean Air Regulations 2014 (CAR 2014) for some of the existing industry to submit air pollutant emission monitoring data to DOE. Some industries had already submitted their monitoring data but only selected data is compiled by DOE to reflect the state of air pollution at the national level.

Operational:
In order to meet the obligation of having an emission inventory, it is proposed that the data submission mechanism under CAR 2014 is used to fulfil obligations under the Minamata Convention, particularly with regards to the inventory. It is also worth noting that the UNEP Toolkit would not be appropriate for the monitoring of mercury emissions, nor would it be appropriate for the setting of emission reduction goals. The reporting mechanism of the Convention is still a work in progress at the COP level and a guidance for reporting will be adopted. The required data for reporting to the Secretariat must be covered in the monitoring data required by CAR 2014.

Domestic regulatory framework:
The duty and function of the DG to publish an annual report on environmental quality might be a starting point for the establishment and maintenance of such an inventory. Although s 3 does not specifically provide for the duty and function of the DG to establish and maintain an inventory of emission, it is of the opinion that s 3(b) could be interpreted to enable the DG Office to establish an inventory of emission as fulfilling in parts, their responsibility for, and the co-ordination of all activities relating to the discharge of wastes into the environment, and for preventing or controlling pollution and protecting and enhancing the quality of the environment. Alternatively, s 3(o) could possibly be interpreted to include the power of the DG and other officers to establish and maintain an inventory of emissions from relevant sources in order to carry out the Office's planning in pollution control. The information that builds the inventory of emissions from relevant sources could also be obtained from the audit report submitted by virtue of s 33A. In addition, the obligation imposed on the owner or occupier of a premise to maintain records of manufacturing processes, and of maintenance and performance monitoring of the air pollution control system as determined by the DG pursuant to Reg 10 of CAR 2014, and the conduct of periodic monitoring as required under the relevant Schs of Regs 2014, pursuant to Reg 16, will provide the information necessary for the establishment of an inventory of emissions from relevant sources, especially those emissions originating from the source categories that have already been identified by the Convention. It is noted that there is a possibility that the full range of mercury emission is not captured just by subjecting certain type of industry to the obligation to monitor (their mercury emission) as required under CAR 2014. Some plants that fall within the source category, but under the threshold for which reporting, and monitoring are made compulsory under CAR 2014, would not be recorded.

Proposed lead agency:
DOE (Air Division)

5.10 AP9: Revision of DOE's BAT to incorporate Convention's Guidance

Description:
The COP of Minamata Conference had released a guidance document on the Best Available Techniques (BATs) for emission for consideration by the Parties. Meanwhile in Malaysia, DOE have also establish BATs for emissions under CAR 2014. However, the guidelines on BATs established by DOE have not incorporated the BATs endorsed by the COP. Therefore, it is proposed that DOE should revise their BATs by taking into account the BATs endorsed by COP.

Operational:
The guidelines on BATs established by DOE through CAR 2014 should be revised and amended to ensure that the guidelines are in line with the BATs guidance document endorsed by the COP of Minamata Convention.

Domestic regulatory framework:
The Minister is empowered to specify conditions of emission, discharge or deposit of environmentally hazardous substances, pollutants or wastes into any area, segment or element of the environment and may set aside any area, segment or element of the environment within which the emission, discharge or deposit is prohibited or restricted by virtue of s 21. CAR 2014 adopt the use of Best Available Techniques Economically Achievable as determined by the DG with regards to methods taken by an owner or occupier of a premise involved in any activity or industry listed in the 1st Sch of the Regs to prevent pollution and, where it is not practicable to do so, to reduce the emission of air pollutants to the atmosphere, as long as such activities and industries specified in the 1st Sch comply with the limit values and technical standards as specified in the 2nd and 3rd Schs. It should be noted that the Best Available Techniques (that are also) Economically Achievable as determined by the DG by virtue of Reg 6 of CAR 2014 should be developed and improved upon (if necessary), in order to ensure that these Techniques are consistent with the guidance document on BATs endorsed by the COP of the Convention.

Proposed lead agency:
DOE (Air Division)

5.11 AP10: Establish mercury release inventory

Description:
Parties to the Minamata Convention is required to establish, as soon as practicable and no later than five years after date of entry into force an inventory of mercury releases (para 6, Art 9). In Malaysia, as requested by Environmental Quality (Industrial Effluent) Regulations 2009, industry that discharges effluent containing mercury has submitted the relevant data to DOE. However, the data is not yet compiled by DOE to represent mercury discharge at the national level.

Operational:
In order to meet the obligation of having a release inventory, it is proposed that the data submission under Environmental Quality (Industrial Effluent) Regulations 2009 are used to fulfil obligations under the Minamata Convention. It is also worth noting that the UNEP Toolkit would not be appropriate for the monitoring of mercury releases, nor would it be appropriate for the setting of release reduction goals, as the Toolkit is more on providing preliminary estimation of releases. The reporting mechanism of the Convention is still a work in progress at the COP level and guidance for reporting will be adopted.

Domestic regulatory framework:
Although s 3 of the EQA 1974 does not specifically provide for the duty and function of the DG to establish and maintain an inventory of releases, for the purpose of developing an inventory of releases, s 3(b) could be interpreted to enable the DG Office to establish an inventory of releases as fulfilling in parts, their responsibility for, and the co-ordination of all activities relating to the discharge of wastes into the environment and for preventing or controlling pollution and protecting and enhancing the quality of the environment. Alternatively, s 3(o) could possibly be interpreted to empower the DG and other officers to establish and maintain an inventory of releases from relevant sources in order to carry out the Office's planning in pollution control. In addition, the duty and function of the DG to publish an annual report under s 3(1)(i) on environmental quality might also be a starting point for the establishment and maintenance of such an inventory. The information required to build the inventory of releases from relevant sources could be obtained from the audit report submitted by virtue of s 33A. For industrial effluent, the obligation imposed on persons prior to the carrying out of any work on any premises that may result in a new source of discharge of mercury-containing industrial effluent or mixed effluent; or construct on any land, building or facility designed or used for a purpose that may cause the land or building or facility to result in a new source of discharge of industrial effluent or mixed effluent that contains mercury; make or cause or permit to be made any change of, to, or in any plant, machine, or equipment used or installed at the premises that causes a material change in the quantity or quality of the discharge or release that contains mercury from an existing source; or carry out upgrading work of an existing industrial effluent treatment system that may result in a material change in the quantity or quality of the discharge or release containing mercury, to notify the DG in writing under Reg 4 of the Environmental Quality (Industrial Effluent) Regulations 2009 is useful as a starting point for the identification of 'new' sources of releases in the establishment of an inventory of releases. Similarly, the obligation imposed under Reg 4 of the Environmental Quality (Control of Pollution from Solid Waste Transfer Station and Landfill) Regulations 2009 on persons to notify the DG in writing prior to the carrying out of any work on any solid waste transfer station or landfill, or construct on any land any facility or building that may result in a new source of leachate discharge or release that might contain mercury, would be useful as a basis upon which an inventory of releases of mercury could be developed.

Proposed lead agency:
DOE (Water and Marine Division)

5.12 AP11: Establish new guideline or revise existing guideline to incorporate environmentally sound interim storage of mercury

Description:
Art 10 of the Minamata Convention indicates that Parties shall take measures to ensure that the interim storage of mercury and mercury compounds are managed in an environmentally sound manner. In this regards, the COP has endorsed guidelines to assist Parties on this matter. In Malaysia, there is no specific guidelines for environmentally sound interim storage of mercury. Nonetheless, there are several guidelines published by DOSH that are either directly or indirectly related to the interim storage of mercury, namely the "Guidelines on Storage of Hazardous Chemicals: A Guide for Safe Warehousing of Packaged Hazardous Chemicals" (in year 2005), "Guidelines on the Control of Chemicals Hazardous to Health" (in year 2001) and "Guidelines on Mercury Management in Oil and Gas Industry" (in year 2011).

Operational:
In order to fulfil the requirement of Arte 10, there are two options. First, to establish a new guideline that specifically dedicated to the interim storage of mercury and mercury compounds. The second option is to revise existing guidelines by introducing a new section in the guideline for interim storage of mercury. Both options above must take into account the guidelines for environmentally sound interim storage of mercury that are endorsed by COP.

Domestic regulatory framework:
The Occupational Safety and Health Act (OSHA) 1994 empowers the Minister, by virtue of s 66, to make regulations for, or with respect to the safety, health and welfare of persons at work in order to achieve the objectives of the Act where such regulations made may regulate or prohibit the manufacture, supply, storage, transport, or use of any substance and prescribe any other matter which may appear to the Minister to be expedient or necessary for the better carrying out of the Act. Interim mercury storage standards may address areas such as location, quantity limits, duration, room temperature and humidity, containers, secondary containment and flooring, labelling, employee training, inspections and monitoring, release/spill response, security, financial responsibility (i.e., bonding, insurance) in the event of spills or facility abandonment, and reporting. The existing Regs made by the Minister by virtue of s 66, prior to the enactment of a specific regulation that would address all aspects of an interim storage of mercury and mercury compounds, include –

- The Occupational Safety and Health (Classification, Labelling and Safety Data Sheets of Hazardous Chemicals) Regulations (CLASS) 2013 stipulating the duties of supplier to classify chemicals, according to their hazardous properties, pack them into appropriate containers, the labelling of these containers with prescribed information, in addition to the requirement to accompany chemicals with a Safety Data Sheet;
- The Occupational Safety and Health (Use and Standard of Exposure of Chemicals Hazardous to Health) Regulations (USECHH) 2000 where the employer is imposed with the obligation to identify chemicals hazardous to health, where permissible exposure limits need to be complied with. In addition, the Regs also imposed on the employer to conduct chemical health risk assessment, to take action to control hazardous exposure, to label and relabel chemicals hazardous to health, to provide information, instruction and training, monitoring to employees, to monitor employee exposure at the place of work, to conduct health surveillance, the posting of warning signs, and to keep records.
- The Occupational Safety and Health (Control of Industrial Major Accident Hazards) Regulations 1996 where specified quantities of particular chemicals are stored or used would be subjected to this Regs for the prevention of major accidents from occurring, and also to limit the effects of these major accidents, if any, which do happen.

Pursuant to the power stipulated under OSHA 1994 for the Minister to make regulations under s 66 with regards to the interim storage of mercury and mercury compounds, and in response to the need to develop guidelines that compile together all the relevant regulations relevant to the management of the interim storage of mercury and mercury compounds, Guidelines providing for the Storage of Hazardous Chemicals for the Safe Warehousing of Packaged Hazardous Chemicals was published by the Department of Occupational Safety and Health in 2005. The development of this Guidelines serves as an example for the development of more specific guidelines that are tailored to address the obligations imposed under Art 10 of the Convention, which should also take into consideration the guidelines developed by the COP of the Minamata Convention with regards to the interim storage of mercury and mercury compounds.

Proposed lead agency:
DOSH

5.13 AP12: Readiness on the definition of mercury waste adopted by COP

Description:
COP has not clarified and refined the definition of mercury wastes that covers both substance and objects. Hence, Malaysia would have to follow closely the development of mercury wastes' definition that will soon be determined by COP. As the definition is expected to fulfil the obligation of the Minamata Convention, as well as the obligations under the Basel Convention on the Control of Transboundary Movement of Hazardous Waste and Their Disposal, Malaysia has the advantage because Malaysia is a Party to the Basel Convention.

Operational:
Malaysia should follow closely the development of mercury wastes' definition in the upcoming COP in 2019. Although Malaysia is not yet a Party to the Minamata Convention, Malaysia can take proactive action in drafting the amendments to the Environmental Quality (Scheduled Wastes) Regulations 2005, and incorporating such amendments into eSWIS.

Domestic regulatory framework:
The Minamata Convention, in Art 11.2, defines mercury wastes, for the purpose of the Convention, to mean substances or objects consisting of, containing, or contaminated with mercury or mercury compounds in a quantity above the relevant thresholds defined by the COP, 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. Explicit reference made to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal shall apply to wastes covered under the Convention, but only to the Parties who are also Parties to the Basel Convention. For Parties to this Convention, but not Parties to the Basel Convention, the definition of wastes laid out in the Basel Convention would only serve as a guidance in the interpretation of 'wastes' covered under the Minamata Convention. Art 2 of the Basel Convention defines 'wastes' as substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law. Amendment was made to EQA 1974 in 1996, following the country's accession to the Basel Convention on 8 October 1993, and its subsequent entry into force for the country on 6 January 1994 where s 34B was inserted to prohibit persons from placing, depositing or disposing of, or cause or permit to place, deposit or dispose of, except at prescribed premises only, any scheduled wastes on land or into Malaysian waters (s 34B(1)(a)). No person shall receive or send, or cause or permit to be received or sent any scheduled wastes in or out of Malaysia; or transit or cause or permit the transit of scheduled wastes without any prior written approval of the DG (s 34B(1)(b) and (c)). The definition of 'waste' at the national level, as stipulated under s 2 of the EQA 1974 was amended to include "any matter prescribed to be scheduled waste, or any matter whether in a solid, semi-solid or liquid form, or in the form of gas or vapour which is emitted, discharged or deposited in the environment in such volume, composition or manner as to cause pollution". 'Scheduled wastes' means "any waste prescribed by the Minister in the regulations as scheduled wastes" as defined under s 2, EQA 1974 whereby the Regulations, known as the Environmental Quality (Scheduled Wastes) Regulations 2005 as enacted, defined 'scheduled wastes' as any waste falling within the categories of waste listed in the 1st Sch of the 2005 Regulations. Since the Convention is in the midst of defining the thresholds exceeding which substances or objects consisting of, containing, or contaminated with mercury or mercury compounds that are to be disposed of would be considered 'mercury wastes', the EQA 1974, and the Scheduled Wastes Regulations 2005 would have to take note of such development in order to make the necessary amendment to ensure that national legislations are capable of implementing the obligations stipulated under the Convention.

Proposed lead agency:
DOE (Hazardous Substances Division)

5.14 AP13: Develop strategies for identifying, assessing and remedying sites contaminated by mercury

Description:
The Department of Environment (DOE) is drafting the regulations to enhance identification, assessment, and remediation of contaminated sites. At the same time, DOE has published three guidelines related to contaminated land for the screening, assessment and remediation of contaminated sites. However, specific strategies to identify sites contaminated by mercury or mercury compounds are still not available, where such requirement is indicated in Art 12, para 1 of the Minamata Convention.

Operational:
There is a need to develop strategies to identify potential sites contaminated by mercury or mercury compounds. Such strategy should take into account existing data related to mercury, e.g., historical background of the site that is related to the use of mercury as raw material, the use of mercury in the manufacturing processes, or the use of equipment that contains mercury, and the remediation of sites contaminated with mercury and mercury compounds.

Domestic regulatory framework:
Although 'contaminated sites' had not been specifically defined under national laws, s 3 empowers the DG to recommend to the Minister, the protection of beneficial uses and maintenance of the quality of the environment and where appropriate, the proposal of appropriate environment protection policies and classifications for the protection of the environment in order to safeguard long range development uses and planning, and other factors relating to the protection and enhancement of the environment, against the likelihood of harm caused by pollution. In furtherance of the duty, functions and powers of the DG in ensuring that the desirable level of protection, and an adequate quality of the environment are achieved, s 31 of EQA 1974 empowered the DG to require owner or occupier of a premise or conveyance to measure, take a sample of, analyse, record and report any environmentally hazardous substances, pollutants, wastes, effluents or emissions containing pollutants, to conduct a study on any environmental risk, and to install, maintain and operate monitoring programme at the expense of the owner or occupier. A series of guidelines pertaining to contaminated land management and control were developed by the DOE in 2009. These Guidelines are –

- Contaminated Land Management and Control Guidelines No. 1: Malaysian Recommended Site Screening Levels for Contaminated Land;
- Contaminated Land Management and Control Guidelines No. 2: Assessing and Reporting Contaminated Sites; and
- Contaminated Land Management and Control Guidelines No. 3: Remediation of Contaminated Sites.

These Guidelines adopted a risk-based approach in the conduct of site identification, assessment, remediation and planning/management of contaminated land, with the objective of getting the polluter, who could be the land owner, the property occupant/users, and/or chemical/product/waste owner, who are responsible for the pollution, to perform and pay for site assessments and remediations. Although these Guidelines provide some guidance, such as the development of Site Screening Levels for the purposes of land screening to be used for the preliminary identification of land that could possibly be contaminated by the list of potentially polluting activities provided in Appendix A of Guidelines No. 1; the procedures involved in the conduct of both initial and detailed assessment of contaminated land in Guidelines No. 2; and also the adoption of a risk-based approach in the undertaking of the 4 stages of remediation activities in Guidelines No. 3, these Guidelines do not specifically address the requirements imposed under Art 12.2 and 12.3 of the Minamata Convention, and the guidance on the management of contaminated sites developed by the COP at its 2nd meeting[28]. Appropriate strategies or the identification and the assessment of sites contaminated by mercury or mercury compounds shall be developed, where actions would have to be taken to reduce the risks posed by such sites in an environmentally sound manner (Art 12.1 and 12.2 of the Minamata Convention). Art 12.3 further provides that the management of contaminated sites could also include methods and approaches for –

- Site identification and characterisation;
- Engaging the public;
- Human health and environmental risk assessment;
- Options for managing the risks posed by contaminated sites;
- Evaluation of benefits and costs; and
- Validation of outcomes.

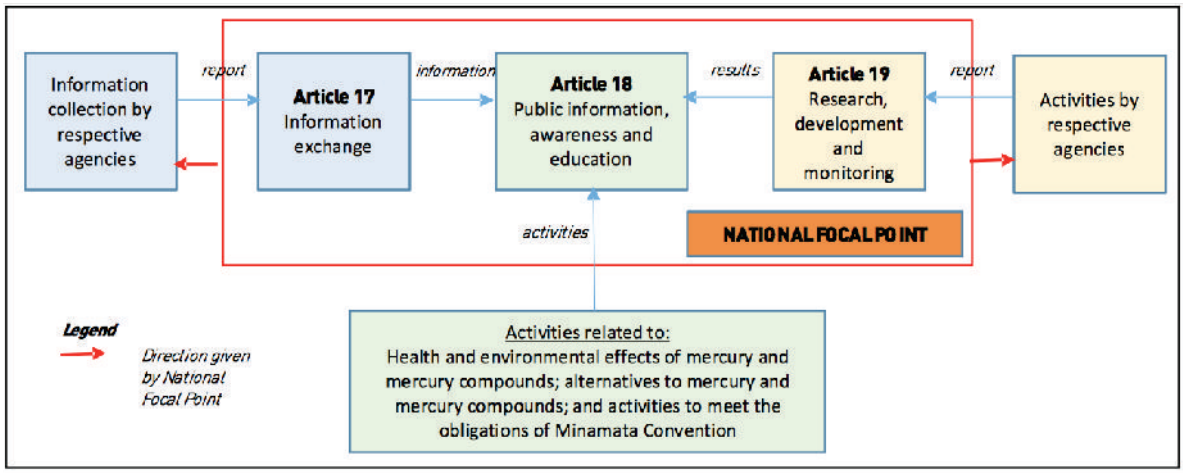
[28] United Nations Environment Programme, Guidance on the management of contaminated sites (2nd Meeting of the Conference of the Parties to the Minamata Convention on Mercury, 19-23 November 2018, Geneva) 6 August 2018 (UNEP/MC/COP.2/7) http://www.mercuryconvention.org/Portals/11/documents/meetings/COP2/English/2_7_e_contaminatedsites.pdf

Therefore, in order to ensure that the identification, assessment, prioritisation, management and as appropriate, remediation of contaminated sites, the existing Guidelines developed by DOE pursuant to the duty, functions and powers vested on the DG under EQA 1974, could be improved upon in order to ensure that they are consistent with the requirements under the Convention.

Proposed lead agency:
DOE (Hazardous Substances Division)

5.15 AP14: Obtain, compile and consolidate information related to Minamata Convention

Description:
Art 17 indicates the requirement for information exchange, as well as the establishment of a national focal point for information exchange (including the consent of importing Parties under Art 3). In Malaysia, the information required under Art 17 might be available, however none of the entity in Malaysia is obtaining, compiling and consolidating this information. Besides, Art 18 that focuses on public information, awareness, and education also requires that, among others, information listed under Art 17 is to be made publicly available. This also includes the results of research, development and monitoring activities that are listed in Art 19. In this regards, the relationship between Arts 17, 18 and 19 has triggered a need to establish a new mechanism under the responsibility of the national focal point (Figure 5.1).



Source: Goh et al. (2019)

Figure 5.1 Relationship between Article 17, 18 and 19.

Operational:
Even though the Environmental Management and Climate Change Division (BPASPI) under MESTECC can serve as a national focal point under the Minamata Convention, where one of the responsibilities is to facilitate information exchange. However, the legal mandate and the formalisation of such a role vested in a Division of the Ministry in law, are not sufficiently explicit. Taking into consideration the lack of a formalised legal institution in performing the legal obligations stipulated under Arts 17, 18 and 19, the country might consider developing a new legal authority that could serve as a national focal point. The national focal point can engage the relevant agencies in Table 5.5 where these agencies might be able to provide the required information. It is important to note that these agencies might not have the data yet, but they can collect such data from relevant sources. For example, the relevant Science, Technology and Innovation (STI) divisions under MESTECC can obtain data from ScienceFund, TechnoFund and InnoFund; Ministry of Education (KPM), particularly the divisions related to higher education can collect relevant data from universities; and the Hazardous Substance Division, DOE can obtain information on the production and use of mercury and mercury compounds from industries in Malaysia. Table 5.5 summarised relevant authorities that might relate to Arts 17, 18 and 19.

Table 5.5 Relevant authorities that might relate to Arts 17, 18 and 19.

Types of information	Aspect	Relevant agencies that might able to provide information
Information concerning mercury and mercury compounds	Scientific	MESTECC (STI), KPM (HE)
	Technical	MESTECC (STI), KPM (HE)
	Economic	MESTECC (STI), KPM (HE)
	Legal	Relevant agencies with legal provision on the management of mercury
Information on the reduction or elimination of mercury and mercury compounds	Production	DOE (Hazardous Substance Division)
	Use	DOE (Hazardous Substance Division)
	Trade	Ministry of Health (Pharmaceutical Enforcement Division)
	Emission	DOE (Air Division)
	Release	DOE (Water and Marine Division)
Information on alternatives for:	Mercury-added products	MESTECC (STI), KPM (HE)
	Manufacturing processes in which mercury or mercury compounds are used.	MESTECC (STI), KPM (HE)
	Activities and processes that emit or release mercury or mercury compounds	MESTECC (STI), KPM (HE)
Epidemiological information	Health impacts associated with mercury exposure	MOH (Disease Control Division)
Activities (e.g., education, seminar, training, workshop, conference) that are related to Art 18 of Minamata Convention	Awareness and education	Relevant agencies that have conducted activities related to awareness and education of mercury (including health and environmental effects of mercury, alternatives and *etc*) in Malaysia.
Research, development and monitoring activities that are related to Art 19 of Minamata Convention	Research, development and monitoring	Relevant agencies that have conducted research, development and monitoring that related to mercury in Malaysia.
Note STI: Science, Technology and Innovation HE: Higher Education		

Domestic regulatory framework:

The importance of Arts 17, 18, 19, which form the backbone for the implementation of the Minamata Convention, a Convention that was structured by an extensive body of scientific knowledge that exposes the omnipresent danger of mercury exposure and pollution and the serious consequences that mercury exposure had on public health and the environment, could not be emphasised enough. In this regard, the ability of the country in integrating and synergising the information collected, analysed, synthesised for exchange, knowledge dissemination and capacity building, research, development, monitoring, and even reporting to the Secretariat, would be instrumental in effectuating an effective implementation of the Convention.

However, as demonstrated in the previous chapter that assesses the regulatory framework as it currently stands in the country, the fragmented state of domestic legislations that could have responded to the requirements and impositions of the Convention are limited in scope, and on their own, are not capable of meeting the obligations imposed in a comprehensive and holistic manner. Moreover, the collection of data is driven by the restrictive mandate that limits the transferability of the data collected between relevant institutions that might collectively, response to the same obligations stipulated under the Convention, such as the possible overlap of mandate between DOE and DOSH, which share a common cause, namely, the protection of public health (and the environment) in the context of a more restricted workplace as intended in OSHA 1994, and a more expansive scope of application of the environment in EQA 1974. If the obligations are sector-specific, such as those applicable to mercury-added products, the applicable law governing the particular subject matter would be specific to that par-

ticular sector. For example, a medical device would be subjected to the Medical Device Act 2012; pesticides would be governed under Pesticides Act 1974; while cosmetics would fall within the purview of the Sales of Drugs Act 1952 and the Control of Drugs and Cosmetics Regs 1984. The manner in which the information is obtained and compiled would be limited to the extent to which the information are obtained under different legislations, making the consolidation of the information necessary to answer to the requirements of the Convention cumbersome.

The relevant authorities mandated by law to collect data and information for the purpose of establishing an inventory, reporting, information exchange, dissemination of knowledge, awareness raising, education and training, research, development, monitoring, and any other purposes intended under the Convention in satisfaction of the obligations under Arts 17, 18, 19 and even 21, which have been discussed in the previous chapter on regulatory framework assessment, are presented in Table 5.6.

Table 5.6 Legislations and institutions relevant to the implementation of the Convention.

Convention's Obligations by Articles		Relevant Domestic Legislations	Responsible Authorities
Art 3: Mercury and Mercury Compounds	Information on Stockpiles	OSHA 1994 (s 21) (USECHH Regs 2000; CLASS Regs 2013)	DOSH, MOHR
		EQA 1974 (ss 3, 18)	DOE, MESTECC
	If the stocks are supplied for the manufacturing of pesticides[29]	Pesticides Act 1974 (s 17-licence)	Pesticides Board, MOA
Art 4: Mercury-Added Products (MAPs)	Whether manufacture, import, and export of a Pt 1 Annex A products is already reduced to a de minimis level (MAP-specific)	Poisons Act 1952 (products subject to 1st Sch, Poisons List)	Poisons Board, Pharmaceutical Services Division, MOH
		Sales of Drugs Act 1952 and the Control of Drugs and Cosmetics Regulations 1984	Drug Control Authority, Pharmaceutical Services Division, MOH
		Pesticides Act 1974 (s 17-licence)	Pesticides Board, MOA
		Medical Device Act 2012 (ss 5, 15, 26, 27, 37, 45)	Medical Device Authority, MOH
		EQA 1974 (unless otherwise provided, ss 30, 30A)	DOE, MESTECC
Art 5: Manufacturing Processes	Identify facilities that use mercury or mercury compounds, the number and types of such facilities and the estimated annual amount used[30]	EQA 1974 (ss 30, 30A, 33)	DOE, MESTECC
		OSHA 1994 (USECHH Regs 2000)	DOSH, MOHR
Art 8: Emission	Establish and maintain an inventory of emissions from relevant sources	EQA 1974, (Clean Air Regs 2014)	DOE, MESTECC
Art 9: Releases	Establish and maintain an inventory of releases from relevant sources	EQA 1974 (Industrial Effluent Regs 2009; Control of Pollution from Solid Waste Transfer Station and Landfill 2009)	DOE, MESTECC

[29] It came to our knowledge that there are no mercury or mercury compounds used as an active ingredient in pesticides in Malaysia. However, there are no legal instrument found, to the best of our ability, declaring that the use of mercury and mercury compounds in pesticides is prohibited.

[30] Although OSHA 1994 does not request for information on manufacturing processes being operated at the workplace, Reg 5 of USECHH Regs 2000 does require the maintenance of information on the substance used at the workplace, especially chemicals hazardous to health, in the form of a register, from which information on the types of facilities that might use mercury and mercury compounds at the workplace could be identified. This information that DOSH would have, would also be useful in identifying facilities that are using any other manufacturing process in which mercury or mercury compounds are intentionally used and did not exist prior to the date of entry into force of the Convention stipulated under Art 5.7 if information regarding the types of substances used in a workplace/facility is obtained.

Art 10: Interim Storage	The identification of the facilities that may store mercury or mercury compounds in the country	EQA 1974 (prescribed premise / conveyance under s 18)	DOE, MESTECC
	Capacity building for the environmentally sound interim storage of mercury and mercury compounds	OSHA 1994 (CLASS Regs 2013; USECHH Regs 2000; Control of Industrial Major Accident Hazards Regs 1996)	DOSH, MOHR
	Capacity building	EQA 1974 (s 3(1)(l),(m))	DOE, MESTECC
Art 11: Mercury Waste	Defining 'waste' in accordance with the threshold level to be decided by the COP	EQA 1974 (Scheduled Wastes Regs 2005)	DOE, MESTECC
	The identification of the potential sources and types of mercury wastes generated in the country	EQA 1974 (Scheduled Wastes Regs 2005)	DOE, MESTECC
Art 12: Contaminated Sites	Contaminated sites identification and characterisation; public engagement; human health and environmental risk assessments; options for risks management; and cost benefits evaluation.	EQA 1974 (Contaminated Land Management and Control Guidelines Nos 1-3)	DOE, MESTECC
Art 16: Health Aspects	The development of science-based education and preventive programmes; promote health care services; and strengthen institutionaland health professional capacities	Public health: Ministerial Functions Act 1969	MOH
		Environmental health: EQA 1974	DOE, MESTECC

At the operational level, the need for a national focal point that serves as a fulcrum, which is capable of drawing in, and converging, all relevant data in meeting the requirements of Arts 17, 18 and 19 is highlighted in the section above. In view of the fragmentary nature in which institutions, mandated by different legislative instruments serving particular objectives, which currently structured the regulatory framework necessary to implement the Minamata Convention, there is a need to establish a national focal point, in the form of a new legal authority, to synergise, integrate, and galvanise the necessary information from all relevant sources, to meet the obligations stipulated under the Convention.

Proposed lead agency:

The establishment of a formal legal authority charged with the mandate to obtain, compile, and consolidate information in satisfaction of both substantive and procedural obligations stipulated under the Minamata Convention, which could be in the form of an inter-agency committee, or other similar institutional arrangements, is proposed. In this MIA, an inter-agency coordinating committee has been proposed, where MESTECC is the chair of this committee. There are 5 working groups that report to this committee, namely mercury and mercury trade working group; mercury-added products and manufacturing working group; environment working group; human health working group; and research, development, and awareness working group. The proposed inter-agency coordinating committee is shown in Figure 5.2.

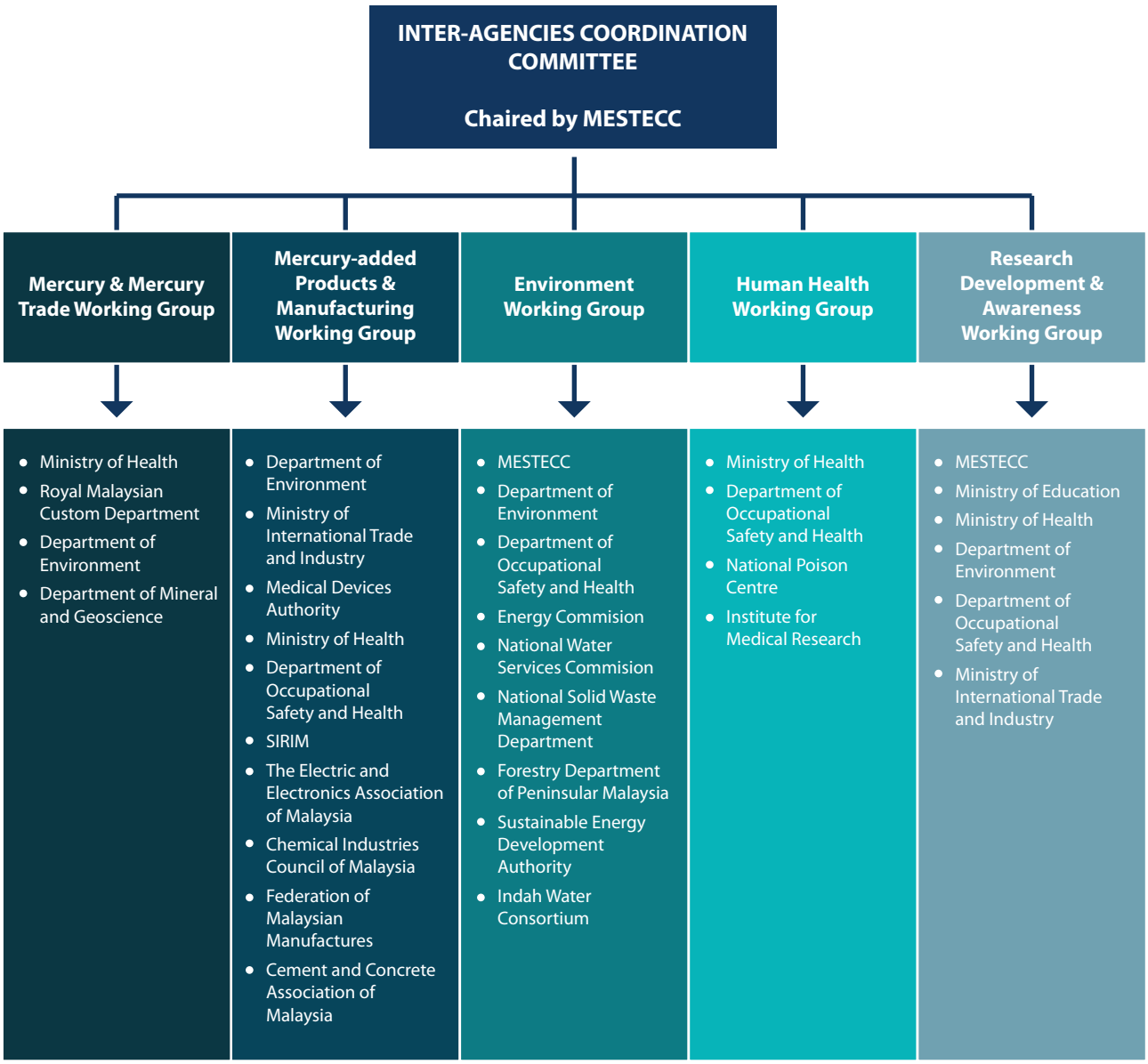


Figure 5.2 The proposed inter-agency coordinating committee

5.16 Conclusion

As far as Minamata Convention on Mercury is concerned, there are numerous regulatory and operational frameworks in Malaysia that regulate and control anthropogenic emissions and releases of mercury and mercury compounds. These regulatory and operational frameworks exist even prior to the establishment of the Minamata Convention because Malaysia is concern of the potential risks posed by mercury and mercury compounds. In this regards, as these regulatory and operational frameworks were made prior to the Minamata Convention, it is almost impossible that existing frameworks are able of fulfilling all the obligations stated under the Minamata Convention. This means, interventions are needed. How these interventions could be formulated depends on the existing situation, and the gaps. The gaps were identified by assessing the regulatory and operational frameworks against the obligations under the Minamata Convention. After the gaps were identified, this MIA has proposed 14 action plans as the interventions required by Malaysia in order to fulfil the obligations under the Minamata Convention. All the proposed action plans have been discussed with the relevant stakeholders, and were amended after taking into account feedbacks from the stakeholders. The Government of Malaysia should take into account all the 14 action plans before ratifying the Minamata Convention on Mercury.

References

AMAP. 1998. Assessment report: *Arctic Pollution Issues*. Arctic Monitoring and Assessment Programme, Oslo.

AMAP. 2011. *Arctic Pollution 2011.* Oslo: Arctic Monitoring and Assessment Programme.

Andresen, S, Rosendal, K., and Skjærseth, J.B., 2013. Why negotiate a legally binding mercury convention? Int. Environ Agreements, 13: 425-440.

Bender, M., Lymberidi-Settimo, E., and Growth, Edward, III, 2014. *Journal of Public Health*, 35: 1-13

Cash, D.W., Clark, W.C., Alcock, F., Dickson, N.M., Eckley, N., Guston, D.H., Jäger, J., and Mitchell, R.B., 2003. Knowledge systems for sustainable development. Proceedings of the National Academy of Sciences, 100: 8086–8091.

Central Bank of Malaysia. 2018. Bank Negara Malaysia Annual Report 2017.

Coelho, J. P., Santos, H., Reis, A. T., Falcão, J., Rodrigues, E. T., Pereira, M. E. & Duarte, A. C. 2010. Mercury bioaccumulation in the spotted dogfish (Scyliorhinus canicula) from the Atlantic Ocean. *Marine Pollution Bulletin*: 1372–1375

Department of Statistics Malaysia. 2016. Press release: Population projection (revised), Malaysia, 2010-2040.

Department of Statistics Malaysia. 2017.Social Statistics Bulletin, Malaysia. https://www.dosm.gov.my/v1/index.php?r=column/pdfPrev&id=aktTTjhhRHd1aHBCZGF1N01aaTl3dz09 [18 May 2018]

Department of Statistics Malaysia. 2018a. Malaysia at a glance (https://www.dosm.gov.my/v1/index.php?r=column/cone&menu_id=ZmVrN2FoYnBvZE05T1AzK0RLcEtiZz09) (28 November 2018)

Department of Statistics Malaysia. 2018b. Selected demographic indicators Malaysia, 2018.

EPU. 2017. Malaysia Productivity Blueprint – Driving Productivity of the Nation. Putrajaya: Prime Minister's Department.

Eriksen, H.H., and Perrez, F.X., 2014. The Minamata Convention: A comprehensive response to a global problem. *RECIEL*, 23(2): 195-210.

Goh Choo Ta, Lee Jing, Mohamad Mahathir Bin Amir Sultan, Loh Kee Shyuan, Latifah Binti Md Yusoff & Mazlin Bin Mokhtar. 2019. Discussion on the life cycle approach in understanding the implementation of obligations stipulated under the Minamata Convention.

Hajeb, P., Jinap, S., Ismail, A., Fatimah, A. B., Jamilah, B. & Abdul Rahim, M. 2009. Assessment of mercury level in commonly consumed marine fishes in Malaysia. *Food Control* 20: 79–84.

Hsu-Kim, H., Eckley, C.S., Acha´, D. , Feng, X., Gilmour, C.C., Jonsson, S,. and Mitchell, C.P.J., 2018. Challenges and opportunities for managing aquatic mercury pollution in altered landscapes. Ambio, 47(2): 141-169. https://doi.org/10.1007/s13280-017-1006-7

Hylander, L.D. & Meili, M. 2003. 500 years of mercury production: global annual mercury inventory by region until 2000 and associated emissions. *The Science of the Total Environment* 304: 13-27.

Kanie, N., 2007. Governance and multilateral environmental agreements: A healthy or ill-equipped fragmentation. In Swart, L., and Perry, E., Global environmental governance: Perspectives on the current debate. New York: Centre for UN Reform Education.

Kementerian Sumber Asli dan Alam Sekitar, 11 April 2014. Perundangan Berkaitan Perlombongan. Program Wadi

Ilmu NRE (Bil. 2/2014) https://wk.kats.gov.my/sites/NREDrive/Program%20Kampus%20NRE%20%20Wadi%20Ilmu/AKTA%20BERKAITAN%20PERLOMBONGAN.PDF%20-%2011%20APRIL%202014.pdf [7 March 2019]

Lennett, D., and Gutierrez, R., 2014 (updated 2015 and 2016). Minamata Convention on Mercury. Ratification and Implementation Manual. The Zero Mercury Working Group.

Lin, Y., Wang, S., Steindal, E.H., Wang, Z., Braaten, H.F.V., Wu, Q., and Larssen, T., 2017. A holistic perspective is needed to ensure success of Minamata Convention on Mercury. Environmental Science & Technology: 1070-1071. DOI: 10.1021/acs.est.6b06309

MDA. 2017. Circular letter of the Medical Device Authority (MDA) No.2 Year 2017 - Policy on Implementation and Enforcement under the Medical Device Act 2012: National Preparation to Ratify Minamata Convention on Mercury.

MITI. 2018. Ministry of International Trade and Industry (MITI) Report 2017.

MOH. 2016. Circular letter of the Ministry of Health (MOH) No. 9 Year 2016 – Compliance towards Minamata Convention: The Use of Medical Device that do Not Contain Mercury.

National Institute for Minamata Disease. 2014. Outbreak & Cause. www.nimd.go.jp/archieves/english/tenji/e_corner/qa1/q6.html [07 March 2015].

Selin H., Keane, S.E., Wang, S. Selin, N., Davis, K., and Bally D., 2018. Linking science and policy to support the implementation of the Minamata Convention on Mercury. Ambio, 47: 198-215.

Selin, H., 2014. The Minamata Convention and Mercury Abatement. Global Environmental Politics, 14: 1-19. DOI:10.1162/GLEP_a_00208

Selin, N.E., 2009. Global biogeochemical cycling of mercury: A review. Annual Review of Environment and Resources, 34: 43-63.

Selin, N.E., and Selin, H., 2006. Global politics of mercury pollution: The need for multi-scale governance. RECIEL, 15(3): 258-269.

Shackley, S., and Wynne, B., 1995. Global climate change: The mutual construction of an emergent science-policy domain. Science and Public Policy, 22: 218–230.

UNDP, 2017. Minamata Initial Assessment Report – Suggested Structure and Contents https://www.undp.org/content/dam/undp/library/Environment%20and%20Energy/Chemicals%20and%20Waste%20Management/undp-ee-wastemgt-Minamata-Initial-Assessment-Report-Guidance-Feb2017.pdf [7 March 2019]

UN-Environment, undated. Guidelines on the Environmentally Sound Interim Storage of Mercury other than Waste Mercury developed by the COP of the Convention http://mercuryconvention.org/Portals/11/documents/forms-guidance/English/Guidelines_Environmentally-sound-interim-storage_Nov2018.pdf [7 March 2019]

UNEP. 2002. *Global Mercury Assessment*. Geneva: United Nations Environment Programme.

UNEP General Council, (21 February 2003). Decision 22/4. Chemicals. Nairobi: UNEP (Proceedings of the Governing Council/Global Environment Ministerial Forum at Its Twenty-Second Session, 3-7 February 2003) UNEP/GC.22/11.

UNEP. 2013a. *Global Mercury Assessment 2013: Sources, Emissions, Releases and Environmental Transport. Geneva*: United Nations Environment Programme.

UNEP. 2013b. *Minamata Convention on Mercury: Text and Annexes. Geneva*: United Nations Environment Programme.

UNEP. 2014. http://www.mercuryconvention.org/News/2014Treatyevent/tabid/4126/Default.aspx

UNEP.2017. Toolkit for Identification and Quantification of Mercury Releases: Guideline for Inventory Level 1 Version 2.0 January 2017. Geneva

Weiss, E.B., 1993. International environmental law: Contemporary issues and the emergence of a new world order. Georgetown Law Journal, 81: 675-710.

World Bank. 2018. Access to electricity (% of population). https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=MY [17 May 2018]

Zürn, M., and Faude, B., 2013. On fragmentation, differentiation, and co-ordination. Global Environmental Politics. 13(3): 119-130.

Annex I

Assessment of the legal and regulatory framework implementing the Minamata Convention

Obligations that are Binding
Policy and Regulatory Measures in Place and Remaining Gaps[31]

Article 3 – Mercury supply sources and trade
Description of Article: The Article provides for the prohibition of primary mercury mining. The Article laid out that measures are to be taken to determine individual stocks of mercury or mercury compounds exceeding 50 MT. The disposal of excess mercury from the decommissioning of chlor-alkali facilities in accordance with the guidelines for environmentally sound management (Art 11.3.a). The prohibition of export of mercury except in accordance with the Art 3.6. The prohibition of the import of mercury from non-Party. An importing Party may submit a general notification to the Secretariat as the written consent required under Art 3.6. Prohibition of import from non-Party despite written consent unless certification that the mercury is not from sources identified as not allowed would not apply if as long as the importing Party maintains comprehensive restrictions on the export of mercury and has domestic measures in place to ensure that imported mercury is managed in an environmentally sound manner. If Art 3.9 is applied, the importing Party shall provide a notification of such decision to the Secretariat, including information describing its export restrictions and domestic regulatory measures, as well as information on the quantities and countries of origin of mercury imported from non-Parties. Report submitted pursuant to Art 21 shall include information showing that the requirements of Art 3 have been met. The provisions of Art 3 shall not apply to (Art 3.2) – (a) quantities of mercury or mercury compounds to be used for laboratory-scale research or as a reference standard; (b) naturally occurring trace quantities of mercury or mercury compounds present in such products as non-mercury metals, ores, or mineral products, including coal, or products derived from these materials, and unintentional trace quantities in chemical products; or (c) mercury-added products.
Succinct summary of provisions relevant to the country in question: A. Mercury supply sources: mining, stockpiles and the decommissioning of chlor-alkali plants B. Trade: (i) from an exporter to an importer who are both parties to the Convention (Art 3.6.a); (ii) from an exporter who is a party to the Convention to an importer who is a non-party to the Convention (Art 3.6.b); and (iii) from an exporter who is a non-party to an importer who is a party to the Convention (Art 3.8). • The prohibition of primary mercury mining • Obtain information on stocks of mercury or mercury compounds exceeding 50 metric tons (MT), and mercury supply generating stocks exceeding 10 MT/year • In accordance with Art 3.5.b, restrict the import and use of excess mercury from decommissioning chlor-alkali plants, and require environmentally sound disposal • The prohibition of the export of mercury • The prohibition of the import of mercury without government consent, ensuring both the mercury source and proposed use are allowed under the Convention, governed by a comprehensive restriction on the export of mercury, with domestic measures that ensure that imported mercury is managed in an environmentally sound manner

[31] The structure of this Schedule is developed in accordance with the suggested structure and contents for Minamata Initial Assessment Report published by the United Nations Development Programme (UNDP) dated February 2017, cited as UNDP, (ver February 2017) Minamata Initial Assessment Report – Suggested Structure and Contents https://www.undp.org/content/dam/undp/library/Environment%20and%20Energy/Chemicals%20and%20Waste%20Management/undp-ee-wastemgt-Minamata-Initial-Assessment-Report-Guidance-Feb2017.pdf [18 February 2019]

Policy and regulatory measures in place that enable the country to comply with the above listed provisions:		
Title and reference number of relevant Policy and Regulatory Measure, as well as date	**Relevant provisions**	**Remarks**
• Non-application of Art 3 to mercury and mercury compounds used for laboratory-scale research or as a reference standard		
Pesticides Act 1974 (Act 149)	S 2: Interpretation 'Active ingredient', defined to mean an ingredient, as listed in the 1st Sch, which has pesticidal properties and gives pesticidal properties to a substance, material, preparation or mixture, of which the ingredient is one of the constituents of the substance, material, preparation or mixture S 14: Importation of pesticides for educational or **research** purposes or as registration sample or **analytical standard** (1) A licence to import pesticides for educational or research purposes or as registration sample or an analytical standard may be issued by the Pesticides Board (corresponding to Article 3(2)(a) of the Minamata Convention, which provides that Article 3 does not apply to quantities of mercury or mercury compounds to be used for laboratory-scale research or as a reference standard) S 14A: **Research or experiment** on unregistered pesticides synthesised in Malaysia (1) A person desiring to carry out any research or experiment **outside** the laboratory on an unregistered pesticide synthesised in Malaysia shall apply to the Pesticides Board for a permit to carry out the research or experiment	Art 3 of the Convention shall not apply to, among others, quantities of mercury or mercury compounds to be used for laboratory-scale research or as a reference standard (Art 3.2.a). Therefore, the definition of 'analytical standard' in s 2 of Pesticides Act 1974 to mean "a substance containing an active ingredient and is used as a reference standard in the analysis of a pesticide" could be used as a point of reference in identifying quantities of mercury or mercury compounds to be used for laboratory-scale research or as a reference standard as stated in the Convention, which is excluded from the application of Art 3 of the Convention. In addition, mercury and mercury compounds used for laboratory-scale research are also excluded from the application of Art 3 of the Convention.
• 1st Sch, List of Pesticides (s 2)	Mercuric chloride, mercuric oxide, mercurous chloride	
• The prohibition of primary mercury mining		
Federal Constitution	Art 74: Subject matter of federal and State laws (1) Without prejudice to any power to make laws conferred on it by any other Art, Parliament may make laws with respect to any of the matters enumerated in the Federal List or the Concurrent List (that is to say, the 1st or 3rd List set out in the 9th Sch. (2) Without prejudice to any power to make laws conferred on it by any other Art, the Legislature of a State may make laws with respect to any of the matters enumerated in the State List (that is to say, the 2nd List set out in the 9th Sch) or the Concurrent List. Art 91: National Land Council (5) It shall be the duty of the National Land Council to formulate from time to time in consultation with the Federal Government, the State Governments and the National Finance Council **a national policy for the promotion and control of the utilisation of land throughout the Federation for mining,** agriculture, forestry or any other purpose, and for the administration of any laws relating thereto; and the Federal and State Governments shall follow the policy so formulated.	The development of mineral resources, mines, mining, minerals and mineral ores are within the jurisdiction of the federal government. The prohibition of primary mercury mining would be within the jurisdiction of the federal government. It is noted that Art 75 provides that in the event that any State law is inconsistent with a federal law, the federal law shall prevail and the State law shall, to the extent of the inconsistency, be void. In addition, Art 76(1)(a) of the Federal Constitution provides the power of Parliament to legislate for States in cases where, for the purpose of implementing any treaty, agreement or convention between the Federation and any other country, or any decision of an international organisation of which the Federation is a member, parliament may make laws with respect to any matter enumerated in the State List. By virtue of Art 91, the National Land Council could then formulate a national policy that prohibits primary mercury mining in accordance with the stipulation of the Minamata Convention.
• 9th Sch, Federal Constitution List I – Federal List	Item 8: Trade, commerce and industry, including – (j) subject to item 2(c) in the State List: Development of mineral resources; mines, mining, minerals and mineral ores; oils and oilfields; purchase, sale, import and export of minerals and mineral ores; petroleum products; regulation of labour and safety in mines and oilfields.	
• 9th Sch, Federal Constitution List II – State List	Item 2: Except with respect to the Federal Territories of Kuala Lumpur, Labuan and Putrajaya, land including – (c) permits and licences for prospecting for mines; mining leases and certificates.	

The National Land Code 1965 (Act 56 of 1965)	S 40: Property in State land, minerals and rock material. There is and shall be vested solely in the State Authority the entire property in – (a) all State land within the territories of the State; (b) all minerals and rock material within or upon any land in the State the rights to which have not been specifically disposed of by the State Authority. S 41: Powers of disposal of State Authority, and rights in reversion, etc Without prejudice to its powers and rights under any other written law for the time being in force, the State Authority shall have – (a) all the powers of disposal conferred by s 42 with respect to – (iii) mining land, which powers shall be exercised in such manner and to such extent as is authorised by the provisions of this Act, and not otherwise; S 42. Powers of disposal. (1) Subject to subs (2), the State Authority shall have power under this Act – (c) to permit the occupation of State land, reserved land and mining land under temporary occupation licences issued in accordance with the provisions of Ch 2 of Part 4; (2) Nothing in this Act shall enable the State Authority – (a) to dispose of any land for the purposes of mining (within the meaning of the Mining Enactment).	Property in the minerals of the State is vested with the State. However, the NLC does not provide for the power of State to dispose of any land for the purposes of mining of minerals. The power to dispose any land for the purpose of mining of minerals is provided under the respective states' Mineral Enactments.
State Mineral Enactments	Selangor State Mineral Enactment 2000 An Enactment to provide for mineral tenements and for purposes connected therewith. S 3: Minerals vested in the State Government There is and shall be vested solely in the State Government all minerals within or upon any land, including so much of the bed of any river, and of the foreshore and bed of the sea, as is within the territories of the State for the limits of the territorial waters if they have not been specifically disposed of by the State Government in accordance with the provisions of this Enactment or any other written law. S 62: Land over which mining lease may be granted. (1) Subject to subsection (2), a mining lease may be granted by the State Authority over any State land, including State land beneath alienated land. S 63: Application for mining lease (1) An application for a mining lease shall be made to the Authority in the prescribed form. (3) Upon receipt of an application under subs (1), the State Authority shall refer the application to the Committee for its recommendation. (5) The Committee shall, as soon as practicable after considering the application, transmit to the State Authority its report and recommendation whether the application should be – (a) approved, in whole or in part – (i) confirming that the application has complied with the requirements of this Enactment; and (ii) specifying the terms and conditions subject to which the lease is to be granted; or (b) refused. (6) On receipt of the report and recommendation by the Committee under subs (5), the State Authority may, subject to subsection (8) and any other provisions of this Enactment, approve or refuse the application whether or not the Committee recommends the approval of the application or the refusal thereof and his decision shall be final.	A model State Mineral Enactment was prepared in order to harmonise all states' mining laws. A total of 13 states had implemented the State Mineral Enactment as of 2014.[32] The power to approve the mining of mercury lies within the jurisdiction of the State government. The prohibition thereof, would also be vested in the State Authority. Art 76 clause (4) of the Federal Constitution stipulated that the Parliament may, for the purpose only of ensuring uniformity of law and policy, make laws with respect to, among others, rights and interests in land. As such, the federal government is vested with the power to declare a prohibition on primary mercury mining in accordance with the obligation imposed under the Convention by virtue of this Art. However, it would be necessary to note the role of the National Land Council in formulating national policies for the control of the utilisation of land throughout the Federation for mining.
· Mineral Regulations (Selangor) 2007	S 41: Application for mining lease (1) An application for a mining lease under subs 63(1) of the Enactment shall be in Form 8A of the 3rd Sch.	

[32] Kementerian Sumber Asli dan Alam Sekitar, 11 April 2014. Perundangan Berkaitan Perlombongan. Program Wadi Ilmu NRE (Bil. 2/2014) https://wk.kats.gov.my/sites/NREDrive/Program%20Kampus%20NRE%20%20Wadi%20Ilmu/AKTA%20BERKAITAN%20PERLOMBONGAN.PDF%20-%2011%20APRIL%202014.pdf [22 Februari 2019]

Mineral Development Act 1994 (Act 525)	S 2: Application to fossicking, panning, etc This Act shall apply to the fossicking, panning prospecting, exploring, mining and processing of minerals and mineral ores and to mines, minerals and mineral ores generally. S 3: 'mineral' means any substance whether in solid, liquid or gaseous form occurring – (a) naturally; (b) as a result of mining in or on the earth; or (c) as a result of mining in or under the sea or sea-bed, Formed by or subject to a geological process, but excludes water, 'rock material' as defined in the National Land Code [Act 56 of 1965] and 'petroleum' as defined in the Petroleum Mining Act 1966 [Act 95]; 'mineral ore' means any mineral of economic interest from which one or ore valuable constituents may profitably be recovered by treatment; 'mineral processing' means any activity whereby minerals or mineral ores are treated for the beneficiation thereof but excludes smelting and refining; 'mineral tenement' means a fossicking licence, *dulang* licence, individual mining licence, prospecting licence, exploration licence, proprietary mining licence, mining lease, or any of them for the purpose of exploration or mining of minerals or mineral ores, as the case may be, issued under any Federal or State law regulating mineral tenements; 'to mine' means intentionally to win minerals and includes any operation directly or indirectly and necessary therefore or incidental thereto, and 'mining' shall be construed accordingly. S 5: The DG shall – (b) exercise supervision and control on the safety aspects relating to mines and to the fossicking, panning, exploration, mining, possession, movement, storage and processing of minerals and mineral ores; (c) obtain information on and keep records of operations pertaining to the fossicking, panning, exploration, mining, possession, movement, storage, processing, purchase and sale of minerals and mineral ores. S 8: Functions and duties of Assistance Director (1) An Assistant Director shall – (a) inspect and regulate the storage, transportation and use of toxic, inflammable or other potentially dangerous substances in respect of or in relation to any fossicking, panning, exploration, mining or mineral processing activity; inspect and regulate the storage, transportation and use of toxic, inflammable or other potentially dangerous substances in respect of or in relation to any fossicking, panning, exploration, mining or mineral processing activity;	
• Obtain information on stocks of mercury or mercury compounds exceeding 50 metric tons (MT), and mercury supply generating stocks exceeding 10 MT/year		
Occupational Safety and Health Act 1994 (Act 514)	S 21. General duties of manufactures, etc. as regards substances for use at work (1) It shall be the duty of a person who formulates, manufactures, imports or supplies any substance for use at work – (c) to take such steps as are necessary to ensure that there will be available in connection with the use of the substance at work **adequate information about the results of any relevant test which has been carried out on or in connection with the substance** and about **any condition necessary** to ensure that it will be safe and without risks to health when properly used S 66: Regulations (1) The Minister may make regulation for or with respect to the safety, health and welfare of persons at work in order to achieve the objects of the Act (2) Such regulations may – **(n) require the employers to keep and preserve records and other documents** (u) prescribe any other matter which may appear to the Minister to be expedient or necessary for the better carrying out of the Act	Under s 21(1)(c), the manufacturers who formulates, manufactures, imports or supplies any substance for use at work could be imposed a duty to make available information with regards to stocks of mercury or mercury compounds exceeding 50 MT and mercury supply generating stocks exceeding 10 MT per year.

• Occupational Safety and Health (Use and Standards of Exposure of Chemical Hazardous to Health) Regulations 2000	Reg 5: Register of chemicals hazardous to health (1) An employer shall **identify and record in a register** all chemicals hazardous to health **used** in the place of work. 'Chemicals hazardous to health' is defined in Reg 2 to mean any chemical or preparation which – (a) is listed in Schedule I or II; (b) possessed any of the properties categories in Part B of Schedule I of the Occupational Safety and Health (Classification, Packaging and Labelling of Hazardous Chemicals) Regulations 1997 (c) comes within the definition of 'pesticide' under the Pesticides Act 1974 (d) is listed in the First Schedule of the Environmental Quality (Scheduled Wastes) Regulations 1989	For this purpose, the Minister, by virtue of s 66 may make regulation to require the employers to keep and preserve records of the stocks of mercury or mercury compounds exceeding 50 MT, and mercury supply generating stocks exceeding 10 MT/year (para (n)), and to prescribe the employers to report on any stocks of mercury or mercury compounds exceeding 50 MT (para (u)). Even though Reg 5 requires only a register of all chemicals hazardous to health used in the place of work (and not the stock and its quantity), the Reg could be amended to include the quantity of mercury in the place of work in order to capture individual stock exceeding 50 MT, and supply of mercury or mercury compounds exceeding 10 MT/year.
• Sch I, USECHH Regs 2000	Mercury, as Hg [CAS: 7439-97-6] and its alkyl compounds of 0.01 mg/m^3, and aryl compounds of 0.1 mg/m^3, and its inorganic forms including metallic mercury that is of 0.025 mg/m^3.	
• Sch II, USECHH Regs 2000	Chemicals for which medical surveillance is appropriate Item 21. Mercury	
• Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013	Reg 14: Inventory of hazardous chemicals (1) An importer or a manufacturer shall prepare an inventory of hazardous chemicals consisting of **information** on each hazardous chemical imported or supplied in a quantity of **one MT and above per year for each calendar year.** (3) The inventory of hazardous chemicals shall contain the following information: (a) the product identifier; (b) the name of the hazardous chemical; (c) the composition and ingredients of a hazardous chemical; (d) the hazard classification; and (e) **the total quantity of each hazardous chemical imported or supplied.** (5) An inventory of hazardous chemicals shall be maintained in good condition and in an orderly manner. Note: 'Hazardous chemical', as defined in Reg 3, means a chemical classified as a hazardous chemical under Reg 4	The relevant authorities had confirmed that there is no primary mercury mining in the country. It is also unclear whether Malaysia obtains its mercury sources from recycled sources. Therefore, all the mercury and mercury compounds supplied and used in the country is imported. For stocks of mercury and mercury compounds of 50 MT, as well as sources of mercury supply generating stocks exceeding 10 MT per year would be able to be captured under Reg 14 of the CLASS Regs 2013. Or, if the Regs are not sufficient specific to include individual stocks of mercury or mercury compounds exceeding 50 MT, or sources of mercury supply generating stocks exceeding 10 MT/year, Regs 2013 could be amended to impose the need to provide the required information in the inventory of hazardous chemicals.
Environmental Quality Act 1974 (Act 127)	S3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (b) to be responsible for and to co-ordinate all activities relating to the discharge of wastes into the environment and for preventing or controlling pollution and protecting and enhancing the quality of the environment. S 18: Prescribed premises to be licenced (1) The Minister after consultation with the Council may by order prescribe the premises the occupation or use of which by any person shall, unless he is the holder of a licence issued in respect of those premises, be an offence under the Act. S 33A: Environmental audit (1) The DG may require the owner or occupier of any vehicle, ship or premises, irrespective of whether the vehicle, ship or premises are prescribed under s 18 or otherwise, to carry out an environmental audit and to submit an audit report in the manner as may be prescribed by the Minister by regs made under this Act.	The duty and function of the DG to publish an annual report on environmental quality might be a starting point for the establishment and maintenance of such an inventory. It is noted that s 3 does not specifically provide for the duty and function of the DG to establish and maintain an inventory of emission. However, s 3(b) could be interpreted to enable the DG's Office to establish an inventory of emission as fulfilling in parts, their responsibility for, and the coordination of all activities relating to the discharge of wastes into the environment and for preventing or controlling pollution and protecting and enhancing the quality of the environment. Alternatively, s 3(o) could possibly be interpreted to include the power of the DG and other officers to establish and maintain an inventory of emissions from relevant sources in order to

		carry out the Office's planning in pollution control. The information that builds the inventory of emissions from relevant sources could also be obtained from the audit report submitted by virtue of s 33A. However, in general, s 3(b) enables the DG Office to be responsible for and to co-ordinate all activities relating to the controlling of pollution and the protection and enhancement of the quality of the environment.
Pesticides Act 1974 (Act 149)	S 17: Licence to sell or store pesticides (1) A person desiring to sell or store for sale a pesticide shall, in the prescribed manner, and accompanied with the prescribed application fee, apply for a licence for that purpose to the Pesticides Licensing Officer for the area in which he resides or, in the case of a body corporate or firm, in which the body corporate or firm has its place or principal place of business. (2) Upon receipt of an application duly made under subs (1) and in accordance with the rules, the Pesticides Licensing Officer may issue to the applicant a licence in the prescribed form **subject to such conditions as the Pesticides Licensing Officer thinks fit to impose**, if he is satisfied that – (a) the pesticide to which the application relates is for the time being registered under this Act; and (b) the applicant is aware of the toxicity of the pesticide and of the risks involved in the use and handling thereof. (3) A licence under s 17 – (a) shall not authorise the sale or storage for sale of a pesticide at more than one premises; (b) shall specify the premises at which the sale or storage for sale of the pesticide is authorised; S 20: Offences relating to manufacture, sale and storage for sale (1) No person shall manufacture, sell, or store for sale a pesticide unless he is licensed to do so under this Act or otherwise than in accordance with the conditions of a licence to do so issued to him under the Act.	Pursuant to s 17(2) the Pesticides Licensing Officer may impose the condition on the applicant the need to provide information on individual stock of mercury or mercury compounds (used in pesticides) that exceeds 50 MT per year, as well as sources of mercury supply generating stocks exceeding 10 MT per year. Discussion of the relevance of the Pesticides Act 1974 would be more appropriate under Art 4 of the Convention as it specifically deals with Mercury-Added Products (MAPs).
• Control on the import and use of excess mercury from decommissioning chlor-alkali plants (Art 3.5.b)[33]		
Environmental Quality Act 1974 (Act 127)	S 34A: Report on impact on environment resulting from prescribed activities (1) The Minister, after consultation with the Council, may by order prescribe any activity which may have significant environment impact as prescribed activity. (2C) The report shall be in accordance with the guidelines as the DG may prescribe and shall contain – (a) an assessment of the impact such activity will have or is likely to have on the environment; and (b) the proposed measures that shall be undertaken to prevent, reduce or control the adverse impact on the environment. (3) If the DG on examining the report and after making such inquiries as he considers necessary, is of the opinion that the report satisfies the requirements of subsection (2C) and that the measures to be undertaken to prevent, reduce or control the adverse impact on the environment are adequate, he shall approve the report, with or without conditions attached thereto, and shall inform the person intending to carry out the prescribed activity and the relevant approving authorities accordingly. (4) If the DG, on examining the report and after making such inquiries as he considers necessary, is of the opinion that – (a) the report is not in accordance with the development plan or physical plan approved by the relevant approving authority; or (b) the report does not satisfy the requirements under subsection (2C), he shall not approve the report, giving reasons for not approving,	The import of excess mercury from the decommissioning of chlor-alkali plants could be prohibited via s 34B where specific provisions were enacted to empower the DG to exert control over the receive (including import) or send (including export), or cause or permit to be received or sent, in or out of Malaysia, excess mercury obtained from the decommissioning of chlor-alkali plants that falls within the category of scheduled wastes listed under the Scheduled Wastes Regs 2005. Since excess mercury from decommissioning chlor-alkali plants would be considered 'scheduled waste' under the EQA 1974, the placing, deposit or dispose of, or cause or permit to place, deposit or dispose of would be regulated by s 34B(1)(a). If the placing deposit, or dispose of the excess mercury could be regulated via the written approval issued by the DG under s 34B(2), the DG could then impose conditions that prohibit the use of excess mercury in the written approval granted.

[33] Eriksen & Perrez (2014) explained that excess mercury from the chlor-alkali sector would be considered waste and be taken out of circulation

	and shall inform the person and the relevant approving authority accordingly. (5) The DG may require the person to submit any other report to him, in addition to the report required to be submitted under subsection 34A(2), relating to the environmental impact for his approval. (7) If the DG approves the report, the person carrying out the prescribed activity, in the course of carrying out such activity, shall provide sufficient proof that the conditions attached to the report (if any) are being complied with and that the proposed measures to be taken to prevent, reduce or control the adverse impact on the environment are being incorporated into the design, construction and operation of the prescribed activity. S 34AA: Prohibition order for prescribed activities (1) The DG may issue a prohibition order S 34B: Prohibition against placing, deposit, etc. of scheduled wastes (1) No person shall – (a) place, deposit or dispose of, or cause or permit to place, deposit or dispose of, except at prescribed premises only, any scheduled wastes on land or into Malaysian waters; (b) receive or send, or cause or permit to be received or sent any scheduled wastes in or out of Malaysia; or (c) transit or cause or permit the transit of scheduled wastes without any prior written approval of the DG. (2) The DG may grant the written approval either subject to conditions or unconditionally.	During the Stakeholders' Workshop, it was informed that the decommissioning of chlor-alkali plant is an activity that is prescribed as an activity that may have significant environmental impact whereby a report on the impact on the environment resulting from this prescribed activity would be required pursuant to s 34A, and the Environmental Quality (Prescribed Activities)(Environmental Impact Assessment) Order 2015. If that is the case, Guidelines in relation to the decommissioning of chlor-alkali plants could be prescribed by the DG in order to ensure that the decommissioning of chlor-alkali plants conforms to the requirements of the Convention, especially with regards to the use of excess mercury. Apart from requiring a report on the environmental impact of the decommissioning of chlor-alkali plants, the DG is empowered to impose conditions attached to the approved Environmental Impact Assessment (EIA) Report, or to submit an additional report under s 34A(5) for the approval of the DG. The person carrying out the prescribed activity of the decommissioning of chlor-alkali plant, shall provide sufficient proof that the conditions attached to the report (with regards to its specific compliance to the Minamata Convention, and measures taken in accordance with the Convention) are being complied with and that the proposed measures to be taken to prevent, reduce or control the adverse impact on the environment are being incorporated into the design, construction and operation of the prescribed activity (s 34A(7).
• o EQ (Scheduled Wastes) Regulations 2005	Reg 2: Interpretation 'scheduled wastes' means any waste falling within the categories of waste listed in the 1st Sch. Reg 3: Notification of the generation of scheduled wastes (1): Every waste generator shall notify the DG of the new categories and quantities of scheduled wastes generated. Reg 4: Disposal of scheduled wastes (1): Scheduled wastes shall be disposed of at prescribed premises only (2): Scheduled wastes shall, as far as is practicable, be rendered innocuous prior to disposal Reg 5: Treatment of scheduled wastes (1): Scheduled wastes shall be treated at prescribed premises or at on-site treatment facilities only. (2): Residuals from treatment of scheduled wastes shall be treated or disposed of at prescribed premises Reg 6: Recovery of material or product from scheduled wastes (1): Recovery of material or product from scheduled wastes shall be done at prescribed premises or at on-site recovery facilities (2): Residuals from recovery of material or product from scheduled wastes shall be treated or disposed of at prescribed premises Reg 7: Application for special management of scheduled wastes (1): A waste generator may apply to the DG in writing to have the scheduled wastes generated from their particular facility or process excluded from being treated, disposed of or recovered in premises or facilities other than at the prescribed premises or on-site treatment or recovery facilities. Reg 8: Responsibility of waste generator (1) Every waste generator shall ensure that scheduled wastes generated by him are properly stored, treated on -site, recovered on-site for material or product from such scheduled wastes or delivered to and received at prescribed premises for treatment, disposal or recovery of material or product from scheduled wastes. (2) Every waste generator shall ensure that scheduled wastes that are subjected to movement or transfer be packaged, labelled and transported in accordance with the guidelines prescribed by the DG. Reg 9: Storage of scheduled wastes (1) Scheduled wastes shall be stored in containers which are compatible with the scheduled wastes to be stored, durable and which are able to prevent spillage or leakage of the scheduled wastes into the environment Reg 10: Labelling of scheduled wastes (1) The date when the scheduled wastes are first generated	

	name, address and telephone number of the waste generator shall be clearly labelled on the containers that are used to store the scheduled wastes Reg 11: Waste generator shall keep an inventory of scheduled wastes A waste generator shall keep accurate and up-to-date inventory in accordance with the 5th Sch of the categories and quantities of scheduled wastes being generated, treated and disposed of an of materials or product recovered from such scheduled wastes for a period up to 3 years from the date the scheduled wastes was generated Reg 12: Information to be provided by waste generator, contractor and occupier of prescribed premises (1) A waste generator, contractor and occupier of the prescribed premises shall provide information in accordance with the 6th Sch in the manner provided in this regulation or DG shall determine other method as he thinks fit Reg 13: Scheduled wastes transported outside waste generator's premises to be accompanied by information (1) Every waste generator shall provide information in accordance with the 7th Sch in respect of each category of scheduled wastes to be delivered to the contractor and shall give the Sch to the contractor upon delivery of the waste to him	
1st Sch (Reg 2)	SW 109 Waste containing mercury or its compound SW 110 Waste from electrical and electronic assemblies containing components such as accumulators, mercury-switches, glass from cathode-ray tubes and other activated glass or polychlorinated biphenyl-capacitors, or contaminated with cadmium, mercury, lead, nickel, chromium, copper, lithium, silver, manganese or polychlorinated biphenyl SW 401 Spent alkalis containing heavy metals	
Occupational Safety and Health Act 1994 (Act 514)	S 35: Power to prohibit the use of plant or substance (1) Notwithstanding any written law to the contrary, the DG may by order published in the *Gazette* prohibit the use of any plant or substance which in his opinion is likely to affect the safety and health of persons at work.	The control over the use of excess mercury from the decommissioning of chlor-alkali plants could then be exerted under s 35 of OSHA 1994, and thereby, complementing the control over the import of such excess mercury exercised under EQA 1974. However, excess mercury from the decommissioning of chlor-alkali plants is not yet a substance prohibited from use under OSHA 1994. In order to prohibit the use of excess mercury from the decommissioning of chlor-alkali plants, Reg 2, and the Sch of the Prohibition of Use of Substance Order 1999 would have to be amended.
• Occupational Safety and Health (Prohibition of Use of Substance) Order 1999	Reg 2: Prohibition of use of substance, listed in column (1) of the Schedule, from use to the extent as specified in column (2).	
Solid Waste and Public Cleansing Management Act 2007 (Act 672)	S 2: Interpretation "controlled solid waste" means any solid waste falling within any of the following categories: (a) commercial solid waste; (b) construction solid waste (c) household solid waste; (d) industrial solid waste; (e) institutional solid waste; (f) imported solid waste; (g) public solid waste; or (h) solid waste which may be prescribed from time to time 'solid waste' includes – (a) any scrap material or other unwanted surplus substance or rejected products arising from the application of any process; (b) any substance required to be disposed of as being broken, worn out, contaminated or otherwise spoiled; or (c) any other material that according to this Act or any other written law is required by the authority to be disposed of, but does not include scheduled wastes as prescribed under the Environmental Quality Act 1974 *[Act 127]*, sewage as defined	Excess mercury from the decommissioning of chlor-alkali plants could be considered solid waste, and could possibly fall within the meaning of 'controlled solid waste' under the Solid Waste and Public Cleansing Management Act 2007, within the waste category of either construction solid waste, industrial solid waste, or alternatively, a solid waste to be prescribed by way of regulations made under the Act. However, since waste containing mercury or its compound is already a scheduled waste as listed under the 1st Sch of the EQ (Scheduled Wastes) Regs 2005, in recognition of such explicit exclusion under the Solid Waste and Public Cleansing Management Act 2007, excess mercury from

	the Water Services Industry Act 2006 *[Act 655]* of radioactive waste as defined in the Atomic Energy Licensing Act 1984 *[Act 304]* Section 6(1)(b): The Director General (DG) shall formulate plans for solid waste management including, among others, the solid waste management schemes to supply controlled solid waste to the solid waste management facilities and the timescale for the implementation of the plans. Section 19(2)(b): If the DG decides to grant a licence (that might subsequently lead to a decommissioning of chlor-alkali plants that produces excess mercury) under section 19(1), he shall impose conditions pertaining to the types of controlled solid waste, the solid waste management facilities to which collected solid waste may be delivered to, and the requirement to deposit such amount as may be prescribed as security for safe closure of solid waste management facilities (paragraphs (d), (e), and (f) of subsection 19(3)).	the decommissioning of chlor-alkali plants, if intended by the Convention to be taken out of circulation, and should be treated as waste where the recovery, recycling, reclamation, direct re-use or alternative uses are absolute prohibited, could only be treated as 'waste' that falls under the jurisdiction of the EQA 1974, and could not possibly be deemed a 'solid waste' that could be prescribed as 'controlled solid waste' and to be subject to control as such, in accordance with the Solid Waste and Public Cleansing Management Act 2007.
• The prohibition of the export of mercury		
Customs Act 1967 (Act 235) · Customs (Prohibition of Exports) Order 2017 2nd Sch: Conditional prohibition except under export licence	S 31: Power of Minister to prohibit imports or exports (1) The Minister may, by order – (a) Prohibit the importation into, or the exportation from, Malaysia or any part thereof, either absolutely or conditionally, or from or to any specified country, territory or place outside Malaysia, or the removal from one place to another place in Malaysia of any goods or class of goods. Para 3. The exportation of goods specified in columns (2) and (3) of the 2nd Sch is prohibited, except under an export licence – (a) issued by the DG; (b) issued by the proper officer of customs appointed by the DG to act on his behalf at the ministry, department or statutory body specified in column (5) of the 2nd Sch; or (c) issued by the ministry, department or statutory body specified in column (5) of the 2nd Sch, and subject to such conditions specified in the export licence. Item No. 22, 2nd Sch: (The export of) Mercury (Hg) and mercury compounds covered under Minamata Convention on Mercury (to all countries). Substances are listed below: (1) Mercury (2805.40.00 00) (2) Amalgam (2843.90.00 00) (3) Inorganic or organic compounds of mercury, whether or not chemically defined, excluding amalgams (including mercury sulphate and mercury compounds of a kind used as lumino phores) (2852.10.10 00, 2852.10.20 00, 2852.10.90 00, 2852, 90.10 00, 2852.90.20 00, 2852.90.90 00) (4) Organo mercury compounds (2852.10.10 00, 2852.10.20 00, 2852.10.90 00, 2852.90.10 00, 2852.90.20 00, 2852.90.90 00) (5) Dental alloys containing mercury (3006.40.10 10) The ministry/department/statutory body issuing licence stipulated under column (5) is the Pharmaceutical Services Division, Ministry of Health	It is noted that amalgam (2843.90.00 00) and dental alloys containing mercury (3006.40.10 10) are provided under Art 4 on MAPs (part II, Annex A of the Minamata Convention). Some relevant scenarios provided by The Zero Mercury Working Group:[34] Scenario 1: Art 3.6.a Where an importer is a party to the Convention (assuming that Malaysia, the exporter, is a party to the Convention) (Art 3.6.a), the general rule is, mercury export is prohibited, unless the importer has provided the exporter its written consent; and that the export is for the purposes of a use allowed to the importer under Art 2.k; and for environmentally sound interim storage (Art 10). Scenario 2: Art 3.6.b Where an importer is a non-party where the exporter is a party (assuming Malaysia is the exporter, and also a party to the Convention), the general rule is, mercury and mercury compound export is prohibited. The exception to the general rule is when the non-party importer has provided the exporter its written consent, and certified that it has measures in place to ensure the protection of human health and the environment and to ensure its compliance with the provisions of storage (Art 10) and final disposal (Art 11); and that such mercury will be used only for a use allowed under the Convention or for environmentally sound interim storage (Art 10).

[34] Lennett, D., and Gutierrez, R., 2015. Minamata Convention on Mercury. Ratification and Implementation Manual. The Zero Mercury Working Group. http://www.zeromercury.org/phocadownload/Developments_at_UNEP_level/minamatamanual_eng_january%202015%20final.pdf

Poisons Act 1952 (Act 366)	S 15: Sale of poisons by wholesale (1) No poison shall be sold by wholesale except by a licensed wholesaler in accordance with the terms and conditions of his licence. (2) No poison shall be sold by a licensed wholesaler except to – (b) a purchaser outside Malaysia to whom such poison is to be immediately exported on sale. S 16: Sale of poisons by retail (1) Subject to s 18 no poison shall be sold by retail except by a person licensed to sell such poison by retail and in accordance with the terms and conditions of such licence. S 18: Restriction on the sale of Part I poisons generally. (1) Part I Poison shall not be sold or supplied to any person except – (d) to be exported to purchasers outside Malaysia.	Poisons Act 1952 provides explicitly for the regulation of the import of 'poisons', of which mercury and mercury compounds are listed under the Poisons List, but it does not provide for the export of mercury and mercury compounds. The obligation pertaining to the control over the 'sale' of poisons by wholesale and retail could possibly be invoked to allow an interpretation that extends to the export via the sale of mercury and mercury compounds to purchasers outside Malaysia (s 18(1)(d)).
Sales of Drugs Act 1952 (Act 368)	S 2: Interpretation 'drug' includes any substance, product or article intended to be used or capable, or purported or claimed to be capable, of being used on humans or any animal, whether internally or externally , for a medicinal purposes; 'medicinal purposes' means any of the following purposes: (a) alleviating, treating, curing or preventing a disease or a pathological condition or symptoms of a disease; (b) diagnosing a disease or ascertaining the existence, degree or extent of a physiological or pathological condition; (c) contraception; (d) inducing anaesthesia; (e) maintaining, modifying, preventing, restoring, or interfering with, the normal operation of a physiological function; (f) controlling of body weight; (g) general maintenance or promotion of health or well-being. 'sale' or 'sell' includes barter and exchange and also includes offering or attempting to sell or causing or allowing to be sold or exposing for sale or receiving or sending or delivering for sale of having in possession for sale or having in possession any drug knowing that the same is likely to be sold or offered or exposed for sale. S 26: Power to make regulations (1) The Minister may make regulations for any of the following purposes: (a) to prescribe the standard of strength, weight, quality, or quantity of any drug or of any ingredient or component part thereof; (b) to prohibit the addition of any specified thing or of more than the specified quantity or proportion thereof to any drug; (c) to prohibit any modes of manufacture, preparation, or preservation of any drug; (i) to prohibit or regulate the manufacture, sale, advertisement for sale, supply, importation or **exportation** of any articles of drugs and for this purpose to establish any body or authority; (j) to require all ingredients contained in any medicine, proprietary, secret or otherwise, to be disclosed in the prescribed manner and form and with the prescribed particulars at or prior to the sale thereof.	For the use of mercury and mercury compounds that falls under the definition of 'drugs', the Sales of Drugs Act 1952 could be invoked to prohibit the export of mercury and mercury compounds consistent with the requirements of the Convention.
The prohibition of the import of mercury without government consent, ensuring both the mercury source and proposed use are allowed under the Convention, governed by a comprehensive restriction on the export of mercury, with domestic measures that ensure that the imported mercury is managed in an environmentally sound manner (Art 3.9)		
Customs Act 1967 (Act 235)	S 31: Power of Minister to prohibit imports or exports (1) The Minister may, by order – (a) Prohibit the importation into, or the exportation from, Malaysia or any part thereof, either absolutely or conditionally, or from or to any specified country, territory or place outside Malaysia, or the removal from one place to another place in Malaysia of any goods or class of goods	It is noted that amalgam (2843.90.00 00) and dental alloys containing mercury (3006.40.10 10) are provided under Art 4 on MAPs (part II, Annex A of the Minamata Convention). A scenario on the import of mercury and mercury compounds is illustrated by The Zero Mercury Working Group:[35] Scenario 3: Art 3.8 Where exporter is a non-party and Malaysia, the importer, is a party (Art

[35] Lennett & Gutierrez (2015).

• Customs (Prohibition of Imports) Order 2017 Pt I, 2nd Sch: Conditional prohibition except under import licence	Para 3: Conditional prohibition except under import licence (1) The importation into Malaysia of goods specified in columns (2) and (3) of Pt I of the 2nd Sch, originating from the countries specified in column (4) of Pt I of the 2nd Sch is prohibited, except under an import licence – (a) issued by the Director General; or (b) issued by the proper officer of customs appointed by the Director General to act on his behalf at the ministry, department or statutory body as specified in column (5) of Pt I of the 2nd Sch, and subject to such conditions specified in the import licence. Part I, 2nd Sch: Item 11. Mercury (Hg) and mercury compounds covered under Minamata Convention on Mercury. Substances as listed below: 1. Mercury 2. Amalgam 3. Inorganic or organic compounds of mercury, whether or not chemically defined, excluding amalgams (including mercury sulphate and mercury compounds of a kind used as lumino phores) 4. Organo Mercury Compounds 5. Dental alloys containing mercury The ministry/department/statutory body issuing licence stipulated under column (5) is the Pharmaceutical Services Division, Ministry of Health.	3.8), the general rule is, the import of mercury is prohibited. However, the Convention allows for an exception if the non-party exporter has provided a certification that the mercury is not sourced from primary mercury mining that existed after the date of entry into force of the Convention for the importer who is a party to the Convention (Art. 3.3), nor was it from the decommissioning of chlor-alkali facilities (Art 3.5.b), and that the importer has provided its written consent under Art 3.7.
Poisons Act 1952 (Act 366)	S 2: Interpretation 'poison' means any substance specified by name in the 1st column of the Poisons List an Includes any preparation, solution, compound, mixture or natural substance containing such substance, other than an exempted preparation or an article or preparation included for the time being in the 2nd Sch. S 8: Control of imports of poisons (1) No person other than a person licensed under the Act in that behalf shall import any poison from any place outside Malaysia S 9: Packaging, labelling and storing of poisons (1) No person, whether licensed under the Act or not, shall knowingly sell, supply, keep or have in his possession or under his control or store any poison otherwise than in accordance with the regulations made under the Act and in force relating to the possession, containers, packaging, labelling or storing of such poison S 10: Transport of poisons No person shall transport or consign for transport any poison otherwise than in accordance with the regulations made under the Act S 11: Control of manufacture of preparations containing poison No preparation containing any poison shall be manufactured otherwise than in accordance with the regulations made under this Act. S 12: Control of compounding of poisons for use in medical treatment (2) No poison shall be dispensed, compounded or mixed with any other substance whether a poison or not otherwise than in accordance with any regulations made under the Act. S 13: Possession for sale of poison and sale of poison in contravention of the Act is an offence S 15: Sale of poisons by wholesale (1) No poison shall be sold by wholesale except by a licensed wholesaler in accordance with the terms and conditions of his licence. S 16. Sale of poisons by retail (1) Subject to s 18 no poison shall be sold by retail except by a person licensed to sell such poison by retail and in accordance with the terms and conditions of such licence. S 18: Restrictions on the sale of Part I poisons generally No preparation containing any poison shall be manufactured otherwise than in accordance with the regulations made under the Act S 19: Supply of poisons for the purpose of treatment by professional men (1) Any poison other than a Group A poison may be sold, supplied or administered by (a) a registered medical practitioner	The consent from the government for the import of mercury and mercury compounds falls within the purview of Poisons Act 1952. S 8 of the Act provides that no import of poison from any place outside Malaysia is allowed unless a licence under the Act has been obtained. The management of mercury and mercury compounds imported pursuant to the Poisons Act 1952 could be exercised through the imposition of specific requirements or conditions that ensure that such mercury and mercury compounds are managed in an environmentally sound manner, consistent with the obligations imposed under the Convention.

	(b) a registered dentist Division I (c) a veterinary officer (2) A registered dentist Division II may sell, supply or administer to his patient for the purposes of the dental treatment of such patient only, any poison other than a Group A or a Group B poison S 23: Group D poisons (1) Group D Poison shall not be sold or supplied by retail to any person except: (a) where the sale or supply of such poison, if it had been a Group C Poison, would have been authorised under or by virtue of s 22; or (b) by a licensed pharmacist to a person known personally to such pharmacist or introduced to the pharmacist personally by a person known personally to the pharmacist and when such poison is sold or supplied in accordance with s 23, and of any regulations made under the Act relating to such sale or supply. (2) Where any Group D Poison is sold to any person by a retailer otherwise than as a dispensed medicine or an ingredient in a dispensed medicine, the retailer shall not deliver it until – (a) he had made or caused to be made an entry in a book to be kept for such purpose in the prescribed form (referred to as the 'Poisons Book') S 26: Licences (1) The Director General of Health, or the Director of Pharmaceutical Services or the Director of Medical and Health Services of any State duly appointed in writing by the Director General of Health to be a Licensing Officer of any State or the Federal Territory may issue licences for the purposes of the Act (2) such licence may be – (b) a Type B licence issued to any person whom the Licensing Officer may consider to be a fit and proper person to hold such licence, or issued to a responsible officer of a company incorporated under the Companies Act 1965 (repealed by Companies Act 2016) to import, store and sell by wholesale such poisons (not being a Group A poison) as may be specified in such licence: Provided that no such licence shall be issued to any person or officer who is engaged or concerned in any business of selling goods by retail or shall continue valid at any time after such person or officer becomes so engaged or concerned. S 35: Regulations (1) The Minister may make regulations to carry out the purposes of this Act and, in particular, but without prejudice to the generality of the foregoing powers, may make regulations with respect to any of the following matters or for any of the following purposes: (a) the importation of poisons.	
• 1st Sch, Poisons List (s 2)	Mercury, for all preparations unless exempted are a Part I Poison (s 2) which falls under a Group D poison specified in the column of the Poisons List entitled 'Part I' of the 1st Sch. A 'Group D' Poison' respectively means a poison having the strength or otherwise coming within the description specified in the column of the Poisons List entitled Group D (s 2).	
Sales of Drugs Act 1952 (Act 368)	S 2: Interpretation 'drug' includes any substance, product or article intended to be used or capable, or purported or claimed to be capable, of being used on humans or any animal, whether internally or externally , for a medicinal purposes; 'medicinal purposes' means any of the following purposes: (a) alleviating, treating, curing or preventing a disease or a pathological condition or symptoms of a disease; (b) diagnosing a disease or ascertaining the existence, degree or extent of a physiological or pathological condition; (c) contraception; (d) inducing anaesthesia; (e) maintaining, modifying, preventing, restoring, or interfering with, the normal operation of a physiological function; (f) controlling of body weight; (g) general maintenance or promotion of health or well-being. 'sale' or 'sell' includes barter and exchange and also includes	For the use of mercury and mercury compounds that fall under the definition of 'drugs', the Sales of Drugs Act 1952 could be invoked in order to ensure that the mercury imported and used is managed in an environmentally sound manner consistent with the requirements of the Convention.

	offering or attempting to sell or causing or allowing to be sold or exposing for sale or receiving or sending or delivering for sale of having in possession for sale or having in possession any drug knowing that the same is likely to be sold or offered or exposed for sale. S 26: Power to make regulations (1) The Minister may make regulations for any of the following purposes: (a) to prescribe the standard of strength, weight, quality, or quantity of any drug or of any ingredient or component part thereof; (b) to prohibit the addition of any specified thing or of more than the specified quantity or proportion thereof to any drug; (c) to prohibit any modes of manufacture, preparation, or preservation of any drug; (d) to secure the cleanliness and freedom from contamination of any drug in the course of its manufacture, preparation, storage, packing, carriage delivery or exposure for sale or sale and the cleanliness of places, receptacles, appliances, and vehicles used in such manufacture, preparation, storage, packing, carriage or delivery exposure for sale or sale and to secure the proper conduct of places in which the preparation or sale of drugs is carried on and for these purposes to require any person to submit to a medical examination; (i) to prohibit or regulate the manufacture, sale, advertisement for sale, supply, importation or exportation of any articles of drugs and for this purpose to establish any body or authority; (j) to require all ingredients contained in any medicine, proprietary, secret or otherwise, to be disclosed in the prescribed manner and form and with the prescribe ed particulars at or prior to the sale thereof.	
• Control of Drugs and Cosmetics Regulations 1984	Reg 2: Interpretation 'cosmetic' means any substance or preparation intended to be placed in contact with the various external parts of the human body (including epidermis, hair system, nails, lips and external genital organs) or with the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them, perfuming them, changing their appearance or correcting body odours, protecting them or keeping them in good condition; 'drug' has the meaning assigned to it under the Ordinance [which should now be the Sales of Drugs Act 1952] but does not include a herbal remedy; 'product' means – (a) a drug in a dosage unit or otherwise, for use wholly or mainly by being administered to one or more human beings or animals for a medicinal purpose; or (b) a drug to be used as an ingredient of a preparation for a medicinal purpose. Reg 7. Prohibition against manufacture, sale, supply, importation, possession and administration (1) Except as otherwise provided in these Regulations, no person shall manufacture, sell, supply, import, possess or administer any product unless – (a) the product is a registered product; and (b) the person holds the appropriate licence required and issued under these Regulations Reg 7A: Prohibition regarding traditional medicine No person shall manufacture, sell, supply, import, possess or administer any traditional medicine which contains any substance as set out in Table II to the Schedule Table II (Reg 7A) The following substances are prohibited in traditional medicine: Item 4: Poison within the meaning of the Poisons Act 1952 Reg 12: Licences (1) The Director of Pharmaceutical Services may issue any of the following licences subject to such conditions as he may impose: (d) an import licence in Form 5 in the Sch, authorising the licensee to **import and sell** by wholesale or supply the registered products from the address of the premises specified in the licence	Although the Sales of Drugs Act 1952 empowers the Minister to make regulations pertaining to both the import and export of articles of drugs, the Control of Drugs and Cosmetics Regulations 1984 provides specifically for the prohibition against manufacture, sale, supply, importation, possession and administration of 'product', but does not mention anything relating to the exportation of such 'product' (whereby a 'product' could be read to include mercury and mercury compounds that would be used as an ingredient in a preparation for a medicinal purpose).

Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of public service and whose powers, duties and functions shall be – (d) to control by the issue of licences the volume, types, constituents and effects of wastes, discharges, emissions, deposits or other sources of emission and substances which are of danger or a potential danger to the quality of the environment or any segment of the environment.	S 3 of the EQA 1974 provides the power of the DG and other officers, to control the volume, types, constituents and effects of wastes, discharges, emissions, deposits or other sources of emission and substances which are of danger or of a potential danger to the quality of the environment or any segment of the environment, which includes the adverse effects posed by mercury contamination to public health and the environment, through the issuance of licence where provisions that ensure the environmentally sound management of mercury and mercury compounds envisioned under the Convention could be directly prescribed in the licence issued.
Occupational Safety and Health Act 1994 (Act 514)	S 21. General duties of manufactures, etc. as regards substances for use at work (1) It shall be the duty of a person who formulates, manufactures, imports or supplies any substance for use at work – (a) to ensure that the substance is safe and without risks to health when properly used; (b) to carry out or arrange for the carrying out of such testing and examination as may be necessary for the performance of the duty imposed on him by paragraph (a) (c) to take such steps as are necessary to ensure that there will be available in connection with the use of the substance at work adequate information about the results of any relevant test which has been carried out on or in connection with the substance and about any condition necessary to ensure that it will be safe and without risks to health when properly used. S 35: Power to prohibit the use of plant or substance (1) The DG may by order published in the Gazette prohibit the use of any plant or substance which in his opinion is likely to affect the safety and health of persons at work S 66: Regulations (1) The Minister may make regulation for or with respect to the safety, health and welfare of persons at work in order to achieve the objects of the Act (2) Such regulations may – (a) regulate or prohibit – (i) the manufacture, supply, storage, transport or use of any substance; and (iii) the carrying on of any process or the carrying out of any operation; (u) prescribe any other matter which may appear to the Minister to be expedient or necessary for the better carrying out of the Act	Additional burden imposed onto the manufacturers to ensure that the substances used at the workplace are safe and without risks to health by virtue of OSHA 1994 where s 21 could be deemed to be a domestic measure that enables the management of mercury and mercury compounds in an environmentally sound manner consistent with the tenets of the Convention. If mercury is determined to be a substance that might pose risk to the health and safety of the workplace, this provision would obliged the manufacturers to take all steps as are necessary, consistent with the Convention in ensuring that imported mercury is managed in an environmentally sound manner as imposed under s 21.
· Occupational Safety and Health (Prohibition of Use of Substance) Order 1999	Reg 2: Prohibition of use of substance, listed in column (1) of the Schedule, from use to the extent as specified in column (2).	
· Guidelines on Storage of Hazardous Chemicals: A Guide for Safe Warehousing of Packaged Hazardous Chemicals (DOSH, 2005)	Para 6.5 Outdoor Storage Where hazardous chemicals are stored outdoors, bunding arrangements should be identical to those for indoor storage and a roof or a cover to protect from sun and rain should be provided. This poses a number of problems: · Outdoor storage of chemicals exposes the chemicals to high temperatures that may lead to thermal degradation. Careful selection of chemicals with the help of their Chemical Safety data Sheet would be therefore important. · To avoid contamination of the soil and the water table, the storage area should be surfaced with impervious, heat and water-resistant material, avoiding asphalt because it softens in hot climates and under the influence of certain solvents; · The bunded area must be equipped with a drain controlled by a valve. · Products stored in this manner must be scrupulously checked for leakage so as to avoid contamination of the drainage system. Weatherproof packs such as 200 litre drums may be stored in	

	the open provided their contents are not sensitive to extremes of temperature and security can be guaranteed. Drum storage upright on pallets is recommended. Drums stored on the roll must be wedged. All drums must be stored in such a way that there is always sufficient space for fire- fighting access. With certain materials such as highly flammable liquids, gas cylinders or liquid chlorine, outdoor storage is recommended.	
Industrial Co-Ordination Act 1975 (Act 156)	'manufacturing activity' with its grammatical variations and cognate expressions means the making, altering, blending, ornamenting, finishing or otherwise treating or adapting any article or substance with a view to its use, sale, transport, delivery or disposal and includes the assembly of parts and ship repairing but shall not include any activity normally associated with retail or wholesale trade; 'product' means any article, thing, substance or service produced as a result of any manufacturing activity and includes a range of products. S 3(1): No person shall engage in any manufacturing activity unless he is issued a licence in respect of such manufacturing activity.	The issuance of licence in respect of manufacturing activities that could fall within the purview of the Convention shall provide for the management of mercury and mercury compounds in an environmentally sound manner in accordance with the requirements stipulated under the Convention.
Malaysian Quarantine and Inspection Services Act 2011 (Act 728)	Preamble: 'soil' S 3: 'contaminant'; 'export'; 'import'; 'soil' 'contaminant' means any foreign, extraneous, toxic, noxious or harmful substance that is contained or present in or on any plant, animal, carcass, fish and agricultural produce including metal, microorganism and its toxin, drug residue, pesticide residue, radioactive residue or any chemical residue prohibited or permissible at a level specified in the relevant written laws; 'export' means to take or cause to be taken out of Malaysia by land, sea, inland waters or air any plant, animal, carcass, fish, agricultural produce, soil, microorganism, or food; 'import' means to bring or cause to be brought into Malaysia by land, sea, inland waters or air any plant, animal, carcass, fish, agricultural produce, soil, microorganism, or food; 'soil' includes earth, ground or other **naturally occurring or processed organic and mineral material.** S9(a): The DG shall have the powers to quarantine and inspect any … soil … or any other article at the entry points, quarantine stations and quarantine premises for the purpose of determining whether …. contaminant is present and to ensure compliance of any … soil … with the import and export conditions as specified in the permit, licence or certificate issued under this Act. S 9(e), (f): The DG shall have the powers to register all importers, exporters and agents involved in the import and export of … soils, and to issue permits, licences and certificates for the purpose of the import and export of … soils. S 49: Regulations (1) The Minister may make regulations, excluding matters relating to food, as are necessary or expedient to give full effect to or for carrying out the provisions of this Act. (2) Without prejudice to the generality of subs (1), regulations may be made for the following purposes: (a) to prescribe all matters relating to quarantine and inspection; (c) to prescribe all matters relating to permits, licences and certificates.	The Minister may make regulations that stipulates 'mercury' and 'mercury compounds' as a contaminant, which could possibly present in 'soil', where the Act could be applicable in quarantining and inspecting such 'soil'. It is noted that the definition of 'contaminant' could be specifically provided in a Regulation to include 'mercury and mercury compounds' to which this Act could be made applicable. The 2011 Act would be useful in ensuring that the import or export of 'soil' that might contain mercury and mercury compounds subjected to the provisions of the Convention did comply with the Convention. In addition, the power of the DG to quarantine and inspect any soil, or any other article to determine whether contaminant is present, could inform the country whether a certain trade of such 'soil' (which might contain mercury compounds that have not already been provided under Art 3 for which is not otherwise provided under the Convention), would compromise the objective of the Convention, and where its listing in an additional annex pursuant to Art 3.13 would be deemed necessary.
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):		
It is crucial for the country planning for the ratification of the Minamata Convention to take a look at what are the information the country has or needs, in terms of capacity and governing institution with regards to the production, export or import of mercury and mercury compounds under the Convention (Art 3.1.b) from any of the supply sources covered by the Convention. The primary concern is the lack of institutional arrangements in enabling a comprehensive development of the required information for the identification of the sources and trade of mercury and mercury compounds, where sources of information on sources, stockpiles, and trade could be found in multiple institutions (e.g. the Department of Environment, the Department of Occupational Safety and Health, the Poisons Board, the Pesticides Board and etc in limited form), which might encumber the country's effort in fulfilling obligations in compliance with the Convention. In isolated parts and on its own, the country has the necessary legislative measures to satisfy in parts, the obligations stipulated under Art 3 on mercury supply sources and trade of the Convention, although inconsistency within and between each institutions limited by their establishing legislations complicates a synergistic implementation of obligations stipulated under the Convention.		

[36] It is noted that there is some discrepancy in the definition of 'contaminant' where 'metal' is stated instead of 'soil'.

Article 4 – Mercury-added products

Description of article:

Manufacture, import or export of mercury-added products listed in Part I of Annex A is not allowed by taking appropriate measures. Or alternatively, indicate that it will implement different measures or strategies to address products listed in Part I of Annex A, as long as they can demonstrate that it has already reduce the manufacture, import, and export of the large majority of the products listed in Part I of Annex A to a de minimis level, and that it has implemented measures or strategies, in accordance with Article 4(2)(a)-(d) to reduce the use of mercury in additional products not listed in Part I of Annex A. Party shall take measures set out for mercury-added products listed in Part II of Annex A. Party shall take measures to prevent mercury-added products where the manufacture, import and export of which are not allowed for under Article 4 to be incorporated into assembled products. The manufacture and the distribution in commerce of mercury-added products that are not covered by any known use prior to the date of the entry into force of the Convention shall be discouraged, unless an assessment of the risks and benefits of the product demonstrates environmental or human health benefits. Such information shall be provided to the Secretariat, who would then make the information publicly available.

Succinct summary of provisions relevant to the country in question:

- The manufacture, import or export of mercury-added products listed in Part I of Annex A shall not be allowed, unless exclusion is specified in Annex A, or an exemption pursuant to Article 6 is registered.
  - Batteries (2020)
  - Switches and relays (2020)
  - Compact Fluorescent lamps (CFLs) (2020)
  - Linear fluorescent lamps (LFLs) (2020)
  - High pressure mercury vapour lamps (HPMV) (2020)
  - Mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps (CCFL and EEFL) (2020)
  - Cosmetics (with mercury content above 1 ppm) (2020)
  - Pesticides, biocides and topical antiseptics (2020)
- Barometers, hygrometers, manometers, thermometers, and sphygmomanometers (2020)
- Alternative methods to Article 4(1) to address products listed in Part I of Annex A if the large majority of the manufacture, import and export of a products is already reduced to a de minimis level
- Undertake measures to address dental amalgam listed under Part II of Article 4(3)
- Take measures to prevent the incorporation of mercury-added products where the manufacture, import and export of which are not allowed under Article 4 into assembled products
- Discourage the manufacture and the distribution in commerce of (new) mercury-added products unless an assessment of the risks and benefits of the product demonstrates environmental or human health benefits

Policy and regulatory measures in place that enable the country to comply with the above listed provisions:

Title and reference number of relevant Policy and Regulatory Measure, as well as date	Relevant provisions	Remarks
• No manufacture, import or export of mercury-added products listed in Part I of Annex A		
Industrial Co-Ordination Act 1975 (Act 156)	S 3(1): No person shall engage in any manufacturing activity unless he is issued a licence in respect of such manufacturing activity	No person shall be issued a licence under s 3(1) for manufacturing activities that manufacture mercury-added products listed in Part I of Annex A of the Minamata Convention after the phase-out date specified for those products, unless an exclusion is specified in Annex A or the Party has a registered exemption pursuant to Art 6 (Art 4.1)
Pesticides Act 1974 (Act 149) Pesticides, biocides (2020)	S 2: Interpretation 'Active ingredient', defined to mean an ingredient, as listed in the 1st Sch, which has pesticidal properties and gives pesticidal properties to a substance, material, preparation or mixture, of which the ingredient is one of the constituents of the substance, material, preparation or mixture S 7: Application for registration of pesticides (1) Any person desiring to import or manufacture a pesticide shall apply to the Pesticides Board in the prescribed manner for registration of the pesticide S 13. Prohibition as to importation and manufacture, and penalty (1) Except as provided in sections 14 and 14A, no person shall import or manufacture – (c) a pesticide otherwise than in accordance with the conditions subject to which it was registered on his application S 14: Importation of pesticides for educational or research	Specific prohibition that prohibits the use of mercury and mercury compounds as active ingredients in the manufacturing of pesticides, and an explicit prohibition of the import and export of pesticides that contain mercury and mercury compounds as active ingredients should be issued by the Pesticides Board. An administrative practice that declines or rejects the issuance of licence, on an ad hoc basis, upon application, would not be sufficient to establish a legal and formal prohibition against the manufacture, importation and exportation of mercury-added pesticides in the satisfaction of

	purposes or as registration sample or analytical standard (1) A licence to import pesticides for educational or research purposes or as registration sample or an analytical standard may be issued by the Pesticides Board (corresponding to Article 3(2)(a) of the Minamata Convention, which provides that Article 3 does not apply to quantities of mercury or mercury compounds to be used for laboratory-scale research or as a reference standard) S 14A: Research or experiment on unregistered pesticides synthesised in Malaysia (1) A person desiring to carry out any research or experiment outside the laboratory on an unregistered pesticide synthesised in Malaysia shall apply to the Pesticides Board for a permit to carry out the research or experiment S 15: Licence to manufacture pesticides S 20: Offences relating to manufacture, sale and storage for sale (2) No person shall manufacture, sell, or store for sale a pesticide unless he is licensed to do so under the Act or otherwise than in accordance with the conditions of a licence to do so issued to him under the Act. S 57: Rules and regulations (1) The Minister may, after consulting the Board, make rules or regulations to – (oa) regulate the export of pesticides	the obligation stipulated under the Convention.
Poisons Act 1952 (Act 366) Cosmetics (with mercury content above 1 ppm) (2020) Topical antiseptics (with mercury content more than 0.5 ppm) (2020)	S 8: Control of imports of poisons (1) No person other than a person licensed under the Act in that behalf shall import any poison from any place outside Malaysia S 9: Packaging, labelling and storing of poisons (1) No person, whether licensed under the Act or not, shall knowingly sell, supply, keep or have in his possession or under his control or store any poison otherwise than in accordance with the regulations made under the Act and in force relating to the possession, containers, packaging, labelling or storing of such poison S 11: Control of manufacture of preparations containing poison S 18: Restrictions on the sale of Part I poisons generally No preparation containing any poison shall be manufactured otherwise than in accordance with the regulations made under the Act	It is noted that the Poisons Act 1952 does not provide for the regulation of the export of poisons for all preparations, where it poses a lacuna in which the obligation to control and in specified circumstances, to prohibit the manufacturing, import and export of listed MAPs as stipulated under the Convention, could not be implemented. In reference to the exemptions laid out under the Poisons Lists, topical antiseptics with mercury content that is more than 0.5 ppm would fall under the jurisdictional scope of Poisons Act 1952. However, for topical antiseptics with mercury content that is not more than 0.5 ppm, such product would fall under the jurisdictional scope of the Control of Drugs and Cosmetic Regulations 1984. Same wise, cosmetics above 1ppm would fall under the jurisdiction of the Poisons Act 1952, and anything less, would be within the jurisdiction of the 1984 Regs.
• 1st Sch, Poisons List (s 2)	Mercury, for all preparations unless exempted are a Part I Poison (s 2) which falls under a Group D poison specified in the column of the Poisons List entitled 'Part I' of the 1st Sch. A 'Group D' Poison' respectively means a poison having the strength or otherwise coming within the description specified in the column of the Poisons List entitled Group D (s 2). Exemption: (1) Cosmetic which is notified under the Control of Drugs and Cosmetics Regulations 1984 containing not more than 1 ppm of mercury calculated as the metal; (2) Product which is registered under the Control of Drugs and Cosmetics Regulations 1984 containing not more than 0.5 ppm of mercury calculated as the metal.	
Sales of Drugs Act 1952 (Act 268)	S 2: Interpretation 'Drug' includes any substance, product or article intended to be used or capable, or purported or claimed to be capable, of being used on humans or any animal, whether internally or externally, for a medicinal purposes; 'Medicinal purpose' means any of the following purposes: (a) alleviating, treating, curing or preventing a disease or a pathological condition or symptoms of a disease; (b) diagnosing a disease or ascertaining the existence, degree or extent of a physiological or pathological condition; (c) contraception; (d) inducing anaesthesia; (e) maintaining, modifying, preventing, restoring, or interfering with, the normal operation of a physiological function; (f) controlling body weight; (g) general maintenance or promotion of health or well-being;	

	'Sale' or 'sell' includes barter and exchange and also includes offering or attempting to sell or causing or allowing to be sold or exposing for sale or receiving or sending or delivering for sale or having in possession for sale or having in possession any drug knowing that the same is likely to be sold or offered or exposed for sale. s 10: Offence and penalty (1) Any person commits an offence who sells – (c) any drug containing any substance the addition of which is prohibited. s 26: Power to make regs (1) The Minister may make regulations for any of the following purposes: (a) to prescribe the standard of strength, weight, quality, or quantity of any drug or of any ingredient or component part thereof; (b) to prohibit the addition of any specified thing or of more than the specified quantity or proportion thereof to any drug; (c) to prohibit any modes of manufacture, preparation, or preservation of any drug; (i) to prohibit or regulate the manufacture, sale, advertisement for sale, supply, importation or exportation of any articles of drugs and for this purpose to establish any body or authority; (j) to require all ingredients contained in any medicine, proprietary, secret or otherwise, to be disclosed in the prescribed manner and form and with the prescribed particulars at or prior to the sale thereof.	
• Control of Drugs and Cosmetics Regulations 1984 Cosmetics (with mercury content not more than 1 ppm) (2020) Topical antiseptics (with mercury content not more than 0.5 ppm) (2020)	Reg 2: Interpretation 'Cosmetic' means any substance or preparation intended to be placed in contact with the various external parts of the human body (including epidermis, hair system, nails, lips and external genital organs) or with the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them, perfuming them, changing their appearance or correcting body odours, protecting them or keeping them in good condition; 'Drug' has the meaning assigned to it in the [Act] but does not include a herbal remedy; 'Herbal remedy' means any drug consisting of a substance or a mixture of substances produced by drying, crushing or comminuting, but without subjecting to any other process, a natural substance or substances of plant, animal or mineral origin, or any part of such substance or substances; 'Homeopathic medicine' means any pharmaceutical dosage form used in the homeopathic therapeutic system in which diseases are treated by the use of minute amounts of such substances which are capable of producing in healthy persons symptoms similar to those of the disease being treated; 'Indigenous medicine' means a system of treatment and prevention of disease established through traditional use of naturally occurring substances; 'Manufacture', in relation to any product includes – (a) the making or assembling of the product; (b) the enclosing or packing of the product in any container in a form suitable for administration or application, and the labelling of the container; and (c) the carrying out of any process in the course of any of the foregoing activities; 'Product' means – (a) a drug in a dosage unit or otherwise, for use wholly or mainly by being administered to one or more human beings or animals for a medicinal purpose; or (b) a drug to be used as an ingredient of a preparation for a medicinal purpose; 'Product variant' means a product which is within a range of cosmetics produced by the same manufacturer that are similar in composition and are intended for the same use but are available in different colours, fragrance or flavours; 'Traditional medicine' means any product used in the practice of indigenous medicine, in which the drug consist solely of one or more naturally occurring substances of a plant, animal or mineral, of parts thereof, in the unextracted or crude extract form, and a homeopathic medicine.	It is observed that exemptions from the prohibition imposed on persons who manufacture, sell, supply, import, possess, or administer any cosmetic unless the cosmetic is a notified cosmetic is provided under Reg 18A(3)(b) for persons who manufacture any cosmetic for the purpose of export only or for assessing the market acceptance if a written approval with or without conditions is issued by the Director of Pharmaceutical Services; or as provided under Reg 18A(3)(c) for persons who imports any cosmetic for (i) assessing the market acceptance; (ii) to be assembled, enclosed, packed or labelled for the sole purpose of re-exporting; or (iv) to be sold or supplied in the free-trade zone or international carriage by ships, aircrafts or other forms of international public transport entering or leaving Malaysia, if a written approval with or without conditions is issued by the Director of Pharmaceutical Services. The Director of Pharmaceutical Services, prior to exercising his or her power to issue a written approval under these Regs, should bear in mind the prohibition imposed on the manufacture, import and export of mercury-added products, including cosmetics with mercury content above 1 ppm. However, it is noted that the exemption from the application of the Poisons Act 1952 only applies to cosmetics which are notified under the Control of Drugs and Cosmetics Regs 1984 containing not more than 1 ppm of mercury calculated as the metal, or products which are registered under the Control of Drugs and Cosmetics Regs 1984 containing not more than 0.5 ppm of mercury calculated as the metal.

	Reg 7: Prohibition against manufacture, sale, supply, importation, possession and administration (1) Except as otherwise provided in these Regulations, no person shall manufacture, sell, supply, import, possess or administer any product unless – (a) the product is a registered product; and (b) the person holds the appropriate licence required and issued under these Regulations Reg 7A: Prohibition regarding traditional medicine No person shall manufacture, sell, supply, import, possess or administer any traditional medicine which contains any substance as set out in Table II to the Schedule Table II (Reg 7A) The following substances are prohibited in traditional medicine: Item 4: Poison within the meaning of the Poisons Act 1952 Reg 10: Declaration relating to imported product or cosmetic (1) The Authority may, in the case of an imported product, require any person applying for the registration of the imported product to furnish a written declaration made by or on behalf of the manufacturer of the imported product that all requirement governing the manufacture of the product imposed by the law of the country of manufacture have been complied with. Reg 12: Licences (1) The Director of Pharmaceutical Services may issue any of the following licences subject to such conditions as he may impose: (d) an import licence in Form 5 in the Sch, authorising the licensee to import and sell by wholesale or supply the registered products from the address of the premises specified in the licence. Reg 18A: Prohibition to manufacture, sell, supply, import, possess or administer cosmetic (1) No person shall manufacture, sell, supply, import, possess or administer any cosmetic – (a) unless the cosmetic is a notified cosmetic (2) For the purpose of subreg (1), 'notified cosmetic' means a cosmetic as specified in the notification note issued by the Director of Pharmaceutical Services, in the manner as he deems fit. (3) The provisions of subreg (1) do not apply to any person – (b) who manufactures any cosmetic for the purpose of export only or for assessing the market acceptance if a written approval with or without conditions is issued by the Director of Pharmaceutical Services; or (c) who imports any cosmetic – (i) for assessing the market acceptance; (ii) to be assembled, enclosed, packed or labelled for the sole purpose of re-exporting; (iii) in transit; or (iv) to be sold or supplied in the free-trade zone or international carriage by ships, aircrafts or other forms of international public transport entering or leaving Malaysia, if a written approval with or without conditions is issued by the Director of Pharmaceutical Services. (3A) In addition to subreg (3), para (1)(b) does not apply to the administration, possession, and sale or supply of any notified cosmetic.	If the cosmetics or products contain mercury above the threshold stipulated under the Poisons Act 1952, the Control of Drugs and Cosmetics Regs 1984 would cease to be applicable for such cosmetics and products, and control would be re-asserted via the application of the Poisons Act 1952. From the reading of both the Poisons Act 1952, and the Control of Drugs and Cosmetics Regulations 1984, it appears that cosmetics with mercury content above 1 ppm, and products with mercury content above 0.5 ppm would fall under the jurisdictional scope of Poisons Act 1952, as the threshold governed under the 1984 Regs for cosmetics (especially) are too low to trigger the prohibition imposed under the Convention. Since no limits or threshold of mercury content is prescribed for topical antiseptic, it is assumed that topical antiseptic with mercury content of 0.5 and above would be regulated by Poisons Act 1952 whereby topical antiseptic with mercury content of less than 0.5 would be regulated by the 1984 Regs.
Consumer Protection Act 1999 (Act 599)	S 2: Interpretation 'consumer' means a person who – (a) acquires or uses goods or services of a kind ordinarily acquired for personal, domestic or household purpose, use or consumption; and (b) does not acquire or use the goods or services, or hold himself out as acquiring or using the goods or services, primarily for the purpose of – (i) resupplying them in trade; (ii) consuming them in the course of a manufacturing process; or (ii) in the case of goods, repairing or treating, in trade, other goods or fixtures on land. S. 19: Safety standards (1) The Minister may by regulations prescribe the safety standards in respect of –	The Consumer Protection Act 1999 has a limited scope with regards to the regulation and control over the manufacture, import and export of mercury-added products where the protection stipulated under the Act is intended for 'consumers'. The limited protection accorded to just consumers under the Act would not be sufficiently comprehensive to enable the phasing out and phasing down of the manufacture, import and export of MAPs listed under Parts I and II of Annex A of the Convention. The limitation of scope could also be observed, in view of the primary

	a) any goods or class of goods And may prescribe different safety standards for different goods or services, or classes of goods or services (2) The safety standard in relation to goods may relate to any or all of the following matters: (a) the performance, composition, contents, manufacture, processing, design, construction, finish or packaging of the goods S 20: compliance with safety standards No person shall supply, or offer to or advertise for supply, any goods or services which do not comply with the safety standards determined under s 19 S 23: Prohibition against unsafe goods and services (1) The Minister may, on the recommendation of the Controller, by order published in the Gazette, declare any goods or any class of goods to be prohibited goods … where the goods or goods of that class … have caused or are likely to cause injury to any person or property or is otherwise unsafe S 24: Prohibition of importation of goods or services The **importation** of any goods or services or any class of goods or services which do not comply with the provisions of this Part is prohibited.	objective of the Act is to protect consumers (in the country) in Part III of the Act in general, and s 24 in particular where s 24 provides for the prohibition of the importation of goods or any class of goods which do not comply with the safety standards stipulated under Part III of the Act, where the exportation of such goods is not envisioned by the Act.
Medical Device Act 2012 (Act 737) Thermometers (2020) Sphygmomanometers (2020) Dental amalgam (phasing down)	S 2: Interpretation 'medical device' means – (a) any instrument, apparatus, implement, machine, appliance, implant, *in-vitro* reagent or calibrator, software, material or other similar or related article intended by the manufacturer to be used, alone or in combination, for human beings for the purpose of – (i) diagnosis, prevention, monitoring, treatment or alleviation of disease; (ii) diagnosis, monitoring, treatment, alleviation of or compensation for an injury; (iii) investigation, replacement or modification, or support of the anatomy or of a physiological process; (iv) support or sustaining life; (v) control of conception; (vi) disinfection of medical device; or (vii) providing information for medical or diagnostic purpose by means of *in-vitro* examination of specimens derived from the human body, which does not achieve its primary intended action in or on the human body by pharmacological, immunological or metabolic means, but that may be assisted in its intended function by such means; and (b) any instrument, apparatus, implement, machine, appliance, implant, *in-vitro* reagent or calibrator, software, material or other similar or related article, to be used on the human body, which the Minister may, after taking into consideration issues of public safety, public health or public risk, declare to be a medical device by order published in the *Gazette*. 'designated medical device' means a medical device specified by the Minister to be a designated medical device by order published in the *Gazette*. 'establishment; means – (a) a person who is either a manufacturer, importer, or distributor who is responsible for placing any medical device in the market but does not include a retailer; and (b) an authorised representative appointed by a manufacturer having a principal place of business outside Malaysia, and such person and authorised representative being – (A) a person domiciled or resident in Malaysia; or (B) a firm or company constituted under the laws of Malaysia. and carrying on business or practice principally in Malaysia. S 4: Manufacturer's obligations A manufacturer shall ensure that a medical device – (a) conforms to the prescribed essential principles of safety and performance (b) is manufactured in accordance with good manufacturing	S 77 of the Medical Device Act 2012 laid out the power of the Minister to exempt any person or medical device from any of the provisions of this Act or any regulations made under this Act for such duration and subject to such conditions as the Minister may specify and he may alter or add the conditions so specified, by order published in the Gazette, if he considers it consistent with the purposes of this Act or in the interest of public health and safety. However, for mercury-added products listed in Part I of Annex A of Minamata Convention, exemptions shall not be granted after the phase-out date specified for those products, except where exclusion is specified in Annex A or the Party has a registered exemption pursuant to Art 6 of the Convention. If the order for such exemption is in place, the order shall be revoked by order published in the Gazette in order to be in accordance with Art 4.1 of the Convention. In order to ensure that mercury-added products that are listed in Part I of Annex A are phased out accordingly, the Minister should specify in an Order that no establishment licence would be issued by the Authority under s 16, and no medical device permit shall be issued by the Authority under s 28, for designated medical devices that are listed under Part I of Annex A after the date after which the manufacture, import or export of the product shall not be allowed as stipulated under the Convention.

	practice and any written directive issued by the Authority S 5: Requirement for registration of medical device (1) No medical device shall be imported, exported or placed in the market unless the medical device is registered under the Act. S 15: Requirement for establishment licence (1) No establishment shall import, export or place in the market any registered medical device unless it holds an establishment licence granted under this Act. S 16: Application for establishment licence (1) An establishment may apply for an establishment licence to be granted under this Act by submitting a written application to the Authority in the prescribed manner. S 26: Designated medical device The Minister may, from time to time, after taking into consideration the risk level of a medical device, the exposure of medical device to public health, patient safety and the degree of complexities of the medical device, specify a medical device to be a designated medical device by an order published in the *Gazette*. S 27: Requirement for designated medical device permit (1) No person shall use or operate any designated medical device unless the person holds a designated medical device permit granted under this Act. S 28: Application for designated medical device permit (1) A person may apply for a designated medical device permit to be granted under this Act by submitting a written application to the Authority in the prescribed manner. S 37: Distribution records (1) An establishment shall maintain a distribution record in respect of each medical device manufactured, imported, exported and placed in the market. (2) The distribution record shall contain information as prescribed by the Minister. (3) An establishment shall provide the distribution records to the Authority upon request. S 43: Usage, operation, maintenance, etc., of medical device (1) A person using or operating a medical device on a third party shall ensure that the medical device is – (a) safe and efficacious; (b) used in accordance with the manufacturer's instructions; and (d) properly installed, tested, commissioned and maintained. (2) A person – (a) using or operating a medical device on a third party; or (b) installing, testing, commissioning, maintaining and disposing of a medical device, shall have the qualification and competency as prescribed by the Minister. S 45: Export permit (1) An establishment may apply to the Authority for a permit to export a registered medical device in the prescribed form and accompanied by the prescribed fees S 79. Regulations (1) The Ministers may make such regulations as may be expedient or necessary for the better carrying out of the provisions of the Act (2) Regulations may be made for the purposes of: (c) to prescribe the design and manufacturing principles of medical devices, the good design principles in relation to risk elimination and minimisation, and the good manufacturing principles in relation to standards, safety and efficacy of medical devices (e) to prescribe procedures and criteria for conformity assessment of medical devices; (f) to prescribe procedures and criteria for conformity assessment standards for various class or categories of medical devices (l) to prescribe matters relating to export permits including the criteria, conditions and the procedure for the application of export permits of medical devices (m) to prescribe the competency requirement of persons using, operating, installing, testing, commissioning, maintain and disposing of medical devices	

Medical Device Authority Act 2012 (Act 738)	S 12. Functions and powers of the Authority (1) The Authority shall have all the functions and powers imposed on it under the medical device laws and shall also have the following functions: (b) to regulate all matters relating to medical device and the medical device industry and its activities	The Authority shall have the function and power to ensure that the manufacture, import and export of MAPs listed under Part I of Annex A of the Minamata Convention shall not be allowed after the date specified under the Annex.
Environmental Quality Act 1974 (Act 127)	S 30: Power to prohibit use of any material or equipment The Minister after consultation with the Council may be order published in the Gazette – (a) prohibit the use of any materials for any process, trade or industry ... within the areas specified in the order S 30A: Power to control use of substance and product and to state environmental labelling (1) The Minister, after consultation with the Council, may by order published in the Gazette – (a) prescribe any substance as an environmentally hazardous substance which requires the substance to be reduced, recycled, recovered or regulated in the manner as specified in the order. S 33: Power to prohibit or control licenced persons from discharging, *etc.* of wastes in certain circumstances (1) Where several persons are licensed under this Act to emit, discharge or deposit environmentally hazardous substances, pollutants or wastes into the same segment or element of environment and appears to the DG that each of such persons is complying with the conditions of the licence but nevertheless the collective effect of the aggregate of such wastes is likely to cause a worsening of condition in that segment or element of the environment such as to affect the health, welfare or safety of human beings, or to threaten the existence of any animals, birds, wildlife, fish or other aquatic life, the DG may, by notice serve on each of the licensees, requiring each of them to abate such emission, discharge or deposit in the manner and within the period specified in the notice.	The EQA 1974 has no provision that explicitly provides for the regulation of the import and export of mercury-added products. Therefore, the option to amend the EQA 1974 is explored. The options are – (1) Amendment to s 21 by inserting a s 21A that empowers the Minister, after consultation with the Environmental Quality Council, to specify the acceptable conditions for the receive or send, or cause or permit to be received or sent any environmentally hazardous substances, pollutants or wastes in or out of Malaysia. This suggestion for amendment refers to the legislative approach adopted by the Parliament in legislating for the insertion of Part IVB, and specifically, s 34B to enable the implementation of the obligations stipulated under the Basel Convention). The proposed amendment to the EQA 1974 to insert a s 21A would enhance the normative scope of Part IV of the EQA 1974 to prohibit and control pollution where pollution as a result of the receiving and sending of environmentally hazardous substances, pollutants, or wastes in or out of Malaysia could be prevented in accordance with the obligations committed by the country in various international platforms and MEAs. (2) Bearing in mind that Environmentally Hazardous Substances Regs are currently being developed for the regulation of environmentally hazardous substances (and articles, including products), this regs could be used as an avenue to regulate the import and export of mercury added products listed in Part I of Annex A of the Minamata Convention when such products are prescribed as environmentally hazardous substance under s 30A of the EQA 1974. As such, s 51(1)(u) that provides for the regulation of environmentally hazardous substances should be amended to empower the Minister after consultation with the council to make regs for or with respect to – "(u) prohibiting or regulating the **[receive, send,]** manufacture, storage, transportation, or the application or use, emission, discharge, or deposit into the environment, of any environmentally hazardous substances". Such amendment would allow the prohibition or regulation of the import and export of mercury added products listed in Annex A of the Minamata Convention, which should also be deemed an environmentally hazardous substances under the EQA 1974 and the proposed Environmental

		Hazardous Substances (EHS) Regs, in order to ensure that the obligations imposed under Art 4 could be implemented. (3) Amendment to s 30 by inserting the power of the Minister to prohibit the receiving and sending in and out of Malaysia, and the use of any materials for any process, trade or industry. (4) The control over the use of mercury-added products laid out in Part I of Annex A of the Convention could be exercised if such products are prescribed by the Minister, after consultation with the Council, and by order published in the Gazette, to be an EHS pursuant to s 30A. In order to enhance the scope of s 30A to enable the satisfaction of the obligations imposed under Art 4 of the Convention on MAPs (in particular, the products listed under Part I of Annex A of the Convention), s 30A could be amended by inserting into: - s 30A(1)(a), the power of the Minister to prescribe any substance as an EHS which requires the substance to be **[receive and send in or out of Malaysia,]** reduced, recycled, recovered or regulated in the manner as specified in the order. Other than that, s 33 could be invoked in regulating mercury-added products that are not covered by any known use of mercury-added products prior to the date of entry into force of the Convention for it, or MAPs which uses are known, but are below the specified threshold, but which accumulatively, would, or is likely to cause a worsening of condition in that segment or element of the environment.
Occupational Safety and Health Act 1994 (Act 514)	S 35: Power to prohibit the use of plant or substance (1) The DG may by order published in the Gazette prohibit the use of any plant or substance which in his opinion is likely to affect the safety and health of persons at work S 66: Regulations (1) The Minister may make regulations for or with respect to the safety, health and welfare of persons at work in order to achieve the objects of the Act	OSHA 1994 has a limited power in prohibiting the manufacturing of MAPs listed in Part I of Annex A of the Minamata Convention after the phase-out date, of the phase-down of MAPs listed in Part II of Annex A, through the power of the DG to prohibit the use of mercury and mercury compounds (as a substance) at the workplace.
Customs Act 1967 (Act 235)	S 31: Power of Minister to prohibit imports or exports (1) The Minister may, by order – (a) Prohibit the importation into, or the exportation from, Malaysia or any part thereof, either absolutely or conditionally, or from or to any specified country, territory or place outside Malaysia, or the removal from one place to another place in Malaysia of any goods or class of goods	It is noted that the Customs (Prohibition of Exports) Order 2017 and the Customs (Prohibition of Imports) Order 2017 provide for the prohibition of the export and import of amalgam and dental alloy containing mercury unless licences are issued by the Pharmaceutical Services Division, Ministry of Health (MOH).
• Customs (Prohibition of Exports) Order 2017 2nd Sch: Conditional prohibition except under export licence	Para 3. The exportation of goods specified in columns (2) and (3) of the 2nd Sch is prohibited, except under an export licence – (a) issued by the DG; (b) issued by the proper officer of customs appointed by the DG to act on his behalf at the ministry, department or statutory body specified in column (5) of the 2nd Sch; or (c) issued by the ministry, department or statutory body specified in column (5) of the 2nd Sch, and subject to such conditions specified in the export licence. Item No. 22, 2nd Sch: (The export of) Mercury (Hg) and mercury compounds covered under Minamata Convention on Mercury (to all countries).	

	Substances are listed below: (1) Mercury (2805.40.00 00) (2) Amalgam (2843.90.00 00) (3) Inorganic or organic compounds of mercury, whether or not chemically defined, excluding amalgams (including mercury sulphate and mercury compounds of a kind used as lumino phores) (2852.10.10 00, 2852.10.20 00, 2852.10.90 00, 2852, 90.10 00, 2852.90.20 00, 2852.90.90 00) (4) Organo mercury compounds (2852.10.10 00, 2852.10.20 00, 2852.10.90 00, 2852.90.10 00, 2852.90.20 00, 2852.90.90 00) (5) Dental alloys containing mercury (3006.40.10 10) The ministry/department/statutory body issuing licence stipulated under column (5) is the Pharmaceutical Services Division, Ministry of Health	
• Customs (Prohibition of Imports) Order 2017 Part I, 2nd Sch: Conditional prohibition except under import licence	Reg 3:Conditional prohibition except under import licence (1) The importation into Malaysia of goods specified in columns (2) and (3) of Part I of the Second Schedule, originating from the countries specified in column (4) of Part I of the Second Schedule is prohibited, except under an import licence – (a) issued by the Director General; or (b) issued by the proper officer of customs appointed by the Director General to act on his behalf at the ministry, department or statutory body as specified in column (5) of Part I of the Second Schedule, and subject to such conditions specified in the import licence. Part I, 2nd Sch: Item 11. Mercury (Hg) and mercury compounds covered under Minamata Convention on Mercury. Substances as listed below: 1. Mercury 2. Amalgam 3. Inorganic or organic compounds of mercury, whether or not chemically defined, excluding amalgams (including mercury sulphate and mercury compounds of a kind used as lumino phores) 4. Organo Mercury Compounds 5. Dental alloys containing mercury	
• Alternative methods to Article 4(1) to address products listed in Part I of Annex A if the large majority of the manufacture, import and export of a product is already reduced to a de minimis level (Art 4.2)		
Poisons Act 1952 (Act 366) • 1st Sch, Poisons List (s 2)	Exemption: (1) Cosmetic which is notified under the Control of Drugs and Cosmetics Regulations 1984 containing not more than 1 ppm of mercury calculated as the metal; (2) Product which is registered under the Control of Drugs and Cosmetics Regulations 1984 containing not more than 0.5 ppm calculated as the metal	
• Undertake measures to address dental amalgam listed under Part II of Annex A (Art 4.3)		
Medical Device Act 2012 (Act 737)	S 2: Interpretation 'Medical device' means – (a) any instrument, apparatus, implement, machine, appliance, implant, implant, *in-vitro* reagent or calibrator, software, material or other similar or related article intended by the manufacturer to be used, alone or in combination, for human beings for the purpose of – (i) diagnoses, prevention, monitoring, treatment or alleviation of disease; (ii) diagnosis, monitoring, treatment, alleviation of or compensation for an injury; (iii) investigation, replacement or modification or support of the anatomy or of a physiological process; (iv) support or sustaining life; (v) control of conception; (vi) disinfection of medical device; or (vii) providing information for medical or diagnostic purpose by means of *in-vitro* examination of specimens derived from the human body, which does not achieve its primary intended action in or on the human body by pharmacological, immunological or metabolic means, but that may be assisted in its intended function by	It came to our knowledge that the governance of dental amalgam falls within the jurisdiction of the Medical Device Act 2012 where the control over the importation, exportation or placement in the market of dental amalgam, as a medical device within the meaning of the Act, is exercised through the imposition of the requirement for registration, first and foremost, in addition to other provisions stipulated under the Medical Device Act. By virtue of the enactment of the Act, dental amalgam is no longer governed under the Sales of Drugs Act 1952. All matters relating to the control of dental amalgam, which falls under the definition of 'medical device' as "any ... material intended by the manufacturer to be used, alone or in combination, for human beings for the purpose of –

	such means; and (b) any instrument, apparatus, implement, machine, appliance, implant, *in-vitro* reagent or calibrator, software, material or other similar or related article, to be used on the human body, which the Minister may, after taking into consideration issues of public safety, public health or public risk, declare to be a medical device by order published in the *Gazette*. 'designated medical device' means a medical device specified by the Minister to be a designated medical device by order published in the *Gazette*. 'establishment; means – (a) a person who is either a manufacturer, importer, or distributor who is responsible for placing any medical device in the market but does not include a retailer; and (b) an authorised representative appointed by a manufacturer having a principal place of business outside Malaysia, and such person and authorised representative being – (A) a person domiciled or resident in Malaysia; or (B) a firm or company constituted under the laws of Malaysia. and carrying on business or practice principally in Malaysia. S 4: Manufacturer's obligations A manufacturer shall ensure that a medical device – (a) conforms to the prescribed essential principles of safety and performance (b) is manufactured in accordance with good manufacturing practice and any written directive issued by the Authority S 5: Requirement for registration of medical device (1) No medical device shall be imported, exported or placed in the market unless the medical device is registered under the Act. S 15: Requirement for establishment licence (1) No establishment shall import, export or place in the market any registered medical device unless it holds an establishment licence granted under this Act. S 16: Application for establishment licence (1) An establishment may apply for an establishment licence to be granted under this Act by submitting a written application to the Authority in the prescribed manner. S 26: Designated medical device The Minister may, from time to time, after taking into consideration the risk level of a medical device, the exposure of medical device to public health, patient safety and the degree of complexities of the medical device, specify a medical device to be a designated medical device by an order published in the *Gazette*. S 27: Requirement for designated medical device permit (1) No person shall use or operate any designated medical device unless the person holds a designated medical device permit granted under this Act. S 28: Application for designated medical device permit (1) A person may apply for a designated medical device permit to be granted under this Act by submitting a written application to the Authority in the prescribed manner. S 37: Distribution records (1) An establishment shall maintain a distribution record in respect of each medical device manufactured, imported, exported and placed in the market. (2) The distribution record shall contain information as prescribed by the Minister. (3) An establishment shall provide the distribution records to the Authority upon request. S 43: Usage, operation, maintenance, etc., of medical device (1) A person using or operating a medical device on a third party shall ensure that the medical device is – (a) safe and efficacious; (b) used in accordance with the manufacturer's instructions; and (d) properly installed, tested, commissioned and maintained. (2) A person – (a) using or operating a medical device on a third party; or (b) installing, testing, commissioning, maintaining and disposing of a medical device, shall have the qualification and competency as prescribed by the Minister. S 45: Export permit	(i) diagnoses, prevention, monitoring, treatment or alleviation of disease; and the (ii) diagnosis, monitoring, treatment, alleviation of or compensation for an injury; would now be governed under the MDA 2012.

	(1) An establishment may apply to the Authority for a permit to export a registered medical device in the prescribed form and accompanied by the prescribed fees S 79. Regulations (1) The Ministers may make such regulations as may be expedient or necessary for the better carrying out of the provisions of the Act (2) Regulations may be made for the purposes of: (c) to prescribe the design and manufacturing principles of medical devices, the good design principles in relation to risk elimination and minimisation, and the good manufacturing principles in relation to standards, safety and efficacy of medical devices (e) to prescribe procedures and criteria for conformity assessment of medical devices; (f) to prescribe procedures and criteria for conformity assessment standards for various class or categories of medical devices (l) to prescribe matters relating to export permits including the criteria, conditions and the procedure for the application of export permits of medical devices (m) to prescribe the competency requirement of persons using, operating, installing, testing, commissioning, maintain and disposing of medical devices.	
Poisons Act 1952 (Act 366)	S 2: Interpretation 'dental treatment' means the treatment of human ailments of the teeth or jaws or accessory structures or the performance of operations or the giving of treatment commonly undertaken or given by those practising dentistry 'dispensed medicine' means a medicine supplied by a registered medical practitioner, registered dentist or veterinary surgeon under and in accordance with s 19 or supplied, for the purpose of the medical, dental or animal treatment, of a particular individual by a licensed pharmacist on the premises specified in his licence. S 18: Restriction on the sale of Part I Poisons generally (1) Part I Poison shall not be sold or supplied to any person except – (a) by wholesale in accordance with s 15; or (b) by retail sale effected by or under the immediate personal supervision of a licensed pharmacist; (c) as an ingredient of a dispensed medicine, by a registered medical practitioner, registered dentist or veterinary surgeon in accordance with s 19; or (d) to be exported to purchasers outside Malaysia; or (e) to person or institution concerned with scientific education or research or chemical analysis and for the purpose of such education research or analysis. S 23: Group D Poisons (1) Group D Poison shall not be sold or supplied by retail to any person except: (a) where the sale or supply of such poison, if it had been a Group c Poison, would have been authorised under or by virtue of s 22; or (b) by a licensed pharmacist to a person known personally to such pharmacist or introduced to the pharmacist personally by a person known personally to the pharmacist and when such poison is sold or supplied in accordance with this section and of any regulations made under this Act relating to such sale or supply.	These definitions could be extended to include dental amalgam, which would be used for 'dental treatment' and 'dispensed medicine' under the Poisons Act 1952. However, the Poisons Act 1952 does not sufficiently and effectively provide for the regulation of dental amalgam in accordance with Part II of Annex A of the Convention. In order to enable Poisons Act 1952 to be capable of addressing dental amalgam in accordance with the Convention, specific provisions would have to be developed in order to enable the country to undertake the necessary measures to address dental amalgam as required under the Convention.
Sales of Drugs Act 1952 (Act 368)	S 2: Interpretation 'drug' includes any substance, product or article intended to be used or capable, or purported or claimed to be capable, of being used on humans or any animal, whether internally or externally , for a medicinal purposes; 'medicinal purposes' means any of the following purposes: (a) alleviating, treating, curing or preventing a disease or a pathological condition or symptoms of a disease; (b) diagnosing a disease or ascertaining the existence, degree or extent of a physiological or pathological condition; (c) contraception;	If 'dental amalgam' falls under the definition of 'drugs' under the Sales of Drugs Act 1952, such dental amalgam could be regulated under the regulations made pursuant to s 26 by the Minister where the standard of strength, weight, quality, or quantity of any drug of any ingredient or component part thereof could be stipulated and regulated. In addition, regulations could be developed to

	(d) inducing anaesthesia; (e) maintaining, modifying, preventing, restoring, or interfering with, the normal operation of a physiological function; (f) controlling of body weight; (g) general maintenance or promotion of health or well-being. 'sale' or 'sell' includes barter and exchange and also includes offering or attempting to sell or causing or allowing to be sold or exposing for sale or receiving or sending or delivering for sale of having in possession for sale or having in possession any drug knowing that the same is likely to be sold or offered or exposed for sale. S 26: Power to make regulations (1) The Minister may make regulations for any of the following purposes: (a) to prescribe the standard of strength, weight, quality, or quantity of any drug or of any ingredient or component part thereof; (b) to prohibit the addition of any specified thing or of more than the specified quantity or proportion thereof to any drug; (c) to prohibit any modes of manufacture, preparation, or preservation of any drug; (d) to secure the cleanliness and freedom from contamination of any drug in the course of its manufacture, preparation, storage, packing, carriage delivery or exposure for sale or sale and the cleanliness of places, receptacles, appliances, and vehicles used in such manufacture, preparation, storage, packing, carriage or delivery exposure for sale or sale and to secure the proper conduct of places in which the preparation or sale of drugs is carried on and for these purposes to require any person to submit to a medical examination; (i) to prohibit or regulate the manufacture, sale, advertisement for sale, supply, importation or exportation of any articles of drugs and for this purpose to establish any body or authority; (j) to require all ingredients contained in any medicine, proprietary, secret or otherwise, to be disclosed in the prescribed manner and form and with the prescribe ed particulars at or prior to the sale thereof.	prohibit or regulate the manufacture, sale, advertisement for sale, supply, importation or exportation of any articles of drugs that contain mercury and mercury compounds as prescribed under the Convention pursuant to the regs enacted by the Minister via s 26(i). However, it has been determined that dental amalgam now lies within the jurisdiction of the Medical Device Authority where it is considered a medical device, rather than a 'drug'. Therefore, the control of the manufacture, import, export, and placement of it in the market now lies with the Medical Device Authority (see above).
· Control of Drugs and Cosmetics Regulations 1984	Reg 7. Prohibition against manufacture, sale, supply, importation, possession and administration (1) Except as otherwise provided in these Regulations, no person shall manufacture, sell, supply, import, possess or administer any product unless – (a) the product is a registered product; and (b) the person holds the appropriate licence required and issued under these Regulations Reg 7A: Prohibition regarding traditional medicine No person shall manufacture, sell, supply, import, possess or administer any traditional medicine which contains any substance as set out in Table II to the Schedule Table II (Reg 7A) The following substances are prohibited in traditional medicine: Item 4: Poison within the meaning of the Poisons Act 1952 Reg 12: Licences (1) The Director of Pharmaceutical Services may issue any of the following licences subject to such conditions as he may impose: (d) an import licence in Form 5 in the Sch, authorising the licensee to **import and sell** by wholesale or supply the registered products from the address of the premises specified in the licence	
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):		
It would be necessary to know what are the MAPs covered by Art 4 that are available in the country. More information would need to be solicited on whether there is any MAP manufactured in the country, and whether the country is primarily a MAPs importing country. It would be necessary for the country, in preparation for ratification, to ascertain whether there would be mercury-free alternatives from domestic or international sources that are commercially available in the country in time to meet the 2020 phase out date. If there are no such alternatives available at the point of phasing out, there is a need to consider applying for an Art 6 extension for 1 or more of the product categories listed in Part I, Annex A of the Convention. Although MAPs covered under Part I of Annex A that have already been in the country prior to the phase-out date would not be governed by the Convention, it is pertinent to consider how the unused MAPs stocks, or used MAPs could be managed in an environmentally sound manner consistent with obligations on storage and mercury wastes as stipulated under the Convention. As to the phasing out of thermometers and sphygmomanometers, the Medical Device Authority had		

issued a circular in 2017, pursuant to its duty to ensure that the use of medical device is safe and effective under s 43 of the Medical Devices Act 2012, stopping the use of thermometer and sphygmomanometer that contain mercury by stating that –

- importation, exportation and manufacture of medical device which contains mercury would be phased out by 2020;
- medical device to be placed in the Malaysian market/imported (containing mercury) will not be registered;
- assessment of the application for registration of existing products (containing mercury) will be discontinued;
- no import, transit, special access, custom made, and for education and demonstration of mercury-containing product will be permitted;
- the establishment shall inform the Authority of any remaining stocks of medical device containing mercury.

By virtue of the circular, 2 (i.e., thermometers and sphygmomanometers) of Part I, Annex A MAPs could be considered to be on track on its way towards being phased out through administrative means, pending the official publication of the Order in the *Gazette*. However, for other Part I, Annex A MAPs, similar measures undertaken to phase out these products should be underway. Consideration should also be underway to implement measures for the phasing down of dental amalgam that incorporate 2 or more of the measures listed under Part II of Annex A of the Convention, which are most appropriate for the country according to the proposed prioritisation process in the MIA. In anticipation of the prohibition to manufacture, import and export MAPs covered under Part I of Annex A, the country would need to consider the appropriate measures that discourage the manufacture and distribution in commerce of new types of mercury products (Art 4.5 and 4.6).

Article 5 – Manufacturing processes in which mercury or mercury compounds are used

Description of article:

The manufacturing processes in which mercury or mercury compounds referred to in this Article and Annex B do not include processes for manufacturing mercury-added products or processes that process mercury containing waste. The use of mercury or mercury compounds in the manufacturing processes listed in Part I of Annex B after the specified phase-out date for each individual process, except where an exemption has been registered, shall not be allowed. Measures to restrict the use of mercury or mercury compounds in the processes listed in Part II of Annex B shall be taken. Identify facilities that use mercury or mercury compounds for processes listed in Annex B, and the number and types of such facilities and the estimated annual amount of mercury or mercury compounds used in those facilities. The information shall be submitted to the Secretariat no later than 3 years after the date of entry into force of the Convention. The Secretariat will make such information publicly available. For facilities that use mercury or mercury compounds in the manufacturing processes listed in Annex B, measures to address emissions and releases of mercury or mercury compounds shall be taken. These measures shall be included in the report submitted pursuant to Article 21. The use of mercury or mercury compounds in processes listed in Annex B in a facility that did not exist prior to the date of entry into force shall not be allowed, with no exemptions. The development of any facility using any other manufacturing processes in which mercury or mercury compounds are intentionally used, which did not exist prior to the date of entry into force of the Convention, shall be discouraged, except where the Party can satisfactorily demonstrated to the Conference of the Parties that the manufacturing process provides significant environmental and health benefits and that there are no technically and economically feasible mercury-free alternatives available providing such benefits. The exchange of information on relevant new technological developments, economically and technically feasible mercury-free alternatives, and possible measures and techniques to reduce and where feasible to eliminate the use of mercury and mercury compounds in, and emissions and releases of mercury and mercury compounds from, the manufacturing processes listed in Annex B are encouraged.

Succinct summary of provisions relevant to the country in question:

- Prohibition of the use of mercury or mercury compounds in the manufacturing processes listed in Part I of Annex B after the specified phase-out date
- Implement measures to restrict the use of mercury or mercury compounds in the processes listed in Part II of Annex B.
- Identify facilities that use mercury or mercury compounds for processes listed in Annex B, and the number and types of such facilities and the estimated annual amount of mercury or mercury compounds used in those facilities.
- For facilities that use mercury or mercury compounds in the manufacturing processes listed in Annex B, measures to address emissions and releases of mercury or mercury compounds shall be taken.
- The use of mercury or mercury compounds in processes listed in Annex B in a facility that did not exist prior to the date of entry into force shall not be allowed, with no exemptions
- Parties shall discourage the development of any facility using any other manufacturing process in which mercury or mercury compounds are intentionally used and did not exist prior to the date of entry into force of the Convention, unless the Party demonstrated to the satisfaction of the COP that the manufacturing process provides significant environmental and health benefits and that there are no technically and economically feasible mercury-free alternatives available providing such benefits.

Policy and regulatory measures in place that enable the country to comply with the above listed provisions:		
Title and reference number of relevant Policy and Regulatory Measure, as well as date	**Relevant provisions**	**Remarks**
• Prohibition of the use of mercury or mercury compounds in the manufacturing processes listed in Part I of Annex B after the specified phase-out date (Art 5.2) Part I, Annex B: Processes subject to Article 5, paragraph 2 - Chlor-alkali production (2025) - Acetaldehyde production in which mercury or mercury compounds are used as a catalyst (2018)		
Industrial Co-Ordination Act 1975 (Act 156)	S 3: Licence require for manufacturing activity (1): No person shall engage in any manufacturing activity unless he is issued a licence in respect of such manufacturing activity.	This provision would be capable of imposing an overarching control of manufacturing activities that involve the use of mercury or mercury compounds in their manufacturing processes (including the prohibition thereof), in particularly, processes that fall within the purview of Annex B of the Minamata Convention.
Environmental Quality Act 1974 (Act 127)	S 30: Power to prohibit use of any material or equipment The Minister after consultation with the Council may be order published in the Gazette – (a) prohibit the use of any materials for any process, trade or industry ... within the areas specified in the order S 30A: Power to control use of substance and product and to state environmental labelling (1) The Minister, after consultation with the Council, may by order published in the *Gazette* – (a) prescribe any substance as an environmentally hazardous substance which requires the substance to be reduced, recycled, recovered or regulated in the manner as specified in the order. S 31: Power to require owner or occupier to install, operate, repair, *etc.* (1) Where any environmentally hazardous substances, pollutants or wastes are being or are likely to be emitted, discharged or deposited from any vehicle, ship or premises irrespective of whether the vehicle, ship or premises are prescribed under s 18 or otherwise, or from any aircraft, the DG may by notice in writing require the owner or occupier of the vehicle, ship or premises, or aircraft, to – (a) install and operate any control equipment or additional control equipment; (b) repair, alter or replace any equipment or control equipment; (c) erect or increase the height of any chimney; (d) measure, take a sample of, analyse, record and report any environmentally hazardous substances, (e) conduct a study on any environmental risk; (f) install, maintain and operate monitoring programme at the expense of the owner or occupier; or (g) adopt any measure to reduce, mitigate, disperse, remove, eliminate, destroy or dispose of pollution, within such time and in such manner as may be specified in the notice. (2) Notwithstanding any other provisions to the contrary, the DG may by notice direct the owner or occupier of any vehicle, ship, or premises, or aircraft to emit, discharge or deposit environmentally hazardous substances, pollutants or wastes during such periods of day as he may specify and may generally direct the manner in which the owner or occupier shall carry out his trade, industry or process or operate any equipment, industrial plant or control equipment therein. S 31A: Prohibition Order, *etc.* (1) The Minister, after consultation with the Council, may by order published in the *Gazette* specify the circumstances whereby the DG may issue a prohibition order to the owner	

	or occupier of any industrial plant or process to prevent its continued operation and release of environmentally hazardous substances, pollutants or wastes either absolutely or conditionally, or for such period as he may direct, or until requirements to make remedy as directed by him have been complied with. (2) The Minister, in circumstances where he considers that the environment, public health or safety is under or likely to be under serious threat, may direct the DG – (a) to issue an order requiring a person to cease all acts that have resulted in the release of environmentally substances, pollutants or wastes; and (b) to effect and render any machinery, equipment, plant or process of the person inoperable. S 32: Owner or occupier to maintain and operate equipment The owner or occupier of any vehicle, ship or premises irrespective of whether the vehicle, ship or premises are prescribed under s 18 or otherwise, or aircraft shall maintain any equipment or control equipment installed on the vehicle, ship or premises, or aircraft in good condition and shall operate the equipment or control equipment in a proper and efficient manner. S 51: Regulation (1) In addition to and not in derogation of any of the powers contained in any other provisions of this Act, the Minister after consultation with the Council may make regulations for or with respect to – (f) prohibiting the use of any equipment, facility, vehicle, or ship capable of causing pollution or regulating the construction, installation or operation thereof so as to prevent or minimise pollution.	
Occupational Safety and Health Act 1994 (Act 514)	S 35: Power to prohibit the use of plant or substance (1) The DG may by order published in the Gazette prohibit the use of any plant or substance which in his opinion is likely to affect the safety and health of persons at work S 66: Regulations (1) The Minister may make regulations for or with respect to the safety, health and welfare of persons at work in order to achieve the objects of the Act	
• **Implement measures to restrict the use of mercury or mercury compounds in the processes listed in Part II of Annex B (Art 5.3).** - Vinyl chloride monomer production - Sodium or potassium methylate or ethylate - Production of polyurethane using mercury containing catalysts		
Industrial Co-Ordination Act 1975 (Act 156)	S 3: Licence require for manufacturing activity (1): No person shall engage in any manufacturing activity unless he is issued a licence in respect of such manufacturing activity.	Restriction of use through conditions imposed in the licence issued.
Environmental Quality Act 1974 (Act 127)	S 30: Power to prohibit use of any material or equipment The Minister after consultation with the Council may be order published in the Gazette – (a) prohibit the use of any materials for any process, trade or industry ... within the areas specified in the order S 30A: Power to control use of substance and product and to state environmental labelling (1) The Minister, after consultation with the Council, may by order published in the *Gazette* – (a) prescribe any substance as an environmentally hazardous substance which requires the substance to be reduced, recycled, recovered or regulated in the manner as specified in the order. S 31A: Prohibition Order, etc. (1) The Minister, after consultation with the Council, may by order published in the *Gazette* specify the circumstances whereby the DG may issue a prohibition order to the owner or occupier of any industrial plant or process to prevent its continued operation and release of environmentally hazardous substances, pollutants or wastes either absolutely	

	or conditionally, or for such period as he may direct, or until requirements to make remedy as directed by him have been complied with. (2) The Minister, in circumstances where he considers that the environment, public health or safety is under or likely to be under serious threat, may direct the DG – (a) to issue an order requiring a person to cease all acts that have resulted in the release of environmentally substances, pollutants or wastes; and (b) to effect and render any machinery, equipment, plant or process of the person inoperable. S 51: Regulation (1) In addition to and not in derogation of any of the powers contained in any other provisions of this Act, the Minister after consultation with the Council may make regulations for or with respect to – (f) prohibiting the use of any equipment, facility, vehicle, or ship capable of causing pollution or regulating the construction, installation or operation thereof so as to prevent or minimise pollution.	
Occupational Safety and Health Act 1994 (Act 514)	S 35: Power to prohibit the use of plant or substance (1) The DG may by order published in the Gazette prohibit the use of any plant or substance which in his opinion is likely to affect the safety and health of persons at work S 66: Regulations (1) The Minister may make regulations for or with respect to the safety, health and welfare of persons at work in order to achieve the objects of the Act	
• **Identify facilities that use mercury or mercury compounds for processes listed in Annex B, and the number and types of such facilities and the estimated annual amount of mercury or mercury compounds used in those facilities (Art 5.5.c).** - Chlor-alkali production (2025) - Acetaldehyde production in which mercury or mercury compounds are used as a catalyst (2018) - Vinyl chloride monomer production (reduce production by 50% by 2020 compared to 2010) - Sodium or potassium methylate or ethylate (phase out within 10 years of entry into force, reduction of emissions and releases by 2020 compared to 2010) - Production of polyurethane using mercury containing catalysts (phase out within 10 years of entry into force) Art 5(6) shall not apply to this manufacturing process.		
Industrial Co-Ordination Act 1975 (Act 156)	S 3: Licence require for manufacturing activity (1): No person shall engage in any manufacturing activity unless he is issued a licence in respect of such manufacturing activity. S 4: Application for and issue and conditions of licence (3) The licensing officer shall, in deciding whether an application for a licence should be approved or refused, consider whether the issue of a licence is consistent with national economic and social objectives and would promote the orderly development of manufacturing activities in Malaysia. (4) The licensing officer in issuing a licence, may, in furtherance of the aforesaid **objectives impose such conditions as he may think fit** and such conditions may be varied on the application of the manufacturer or on the licensing officer's own motion after consultation with the manufacturer in respect of whom the conditions in the licence are to be varied. S 8: Compliance with other laws The issue of a licence shall not be deemed to relieve the manufacturer to whom a licence is issued from compliance with any other written law relating to the manufacturing activity for which the licence is issued.	Ss 3, 4 and 8, to be read together, enable an overarching control over all manufacturing activities that involve mercury and mercury compounds in their processes, whereby the monitoring of these processes, which allows for the identification of facilities that use mercury or mercury compounds for processes listed in Annex B of the Minamata Convention (or any other manufacturing processes in which mercury or mercury compounds are intentionally used that did not exist prior to the date of the entry into force of the Convention under Art 5.7), and the number and the types of such facilities and the estimated annual amount of mercury or mercury compounds used in those facilities, through the imposition of conditions under s 4(4) as the licensing officer may think fit, in the issuance of a licence under the Act.
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose powers, duties and functions shall be – (e) to undertake surveys and investigations as to the causes, nature, extent of pollution and as to the methods of prevention of pollution and to assist and co-operate with other persons or	The power, duties and functions of the DG and other officers under s 3(e) to undertake surveys and investigations as to the causes, nature, extent of pollution could then allow the DG Office to investigate into the facilities that use mercury or mercury

	bodies carrying out similar surveys or investigations; (f) to conduct, promote and co-ordinate research in relation to any aspect of pollution or the prevention thereof and to develop criteria for the protection and enhancement of the environment S 18: Prescribed premises to be licenced (1) The Minister after consultation with the Council may by order prescribe the premises the occupation or use of which by any person shall, unless he is the holder of a licence issued in respect of those premises, be an offence under the Act (1A) The Minister, after consultation with the Council, may by order prescribe the vehicle or ship used for the movement, transfer, placement or deposit of wastes the use of which by any person shall, unless he is the holder of a licence issued in respect of the prescribed conveyance, be an offence under the Act S 19: Prohibition against causing vehicle, ship or premises to become prescribed conveyance or prescribed premises No person shall – (a) carry out any work on any vehicle, ship or premises that would cause the vehicle, ship or premises to become a prescribed conveyance or prescribed premises, as the case may be (b) construct on any land any building designed for or used for a purpose that would cause the land or building to become prescribed premises Without the prior written permission of the DG. S 31: Power to require owner or occupier to install, operate, repair, etc (1) Where any environmentally hazardous substances, pollutants or wastes are being or are likely to be emitted, discharged or deposited from any vehicle, ship or premises irrespective of whether the vehicle, ship or premises are prescribed under s 18 or otherwise, or from any aircraft, the DG may by notice in writing require the owner or occupier of the vehicle, ship or premises, or aircraft, to – (d) measure, take a sample of, analyse, record and report any environmentally hazardous substances, pollutants, wastes, effluents or emissions containing pollutants; (e) conduct a study on any environmental risk; (f) install, maintain and operate monitoring programme at the expense of the owner or occupier; or (g) adopt measure to reduce, mitigate, disperse, remove, eliminate, destroy or dispose of pollution. 'environmental risk' is defined under s 2 to mean any risk, hazard or chances of bad consequences that may be brought upon the environment. S 33A: Environmental audit (1) The DG may require the owner or occupier of any vehicle, ship or premises, irrespective of whether the vehicle, ship or premises are prescribed under s 18 or otherwise, to carry out an environmental audit and to submit an audit report in the manner as maybe prescribed by the Minister by regulations made under this Act. 'environmental audit' is defined under s 2 to mean a periodic, systematic, documented and objective evaluation to determine – (a) the compliance status to environmental regulatory requirements; (b) the environmental management system; and (c) the overall environmental risk of the premises. 'environmental management system' means a system comprising of an organisational structure with its responsibilities, practices, procedures, processes and resources for implementing and maintain the system relating to the management of the environment.	compounds for processes listed in Annex B, and the number and types of such facilities and the estimated annual amount of mercury or mercury compounds used in those facilities. The Minister could impose conditions in the licence issued under ss 18 and 19 that could enable the obligations stipulated under the Convention where the licenced holder would have to comply, without prejudice to, or in addition to, compliance under other relevant laws in the country, such as, the relevant laws pertaining to occupational health and safety at the workplace (ss 20 and 21 of the Occupational Safety and Health Act 1994) which could be invoked to regulate the use mercury or mercury compounds for processes listed in Annex B of the Minamata Convention. The obligation imposed under s 31 of EQA on the owner or occupier to measure, take a sample of, analyse, record and report any environmentally hazardous substances, pollutants, wastes, effluents or emissions containing pollutants; conduct a study on any environmental risk; install, maintain and operate monitoring programme at the expense of the owner or occupier; or alternatively, to conduct an environmental audit pursuant to s 33A, would provide the basis to which facilities that use mercury or mercury compounds for processes listed in Annex B of the Minamata Convention could be identified, where the number and types of such facilities and the estimated annual amount of mercury or mercury compounds used in those facilities could be ascertained. The DG could also requires, pursuant to s 33A, the owner or occupier of premise or conveyance that carries out manufacturing activities (especially), whether prescribed or otherwise, to undertake environmental audit that evaluates the compliance status of the premise/conveyance to environmental regulatory requirements, its environmental management system, and the overall environmental risk of the premises in order to generate some insights on whether the premise/conveyance uses mercury in any of its manufacturing activities and the annual amount of mercury or mercury compounds used in the premise/conveyance in order to compile a more comprehensive overview of the number and types of facilities that carries out manufacturing processes that involve mercury and mercury compounds. Such evaluation could produce data on whether mercury is used in the manufacturing processes conducted at these premises/conveyances, the types and numbers of such premises/conveyance (facilities) that involve mercury in its manufacturing processes, and

		also the annual amount of mercury and mercury compounds used prior to undertake steps to discourage the operation of all mercury related processes beyond the processes listed under Annex B of the Convention.
Occupational Safety and Health Act 1994 (Act 514)	S 66: Regulations (1) The Minister may make regulations for or with respect to the safety, health and welfare of persons at work in order to achieve the objects of this Act. (2) In particular and without prejudice to the generality of subs (1), such regulation may – (n) require the employers to keep and preserve records and other documents.	Although OSHA 1994 does not request for information on manufacturing processes that are being operated at the workplace, s 66 empowers the Minister to make regulations pertaining to the keeping and preserving of records and other documents at the work place, where Reg 5 of USECHH Regs 2000 stipulates for the maintenance of information on the substance used at the workplace, especially chemicals hazardous to health, in the form of a register, from which information on the types of facilities that might use mercury and mercury compounds at the workplace could be identified. This information that DOSH would have, would also be useful in identifying facilities that are using any other manufacturing process in which mercury or mercury compounds are intentionally used and did not exist prior to the date of entry into force of the Convention stipulated under Art 5.7 if information regarding the types of substances used in a workplace/ facility is obtained.
• Occupational Safety and Health (Use and Standards of Exposure of Chemicals Hazardous to Health) Regulations 2000	Part II: Identification of chemicals hazardous to health Reg 5: Register of chemicals hazardous to health. (1) An employer shall identify and record in a register all chemicals hazardous to health used in the place of work.	
• For facilities that use mercury or mercury compounds in the manufacturing processes listed in Annex B, measures to address emissions and releases of mercury or mercury compounds shall be taken (Art 5.5.a).		
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose powers, duties and functions shall be – (f) to conduct, promote and co-ordinate research in relation to any aspect of pollution or the prevention thereof and to develop criteria for the protection and enhancement of the environment. S 21: Power to specify conditions of emission, discharge, etc The Minister, after consultation with the Council, may by regulations specify the acceptable conditions for the emission, discharge or deposit of environmentally hazardous substances, pollutants or wastes ... into any area, segment or element of the environment and may set aside any area, segment or element of the environment within which the emission, discharge or deposit is prohibited or restricted S 22: Restrictions on pollution of the atmosphere (1) No person shall, unless licenced, emit or discharge any environmentally hazardous substances, pollutants or wastes into the atmosphere in contravention of the acceptable conditions specified under s 21	The 'research' to be conducted by the DG and other officers as provided under s 3(1)(f) could be taken to mean a research for the development of criteria regulating manufacturing processes that reduce or eliminate emissions and releases, as part of the measures adopted to address emissions and releases of mercury or mercury compounds
• Environmental Quality (Clean Air) Regulations 2014	Reg 3: Application These Regulations shall apply to – (a) any premises used for any industrial or trade purposes, or on which matter is burnt in connection with any industrial or trade purposes, including burning of waste, whether or not the premises are prescribed under s 18 of the EQA (b) any other premises or process that discharges or is capable of discharging air pollutants into the open air (c) any industrial plant (d) any fuel burning equipment Reg 6: Measures to reduce emission	

	An owner or occupier of a premises involved in any activity or industry listed in the 1st Sch shall incorporate measures to reduce the emission of air pollutants to the atmosphere in accordance with the Best Available Techniques Economically Achievable determined by the DG Reg 7: Air pollution control system (1) Every premises shall be equipped with an air pollution control system in accordance with the specifications as determined by the DG Reg 13: Limit values and technical standards (1) All activities and industries specified in the 1st Sch shall comply with the limit values and technical standards as specified in the 2nd and 3rd Schs Reg 15: Hazardous substances (1) An owner or occupier of a premise shall use the best practicable means to prevent the emission of hazardous substances and to render harmless and inoffensive those substances necessarily discharged (2) In the case of the use or handling or unintentional release of hazardous or toxic substances, the limit values and technical standards prescribed in the 5th Sch shall apply Reg 24: Prohibition order (1) In the event of any undesirable occurrence as specified in the 6th Sch, and where in the opinion of the DG, the continued operation of any premises or process in question should not be permitted in order to safeguard public health, safety or welfare, the DG may by notice in writing issue an order to the owner or occupier of a premises prohibiting the further operation of such premises or process absolutely or conditionally, or for such period as he may direct, or until remedial requirements as directed by him have been complied with	
Environmental Quality Act 1974 (Act 127)	S 24: Restrictions on pollution of the soil (1) No person shall, unless licenced, pollute or cause or permit to be polluted any soil or surface of any land in contravention of the acceptable conditions specified under s 21 S 25: Restrictions on pollution of inland waters (1) No person shall, unless licenced, emit, discharge or deposit any environmentally hazardous substances, pollutants or wastes in to any inland waters in contravention of the acceptable conditions specified under s 21 S 29: Prohibition of discharge of wastes into Malaysian waters (1) No person shall, unless licenced, discharge environmentally hazardous substances, pollutants or wastes into the Malaysian waters in contravention of the acceptable conditions specified under s 21 S 31A: Prohibition order (1) The Minister, after consultation with the Council, may by order published in the Gazette specify the circumstances whereby the DG may issue a prohibition order to the owner or occupier of any industrial plant or process to prevent its continued operation and release of environmentally hazardous substances, pollutants or wastes either absolutely or conditionally, or for such period as he may direct, or until requirements to make remedy as directed by him have been complied with (2) The Minister, in circumstances where he considers that the environment, public health or safety is under serious threat, may direct the DG – (a) to issue an order requiring a person to cease all acts that have resulted in the release of environmentally hazardous substances, pollutants or wastes; and (b) to effect and render any machinery, equipment, plant or process of the person inoperable	
· Environmental Quality (Industrial Effluent) Regulations 2009	Reg 3: Application These Regulations shall apply to any premises which discharge or release industrial effluent or mixed effluent, onto or into any soil, or into inland waters or Malaysian waters, other than the premises as specified in the 1st Sch Reg 4: Obligation to notify the DG (1) No person shall, without prior written notification to the DG – (a) carry out any work on any premises that may result in a new	

	source of discharge of industrial effluent or mixed effluent (b) construct on any land, building or facility designed or used for a purpose that may cause the land or building or facility to result in a new source of discharge of industrial effluent or mixed effluent (c) make or cause or permit to be made any change of, to, or in any plant, machine, or equipment used or installed at the premises that causes a material change in the quantity or quality of the discharge or release from an existing source; or (d) carry out upgrading work of an existing industrial effluent treatment system that may result in a material change in the quantity or quality of the discharge or release Reg 11: Acceptable conditions for the discharge of industrial effluent other than parameter of chemical oxygen demand (COD) (1) No person shall discharge industrial effluent which contains any parameter in concentration greater than the limits of – (a) Standard A, as shown in the 3rd column of the 5th Sch (mercury, parameter (v), 0.005 mg/L), into any inland wasters within the catchment areas as specified in the 6th Sch (b) Standard B, as shown in the 4th column of the 5th Sch (mercury, parameter (v), 0.05 mg/L), into any other inland waters or Malaysian waters Reg 14: Best management practice for the discharge of industrial effluent or mixed effluent for other parameters An owner or occupier of a premises shall adopt the best management practice for discharge of any industrial effluent or mixed effluent for any parameter as specified in the 9th Sch (mercury is not listed in the 9th Sch, the nearest possible parameters that might be extended to cover mercury is (xii) any substance that either by itself or in combination or by reaction with other waste may give rise to any gas, fume or odour or substance which causes or is likely to cause pollution) Reg 18: Prohibition against industrial effluent or mixed effluent discharge through by-pass (1) No person shall discharge or cause or permit to be discharged any industrial effluent or mixed effluent onto or into any soil, or into any inland waters or Malaysian waters through a by-pass Reg 23: Restriction on discharge or disposal of sludge (1) No person shall discharge, or cause or permit the discharge or disposal of any sludge generated from any production or manufacturing process, any industrial effluent treatment system or water treatment plant onto or into any soil, or surface of any land, or into any inland waters or Malaysian waters without the prior written permission of the DG Reg 30: Prohibition order (1) In the event of any undesirable occurrence as listed in the 12th Sch, the DG may issue a prohibition order to an owner or the occupier of a premise prohibiting the further operation of an industrial plant or process absolutely or conditionally for such period as the DG may direct or until remedial measures as directed by the DG have been complied with	
· Environmental Quality (Control of Pollution from Solid Waste Transfer Station and Landfill) Regulations 2009	Reg 3: Application These Regulations shall apply to solid waste transfer stations and landfills which discharge or release leachate Reg 4: Notification for new source of leachate discharge or release (1) No person shall, without the prior written notification to the DG, carry out any work on any solid waste transfer station or landfill, or construct on any land any facility or building that may result in a new source of leachate discharge or release Reg 5: Operation of solid waste transfer station and landfill An owner or occupier of a solid waste transfer station or landfill shall design and operate the solid waste transfer station or landfill in such a manner that the following are strictly controlled: (b) air pollution (c) pollution of the soil, surface water or ground water (d) entry and disposal of scheduled wastes Reg 7. Control of ground water pollution An owner or occupier of a landfill shall – (a) ensure that the design and operation of the landfill	

	incorporates measures to prevent and control the pollution to groundwater (b) establish and operate a ground water monitoring program to monitor the leakage or movement of leachate from the landfill Reg 13: Acceptable conditions for discharge of leachate No person shall discharge leachate which contains substances in concentrations greater than those specified as acceptable conditions as shown in the 3rd column of the 2nd Sch (mercury (parameter vii), 0.005 mg/L), onto or into any soil, or into any inland waters or Malaysian waters Reg 16: Point of discharge of leachate (1) The point of discharge of leachate shall comply with the specifications as specified int eh 4th Sch and shall be clearly indicated by the owner or occupier of a solid waste transfer station or landfill on the layout plans and engineering drawings certified by a professional engineer Reg 17: Prohibition against leachate discharge or release through by-pass (1) No person shall discharge or release or cause or permit to be discharged or released leachate onto or into any soil, or into any inland waters or Malaysian waters through a by-pass Reg 18: Dilution of leachate (1) No person shall dilute, or cause or permit to be diluted, any leachate, whether raw or treated at any time or point after it is produced at any solid waste transfer station or landfill	
Environmental Quality Act 1974 (Act 127)	S 31A: Prohibition order (1) The Minister, after consultation with the Council, may by order published in the Gazette specify the circumstances whereby the DG may issue a prohibition order to the owner or occupier of any industrial plant or process to prevent its continued operation and release of environmentally hazardous substances, pollutants or wastes either absolutely or conditionally, or for such period as he may direct, or until requirements to make remedy as directed by him have been complied with (2) The Minister, in circumstances where he considers that the environment, public health or safety is under serious threat, may direct the DG – (a) to issue an order requiring a person to cease all acts that have resulted in the release of environmentally hazardous substances, pollutants or wastes; and (b) to effect and render any machinery, equipment, plant or process of the person inoperable	
• **The use of mercury or mercury compounds in processes listed in Annex B in a facility that did not exist prior to the date of entry into force shall not be allowed, with no exemptions (Art 5.6)**		
Industrial Co-Ordination Act 1975 (Act 156)	S 3(1): No person shall engage in any manufacturing activity unless he is issued a licence in respect of such manufacturing activity	In the event that an industrial process had been identified as using mercury and mercury compounds in its manufacturing operation, no licence should be issued with respect to this particular manufacturing activity.
Environmental Quality Act 1974	S 19: Prohibition against causing vehicle, ship or premises to become prescribed conveyance or prescribed premises No person shall – (a) carry out any work on any vehicle, ship or premises that would cause the vehicle, ship or premises to become a prescribed conveyance or prescribed premises, as the case may be; or (b) construct on any land any building designed for or used for a purpose that would cause the land or building to become prescribed premises Without the prior written permission of the DG S 20: Requirement and approval of plans (1) Every application to carry out any work, building, erection or alteration specified in s 19 shall be submitted to the DG	

• Parties shall discourage the development of any facility using any other manufacturing process in which mercury or mercury compounds are intentionally used and did not exist prior to the date of entry into force of the Convention, unless the Party demonstrated to the satisfaction of the COP that the manufacturing process provides significant environmental and health benefits and that there are no technically and economically feasible mercury-free alternatives available providing such benefits (Art 5.7).		
Environmental Quality Act 1974 (Act 127)	S 18: Prescribed premises to be licenced (1) The Minister after consultation with the Council may by order prescribe the premises the occupation or use of which by any person shall, unless he is the holder of a licence issued in respect of those premises, be an offence under the Act (1A) The Minister, after consultation with the Council, may by order prescribe the vehicle or ship used for the movement, transfer, placement or deposit of wastes the use of which by any person shall, unless he is the holder of a licence issued in respect of the prescribed conveyance, be an offence under the Act S 19: Prohibition against causing vehicle, ship or premises to become prescribed conveyance or prescribed premises No person shall – (a) carry out any work on any vehicle, ship or premises that would cause the vehicle, ship or premises to become a prescribed conveyance or prescribed premises, as the case may be (b) construct on any land any building designed for or used for a purpose that would cause the land or building to become prescribed premises Without the prior written permission of the DG. S 20: Requirement and approval of plans (1) Every application to carry out any work, building, erection or alteration specified in s 19 shall be submitted to the DG S 31A: Prohibition order (1) The Minister, after consultation with the Council, may by order published in the Gazette specify the circumstances whereby the DG may issue a prohibition order to the owner or occupier of any industrial plant or process to prevent its continued operation and release of environmentally hazardous substances, pollutants or wastes either absolutely or conditionally, or for such period as he may direct, or until requirements to make remedy as directed by him have been complied with (2) The Minister, in circumstances where he considers that the environment, public health or safety is under serious threat, may direct the DG – (a) to issue an order requiring a person to cease all acts that have resulted in the release of environmentally hazardous substances, pollutants or wastes; and (b) to effect and render any machinery, equipment, plant or process of the person inoperable	
Occupational Safety and Health Act 1994 (Act 514)	S 35: Power to prohibit the use of plant or substance (1) The DG may by order published in the Gazette prohibit the use of any plant or substance which in his opinion is likely to affect the safety and health of persons at work S 66: Regulations (1) The Minister may make regulations for or with respect to the safety, health and welfare of persons at work in order to achieve the objects of the Act	
Poisons Act 1952 (Act 366)	S 35: Regulations (1) The Minister may make regulations to carry out the purposes of this Act and, in particular, but without prejudice to the generality of the foregoing powers, may make regulations with respect to any of the following matters or for any of the following purposes: (a) the manufacture of preparations containing poisons.	
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):		
A glaring gap that could be observed from the comparative analysis, based on the text of the relevant legal instruments available in the country governing manufacturing processes in which mercury or mercury compounds are used, against the obligations stipulated under the Convention, is the lack of an overarching institution that gather all the salient information regarding the types of processes		

and the substances used in such processes that are currently in operation in the manufacturing sector of the country. There is a need to establish such an institution to host an inventory of information on all manufacturing processes in operation in the country, which includes information on whether there are any listed manufacturing processes still in operation in the country. There would be a need to develop steps for the determination of the volume of mercury used in these processes, the sources of mercury supply, the emissions and releases from the facilities (that are also separately dealt with under Arts 8 and 9 of the Convention), and how mercury wastes will be managed consistent with the provisions of Art 11. It would be necessary to consider the measures necessary to phase out mercury use in the affected manufacturing processes as soon as possible, and to ascertain whether mercury-free alternative processes would be available in the country in time to meet the applicable phase out dates in order to determine whether an extension under Art 6 for Part I, Annex B would be necessary. The country would need to decide the appropriate measures to be taken to restrict the use of mercury in the manufacturing processes listed in Part II of Annex B, and the mechanisms that will be put in place to discourage and prevent the setting up of new facilities that use the processes listed in Annex B, and also new facilities that use mercury (regardless of whether it is a process listed in Annex B or not).

Article 8 – Emissions

Description of article:
Control and where feasible, reduce emissions of total mercury to the atmosphere through measures to control emissions from the point sources falling within the source categories listed in Annex D. A Party may choose to establish criteria to identify the 'relevant sources' covered within a source category listed in Annex D so long as those criteria for any category include at least 75% of the emissions from that category. Measures to control emissions from relevant sources shall be taken. National plan setting out the measures to be taken to control emissions and its expected targets, goals and outcomes may be prepared. The use of best available techniques and best environmental practices to control and reduce emissions from new sources no later than 5 years after the date of entry into force of the Convention are required. Emission limit values (limit on the concentration, mass or emission rate of mercury or mercury compounds (total mercury)) consistent with the application of best available techniques may be used. For existing sources, one or more measures in Article 8(5)(a)-(e), which are – quantified goal for the control and reduction of emission and the emission limit values, the use of BAT and BEP in the control of emission from relevant sources, the implementation of multi-pollutant control strategy that would deliver co-benefits for the control of mercury emissions, and other alternative measures to reduce emissions, shall be included in any national plan and be implemented. Each Party is required to establish and maintain an inventory of emissions from relevant sources no later than 5 years after the date of entry into force of the Convention.

Succinct summary of provisions relevant to the country in question:

- To control and reduce emissions of total mercury (mercury and mercury compounds) to the atmosphere through measures to control emissions from the point sources falling within the source categories listed in Annex D
- Take measures to control emissions for relevant sources, and may prepare a national plan setting out the measures to be taken to control emissions (a national plan is not binding)
- Use of best available techniques and best environmental practices to control and, where feasible, reduce emissions for new sources no later than 5 years after the date of entry into force of the Convention for that Party. Emission limit values that are consistent with the application of best available techniques may be used.
- For existing sources, include in any national plan, implement a quantified goal and emission limit values for controlling and reducing emissions from existing sources by: using best available techniques and best environmental practices to control emission from existing sources; implementing a multi-pollutant control strategy that would deliver co-benefits for the control of mercury emissions, and implementing alternative measures to reduce emissions from existing sources
- Establish and maintain an inventory of emissions from relevant sources no later than 5 years after the date of entry into force of the Convention

Policy and regulatory measures in place that enable the country to comply with the above listed provisions:

Title and reference number of relevant Policy and Regulatory Measure, as well as date	Relevant provisions	Remarks
• To control and reduce emissions of total mercury (mercury and mercury compounds) to the atmosphere through measures to control emissions from the point sources falling within the source categories listed in Annex D (Art 8.1). Annex D, Point source category - 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		
Environmental Quality Act 1974 (Act 127)	S 21: Power to specify conditions of emission, discharge, etc The Minister, after consultation with the Council, may by regulations specify the acceptable conditions for the emission, discharge or deposit of environmentally hazardous substances, pollutants or wastes ... into any area, segment or element of the environment and may set aside any area, segment or element of the environment within which the emission, discharge or deposit is prohibited or restricted S 22: Restrictions on pollution of the atmosphere	

	(1) No person shall, unless licenced, emit or discharge any environmentally hazardous substances, pollutants or wastes into the atmosphere in contravention of the acceptable conditions specified under s 21	
• Environmental Quality (Clean Air) Regulations 2014	Reg 3: Application These Regulations shall apply to – (a) any premises used for any industrial or trade purposes, or on which matter is burnt in connection with any industrial or trade purposes, including burning of waste, whether or not the premises are prescribed under s 18 of the EQA (b) any other premises or process that discharges or is capable of discharging air pollutants into the open air (c) any industrial plant (d) any fuel burning equipment Reg 4: Obligation to comply (1) An owner or occupier of a new premises shall comply with the limit values and technical standards specified in these Regs. Reg 5: Obligation to notify (1) An owner or occupier of a premises shall not, without giving prior written notification to the DG – (a) carry out any change in operation of his premises; (b) carry out any work on any premises that may result in a source of emission; (c) construction on any land, any building or premises designed or used for a purpose that may result in a new source of emission; (d) make, cause, or permit to be made any change of, to, or in any plant, machine, or equipment used or installed at the premises that causes a material change in the quantity or quality of emission from an existing source; or (e) carry out any changes or modifications to an existing air pollution control system Reg 6: Measures to reduce emission An owner or occupier of a premises involved in any activity or industry listed in the 1st Sch shall incorporate measures to reduce the emission of air pollutants to the atmosphere in accordance with the Best Available Techniques Economically Achievable determined by the DG Reg 7: Air pollution control system (1) Every premises shall be equipped with an air pollution control system in accordance with the specifications as determined by the DG Reg 13: Limit values and technical standards (1) All activities and industries specified in the 1st Sch shall comply with the limit values and technical standards as specified in the 2nd and 3rd Schs Reg 15: Hazardous substances (1) An owner or occupier of a premise shall use the best practicable means to prevent the emission of hazardous substances and to render harmless and inoffensive those substances necessarily discharged (2) In the case of the use or handling or unintentional release of hazardous or toxic substances, the limit values and technical standards prescribed in the 5th Sch shall apply Reg 24: Prohibition order (1) In the event of any undesirable occurrence as specified in the 6th Sch, and where in the opinion of the DG, the continued operation of any premises or process in question should not be permitted in order to safeguard public health, safety or welfare, the DG may by notice in writing issue an order to the owner or occupier of a premises prohibiting the further operation of such premises or process absolutely or conditionally, or for such period as he may direct, or until remedial requirements as directed by him have been complied with	

• **Take measures to control emissions for relevant sources, and may prepare a national plan setting out the measures to be taken to control emissions (a national plan is not binding) (Art 8.3).**		
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (o) to promote, encourage, co-ordinate and carry out planning in environmental management, waste management and pollution control. S 21: Power to specify conditions of emission, discharge, etc The Minister, after consultation with the Council, may by regulations specify the acceptable conditions for the emission, discharge or deposit of environmentally hazardous substances, pollutants or wastes or the emission of noise into any area, segment or element of the environment and may set aside any area, segment or element of the environment within which the emission, discharge or deposit is prohibited or restricted.	The Minister may regulate the emissions of mercury for relevant sources, which could then be incorporated into a multi-pollutant strategy (Art 8.5.d) within an area, segment or element of the environment within which such emission is prohibited or restricted. There is a possibility that the full range of mercury emission is not captured just by subjecting certain type of industry to the obligation to monitor (their mercury emission) as required under the CAR 2014. Some plants that fall within the source category, but under the threshold for which reporting, and monitoring are made compulsory, would not be recorded.
• Environmental Quality (Clean Air) Regulations 2014	Reg 2:Interpretation 'limit value' means the quantity of the substance expressed in terms of certain specific parameters, concentration, or levels which shall not be exceeded during normal operation. 'Best Available Techniques Economically Achievable' means the effective method in preventing pollution and, where that is not practicable, generally to reduce emissions into the air from the industrial activities and their impact on the environment as a whole. Reg 6: Measures to reduce emission An owner or occupier of a premise involved in any activity or industry listed in the 1st Sch shall incorporate measures to reduce the emission of air pollutants to the atmosphere in accordance with the Best Available Techniques Economically Achievable determined by the DG Reg 7: Air pollution control system (1) Every premises shall be equipped with an air pollution control system in accordance with the specifications as determined by the DG Reg 13: Limit values and technical standards (1) All activities and industries specified in the 1st Sch shall comply with the limit values and technical standards as specified in the 2nd and 3rd Schs Reg 15: Hazardous substances (1) An owner or occupier of a premise shall use the best practicable means to prevent the emission of hazardous substances and to render harmless and inoffensive those substances necessarily discharged (2) In the case of the use or handling or unintentional release of hazardous or toxic substances, the limit values and technical standards prescribed in the 5th Sch shall apply Reg 24: Prohibition order (1) In the event of any undesirable occurrence as specified in the 6th Sch, and where in the opinion of the DG, the continued operation of any premises or process in question should not be permitted in order to safeguard public health, safety or welfare, the DG may by notice in writing issue an order to the owner or occupier of a premises prohibiting the further operation of such premises or process absolutely or conditionally, or for such period as he may direct, or until remedial requirements as directed by him have been complied with	
• **Use of best available techniques and best environmental practices to control and, where feasible, reduce emissions for new sources no later than 5 years after the date of entry into force of the Convention for that Party. Emission limit values that are consistent with the application of best available techniques may be used (Art 8.4).**		
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (o) to promote, encourage, co-ordinate and carry out planning in environmental management, waste management and pollution control. S 21: Power to specify conditions of emission, discharge, etc	There is a possibility that the full range of mercury emission is not captured just by subjecting certain type of industry to the obligation to monitor (their mercury emission) as required under the CAR 2014. Some plants that fall within the source category, but under the threshold for which

	The Minister, after consultation with the Council, may by regulations specify the acceptable conditions for the emission, discharge or deposit of environmentally hazardous substances, pollutants or wastes or the emission of noise into any area, segment or element of the environment and may set aside any area, segment or element of the environment within which the emission, discharge or deposit is prohibited or restricted.	reporting, and monitoring are made compulsory under CAR Regs 2014, would not be recorded. As such, even though all the activities and industries specified in the 1st Sch had complied with the limit values and technical standards as specified in the 2nd and 3rd Schs, there is a possibility that emissions from **other sources that fall below the threshold required to invoke mandatory monitoring** would not be captured, and thus, left unaddressed.
· Environmental Quality (Clean Air) Regulations 2014	Reg 2: Interpretation 'Best Available Techniques Economically Achievable' means the effective method in preventing pollution and, where it is not practicable, generally to reduce emissions into the air from the industrial activities and their impact on the environment as a whole. Reg 6: Measures to reduce emission An owner or occupier of a premises involved in any activity or industry listed in the 1st Sch shall incorporate measures to reduce the emission of air pollutants to the atmosphere in accordance with the Best Available Techniques Economically Achievable determined by the DG Reg 13: Limit values and technical standards (1) All activities and industries specified in the 1st Sch shall comply with the limit values and technical standards as specified in the 2nd and 3rd Schs.	
• For existing sources, include in any national plan, implement a quantified goal and emission limit values for controlling and reducing emissions from existing sources by: using best available techniques and best environmental practices to control emission from existing sources; implementing a multi-pollutant control strategy that would deliver co-benefits for the control of mercury emissions, and implementing alternative measures to reduce emissions from existing sources (Art 8.5).		
Environmental Quality Act 1974	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (o) to promote, encourage, co-ordinate and carry out planning in environmental management, waste management and pollution control	The DG and other officers have the duty, function and power to develop a national plan setting out the measures to be taken to control emissions and its expected targets, goals and outcomes, where a multi-pollutant strategy could be incorporated within the plan.
· Environmental Quality (Clean Air) Regulations 2014	Reg 2: Interpretation 'Best Available Techniques Economically Achievable' means the effective method in preventing pollution and, where that is not practicable, generally to reduce emissions into the air from the industrial activities and their impact on the environment as a whole. Reg 6: Measures to reduce emission An owner or occupier of a premise involved in any activity or industry listed in the 1st Sch shall incorporate measures to reduce the emission of air pollutants to the atmosphere in accordance with the Best Available Techniques Economically Achievable determined by the Director General. Reg 7: Air pollution control system (1) Every premises shall be equipped with an air pollution control system in accordance with the specifications as determined by the DG. Reg 13: Limit values and technical standards (1) All activities and industries specified in the 1st Sch shall comply with the limit values and technical standards as specified in the **2nd** and **3rd Schs**	
• Establish and maintain an inventory of emissions from relevant sources no later than 5 years after the date of entry into force of the Convention (Art 8.7).		
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (b) to be responsible for and to co-ordinate all activities relating to the discharge of wastes into the environment and for preventing or controlling pollution and protecting and enhancing the quality of the environment. (e) to undertake surveys and investigations as to the **causes,**	The duty and function of the DG to publish an annual report on environmental quality might be a starting point for the establishment and maintenance of such an inventory. S 3 does not specifically provide for the duty and function of the DG to establish and maintain an inventory of emission. S 3(b) could be

	nature, extent of pollution and as to the methods of prevention of pollution and to assist and co-operate with other persons or bodies carrying out similar surveys or investigations; (i) to publish an annual report on environmental quality not later than 30th September of the following year and such other reports and information with respect to any aspect of environmental protection (o) to promote, encourage, co-ordinate and carry out planning in environmental management, waste management and pollution control. S 33A: Environmental audit (1) The DG may require the owner or occupier of any vehicle, ship or premises, irrespective of whether the vehicle, ship or premises are prescribed under s 18 or otherwise, to carry out an environmental audit and to submit an audit report in the manner as may be prescribed by the Minister by regs made under this Act.	interpreted to enable the DG Office to establish an inventory of emission as fulfilling in parts, their responsibility for, and the co-ordination of all activities relating to the discharge of wastes into the environment and for preventing or controlling pollution and protecting and enhancing the quality of the environment. Alternatively, s 3(o) could possibly be interpreted to include the power of the DG and other officers to establish and maintain an inventory of emissions from relevant sources in order to carry out the Office's planning in pollution control. The information that builds the inventory of emissions from relevant sources could also be obtained from the audit report submitted by virtue of s 33A.
• Environmental Quality (Clean Air) Regulations 2014	Reg 10: Maintenance of records (1) An owner or occupier of a premises shall maintain records of manufacturing processes, and of maintenance and performance monitoring of the air pollution control system as determined by the DG. Reg 16: Periodic monitoring (1) An owner or occupier of a premise shall conduct periodic monitoring if required under the relevant Schedules. (4) An owner or occupier of a premises shall submit a periodic monitoring report in accordance with the specifications as determined by the DG and any samples shall be analysed by an accredited laboratory. (5) Any record of periodic monitoring under this Reg shall be kept for at least 3 years and shall be made available for inspection by the DG or any officer duly authorised in writing by him.	These records could then be used to establish an inventory of emissions from relevant sources. It is noted that there is a possibility that the full range of mercury emission is not captured just by subjecting certain type of industry to the obligation to monitor (their mercury emission) as required under the CAR 2014. Some plants that fall within the source category, but under the threshold for which reporting, and monitoring are made compulsory under CAR Regs 2014, would not be recorded.
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):		
It is important to develop an inventory of emissions from the source categories covered by the Minamata Convention. Although the existing regulatory framework provides for some monitoring and tracking of emissions, however, the mechanisms provided would not be adequate to satisfy the requirements of the Convention, especially where the CAR 2014 merely imposed on certain facilities that exceeded a specified threshold the obligation to monitor and report their emissions. Plans would have to be in place to ensure that Art 8 obligations stipulated under the Convention could be met. In particular, keeping in view the approach adopted by CAR 2014 requiring Best Available Techniques Economically Feasible for the control of emissions, reference had to be made in order to ensure that this standard is consistent with the BATs adopted by the COP of the Convention, where decisions might have to be made in deciding the types of control measure approaches that are most appropriate to the national circumstance. It should also be considered, even though a National Implementation Plan under Art 20 is not a binding obligation, whether the control and reduction of emissions of mercury and mercury compounds into the atmosphere would be included in a broader National Implementation Plan.		

Article 9 – Releases

Description of article:
Control and where feasible, reduce releases of total mercury to land and water from relevant point sources (which mean any significant anthropogenic point sources of release as identified by a Party). The relevant point source categories shall be identified no later than 3 years after the date of entry into force of the Convention. Measures, including release limit values to control and reduce releases from relevant sources with the use of BAT and BEP, a multi-pollutant control strategy that would deliver co-benefits for the control of mercury releases and other alternative measures for reduction of releases, shall be taken to control releases from relevant sources. The Party may prepare a national plan setting out the measures to be taken to control releases, and its expected targets, goals and outcomes. The plan shall be submitted to the Conference of the Parties within 4 years of the date of entry into force of the Convention. If an implementation plan is developed in accordance with Article 20, the plan developed to control releases could be included in the implementation plan. An inventory of releases from relevant sources shall be established no later than 5 years after the date of entry into force of the Convention and be maintained thereafter. Information on the implementation of this Article shall be included in its reports submitted pursuant to Article 21.

Succinct summary of provisions relevant to the country in question:

- Control and reduce releases of total mercury to land and water from the relevant point sources
- Identify the relevant point source categories no later than 3 years after the date of entry into force of the Convention and on a regular basis thereafter
- Take measures to control releases and prepare a national plan setting out measures to control releases, with expected targets, goals and outcomes, including release limit values, use of best available techniques and best environmental practices, a multi-pollutant control strategy that would deliver co-benefits for control of mercury releases, and alternative measures to reduce releases from relevant sources

Establish and maintain an inventory of releases from relevant sources no later than 5 years from the date of entry into force of the Convention

Policy and regulatory measures in place that enable the country to comply with the above listed provisions:

Title and reference number of relevant Policy and Regulatory Measure, as well as date	Relevant provisions	Remarks
• Control and reduce releases of total mercury to land and water from the relevant point sources (Art 9.1)		
Environmental Quality Act 1974 (Act 127)	S 24: Restrictions on pollution of the soil (1) No person shall, unless licenced, pollute or cause or permit to be polluted any soil or surface of any land in contravention of the acceptable conditions specified under s 21 S 25: Restrictions on pollution of inland waters (1) No person shall, unless licenced, emit, discharge or deposit any environmentally hazardous substances, pollutants or wastes in to any inland waters in contravention of the acceptable conditions specified under s 21 S 29: Prohibition of discharge of wastes into Malaysian waters (1) No person shall, unless licenced, discharge environmentally hazardous substances, pollutants or wastes into the Malaysian waters in contravention of the acceptable conditions specified under s 21	
Environmental Quality (Industrial Effluent) Regulations 2009	Reg 3: Application These Regulations shall apply to any premises which discharge or release industrial effluent or mixed effluent, onto or into any soil, or into inland waters or Malaysian waters, other than the premises as specified in the 1st Sch Reg 4: Obligation to notify the DG (1) No person shall, without prior written notification to the DG – (a) carry out any work on any premises that may result in a new source of discharge of industrial effluent or mixed effluent (b) construct on any land, building or facility designed or used for a purpose that may cause the land or building or facility to result in a new source of discharge of industrial effluent or mixed effluent (c) make or cause or permit to be made any change of, to, or in any plant, machine, or equipment used or installed at the premises that causes a material change in the quantity or quality of the discharge or release from an existing source; or (d) carry out upgrading work of an existing industrial effluent treatment system that may result in a material change in the	Pursuant to Regs 11(1)(a), 12 and 13, the 6th Sch laid out the list of catchment areas where Standard A applies. Item no. 1 of the Sch stipulated that – 1. The catchment areas referred to in these Regulations shall be the areas upstream of surface or above subsurface water supply intakes, for the purpose of human consumption including drinking water. The Sch further defines the water supply intake points, for the purpose of the Regs, to include the public water supply intakes specified in the *List of Catchment Areas where Standard A Applies*. The actual application of this definition is confirmed by the relevant stakeholders.

	quantity or quality of the discharge or release Reg 11: Acceptable conditions for the discharge of industrial effluent other than parameter of chemical oxygen demand (COD) (1) No person shall discharge industrial effluent which contains any parameter in concentration greater than the limits of – (a) Standard A, as shown in the 3rd column of the 5th Sch (mercury, parameter (v), 0.005 mg/L), into any inland wasters within the catchment areas as specified in the 6th Sch (b) Standard B, as shown in the 4th column of the 5th Sch (mercury, parameter (v), 0.05 mg/L), into any other inland waters or Malaysian waters Reg 14: Best management practice for the discharge of industrial effluent or mixed effluent for other parameters An owner or occupier of a premises shall adopt the best management practice for discharge of any industrial effluent or mixed effluent for any parameter as specified in the 9th Sch (mercury is not listed in the 9th Sch, the nearest possible parameters that might be extended to cover mercury is (xii) any substance that either by itself or in combination or by reaction with other waste may give rise to any gas, fume or odour or substance which causes or is likely to cause pollution) Reg 18: Prohibition against industrial effluent or mixed effluent discharge through by-pass (1) No person shall discharge or cause or permit to be discharged any industrial effluent or mixed effluent onto or into any soil, or into any inland waters or Malaysian waters through a by-pass Reg 23: Restriction on discharge or disposal of sludge (1) No person shall discharge, or cause or permit the discharge or disposal of any sludge generated from any production or manufacturing process, any industrial effluent treatment system or water treatment plant onto or into any soil, or surface of any land, or into any inland waters or Malaysian waters without the prior written permission of the DG Reg 30: Prohibition order (1) In the event of any undesirable occurrence as listed in the 12th Sch, the DG may issue a prohibition order to an owner or the occupier of a premise prohibiting the further operation of an industrial plant or process absolutely or conditionally for such period as the DG may direct or until remedial measures as directed by the DG have been complied with	
Environmental Quality (Control of Pollution from Solid Waste Transfer Station and Landfill) Regulations 2009	Reg 3: Application These Regulations shall apply to solid waste transfer stations and landfills which discharge or release leachate Reg 4: Notification for new source of leachate discharge or release (1) No person shall, without the prior written notification to the DG, carry out any work on any solid waste transfer station or landfill, or construct on any land any facility or building that may result in a new source of leachate discharge or release Reg 5: Operation of solid waste transfer station and landfill An owner or occupier of a solid waste transfer station or landfill shall design and operate the solid waste transfer station or landfill in such a manner that the following are strictly controlled: (b) air pollution (c) pollution of the soil, surface water or ground water (d) entry and disposal of scheduled wastes Reg 7. Control of ground water pollution An owner or occupier of a landfill shall – (a) ensure that the design and operation of the landfill incorporates measures to prevent and control the pollution to groundwater (b) establish and operate a ground water monitoring program to monitor the leakage or movement of leachate from the landfill Reg 13: Acceptable conditions for discharge of leachate No person shall discharge leachate which contains substances in concentrations greater than those specified as acceptable conditions as shown in the 3rd column of the 2nd Sch (mercury (parameter vii), 0.005 mg/L), onto or into any soil, or into any inland waters or Malaysian waters	

	Reg 16: Point of discharge of leachate (1) The point of discharge of leachate shall comply with the specifications as specified int eh 4th Sch and shall be clearly indicated by the owner or occupier of a solid waste transfer station or landfill on the layout plans and engineering drawings certified by a professional engineer Reg 17: Prohibition against leachate discharge or release through by-pass (1) No person shall discharge or release or cause or permit to be discharged or released leachate onto or into any soil, or into any inland waters or Malaysian waters through a by-pass Reg 18: Dilution of leachate (1) No person shall dilute, or cause or permit to be diluted, any leachate, whether raw or treated at any time or point after it is produced at any solid waste transfer station or landfill	
• Identify the relevant point source categories no later than 3 years after the date of entry into force of the Convention and on a regular basis thereafter (Art 9.3)		
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (e) to undertake surveys and investigations as to the cause, nature, extent of pollution and as to the methods of prevention of pollution and to assist and co-operate with other persons or bodies carrying out similar surveys or investigations.	
· Environmental Quality (Industrial Effluent) Regulations 2009	Reg 4: Obligation to notify the DG (1) No person shall, without prior written notification to the DG - (a) carry out any work on any premises that may result in a new source of discharge of industrial effluent or mixed effluent; (b) construct on any land, building or facility designed or used for a purpose that may cause the land or building or facility to result in a new source of discharge of industrial effluent or mixed effluent; (c) make or cause or permit to be made any change of, to, or in any plant, machine, or equipment used or installed at the premises that causes a material change in the quantity or quality of the discharge or release from an existing source; or (d) carry out upgrading work of an existing industrial effluent treatment system that may result in a material change in the quantity or quality of the discharge or release. (2) The written notification to carry out any work, construction, or upgrading, or to make any change referred to in subreg (1) shall be submitted to the DG in the form as specified in the Second Schedule within 30 days before the work or construction or upgrading commences.	Sources of 'new' sources or release could be identified if the DG is notified over the carrying out of any work, construction, changes to existing effluent treatment system that may cause the land or building or facility to result in a new source of discharge of industrial effluent or mixed effluent.
· Second Schedule Notification for New or Altered Sources of Discharge of Industrial Effluent or Mixed Effluent [Subreg 4(2)]	D. Information on Industrial Effluent Treatment System and Effluent Disposal 17. Mode and characteristic of effluent discharged (ii) Quality of effluent discharged: Parameter (in mg/L) for both raw effluent and treated effluent: (6) Mercury	The notification could be a starting point in identifying point source categories for 'new' sources, or the alteration of existing sources that might release mercury.
· Environmental Quality (Control of Pollution from Solid Waste Transfer Station and Landfill) Regulations 2009	Reg 4: Notification for new source of leachate discharge or release (1) Notwithstanding any other provisions in these Regulations, no person shall, without the prior written notification to the DG, carry out any work on any solid waste transfer station or landfill, or construct on any land any facility or building that may result in a new source of leachate discharge or release.	Sources of 'new' sources or release could be identified.

• Take measures to control releases and may prepare a national plan setting out measures to control releases, with expected targets, goals and outcomes, including release limit values, use of best available techniques and best environmental practices, a multi-pollutant control strategy that would deliver co-benefits for control of mercury releases, and alternative measures to reduce releases from relevant sources (Art 9.4) The measures to be included shall be one or more of the following, as appropriate (Art 9.5, (a) – (d)) (a) Release limit values to control and reduce releases from relevant sources; (b) Best available techniques and best environmental practices to control releases from relevant sources (c) A multi-pollutant control strategy that would deliver co-benefits for control of mercury releases (d) Alternative measures to reduce releases from relevant sources		
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (f) to conduct, promote and co-ordinate research in relation to any aspect of pollution or the prevention thereof and to develop criteria for the protection and enhancement of the environment; (g) to recommend to the Minister standards and criteria for the protection of beneficial uses and the maintenance of the quality of the environment having regard to the ability of the environment to absorb waste without detriment to its quality and other characteristics; (o) to promote, encourage, co-ordinate and carry out planning in environmental management, waste management and pollution control	
• Environmental Quality (Industrial Effluent) Regulations 2009	Reg 11: Acceptable conditions for the discharge of industrial effluent other than parameter of chemical oxygen demand (COD) (1) No person shall discharge industrial effluent which contains any parameter in concentration greater than the limits of – (a) Standard A, as shown in the 3rd column of the 5th Sch (mercury, parameter (v), 0.005 mg/L), into any inland wasters within the catchment areas as specified in the 6th Sch (b) Standard B, as shown in the 4th column of the 5th Sch (mercury, parameter (v), 0.05 mg/L), into any other inland waters or Malaysian waters Reg 14: Best management practice for the discharge of industrial effluent or mixed effluent for other parameters An owner or occupier of a premises shall adopt the best management practice for discharge of any industrial effluent or mixed effluent for any parameter as specified in the 9th Sch (mercury is not listed in the 9th Sch, the nearest possible parameters that might be extended to cover mercury is (xii) any substance that either by itself or in combination or by reaction with other waste may give rise to any gas, fume or odour or substance which causes or is likely to cause pollution) Reg 23: Restriction on discharge or disposal of sludge (1) No person shall discharge, or cause or permit the discharge or disposal of any sludge generated from any production or manufacturing process, any industrial effluent treatment system or water treatment plant onto or into any soil, or surface of any land, or into any inland waters or Malaysian waters without the prior written permission of the DG Reg 30: Prohibition order (1) In the event of any undesirable occurrence as listed in the 12th Sch, the DG may issue a prohibition order to an owner or the occupier of a premise prohibiting the further operation of an industrial plant or process absolutely or conditionally for such period as the DG may direct or until remedial measures as directed by the DG have been complied with.	The long title of the 2009 Regs stated clearly that the 2009 Regs was made pursuant to the powers conferred by ss 21, 24, 25 and 51 of the EQA 1974, whereby s 24 provides for restrictions on pollution of the soil and s 25 provides for restrictions on pollution of inland waters.
• Environmental Quality (Control of Pollution from Solid Waste Transfer Station and Landfill) Regulations 2009	Reg 5: Operation of solid waste transfer station and landfill An owner or occupier of a solid waste transfer station or landfill shall design and operate the solid waste transfer station or landfill in such a manner that the following are strictly controlled: (c) pollution of the soil, surface water or ground water; and (d) entry and disposal of scheduled wastes. Reg 7: Control of ground water pollution An owner or occupier of a landfill shall –	Even though Reg 13 provides for acceptable conditions for the discharge of leachate, it is, in itself, not inconsistent with the Convention. Although the Convention imposes on the Parties to 'take measures to control releases' (Art 9.4), the measures stipulated under Art 9.5 that shall be included in the

	(a) ensure that the design and operation of the landfill incorporates measures to prevent and control the pollution to ground water; and (b) establish and operate a ground water monitoring program to monitor the leakage or movement of leachate from the landfill. Reg 8: Monitoring of leachate discharge An owner or occupier of a landfill that discharges leachate onto or into any soil, or into any inland waters or Malaysian waters shall, at his own expense – (b) monitor the concentration of other parameters as listed in the **1st column of the 2nd Sch** in the leachate discharged from the landfill. Reg 9: Provision of leachate treatment system No person shall operate a solid waste transfer station or landfill without a leachate treatment system. **Reg 13: Acceptable conditions for discharge of leachate** No person shall discharge leachate which contains substances in concentrations greater than those specified as acceptable conditions as shown in the third column of the Second Schedule, onto or into any soil, or into any inland waters or Malaysian waters. Reg 16: Point of discharge of leachate (1) The point of discharge of leachate shall comply with the specification as specified in the Fourth Schedule and shall be clearly indicated by the owner or occupier of a solid waste transfer station or landfill on the layout plans and engineering drawing certified by a professional engineer. Reg 17: Prohibition against leachate discharge or release through by-pass (1) No person shall discharge or release or cause or permit to be discharged or released leachate onto or into any soil, or into any inland waters or Malaysian waters through a by-pass. Reg 18: Dilution of leachate (1) No person shall dilute, or cause or permit to be diluted, any leachate, whether raw or treated at any time or point after it is produced at any solid waste transfer station or landfill Reg 20: Making changes that alter quality of leachate The holder of a licence shall not make, or cause or permit to be made, any changes to a solid waste transfer station or landfill or in the manner of maintaining or operating the solid waste transfer station or landfill, which cause, or is intended or is likely to cause, a material increase in the quantity or quality of leachate or both discharged from the solid waste transfer station or landfill, unless the prior written approval of the DG has been obtained for the change.	measures taken to implement Art 9.4, merely include any one or more of the measures stipulated. These measures do not impose total prohibition of releases. Therefore, the conditions whereby certain discharge of leachate is acceptable is allowed under this Regs do not, in itself, contravene the spirit and objective of the Minamata Convention as long as our country had taken measures, together with their expected targets, goals and outcomes aiming to control and where feasible, reduce releases of mercury and mercury compounds (total mercury) to land and water from relevant point sources not otherwise addressed in other provisions of the Minamata Convention.
• Second Schedule Acceptable Conditions for Discharge of Leachate (Reg 13)	Parameter (vii) Mercury: 0.005 mg/L	
• Establish and maintain an inventory of releases from relevant sources no later than 5 years from the date of entry into force of the Convention		
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (b) to be responsible for and to co-ordinate all activities relating to the discharge of wastes into the environment and for preventing or controlling pollution and protecting and enhancing the quality of the environment. (e) to undertake surveys and investigations as to the **causes, nature, extent of pollution** and as to the methods of prevention of pollution and to assist and co-operate with other persons or bodies carrying out similar surveys or investigations; (i) to publish an annual report on environmental quality not later than 30th September of the following year and such other reports and information with respect to any aspect of environmental protection (o) to promote, encourage, co-ordinate and carry out planning in environmental management, waste management and pollution	S 3 does not specifically provide for the duty and function of the DG to establish and maintain an inventory of releases. S 3(b) could be interpreted to enable the DG Office to establish an inventory of releases as fulfilling in parts, their responsibility for, and the co-ordination of all activities relating to the discharge of wastes into the environment and for preventing or controlling pollution and protecting and enhancing the quality of the environment. Alternatively, s 3(o) could possibly be interpreted to include the power of the DG and other officers to establish and maintain an inventory of releases from relevant sources in order to carry out the Office's planning in pollution control.

	control. S 33A: Environmental audit (1) The DG may require the owner or occupier of any vehicle, ship or premises, irrespective of whether the vehicle, ship or premises are prescribed under s 18 or otherwise, to carry out an environmental audit and to submit an audit report in the manner as may be prescribed by the Minister by regs made under this Act.	In addition, the duty and function of the DG to publish an annual report under s 3(1)(i) on environmental quality might be a starting point for the establishment and maintenance of such an inventory. The information that builds the inventory of releases from relevant sources could also be obtained from the audit report submitted by virtue of s 33A.
· Environmental Quality (Industrial Effluent) Regulations 2009	Reg 4: Obligation to notify the DG (1) No person shall, without prior written notification to the DG - (a) carry out any work on any premises that may result in a new source of discharge of industrial effluent or mixed effluent; (b) construct on any land, building or facility designed or used for a purpose that may cause the land or building or facility to result in a new source of discharge of industrial effluent or mixed effluent; (c) make or cause or permit to be made any change of, to, or in any plant, machine, or equipment used or installed at the premises that causes a material change in the quantity or quality of the discharge or release from an existing source; or (d) carry out upgrading work of an existing industrial effluent treatment system that may result in a material change in the quantity or quality of the discharge or release.	Sources of 'new' sources or release identified through notification could be used as a starting point for the establishment of an inventory of releases.
· Environmental Quality (Control of Pollution from Solid Waste Transfer Station and Landfill) Regulations 2009	Reg 4: Notification for new source of leachate discharge or release (1) Notwithstanding any other provisions in these Regulations, no person shall, without the prior written notification to the DG, carry out any work on any solid waste transfer station or landfill, or construct on any land any facility or building that may result in a new source of leachate discharge or release.	Sources of 'new' sources or release identified through notification could be used as a starting point for the establishment of an inventory of releases.
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):		
There is a need to identify other (potential) significant sources of mercury releases to land or water that have not otherwise been addressed by other parts of the Convention, such as existing primary mercury mines operating prior to the phase-out deadline in Art 3 (although authorities had confirmed that there is no primary mercury mining in the country), air emission sources identified in Annex D, and non-ferrous mining operations that are not covered under Annex D or Art 11, in the country. An inventory of releases to land and water would need to be established where facilities releasing significant sources of mercury into land or water would need to be identified so that measures could be developed to address such releases. There is also a need to consider if the implementation of Art 9 obligations would be included in a broader National Implementation Plan even though Art 20 obligation is not binding on the Parties.		

Article 10 – Environmentally sound interim storage of mercury, other than waste mercury

Description of article:
This Art applies to the interim storage of mercury and mercury compounds that do not fall within the meaning of mercury wastes set out in Art 11. Each Party is obliged to take measures to ensure that the interim storage of such mercury and mercury compounds[37] intended for a use allowed to a Party under the Convention is undertaken in an environmentally sound manner, which takes into account any guidelines and in accordance with any requirements adopted under Art 10.3. Cooperation between parties, and with the relevant intergovernmental organisations and other entities should be forged in order to enhance capacity-building for the environmentally sound interim storage of such mercury and mercury compounds. The scope of Art 10 is limited to 'interim' or temporary storage whereby the 'storage' of mercury and mercury compounds are associated with an allowed use under the Convention.

Succinct summary of provisions relevant to the country in question:

- Ensure the interim storage of mercury and mercury compounds intended for an allowed use is undertaken in an environmentally sound manner
- Cooperate with other Parties and with relevant intergovernmental organisations and other entities to enhance capacity-building for the environmentally sound interim storage of such mercury and mercury compounds

Interim mercury storage standards may address areas such as location, quantity limits, duration, room temperature and humidity, containers, secondary containment and flooring, labelling, employee training, inspections and monitoring, release/spill response, security, financial responsibility (i.e., bonding, insurance) in the event of spills or facility abandonment, and reporting.[38]

Policy and regulatory measures in place that enable the country to comply with the above listed provisions:

Title and reference number of relevant Policy and Regulatory Measure, as well as date	Relevant provisions	Remarks
• Ensure the interim storage of mercury and mercury compounds intended for an allowed use is undertaken in an environmentally sound manner		
Poisons Act 1952 (Act 366)	S 9: Packaging, labelling and storing of poisons (1) No person, whether licenced under the Act or not, shall knowingly sell, supply, keep or have in his possession or under his control or store any poison otherwise than in accordance with the regulations made under the Act and in force relating to the possession, containers, packaging, labelling or storing of such poison S 35: Regulation (1) The Minister may make regulations to carry out the purposes of this Act and, in particular, but without prejudice to the generality of the foregoing powers, may make regulations with respect to any of the following matters or for any of the following purposes: (d) the storage, transport and labelling of poisons.	The interim storage of mercury and mercury compounds should be specifically provided under the Poisons Act 1952 and the Poison Regulations 1952. Amendments to the legislations might be necessary in order to ensure that the interim storage of mercury and mercury compounds intended for an allowed use falling within the purview of the Poisons Act 1952 takes into account the Guidelines on the Environmentally Sound Interim Storage of Mercury other than Waste Mercury developed by the COP of the Convention.[39]
• Poison Regulations 1952	Reg 6: Manner in which Poison is to be stored Where any poison is kept for sale, whether by wholesale or retail or for dispensing purpose, it shall be kept (a) in an unbroken case or package as received from the manufacturer; or (b) in a container tied over, capped, locked or otherwise safely secured in a manner different from that in which container of non-poisonous substances kept in the same warehouse shop or dispensary are secured; or (c) in a container readily distinguishable by touch from all containers holding non-poisonous substances; or (d) in a room or cupboard under lock and key set apart for the keeping of poisons; Provided that where any poison is stored in any dispensary, retail shop or premises used in connection therewith, it shall be stored –	

[37] Mercury compounds covered by this Art refers to those listed in Art 3.1.b of the Convention (NRDC, 2016).
[38] Natural Resources Defense Council. 2016. Guide to checklist of Minamata Convention on Mercury obligations which may require new legal authority.
[39] UN-Environment, undated. Guidelines on the Environmentally Sound Interim Storage of Mercury other than Waste Mercury developed by the COP of the Convention http://mercuryconvention.org/Portals/11/documents/forms-guidance/English/Guidelines_Environmentally-sound-interim-storage_Nov2018.pdf

	(a) in a cupboard or drawer under lock and key reserved solely for the storage of poisons, or in a part of the premises which is partitioned off or otherwise separated from the remainder of the premises and to which customers are not permitted access; and (b) if a liquid kept in a container holding 2.5 litres or less, in a container which shall be readily distinguishable by touch from all containers holding non-poisonous liquids.	
Pesticides Act 1974 (Act 149)	S 17. Licence to sell or store pesticides (1) Any person desiring to sell or store for sale a pesticide shall, in the prescribed manner, and accompanied with the prescribed application fee, apply for a licence for that purpose to the Pesticides Licensing Officer for the area in which he resides or, in the case of a body corporate or firm, in which the body corporate or firm has its place or principal place of business S 57: Rules and regulations (1) The Minister may, after consulting the Board, make rules or regulations to carry out the purposes of this Act and to give effect to the provisions thereof and in particular, but without prejudice to the generality of the foregoing power, such rules or regulations may – (g) prescribe the manner of storing or keeping pesticides.	
Environmental Quality Act 1974 (Act 127)	S 18: Prescribed premises to be licenced (1) The Minister after consultation with the Council may by order prescribe the premises the occupation or use of which by any person shall, unless he is the holder of a licence issued in respect of those premises, be an offence under the Act (1A) The Minister, after consultation with the Council, may by order prescribe the vehicle or ship used for the movement, transfer, placement or deposit of wastes the use of which by any person shall, unless he is the holder of a licence issued in respect of the prescribed conveyance, be an offence under the Act. S 19: Prohibition against causing vehicle, ship or premises to become prescribed conveyance or prescribed premises No person shall – (a) carry out any work on any vehicle, ship or premises that would cause the vehicle, ship or premises to become a prescribed conveyance or prescribed premises, as the case may be (b) construct on any land any building designed for or used for a purpose that would cause the land or building to become prescribed premises; without the prior written permission of the DG. S 51: Regulations (1) In addition to and not in derogation of any of the powers contained in any other provisions of this Act, the Minister after consultation with the Council may make regulations for or with respect to – (u) prohibiting or regulating the manufacture, storage, transportation, or the application or use, emission, discharge, or deposit into the environment, of any environmentally hazardous substances.	The Minister could impose conditions in the licence that enable the obligations stipulated under the Convention of which the licenced holder have to comply, without prejudice to, or in addition to, compliance under other relevant laws in the country. For example, in the workplace, ss 20 and 21 of the Occupational Safety and Health Act 1994 could be invoked to regulate the use of mercury or mercury compounds in interim storage. As it currently stands, there are 3 types of premises prescribed under the Order of the DG pursuant to s 18, namely – · Environmental Quality (Prescribed Premises) (Crude Palm Oil) Order 1977 · Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Order 1978 · Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Order 1989 Therefore, similar order by virtue of the power conferred to the Minister under s 18 could be made to regulate premises and conveyance (or 'facilities') where the occupation or use of which by persons for the sending, receiving, manufacture, storage, transportation, or the application or use, emission, discharge, or deposit into the environment of mercury and mercury compounds, and mercury wastes in accordance with the impositions stipulated under the Minamata Convention, which could include the regulation of the interim storage of mercury and mercury compounds in an environmentally sound manner.

Occupational Safety and Health Act 1994 (Act 514)	S 21: General duties of manufacturers, etc. as regards substances for use at work (1) It shall be the duty of a person who formulates, manufactures, imports or supplies any substance for use at work – (a) to ensure, so far as is practicable, that the substance is safe and without risks to health when properly used; (b) to carry out or arrange for the carrying out of such testing and examination as may be necessary for the performance of the duty imposed on him by para (a); and (c) to take such steps as are necessary to ensure that there will be available in connection with the use of the substance at work adequate information about the results of any relevant test which has been carried out on or in connection with the substance and about any condition necessary to ensure that it will be safe and without risks to health when properly used. S 66: Regulations (1) The Minister may make regulation for or with respect to the safety, health and welfare of persons at work in order to achieve the objects of the Act (2) Such regulations may – (a) regulate or prohibit – (i) the manufacture, supply, **storage,** transport or use of any substance; and (iii) the carrying on of any process or the carrying out of any operation; (u) prescribe any other matter which may appear to the Minister to be expedient or necessary for the better carrying out of the Act	The regulations to be made by the Minister for the regulation of the storage of any substance, in particular mercury and mercury compounds as provided under the Minamata Convention could incorporate interim mercury storage standards regulating areas such as location, quantity limits, duration, room temperature and humidity, containers, secondary containment and flooring, labelling, employee training, inspections and monitoring, release/spill response, security, financial responsibility (i.e., bonding, insurance) in the event of spills or facility abandonment, and reporting, which are crucial to ensure that the interim storage of mercury and mercury compounds are undertaken in an environmentally sound management consistent with the obligations imposed under Art 10 of the Convention.
· Occupational Safety and Health (Classification, Labelling and Safety Data Sheet of Hazardous Chemicals) Regulations 2013	Part II: Classification Reg 4: Duty of principal supplier to classify chemical as hazardous chemical (1) Subject to subreg (2), a principal supplier shall classify a chemical as a hazardous chemical in accordance with the list of classified chemicals specified in Pt 1 of the Industry Code of Practice. Reg 5: Record of classification (1) A principal supplier shall record the classification of chemicals as hazardous chemicals made under reg 4 in such form and manner specified in Pt 2 of the Industry Code of Practice. Part III: Packaging Reg 6: Packaging requirement of hazardous chemical (1) A supplier shall ensure that a hazardous chemical is supplied in a packaging that satisfies the requirements set forth in the reg. Part IV: Labelling Reg 8: Duty to label packaging of hazardous chemical Reg 9: Requirement for hazard pictogram Part V: Safety Data Sheet Reg 13: Duty to furnish Safety Data Sheet (1) A supplier shall furnish a Safety Data Sheet to a chemical recipient for – (a) each hazardous chemical supplied; and (b) any chemical mixture containing hazardous substance at the concentration exceeding the cut-off value of concentration for the relevant hazard class as specified in the 5th Sch. Part VI: Inventory of hazardous chemicals Reg 14: Inventory of hazardous chemicals (1) An importer or a manufacturer, as the case may be, shall prepare an inventory of hazardous chemicals consisting of information on each hazardous chemical imported or supplied in a quantity of 1 MT and above per year for each calendar year.	
· Occupational Safety and Health (Use and Standard of Exposure of Chemicals Hazardous to Health) Regulations 2000	Part II: Identification of Chemicals Hazardous to Health Reg 5: Register of chemicals hazardous to health Part III: Permissible Exposure Limit Reg 6 : Ceiling limit Reg 7 : Eight-hour time-weighted average Reg 8: Compliance with permissible exposure limit using respirator Part IV: Assessment of Risk to Health Reg 9: Assessment of risk to health Part V: Action to Control Exposure	

	Reg 14: Action to control exposure Reg 15: Control measures Reg 16: Use of approved personal protective equipment Reg 17: Engineering control equipment Reg 18: Design, construction and commissioning of local exhaust ventilation equipment Reg 19: Records of engineering control equipment Part VI: Labelling and Relabelling Reg 20: Duty of employer to ensure labelling Reg 21: Relabelling Part VII: Information, Instruction, and Training Reg 22: Information, instruction and training Reg 23: Information, instruction and supervision of person Reg 24: Chemical Safety Data Sheet Reg 25: Provision of Chemical Safety Data Sheet in a place of work Part VIII: Monitoring of Exposure at the Place of Work Reg 26: Monitoring of exposure Part XI: Warning Sign Reg 29: Warning sign Part XII: Record Keeping Reg 30: Retention of records by employer	
• Occupational Safety and Health (Control of Industrial Major Accident Hazards) Regulations 1996	Reg 5: Obligations of manufacturer and employee (1) Every manufacturer who undertakes an industrial activity shall – (a) comply with the requirements of these Regs; (b) as soon as he becomes aware of an imminent danger which may affect the safety of persons or the environment, take immediate action to rectify the situation; and (c) establish and maintain a good management system for controlling any major accident as described in the report made under subreg 14(1) and reg 16. (2) Every employee shall – (a) co-operate with the manufacturer in complying with the requirements of these Regs; (b) act in such a manner so as not to endanger himself or to cause or be likely to cause bodily injury to himself or to other persons, or damage to life and property; and (c) notify the manufacturer as soon as he becomes aware of any potential hazard which he considers is capable of generating a major accident, and shall have the right to notify an officer of the potential hazard.	
• Guidelines on Storage of Hazardous Chemicals: A Guide for Safe Warehousing of Packaged Hazardous Chemicals (DOSH, 2005)	Para 6.5 Outdoor Storage Where hazardous chemicals are stored outdoors, bunding arrangements should be identical to those for indoor storage and a roof or a cover to protect from sun and rain should be provided. This poses a number of problems: • Outdoor storage of chemicals exposes the chemicals to high temperatures that may lead to thermal degradation. Careful selection of chemicals with the help of their Chemical Safety data Sheet would be therefore important. • To avoid contamination of the soil and the water table, the storage area should be surfaced with impervious, heat and water-resistant material, avoiding asphalt because it softens in hot climates and under the influence of certain solvents; • The bunded area must be equipped with a drain controlled by a valve. • Products stored in this manner must be scrupulously checked for leakage so as to avoid contamination of the drainage system. Weatherproof packs such as 200 litre drums may be stored in the open provided their contents are not sensitive to extremes of temperature and security can be guaranteed. Drum storage upright on pallets is recommended. Drums stored on the roll must be wedged. All drums must be stored in such a way that there is always sufficient space for fire- fighting access. With certain materials such as highly flammable liquids, gas cylinders or liquid chlorine, outdoor storage is recommended.	As this Guidelines are developed specifically for the safe warehousing of packaged hazardous chemicals, a more general guidelines that address all types of storage of mercury and mercury compounds in all types of premises should be developed in order to address the particular needs of the Convention, which also takes into account the guidelines developed by COP of the Convention in order to ensure that the interim storage of mercury and mercury compounds is undertaken in an environmentally sound manner.

• Cooperate with other Parties and with relevant intergovernmental organisations and other entities to enhance capacity-building for the environmentally sound interim storage of such mercury and mercury compounds (Art 10.4)		
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (l) to provide information and education to the public regarding the protection and enhancement of the environment; (m) to establish and maintain liaison and co-operation with each of the State Authorities in Malaysia and with other countries with respect to environment protection, pollution control and waste management.	
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):		
More information is needed to ascertain whether there is in existence 1 or more of the types of facilities which may store mercury or mercury compounds intended for an allowed use under the Convention, in the country in order to ensure that these facilities are properly identified and subject to control consistent with the obligations imposed under the Convention. It is timely to assess whether existing storage requirements, mostly found within the purview of the Department of Occupational Safety and Health are adequate to cover all the relevant facilities, and sufficiently comprehensive to meet the obligations of the Convention. Further efforts would need to be undertaken to identify whether there are any control measures or administrative mechanisms in place that could ensure that the storage of mercury and mercury compounds intended for an allowed use under the Convention, at a relevant facility, complies with the obligations imposed under Art 10 of the Convention. It is noted that Parties to the Convention would need to report to the Secretariat, if there are any large stockpiles of mercury and specific mercury compounds (individual stock of 50 MT, or supply capable of generating stocks of 10 MT per year) in the country, and also the measures taken to ensure environmentally sound storage of such mercury and mercury compounds. The country would want to implement monitoring and tracking requirements necessary to ensure mercury is not stored longer than intended and it is in fact destined for an allowed use under the Convention.		

Article 11 – Mercury waste

Description of article:

The Art noted that the relevant definitions of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal shall apply to wastes covered under this Convention for Parties to the Basel Convention. However, Parties to this Convention, but not Parties to the Basel Convention shall use those definitions as guidance as applied to wastes covered under this Convention. For the present purpose, mercury wastes are defined to mean (Art 11.2) substances or objects that consist of, contain, or contaminated with mercury or mercury compounds in a quantity above the relevant thresholds 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 definition of mercury waste excludes overburden, waste rock and tailings from mining, except from primary mercury mining, unless they contain mercury or mercury compounds above the defined thresholds. The measures that each Party shall take would ensure that mercury waste is managed in an environmentally sound manner, taking into account the guidelines developed under the Basel Convention, and in accordance with requirements that the COP shall adopt in an additional annex in accordance with Art 27 (Art 11.3.a). These measures would also ensure that mercury waste is only recovered, recycled, reclaimed or directly re-used for a use allowed to a Party under the Convention or for environmentally sound disposal pursuant to Art 11.3.a. Art 11.3.c applies specifically to Parties to the Basel Convention where Parties who are Parties to both Convention adopt appropriate measures so that mercury wastes are not transported across international boundaries except for the purpose of environmentally sound disposal in conformity with Art 11 and with the Basel Convention. Where Basel Convention does not apply to transport across international boundaries for a Party, the Party shall allow such transport only after taking into account relevant international rules, standards, and guidelines. Art 11 covers the long-term management or disposal of waste mercury and mercury compounds. As more allowed uses would be gradually phased out over time, this Art would become increasingly important.

Succinct summary of provisions relevant to the country in question:

Appropriate measures in relation to mercury waste shall be taken. These measures are:

- Manage mercury wastes in an environmentally sound manner, taking into account the guidelines developed under the Basel Convention
- Recover, recycle, reclaim or directly re-use mercury waste only for a use allowed to a Party or for environmentally sound disposal pursuant to Article 3(a)
- Do not transport across international boundaries except for environmentally sound disposal (for parties to the Basel Convention)

Policy and regulatory measures in place that enable the country to comply with the above listed provisions:

Title and reference number of relevant Policy and Regulatory Measure, as well as date	Relevant provisions	Remarks
• Appropriate measures in relation to mercury waste shall be taken (Art 11.3)		
Environmental Quality Act 1974 (Act 127)	S 33; Power to prohibit or control licenced persons from discharging, etc. of wastes in certain circumstances (1) Where several persons are licensed under this Act to emit, discharge or deposit environmentally hazardous substances, pollutants or wastes into the same segment or element of environment and appears to the DG that each of such persons is complying with the conditions of the licence but nevertheless the collective effect of the aggregate of such wastes is likely to cause a worsening of condition in that segment or element of the environment such as to affect the health, welfare or safety of human beings, or to threaten the existence of any animals, birds, wildlife, fish or other aquatic life, the DG may, by notice serve on each of the licensees, requiring each of them to abate such emission, discharge or deposit in the manner and within the period specified in the notice. S 34B: Prohibition against placing, deposit, etc of scheduled wastes (1) No person shall – (a) place, deposit or dispose of, or cause or permit to place, deposit or dispose of, except at prescribed premises only, any scheduled wastes on land or into Malaysian waters; (b) receive or send, or cause or permit to be received or sent any schedules wastes in or out of Malaysia; (c) transit or cause or permit the transit of scheduled wastes Without any prior written approval of the DG	

· Environmental Quality (Scheduled Wastes) Regulations 2005	Reg 3: Notification of the generation of scheduled wastes (1) Every waste generator shall notify the DG of the new categories and quantities of scheduled wastes which are generated Reg 4: Disposal of scheduled wastes (1) Scheduled wastes shall be disposed of at prescribed premises only (2) Scheduled wastes shall, as far as is practicable, be rendered innocuous prior to disposal Reg 5: Treatment of scheduled wastes (1) Scheduled wastes shall be treated at prescribed premises or at on-site treatment facilities only (2) Residuals from treatment of scheduled wastes shall be treated or disposed of at prescribed premises Reg 6: Recovery of material or product from scheduled wastes (1) Recovery of material or product from scheduled wastes shall be done at prescribed premises or at on-site recovery facilities (2) Residuals from recovery of material or product from scheduled wastes shall be treated or disposed of at prescribed premises Reg 7: Application for special management of scheduled wastes (1): A waste generator may apply to the DG in writing to have the scheduled wastes generated from their particular facility or process excluded from being treated, disposed of or recovered in premises or facilities other than at the prescribed premises or on-site treatment or recovery facilities. Reg 8: Responsibility of waste generator (1) Every waste generator shall ensure that scheduled wastes generated by him are properly stored, treated on-site, recovered on-site for material or product from such scheduled wastes or delivered to and received at prescribed premises for treatment, disposal or recovery of material or product from scheduled wastes (2) Every waste generator shall ensure that scheduled wastes that are subjected to movement or transfer be packaged, labelled and transported in accordance with the guidelines prescribed by the DG Reg 9: Storage of scheduled wastes (1) Scheduled wastes shall be stored in containers which are compatible with the scheduled wastes to be stored, durable and which are able to prevent spillage or leakage of the scheduled wastes into the environment Reg 10: Labelling of scheduled wastes (1) The date when the scheduled wastes are first generated, name, address and telephone number of the waste generator shall be clearly labelled on the containers that are used to store the scheduled wastes (2) Containers of scheduled waste shall be clearly labelled in accordance with the types applicable to them as specified int eh 3rd Sch and marked with the scheduled wastes code as specified int eh 1st Sch for identification and warning purposes Reg 11: Waste generator shall keep an inventory of scheduled wastes A waste generator shall keep accurate and up-to-date inventory in accordance with the 5th Sch of the categories and quantities of scheduled wastes being generated, treated and disposed of an of materials or product recovered from such scheduled wastes for a period up to 3 years from the date the scheduled wastes were generated Reg 12: Information to be provided by waste generator, contractor and occupier of prescribed premises (1) A waste generator, contractor and occupier of prescribed premises shall provide information in accordance with the 6th Sch in the manner provided in the Regulations or DG shall determine other method as he thinks fit Reg 13: Scheduled wastes transported outside waste generator's premises to be accompanied by information (1) Every waste generator shall provide information in accordance with 7th Sch in respect of each category of scheduled wastes to be delivered to the contractor and shall give the Sch to the contractor upon delivery of the waste to him Reg 14: Spill or accidental discharge (1) The contractor responsible for the waste that was spilt or	

	accidentally discharged shall immediately inform the DG of the occurrence (2) The contractor shall do everything that is practicable to contain, cleanse or abate the spill or accidental discharge and to recover substances involved in the spill or accidental discharge	
Solid Waste and Public Cleansing Management Act 2007 (Act 672)	Section 2. Interpretation "controlled solid waste" means any solid waste falling within any of the following categories: (a) commercial solid waste; (b) construction solid waste (c) household solid waste; (d) industrial solid waste; (e) institutional solid waste; (f) imported solid waste; (g) public solid waste; or (h) solid waste which may be prescribed from time to time 'solid waste' includes – (a) any scrap material or other unwanted surplus substance or rejected products arising from the application of any process; (b) any substance required to be disposed of as being broken, worn out, contaminated or otherwise spoiled; or (c) any other material that according to this Act or any other written law is required by the authority to be disposed of, but does not include scheduled wastes as prescribed under the Environmental Quality Act 1974 *[Act 127]*, sewage as defined in the Water Services Industry Act 2006 *[Act 655]* of radioactive waste as defined in the Atomic Energy Licensing Act 1984 *[Act 304]*. S 6(1)(b): The Director General shall formulate plans for solid waste management including, among others, the solid waste management schemes to supply controlled solid waste to the solid waste management facilities and the timescale for the implementation of the plans. Section 19(2)(b): If the Director General decides to grant a licence under section 19(1), he shall impose conditions pertaining to the types of controlled solid waste, the solid waste management facilities to which collected solid waste may be delivered to, and the requirement to deposit such amount as may be prescribed as security for safe closure of solid waste management facilities (paras (d), (e), and (f) of subs 19(3)).	
• Manage mercury wastes in an environmentally sound manner, taking into account the guidelines developed under the Basel Convention (Art 11.3.a)		
Environmental Quality Act 1974 (Act 127)	S 34B: Prohibition against placing, deposit, etc of scheduled wastes (1) No person shall – (a) place, deposit or dispose of, or cause or permit to place, deposit or dispose of, except at prescribed premises only, any scheduled wastes on land or into Malaysian waters; (b) receive or send, or cause or permit to be received or sent any schedules wastes in or out of Malaysia; (c) transit or cause or permit the transit of scheduled wastes Without any prior written approval of the DG	
· Environmental Quality (Scheduled Wastes) Regulations 2005	Reg 8: Responsibility of waste generator (1) Every waste generator shall ensure that scheduled wastes generated by him are properly stored, treated on-site, recovered on-site for material or product from such scheduled wastes or delivered to and received at prescribed premises for treatment, disposal or recovery of material or product from scheduled wastes (2) Every waste generator shall ensure that scheduled wastes that are subjected to movement or transfer be packaged, labelled and transported in accordance with the guidelines prescribed by the DG Reg 9: Storage of scheduled wastes (1) Scheduled wastes shall be stored in containers which are compatible with the scheduled wastes to be stored, durable and which are able to prevent spillage or leakage of the scheduled wastes into the environment	

	Reg 10: Labelling of scheduled wastes (1) The date when the scheduled wastes are first generated, name, address and telephone number of the waste generator shall be clearly labelled on the containers that are used to store the scheduled wastes (2) Containers of scheduled waste shall be clearly labelled in accordance with the types applicable to them as specified int eh 3rd Sch and marked with the scheduled wastes code as specified int eh 1st Sch for identification and warning purposes	
> 1st Sch (Reg 2)	SW 109 Waste containing mercury or its compound SW 110 Waste from electrical and electronic assemblies containing components such as accumulators, mercury-switches, glass from cathode-ray tubes and other activated glass or polychlorinated biphenyl-capacitors, or contaminated with cadmium, mercury, lead, nickel, chromium, copper, lithium, silver, manganese or polychlorinated biphenyl SW 401 Spent alkalis containing heavy metals	
Solid Waste and Public Cleansing Management Act 2007 (Act 672)	Section 2. Interpretation "controlled solid waste" means any solid waste falling within any of the following categories: (a) commercial solid waste; (b) construction solid waste (c) household solid waste; (d) industrial solid waste; (e) institutional solid waste; (f) imported solid waste; (g) public solid waste; or (h) solid waste which may be prescribed from time to time 'solid waste' includes – (a) any scrap material or other unwanted surplus substance or rejected products arising from the application of any process; (b) any substance required to be disposed of as being broken, worn out, contaminated or otherwise spoiled; or (c) any other material that according to this Act or any other written law is required by the authority to be disposed of, but does not include scheduled wastes as prescribed under the Environmental Quality Act 1974 *[Act 127]*, sewage as defined in the Water Services Industry Act 2006 *[Act 655]* of radioactive waste as defined in the Atomic Energy Licensing Act 1984 *[Act 304]* Section 6(1)(b): The Director General shall formulate plans for solid waste management including, among others, the solid waste management schemes to supply controlled solid waste to the solid waste management facilities and the timescale for the implementation of the plans. Section 19(2)(b): If the Director General decides to grant a licence under section 19(1), he shall impose conditions pertaining to the types of controlled solid waste, the solid waste management facilities to which collected solid waste may be delivered to, and the requirement to deposit such amount as may be prescribed as security for safe closure of solid waste management facilities (paragraphs (d), (e), and (f) of subsection 19(3)).	
• Recover, recycle, reclaim or directly re-use mercury waste only for a use allowed to a Party or for environmentally sound disposal pursuant to Art 3.a (Art 11.3.b)		
Environmental Quality Act 1974 (Act 127)	S 18: Prescribed premises to be licenced (1) The Minister after consultation with the Council may by order prescribe the premises the occupation or use of which by any person shall, unless he is the holder of a licence issued in respect of those premises, be an offence under the Act (1A) The Minister, after consultation with the Council, may by order prescribe the vehicle or ship used for the movement, transfer, placement or deposit of wastes the use of which by any person shall, unless he is the holder of a licence issued in respect of the prescribed conveyance, be an offence under the Act S 34B: Prohibition against placing, deposit, etc of scheduled wastes	The recovering, recycling, reclaiming or the direct re-using of mercury waste (a scheduled waste) will be prohibited at prescribed premises or at on-site recovery facilities unless it satisfies the conditions stipulated for allowable use, or for environmentally sound disposal. The Minister could impose conditions in the licence issued under s 18 that enable the obligations stipulated under the Convention of which the licenced holder have to comply,

	(1) No person shall – (a) place, deposit or dispose of, or cause or permit to place, deposit or dispose of, except at prescribed premises only, any scheduled wastes on land or into Malaysian waters; (b) receive or send, or cause or permit to be received or sent any schedules wastes in or out of Malaysia; (c) transit or cause or permit the transit of scheduled wastes Without any prior written approval of the DG	without prejudice to, or in addition to, compliance under other relevant laws in the country. For example, in the workplace, ss 20 and 21 of the OSHA 1994 could be invoked to regulate mercury wastes.
• Environmental Quality (Scheduled Wastes) Regulations 2005	Reg 6: Recovery of material or product from scheduled wastes (1) Recovery of material or product from scheduled wastes shall be done at prescribed premises or at on-site recovery facilities (2) Residuals from recovery of material or product from scheduled wastes shall be treated or disposed of at prescribed premises	
Solid Waste and Public Cleansing Management Act 2007 (Act 672)	Section 2. Interpretation "controlled solid waste" means any solid waste falling within any of the following categories: (a) commercial solid waste; (b) construction solid waste (c) household solid waste; (d) industrial solid waste; (e) institutional solid waste; (f) imported solid waste; (g) public solid waste; or (h) solid waste which may be prescribed from time to time 'solid waste' includes – (a) any scrap material or other unwanted surplus substance or rejected products arising from the application of any process; (b) any substance required to be disposed of as being broken, worn out, contaminated or otherwise spoiled; or (c) any other material that according to this Act or any other written law is required by the authority to be disposed of, but does not include scheduled wastes as prescribed under the Environmental Quality Act 1974 *[Act 127]*, sewage as defined in the Water Services Industry Act 2006 *[Act 655]* of radioactive waste as defined in the Atomic Energy Licensing Act 1984 *[Act 304]*. Section 6(1)(b): The Director General shall formulate plans for solid waste management including, among others, the solid waste management schemes to supply controlled solid waste to the solid waste management facilities and the timescale for the implementation of the plans. Section 19(2)(b): If the Director General decides to grant a licence under section 19(1), he shall impose conditions pertaining to the types of controlled solid waste, the solid waste management facilities to which collected solid waste may be delivered to, and the requirement to deposit such amount as may be prescribed as security for safe closure of solid waste management facilities (paragraphs (d), (e), and (f) of subsection 19(3)).	
• Do not transport across international boundaries except for environmentally sound disposal (for parties to the Basel Convention) (Art 11.3.c)		
Environmental Quality Act 1974 (Act 127)	S 34B: Prohibition against placing, deposit, etc of scheduled wastes (1) No person shall – (a) place, deposit or dispose of, or cause or permit to place, deposit or dispose of, except at prescribed premises only, any scheduled wastes on land or into Malaysian waters; (b) receive or send, or cause or permit to be received or sent any schedules wastes in or out of Malaysia; (c) transit or cause or permit the transit of scheduled wastes Without any prior written approval of the DG	

• Environmental Quality (Scheduled Wastes) Regulations 2005	Reg 8: Responsibility of waste generator (1) Every waste generator shall ensure that scheduled wastes generated by him are properly stored, treated on-site, recovered on-site for material or product from such scheduled wastes or delivered to and received at prescribed premises for treatment, disposal or recovery of material or product from scheduled wastes (2) Every waste generator shall ensure that scheduled wastes that are subjected to movement or transfer be packaged, labelled and transported in accordance with the guidelines prescribed by the DG Reg 13: Scheduled wastes transported outside waste generator's premises to be accompanied by information (1) Every waste generator shall provide information in accordance with 7th Sch in respect of each category of scheduled wastes to be delivered to the contractor and shall give the Sch to the contractor upon delivery of the waste to him	

Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):

Since Malaysia is a Party to the Basel Convention, the definition of waste, and the obligations imposed on the transboundary movement of waste falling within the definition of 'waste' defined as 'hazardous' under the Basel Convention would be applicable to Parties to the Minamata Convention. Potentially 'hazardous' waste that was defined under s 2, EQA 1974 as 'scheduled waste' of which the disposal of it would be governed specifically by the Scheduled Wastes Regs 2005. As such, the existing mechanism would need to be deployed in ascertaining the potential sources and types of mercury wastes generated in the country (through the monitoring and control of generators of wastes that fall under the definition of scheduled wastes). There is a need to develop, more comprehensively, the sources and types of mercury wastes generated in the country which warrant special measures, especially in light of the impending phasing out of mercury, mercury compounds, and MAPs in the country, which would all turn into mercury wastes. It would be pertinent to assess the capabilities in the country to safely manage mercury wastes. The country would also need to brace itself to embrace the outcome achieved by the Convention with regards to the thresholds in mercury wastes, and additional requirements for environmentally sound management (of mercury wastes).

Article 12 – Contaminated sites

Description of article:

Art 12 laid out the obligation of the Parties to endeavour to develop appropriate strategies for the identification and assessment of sites contaminated by mercury or mercury compounds. The risks posed by such sites shall be reduced through actions that 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 and mercury compounds they contain. The guidance that the COP shall adopt to manage contaminated sites may include methods and approaches for –

a) Site identification and characterisation;
b) Engaging the public;
c) Human health and environmental risk assessments;
d) Options for managing the risks posed by contaminated sites;
e) Evaluation of benefits and costs; and
f) Validation of outcomes.

Succinct summary of provisions relevant to the country in question:

- Develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds
- Actions to reduce the risks posed by such sites shall be performed in an environmentally sound manner incorporating an assessment of the risks to human health and the environment

Policy and regulatory measures in place that enable the country to comply with the above listed provisions:

Title and reference number of relevant Policy and Regulatory Measure, as well as date	Relevant provisions	Remarks
• Develop appropriate strategies for identifying and assessing sites contaminated by mercury or mercury compounds (Art 12.1)		
Federal Constitution	Art 74: Subject matter of federal and State laws (1) Without prejudice to any power to make laws conferred on it by any other Art, Parliament may make laws with respect to any of the matters enumerated in the Federal List or the Concurrent List (that is to say, the 1st or 3rd List set out in the 9th Sch. (2) Without prejudice to any power to make laws conferred on it by any other Art, the Legislature of a State may make laws with respect to any of the matters enumerated in the State List (that is to say, the 2nd List set out in the 9th Sch) or the Concurrent List.	The concurrent jurisdiction that was given to both the Federal and State Governments for the rehabilitation of mining lands where soil erosion had occurred could perhaps cover the identification, assessment, and subsequently, the reduction of risk posed by sites contaminated with the historical use of mercury for mining.
• 9th Sch, Federal Constitution List III – Concurrent List	Item 9: Rehabilitation of mining land and land which has suffered soil erosion.	
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose powers, duties and functions shall be – (c) to recommend to the Minister the environment protection policy and classifications for the protection of any portion of the environment or any segment of the environment with respect to the uses and values, whether tangible or intangible, to be protected, the quality to be maintained, the extent to which the discharge of wastes may be permitted without detriment to the quality of the environment, long range development uses and planning and any other factors relating to the protection and enhancement of the environment; (e) to undertake surveys and investigations as to the causes, nature, extent of pollution and as to the methods of prevention of pollution and to assist and co-operate with other persons or bodies carrying out similar surveys or investigations; (g) to recommend to the Minister standards and criteria for the protection of beneficial uses and the maintenance of the quality of the environment having regard to the ability of the environment to absorb waste without detriment to its quality and other characteristics;	The duty of the DG to recommend to the Minister the environmental protection policy and the protection of any portion or segment of the environment, and the quality to be maintained, in addition to the recommendation of "standards and criteria for the protection of beneficial uses and the maintenance of the quality of the environment having regard to the ability of the environment to absorb waste without detriment to its quality and other characteristics" which the DG and other officers would have to bear in mind in their recommendation to the Minister pursuant to s 3(1)(g) could probably be interpreted to encompass a broad reading of this duty and function to include the abatement of pollution/contamination that might affect beneficial use (or, in

	S 31: Power to require owner or occupier to install, operate, repair, etc (1) Where any environmentally hazardous substances, pollutants or wastes are being or are likely to be emitted, discharged or deposited from any vehicle, ship or premises irrespective of whether the vehicle, ship or premises are prescribed under s 18 or otherwise, or from any aircraft, the DG may by notice in writing require the owner or occupier of the vehicle, ship or premises, or aircraft, to – (d) measure, take a sample of, analyse, record and report any environmentally hazardous substances, pollutants, wastes, effluents or emissions containing pollutants (e) conduct a study on any environmental risk (f) install, maintain and operate monitoring programme at the expense of the owner or occupier.	the Convention language, to "reduce the risks posed by such sites"). Although contaminated sites is not defined in the Act, it is still within the jurisdiction of the Act to provide for the protection of the environment against harm that might affect the beneficial use of the environment in a way that is conducive to public health, welfare or safety and which requires protection from the effects of wastes, discharges, emissions and deposits. S 31 could be deemed a means through which such environment protection policies could be implemented to ensure that the desirable standard of protection of beneficial uses, and the maintenance of quality of the environment could be achieved.
• Contaminated Land Management and Control Guidelines No. 1: Malaysian Recommended Site Screening Levels for Contaminated Land	Ch 3.0 Contaminated Land Assessment Criteria Site Screening Levels (SSLs) Application of SSLs to residential and industrial soil, ambient air, and tap water Appendix A: List of Potentially Polluting Activities Appendix C: SSLs Mercury Compounds (at p 45) • Mercuric Chloride (CAS No. 7487-94-7) • Mercuric Sulfide (CAS No. 1344-48-5) • Mercury, Inorganic Salts (no CAS No.) • Methyl Mercury (CAS No. 22967-92-6)	SSLs could be applied to the assessment of sites whereas the List of Potentially Polluting Activities in Appendix A could be used in the identification of possible sites that could be contaminated by mercury or mercury compounds, in accordance with the Convention.
• Contaminated Land Management and Control Guidelines No. 2: Assessing and Reporting Contaminated Sites	Chapter 3.0 Initial Assessment, comprising – • desktop study • ite reconnaissance • evelopment of a conceptual site mode • design of the detailed investigation • a report summarising the results of the assessment Chapter 4.0 Detailed Assessment, the planning of the assessment should consider – • objectives of the site investigation including data quality objectives • the number, type and locations of the samples to be collected • the most appropriate (and cost-effective) field sampling procedures for each of the targeted environmental media • identification of safety, health and environmental issues Ch 5.0 Risk Assessment A risk-based approach to the design and implementation of site management strategies arises out of an understanding of exposure pathway analysis.	The mechanisms outlined in Chapters 3.0 and 4.0 for the initial assessment and the detailed assessment of sites that could possibly be contaminated with mercury and mercury compounds could be more specifically tailored for the assessment of sites contaminated by mercury or mercury compounds, in accordance with the Convention.
• Actions to reduce the risks posed by such sites shall be performed in an environmentally sound manner incorporating an assessment of the risks to human health and the environment (Art 12.2)		
Environmental Quality Act 1974 (Act 127)	S 31: Power to require owner or occupier to install, operate, repair, etc (1) Where any environmentally hazardous substances, pollutants or wastes are being or are likely to be emitted, discharged or deposited from any vehicle, ship or premises irrespective of whether the vehicle, ship or premises are prescribed under s 18 or otherwise, or from any aircraft, the DG may by notice in writing require the owner or occupier of the vehicle, ship or premises, or aircraft, to – (a) install and operate any control equipment or additional control equipment (b) repair, alter or replace any equipment or control equipment (c) erect or increase the height of any chimney	S 18 of EQA 1974 could be invoked in issuing licences that incorporate conditions of which licenced holder would have to comply in order to ensure that actions to reduce the risks posed by contaminated sites are performed in an environmentally sound manner, including an assessment of the risks to human health and the environment, as provided under the Contaminated Land Management and Control Guidelines No. 3: Remediation of Contaminated Sites.

	(d) measure, take a sample of, analyse, record and report any environmentally hazardous substances, pollutants, wastes, effluents or emissions containing pollutants (e) conduct a study on any environmental risk (f) install, maintain and operate monitoring programme at the expense of the owner or occupier (g) adopt any measure to reduce, mitigate, disperse, remove, eliminate, destroy or dispose of pollution S 31A: Prohibition order (1) The Minister, after consultation with the Council, may by order published int eh Gazette specify the circumstances whereby the DG may issue a prohibition order to the owner or occupier of any industrial plant or process to prevent its continued operation and release of environmentally hazardous substances, pollutants or wastes either absolutely or conditionally, or for such period as he may direct, or until requirements to make remedy as directed by him have been complied with S 33: Power to prohibit or control licenced persons from discharging, etc. of wastes in certain circumstances (1) Where several persons are licenced under the Act to emit, discharge or deposit environmentally hazardous substances, pollutants or wastes into the same segment or element of environment and appears to the DG that each of such persons is complying with the conditions of the licence but nevertheless the collective effect of the aggregate of such wastes is likely to cause a worsening of condition in that segment or element of the environment such as to affect the health, welfare or safety of human beings, or to threaten the existence of any animals, birds wildlife, fish or other aquatic life, the DG may, by notice serve on each of the licensees, requiring each of them to abate such emission, discharge or deposit in the manner and within the period specified in the notice	
• Contaminated Land Management and Control Guidelines No. 3: Remediation of Contaminated Sites	Ch 2.0 Overview of the Guidelines A 'risk-based' approach is the overall guiding principle for the Contaminated Land Management Framework. The 4 stages of remediation activities are – Stage 1: Remediation Action Plan (RAP) Stage 2: Remedial Investigation, Feasibility Study and Remedial Design Stage 3: Remediation Implementation Stage 4: Post Remediation Evaluation	
Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):		
It is noted that the obligation to 'endeavour' to develop strategies for the identification and assessment of sites contaminated by mercury or mercury compounds is not a mandatory, binding obligation, which might adversely impact efforts to obtain financial assistance though the Convention mechanisms, which places a greater onus on the domestic legal authorities to address contaminated sites. Guidance on the management of contaminated sites had been endorsed by the COP of the Convention. Since a series of Contaminated Land Management and Control Guidelines had been developed by the Department of Environment, it would be timely to see how these Guidelines could be adapted to incorporate the guidance on the management of contaminated sites endorsed by the COP of the Convention. The management of contaminated sites, taking into consideration the risks to local communities and exposed populations, and the complexity, technically and legally, shrouds the application of the polluter-pay principle when the liability of a particular 'polluter' is poorly defined and understood. In recognition of the complexities of the issue of contaminated sites, no mandatory obligation is imposed to propel progress in cleaning up contaminated sites, nor there is any advancement in the development of a pollution liability framework to get polluters to pay for site remediation. As such, Art 12 could be viewed more as a capacity building provision where governments are mostly left to their own devices as to how a legal framework (and the necessary financial and technical capabilities) could be developed to remediate mercury contaminated sites.		

Article 18 – Public information, awareness and education

Description of article:

This Article imposed the obligation on each Party, within its capabilities, to promote and facilitate the provision of available information to the public. The information that shall be provided by the Party are the health and environmental effects of mercury and mercury compounds, and the alternatives to mercury and mercury compounds. In addition, each party shall provide information on the topics identified in Article 17(1), namely, the scientific, technical economic and legal information concerning mercury and mercury compounds including toxicological, ecotoxicological and safety information; information on the reduction or elimination of the production, use, trade, emissions and releases of mercury and mercury compounds; the information on technically and economically viable alternatives to mercury-added products, manufacturing processes in which mercury or mercury compounds are used; and activities and processes that emit or release mercury or mercury compounds, including information on the health and environmental risks and economic and social costs and benefits of such alternatives; and the epidemiological information concerning health impacts associated with exposure to mercury and mercury compounds, in close cooperation with the World Health Organisation and other relevant organisation as appropriate. The Party shall also provide information on the results of its research, development and monitoring activities under Article 19, such as the inventories of use, consumption, and anthropogenic emissions to air and releases to water and land of mercury and mercury compounds; modelling and geographically representative monitoring of levels of mercury and mercury compounds in vulnerable populations and in environmental media, as well as collaboration in the collection and exchange of relevant and appropriate samples; assessments of the impact of mercury and mercury compounds on human health and the environment, in addition to social, economic and cultural impacts, particularly in respect of vulnerable populations; information on the environmental cycle, transport (including long-range transport and deposition), transformation and fate of mercury and mercury compounds in a range of ecosystems, taking appropriate account of the distinction between anthropogenic and natural emissions and releases of mercury and of remobilisation of mercury from historic deposition; information on commerce and trade in mercury and mercury compounds and mercury-added products; and the information and research on the technical and economic availability of mercury-free products and processes and on best available techniques and best environmental practices to reduce and monitor emission and releases of mercury and mercury compounds. Each Party shall also promote and facilitate provision of available information to the public on activities to meet its obligations under the Convention. Article 18 also imposes the obligation on each party to provide education, training and public awareness related to the effects of exposure to mercury and mercury compounds on human health and the environment. For these purposes, each Party shall use existing mechanisms or give consideration to the development of mechanisms, such as pollutant release and transfer register where applicable, for the collection and dissemination of information on estimates of its annual quantities of mercury and mercury compounds that are emitted, released or disposed of through human activities.

Succinct summary of provisions relevant to the country in question:

- The provision of available information to the public on the health and environmental effects of mercury and mercury compounds
- The provision of available information to the public on the alternatives to mercury and mercury compounds
- The provision of available information to the public on the topics identified in Article 17(1), spelling out the obligation of each Party to facilitate the exchange of information, namely –
    - scientific, technical, economic and legal information concerning mercury and mercury compounds, including toxicological, ecotoxicological and safety information
    - information on the reduction or elimination of the production, use, trade, emissions and releases of mercury and mercury compounds;
    - information on technically and economically viable alternatives to mercury-added products, manufacturing processes in which mercury or mercury compounds are used, and activities and processes that emit or release mercury or mercury compounds, including information on the health and environmental risks and economic and social costs and benefits of such alternatives
    - epidemiological information concerning health impacts associated with exposure to mercury and mercury compounds.
- The provision of the results of its research, development and monitoring activities under Article 19, which are –
    - Inventories of use, consumption, and anthropogenic emissions to air and releases to water and land of mercury and mercury compounds;
    - Modelling and geographically representative monitoring of levels of mercury and mercury compounds in vulnerable populations and in environmental media, as well as collaboration in the collection and exchange of relevant and appropriate samples
    - Assessments of the impact of mercury and mercury compounds on human health and the environment, in addition to social, economic and cultural impacts, particularly in respect of vulnerable populations
    - The harmonised methodologies for the activities undertaken for the above
    - Information on the environmental cycle, transport (including long-range transport and deposition), transformation and fate of mercury and mercury compounds in a range of ecosystems, taking appropriate account of the distinction between anthropogenic and natural emissions and releases of mercury and of remobilisation of mercury from historic deposition
    - Information on commerce and trade in mercury and mercury compounds and mercury-added products, and
    - Information and research on the technical and economic availability of mercury-free products and processes and on best available techniques and best environmental practices to reduce and monitor emission and releases of mercury and mercury compounds
- The provision of available information to the public on the activities to meet the Party's obligations under the Convention
- The provision of 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 organisations and vulnerable populations
- Each Party shall use existing mechanisms or give consideration to the development of mechanisms, such as pollutant release and transfer registers where applicable, for the collection and dissemination of information on estimates of its annual quantities of mercury and mercury compounds that are emitted, released or disposed of through human activities

Policy and regulatory measures in place that enable the country to comply with the above listed provisions:		
Title and reference number of relevant Policy and Regulatory Measure, as well as date	**Relevant provisions**	**Remarks**
• **The provision of available information, as required, to the public on the health and environmental effects of mercury and mercury compounds (Art 18.1.a)**		
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (i) to publish an annual report on environmental quality not later than 30th September of the following year and such other reports and information with respect to any aspect of environmental protection; (l) to provide information and education to the public regarding the protection and enhancement of the environment.	
Occupational Safety and Health Act 1994 (Act 514)	S 11: Powers and functions of the Council (1) The Council shall have power to do all things expedient or reasonably necessary for or incidental to the carrying out of the objects of [the] Act (2) The Council may, and when requested by the Minister to do so shall, carry out investigations and make reports and recommendations to him with regard to any matter relating to the objects of this Act and, in particular, but without prejudice to the generality of the foregoing provisions, with regard to – (c) the fostering of a co-operative consultative relationship between management and labour on the safety, health and welfare of persons at work.	
• **The provision of available information to the public on the health and environmental effects of mercury and mercury compounds (Art 18.1.a(i))**		
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (i) to publish an annual report on environmental quality not later than 30th September of the following year and such other reports and information with respect to any aspect of environmental protection; (l) to provide information and education to the public regarding the protection and enhancement of the environment.	
Occupational Safety and Health Act 1994 (Act 514)	S 11: Powers and functions of the Council (1) The Council shall have power to do all things expedient or reasonably necessary for or incidental to the carrying out of the objects of [the] Act (2) The Council may, and when requested by the Minister to do so shall, carry out investigations and make reports and recommendations to him with regard to any matter relating to the objects of this Act and, in particular, but without prejudice to the generality of the foregoing provisions, with regard to – (c) the fostering of a co-operative consultative relationship between management and labour on the safety, health and welfare of persons at work.	
• **The provision of available information to the public on the topics identified in Art 17(1) (Art 18.1.a (iii))**		
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (i) to publish an annual report on environmental quality not later than 30th September of the following year and such other reports and information with respect to any aspect of environmental protection; (l) to provide information and education to the public regarding the protection and enhancement of the environment.	

Occupational Safety and Health Act 1994 (Act 514)	S 11: Powers and functions of the Council (1) The Council shall have power to do all things expedient or reasonably necessary for or incidental to the carrying out of the objects of [the] Act (2) The Council may, and when requested by the Minister to do so shall, carry out investigations and make reports and recommendations to him with regard to any matter relating to the objects of this Act and, in particular, but without prejudice to the generality of the foregoing provisions, with regard to – (c) the fostering of a co-operative consultative relationship between management and labour on the safety, health and welfare of persons at work.	
• **The provision of the results of its research, development and monitoring activities under Art 19 (Art 18.1.a(iv))**		
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (i) to publish an annual report on environmental quality not later than 30th September of the following year and such other reports and information with respect to any aspect of environmental protection; (l) to provide information and education to the public regarding the protection and enhancement of the environment.	
Occupational Safety and Health Act 1994 (Act 514)	S 11: Powers and functions of the Council (1) The Council shall have power to do all things expedient or reasonably necessary for or incidental to the carrying out of the objects of [the] Act (2) The Council may, and when requested by the Minister to do so shall, carry out investigations and make reports and recommendations to him with regard to any matter relating to the objects of this Act and, in particular, but without prejudice to the generality of the foregoing provisions, with regard to – (c) the fostering of a co-operative consultative relationship between management and labour on the safety, health and welfare of persons at work.	
• **The provision of available information to the public on the activities to meet the Party's obligations under the Convention (Art 18.1.a(v))**		
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (i) to publish an annual report on environmental quality not later than 30th September of the following year and such other reports and information with respect to any aspect of environmental protection; (l) to provide information and education to the public regarding the protection and enhancement of the environment.	
Occupational Safety and Health Act 1994 (Act 514)	S 11: Powers and functions of the Council (1) The Council shall have power to do all things expedient or reasonably necessary for or incidental to the carrying out of the objects of [the] Act (2) The Council may, and when requested by the Minister to do so shall, carry out investigations and make reports and recommendations to him with regard to any matter relating to the objects of this Act and, in particular, but without prejudice to the generality of the foregoing provisions, with regard to – (c) the fostering of a co-operative consultative relationship between management and labour on the safety, health and welfare of persons at work.	

• **The provision of 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 organisations and vulnerable populations[40] (Art 18.1.b)**		
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (i) to publish an annual report on environmental quality not later than 30th September of the following year and such other reports and information with respect to any aspect of environmental protection; (l) to provide information and education to the public regarding the protection and enhancement of the environment.	
Environmental Quality (Scheduled Wastes) Regulations 2005	Reg 15:Conduct of training Every waste generator shall ensure that all his employees involved in the identification, handling, labelling, transportation, storage and spillage or discharge response of scheduled wastes attend training programmes.	
Occupational Safety and Health Act 1994 (Act 514)	S 11: Powers and functions of the Council (1) The Council shall have power to do all things expedient or reasonably necessary for or incidental to the carrying out of the objects of [the] Act (2) The Council may, and when requested by the Minister to do so shall, carry out investigations and make reports and recommendations to him with regard to any matter relating to the objects of this Act and, in particular, but without prejudice to the generality of the foregoing provisions, with regard to – (c) the fostering of a co-operative consultative relationship between management and labour on the safety, health and welfare of persons at work; (d) the special problems with respect to occupational safety, health and welfare of women, handicapped persons and other groups in the community.	
• **The use of existing mechanisms, or the development thereof, such as pollutant release and transfer registers where applicable, to collect and disseminate information on estimates of its annual quantities of mercury and mercury compounds that are emitted, released or disposed of through human activities (Art 18.2)**		
Environmental Quality Act 1974 (Act 127)	S 3: DG and other officers (1) There shall be a DG of Environmental Quality who shall be appointed by the Minister from amongst members of the public service and whose power, duties and functions shall be – (i) to publish an annual report on environmental quality not later than 30th September of the following year and such other reports and information with respect to any aspect of environmental protection; (l) to provide information and education to the public regarding the protection and enhancement of the environment.	
Occupational Safety and Health Act 1994 (Act 514)	S 11: Powers and functions of the Council (1) The Council shall have power to do all things expedient or reasonably necessary for or incidental to the carrying out of the objects of [the] Act (2) The Council may, and when requested by the Minister to do so shall, carry out investigations and make reports and recommendations to him with regard to any matter relating to the objects of this Act and, in particular, but without prejudice to the generality of the foregoing provisions, with regard to – (c) the fostering of a co-operative consultative relationship between management and labour on the safety, health and welfare of persons at work.	

[40] According to Selin & Selin (2006), mercury pollution would particularly affect the indigenous communities in the Arctic environment as the accumulation of high levels of mercury through the food chain would rendered these communities, where their traditional diets are predominantly fishes, particularly vulnerable to mercury contamination, which exposes them to high risk of adverse neurological and developmental effects. Prenatal methylmercury exposure and the consumption of mercury-contaminated fish and seafood by both adults and children would inadvertently result in an increased risk to adverse health effects due to such exposure (Bender, Elena & Groth, 2014).

Outstanding regulatory or policy aspects that would need to be addressed/developed to ensure compliance with the Convention's provisions (only in relation to binding provisions):
The focus of Art 18 is on the sharing of information between the government and the public and how awareness of the public could be raised. More importantly, the mandate for education, training and public awareness encourages collaborations between government and NGOs and vulnerable populations. Therefore, the government would have to take steps to identify the relevant NGO stakeholders and vulnerable populations and include them in the ratification and implementation processes of the Convention. Although it is not specified in Art 18 that information regarding preventative measures that protect against mercury exposure, such as fish advisories, is equally important, and should also form part of the information that should be disseminated under Art 18. More specifically on the collection and dissemination of information on emissions and releases, Parties shall use existing mechanisms (lacking which, mercury emission and release inventories would still have to be developed under Arts 8 and 9), or, if necessary, consider developing mechanisms such as pollutant release and transfer registers (PRTR) to collect and disseminate information on estimates of the country's annual quantities of mercury emissions and releases in accordance with Art 18.2.[41]

[41] The United Nations Institute for Training and Research has a PRTR Programme that assists countries in the design of national PRTRs through multi-stakeholder processes. See Lennett & Gutierrez (2016).

Annex II

Minamata Convention Initial Assessment
Mercury Inventory Report
Malaysia

Table of Contents

Acronym 175
Units 175

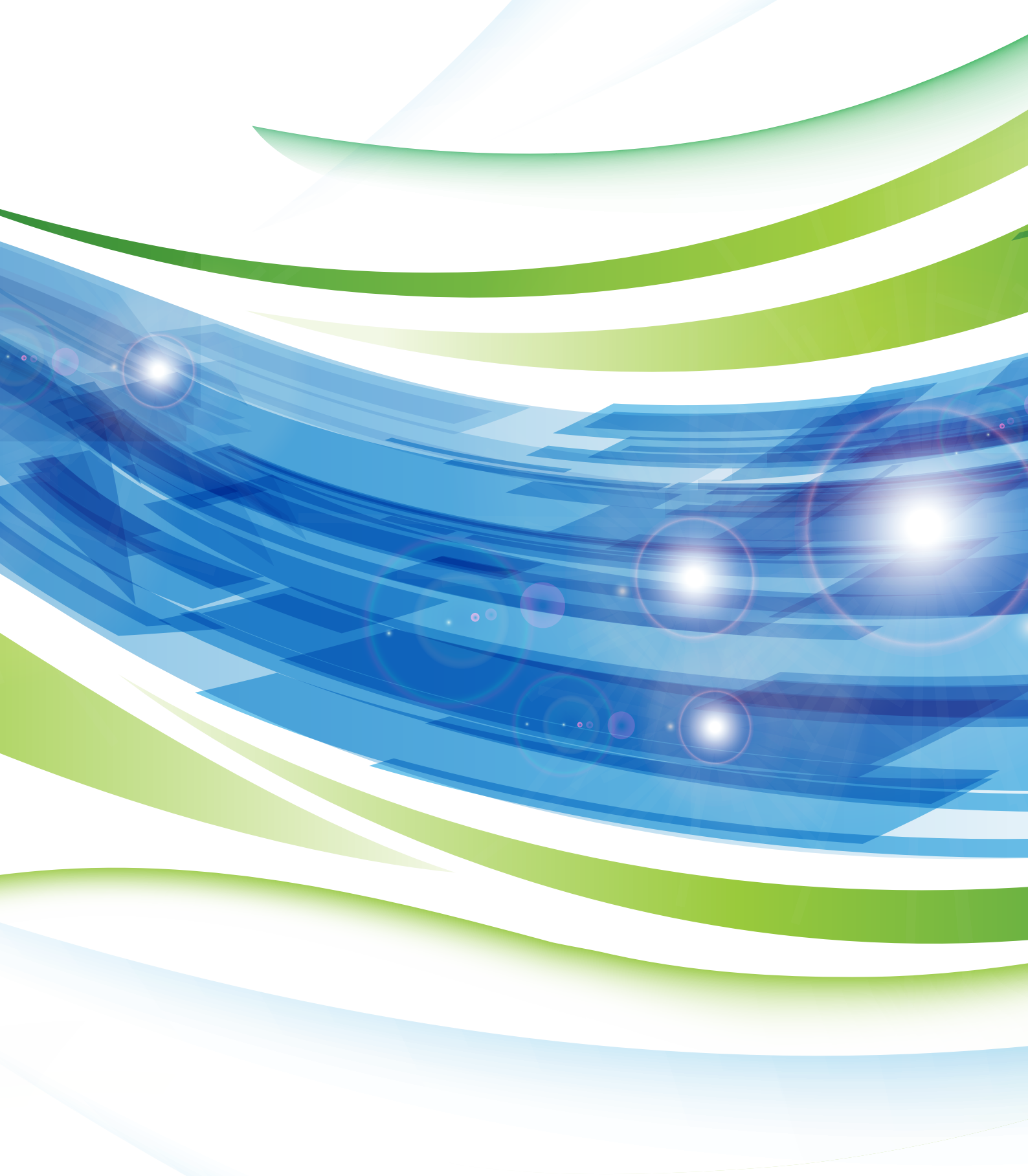
1.0 Introduction 178
2.0 The Toolkit 178
3.0 Advantages 180
4.0 Scopes and limitations 180
5.0 Building the mercury inventory using UNEP Toolkit Level 1 (Version 2.0) 180
6.0 Result and Discussion 190
6.1 Step 1 – Country Profile 190
6.2 Step 2 – Energy Consumption and Fuel Production 191
6.2.1 Energy consumption 191
6.2.2 Fuel production 195
6.3 Step 3 - Domestic Production of Metals and Raw Materials 198
6.3.1 Primary metal production 198
6.3.2 Others materials production 199
6.4 Step 4 - Domestic Production and Processing with Intentional Mercury Use 202
6.4.1 Productions of chemicals 202
6.4.2 Production of products with mercury content 203
6.5 Step 5 - Data And Inventory On Waste Handling And Recycling 206
6.5.1 Production of recycled of metals 206
6.5.2 Waste incineration 207
6.5.3 Waste deposition/landfilling and waste water treatment 208
6.6 Step 6 - General Consumption of Mercury in Products, as Metal Mercury and as Mercury Containing Substances 211
6.6.1 Use and disposal of products with mercury content 212
6.7 Step 7 - Data and Inventory on Crematoria and Cemeteries 218
6.7.1 Crematoria and cemeteries 218
6.8 Step 8 - Miscellaneous Mercury Release Sources Not Quantified on Inventory Level 1 219
6.9 Result-Executive Summary 222
6.10 Result-Total Summary 224
7.0 Control Measures 230
7.1 Background 230
7.2 Data gaps and the use of predictive study 230
7.3 Step 1 – Country Profile 231
7.4 Step 2 – Energy Consumption & Fuel Production 231
7.5 Step 3 - Domestic Production of Metals and Raw Materials 233
7.6 Step 4 - Domestic Production and Processing with Intentional Mercury Use 235
7.7 Step 5 - Data and Inventory on Waste Handling and Recycling 235
7.8 Step 6 - General Consumption of Mercury in Products, as Metal Mercury and as Mercury Containing Substances 236
7.9 Step 7 - Data and inventory on crematoria and cemeteries 237
7.10 Step 8 - Miscellaneous Mercury Release Sources Not Quantified in Inventory Level 1 237
7.11 Summary of Control Measures Predictive Study 237
8.0 Conclusion 239
9.0 References 240
Annex A: Data Authority and Contacts 241

LIST OF ACRONYMS

ASGM	Artisanal and Small Scale Gold Mining
CIMS	Chemical Information Management System
CUSTOMS	Royal Customs Malaysia
DOA	Department of Agriculture
DOE	Department of Environment
DOSH	Department of Occupational Safety and Health
EC	Energy Commission
GDP	Gross Domestic Product
Hg	Mercury
IEA	International Energy Agency
IWK	Indah Water Consortium
JMG	Minerals and Geoscience Department
JPJ	Road Transport Department
JPSM	Forestry Department Peninsular Malaysia
JPSPN	National Solid Waste Management Department
KPDNKK	Ministry of Domestic Trade, Co-operatives and Consumerism (it is now known as Ministry of Domestic Trade and Consumer Affairs, KPDNHEP)
LPG	Liquefied Petroleum Gas
MAI	Malaysia Automotive Institute
MARINE	Marine Department Malaysia
MIA	Minamata Initial Assessment
MIDA	Malaysian Investment Development Authority
MINDEF	Ministry of Defence
MITI	Ministry of International Trade and Industry
MOA	Ministry of Agriculture and Agro-Based Industry
MOH	Ministry of Health
NRE	Ministry of Natural Resources and Environment (NRE has been restructured to 2 ministries which are Ministry of Energy, Science, Technology, Environment & Climate Change (MESTECC) and Ministry of Water, Land and Natural Resources (KATS). MESTECC superseded the environmental portfolio of NRE. Reference to NRE in this report refers to the current MESTECC).
PU	Polyurethane
PVC	Polyvinyl Chloride
SEDA	Sustainable Energy Development Authority
SIRIM	SIRIM Berhad
SPAN	National Water Services Commission
STRIDE	Science Technology Research Institute for Defence
UNEP	United Nations Environment Programme
US-EPA	United States Environmental Protection Agency
VCM	Vinyl Chloride Monomer

Units

g	Gram
kg	Kilogram
ktoe	Kilotonne of oil equivalent
m^3	Cubic meter
MWh	Mega Watt Hour
Nm^3	Normal cubic meter
t	Tonne
TJ	Terajoule
µg	Microgram



National Mercury Inventory based on UNEP's Toolkit for Identification and Quantification of Mercury Releases (Level 1 Version 2.0)

1.0 Introduction

Minamata Convention on Mercury was established with the objective to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds (UNEP, 2013b). As the health and environmental risk is directly related to the intensity of mercury releases, quantifying of mercury releases is the first step in the assessment and management of the risk for the environment and human health posed by mercury. A comprehensive and detailed mercury inventory is a fundamental tool for a country in the identification of priority mercury-releasing activities and for establishing a plan in preparation of the ratification of the Convention. Furthermore, the mercury inventory will help in establishing an adequate baseline that will be used to monitor progresses toward the reduction of mercury releases.

Quantifying mercury releases requires expertise in various fields and demands high technical capability that could be not readily available in many parts of the world. In assisting Developing Country and Country in Economic Transition, United Nations Environment Programme (UNEP) developed an instrument called *"Toolkit for Identification and Quantification of Mercury Releases"* aiming to assist countries to develop part of the knowledge needed for the development of mercury inventory that identifies sources of mercury releases and quantifies their releases (UNEP, 2017).

2.0 The Toolkit

UNEP's Toolkit for Identification and Quantification of Mercury Releases was built as a Microsoft Excel's spreadsheet containing predetermined calculation of mercury releases quantification based on the activity rates identified by the country. This Toolkit is made publicly available at UNEP's website (https://www.unenvironment.org/explore-topics/chemicals-waste/what-wedo/mercury/mercury-inventory-toolkit). This Toolkit will quantify the mercury release through eight steps which contain various source categories. Table 2.1 shows the steps in this Toolkit. A country will have to enter their respective data through the eight steps to generate their mercury releases.

Table 2.1 Steps in Toolkit for Identification and Quantification of Mercury Releases

Step	Title
1	Country Profile/ Country Data
2	Energy consumption and fuel production
3	Domestic production of metals and raw materials
4	Domestic production and processing with intentional mercury use
5	Waste treatment and recycling
6	General consumption of mercury in products, as metal mercury and as mercury containing substances
7	Crematoria and cemeteries
8	Miscellaneous mercury source

The Toolkit utilises the mass balance principle that states that the sum of inputs will be equal to the total sums of output. That means that the total mercury introduced into the system will be equal to the total releases of mercury via various release pathways including air, water, land, or as by-products and impurities. In a basic process system, there are three main sections which are, the input, process and output (Figure 2.1). In a mercury-based system, mercury will form part of input and will undergo certain process which will then produce outputs containing mercury or releases, which will be emitted or released into the environment. Adopting the mass balance principle, it is assumed that the amount of mercury emission and releases will be equivalent to the amount of mercury input.

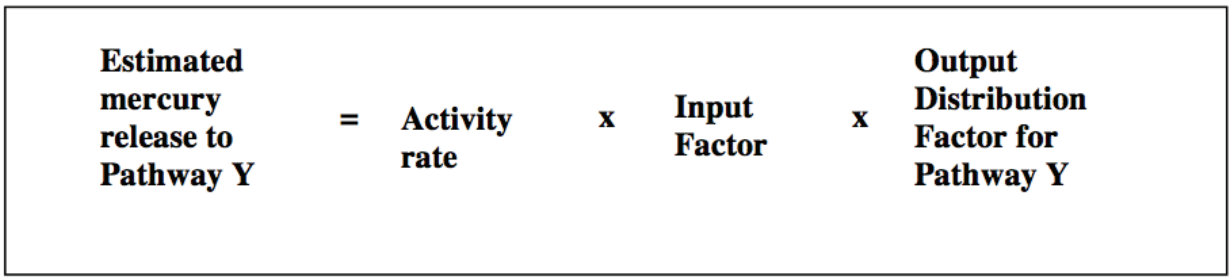


Source: UNEP, 2017

Figure 2.1: Basic diagram of mercury system

Estimating mercury as input will involve the use of 2 parameters called activity rate and input factors. Activity rate is the data that will be entered into the spreadsheet which will then be used to estimate mercury input and must be in the correct specific unit as required by the Toolkit. To estimate mercury input, an input factor, which is an accepted factor of mercury concentration for that process, is used. This is required since mercury is often introduced into systems as impurity in raw material (for instance coal) rather than pure mercury. Using an input factor, it is possible to estimate the amount of mercury introduced into the system based on the process magnitude.

Meanwhile in quantifying the output, the Toolkit will utilise an output distribution factor. As a result of a process, mercury can be released in various pathways including releases to air, land, water, or can be and trapped in the system or in the product, as impurities. Output distribution factor establishes the proportion of mercury which is released in specific pathways depending on the specific process and industries. Output quantification can be illustrated through the following equation (Figure 2.2):



Source: UNEP, 2017

Figure 2.2: Basic diagram of mercury system

Overall, quantification of mercury release requires input factor and output distribution factor. However, deriving these factors will involve high technical expertise and can be challenging for most developing countries. Therefore, UNEP had developed 2 levels of Toolkits which include the simpler Inventory Level 1 and a more comprehensive Inventory Level 2. Inventory Level 1 is much simpler as it only requires input activity rate and the calculation will be conducted using a default factor for both Input Factor and Output Distribution Factor. These default factors have been developed by UNEP's experts as the average value for each specific process. This allows developing countries to develop their inventories by quantifying releases and the result is comparable worldwide due to the use of the same factors. While the more complicated Level 2 Inventory will allow a country to utilise their own factors. This enables countries with much more extensive data to produce a more accurate quantification of releases using their own factors rather than the proposed defaults.

In 2017, UNEP updated the Toolkit by allowing the entry of control measures into the activity (Version 2.0 January 2017 update). In the previous version, the assumption was that no mercury control measures are in place and therefore the mercury output is similar to input value. However, in a real scenarios, the system may be equipped with some form of control measures aimed at reducing mercury releases. The amount of reduction will depend

on many factors including types of control measures, efficiency, maintenance and others. The Toolkit provides several categories of control measures and the country will have to enter the percentage of application of the selected control measures in the country.

3.0 Advantages

The UNEP's Toolkit is a good tool for a preliminary study on mercury releases in a country. By conducting this exercise, a country will be able to identify sources of mercury release and quantify it through the proper guidelines given by UNEP. This enables countries with limited technological and technical expertise to gain first hand insight on mercury issues particularly the releases. The availability of Level 1 Inventory enables countries with limited data to carry out the quantification using acceptable factors and the results generated can be used for comparison, planning and decision making. The updates on control measures entry allow countries to take into considerations the control measures implemented and to strategically plan for improvements in a particular area. An understanding of local mercury releases will help countries in focusing on significant industries and make a leap towards preparing for the ratification of Minamata Convention on Mercury.

4.0 Scopes and limitations

The Toolkit contains several limitations that needed to be acknowledged. The aspiration of the Level 1 inventory is to assist the process of getting the first sight of mercury release by developing a basic inventory. This is done by using default input and output distribution factors determined by previous studies, and expert judgement where no previous studies are available. Even though this simplifies the process of release quantification, it masks various influencing variables such as types and origin of mercury inputs, technologies used and others factors which can contribute to a higher or lower release value. With the latest update, the Toolkit enabled the use of control measures in reducing the release. However, the availability of data that represents the country's situation would be a challenge due to the huge numbers of existing industries and technologies in the market, unless there is a database of control measures already in place at the national level. The main limitation of the Toolkit is data availability. Even after adopting a simple approach, some data may not be available specifically in the unit needed by the Toolkit, and this may lead to uncertainty in total release estimation.

5.0 Building the mercury inventory using UNEP Toolkit Level 1 (Version 2.0)

The overall process of this Toolkit consists of three main phases, namely mapping of needed data, data collection and data analysis. Prior to these phases it is vital that the scope of the assessment is determined including the assessment year and data scope.

Prior to the data collection phase, the Ministry of Energy, Science, Technology, Environment and Climate Change (MESTECC) (formerly Ministry of Natural Resources and Environment (NRE)) had agreed to focus only on the data obtained from competent national authorities for the analysis. This narrows down the scope of data to only national reliable data excluding data from third party documents which may raise concerns on the validity and reliability of the data that represents the country's situation. It is also agreed that the process of the data collection will cover years between 2013-2016 in general, but the assessment year will be the year that have the most available data. This is the scope of the data collection phase for this exercise.

1. Data Mapping
   The first phase of the assessment involves the mapping of needed data on mercury source. There are various sources being covered in the Toolkit and these data are scattered among various relevant authorities. Therefore, identifying and mapping the data owner amongst the authorities is a crucial part of establishing the mercury release inventory. Process of data mapping had been conducted through the Inception Workshop that was conducted on 18 December 2017 in Le Meridian, Putrajaya. This workshop was attended by all relevant stakeholders and aimed to identify the respective authorities for the needed data. Table 5.1 shows the result of data mapping for the UNEP's Level 1 Inventory according to steps outlined in the Toolkit, and the identified agencies. Table 5.2 summarised the relevant agencies in this exercise based on the Steps. The term 'no data custodian' will be used in this study to describe the situation in which a mandated data owner (the 'custodian') (specific to the parameter and unit required by the Toolkit) has failed to be identified not only at the Inception Workshop, but also throughout the study.

Table 5.1 The results of data mapping for the UNEP's Level 1 Inventory

Step	Indicators	Unit	Proposed Agencies
Step 1- Country Data	Population	Number of People	Department of Statistics Malaysia (STAT)
	Gross Domestic Product (GDP)	GDP	Department of Statistics Malaysia (STAT)
	Main sectors in the economy of country	List of major sectors	Ministry of International Trade and Industry (MITI)
	Dental Personnel per 1000 inhabitants	Ratio	Ministry of Health (MOH)
Step 2-Energy	Coal combustion in large power plants	Coal combusted, tonne/year	Energy Commission
	Coal combustion in coal fired industrial boilers	Coal combusted, tonne/year	Energy Commission
	Other coal uses	Coal used, tonne/ year	Energy Commission
	Combustion/use of petroleum coke and heavy oil	Oil product combusted, tonne/ year	Energy Commission
	Combustion/use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates	Oil product combusted, tonne/ year	Energy Commission
	Use of raw or pre-cleaned natural gas	Gas used, Nm^3/year *can also use Terajoule (TJ) gas used/year	Energy Commission
	Use of pipeline gas (consumer quality)	Gas used, Nm^3/year *can also use Terajoule (TJ) gas used/year	Energy Commission
	Biomass fired power and heat production	Biomass combusted, tonne/ year	Sustainable Energy Development Authority (SEDA)
	Charcoal combustion	Charcoal combusted, tonne/ year	Forestry Department Peninsular Malaysia (JPSM)
	Oil extraction	Crude oil produced, tonne/year	Energy Commission
	Oil refining	Crude oil refined, tonne/year	Energy Commission
	Extraction and processing of natural gas	Gas produced, Nm^3/ year *can also use Terajoule (TJ) gas used/year	Energy Commission

Step 3 - Metals - Raw Materials	Mercury (primary) extraction and initial processing	Mercury produced, tonne/year	Minerals and Geoscience Department (JMG)
	Production of zinc from concentrates	Concentrate used, tonne/year *can also use zinc produced/year	Minerals and Geoscience Department (JMG)
	Production of copper from concentrates	Concentrate used, tonne/year *can also use copper produced/ year	Minerals and Geoscience Department (JMG)
	Production of lead from concentrates	Concentrate used, tonne/year *can also use lead produced/year	Minerals and Geoscience Department (JMG)
	Gold extraction by methods other than mercury amalgamation	Gold ore used, tonne/year *can also use gold produced/year	Minerals and Geoscience Department (JMG)
	Alumina production from bauxite (aluminium production)	Bauxite processed, tonne/year *can also use raw aluminium metal produced/year	Minerals and Geoscience Department (JMG)
	Primary ferrous metal production (pig iron production)	Pig iron produced, tonne/year	Minerals and Geoscience Department (JMG)
	Gold extraction with mercury amalgamation – from whole ore	Gold produced, kg/year	Minerals and Geoscience Department (JMG)
	Gold extraction with mercury amalgamation – from concentrate	Gold produced, kg/year	Minerals and Geoscience Department (JMG)
	Cement production	Cement produced, tonne/year	Minerals and Geoscience Department (JMG)
	Pulp and paper production	Biomass used for production, tonne/ year	No data custodian
Step4 - Industrial Hg Use	Chlor-alkali production with mercury-cells	Cl_2 produced, tonne/ year	Department of Occupational Safety and Health (DOSH)
	VCM production with mercury catalyst	VCM produced, tonne/year	Department of Occupational Safety and Health (DOSH)
	Acetaldehyde production with mercury catalyst	Acetaldehyde produced, tonne/ year	Department of Occupational Safety and Health (DOSH)
	Hg thermometers (medical, air, lab, industrial etc.)	Mercury used for production, kg/year	No data custodian
	Electrical switches and relays with mercury	Mercury used for production, kg/year	No data custodian
	Light sources with mercury (fluorescent, compact, others: see guideline)	Mercury used for production, kg/year	No data custodian

	Batteries with mercury	Mercury used for production, kg/year	No data custodian
	Manometers and gauges with mercury	Mercury used for production, kg/year	No data custodian
	Biocides and pesticides with mercury	Mercury used for production, kg/year	Department of Agriculture Malaysia (DOA)
	Paints with mercury	Mercury used for production, kg/year	No data custodian
	Skin lightening creams and soaps with mercury chemicals	Mercury used for production, kg/year	Ministry of Health (MOH)
Step 5 Waste Treatment and Recycling	Is more than 2/3 (two thirds; 67%) of the general waste collected and deposited on lined landfills or incinerated with pollution abatement?	Yes /No	National Solid Waste Management Department (JPSPN)
	Is more than 1/3 (one third = 33%) of the mercury-added products waste safely collected and treated separately?	Yes /No	Department of Environment (DOE)
	Production of recycled mercury ('secondary production')	Mercury produced, kg/year	Department of Environment (DOE)
	Production of recycled ferrous metals (iron and steel)	Number of vehicles recycled/year	Road Transport Department (JPJ)
	Incineration of municipal/general waste	Waste incinerated, tonne/year	National Solid Waste Management Department (JPSPN)
	Incineration of hazardous waste	Waste incinerated, tonne/year	Department of Environment (DOE)
	Incineration / burning of medical waste	Waste incinerated, tonne/year	Department of Environment (DOE)
	Sewage sludge incineration	Waste incinerated, tonne/year	National Water Services Commission (SPAN)
	Open fire waste burning (on landfills and informally)	Waste burned, tonne/year	National Solid Waste Management Department (JPSPN)
	Controlled landfills/deposits	Waste landfilled, tonne/year	National Solid Waste Management Department (JPSPN)
	Informal dumping of general waste	Waste dumped, tonne/year	National Solid Waste Management Department (JPSPN)
	Waste water system/treatment	Waste water, m^3/ year	National Water Services Commission (SPAN)
Step 6 Hg Products Substances	*Dental amalgam fillings ('silver' fillings)*	Number of dental amalgam fillings	Ministry of Health (MOH)
	Preparations of fillings at dentist clinics	Number of new fillings	Ministry of Health (MOH)
	Use – from fillings already in the mouth	Number of redo fillings	Ministry of Health (MOH)

	Disposal (lost and extracted teeth)	Number of extracted teeth	Ministry of Health (MOH)
	Medical Hg thermometers	Items sold/year *can also use kg	Ministry of Health (MOH)
	Other glass Hg thermometers (air, laboratory, dairy, etc.)	Items sold/year	Ministry of Domestic Trade, Co-operatives and Consumerism (KPDNKK)
	Engine control Hg thermometers and other large industrial/speciality Hg thermometers	Items sold/year	Ministry of Domestic Trade, Co-operatives and Consumerism (KPDNKK)
	Electrical switches and relays with mercury	Yes /No	Ministry of Domestic Trade, Co-operatives and Consumerism (KPDNKK)
	Fluorescent tubes (double end)	Items sold/year *can also use kg	Ministry of Domestic Trade, Co-operatives and Consumerism (KPDNKK)
	Compact fluorescent lamp (CFL single end)	Items sold/year *can also use kg	Ministry of Domestic Trade, Co-operatives and Consumerism (KPDNKK)
	Other Hg containing light sources (see guideline)	Items sold/year	Ministry of Domestic Trade, Co-operatives and Consumerism (KPDNKK)
	Mercury oxide (button cells and other sizes); also called mercury-zinc cells	Batteries sold, tonne/year	Ministry of Domestic Trade, Co-operatives and Consumerism (KPDNKK)
	Other button cells (zinc-air, alkaline button cells, silver-oxide)	Batteries sold, tonne/year	Ministry of Domestic Trade, Co-operatives and Consumerism (KPDNKK)
	Other batteries with mercury (plain cylindrical alkaline, permanganate, etc., see guideline)	Batteries sold, tonne/year	Ministry of Domestic Trade, Co-operatives and Consumerism (KPDNKK)
	Polyurethane (PU, PUR) produced with mercury catalyst	Yes /No	Department of Occupational Safety and Health (DOSH)
	Paints with mercury preservatives	Paint sold, tonne/year	Ministry of Domestic Trade, Co-operatives and Consumerism (KPDNKK)
	Skin lightening creams and soaps with mercury chemicals	Cream or soap sold, tonne/year	Ministry of Health (MOH)
	Medical blood pressure gauges (mercury sphygmomanometers)	Items sold/year	Ministry of Health (MOH)
	Other manometers and gauges with mercury	Yes /No	Ministry of Domestic Trade, Co-operatives and Consumerism (KPDNKK)
	Laboratory chemicals	Yes /No	Ministry of International Trade and Industry (MITI)
	Other laboratory and medical equipment with mercury	Yes /No	Ministry of International Trade and Industry (MITI)

Step 7 Crematoria and Cemeteries	Crematoria	Corpses cremated/ year	No data custodian
	Cemeteries	Corpses buried/year	No data custodian
Step 8 Miscellaneous (Indicate YES if the source is present in your country, NO if the source is proven not exist. Indicate '?' if have no indications of their presence or absence)	Combustion of oil shale	Yes /No	No data custodian
	Combustion of peat	Yes /No	No data custodian
	Geothermal power production	Yes /No	Sustainable Energy Development Authority (SEDA)
	Production of other recycled metals	Yes /No	Ministry of International Trade and Industry (MITI)
	Production of lime	Yes /No	Minerals and Geoscience Department (JMG)
	Production of light weight aggregates (burnt clay nuts for building purposes)	Yes /No	No data custodian
	Production of other chemicals (than chlorine and sodium hydroxide) in Chlor-alkali facilities with mercury-cell technology	Yes /No	No data custodian
	Polyurethane production with mercury catalysts	Yes /No	Department of Occupational Safety and Health (DOSH)
	Seed dressing with mercury chemicals	Yes /No	Department of Agriculture Malaysia (DOA)
	Infra-red detection semiconductors	Yes /No	No data custodian
	Bougie tubes and Cantor tubes (medical)	Yes /No	No data custodian
	Educational uses	Yes /No	Ministry of Health
	Gyroscopes with mercury	Yes /No	No data custodian
	Vacuum pumps with mercury	Yes /No	No data custodian
	Mercury used in religious rituals (amulets and other uses)	Yes /No	No data custodian
	Mercury used in traditional medicines (ayurvedic and others) and homeopathic medicine	Yes /No	No data custodian
	Use of mercury as a refrigerant in certain cooling systems	Yes /No	SIRIM
	Light houses (levelling bearings in marine navigation lights)	Yes /No	Malaysia Marine Department
	Mercury in large bearings of rotating mechanic parts in for example older waste water treatment plants	Yes /No	Department of Environment (DOE)
	Tanning	Yes /No	No data custodian
	Pigments	Yes /No	No data custodian
	Products for browning and etching steel	Yes /No	No data custodian

	Certain colour photograph paper types	Yes /No	No data custodian
	Recoil softeners in rifles	Yes /No	Ministry of Defence (MINDEF)
	Explosives (mercury-fulminate a.o.)	Yes /No	Ministry of Defence (MINDEF)
	Fireworks	Yes /No	No data custodian
	Executive toys	Yes /No	No data custodian

Table 5.2 Data mapping according to agencies and steps

Agencies	Steps							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
STAT	X						X	
MITI	X					X		X
EC		X						
SEDA		X						X
JPSM		X						
JMG			X					X
DOSH				X		X		X
DOA				X				X
DOE					X			
JPSPN					X			
JPJ					X			
SPAN					X			
MOH	X			X		X		X
KPDNKK						X		
NRE								
SIRIM								X
MARINE								X
MINDEF								X

Following the initial stage of agency-mapping and data-request, the study did also extend the efforts to contact more agencies that may possibly have additional information. This includes Malaysia Automotive Institute (MAI), Indah Water Konsortium (IWK), Sabah Energy, Sarawak Energy and Malaysian Investment Development Authority (MIDA). However, there was no additional data or response that fit into the Toolkit except from MIDA and IWK which had been incorporated into the study as appropriate.

This study acknowledges the importance of covering Sabah and Sarawak in pursuing a more holistic data representative of the country. This is due to the fact that certain matters including local government, sewerage, water and energy management in these states fall under the mandate of state governments of Sabah and Sarawak. Therefore, the study had proactively conducted two workshops in East Malaysia with one dedicated for each state. These workshops were held on 16 and 17 July 2018 in Kuching and Kota Kinabalu respectively. However, since this initiative was the first engagement with the authorities from East Malaysia, the focus has also been given for awareness raising as well as data collection for the development of a national mercury inventory. Relevant data was used in the Toolkit whenever possible and additional data will be documented in the report for future references. If the federal government is the mandated data custodian, then the data from state agencies will only be incorporated if it is proven that this data has not been included in the report by the said federal government in order to avoid any double counting in the Toolkit. Table 5.3 shows the list of agencies participated in the Sabah and Sarawak workshops. This list is also excluded from the statistics of responses as this initial contact also focused more on awareness raising where data is generally lacking at state government level.

Table 5.3 The list of State's agencies involved in Sabah and Sarawak data collection workshops.

Sarawak Workshop	Sabah Workshop
1. Ministry of International Trade and Industry, Sarawak 2. Department of Agriculture Sarawak 3. Royal Malaysian Customs Department, Sarawak 4. Forest Department Sarawak 5. Sarawak Health Department 6. Department of Statistics Malaysia, Sarawak 7. Sarawak Region Marine Department 8. Department of Irrigation and Drainage, Sarawak 9. Department of Occupational Safety and Health, Sarawak 10. The Ministry of Local Government and Housing Sarawak 11. SIRIM Sarawak	1. Ministry of Domestic Trade and Consumer Affairs, Sabah Department of Statistics Malaysia, Sabah 2. Department of Environment, Sabah 3. Royal Malaysian Customs Department, Sabah 4. Sabah Health Department 5. Sabah Forestry Department 6. Department of Occupational Safety and Health, Sabah 7. Mineral and Geoscience Department, Sabah 8. The Ministry of Local Government and Housing Sabah 9. Energy Commission, Sabah 10. SIRIM Sabah 11. FMM Sabah

2. Data Collection & input

Following the process of mapping through stakeholder consultations and discussions, the study then proceeded to the data collection process. Contacts were made with identified authorities to gather the required data for the analysis. Efforts have also been made to collect any relevant data to be included in the report in order to make it a much more comprehensive inventory. The study focused on the collection of available data, instead of the collection of primary data because first of all, the collection of primary data will take much longer and secondly, the collection of primary data is not within the scope of this study. The data is collected for years 2013 to 2016 before a decision is made on the assessment year to be adopted. The study also takes note of the data provider as a focal point for future contact whenever necessary.

The data was collected based on the format needed in conducting the assessment using the Toolkit. The data collected was separated into 3 types covering the qualitative and quantitative aspects. The 3 types of data collected were data availability, activity rate and control measures. The summary of the data format is shown in Table 5.4.

Table 5.4 Summary of the data format for the Toolkit

Data Type	Data	Remarks
Data Availability (Qualitative)	Yes 'Y'	For this component, a response need to be choose based on the source availability. Yes – The source is available and activity rate is known No – The source is absent ? – No information on this source
	No 'N'	
	Unknown '?'	
Activity Rate (Quantitative)	Exact Value	The activity rate value must be entered if a source is declared as available in the country. Activity rate must be in the exact unit as required by the Toolkit.
Control Measures (Quantitative)	Percentage of application	For the entry of control measures, the Toolkit will require the percentage of application of that particular measures in the country.

As mentioned previously, the first focus of the data collection will be to determine a single year for the assessment. This was done by collecting data for several years (2013 to 2016) before establishing the assessment year and then followed by analysing the total percentage of data availability (if source and activity rate are available) (Table 5.5).

Table 5.5 The percentage of data in determining assessment year

Category	2013	2014	2015	2016
Total indicator	96	96	96	96
Data available*	48	50	41	41
Data not available**	48	46	55	55
Percentage of data available	50%	52%	43%	43%

**Data available is the number of indicator with source present/absent and activity rate is known.*
*** Data not available is when there is no data available and no custodian can be identified.*

The deciding factor in selecting the assessment year is the availability of data for Step 2 (Energy Consumption and Fuel Production). The Toolkit advises to use data from International Energy Agency (IEA). However since Malaysia is not a member of IEA, the data from IEA could be questionable. Besides, it has already been decided from the outset that the study will only use the data released by competent government agencies. In the local setting, data for Step 2 is available from Energy Commission (EC). This can be accessible through the National Energy Balance Report. The latest National Energy Balance Report available is year 2016. However, the 2016 Report merely reported data until year 2014. Therefore, the best assessment year for this exercise is 2014 as the other data required demonstrated almost similar patterns between 2013 and 2016.

Figure 5.1 shows the number of response from agencies identified as data custodian from the initial data mapping exercise. The data response can be categorised into several categories (Table 5.6) and the distribution is illustrated in Figure 5.2.

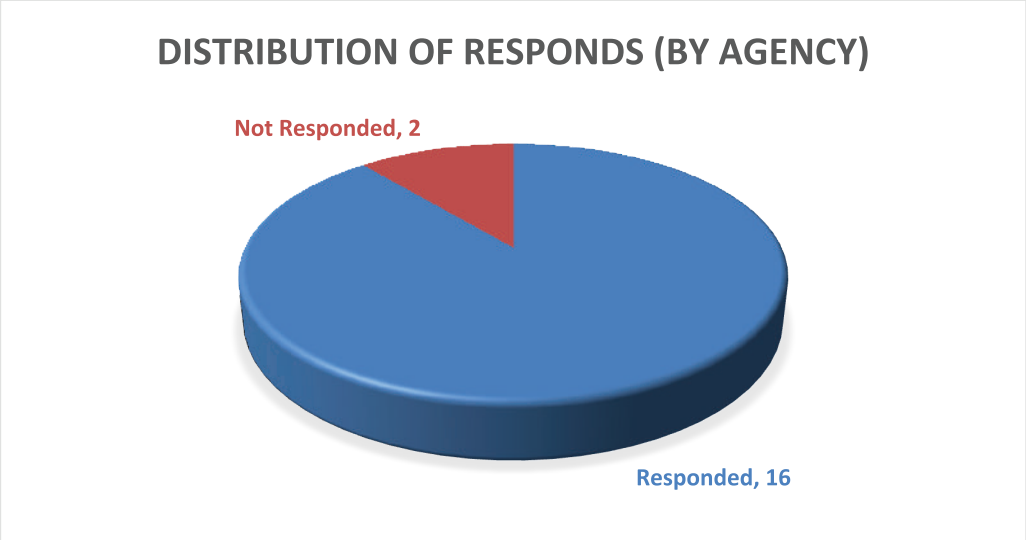


Figure 5.1: Agency response distribution

Table 5.6 Data categories

Category	Remarks
Data is available	The required data is confirmed presence/absent and the activity rate is available in the format required by the Toolkit.
Data is not available	The data is not collected by the relevant authority.
Data is available in other format (conversion)	Similar data is available and can be converted into the required unit/format.
No respond	No responds were received by these agencies (e.g., SPAN and JPJ).
No data custodian	The data custodian for the required data cannot be identified amongst the stakeholders consulted.

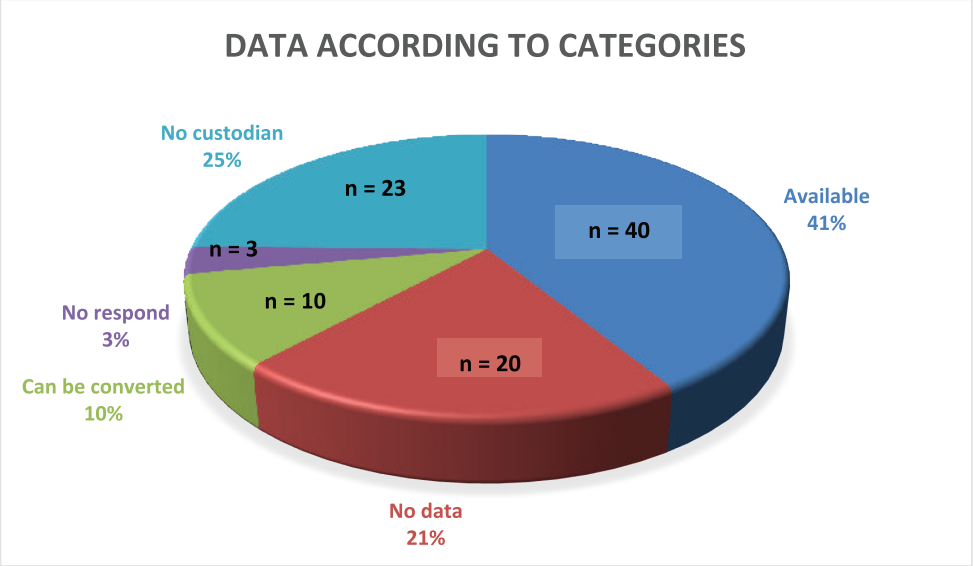


Figure 5.2: Data distribution according to categories

All collected data were carefully inputted into the Toolkit following the guideline provided by UNEP. All source categories present in Malaysia were noted as present and the activity rate were inserted. In case where no activity rate data is present, a remark was made indicating the need for future assessment of the existing source categories. Therefore, this exercise will provide insight on source availability, data availability and areas that are needed to be further studied.

3. Data Analysis and Reporting

Following the data collection process, the study then proceeded in building the national mercury release inventory for year 2014 using UNEP's Toolkit for Identification and Quantification of Mercury Release (Level 1 2017 updated version). The data used is the data provided by local competent authority and excluded other third party sources. This study also minimized projection based on previous years, however the study allows conversion of units to meet the requirement of the Toolkit.

This study utilised Microsoft Excel's spreadsheet that is preloaded with equations by UNEP to quantify releases. All the finding generated were reported in this report including all information gathered from the stakeholders for future references, regardless whether these information are directly- or indirectly related to the Toolkit. The following are the results according to the steps applied in the Level 1 Inventory Toolkit.

6.0 Result and Discussion

6.1 Step 1 – Country Profile

Step 1 in using the Toolkit is to report the basic country profile data. Most of the data is for reporting purposes while only a few will be used for calculation. Table 6.1 shows the general information on Malaysia based on the reports of Department of Statistics Malaysia. According to the Report on Economic Developments in 2014 , which was published by Bank Negara Malaysia, the main sectors in Malaysia were construction, services, manufacturing, mining and agriculture (Bank Negara Malaysia, 2014).

Table 6.1 General Data on Malaysia

General Data	
Country	Malaysia
Population	30,708,500
Year and reference for population data	2014
GDP (Gross Domestic product)	RM 1,012,400,000,000
Year and reference for GDP data	2014
Main sectors in the economy of country (list)	1. Construction 2. Services 3. Manufacturing 4. Mining 5. Agriculture, forestry and fishing

However, for the use of the Toolkit, UNEP provided every country with a selection of preloaded data for country profile. The provided data is based on available database such as the United Nations Statistics Division (UNSD). The data provided is for the year 2010. However, country can only correct the preloaded population data while the other two entries (dental personnel ratio and electrification rate) were locked, preventing any corrections from the part of the country. Therefore, this study had used the corrected population (30,708,500 in 2014) and have to opt for the other two given values. Table 6.2 shows the comparison between the preloaded data and national available data. We will use the local data for this analysis whenever allowed by the Toolkit.

Table 6.2 Background data for default calculation (Toolkit and real data)

Indicator	Toolkit's Value	Real Value
Population in 2010 (or as recent as available data allow; UNSD, 2012)	28,250,458	30,708,500 (Department of Statistics data)
Dental personnel per 1000 inhabitants	0.093	0.19*
Electrification rate, % of population with access to electricity	99	99.985 (World Bank, 2018)

*According to Social Statistics Bulletin 2017, there are 1:5215 dentists to population ratio in 2014. Using the population data (30,708,500) the ratio of dental personnel per 1000 inhabitants can be calculated (Department of Statistics Malaysia, 2017).

6.2 Step 2 – Energy Consumption and Fuel Production

6.2.1 Energy consumption

Ref. No.	Indicator	Source Presence	Activity rate	Unit	Data Origin
6.2.1.1	Coal combustion in large power plants	Yes	19,493,606	Coal combusted, t/y	Energy Commission Malaysia
6.2.1.2	Coal combustion in coal fired industrial boilers	Yes	2,439,796	Coal combusted, t/y	Energy Commission Malaysia
6.2.1.3	Other coal uses	Yes	?	Coal used, t/y	Energy Commission Malaysia
6.2.1.4	Combustion/use of petroleum coke and heavy oil	Yes	248,018	Oil product combusted, t/y	Energy Commission Malaysia
6.2.1.5	Combustion/use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates	Yes	27,289,322	Oil product combusted, t/y	Energy Commission Malaysia
6.2.1.6	Use of raw or pre-cleaned natural gas	?	?	Gas used, Nm^3/y	Energy Commission Malaysia
6.2.1.7	Use of pipeline gas (consumer quality)	Yes	10,326,513,664	Gas used, Nm^3/y	Energy Commission Malaysia
6.2.1.8	Biomass fired power and heat production	?	?	Biomass combusted, t/y	Sustainable Energy Development Authority
6.2.1.9	Charcoal combustion	?	?	Charcoal combusted, t/y	Peninsular Malaysia Forestry Department

'?' = Unknown / No data on the source.

Discussion

Energy consumption and fuel production sectors are among the main industries with high mercury concerns. The consumption of coal-powered energy had been proven to contribute to mercury releases as mercury is present in trace amount in coal and this process usually involves a large number of coal in meeting the energy demand in a country. Other fuels such as petroleum derivatives, natural gas, biomass energy production, and charcoal usage also release mercury throughout the consumption processes.

In Malaysia, all relevant data on energy consumption and fuel production are monitored by the Energy Commission. Annual reports on relevant parameters covering Peninsular Malaysia, Sabah and Sarawak are published to provide the information to the public. The latest Malaysia Energy Statistics 2016 Report became the primary source of data to be used in the Toolkit for the quantification of mercury release. However, the Report produced data mainly in the energy format (kilotonne of oil equivalent, ktoe) instead of in metric mass (tonne, t). The study had decided to use the given conversion factors in getting the data in the format suitable for the Toolkit. Conversion factors from National Energy Balance 2015 will be used to convert the ktoe data into terajoule (TJ) and then to metric tonne. This process will create some uncertainty due to the conversion process but the study decided to abide by the actual data provided by competent national authorities.

Coal remains a major power source for the country especially for electricity production and power generation. National coal reserves as of 31st December 2014 was as follows (Table 6.3):

Table 6.3 National coal reserves in 2014

Location	Reserves (million tonnes)			Coal Type
	Measured	Indicated	Inferred	
Sarawak				
Abok & Silantek, Sri Aman	7.25	10.60	32.40	Coking Coal, Semi-Anthracite and Anthracite
Merit-Pila, Kapit	170.26	107.02	107.84	Sub-Bituminous
Bintulu	6.00	0.00	14.00	Bituminous (partly coking coal)
Mukah - Balingian	86.95	170.73	646.53	Lignite, Hydrous Lignite and Sub-Bituminous
Tutoh Area	5.58	34.66	162.33	Sub-Bituminous
Subtotal	276.04	323.01	963.10	
Sabah				
Salimpopon	4.80	14.09	7.70	Sub-Bituminous
Labuan	-	-	8.90	Sub-Bituminous
Maliau	-	-	215.00	Bituminous
Malibau	-	17.90	25.00	
SW Malibau	-	23.23	-	
Pinangan West Middle Block	-	-	42.60	Bituminous
Subtotal	4.80	55.22	299.20	
Selangor				
Batu Arang	-	-	17.00	Sub-Bituminous
Subtotal	-	-	17.00	
Total	280.84	378.23	1,279.30	
Grand Total	1,938.37			

Source: Energy Commission, 2016

In quantifying mercury releases, the Toolkit had separated the use of coal combustion into 3 categories namely the use in large power plants, industrial boilers and other coal uses. In the local context, this data can be gathered from the national report even with the difference in the reporting format. It is reported that in 2014, 43.2% from a total of 31,608 ktoe of fuel input to power stations came from coal and coke (Energy Commission, 2016). This is equivalent to 13,654.66 ktoe. It is also reported that 1,709 ktoe of coal and coke were consumed by industries (Energy Commission, 2016). However, there is no reporting of other coal uses in the country (Energy Commission, 2016). Table 6.4 shows the conversion process of this data in obtaining the data relevant for the Toolkit.

Table 6.4 Data conversion for data on coal combustion

Parameter	Reported data (ktoe)	Ktoe to Terajoule Conversion Factors	Terajoules	Terajoules to tonne Conversion Factors*	Tonne
Coal combustion in large power plants	13,654.66	1 ktoe = 41.84 TJ	571,310.8	29.3076 TJ = 1000 Tonne (assume hard coal)	19,493,605.99
Coal combustion in coal fired industrial boilers	1,709	1 ktoe = 41.84 TJ	71,504.56	29.3076 TJ = 1000 Tonne (assume hard coal)	2,439,795.8
Other coal uses	?	?	?	?	?

*According to National Energy Balance 2015 Report
? = Unknown / No data on the source.

In 2014, it is reported that 246 ktoe of fuel oil (heavy oil) was consumed (Energy Commission, 2016). There is no data on petroleum coke usage and therefore the data on fuel oil would have to be used in inputting data for the parameter on the use of petroleum coke and heavy oil. Meanwhile, the total consumption of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates was 28,679 ktoe (Table 6.5). According to the Toolkit's guidelines, the components that can be measured in this parameter includes domestic supply of natural gas liquids, naphta, liquefied petroleum gases (LPG), motor gasoline, aviation gasoline, jet kerosene, other kerosene and gas/diesel (UNEP 2017). Table 6.6 shows the conversion process of this data in obtaining the data relevant for the Toolkit.

Table 6.5 Amount of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates

Fuel Type	Reported data (ktoe)	Terajoules to tonne conversion factors*
Liquid Natural Gas	0	45.1923 TJ = 1000 Tonne
Motor gasoil/ Diesel	10161	42.4960 TJ = 1000 Tonne
Kerosene	23	43.1994 TJ = 1000 Tonne
LPG	2632	45.5440 TJ = 1000 Tonne
Naptha	0	44.1289 TJ = 1000 Tonne
Motor Gasoline	12705	43.9614 TJ = 1000 Tonne
Aviation Gasoline	3158	43.9614 TJ = 1000 Tonne
Total	28,679	

*According to National Energy Balance 2015 Report
Source: Energy Commission, 2016

Table 6.6 Data conversion for petroleum products

Parameter	Reported data (ktoe)	Ktoe to Terajoule Conversion Factors	Terajoules (TJ)	Terajoules (TJ) to tonne Conversion Factors*	Tonne
Combustion/ use of petroleum coke and heavy oil	246	1 ktoe = 41.84 TJ	10,292.64	41.4996 TJ = 1000 Tonne (Residual Fuel oil)	248,017.8
Combustion/ use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates	28,679	1 ktoe = 41.84 TJ	1,199,929.4	Used individual type conversion factors as mentioned in National Energy Balance 2015(described in Table 6.5)	27,289,322

*According to National Energy Balance 2015 Report

In 2014, the country reported to be using 9,641 ktoe of natural gas without any indication of the quality of the natural gas used (Energy Commission, 2016). Since, this number represents the total final consumption, the study assumed that the natural gas used are of consumer quality pipeline gas instead of raw natural gas. Using the conversion factor of 41.84 TJ = 1 ktoe, the amount of energy from natural gas used (which is 9,641 ktoe) is equivalent to 403,379.44 TJ. This value can be converted to the unit of Nm^3 gas used by using the unit conversion tab in the Toolkit generating the final value of 10,326,513,664 Nm^3 gas used in 2014.

The next source of energy is from the biomass fired power and heat production. Upon checking with the relevant authorities (Sustainable Energy Development Authority, SEDA), it is found that the data on the weight of biomass combusted is not available. However, the data on the capacity of renewable energy generated is available as in Table 6.7.

Table 6.7 Annual power generation (MWh) of commissioned RE installations

Year	Biomass	Biomass (Solid Waste)
2014	226196.38	4347.83

Source: SEDA, 2018

Another source of energy that is needed by the Toolkit for the quantification of mercury release is the charcoal combustion. Based on the discussion with the authority (Forestry Department Peninsular Malaysia), there is no available data on the amount of charcoal combusted in the country. However, data on the production of charcoal (m^3) from West Malaysia in 2015 to 2017 is available as in Table 6.8. Forest Department Sarawak also informed that no activities of charcoal combustion was conducted in Sarawak.

Table 6.8: Production of charcoal and firewood from West Malaysia

Year	Production of charcoal (m^3)	Production of firewood (m^3)
2015	21,515.64	5,076.77
2016	26,177.74	5,977.45
2017	22,593.37	5,004.94
Total	70,286.75	16,059.16

6.2.2 Fuel production

Ref. No.	Indicator	Source Presence	Activity rate	Unit	Data Origin
6.2.2.1	Oil extraction	Yes	28,548,795	Crude oil produced, t/y	Energy Commission Malaysia
6.2.2.2	Oil refining	Yes	25,526,265	Crude oil refined, t/y	Energy Commission Malaysia
6.2.2.3	Extraction and processing of natural gas	Yes	67,577,021,440	Gas produced, Nm^3/y	Energy Commission Malaysia

Discussion

Fuel production is another dimension of energy sector that has concerns regarding mercury releases. Activities including oil extraction, oil refining, extraction, and processing of natural gas are believed to contribute to mercury releases particularly mercury that present as impurities in the minerals present in the earth core. For oil extraction, it is reported that primary production of energy in 2014 includes 29,545 ktoe of crude oil (Energy Commission, 2016). In 2014, there was 26,417 ktoe of crude oil from both local and imported sources refined in Malaysia (Energy Commission, 2016). Meanwhile for natural gas, 63,091 ktoe was produced (primary production) in 2014 (Energy Commission, 2016). All these values are then converted using the relevant conversion factors to the required unit (Table 6.9).

Table 6.9 Data conversion for fuel production data

Parameter	Reported data (ktoe)	Ktoe to Terajoule Conversion Factors	Terajoules (TJ)	Terajoules (TJ) to tonne Conversion Factors*	Tonne / (Nm^3 for natural gas)
Oil extraction	29,545	1 ktoe = 41.84 TJ	1,236,162.8	43.3	28,548,794.5
Oil refining	26,417	1 ktoe = 41.84 TJ	1,105,287.3	43.3	25,526,265.1
Extraction and processing of natural gas	63,091	1 ktoe = 41.84 TJ	2,639,727.4	Utilised Unit Conversion provided in Toolkit	67,577,021,440

*According to National Energy Balance 2015 Report

Summary STEP 2 - Data and inventory on energy consumption and fuel production

Ref.	Source category	UNEP's predetermined input factor	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
				Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment/ disposal
Energy consumption									
6.2.1.1	Coal combustion in large power plants	0.15g Hg/t combusted	2,924	2,573.2	0.0	0.0	0.0	0.0	350.9
6.2.1.2	Coal combustion in coal fired industrial boilers	0.15g Hg/t combusted	325	325.3	0.0	0.0	0.0	0.0	0.0
6.2.1.3	Other coal uses	0.13 Hg/t coal combusted	?	?	?	?	?	?	?
6.2.1.4	Combustion/use of petroleum coke and heavy oil	55mg Hg/ton heavy petroleum product	14	13.6	0.0	0.0	0.0	0.0	0.0
6.2.1.5	Combustion/use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates	5.5mg Hg/ton light distillate petroleum product	150	150.1	0.0	0.0	0.0	0.0	0.0
6.2.1.6	Use of raw or pre-cleaned natural gas	100 µg Hg/Nm^3 gas	?	?	?	?	?	?	?
6.2.1.7	Use of pipeline gas (consumer quality)	0.2 µg Hg/Nm^3 gas	2	2.3	0.0	0.0	0.0	0.0	0.0
6.2.1.8	Biomass fired power and heat production	0.03 g Hg/t biomass	?	?	?	?	?	?	?
6.2.1.9	Charcoal combustion	0.12 g Hg/t charcoal	?	?	?	?	?	?	?
Fuel production									
6.2.2.1	Oil extraction	3,4 mg Hg/ton crude oil	97	0.0	19.4	0.0	0.0	0.0	0.0
6.2.2.2	Oil refining	3,4 mg Hg/ton crude oil	87	21.7	0.9	0.0	0.0	0.0	13.0
6.2.2.3	Extraction and processing of natural gas	100 µg Hg/Nm^3 gas	6,758	1,013.7	1,351.5	0.0	2,027.3	0.0	2,365.2

*N/A- Not available in the Appendix 1 of Toolkit for Identification and Quantification of Mercury Releases: Guideline for Inventory Level 1 Version 2.
'-': The source is absent in the country and therefore no release.
'?': No data available on this source.

Data Gaps: Energy consumption and fuel production (Step 2)

1. Most of the data is available from National Energy Balance Report. However, the latest data available is two years back from the reporting year (i.e., the 2016 Report presents the data of 2014). Another source of data is from International Energy Agency (IEA). However this data is not validated as Malaysia is not a member of IEA.
2. For local reporting, the data usually is presented in the unit of kilotonne of oil equivalent (ktoe). However, the Toolkit usually requested the data in metric unit (tonne). It is possible to convert the data from energy (ktoe) to mass (tonne) with the use of conversion factors. However, the conversion entails a degree of uncertainty as different fuel types actually carries different conversion factors. Therefore, the generalisation of the conversion factors for the different fuel types compounded the uncertainty of converted data.
3. Some data are not available or accessible and this produced some gaps in the quantification process. Evidence of scenarios (e.g. use of biomass) shows the potential of availability of sources but there is a lack of data (as required by the Toolkit), which masked the real magnitude of the contribution to mercury release and quantification.
4. A lack of data on the quality of natural gas had forced the study to assume that the natural gas consumed is of a higher grade meant for consumers. The use of pre-cleaned natural gas might produce a much larger amount in the quantification of mercury release.
5. The Toolkit uses a general mix of coal types relevant to developing countries in estimating the release. A better understanding of the types of coal used will give more accurate estimations in mercury release.

6.3 Step 3 - Domestic Production of Metals and Raw Materials

6.3.1 Primary metal production

Ref. No.	Indicator	Source Presence	Activity rate	Unit	Data Origin
6.3.1.1	Mercury (primary) extraction and initial processing	No	-	Mercury produced, t/y	JMG
6.3.1.2	Production of zinc from concentrates	No	-	Concentrate used, t/y	JMG
6.3.1.3	Production of copper from concentrates	No	-	Concentrate used, t/y	JMG
6.3.1.4	Production of lead from concentrates	No	-	Concentrate used, t/y	JMG
6.3.1.5	Gold extraction by methods other than mercury amalgamation	Yes	1,075,000	Gold ore used, t/y	JMG
6.3.1.6	Alumina production from bauxite (aluminium production)	No	-	Bauxite processed, t/y	JMG
6.3.1.7	Primary ferrous metal production (pig iron production)	Yes	4,320,000	Pig iron produced, t/y	JMG
6.3.1.8	Gold extraction with mercury amalgamation – from whole ore	No	-	Gold produced, kg/y	JMG
6.3.1.9	Gold extraction with mercury amalgamation – from concentrate	No	-	Gold produced, kg/y	JMG

Discussion

Mercury is present in the earth crust as ore, primarily cinnabar. The process of mining causes mobilisation of mercury into the environment. Primary production of ferrous metal, non-ferrous metal, large scale gold production and mercury mining account for approximately 18% of total anthropogenic emissions (UNEP, 2013b). This is further increased by the artisanal and small scale gold mining which has accounted for an additional 37% of the total anthropogenic emissions (UNEP, 2013b).

Based on the data provided by the Mineral and Geosciences Department of Malaysia (JMG), it is reported that there is no mercury, zinc, copper and lead mining activities in Malaysia. There is also no aluminium production reported in 2014. Even though there are bauxite mining activities reported but the process of aluminium production is not conducted in the country. However, the country produced 4.32 million tonnes of primary ferrous metal (pig iron) in 2014.

Gold extraction is a process that was highly emphasised in the Minamata Convention on Mercury, with a particular focus on the artisanal and small scale gold mining (ASGM). Mercury may be used in gold extraction as a cheaper means of extracting gold from gold ore, which might lead to intentional mercury vapour emissions to the atmosphere. Besides the mercury amalgamation process used in gold extraction, there are other methods

available, including Carbon-In-Leach (CIL), Resin-In-Leach (RIL) and Heap Leaching. According to the data provided by JMG, no gold was extracted using mercury amalgamation. All gold produced in the country uses other than mercury amalgamation method. In 2014, the amount of gold produced in the country is approximately 4.3 tonne (4,308,329 gram). However, the Toolkit requires the amount of gold ore used instead of gold produced. This can be achieved by using the unit conversion provided in the Toolkit. The amount of gold ore used to produce 4.3 tonne of gold is approximately 1,075,000 tonne. This value will be inserted into the Toolkit for analysis.

6.3.2 Others materials production

Ref. No.	Indicator	Source Presence	Activity rate	Unit	Data Origin
6.3.2.1	Cement production	Yes	22,400,000	Cement produced, t/y	JMG
6.3.2.2	Pulp and paper production	?	?	Biomass used for production, t/y	No data custodian

'?' = Unknown / No data on the source.

Discussion

The construction industry is a major industry in Malaysia in the recent years. The cement industry contributed to mercury releases through burning of fossil fuels to heat the mixture that includes mercury-containing raw materials (UNEP, 2013b). In a cement production process, mercury can naturally present in both the raw materials (limestone, clay, and marl) and fuels used (coal, coke, natural gas, and others) which causes mercury releases due to the heating process in the production (Hoenig, 2013). The amount of mercury content in raw materials may vary between individual raw materials, which will lead to a range of release amount (Renzoni et al., 2010). According to JMG, in 2014, Malaysia's cement industry produced 22.4 Million (22,400,000) tonne of cement.

Pulp and paper production is another industry that can contribute to mercury releases. This is largely due to the usage of caustic soda, which is produced by chlor-alkali facilities. Chlor-alkali produced chlorine and caustic soda by the use of mercury cell (alternatively, other cell technologies are also available). However, there is no data available on the amount of biomass used for paper production and no authority was identified as the custodian of this process.

Summary STEP 3 - Data and inventory on domestic production of metals and raw materials

Ref.	Source category	UNEP's predetermined input factor	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
				Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment/ disposal
Primary metal production									
6.3.1.1	Mercury (primary) extraction and initial processing	N/A*	-	-	-	-	-	-	-
6.3.1.2	Production of zinc from concentrates	65 g Hg/metric ton	-	-	-	-	-	-	-
6.3.1.3	Production of copper from concentrates	30 g Hg/metric ton	-	-	-	-	-	-	-
6.3.1.4	Production of lead from concentrates	30 g Hg/metric ton	-	-	-	-	-	-	-
6.3.1.5	Gold extraction by methods other than mercury amalgamation	15 g Hg/metric ton	16,125	645.0	322.5	14,512.5	645.0	0.0	0.9
6.3.1.6	Alumina production from bauxite (aluminium production)	0.5 g Hg/metric ton bauxite	-	-	-	-	-	-	-
6.3.1.7	Primary ferrous metal production (pig iron production)	N/A*	216	205.2	0.0	0.0	0.0	0.0	10.8
6.3.1.8	Gold extraction with mercury amalgamation – from whole ore	N/A*	-	-	-	-	-	-	-
6.3.1.9	Gold extraction with mercury amalgamation – from concentrate	N/A*	-	-	-	-	-	-	-
Other materials production									
6.3.2.1	Cement production	N/A*	3,064	2,298.3	0.0	0.0	766.1	0.0	0.0
6.3.2.2	Pulp and paper production	0.03g Hg/t biomass	?	?	?	?	?	?	?

*N/A- Not available in the Appendix 1 of Toolkit for Identification and Quantification of Mercury Releases: Guideline for Inventory Level 1 Version 2.
'-': The source is absent in the country and therefore no release.
'?': No data available on this source.

Data Gaps: Domestic production of metals and raw materials (Step 3)

1. Lack of data custodian and no data available for the amount of biomass used for production in pulp and paper production. This may provide some uncertainty in the final quantity of mercury release estimated by this Toolkit. Based on our observation, there are many paper mills in Malaysia and therefore, further study and data collection are needed on this matter.
2. The concentration of mercury in ores usually varies due to various factors and leading to a different amount of mercury release. This Toolkit only estimates based on the average input factor agreed by UNEP's experts and may differ from the specific ores used in the country.
3. The amount of release from cement production will largely depend on the type of fuels used in the production. This Toolkit will estimate the mercury released based on average of normal process. The release can be refined with the establishment of its own factors and the identification of the type of fuels used in local cement industries.

6.4 Step 4 - Domestic Production and Processing with Intentional Mercury Use

6.4.1 Productions of chemicals

Ref. No.	Indicator	Source Presence	Activity rate	Unit	Data Origin
6.4.1.1	Chlor-alkali production with mercury-cells	No	-	Cl_2 produced, t/y	DOSH
6.4.1.2	VCM production with mercury catalyst	No	-	VCM produced, t/y	DOSH
6.4.1.3	Acetaldehyde production with mercury catalyst	No	-	Acetaldehyde produced, t/y	DOSH

Discussion

There are 3 major manufacturing processes that contributed to mercury emissions, which were also highlighted in the Minamata Convention of Mercury. These manufacturing processes are chlor-alkali production, vinyl chloride monomer production, and acetaldehyde production. Mercury is being used as a catalyst in these processes, which contributed to mercury emissions.

Chlor-alkali process is a process of electrolysis of sodium chloride which will produce chlorine and sodium hydroxide (caustic soda). The process of electrolysis can be conducted using several technologies, including mercury cells, membrane cells, and diaphragm cells. The concern of mercury is obviously related to the use of mercury cells which consumes mercury and give rise to potential environmental and health hazards. The products of this process are often contaminated with mercury, increasing the magnitude of the risk. According to DOSH, there were two chlor-alkali manufacturing in Malaysia. However, based on verbal engagements, the Department of Occupational Safety and Health (DOSH) and Malaysian Investment Development Authority (MIDA) reported that both manufacturers use mercury-free technologies.

Vinyl Chloride Monomer (VCM) production is another process which raises concern over mercury emissions and releases. VCM is used as a monomer in producing the famous polymer polyvinyl chloride (PVC) that is widely used. VCM is produced from natural gas, petroleum, and coal. The coal-based technology utilises mercury as a catalyst and the fate of the mercury throughout the VCM production process is poorly understood at the moment (UNEP, 2013b). China is estimated to be using 800 tonnes of mercury as catalysts in this industry and the used mercury is being recycled and reused (UNEP, 2013b). According to DOSH , Malaysia had only 1 VCM production manufacturer. However, this facility is no longer in operation.

Acetaldehyde is a chemical used to be primarily used for the production of acetic acid. However, with the development of methanol in producing acetic acid, the production of acetaldehyde had been declining. In producing acetaldehyde, mercury (II) sulphate ($HgSO_4$) is used as a catalyst from acetylene and water. The production of acetaldehyde and acetic acid is among the first to take mercury pollution reduction measures in the late 1950s (UNEP, 2013c). The by-product of acetaldehyde was the culprit in the infamous incident of Minamata disease that occurred in Japan during 1960/70s (UNEP, 2002). In addition, DOSH had also confirmed that there is no acetaldehyde production activity in Malaysia.

According to the latest data collected by DOSH, in 2014, there are 12,0217 tonne of chlorine manufactured while there is no manufacturing of VCM and acetaldehyde. This data is gathered from the Chemical Information Management System (CIMS), which serves as an inventory of chemicals present in Malaysia. The system was built under the provisions of CLASS Regulations 2013 where the manufacturer using hazardous chemicals in their workplace with quantity over 1 tonne per year is required to notify DOSH. Table 6.10 shows data from CIMS on several chemicals that are related to this assessment as discussed earlier. DOSH also confirmed that there are no data indicating the use of mercury in the production of the mentioned chemicals. However, since CIMS only

operates from 2014, data from previous reports would have to be taken into consideration. It was found that no mercury was used in any of the discussed processes, it is safe to say there is no mercury used in these processes.

Table 6.10 Data on chlorine, VCM, and acetaldehyde according to CIMS

Chemical	2015		2016		2017	
	Import	Manufactured	Import	Manufactured	Import	Manufactured
Chlorine	11	17962	1062.2	170217	0	250
VCM	46441.4	0	50099	0	0	0
Acetaldehyde	0	0	0	0	0	0

*All measurement in metric tonne.

6.4.2 Production of products with mercury content

Ref. No.	Indicator	Source Presence	Activity rate	Unit	Data Origin
6.4.2.1	Hg thermometers (medical, air, lab, industrial etc.)	?	-	Mercury used for production, kg/y	No Custodian
6.4.2.2	Electrical switches and relays with mercury	?	?	Mercury used for production, kg/y	No Custodian
6.4.2.3	Light sources with mercury (fluorescent, compact, others: see guideline)	?	?	Mercury used for production, kg/y	No Custodian
6.4.2.4	Batteries with mercury	?	?	Mercury used for production, kg/y	No Custodian
6.4.2.5	Manometers and gauges with mercury	?	?	Mercury used for production, kg/y	No Custodian
6.4.2.6	Biocides and pesticides with mercury	No	-	Mercury used for production, kg/y	DOA
6.4.2.7	Paints with mercury	?	?	Mercury used for production, kg/y	No Custodian
6.4.2.8	Skin lightening creams and soaps with mercury chemicals	No	-	Mercury used for production, kg/y	Pharmacy Enforcement Division, MOH

'?' = Unknown / No data on the source.

Discussion

Mercury is also used as a raw material in the production of various mercury containing products including thermometers, batteries, manometers, pesticides, and paints. The use of mercury in production processes can cause mercury releases and emissions to the environment. Having a clear idea and understanding of the magnitude of these industrial activities will help in quantifying mercury releases more accurately.

Mercury thermometer is one of the primary mercury containing products that are being used in various sectors including the medical sector. The physical properties of mercury allow reactions to temperature change and provide a readable change when compared with a scale. According to United State Environmental Protection Agency (US-EPA), different types of thermometer will have different amount of mercury where the oral thermometer contains 0.61 grams mercury and basal thermometer contains 2.25 grams of mercury (US-EPA, 2015b). A study on thermometers used in Cameroon indicates that by calculation, the average quantity of metallic mercury consumption through the use of medical thermometer was about 2430kg between 2006 to 2010 (Kuepouo, 2013). This proves the massive use of mercury in this production activity.

In the case of medical thermometer, Malaysia had enacted the Medical Devices Act in 2012 which governed medical devices and the related industries, and to regulate other relevant matters. According to this act, no medical devices can be imported, exported, or placed in the market without being registered under this act *(Seksyen 5 Kehendak bagi pendaftaran peranti perubatan)*. Any establishment intended to import, export, or placed a medical device in the market needs a license under the act. However, the Ministry of Health (MOH) does not have data on the quantity of mercury used for manufacturing of thermometers. There are also a lack of data on the other types of thermometers particularly, of the amount of mercury used for thermometer manufacturing.

Mercury is also being used as seed dressing, pesticides, and biocides. In the past, this had contributed to both the incidents of mercury poisoning in Iraq (1956 & 1959) which were cause by methylmercury and ethylmercury (UNEP, 2002). This had led to the reduction and bans in the use of mercury containing pesticides in several countries in the world. In Malaysia, the production of biocides and pesticides is regulated by the Department of Agriculture (DOA) under the Ministry of Agriculture and Agro-Based Industry (MOA). According to the Pesticides Act 1974, all pesticides must be registered with the Pesticides Board and licenses are needed for manufacturing, sale, and storage. According to DOA, the registration of pesticides and biocides containing mercury and mercury compound is prohibited in Malaysia.

Mercury is also found to be used in some paints, skin lightening and soap products. Mercury is used in paint products as fungicides to eliminate and prevent growth of bacteria. For cosmetic products, mercury is commonly used to lighten the skin and as freckles cream (US-EPA, 2015a).

Mercury and mercury compound are classified as poisons under the Poison Act 1952. Importers and wholesalers need licenses to operate. The Act has the provision to record the sale of mercury by license holder which will also need to state the permitted quantity of mercury. However, it does not have provisions that require stakeholders to submit report on purchasing, importing, selling, or the use of mercury to the authority. The license also does not require the owner to maintain a mercury inventory for mercury and mercury compound for use or for sale. Therefore, at this point, it is not conclusive enough to identify the amount of mercury used in the production of paints, skin lightening and soap products.

Mercury is also commonly used in the production of electrical switches , relays, some light sources (fluorescent and compact), and batteries. According to Malaysian Investment Development Authority (MIDA), there is no mercury being used for production of electrical switches, relays, and batteries in Malaysia. There is a use of an average of 90-100kg of mercury annually for the production of light sources. However this data is not added into the Toolkit as MIDA's licensing condition only covers entities that have funds exceeding RM 2.5 million and employing more than 75 full time paid employees as stated in a guideline on the application for manufacturing license that issued by MIDA. Therefore this data is not nationally representative of the whole sector and deeper study is needed.

Summary STEP 4 - Data and inventory on domestic production and processing with intentional mercury use

Ref.	Source category	UNEP's predetermined input factor	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
				Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment/ disposal
Production of chemicals									
6.4.1.1	Chlor-alkali production with mercury-cells	100g Hg/ t Cl_2	-	-	-	-	-	-	-
6.4.1.2	VCM production with mercury catalyst	N/A*	-	-	-	-	-	-	-
6.4.1.3	Acetaldehyde production with mercury catalyst	N/A*	-	-	-	-	-	-	-
Production of products with mercury content									
6.4.2.1	Hg thermometers (medical, air, lab, industrial etc.)	N/A*	?	?	?	?	?	?	?
6.4.2.2	Electrical switches and relays with mercury	N/A*	?	?	?	?	?	?	?
6.4.2.3	Light sources with mercury (fluorescent, compact, others: see guideline)	N/A*	?	?	?	?	?	?	?
6.4.2.4	Batteries with mercury	N/A*	?	?	?	?	?	?	?
6.4.2.5	Manometers and gauges with mercury	N/A*	?	?	?	?	?	?	?
6.4.2.6	Biocides and pesticides with mercury	N/A*	-	-	-	-	-	-	-
6.4.2.7	Paints with mercury	N/A*	?	?	?	?	?	?	?
6.4.2.8	Skin lightening creams and soaps with mercury chemicals	N/A*	-	-	-	-	-	-	-

*N/A- Not available in the Appendix 1 of Toolkit for Identification and Quantification of Mercury Releases: Guideline for Inventory Level 1 Version 2.
'-': The source is absent in the country and therefore no release.
'?': No data available on this source.

Data gaps: Domestic production and processing with intentional mercury use (STEP 4)

1. Currently, there is a big gap in data availability for domestic processing and production with intentional mercury use. Most data on mercury use for the purpose of production is lacking and therefore it is hard to estimate mercury releases from production and manufacturing sectors. It is also hard to estimate the dependency of industries on mercury which will be crucial in planning for the phasing out of mercury.

6.5 Step 5 - Data And Inventory On Waste Handling And Recycling

General waste management

Please answer questions about the current waste treatment set-up in your country:	Yes / No
Is more than 2/3 (two thirds; 67%) of the general waste collected and deposited on lined landfills or incinerated in closed incinerators?	No
Is more than 1/3 (one third = 33%) of the mercury-added products waste safely collected and treated separately?	Yes

Discussion

Based on the data from the National Solid Waste Management Department (JPSPN), there are less than 2/3 (67%) of the general wastes collected and deposited on lined landfills or incinerated with pollution abatement in Malaysia. In this updated Toolkit, there is an additional question on the process of mercury-added products wastes. Based on the Department of Environment's (DOE) response, there are more than 1/3 (33%) of mercury-added product wastes safely collected and treated separately. This is in accordance with the Environmental Quality (Scheduled Waste) Regulations 2005 where there is a specific code (SW109) for waste containing mercury or its compounds.

Therefore, the study will adopt the responses given by the authorities (i.e., No). However, the Toolkit generated an error when the responses given by the authorities for STEP 5 were combined. This is due to the fact that the Toolkit has fixed the assumption that most countries in the world might conduct separate collections for mercury containing wastes, but the collection rate of more than 33% is not so common. There is no way that the Toolkit could be corrected to reflect actual situations of the country. Therefore, the study had decided to maintain this combination of responses because in the local setting, all mercury containing waste must be disposed according to the Environmental Quality (Scheduled Waste) Regulations 2005 and therefore the percentage of collection should be more than 33% fixed, and not subject to change, in the Toolkit.

6.5.1 Production of recycled of metals

Ref. No.	Indicator	Source Presence	Activity rate	Unit	Data Origin
6.5.1.1	Production of recycled mercury ('secondary production')	No	-	Mercury produced, kg/y	DOE
6.5.1.2	Production of recycled ferrous metals (iron and steel)	?	?	Number of vehicles recycled/y	JPJ

'?' = Unknown / No data on the source.

Discussion

Over the years, the global primary mining of mercury is decreasing from over 10,000 to 2,000 metric tonne of mercury within the year of 1971-2011, largely due to an increase of environmental and health concerns (UNEP, 2013c). Much of the mercury used today is recovered mercury and existing stockpiles (UNEP, 2013b). In Malaysia, DOE reported that there is no production of recycled mercury. Another source of mercury releases is the production of recycled ferrous metals and this can be estimated by the number of vehicles recycled. However, there is no data available for this source category in Malaysia.

6.5.2 Waste incineration

Ref. No.	Indicator	Source Presence	Activity rate	Unit	Data Origin
6.5.2.1	Incineration of municipal/general waste	No	-	Waste incinerated, t/y	JPSPN
6.5.2.2	Incineration of hazardous waste	Yes	52,559.74	Waste incinerated, t/y	DOE
6.5.2.3	Incineration / burning of medical waste	Yes	21,976.12	Waste incinerated, t/y	DOE
6.5.2.4	Sewage sludge incineration	?	?	Waste incinerated, t/y	SPAN
6.5.2.5	Open fire waste burning (on landfills and informally)	?	?	Waste burned, t/y	JPSPN

'?' = Unknown / No data on the source.

Discussion

The incineration of waste can emit traces of mercury especially to the atmosphere. In Malaysia, municipal wastes are being managed by JPSPN. According to JPSPN, there is no incineration of municipal waste in 2014. Meanwhile DOE reported that the total amount of hazardous waste in Malaysia is 43,916 tonne per year. This value is inclusive of all wastes that are characterised as scheduled waste, but is not exclusive to just mercury containing waste only. The medical industry is a major industry that releases mercury from the activity of incinerations. Medical wastes may contain dental amalgams, mercury from thermometers and other medical devices. Upon incineration, mercury can be emitted to the atmosphere. In Malaysia, DOE reported that 23,845 tonnes of mercury waste are incinerated in 2013.

There is no data on sewage sludge incineration and open fire waste burning, which may also contribute to mercury emissions. Indah Water Konsortium (IWK) had informed the study that no activities of sewage sludge incineration is being conducted. However, this information is not representative of the national scenario as IWK does not operate in Kelantan, Sabah, Sarawak and in some parts of Johor. In addition, DOE had also provided data on the quantity of sludge generated for the year 2014 to 2017. However, this data is not compatible with the format required for the assessment by Toolkit as the required parameter is the quantity of sewage sludge incinerated, and not the quantity of sewage sludge generated. Moreover, the data given is specific to a Scheduled Waste code (i.e., SW204) which is the code for sludge containing one or several metals including chromium, copper, nickel, zinc, lead, cadmium, aluminium, tin, vanadium, and beryllium, but not mercury. The sludge generation data provided by DOE is shown in Table 6.11.

Table 6.11 Sludge generation in Malaysia

Item	Quantity (Metric Tonne)			
	2014	2015	2016	2017
Total quantity of waste generated by all Scheduled Waste Code	1,665,346.90	2,918,478.34	2,766,613.45	2,017,280.76
Quantity of metal –containing sludge generated (Code SW204)	213,392.79	846,680.03	376,526.83	226,747.90
Total waste (SW204) from water treatment plant	75,531.10	645,498.62	22,698.75	26,032.33

6.5.3 Waste deposition/landfilling and waste water treatment

Ref. No.	Indicator	Source Presence	Activity rate	Unit	Data Origin
6.5.3.1	Controlled landfills/deposits	Y	36,660	Waste landfilled, t/y	JPSPN
6.5.3.2	Informal dumping of general waste	?	?	Waste dumped, t/y	JPSPN
6.5.3.3	Waste water system/treatment	?	?	Waste water, m^3/y	SPAN

'?' = Unknown / No data on the source.

Discussion

According to JPSPN, there was an approximately 36,660 tonnes of solid waste generated in 2014. Most of the waste is deposited in controlled landfills and therefore this value is used in the Toolkit for mercury release quantification. However, there is no data available for informal dumping of general wastes. There is also no data available on the amount of wastewater treated in 2014.

Summary STEP 5- Data and inventory on waste handling and recycling

Ref.	Source category	UNEP's predetermined input factor	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
				Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment/ disposal
Production of recycled of metals									
6.5.1.1	Production of recycled mercury ('secondary production')	N/A*	-	-	-	-	-	-	-
6.5.1.2	Production of recycled ferrous metals (iron and steel)	1 g / vehicle	?	?	?	?	?	?	?
Waste incineration									
6.5.2.1	Incineration of municipal/general waste	5 g / ton metric	-	-	-	-	-	-	-
6.5.2.2	Incineration of hazardous waste	24 g / ton metric	1,262	1,136.2	0.0	0.0	0.0	0.0	126.2
6.5.2.3	Incineration and open burning of medical waste	24 g / ton metric	527	527.4	0.0	0.0	0.0	0.0	0.0
6.5.2.4	Sewage sludge incineration	2 g / ton metric	?	?	?	?	?	?	?
6.5.2.5	Open fire waste burning (on landfills and informally)	N/A*	?	?	?	?	?	?	?
Waste deposition/landfilling and waste water treatment									
6.5.3.1	Controlled landfills/deposits	5 g / ton metric	183	1.8	0.0	0.0	-	-	-
6.5.3.2	Informal dumping of general waste	5 g / ton metric	?	?	?	?	?	?	?
6.5.3.3	Waste water system/treatment	N/A*	?	?	?	?	?	?	?

*N/A- Not available in the Appendix 1 of Toolkit for Identification and Quantification of Mercury Releases: Guideline for Inventory Level 1 Version 2.
'-': The source is absent in the country and therefore no release.
'?': No data available on this source.

Data Gaps: Data and inventory on waste handling and recycling (STEP 5)

1. The Toolkit generates an error for the combination of answer provided in the general scenario-setting questions on waste management setup in Malaysia. This is based on the assumption that it is rare for a country to have a collection rate of mercury waste more than 33%. However, due to the availability of a legally binding regulation for hazardous waste disposal in which mercury waste is listed as one of the scheduled waste categories, this enables the country to exceed the assumption with regards to mercury waste disposal. The impact of this error to the calculation is unknown and there is a need to be explored further.
2. A majority of the data needed for the quantification of mercury from waste handling and recycling is not available. This becomes a major limitation in estimating the quantification of mercury releases especially from this source.
3. Some of the data are not mercury specific (hazardous waste), which led to high estimation of releases because of high activity rate. Understanding the processes and materials involve in hazardous waste incineration will assist in getting more accurate estimation of mercury release.
4. The mercury release from waste is estimated from the available data from other countries and will differ from Malaysia due to variances in consumption patterns and the amount of mercury presence in waste. The use of certain pollution control technology in incineration and waste treatment systems will help in reducing the amount of mercury released.

6.6 Step 6 - General Consumption of Mercury in Products, as Metal Mercury and as Mercury Containing Substances

For the purpose of Step 6, background calculations for the product groups listed below were based on the data on population, electrification rate, and dental personnel density shown in Table 6.12. Background data used for this step calculation is shown in Table 6.13.

Table 6.12 Background calculation data used for source quantification

Sub-category	Data types used as activity rates
Dental amalgam fillings ('silver' fillings)	Population, density of dental personnel
Electrical switches and relays with mercury	Population, electrification rate (percent of population with access to electricity)
Polyurethane (PU, PUR) produced with mercury catalyst	Population, electrification rate (percent of population with access to electricity)
Other manometers and gauges with mercury	Population, electrification rate (percent of population with access to electricity)
Laboratory chemicals	Population, electrification rate (percent of population with access to electricity)
Other laboratory equipment with mercury	Population, electrification rate (percent of population with access to electricity)

Table 6.13 Background data value used for calculation

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
Malaysia	28,250,458 (however the data used is the actual population of 30,709,000)	0.093	99

6.6.1 Use and disposal of products with mercury content

Ref. No.	Indicator	Source Presence	Activity rate	Unit	Data Origin
Dental amalgam fillings ('silver' fillings)					
6.6.1.1	Preparations of fillings at dentist clinics	Y	Auto-generated		MOH
6.6.1.2	Use - from fillings already in the mouth	Y	Auto-generated		MOH
6.6.1.3	Disposal (lost and extracted teeth)	Y	Auto-generated		MOH
Thermometers					
6.6.1.4	Medical Hg thermometers	Y	57,893	Items sold/y	MOH
6.6.1.5	Other glass Hg thermometers (air, laboratory, dairy, etc.)	?	?	Items sold/y	KPDNKK
6.6.1.6	Engine control Hg thermometers and other large industrial/speciality Hg thermometers	?	?	Items sold/y	KPDNKK
Electrical switches and relays with mercury					
6.6.1.7	Electrical switches and relays with mercury	?	Auto-generated		KPDNKK
Light sources with mercury					
6.6.1.8	Fluorescent tubes (double end)	?	?	Items sold/y	MOH
6.6.1.9	Compact fluorescent lamp (CFL single end)	?	?	Items sold/y	KPDNKK
6.6.1.10	Other Hg containing light sources (see guideline)	?	?	Items sold/y	KPDNKK
Batteries with mercury					
6.6.1.11	Mercury oxide (button cells and other sizes); also called mercury-zinc cells	?	?	Batteries sold, t/y	KPDNKK
6.6.1.12	Other button cells (zinc-air, alkaline button cells, silver-oxide)	?	?	Batteries sold, t/y	KPDNKK

6.6.1.13	Other batteries with mercury (plain cylindrical alkaline, permanganate, etc., see guideline)	?	?	Batteries sold, t/y	KPDNKK
Others					
6.6.1.14	Polyurethane (PU, PUR) produced with mercury catalyst	N	Auto-generated		DOSH
6.6.1.15	Paints with mercury preservatives	?	?	Paint sold, t/y	KPDNKK
6.6.1.16	Skin lightening creams and soaps with mercury chemicals	?	?	Cream or soap sold, t/y	Pharmacy Enforcement Division, MOH
6.6.1.17	Medical blood pressure gauges (mercury sphygmomanometers)	Y	2199	Items sold/y	MOH
6.6.1.18	Other manometers and gauges with mercury	?	Auto-generated		KPDNKK
6.6.1.19	Laboratory chemicals	Y	Auto-generated		MITI
6.6.1.20	Other laboratory and medical equipment with mercury	Y	Auto-generated		MITI

'?' = Unknown / No data on the source.

Discussion

The use of dental amalgam in dental treatments is a common practice in most medical facilities and dental clinics. MOH reported that mercury amalgams are still being used in dental treatments in Malaysia. However, amalgam filling usage is declining from 48.92% in 2013 to 18.39% in 2016 and it is targeted to be reduced to 15% by year 2020. The reduction in amalgam usage is due to the rising awareness of the adverse environmental effect of mercury, and patients' preference for a more aesthetically acceptable tooth-coloured material. MOH has taken the steps to reduce the usage of dental amalgam fillings in children under 12 years, pregnant and breastfeeding mothers. Until a tooth-coloured material which has the equivalent strength is found, amalgams will still be used as a dental filling in load-bearing areas. In the Toolkit, the release from dental amalgam is being calculated based on the number of population and the density of the dentists in the population. In addition, the following is a more detailed data provided by MOH in relation with oral health and mercury used (Table 6.14).

Table 6.14: Data on the use of dental amalgam in Malaysia

Item	2013	2014	2015	2016
Number of dental amalgam filling in government dental facilities	603,729	593,365	562,375	527,005
Number of alternative filling materials used in government dental facilities	630,415	2,496,444	2,188,479	2,338,061
Number of Dental Institutions training dental professionals & students on the appropriate use of dental amalgam and alternative filling materials	N/A	13	13	13
Use of encapsulated dental amalgam in government dental facilities	Yes	Yes	Yes	Yes
Number of dental units/chairs in government dental facilities with amalgam traps	3067	3121	3212	3290
Amount spent to purchase Amalgam filling materials per year (in RM)	N/A	1,455,940.33	1,751,645.75	1,491,686.57

Thermometers with mercury can be found to be used in various industries, such as the medical industry and laboratories. However, data on units of thermometer sold is not available except for medical thermometers (thermometer used to measure body temperature). The quantity of medical mercury thermometers bought by the MOH for the use in general hospitals is available and reported by MOH. Table 6.15 shows the data on the quantity of thermometers purchased by MOH. From this table, a decline of medical thermometers purchased in general hospitals shows that the Ministry is moving towards reducing the use of mercury thermometers in medical facilities.

Table 6.15 The number of medical thermometer purchased in general hospital

Product	2013	2014	2015	2016
Clinical Thermometer	57,893	54,566	18,288	1,104

Electrical switches and relays with mercury are another type of products important for the quantification of mercury releases. The estimation of mercury releases is calculated by using the population and electrification rate predetermined by the Toolkit. However, there is no concrete data on the use of switches and relays that contained mercury in Malaysia. Therefore, the study opted to report that this source of mercury release is unknown.

Mercury is also being used in light sources including fluorescent tubes, compact fluorescent lamp, and other light sources. However, the relevant data of the quantity of light source with mercury sold per year is not available.

Batteries may also contain mercury in its chemical makeup. This includes mercury oxide, button cells, and various other batteries. These batteries are capable of releasing mercury if not properly disposed and treated. However, there is no data available on the quantity of the batteries sold in the country for the particular study year.

Other products are polyurethane which may use mercury as catalysts in production processes. However, according to DOSH data there is no polyurethane production in the country. This is proven by previous reports and the latest data from CIMS indicating the polyurethane available locally is all imported (Table 6.16).

Table 6.16 Data on polyurethane (tonne)

Chemical	2015		2016		2017	
	Import	Manufactured	Import	Manufactured	Import	Manufactured
Polyurethane	147	0	163	0	147	0

The release from other manometers and gauges with mercury, laboratory chemicals, and other laboratory and medical equipment are estimated using predetermined parameters (Table 6.11). There are positive inputs for laboratory chemicals and other laboratory equipment, because it is readily observable that the vast scale of research activities conducted at various levels using various chemicals. However, the status of manometers and gauges with mercury are reported as unknown due to a lack of conclusive data on these products. There is also a lack of availability of data on the amount of paints, skin lightening creams and soaps sold in the country.

For mercury sphygmomanometers used in medical facilities, data is available for sphygmomanometers bought by MOH for the use in general hospitals. However, this data is not inclusive of mercury sphygmomanometers sold to private clinics and hospitals. Data on mercury sphygmomanometers purchased by MOH is in Table 6.17.

Table 6.17 The number of clinical sphygmomanometer purchased in general hospitals

Product	2014	2015	2016	2017
Clinical Sphygmomanometer	2199	3354	1678	338

Summary STEP 6 - Data and inventory on general consumption of mercury in products, as metal mercury and as mercury containing substances

Ref.	Source category	UNEP's predetermined input factor	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
				Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment/ disposal
Use and disposal of products with mercury content									
6.6.1.1-3	Dental amalgam fillings ('silver' fillings)	0.2 g Hg/ inhabitant/ year	690	13.8	303.8	55.2	41.4	138.1	138.1
6.6.1.4-6	Thermometers	N/A*	58	11.6	17.4	11.6	0.0	17.4	0.0
6.6.1.7	Electrical switches and relays with mercury	1.4 g Hg/ inhabitant/ year	?	?	?	?	?	?	?
6.6.1.8-10	Light sources with mercury	N/A*	?	?	?	?	?	?	?
6.6.1.11-13	Batteries with mercury	N/A*	?	?	?	?	?	?	?
6.6.1.14	Polyurethane (PU, PUR) produced with mercury catalyst	0.03 g Hg/ inhabitant/ year	-	-	-	-	-	-	-
6.6.1.15	Paints with mercury preservatives	2.6 kg Hg/metric ton	?	?	?	?	?	?	?
6.6.1.16	Skin lightening creams and soaps with mercury chemicals	30 kg Hg/metric ton	?	?	?	?	?	?	?
6.6.1.17	Medical blood pressure gauges (mercury sphygmomanometers)	80 g Hg/item	176	35.2	52.8	35.2	0.0	52.8	0.0
6.6.1.18	Other manometers and gauges with mercury	0.005 g Hg/ inhabitant/ year	?	?	?	?	?	?	?
6.6.1.19	Laboratory chemicals	0.01 g Hg/inhabitant	305	0.0	100.7	0.0	0.0	100.7	103.8
6.6.1.20	Other laboratory and medical equipment with mercury	0.04 g Hg/ inhabitant/ year	1,221	0.0	402.9	0.0	0.0	402.9	415.1

*N/A- Not available in the Appendix 1 of Toolkit for Identification and Quantification of Mercury Releases: Guideline for Inventory Level 1 Version 2.0
'-': The source is absent in the country and therefore no release.
'?': No data available on this source.

Data Gaps: General consumption of mercury in products, as metal mercury and as mercury containing substances (STEP 6)

1. Data on national annual consumption of mercury-added products is not available. There is no data on the amount of usage and consumption of mercury-added product and this might have been due to a limited information of products contain mercury.
2. For some products (thermometer and medical sphygmomanometer), available data may not be representative of the whole country scenario where in the present case, only the amount of products purchased by public medical facilities is known. This excluded the number of devices purchased by private institutions that may contribute to higher mercury release.
3. Data on the use of mercury-added products could not be directly gathered by using CUSTOMS' HS-code due to the nature of categorisation, classification and a lack of specificity of ingredients contained within an imported product. Therefore, it is hard to filter the mercury-added products compared to the other products.

6.7 Step 7 - Data and Inventory on Crematoria and Cemeteries

6.7.1 Crematoria and cemeteries

Ref. No.	Indicator	Source Presence	Activity rate	Unit	Data Origin
6.7.1.1	Crematoria	Y	37,580	Corpses cremated/y	Department of Statistics
6.7.1.2	Cemeteries	Y	112,738	Corpses buried/y	Department of Statistics

Discussion

The cremation of corpses contributes to mercury releases due to the highly unstable and volatile dental amalgams at during cremation when the temperature could reach 650 – 700^{0}C (Mari & Domingo, 2010). According to the Department of Statistics, the number of deaths in 2014 were 150,318 in total. However, there is no specific data on burial methods. Therefore, this study uses the similar assumption as in Substance Flow Analysis of Mercury in Malaysia (Ministry of Natural Resources and Environment Malaysia, 2006), where 20-30% (25% as average) of deceased is assumed to be cremated. Therefore, in Malaysia, in 2014, the amount of cremated corpses would be 37,580 while the rest (112,738) would be buried.

Summary STEP 7 - Data and inventory on crematoria and cemeteries

Ref.	Source category	UNEP's predetermined input factor	Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
				Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment/ disposal
Crematoria and cemeteries									
6.7.1.1	Crematoria	N/A*	94	94.0	0.0	0.0	-	0.0	0.0
6.7.1.2	Cemeteries	N/A*	282	0.0	0.0	281.8	-	0.0	0.0

*N/A- Not available in the Appendix 1 of Toolkit for Identification and Quantification of Mercury Releases: Guideline for Inventory Level 1 Version 2.0
'-': The source is absent in the country and therefore no release.
'?': No data available on this source.

Data Gaps: Data and inventory on crematoria and cemeteries (STEP 7)

1. Data on the real value of the corpses buried and cremated are not available. The current value is based on the assumption that 20-30% of deceased were cremated. This value carries some uncertainty and may alter the quantification of the mercury release. This study has use the average value of 25% to estimate the number of bodies being cremated.

6.8 Step 8 - Miscellaneous Mercury Release Sources Not Quantified on Inventory Level 1

Besides the process of the quantification of mercury based on the given indicators, the Toolkit also provides the template in identifying the miscellaneous mercury release. For this purpose, the only sources which are confirmed to exist in the country during the assessment year, will be marked as 'YES' whereas sources confirmed as not exist will be marked as 'NO'. Sources which could not be confirmed is labelled as '?'. The information and data custodians of Step 8 are shown in Table 6.18.

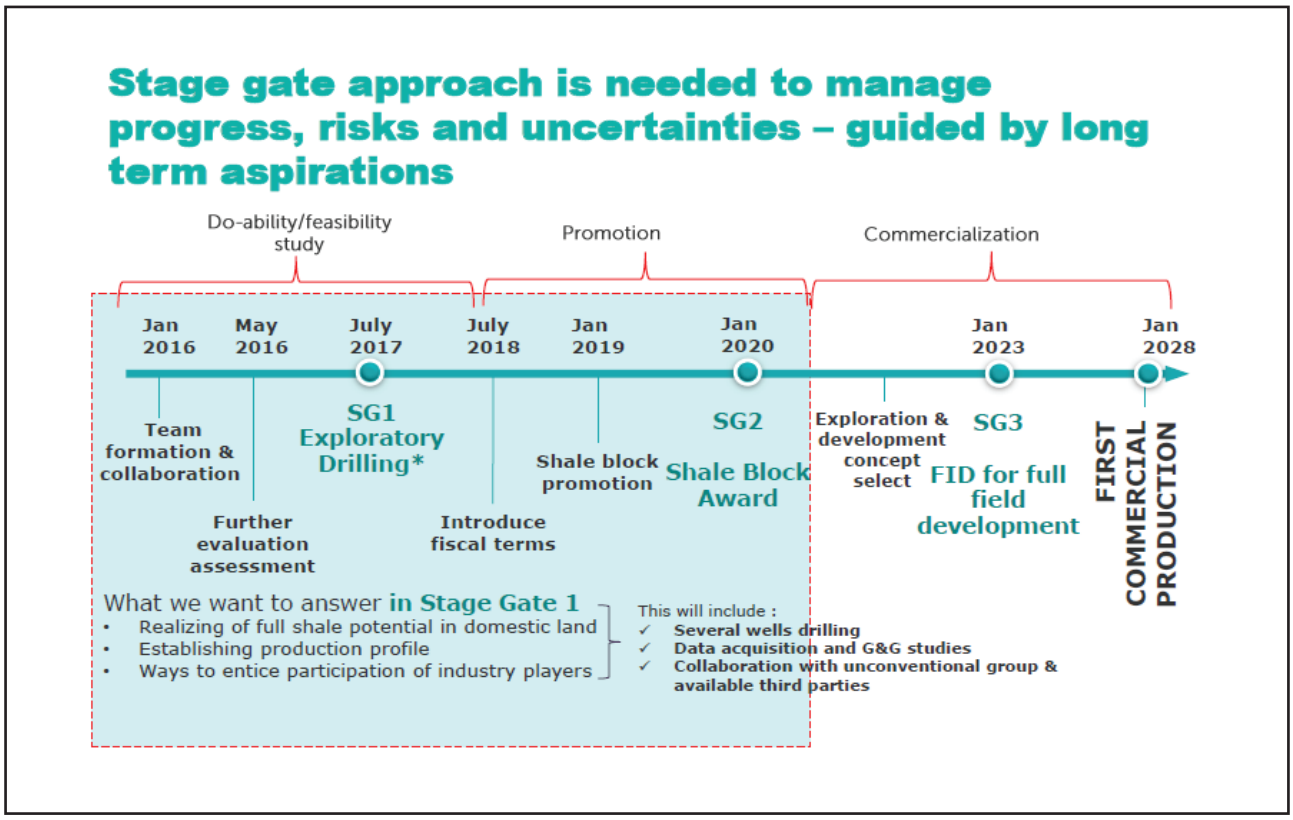
Table 6.18 Miscellaneous mercury release sources not quantified in Inventory Level 1

Source category	Source present? Y/N/?	Data Origin
Combustion of oil shale	?	No data custodian
Combustion of peat	?	No data custodian
Geothermal power production	N	SEDA
Production of other recycled metals	Y	MITI
Production of lime	Y	JMG
Production of light weight aggregates (burnt clay nuts for building purposes)	?	No data custodian
Production of other chemicals (than chlorine and sodium hydroxide) in chlor-alkali facilities with mercury-cell technology	?	No data custodian
Polyurethane production with mercury catalysts	N	DOSH
Seed dressing with mercury chemicals	N	DOA
Infra-red detection semiconductors	?	No data custodian
Bougie tubes and Cantor tubes (medical)	?	No data custodian
Educational uses	?	MOH
Gyroscopes with mercury	?	No data custodian
Vacuum pumps with mercury	?	No data custodian
Mercury used in religious rituals (amulets and other uses)	?	MOH
Mercury used in traditional medicines (ayurvedic and others) and homeopathic medicine	?	MOH
Use of mercury as a refrigerant in certain cooling systems	?	SIRIM
Light houses (levelling bearings in marine navigation lights)	Y	Marine Department Malaysia
Mercury in large bearings of rotating mechanic parts in for example older waste water treatment plants	?	DOE
Tanning	?	No data custodian
Pigments	?	No data custodian
Products for browning and etching steel	?	No data custodian
Certain colour photograph paper types	?	No data custodian
Recoil softeners in rifles	N	MINDEF
Explosives (mercury-fulminate a.o.)	N	MINDEF
Fireworks	?	No data custodian
Executive toys	?	No data custodian

Discussion

Step 8 aimed to identify additional sources that contribute to mercury releases in the country. However, this step only involves qualitative assessment, where the sources are only being identified without the need for quantitative data. Further quantification needed to be done through Level 2 Inventory by UNEP, which will provide much detailed analysis. Table 6.17 indicates the sources that positively present, absent, and sources which are of unsure status. This exercise had taken the proactive initiative in trying to gather more data available on Step 8's sources.

According to a report by PETRONAS (2016), shale oil is a source of energy that is still untapped and present in Sarawak. The resource is still under study and the first commercialised product might be available by 2028 (Figure 6.1.). Due to this development, the status for this source is put as unknown ('?') and need to be studied further in the future.



Source: PETRONAS, 2016

Figure 6.1 Information on the development of shale oil

According to Marine Department Malaysia (Peninsular), mercury is still being used as part of the light navigation system in the light house. The Department (Table 6.19) uses mercury as a connector between power supply wires in the rotating light house. Some of the light houses (Tg. Tuan and One Fathom Bank) use mercury for the suspension of the main lens in the light house. The Department is conducting relevant researches in shifting mercury-based system to other mechanical alternatives to assist maintenance and to reduce mercury exposure.

Table 6.19 The use of mercury in light houses (Marine Department)

Bil.	Light House	Location	Mercury Quantity
1.	Muka Head	Teluk Bahang, Pulau Pinang	< 10 kg
2.	Pulau Rimau	Balik Pulau, Pulau Pinang	< 10 kg
3.	Kuala Selangor	Bukit Malawati, Selangor	< 10 kg
4.	Pulau Angsa	Pulau Angsa, Selangor	< 10 kg
5.	One Fathom Bank	Selangor	< 10 kg
6.	One Fathom Bank lama	Selangor	<30L
7.	Bukit Jugra	Banting, Selangor	< 10 kg
8.	Tg Tuan	Melaka	<30L
9.	Pulau Undan	Melaka	< 10 kg
10.	Tg Gelang	Kuantan, Pahang	< 10 kg

Meanwhile Sabah Marine Department shared that mercury is still being used in Rumah Api Tanjung Jerijih, in the following parts (Table 6.20):

Table 6.20 The use of mercury-containing parts in Sabah's Light House

Parts	Components
Mercury Trough Lock Nut	-
Mercury Trough Sub Assembly	Inner Mercury Trough Slip Ring
	Centre Mercury Trough Slip
	Outer Mercury Trough Slip
	Mercury Trough
	Mercury Level Sight Glass
	Mercury Container
	Mercury (14lbs) (equivalent to 6.35kg)

Other mercury-releasing sources that had been confirmed to be present in the country but needed more study particularly in primary data collection are the production of other recycled metals. Meanwhile, for the production of lime, JMG had reported the amount as stated in Table 6.21.

Table 6.21 The production of lime (tonnes)

Item	2013	2014	2015	2016
Production of lime	2,558,806	3,118,027	3,585,444	3,221,839

There are several other mercury-releasing sources that can been confirmed to be absent in the country. These include geothermal power production, polyurethane production using mercury catalyst, and seed dressing using mercury compounds. According to Sustainable Energy Development Authority (SEDA), there is no geothermal power generation activity exists in Malaysia (Table 6.22). In addition to this, Ministry of Defence through Science Technology Research Institute for Defence (STRIDE) had confirmed that there is also no mercury used in recoil softeners and explosives.

Table 6.22 The annual power generation (MWh) of commissioned renewable energy installations

Year	Biogas	Biogas (landfill/ Agri Waste)	Biomass	Biomass (Solid Waste)	Geothermal
2014	19772.25	31844.44	226196.38	4347.83	0.00

Source: SEDA, 2018

The use of mercury for religious belief and traditional medicine are among those that cannot be confirmed at this moment. This is due to the fact that the license for mercury import by MOH does not require a submission of an inventory of use. Meanwhile, the use for educational purposes is too broad and warrants further studies. There are also no conclusive evidence on the use of mercury in large bearings of rotating mechanic parts, for example, older waste water treatment plants. Several sources listed under Step 8 are also too general in definition, which leads to difficulties in data collection. For example, fireworks and executive toys.

6.9 Result-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	3,249.3	2,898.5	0.0	0.0	0.0	0.0	350.9	3,249	9%
Other fossil fuel and biomass combustion	166.0	166.0	0.0	0.0	0.0	0.0	0.0	166	0%
Oil and gas production	6,941.6	1,035.4	1,371.8	0.0	2,027.3	0.0	2,378.2	6,813	20%
Primary metal production (excl. gold production by amalgamation)	16,341.0	850.2	322.5	14,512.5	645.0	0.0	10.8	16,341	48%
Gold extraction with mercury amalgamation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0	0%
Other materials production*6	3,064.4	2,298.3	0.0	0.0	766.1	0.0	0.0	3,064	9%
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	690.4	13.8	303.8	55.2	41.4	138.1	138.1	690	2%
Use and disposal of other products	1,760.1	46.8	573.8	46.8	0.0	573.8	518.9	1,760	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	1,789.8	1,663.6	0.0	0.0	0.0	0.0	126.2	1,790	5%
Waste deposition*2	183.3	1.8	0.0	0.0	-	-	-	2	0%
Informal dumping of general waste *2*3	?	?	?	?	?	?	?	0	0%
Waste water system/treat ment *4	?	?	?	?	?	?	?	0	0%
Crematoria and cemeteries	375.8	94.0	0.0	281.8	0.0	0.0	0.0	376	1%
TOTALS (rounded) *1*2*3*4*5*6	32,660	9,070	2,570	14,900	3,480	710	3,520	34,250	100%

Notes:
*1 To avoid double counting of mercury in products produced domestically and sold on the domestic market (including oil and gas) only the part of mercury inputs released from production are included in the input Total.
*2: To avoid double counting of mercury inputs from waste and products in the TOTAL, only 10% of the mercury input to waste incineration, waste deposition and informal dumping is included in the total for mercury inputs. These 10% represent approximately the mercury input to waste from materials which were not quantified individually in inventory Level 1 of this Toolkit. See Appendix 1 to the Inventory Level 1 Guideline for more explanation.
*3: The estimated quantities include mercury in products which has also been accounted for under each product category. To avoid double counting, the release to land from informal dumping of general waste has been subtracted automatically in the TOTALS.
*4: The estimated input and release to water include mercury amounts which have also been accounted for under each source category. To avoid double counting, input to and release to water, waste water system/treatment have been subtracted automatically in the TOTALS.
*5: Total inputs do not necessarily equal total outputs due to correction for double counting (see notes *1 - *3) and because some mercury follows product/metal mercury which are not sold in the same country or in the same year.
*6 To avoid double counting, fossil fuel mercury contributions to cement production was subtracted automatically in the TOTALS.

6.10 Result-Total Summary

INVENTORY LEVEL 1 - TOTAL SUMMARY

Source category	Source present?			Estimated Hg input, Kg Hg/y	Estimated Hg releases, standard estimates, Kg Hg/y					
	Y/N/?	Activity rate	Unit	Standard estimate	Air	Water	Land	By-products and impurities	General waste	Sector specific waste treatment /disposal
Energy consumption										
Coal combustion in large power plants	Y	19,493,606	Coal combusted, t/y	2,924	2,573.2	0.0	0.0	0.0	0.0	350.9
Coal combustion in coal fired industrial boilers	Y	2,439,796	Coal combusted, t/y	325	325.3	0.0	0.0	0.0	0.0	0.0
Other coal uses	?	0	Coal used, t/y	?	?	?	?	?	?	?
Combustion/use of petroleum coke and heavy oil	Y	248,018	Oil product combusted, t/y	14	13.6	0.0	0.0	0.0	0.0	0.0
Combustion/use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates	Y	27,289,322	Oil product combusted, t/y	150	150.1	0.0	0.0	0.0	0.0	0.0
Use of raw or pre-cleaned natural gas	?	0	Gas used, Nm^3/y	?	?	?	?	?	?	?
Use of pipeline gas (consumer quality)	Y	10,326,513,664	Gas used, Nm^3/y	2	2.3	0.0	0.0	0.0	0.0	0.0
Biomass fired power and heat production	?	0	Biomass combusted, t/y	?	?	?	?	?	?	?
Charcoal combustion	?	0	Charcoal combusted, t/y	?	?	?	?	?	?	?

Fuel production										
Oil extraction	Y	28,548,795	Crude oil produced, t/y	97	0.0	19.4	0.0	0.0	0.0	0.0
Oil refining	Y	25,526,265	Crude oil refined, t/y	87	21.7	0.9	0.0	0.0	0.0	13.0
Extraction and processing of natural gas	Y	67,577,021,440	Gas produced, Nm^3/y	6,758	1,013.7	1,351.5	0.0	2,027.3	0.0	2,365.2
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	1,075,000	Gold ore used, t/y	16,125	645.0	322.5	14,512.5	645.0	0.0	0.0
Alumina production from bauxite (aluminium production)	N	0	Bauxit processed, t/y	-	-	-	-	-	-	-
Primary ferrous metal production (pig iron production)	Y	4,320,000	Pig iron produced, t/y	216	205.2	0.0	0.0	0.0	0.0	10.8
Gold extraction with mercury amalgamation – from whole ore	N	0	Gold produced, kg/y	-	-	-	-	-	-	-
Gold extraction with mercury amalgamation – from concentrate	N	0	Gold produced, kg/y	-	-	-	-	-	-	-

Other materials production										
Cement production*5	Y	22,400,000	Cement produced, t/y	3,064	2,298.3	0.0	0.0	766.1	0.0	0.0
Pulp and paper production	?	0	Biomass used for production, t/y	?	?	?	?	?	?	?
Production of chemicals										
Chlor-alkali production with mercury-cells	N	0	Cl_2 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.)	?	0	Mercury used for production, kg/y	?	?	?	?	?	?	?
Electrical switches and relays with mercury	?	0	Mercury used for production, kg/y	?	?	?	?	?	?	?
Light sources with mercury (fluorescent, compact, others: see guideline)	?	0	Mercury used for production, kg/y	?	?	?	?	?	?	?
Batteries with mercury	?	0	Mercury used for production, kg/y	?	?	?	?	?	?	?
Manometers and gauges with mercury	?	0	Mercury used for production, kg/y	?	?	?	?	?	?	?
Biocides and pesticides with mercury	N	0	Mercury used for production, kg/y	-	-	-	-	-	-	-

Paints with mercury	?	0	Mercury used for production, kg/y	?	?	?	?	?	?	?
Skin lightening creams and soaps with mercury chemicals	?	0	Mercury used for production, kg/y	-	-	-	-	-	-	-
Use and disposal of products with mercury content										
Dental amalgam fillings ('silver' fillings)	Y	30,709,000	Number of inhabitants	690	13.8	303.8	55.2	41.4	138.1	138.1
Thermometers	Y	57,893	Items sold/y	58	11.6	17.4	11.6	0.0	17.4	0.0
Electrical switches and relays with mercury	?	30,709,000	Number of inhabitants	?	?	?	?	?	?	?
Light sources with mercury	?	0	Items sold/y	?	?	?	?	?	?	?
Batteries with mercury	?	0	t batteries sold/y	?	?	?	?	?	?	?
Polyurethane (PU, PUR) produced with mercury catalyst	N	30,709,000	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	2,199	Items sold/y	176	35.2	52.8	35.2	0.0	52.8	0.0
Other manometers and gauges with mercury	?	30,709,000	Number of inhabitants	?	?	?	?	?	?	?
Laboratory chemicals	Y	30,709,000	Number of inhabitants	305	0.0	100.7	0.0	0.0	100.7	103.8
Other laboratory and medical equipment with mercury	Y	30,709,000	Number of inhabitants	1,221	0.0	402.9	0.0	0.0	402.9	415.1

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)	?	0	Number of vehicles recycled/y	?	?	?	?	?	?	?
Waste incineration										
Incineration of municipal/general waste*1	N	0	Waste incinerated, t/y	-	-	-	-	-	-	-
Incineration of hazardous waste*1	Y	52,600	Waste incinerated, t/y	1,262	1,136.2	0.0	0.0	0.0	0.0	126.2
Incineration and open burning of medical waste*1	Y	21,976	Waste incinerated, t/y	527	527.4	0.0	0.0	0.0	0.0	0.0
Sewage sludge incineration*1	?	0	Waste incinerated, t/y	?	?	?	?	?	?	?
Open fire waste burning (on landfills and informally)*1	?	0	Waste burned, t/y	?	?	?	?	?	?	?
Waste deposition/landfilling and waste water treatment										
Controlled landfills/deposits *1	Y	36,660	Waste landfilled, t/y	183	1.8	0.0	0.0	-	-	-
Informal dumping of general waste *1*2	?	0	Waste dumped, t/y	?	?	?	?	?	?	?
Waste water system/treatment *3	?	0	Waste water, m^3/y	?	?	?	?	?	?	?

Crematoria and cemeteries										
Crematoria	Y	37,580	Corpses cremated/y	94	94.0	0.0	0.0	-	0.0	0.0
Cemeteries	Y	112,738	Corpses buried/y	282	0.0	0.0	281.8	-	0.0	0.0
TOTAL of quantified releases *1*2*3*4*5				32,500	8,950.0	2,570.0	14,900.0	3,440.0	710.0	3,520.0

Notes:
*1: To avoid double counting of mercury inputs from waste and products in the input TOTAL, only 10% of the mercury input to waste incineration sources, waste deposition and informal dumping is included in the total for mercury inputs. These 10% represent approximately the mercury input to waste from materials which were not quantified individually in Inventory Level 1 of this Toolkit. See Appendix 1 to the Inventory Level1 Guideline for more explanation.
*2: 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.
*3: The estimated input and release 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.
*4 To avoid double counting of mercury in products produced domestically and sold on the domestic market (including oil and gas), only the part of mercury inputs *released* from production are included in the input TOTAL.
*5 To avoid double counting, fossil fuel mercury contributions to cement production was subtracted automatically in the TOTALS.
*6 It is found that there are differences in the result generated in the TOTAL SUMMARY and in the EXECUTIVE SUMMARY of this Toolkit.

7.0 Control Measures

7.1 Background

As mentioned previously, this study was conducted using the updated Toolkit from UNEP. The major component of the updated Toolkit is, countries are allowed to enter the data on existing mercury control measures, which the countries were not capable of doing in the previous version of the Toolkit, in order to ensure that the estimation of mercury releases is more reflective of the real situation in the country. As mentioned in Part 2.0, the mercury released from a system is calculated by using the mass balance principle. However, it is worth to note that most of the countries had implemented some forms of mercury release control that aimed to reduce the amount of mercury released. Therefore, control measures data is important in producing a more accurate release quantification rather than assuming that there is no control measure applied as assumed in the previous version of the Toolkit.

In order to include the control measures, data on the types of control measures used and the percentage of the total national activity rate that adopted these technologies are required. In a similar approach like the mercury source quantification, users need to choose **yes or no** (y/n) in the column entitled **'Include Hg controls in estimation?'.** If the option 'No' is chosen, the calculation will be based on the default standard mercury controls configurations (as described in Appendix 1 of the Toolkit's Guideline). Alternatively, if the menu 'Yes' is chosen, user will have to enter the data on control measures. This can be done by referring to the guidelines, which had given us the categories of control measures for each parameter. Users will have to determine the percentage of national activity rate treated with the described control measures except for the category with the lowest mercury retention, which will be calculated automatically. It has to be ensured that the total of the percentage must not exceed 100% in total to prevent errors. This data will be used to rectify the total mercury releases estimated for each source.

7.2 Data gaps and the use of predictive study

In the context of Malaysia, there are data gaps on the control measures available and applied in the various sources mentioned in the system, especially when there is a wide range of control measure options available in the market at different cost and efficiency. There is also no requirement for industries to declare the type of control measures adopted in their processes to the authorities. This is because in Malaysia, controls are being monitored through release limits rather than the application of certain technologies. This means, industries will have to oblige to the limits set by the regulations but freedom is given to the means of technologies they adopted. This gives room for industries to choose the best technique or technologies within their capacity and resources to be applied as long as they are adhering to the legally binding limits set by the authorities through various legislations.

This situation leads to the challenge in populating the applied control measures in the identified sources and a bigger challenge in estimating the percentage of activity rate relevant to those control measures. These challenges are intensified with the large number of industries and companies that needed to be covered if efforts are to be made to populate primary data, which is impossible as this requires policy intervention. Therefore, this study had adopted a more predictive approach, whereby the total release estimation will be simulated with several scenarios of control measures.

The mercury releases data generated from Steps 1 – 8 of this Toolkit, quantified using default control measures, are subsequently used to predict the variation in mercury releases where selected control measures are applied. It is well understood that higher level control measures will reduce the release much significantly than lower level control measures. However, as the status quo where the country does not have a database on the adopted control measures, this study will enable decision makers to understand the magnitude of changes that is caused by the use of different types of control measures. These preliminary findings will provide more insights to the policy makers on the selection of certain control measures, where appropriate control measures could be suggested to relevant industries. However, the selection of appropriate control measures must be studied more intensively particularly on the aspect of the financial and technical capabilities of the relevant industries to apply these measures.

The scenario chosen in this predictive study will be the default (which means no control measure), lowest, and the highest level of control measure categories. The study also acknowledges that each scenario will directly impact the releases to every medium covered by this Toolkit (air, water, land and *etc*), and this will create multiple scenarios

of releases for every medium. Therefore, since this is a preliminary and the 1st insight into such exercise, this study only focused on total releases without exploring releases in different mediums. In future, upon selecting a specific category of control measure, the distribution of releases can be easily replicated by using the Toolkit. The study also assumed a total application (100%) of the selected category to show the efficacy of specific control measures if a measure is totally applied in the country. It is also important to note that since control measures are not available for all parameters, this part (Part 7.0) will only focus on the sources with control measures.

The Toolkit was built based on the mass balance principle, which assumed that the total amount of mercury entering the system will be equivalent to the total amount of mercury coming out from the system through various routes, including air, water, land, by-products, general wastes, and sector-specific waste treatments. This principle is still true even with the use of mercury control measures to reduce the amount of mercury released. However, there will be changes in the proportion because more mercury would be released in the sector-specific waste treatment category, rather than the category of air, water, land, general waste, and impurities, if mercury control measures are used by the relevant industries. This is because mercury wastes could be properly capture and treated, rather than being discharged to the other mediums. Therefore, this analysis only compares the total amount of mercury released into air, water, land, general wastes, and as impurities, and assumed that the amount of mercury collected in sector-specific waste treatments will be treated properly. Otherwise, there will be no changes or reduction due to the core principle of mass balance adopted in the Toolkit.

7.3 Step 1 – Country Profile

The 1st step of the Toolkit involves only general data on country profiles where no assessment of control measures is involved. Therefore, the entire discussion on Part 6.1 (Step 1 – Country Profile) is also valid and applicable to this part of study.

7.4 Step 2 – Energy Consumption & Fuel Production

For Step 2, the categories of control measures that are available are shown in Table 7.1. Control measures for certain sources are numbered, where the bigger number indicates the highest level of mercury control measures.

Table 7.1 Control measures for STEP 2

STEP 2 – Energy Consumption & Fuel Production		
Source sub-category	**Mercury control name in spreadsheet**	**Explanation**
Coal combustion in large power plants / Coal combustion in coal fired industrial boilers	0: No filters	
	1: Simple particle filters	Electrostatic precipitators (ESP), particle scrubbers (PS), cyclones (CYC) or similar particle filters with low mercury retention
	2: Fabric filters	Fabric filters (FF; also called bag filters)
	3: Efficient APC	Particle filters (PM) + spray dryer absorption (SDA) or wet flue gas de-sulphurisation (wFGD)
	4: Very efficient APC	Particle filters (PM) plus + flue gas de-sulphurisation (FGD) + selective catalytic reduction (SCR)
	5: Mercury specific	Activated carbon injection (ACI) or other mercury specific filters

Combustion/use of petroleum coke and heavy oil / Combustion/use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates	ESP or scrubber	Electrostatic precipitators (ESP), particle scrubbers (PS), or other particle filters with similar performance
	cESP and FGD	Cold-side electrostatic precipitators (cESP) + flue gas de-sulphurisation (FGD), or other advanced filter con-figuration with similar performance
Extraction and processing of natural gas	Without mercury removal	
	With mercury removal	Cleaning of gas in fixed bed filters with mercury absorbants (or similar)

Using the mercury release quantified in Part 6.2, the following results can be generated as a prediction for the application of specific mercury controls (Table 7.2).

Table 7.2 The prediction of mercury release data for STEP 2

Parameter	Release with no control measures	Release with lowest level control measures	Release with highest level control measures
Coal combustion in large power plants	Release: 2573.2 Kg Hg/y	Release: 2573.2 Kg Hg/y	Release: 1608.2 Kg Hg/y
	Reduction: 0%	Reduction: 0%	Reduction: 37.5%
	N/A	Control Measure: Simple Particle Control	Control Measure: Mercury Specific
Coal combustion in coal fired industrial boilers	Release: 325.3 Kg Hg/y	Release: 286.3 Kg Hg/y	Release: 58.6 Kg Hg/y
	Reduction: 0%	Reduction: 12%	Reduction: 82%
	N/A	Control Measure: Simple Particle Control	Control Measure: Mercury Specific
Combustion/use of petroleum coke and heavy oil	Release: 13.6 Kg Hg/y	Release: 12.3 Kg Hg/y	Release: 6.8 Kg Hg/y
	Reduction: 0%	Reduction: 9.6%	Reduction: 50%
	N/A	Control Measure: ESP or scrubber	Control Measure: cESP and FGD
Combustion/use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates	Release: 150.1 Kg Hg/y	Release: 135.1 Kg Hg/y	Release: 75 Kg Hg/y
	Reduction: 0%	Reduction: 10%	Reduction: 50%
	N/A	Control Measure: ESP or scrubber	Control Measure: cESP and FGD
Extraction and processing of natural gas	Release: 6758 Kg Hg/y	Cannot change value	Cannot change value
	Reduction: 0%	Reduction: Toolkit do not enable change in percentage in mercury pollution abatement percentage.	Reduction: Toolkit do not enable change in percentage in mercury pollution abatement percentage.

7.5 Step 3 - Domestic Production of Metals and Raw Materials

For Step 3, the categories of control measures that are available are shown in Table 7.3.

Table 7.3 Control measures for STEP 3

STEP 3 – Domestic Production of Metals and Raw Materials		
Source sub-category	**Mercury control name in spreadsheet**	**Explanation**
Production of zinc from concentrates / Production of copper from concentrates / Production of lead from concentrates	No filters used or coarse, dry PM retention	No filters or coarse, dry PM retention such as electrostatic precipitators (ESP) and cyclones (CYC)
	Wet gas cleaning	Wet gas cleaning of the off-gas from roasting of concentrate
	Wet gas cleaning and acid plant	Wet gas cleaning of the off-gas from roasting of concentrate + removal of acid gasses (normally sold as by-product)
	Wet gas cleaning, acid plant and Hg specific filter	Wet gas cleaning of the off-gas from roasting of concentrate + removal of acid gasses + dedicated mercury removal (acid is normally sold as by-products, mercury or produced mercury compounds like calomel may be sold or deposited on-site or elsewhere)
Gold extraction with mercury amalgamation - from concentrate	No retorts used	
	Use of reports	Use of retorts or similar devices that prevent the mercury from evaporating when burning the amalgam, and collects it for possible re-use (sometimes after a simple cleaning procedure called 're-activation')
Cement production 1) WITH WASTE USED as fuel (>3% of energy) / Cement production 2) WITH NO/LOW WASTE use as fuel	Optimized particle control (FF+SNCR / FF+WS / ESP+FGD / optimized FF)	'Optimized' particle control with fabric filters (FF) + selective non-catalytic reduction (SNCR) OR Fabric filters (FF)+ wet scrubbers (WS) OR Electrostatic precipitator (ESP) + flue gas desulphurisation (FGD) OR Optimized fabric filters (FF)
	Efficient air pollution control (FF+DS / ESP+DS / ESP+WS / ESP+SNCR)	Efficient air pollution control with fabric filters (FF) + dry scrubber (DS) OR Electrostatic precipitator (ESP) + dry scrubber (DS) OR Electrostatic precipitator (ESP) + wet scrubber (WS) OR Electrostatic precipitator (ESP) + selective non-catalytic reduction (SNCR)

	Very efficient Hg pollution control (wet-FGD+ACI / FF+scrubber+SNCR)	Very efficient Hg pollution control with wet flue gas de-sulphurisation (wetFGD) + activated carbon injection (ACI) OR Fabric filter (FF) + scrubber + selective non-catalytic reduction (SNCR)
Pulp and paper production	No filters used	
	PM control with general ESP, or PS	Dust filters such as electrostatic precipitators (ESP), particle scrubbers (PS), or similar

Using the mercury release quantified in Part 6.3, the following results can be generated as a prediction for the application of specific mercury controls (Table 7.4).

Table 7.4 The prediction of mercury release data for STEP 3

Parameter	Release with no control measures	Release with lowest level control measures	Release with highest level control measures
Production of zinc from concentrates	-	-	-
Production of copper from concentrates	-	-	-
Production of lead from concentrates	-	-	-
Gold extraction with mercury amalgamation - from concentrate	-	-	-
Cement production 1) WITH WASTE USED as fuel (>3% of energy) * / Cement production 2) WITH NO/LOW WASTE use as fuel	Release: 3064.4	Release: 3503.4	Release: 1891.8
	Reduction: 0%	Reduction: 14.3%	Reduction: 38.3%
	N/A	Control measure: Simple particle control (ESP/PS/ FF)	Control measure: Very efficient Hg pollution control (wetFGD + ACI / FF + scrubber + SNCR)
Pulp and paper production	?	?	?

* There are two available options for cement production's control measures depending on the types of fuel. This study utilises the option of using waste as part of fuel because of the use of fly ash in domestic cement industries.
'-' The source is not available in Malaysia during the assessment year.
'?' There is no data available regarding this source.
'N/A' Not applicable since there is no control measure applied

7.6 Step 4 - Domestic Production and Processing with Intentional Mercury Use

The Toolkit does not contain any element of control measures for this step. The mercury release quantification is solely based on the calculation using default factors. Therefore, the findings in Part 6.4 are valid and applicable here.

7.7 Step 5 - Data and Inventory on Waste Handling and Recycling

For Step 5, the categories of control measures that are available are shown in Table 7.5.

Table 7.5 Control measures for STEP 5

STEP 5 – Data and Inventory on Waste Handling and Recycling		
Source sub-category	**Mercury control name in spreadsheet**	**Explanation**
Incineration of municipal/general waste / Incineration of hazardous waste / Incineration and open burning of medical waste	No emission reduction devices	
	PM reduction; simple ESP, or similar	Particle filters such as simple electrostatic precipitators (ESP) or others
	Acid gas control + high efficiency FF or ESP PM retention	Acid gas filters (usually wet, dry or semi-dry scrubbers) + high efficiency fabric filters (FF; also called bag filters) or electrostatic precipitators (ESP)
	Mercury specific absorbents + FF	Activated carbon injection (or fixed beds) + fabric filters (FF)
Waste water system/treatment	No treatment	
	Mechanical treatment only	Mechanical treatment (filtering of solid materials) only
	Mechanical and biological treatment; no land application of sludge	Mechanical treatment (filtering of solid materials) + biological treatment (reduction of organic substances with biological digestion in the waste water)
	Mechanical and biological treatment; with >40% of sludge used for land application	Mechanical treatment (filtering of solid materials) + biological treatment (reduction of organic substances with biological digestion in the waste water), where a substantial part (above 40%) of the waste water sludge is applied (as fertiliser) on land.

Using the mercury release quantified in Part 6.3, the following results can be generated as a prediction for the application of specific mercury controls (Table 7.6).

Table 7.6 The prediction of mercury release data for STEP 5

Parameter	Release with no control measures	Release with lowest level control measures	Release with highest level control measures
Incineration of municipal/general waste	-	-	-
Incineration of hazardous waste	Release: 1136.2 Kg Hg/y	Release: 1136.2 Kg Hg/y	Release: 126.2 Kg Hg/y
	Reduction: 0%	Reduction: 0%	Reduction: 88.9%
	N/A	Control Measure: PM reduction; simple ESP, or similar	Control Measure: Mercury specific absorbents + FF
Incineration and open burning of medical waste	Release: 527.4 Kg Hg/y	Release: 474.7 Kg Hg/y	Release: 52.7 Kg Hg/y
	Reduction: 0%	Reduction: 10%	Reduction: 90%
	N/A	Control Measure: PM reduction; simple ESP, or similar	Control Measure: Mercury specific absorbents + FF
Waste water system/treatment	?	?	?

'-' The source is not available in Malaysia during the assessment year.
'?' There is no data available regarding this source.
'N/A' Not applicable since there is no control measure applied

7.8 Step 6 - General Consumption of Mercury in Products, as Metal Mercury and as Mercury Containing Substances

For Step 6, the categories of control measures that are available are shown in Table 7.7.

Table 7.7 Control measures for STEP 6

STEP 6 – General Consumption of Mercury in Products, As Metal Mercury and As Mercury Containing Substances		
Source sub-category	**Mercury control name in spreadsheet**	**Explanation**
Dental amalgam fillings ('silver' fillings)	Clinics where only simple chair strainers/filters are used	N/A
	Clinics where high efficiency amalgam separators are used	N/A

Using the mercury release quantified in Part 6.3, the following results can be generated as a prediction for application of specific mercury controls (Table 7.8).

Table 7.8 The prediction of mercury release data for STEP 6

Parameter	Release with no control measures	Release with lowest level control measures	Release with highest level control measures
Dental amalgam fillings ('silver' fillings)	Release: 552.3 Kg Hg/y	Release: 552.3 Kg Hg/y	Release: 435 Kg Hg/y
	Reduction: 0%	Reduction: 0%	Reduction: 21.2%
	-	Control Measure: Clinics where only simple chair strainers/filters are used	Control Measure: Clinics where high efficiency amalgam separators are used

7.9 Step 7 - Data and inventory on crematoria and cemeteries

The Toolkit does not contain element of control measures for this step. The mercury release quantification is solely based on the calculation using default factors. Therefore, the findings in Part 6.7 are valid and applicable here.

7.10 Step 8 - Miscellaneous Mercury Release Sources Not Quantified in Inventory Level 1

Step 8 in the Toolkit is meant to identify qualitatively, possible sources that may present in this country. These sources will not be quantified but remarks on their presence will help future research. Since there is no quantification of mercury release, this step does not have any element of control measures for the sources listed within it.

7.11 Summary of Control Measures Predictive Study

This predictive study shows that different levels of control measures will produce different degree of reduction in the amount of mercury released into the environment. Table 7.9 illustrates the summary of mercury release reduction according to the level of control measures.

Table 7.9 The summary of mercury release reduction according to the level of control measures

Summary of Mercury Release Reduction According Control Measure Categories STEP 2 – Energy Consumption & Fuel Production			
Parameter	Mercury Release Kg/year*	Lowest control (Reduction %)	Highest control (Reduction %)
Coal combustion in large power plants	2573.2	0%	37.5%
Coal combustion in coal fired industrial boilers	325.3	12%	82%
Combustion/use of petroleum coke and heavy oil	13.6	9.6%	50%
Combustion/use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates	150.1	10%	50%
Extraction and processing of natural gas	6758	N/P**	N/P

STEP 3 – Domestic Production of Metals and Raw Materials			
Production of zinc from concentrates	-	-	-
Production of copper from concentrates	-	-	-
Production of lead from concentrates	-	-	-
Gold extraction with mercury amalgamation - from concentrate	-	-	-
Cement production 1) WITH WASTE USED as fuel (>3% of energy) / Cement production 2) WITH NO/LOW WASTE use as fuel	3064.4	14.3%	38.3%
Pulp and paper production	?	?	?
STEP 5 – Data and Inventory on Waste Handling and Recycling			
Incineration of municipal/general waste	-	-	-
Incineration of hazardous waste	1136.2	0%	88.9%
Incineration and open burning of medical waste	527.4	10%	90%
Waste water system/treatment	?	?	?
STEP 6 – General Consumption of Mercury in Products, As Metal Mercury and As Mercury Containing Substances			
Dental amalgam fillings ('silver' fillings)	552.3	0%	21.2%

*The amount of mercury release (kg/year) is the amount of release without any control measures.
**(N/P) is used to show not possible in which the toolkit do not allow modification of control measures
Steps 1, 4, 7 & 8 are excluded from this table because there is no control measures element in these steps
'-' is used to show the source is not present in the country.
'?' is used to show the quantity of the source is unknown.

Legend: 0% 1-25% 26-50% 51-75% 76-100%

It is found that, most of the time, the lowest category control measure produces no or non-significant changes to the mercury release when compare with having no control measures at all. Therefore, it is better to avoid this kind of measure and instead, promotes a higher category of control measures. This exercise also demonstrates that for some areas, even the highest level of control measure will only bring small changes to the amount of mercury released. This information will be useful in decision making and planning for the reduction of mercury releases at the national scale.

Application of the highest level of control measure usually requires large financial funding and often requires high level of technical capabilities. These factors will surely have an economic impact and therefore legal requirements on such technologies must be preceded with a thorough stakeholder consultation process. From the analysis, the study also found some lower category control measures that are able to produce significant reduction in mercury releases, making these measures a viable short-term strategy to reduce mercury release as it usually costs lower than higher technology measures. However it is important to note that this scenario is only applicable to mercury release and should not undermine the need for control measures for other substances of concern. The finding of this predictive study is a preliminary exercise in understanding the impact of control measures on mercury releases. Further studies need to be conducted especially in gathering the information on technologies used by industries in relation to mercury control to enable the country to better estimate mercury releases.

8.0 Conclusion

This study had developed a national mercury release inventory based on the latest version of UNEP's Toolkit for Identification and Quantification of Mercury Releases which helped in quantifying the amount of mercury input and releases in Malaysia. From this study, it is estimated that the number of mercury input in Malaysia for the year 2014 was 32,500 kg (equivalent to 32.5 tonne of mercury). This amount of mercury input was calculated by using the activity rate established from available data and the default input factor. Meanwhile the total mercury released in 2014 was estimated to be 34,090 kg (34.1 tonne). The difference between mercury input and release is caused by the corrections of double counting by the Toolkit (refer to footnotes under TOTAL SUMMARY Table (Part 6.10)). However, these corrections include the deduction of several data such as releases from illegal dumping and waste water systems. Since this data is not available for Malaysia and therefore cannot be deducted, it caused the release to be higher than the input.

The study also that found that 8,950 kg of mercury is released to the air, 2,570 kg of mercury to water bodies and 14,900 kg mercury to land. There are also releases as by products and impurities (3,440 kg mercury), general waste (710 kg mercury) and to sector specific waste disposal (3,520 kg mercury). Overall, majority of mercury is released or emitted to land and air, or be treated as sector specific waste. Primary source categories that had contributed to mercury releases are primary metal production (48%), oil and gas production (20%) and coal combustion (9%). Primary metal production is the main source of mercury releases and emissions due to the contribution of gold extraction by methods other than amalgamation. Further studies are needed in order to understand these alternative methods and their real contribution to mercury releases.

In this updated version, the Toolkit enables the entry of mercury control measures that can influence the amount of mercury releases. These control measures are able to trap and reduce the amount of mercury that is being released into the environment and hence, reducing the negative impacts associated with it. Currently, the industries and processes are unable to proceed with a complete phase-out of mercury usage as aspired except for several products and processes that have readily available mercury-free alternatives. Therefore, the best solution for products and industries without mercury-free alternatives is to adopt a good mercury control measure. This will help not just in reducing the amount of mercury released, but also in promoting a proper disposal of mercury waste from specific industries.

However, there is a lack of database on the application of control measures in the country. This is most probably due to the monitoring methods that primarily depend on limits rather than means. This becomes a challenge in inputting the control measure data as needed by the Toolkit, which requires data on percentage of coverage of specific control measures. The study then proceeded to conduct a predictive test using the estimated amount of releases and the maximum (highest) and minimum (lowest) levels of control measures. This study found that the application of control measures in general will reduce the amount of mercury releases. However, there are areas where the application of the lowest level of control measures do not invoke any changes to the mercury released. Hence, it will require a higher level of control. Through this exercise, the percentage of reduction can provide more information on the sources that can be reduced by applying a specific control measure. This preliminary predictive study also enables the country to plan the immediate short-term action plan by adopting a lower-level control measure categories if needed in order to reduce the mercury released.

The main limitation of this study is the availability of data both in activity rates of sources and the percentage of control measures applied in the nation. The lack of data in activity rates make it challenging to accurately estimate mercury input and release in the country. Meanwhile, the lack of data on mercury specific control measures produced an anonymity of applied control measures on the ground that may have significantly reduced mercury releases. Further studies in improving the data identification, collection, management, and analysis framework with respect to mercury in Malaysia will assist the improvement of mercury management in the country. There are also possibilities for the country to proceed with studies in determining its own input and output distribution factors, particularly on the major sources identified by this study to gain more accurate understanding of the releases. In conclusion, this study had provided further insights on mercury sources and releases in the country using the data from the competent national authorities to ensure the highest possible level of reliability. This study will provide useful inputs to our commitment towards the ratification of the Minamata Convention on Mercury, which could also be used to improve the national mercury management system.

9.0 References

Bank Negara Malaysia. 2014. Economic Developments in 2014. https://www.bnm.gov.my/files/publication/ar/en/2014/cp01.pdf [09 June 2018].

Department of Statistics Malaysia. 2017.Social Statistics Bulletin, Malaysia. https://www.dosm.gov.my/v1/index.php?r=column/pdfPrev&id=aktTTjhhRHd1aHBCZGF1N01aaTl3dz09 [18 May 2018]

Energy Commission Malaysia.2016. *Malaysia Energy Statistics Handbook 2016.* Putrajaya: Energy Commission Malaysia.

Energy Commission Malaysia.2015. National Energy Balance 2015. Putrajaya: Energy Commission Malaysia.

Hoenig, V. 2013. Sources of mercury, behaviour in cement process and abatement options. European Cement Research Academy. https://wedocs.unep.org/bitstream/handle/20.500.11822/13782/ECRA_WBCSD-CSI_Mercury_20130618_upload.pdf?sequence=1&isAllowed=y [18 June 2018].

Kuepouo, G. 2013. Estimating environmental release of mercury from medical-thermometers and potential "hot spot" development: Case study of need for improved waste management capacity in Cameroon. *Resources, Conservation and Recycling, 71,* 48–52. doi:10.1016/j.resconrec.2012.10.004

Malaysian Investment Development Authority. 2014. Laporan Prestasi Pelaburan Malaysia 2014. http://www.mida.gov.my/home/administrator/system_files/modules/photo/uploads/20151008122949_IPR-BM.pdf [13 Seprember 2018]

Mari, M. & Domingo, J.L. 2010. Toxic emissions from crematories: A review. *Environment International 36* (2010) 131–137.

Ministry of Natural Resources and Environment Malaysia. 2006. Substance Flow Analysis of Mercury In Malaysia.

PETRONAS. 2016. Shale Oil & Gas: Overview of SHALE HC Potential in Onshore East Malaysia. http://ccop.asia/uc/data/40/docs/7-MALAYSIA.pdf [8 May 2018].

Renzoni, R., Ullrich, C., Belboom, S. & Germain, A. 2010. Mercury in Cement Industry. CEMBUREAU-CSI. https://www.wbcsdcement.org/pdf/MercuryReport.pdf [9 Mac 2018]

Sustainable Energy Development Authority. 2018. Annual Power Generation (MWh) of Commissioned RE Installations. http://seda.gov.my/ [17 April 2018]

UNEP. 2002. Global Mercury Assessment. Geneva: United Nations Environment Programme Chemicals.

UNEP. 2013a. Minamata Convention on Mercury: Text and Annexes. Geneva.

UNEP. 2013b. Global Mercury Assessment 2013: Sources, Emissions, Releases and Environmental Transport. Geneva.

UNEP. 2013c. Mercury: Time To Act. ISBN 978-92-807-3310-5. Geneva.

UNEP.2017. Toolkit for Identification and Quantification of Mercury Releases: Guideline for Inventory Level 1 Version 2.0 January 2017. Geneva

US-EPA. 2015a. Consumer and Commercial Products. https://www.epa.gov/mercury/mercury-consumer-products [1 June 2018].

US-EPA. 2015b. Thermometers. https://www.epa.gov/mercury/mercury-thermometers [1 June 2018]

World Bank. 2018. Access to electricity (% of population). https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=MY [17 May 2018]

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