RWANDA MINAMATA INITIAL ASSESSMENT

2023



CONTENTS

ABBREVIATIONS AND ACRONYMS 6

FOREWORD 7

ACKNOWLEDGEMENTS 8

EXECUTIVE SUMMARY 9

INTRODUCTION 15

BACKGROUND 15

KEY PROVISIONS OF THE CONVENTION 16

THE MERCURY INITIAL ASSESSMENT PROCESS 16

CHAPTER 1: NATIONAL BACKGROUND INFORMATION 18

1.1. GEOGRAPHICAL PROFILE 18

1.2. BIOPHYSICAL PROFILE 19

1.3. SOCIO-ECONOMIC PROFILE 21

1.4. ENVIRONMENTAL PROFILE 24

CHAPTER II: MERCURY INVENTORY AND IDENTIFICATION OF SOURCES 26

2.1. INTRODUCTION 26

2.2. METHODOLOGY 27

2.3. *SUMMARY OF ASSUMPTIONS* 30

2.4. SUMMARY OF MERCURY RELEASES AND EMISSIONS IN RWANDA 30

2.4. DETAILED INVENTORY OF MERCURY SOURCES 42

2.5. HOT-SPOTS OF MERCURY CONTAMINATION 56

2.6. SUMMARY OF MERCURY STOCKPILES 62

2.7. SUMMARY CONCLUSION AND RECOMMENDATIONS 63

CHAPTER III: POLICY, REGULATORY AND INSTITUTIONAL FRAMEWORK REVIEW 64

3.1. INTRODUCTION 64

3.2. METHODOLOGY 64

3.3. LEGAL REVIEW 65
3.4. INSTITUTIONAL CAPACITY ASSESSMENT 86

CHAPTER IV: IDENTIFICATION OF POPULATIONS AT RISKS AND GENDER DIMENSIONS 109

4.1. INTRODUCTION 109
4.2. METHODOLOGY 111
4.3. FINDINGS 111

CHAPTER V: AWARENESS/UNDERSTANDING OF WORKERS AND THE PUBLIC 115

5.1. INTRODUCTION 115
5.2. METHODOLOGY 116
5.3. FINDINGS 116

CHAPTER VI: IMPLEMENTATION PLAN AND PRIORITIES FOR ACTION 118

6.1. ATIONAL OBJECTIVES AND MERCURY REDUCTION TARGETS 118
6.2. OVERALL SCHEDULE OF IMPLEMENTATION 122
6.3. WORK PLAN AND BUDGET 123
6.4. MONITORING AND EVALUATION MECHANISMS 127

ANNEXES 128

ANNEX A.....INTRODUCTORY LETTER FOR FIELD STUDIES 128
ANNEX B ....COMBINED LIST OF KEY INFORMANTS 128
ANNEX B .COMBINED LIST OF KEY INFORMANTS 128
ANNEX C GUIDING QUESTIONS FOR KII AND SEJ 128
ANNEX D MERCURY INVENTORIES INTERVIEW GUIDE 128
ANNEX E FIELD VISIT ITINERARY AND INTERVIEW GUIDES 128
ANNEX C GUIDING QUESTIONS FOR KII AND SEJ 129
ANNEX D MERCURY INVENTORIES INTERVIEW GUIDE 138
ANNEX E FIELD VISIT ITINERARY AND INTERVIEW GUIDES 145

LIST OF TABLES

Tables 1	*Components of the MIA process and structure of report*	19
Tables 2	*Selected development indicators trend*	24
Tables 3	*Rwanda macro-economic aggregates*	24
Tables 4	*Rwanda energy mix for electricity generation (2016-2021)*	25
Tables 5	*Existence of mercury sources in Rwanda by category*	28
Tables 6	*Rwanda MIA Inventory approach*	29
Tables 7	*the assumptions made during the preparation of theinventory.*	32
Tables 8	*Summary of mercury releases and emissions*	33
Tables 9	*Mercury source categories present in Rwanda*	34
Tables 10	*Rwanda mercury releases into various release pathways*	37
Tables 11	*Overview of the extraction and use of fuels/energy sources*	45
Tables 12	*Overview of the primary (virgin) metal production*	47
Tables 13	*Overview of other minerals and materials with mercury impurities*	49
Tables 14	*Overview of consumer products with intentional use of mercury*	50
Tables 15	*Overview of other intentional uses*	53
Tables 16	*Overview of waste incineration and burning*	54
Tables 17	*Overview of waste disposal/landfilling and wastewater treatment*	56
Tables 18	*Overview of crematoria and cemeteries*	58
Tables 19	*Mercury permissible limits in different environmental compartments*	59
Tables 20	*Preliminary survey on mercury in Kigali City, Eastern and Northern Provinces*	60
Tables 21	*Results on confirmed mercury contaminated sites*	62
Tables 22	*the results of studies and their implications on mercury contamination*	63
Tables 23	*Selected environmental laws*	67
Tables 24	*Selected Multilateral Environmental Agreements to which Rwanda is a party*	68
Tables 25	*Selected Ministerial Orders with implications on mercury*	69
Tables 26	*Selected sector-specific policies and strategic plans*	70
Tables 27	*Selected regulations governing key sectors and environmental matters*	71
Tables 28	*Policy and regulatory measures in place and remaining gaps*	73
Tables 29	*Selected Government institutions concerned with mercury issues*	91
Tables 30	*Institutional capacity analysis*	92
Tables 31	*Comparison of mercury with other heavy metals*	112
Tables 32	*Summary of findings on populations at risks and gender issues*	115

Tables 33 *Mercury learning needs for Rwanda by stakeholder group.....119*

Tables 34 *Objectives of the implementation plan 121*

Tables 35 *Work plan and budget.....126*

LIST OF FIGURES

Figures 1 *Location and administrative map of Rwanda.....20*

Figures 2 *Sites visited during the mercury assessment survey in Rwanda.....30*

Figures 3 *Summary of assumptions.....32*

Figures 4 *Summary of mercury releases by release pathway.....36*

Figures 5 *Mercury releases into air.....41*

Figures 6 *Summary of mercury releases to Water 41*

Figures 7 *Mercury releases into water 42*

Figures 8 *Mercury releases to land.....42*

Figures 9 *Mercury outputs to by-products and impurities.....43*

Figures 10 *Mercury releases to general waste 43*

Figures 11 *Summary of mercury releases to Specific Waste treatment and disposal 43*

Figures 12 *Mercury releases to specific waste treatment and disposal 44*

Figures 13 *Power stations with potential mercury releases from fuel combustion.....45*

Figures 14 *The predominant Medical Incinerator type in Rwanda.....55*

Figures 15 *Preliminary survey on mercury in the Southern and Western Provinces,.....60*

Figures 16 *Initial decision tree for management of mercury contaminated sites 61*

Figures 17 *Selected historical sampling locations for surface water and fish.....62*

Figures 18 *Results summary of some studies related to water quality in Rwanda.....64*

Figures 19 *Key regulations related directly or indirectly to mercury management in Rwanda.*

ABBREVIATIONS AND ACRONYMS

AMAP	Arctic Monitoring and Assessment Programme
ASGM	Artisanal and Small-scale Gold Mining
CHUB	University Teaching Hospital of Butare
CHUK	Centre Hospitalier Universitaire de Kigali
DFNC	Department of Forestry and Nature Conservation (former name)
EDCL	Energy Development Company Ltd
FAO	Food and Agriculture Organization of the United Nations
FONERWA	Fonds National de l'Environnement du Rwanda
GMA	Global Mercury Project
ICF	International Classification of Functioning, Disability and Health
LEAF	Lifting and Empowering All Families
LMIC	Low-Middle Income Country
MIA	Minamata Initial Assessment
MIFOTRA	Public Service and Labour
MIGEPROF	Ministry of Gender and Family Promotion
MINAGRI	Ministry of Agriculture and Animal Resource
MINALOC	Ministry of local government
MINECOFIN	Ministry of Finance and Economic Planning
MINEDUC	Ministry of Education
MINIJUST	Ministry of Justice
MININFRA	Ministry of Infrastructure
MoE	Ministry of Environment
MoH	Ministry of Health
NCDA	National Child Development Agency
NCPD	National Council of Persons with Disabilities
NIRDA	National Industrial Research and Development Agency
NISR	National Institute of Statistics of Rwanda
NPPA	National Public Prosecution Authority
NSC	National Steering Committee
NWC	National Women Council
RAB	Rwanda Agricultural Board
RBA	Rwanda Broadcasting Agency
RBC	Rwanda Biomedical Centre
REG	Rwanda Energy Group
REMA	Rwanda Environment Management Authority
RHA	Rwanda Housing Authority
RICA	Rwanda Inspectorate Competition and Consumer Protection Authority
RLRC	Rwanda Law Reform Commission
RMB	Rwanda Mines, Petroleum and Gas Board
RMI	Rwanda Management Institute
RMUA	Rwanda Land Management and Use Authority
RRA	Rwanda Revenue Authority
RTDA	Rwanda Transport Development Agency
RURA	Rwanda Utilities Regulatory Authority
Rwanda FDA	Rwanda Food and Drugs Authority
RWB	Rwanda Water Resources Board
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
UNITAR	United Nations Institute for Training and Research
UR	University of Rwanda
WBG	World Bank Group
WHO	World Health Organization

FOREWORD

Human health and the environment are the backbone of all sectors of the economy and society. As such, it is key to note that the use of natural resources and chemicals should not threaten populations and the natural functions of the environment. The Government is aware of socioeconomic benefits that emanate from the industry. The use of chemicals in industry is widespread, however the Government advocates for the safe and sustainable use of chemicals and in particular mercury. In 2013, the Minamata Convention was signed to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. As a Party to the Convention, Rwanda is supported in its efforts to control mercury.

The Minamata Initial Assessment (MIA) conducted by Rwanda provides an overview of the mercury situation in the country, enabling the government to identify key issues and develop strategies to reduce, And if possible eliminate, the use of mercury and mercury containing products. The MIA development started in December 2021 and ended in September 2022. Information on the sources of mercury in Rwanda was gathered by consultants working with Rwanda Environment Management Authority (REMA) together with all relevant national stakeholders. The MIA report reflects the situation, concerns and views of stakeholders on mercury management in Rwanda.

The MIA provides a building block for the protection of human health from the harmful effects of mercury. The MIA focused on six specific objectives which sought to understand the mercury situation in Rwanda in a bid to protect human health and the environment. The development of the MIA marks the onset of Rwanda's steps towards the sound management of mercury and paves the way for the sustainable utilization of natural resources, and prevention of pollution and land degradation. REMA is consistent with, and will continuously promote the national agenda for sustainable development. With this in mind, I am convinced that the implementation of the MIA report will not only contribute to the protection of human health and the environment, but largely, to sustainable economic development.

On behalf of REMA, I wish to express my sincere gratitude to the Global Environment Facility, UNIDO, and UNITAR, for supporting the development of the MIA. I also wish to thank all the stakeholders who have been involved in the process, whether through participating in the National Steering Committee or workshops, or by carrying out various activities related to the MIA development.

I look forward to continued cooperation in implementing the recommendations identified in the MIA.

Sincerely,



Digitally signed by REMA(DG)

Juliet KABERA,
Director General, REMA

ACKNOWLEDGEMENTS

The Rwanda Environment Management Authority (REMA), on behalf of the Government of the Republic of Rwanda, wishes to acknowledge with sincere gratitude the contribution of everyone who participated in the development of the Rwanda Minamata Initial Assessment (MIA).

The MIA was developed with financial support from the Global Environmental Facility (GEF) channelled through the United Nations Industrial Development Organization as the implementing agency. The MIA development process benefitted immensely from technical support provided by experts from the United Nations Institute for Training and Research (UNITAR) and United Nations Industrial Development Organization (UNIDO) as implementing agency. Field surveys, stakeholder consultations and workshops were conducted under the facilitation of a multi-disciplinary team of experts, officials from Government ministries, departments and agencies, and private entities. The assignment could not be successful without the corporation of data and information providers from various sectors of the economy.

Special thanks are extended to the following experts for their contribution to the MIA development:

1. National Steering Committee members, drawn from both the government and the private sector.

2. UNITAR and UNIDO technical experts and international reviewers.

3. REMA officials directly involved in the assignment.

EXECUTIVE SUMMARY

The Republic Rwanda reports its Minamata Initial Assessment (MIA), which aims to generate baseline information and data on mercury, including the mercury inventory, in order to inform on the country'scourse of action regarding its obligations to the Minamata Convention. The country acceded to the Minamata Convention on Mercury on 29 June 2017 and the convention itself entered into force on 27 September 2017. The MIA development process followed a series of activities, starting with putting in place a coordination mechanism through the establishment of National Steering Committee. Capacitybuilding for the implementing members, including the national consultant, was conducted under the support of the United Nations Institute for Training and Research (UNITAR) and United Nations Industrial Development Organization (UNIDO). The compilation and review of the (1) profile of Rwanda, (2) legal framework and institutional capacities, (3) mercury inventory, (4) strategies for identification and assessment of mercury contaminated sites, (5) populations at risk of mercury exposure and their gender and cultural dimensions, and (6) mercury learning strategies were conducted through both desk studies and field data collection, covering a diversity of sectors of the economy of Rwanda. An implementation plan and priorities for action, together with associated costs, were prepared based on the findings from the baseline study and subsequent consultations with relevant stakeholders.

National Mercury Inventory

This mercury release inventory was made with the use of the "Toolkit for identification and quantification of mercury releases" made available by the Chemicals Branch of the United Nations Environment Programme. This inventory was developed on the Toolkit Inventory Level 2. The Toolkit methodology is based on mass balances for each mercury release source sub-category. The input factors and output distribution factors that were used were the default ones provided in the Toolkit, since site- specific factors have not been developed for Rwanda. When relevant, inputs factors from countries in the region were used instead of the default factors.

The compiled mercury inventory for the 2018 baseline year estimated Rwanda's total mercury releases by source category stood at 19,558.85 kg/year of mercury. A total of 2,396.58 kg was emitted to air, 544.01 kg was released to water, 13,480.66 kg was released to land, 600.41 kg was partitioned to by-products and impurities, 2,415.00 kg was released to general waste and 122.19 kg went into sector specific treatment or disposal.

SUMMARY OF MERCURY RELEASES BY SECTOR IN RWANDA

Source category	Calculated Hg output, Kg/y							
	Air	Water	Land	By-products and impurities	General waste	Sector specific treatment / disposal	Total releases by source category	Percent of total releases*3*4
5.1: Extraction and use of fuels/energy sources	77.41	1.38	-	3.45	-	1.17	83.42	0.43%
5.2: Primary (virgin) metal production	586.37	293.19	13,193.39	586.37	-	-	14,659.32	74.95%
5.3: Production of other minerals and materials with mercury impurities*1	31.75	-	-	10.58	-	10.58	52.92	0.27%
5.4: Intentional use of mercury in industrial processes	-	-	-	-	-	-	-	0.00%
5.5: Consumer products with intentional use of mercury (whole life cycle)	107.18	21.61	84.63	-	2,175.82	-	2,389.23	12.22%
5.6: Other intentional product/process use*2	4.01	116.70	-	-	123.80	108.68	353.19	1.81%
5.7: Production of recycled metals	-	-	-	-	-	-	-	0.00%
5.8: Waste incineration and burning	1,476.76	-	-	-	-	1.75	1,478.51	7.56%
5.9: Waste deposition/ landfilling and waste water treatment*3*4	113.10	1,153.64	1,085.04	-	115.83	-	2,467.61	2.74%
5.10: Crematoria and cemeteries	-	-	6.49	-	-	-	6.49	0.03%
SUM OF QUANTIFIED RELEASES*3*4	2,396.58	544.01	13,480.66	600.41	2,415.00	122.19	19,558.85	100.00%

NB: Table notes:

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

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

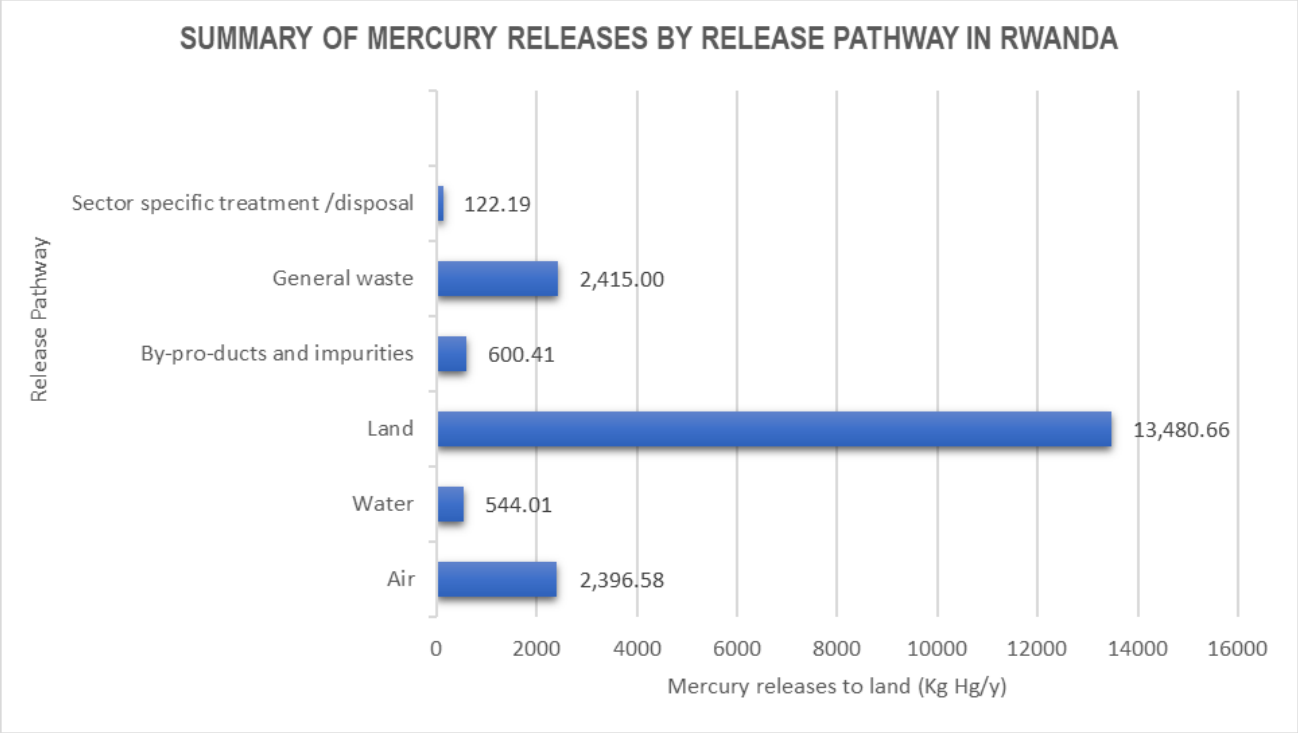
**3: The estimated quantities include mercury in products which has also been accounted for under each product category.*

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

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

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

Summary of mercury releases by release pathway in Rwanda



The main potential source of mercury releases and emission in Rwanda appears to be the extractive industrial sector (Primary metal production) which is consistent with findings from countries in the region. Primary metal production ranked first and is estimated to account for the 74.95% of total mercury emissions and releases in Rwanda (14,659.32 kg of mercury). Consumer products with intentional use of mercury ranked second contributor of mercury input to society at 2,389.23 kg of mercury per annum (12.22% of total). Waste incineration ranked third contributor of mercury at 1,478.51 kg of mercury per annum (7.56% of total) while Waste deposition and waste water treatment ranked fourth at 2.74% of the total releases. Other source categories, namely extraction and use of fuels, production of other minerals and materials with mercury impurities and crematoria and cemeteries contributed an estimated less than 500 kg of mercury per annum.

An estimated total of 2,396.58 kg of mercury is released into air from the various release pathways. The individual mercury releases sub-category contributing with the highest mercury releases to the atmosphere was Waste incineration which accounts for 1,476.76 kg of mercury per annum. Primary metal production accounts for 586.37 kg of mercury per annum and ranked second. Waste disposal and wastewater treatment ranked third and accounts for the release of 113.10 kg of mercury per annum.

An estimated total of 544.01 kg of mercury is released into water, of which 1,153.64 kg of mercury were found out to emanate from waste and wastewater treatment. The estimated quantities include mercury in products which has also been accounted for under each product category. Therefore, to avoid double counting, releases to water from wastewater treatment was automatically subtracted in the estimated total releases. 293.19 kg of mercury are released from primary metal production. The other source categories (Other intentional use of mercury, Extraction and use of fuels and consumer products with mercury) account for the release of less than 200 kg of mercury per year

An estimated total of 13,480.66 kg of mercury is released to land from the various release pathways. The individual mercury releases sub-categories contributing with the highest mercury releases to land were primary metal production accounting for 13,193.39 kg of mercury per year and Waste deposition and wastewater treatment accounting for 1,085.04 kg of mercury per year. The other source categories (Crematoria and Cemeteries, Consumer products with intentional use of mercury and other intentional use of mercury) account for less than 100 kg of mercury per year.

In this inventory, default input factors were used for the estimation of mercury releases from general waste treatment and wastewater treatment. The default factors were based on literature data of mercury contents in waste and wastewater, and these data were only available for high income countries. The calculations indicate that the default input factors for general waste and wastewater may over-estimate the mercury releases from these sources (see section on waste data). The establishment of country-specific input factors for source categories may be of priority in follow-up work, as feasible.

No contaminated sites were identified as mercury hot spots in the country. Further analysis needs to be carried out in order to confirm these preliminary results. In this assessment, a desk review of mercury assessment and bio-monitoring studies in Rwanda was conducted, followed by field visits to sites and institutions preliminary considered as potential mercury contamination hotspots. These were areas with industrial, mining and energy production activities, as well as service centres, particularly medical facilities and waste disposal sites.

Major data gaps identified are the following:

1. Data on water, sediment, soil and air emission monitoring from potential mercury receptor sites does not include mercury as part of the scope of analysis,

2. Inadequate capturing of activity data rate by institutions including lack of information on emissions of various air emission points,

3. Lack of country specific input factors,

4. Level of awareness of stakeholder on mercury issues was noted to the relatively low.

The main priorities identified for further assessment include:

1. Carrying out studies on the determination of country specific input factors for major mercury releasing categories specifically for the Primary metal production,

2. Development of a coordinated harmonised data gathering system on mercury emissions. The system may include mandatory recording of activity data rate and emissions data at source.

Policy, Regulatory and Institutional Framework

The review of the country's policy, regulatory and institutional framework revealed that the country is supported by a strong political will to meet the obligations of the Minamata Convention and to align its legal framework with the Minamata Convention. These include the ban on cosmetics containing mercury and ban of some mercury compounds. The gaps identified within the current

policy and legal framework are related to the insufficiency or absence of: (1) provisions against the use of elemental mercury in gold mining in order to maintain mercury-free gold processing, (2) explicit coverage of mercury in legislations on chemicals, poisonous substances, hazardous waste and electronic waste (e-waste), and (3) regulations on dental amalgams and other mercury added products stipulated in the Convention (4) national standards for permissible limits of mercury in air, soil and waste, including inspection and enforcement for compliance under various sectors of the economy.

The review of the institutional framework established that Rwanda has a decentralized administrative structure with an extensive local governmentthat encourages citizens' participation in local decision making at the lowest level (Village). This facilitates effective communication, awareness and collective action on matters related to the Convention and encourages accountability, transparency, inclusiveness and equitable allocation of resources and services. Institutions supporting the country in meeting its obligations to the Convention were identified and include the Rwanda Environment Management Authority (REMA), Ministry of Health, Ministry of Environment, Ministry of Trade and Industry, Rwanda Mines, Petroleum and Gas Board (RMB), Rwanda Inspectorate Competition and Consumer Protection Authority (RICA), Ministry of Infrastructure (MININFRA), Rwanda Housing Authority (RHA), Rwanda Energy Group-Energy Development Company Ltd (REG - EDCL), Ministry of Agriculture and Animal Resources (MINAGRI), Rwanda Food and Drugs Authority (Rwanda FDA), Rwanda Standards Board (RSB), Sulfo Lifting and Empowering All Families (LEAF) Rwanda Ltd, National Federation of Mining Cooperatives (FECOMIRWA), Rwanda Utilities Regulatory Authority (RURA), Enviroserve, Depot Kalisimbi, Rwanda Green Fund (FONERWA), Ministry of Public Services and Labour, Ministry of Education (MINEDUC), University of Rwanda (UR) and National Industrial Research and Development Agency (NIRDA).

The gaps identified within the current institutional framework are related to insufficiency or absence of: (1) awareness on mercuryamong the public, workers and other professionals, (2) capacity to assess releases and emissions of mercury, as well as mercury contamination (3) capacity to assess impact of mercury on the population, in particular on women and other vulnerable populations , (4) capacity to effectively dispose of hazardous waste, including mercury waste and interim mercury storage, (5) conduct scientific research on mercury, including incorporation of mercury issues in basic and professional education programmes, as well as generating standards for permissible limits of mercury in the environment and (6) capacity to conduct gender analysis in mercury related issues.

Populations at risks and awareness raising strategies

The sectors identified for education, awareness raising and capacity building initiatives targeting specific groups are: Primary metal production, waste management and consumers/users of mercury containing products.

The specific needs of communities at risks, such as women using traditional cook stoves, ASGM and other gold mining communities, consumers of beauty care and dental products, and waste workers and communities living close to waste management sites, should also be taken into account in future government actions.

Implementation Plan

The survey established the need to raise awareness on mercury dangers and risks in all source categories. In particular, the knowledge on unintentional release of mercury to society from gold extraction and processing, consumer products with mercury and waste management need to be imparted. In response to the assessed challenges and objectives of the Minamata Convention an implementation plan with a budget of USD1,150,000 is proposed. The components and objectives of the implementation plan are as follows: (1) Building and strengthening capacity of the gold processing industries and regulatory authorities to protect miners and communities from intentional and unintentional releases of mercury from gold mining and processing activities (USD620,000 or 54%); (2) Reducing mercury releases to society from the importation and consumption of products with intentional use of mercury (USD90,000 or 8%); (3) Improving solid waste and wastewater management to reduce potential risks of exposure to mercury (USD138,000 or 12%); (4) Reducing the exposure of vulnerable populations, particularly women of child-bearing ages, pregnant women and children, to unintentional releases of mercury from biomass burning, dental amalgams and waste (USD55,000 or 5%); and (5) Developing and adopting technologies for the safe handling, storage and disposal of mercury waste (USD 247,000 or 21%). These objectives will be achieved through; (1) engagement with government, industry, non-governmental organizations, local leadership, academia and other stakeholders; (2) development and implementation of an outreach plan that increases awareness of mercury risks and advocacy on responsive consumption; (3) formulating and implementing of fundraising strategies to support the implementation plan; and (4) increasing collaboration and networks with local, regional and international institutions.

INTRODUCTION

BACKGROUND

Mercury is one of the most toxic chemicals whose impacts on human health largely depend on exposure pathway. The most severe impacts caused by exposure to mercury include death, neurological disorders and foetus development anomalies. People can be exposed to mercury through consumption of methyl-mercury in their diet (especially in fish), inhalation of mercury-contaminated air or use products containing mercury present as an impurity or intentionally added. Unlike other heavy metals, mercury has a long-range transport potential as it is not only highly volatile but can also be dispersed to any part of world through trade (UNEP, 2020)[1]. Thus, mercury is considered a toxic chemical of both national and global significance. The main objective of the Minamata Convention on Mercury is to "*protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds and it sets out a range of measures to meet that objective*" (UNEP, 2013)[2]. Rwanda has many dietary requirements, cultural settings and occupational health and safety practices in common with the rest of the world and the country is therefore exposed to mercury.

The Republic of Rwanda acceded to the Minamata Convention on Mercury on 29th June 2017 and the convention entered into force on 27th September 2017. In the first Global Mercury Assessment (GMA, UNEP, 2002)[3], Rwanda was listed among countries party to the Stockholm Convention on Persistent Organic Pollutants (POPs), recognising the persistence, bioaccumulation, long-range environmental transport, and adverse health effects of organic mercury compounds. In the 2002 GMA, Rwanda was not listed among countries with high intensity of mercury-based artisanal gold extraction activities. The country therefore did not take part in the Global Mercury Project undertaken from 2002 to 2007 (UNIDO, 2008)[4]. The main objective of the Global Mercury Project was to promote cleaner technologies that reduce the risk of mercury poisoning in mining communities using mercury-based gold extraction methods.

In the second GMA (UNEP, 2013)[5], Rwanda was not included in the countries emitting more than 2 g Hg/km^2. However, some mining activities in surrounding countries, notably Uganda, Tanzania and Burundi, were estimated to be contributing to mercury contamination within their territories by an amount between 10 and 100 g Hg/km^2. This aspect could be of significance in terms of possible long-range environmental transport of mercury into Rwanda and its impact on populations. The Global Mercury Supply, Trade and Demand report (UN Environment, 2017)[6] estimated Rwanda's mercury use in the Artisanal and Small-scale Gold Mining (ASGM) sector to be at 0.1-0.5 (mean, 0.3) tonne/year. However, the report noted that the figures are only an indication of the presence or absence of mercury use in Rwanda's ASGM sector, with a margin of error that could be ±100% due to the unavailability of quantitative information on mercury in Rwanda.

1 *UNEP (2020) An assessment report on issues of concern: Chemicals and waste issues posing risks to human health and the environment. United Nations Environment Programme (UNEP), Geneva*
2 *UNEP (2013) Minamata Convention on Mercury: Text and annexes. United Nations Environment Programme (UNEP), Geneva. https://wedocs.unep.org/handle/20.500.11822/8541*
3 *UNEP (2002) Global Mercury Assessment. United Nations Environment Programme (UNEP) Chemicals, Geneva, 258p*
4 *UNIDO-UNEP (2008) Global mercury project: Results of the awareness campaign and technology demonstration for artisanal gold miners (Summary Report), United Nations Industrial Development Organization (UNIDO), Vienna https://archive.iwlearn.net/globalmercuryproject.org/documents/non_country%20specific/UN_Final_GMP%20Synopsis% 20Report.pdf*
5 *UNEP (2013) Global Mercury Assessment 2013: Sources, emissions, releases and environmental transport. UNEP Chemicals Branch, Geneva, Switzerland https://www.zaragoza.es/contenidos/medioambiente/onu/942-eng.pdf*
6 *UN Environment (2017) Global mercury supply, trade and demand. United Nations Environment Programme, Chemicals and Health Branch, Geneva, Switzerland*

KEY PROVISIONS OF THE CONVENTION

The Convention can be divided into four main categories, namely:

1. Operational articles, which describe the obligations on Parties which will reduce anthropogenic emissions and releases of mercury and mercury compounds to the environment,

2. Support to Parties, which describe the financial resources, capacity building, technical assistance and technology transfer opportunities available to Parties; and establishment of the implementation and compliance committee,

3. Information and awareness raising, which includes actions that would reduce impacts of mercury, and

4. Administrative matters, which look into issues such as the establishment of the Conference of Parties and a Secretariat.

The operational articles of the Convention put obligations on parties to reduceanthropogenic emissions and releases of mercury and mercury compounds to the environment. In line with paragraph 5 (a) of Article 3 of the Convention, Rwanda endeavoursto identify individual stocks of mercury and/or mercury compounds exceeding 50 metric tons and sources of mercury supply generating stocks exceeding 10 metric tons per year that are located within its territory. The Parties also have an obligation to produce an inventory of mercury emissions into the air and releases to land and water (Articles 8 and 9). TheMinamata Initial Assessment (MIA) is an enabling process that strengthens national decision-making for obligations related to the Convention.

THE MERCURY INITIAL ASSESSMENT PROCESS

The MIA aims to generate baseline information and data on mercury in order to inform on Rwanda's future course of action regarding its obligations to theConvention. The process was guided by the following specific objectives:

1. Review the profile of Rwanda in the context of the country's resources endowment, socio-economic setting, and other factors as they relate to mercury

2. Produce the Rwanda mercury inventory and identify emissions and releases

3. Review Rwanda's policies, regulatory and institutional frameworks in the context of mercury

4. Identify populations at risk of mercury exposure and their gender and cultural dimensions

5. Raise awareness or understanding of workers and the public, including training of target groups and professionals on mercury management

6. Develop an implementation plan and priorities for action

The MIA process was organised in eight components (Table 0.1) and directed by the Rwanda Environment Management Authority (REMA).

TABLE 0.1 COMPONENTS OF THE MIA PROCESS AND STRUCTURE OF REPORT

Component	Output
1. Establishment of coordination mechanism and organization of process	2. National Steering Committee coordinating the MIA project
3. Review the profile of Rwanda and issues related to mercury	4. Report on the national background information (CHAPTER I)
5. Development of the mercury inventory and strategies to identify and assess mercury-contaminated sites	6. Level 2 mercury inventory report and strategy on mercury-contaminated sites (CHAPTER II)
7. Assessment of national infrastructure, capacity, mercury management, and legislation	8. Review report on legal and institutional capacities (CHAPTER III)
9. Identification of populations at risk and gender dimensions	10. Report on populations at risk and gender (CHAPTER IV)
11. Awareness/understanding of workers and the public; training and education opportunities of target groups and professionals	12. Awareness raising, training, and national mercury learning strategy (CHAPTER V)
13. Development of the implementation plan and priorities for action	14. Implementation plan and priorities for action (CHAPTER VI)
15. Feedback, validation, and submission of MIA report	16. MIA full report

At the national level, the country established a National Steering Committee (NSC) composed of various experts from different government ministries, departments and agencies, as well as the private sector. The NSC engaged a national consultant to conduct the inventory data collection of mercury at the national level and to draft and finalise the MIA. The NSC mainly focused on overseeing the implementation of the MIA. An inception workshop was conducted on the 17th of February 2022. The workshop crafted a work plan and assigned tasks and responsibilitiesto committee members. The NSC members and the consultant were orientedon the use of the UNEP Toolkit Levels 1 and 2 mercury inventory compilation byUNITAR technical experts on 3rd and 4th March 2022. The experts were also available for technical backstopping throughout the MIA process.

CHAPTER 1: NATIONAL BACKGROUND INFORMATION

1.1. GEOGRAPHICAL PROFILE

1.1.1. Location and administrative boundaries

Rwanda is located in east-central Africa (Figure I.1). It extends from 01°02′51″ to 02°50′24″ south, and lies between 28°51′42″ and 30°53′57″ east, covering a total area of 26,338 km2. The country is landlocked and bordered by Uganda to the North, Tanzania to the East, Burundi to the South and the Democratic Republic of Congo to the West. Kigali is the capital city surrounded by four Administrative Provinces (Eastern, Western, Northern and Southern Provinces).

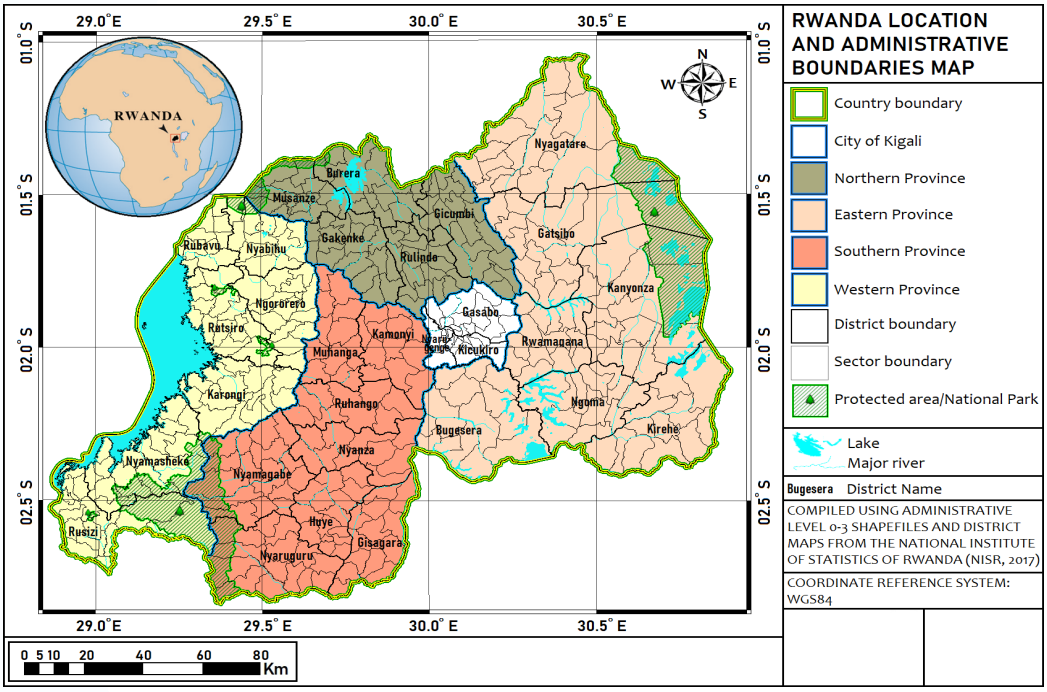


Figure I 1. Location and administrative map of Rwanda

The country is subdivided into 30 Districts, with the number of Districts per province ranging from three (City of Kigali) to eight (Southern Province). Each District is divided into Sectors, Cells and Villages. Rwanda started decentralising administrative functions in 2001 and the country now has extensive local governments encouraging citizens' participation in local decision making (RoR, 2021)[7]. The decentralised administrative structure, encouraging accountability, transparency, inclusiveness and equitable allocation of resources and services, may facilitate effective communication, awareness and collective action on matters related to the Minamata Convention.

1.1.2. Climate profile

Rwanda has a tropical climate with four major climatic regions: Lake Kivu (mean annual rainfall, 1,200-1,500 mm), Nile-Congo highlands (1,300-1,650 mm), Central plateau (1,100-1,300 mm) and Eastern lowlands (700-1,100 mm) (NISR-MINECOFIN-MoE, 2019[8]). The rainfall is moderated

7 *RoR (2021) Republic of Rwanda administrative structure. Republic of Rwanda (RoR), Kigali. https://www.gov.rw/government/administrative-structure (accessed: 23/12/2021)*

8 *NISR-MINECOFIN-MoE (2019) Rwanda natural capital accounts – Ecosystems. National Institute of Statistics of Rwanda (NISR), Ministry of Finance and Economic Planning (MMINECOFIN) and the Ministry of Environment (MoE), Kigali.*

by hilly topography stretching from east to west. A study conducted by Henninger (2013)[9] on climate change impact on Rwanda's climatic regions, based on data from 1996 to 2011, suggests the increasing proportion of relatively drier regions in Rwanda. Regions within the Nile-Congo highlands now have distinct drier mountain climates in the north and humid mountain climate in the south. Fahnestock et al. (2019)[10] have shown that climate change increases the risk of mercury contamination largely due to close linkages between the mercury and carbon cycles. Mercury transportation and exchange in air, water, soil, sediments and biota is temperature dependant and depend on the behaviour of living organisms.

1.2. BIOPHYSICAL PROFILE

1.2.1. Land cover, land use and ecosystems

Rwanda's land cover is made up of a diversity of protected natural and managed ecosystems in which agriculture and forestry are the primary land users (MoE, 2020[11]). Agriculture has the greatest share of land area in 2020 in terms of land use (60.6%), followed by forestry (9.3%), industry (0.2%), livestock (5.7%), residential areas (8.5%), unclassified (13.5%) and other uses (2.2%) (NISR, 2021)[12]. The cultivated area has been increasing largely through the encroachment of forest land whose area was estimated at 1,089,389 ha in 1990, 747,115 ha in 2000, 738,840 ha in 2010 and 432,209 ha in 2015. There is a relatively close linkage between changes in land use and mercury, which also relates to the carbon cycle. Reduction in the carbon stocks of forestland, because of deforestation, increases mercury stocks and supply, as biomass is the main energy source in Rwanda accounting for about 85% of energy consumption (Nyaga et al., 2021)[13]. Burning of biomass containing traces of mercury may result in mercury emissions into air. When trees are removed and the soil is tilled, there is increased mineralisation of soil organic matter that may also release traces of mercury from the soil, which may have primarily come from the mercurytaken up by tree roots and deposited on forest soils through leaf litter fall.

1.2.2. Geology and mineral resources

The geology of Rwanda is predominantly composed of about 80% of basement and mezoproterozoic rocks that have been intruded by different generations of granitic and mafic rocks (RNRA, 2013[14]). There are no reported litho-chemistry studies to measure the levels of mercury in the rocks of Rwanda, however the extraction and processing of mineral resources such as gold and lime are known to release trace amounts of mercury into the environment.

Studies from other regions of the world have shown relatively higher concentrations of mercury in extrusive volcanic rocks, other igneous, sedimentary rocks, and soils derived therefrom, relative to the mercury concentrations in metamorphic rocks (Richardson et al., 2018[15]; Kokh et al. 2021[16]). In

9 *Henninger, S.M. (2013) Does the global warming modify the local Rwandan climate? Natural Science, 5 (1A), 124-129*

10 *Fahnestock, M.F., Bryce, J.G., McCalley, C.K., Montesdeoca, M., Bai, S., Li, Y., Driscoll, C.T., Crill, P.M., Rich, V.I. and Varner, R.K. (2019) Mercury reallocation in thawing subarctic peatlands. Geochemical Perspectives Letters, 33 DOI:10.7185/geochemlet.1922*

11 *MoE (2020) National land use and development master plan (NLUDMP) 2020-2015: Integrative Plan. Ministry of Environment (MoE), Rwanda Land Management and Use Authority, Kigali*

12 *NISR (2021) Rwanda Statistical Yearbook 2021, December 2021. National Institute of Statistics of Rwanda (NISR), Kigali, 173 pp.*

13 *Nyaga, H.N., Ndayishimiye, I., Saulve, D.N. and Alonso, J.B. (2021) Policy and market review for modern energy cooking in Rwanda. Energy 4 Impact (E4I) and Modern Energy Cooking Services (MECS), UK. https://mecs.org.uk/wp-content/uploads/2021/10/Policy-and-market-review-for-modern-energy-cooking-in-Rwanda.pdf*

14 *RNRA (2013) Mining in Rwanda. Rwanda Natural Resources Authority, Kigali http://rnra.rw/fileadmin/user_upload/Mining_in_Rwanda_.pdf*

15 *Richardson, J.B., Aguirre, A.A., Buss, H.L., Toby O'Geen, A., Gu, X., Rempe, D.M. and Richter, D.D.B. (2018) Mercury sourcing and sequestration in weathering profiles at six Critical Zone Observatories. Global Biogeochemical Cycles, 32, 1542-1555. https://doi.org/10.1029/2018GB005974*

16 *Kokh, S.N., Sokol, E.V. and Gustaytis, M.A. (2021) Mercury anomaly in Oligocene-Miocene Maykop Group sediments (Caucasus continental colli-*

Rwanda, there is extensive extraction of both limestone and volcanic rock for cement production, particularly in the Rusizi and Musanze Districts (Figure I.1s. Thus, these areas could be considered as potential sources of mercury emissions into air or releases to land or surface waters and sediments. Another potential source of mercury is the dry deposition of volcanic ashes containing traces of mercury on the surfaces of vegetation, soil and water, as Rwanda is located in a region with active volcanoes.

1.2.3. Vegetation and biomass resources

Rwanda is endowed with a diversity of natural vegetation and plantations providing numerous ecosystem services. The natural vegetation can be broadly categorised into mountain forests, Savanna woodlands, Savanna grasslands, and the riverine vegetation and marshlands. The woodland and bushland/shrubland form represent about 70% of the natural vegetation cover. They are largely outside protected areas and therefore crucial in supporting communities with resources such as fuelwood and other woodland products. Biomass is the main energy source in Rwanda, accounting for about 85% of the national final energy consumption (Nyaga et al., 2021[17]). However, trees play an important role in the mercury cycle and their exploitation is considered an important source of mercury emissions or releases into the environment. There are no reported studies on mercury levels in trees in Rwanda. However, studies elsewhere have shown that trees can efficiently: (a) take up mercury by adsorbing it from the atmospheric via leaf stomata, (b) take up mercury using xylem vessels via root, and (c) add mercury to forest floors via leaf fall (Yang et al., 2018)[18]. The use of biomass energy resources is therefore be a potential mercury exposure pathway, particularly for the rural communities who rely on such resources for cooking and heating on a daily basis.

1.2.4. ater resources, fisheries and wastewater

Rwanda has a diversity of water resources that include 101 lakes covering about 149,487 ha, 860 marshlands covering about 278,536 ha (10.6% of Rwanda land area), and 861 rivers totalling 6,462 km in length (REMA, 2009)[19]. More than 95% of Rwanda's water resources originate from within the country, and less than 3% from outside its territory (NISR-MoE, 2019)[20]. This situation makes Rwanda a catchment of its own water supply, and points to the need for firm water resources management, particularly sound management of wastewater.

Aquaculture is one of the practices that are negatively affected by mercury contamination of water bodies. There are currently no reported studies on mercury levels in fish in Rwanda, however the study by Nteziyaremye and Omara (2020)[21] confirmed bioaccumulation of other heavy metals in the edible muscles of the West African lungfish (Protopterus annectens Owen, 1839) from Nyabarongo River, on the northern and western borders of Kigali City. According Rurangwa and Kabagambe (2018)[22], aquaculture in Rwanda is largely artisanal, characterized by smallholder fishers and farmers,

sion zone): Mercury hosts, distribution, and sources, Minerals, 11, 751. https://doi.org/10.3390/min11070751

17 *Nyaga, H.N., Ndayishimiye, I., Saulve, D.N. and Alonso, J.B. (2021) Policy and market review for modern energy cooking in Rwanda. Working paper June 2021. Energy 4 Impact (E4I) and Modern Energy Cooking Services (MECS), UK. https://mecs.org.uk/wp-content/uploads/2021/10/Policy-and-market-review-for-*

18 *Yang, Y., Yanai, R.D., Driscoll, C.T. Montesdeoca, M. and Smith, K.T. (2018) Concentrations and content of mercury in bark, wood, and leaves in hardwoods and conifers in four forested sites in the northeastern USA. PLoS ONE 13(4): e0196293. https://doi.org/10.1371/journal.pone.0196293*

19 *REMA (2009) Water and wetland resources. In: State of the environment and outlook report. Rwanda Environment Management Authority (REMA), Kigali. https://www.rema.gov.rw/soe/chap7.php*

20 *NISR-MoE (2019) Natural capital accounts for water. Version 1.0. June 2019. National Institute of Statistics of Rwanda (NISR) and Ministry of Environment (MoE), Kigali*

21 *Nteziyaremye, P. and Omara, T. (2020) Bioaccumulation of priority trace metals in edible muscles of West African lungfish (Protopterus annectens Owen, 1839) from Nyabarongo River, Rwanda, Cogent Environmental Science, 6:1, 1779557, DOI: 10.1080/23311843.2020.1779557*

22 *Rurangwa, E. and Kabagambe, J.B. (2018) Review and analysis of small-scale aquaculture production in East Africa: Part 2, Rwanda. Centre for*

with the major species of fish being the Lake Tanganyika sardine (Isambaza) (Limnothrissa miodon), Nile tilapia (Oreochromis niloticus), African catfish (Clarias gariepinus), and the Indian oil sardine (chala) (Sardinella longiceps). These species are commonly non-carnivorous and can produce significant yields in ponds or cages. They are therefore not likely to pose a problem of mercury bio-magnification within their communities. However, they can still bio-accumulate mercury in their tissues where traces of mercury are found in water.

There are currently no reported studies on mercury concentrations in Rwanda groundwater. According to WHO (2005)[23], naturally occurring concentrations of mercury in groundwater are below 0.5 µg/L, however, some local mineral deposits can produce higher mercury concentrations in groundwater. In general, shallow groundwater with elevated concentration of mercury is most likely to have been a result of human activities, including land disposal of domestic and industrial solid waste and wastewater containing traces of mercury. Rwanda is currently working on a centralised sewage treatment system for the city of Kigali which is expected to improve the quality of treated effluent and address the concerns over potential mercury contamination of groundwater resources.

1.3. SOCIO-ECONOMIC PROFILE

1.3.1. Population size and structure

The 2012 national census estimated the total population of Rwanda at 10,515,973 (NISR- MINECOFIN, 2012)[24]. Between 2012 and 2021, the population is estimated to have increased at a rate comprised between 2.3% and 2.6% per annum, coming to a total estimated population of 12,955,736 in 2021, with an estimated 91 males per 100 females (NISR, 2015[25]; NISR, 2018[26]; NISR, 2021[27]). The Rwandan population is young, with 42% of the population being aged 15 years or below, and only 4% aged 65 and above (NISR-MoH-ICF, 2021)[28]. Current population density is about 490 persons/km2, however with the average annual population growth rate Rwanda's population could reach 25.8 million and about 1,000 persons/km2 by 2050.

The 2020 Integrated Household Living Conditions Surveys estimated the national average household size at 4.4, with about 88% of the total number of households being located in rural areas. Employment to population ratio is estimated at 46.3%, with the percentage of employed population in market-oriented agriculture, industry and in services being 40.5%, 20.4% and 39.1%, respectively (NISR, 2021)[29].

Development Innovation, Wageningen University and Research. Report WCDI-18-022, Wageningen. https://edepot.wur.nl/466985

23 *WHO (2005) Mercury in drinking-water: Background document for development of WHO Guidelines for Drinking-water Quality. World Health Organization (WHO), Geneva. https://www.who.int/water_sanitation_health/dwq/chemicals/mercuryfinal.pdf*

24 *NISR-MINECOFIN (2012) Fourth Rwanda Population and Housing Census. National Institute of Statistics of Rwanda (NISR), Ministry of Finance and Economic Planning (MINECOFIN), Kigali*

25 *NISR (2015) Rwandan Integrated Household Living Conditions Survey 2013/14, Main Indicators Report, National Institute of Statistics of Rwanda (NISR), Kigali. https://www.statistics.gov.rw/file/4445/download?token=9YG7-2UO*

26 *NISR (2018) EICV5 Main Indicators Report, November 2018. National Institute of Statistics of Rwanda (NISR), Kigali. https://www.statistics.gov.rw/file/7279/download?token=ns9PQDK8*

27 *NISR (2021) Rwanda Household Survey 2019/2020 report, March 2021 National Institute of Statistics of Rwanda (NISR), Kigali. https://www.statistics.gov.rw/file/9703/download?token=4JqM-Qbz*

28 *NISR-MoH-ICF (2021) Rwanda demographic and health survey 2019-20 Final report. National Institute of Statistics of Rwanda (NISR) - Ministry of Health (MoH) and ICF International. Kigali (Rwanda) and Maryland (USA).*

29 *NISR (2021) Rwanda Statistical Yearbook 2021, December 2021. National Institute of Statistics of Rwanda (NISR), Kigali, 173 pp.*

1.3.2. Development indicators and economic profile

Based on the Integrated Household Living Conditions Surveys conducted at three year intervals, Rwanda has shown some positive development in its socio-economic profile (Table I.1, NISR, 201525; NISR, 201826; NISR, 202127). The improvement in the standards of living for the general population facilitates the implementation of the Minamata Convention on Mercury as it ensures increased capacities to meet its obligations and address the adverse impact of mercury on human health and the environment.

TABLE I.1 SELECTED DEVELOPMENT INDICATORS TREND

Area	Indicator Name	Value by assessment period (%)				
		2005/06 EICV2	2010/11 EICV3	2013/14 EICV4	2016/17 EICV5	2019/20 EICV6
Poverty	Households under poverty	56.7	44.9	39.1	38.2	38.2
	Households under extreme poverty	35.8	24.1	16.3	16.0	16.0
Education	Literacy rate, people aged 15-24	76.9	83.1	86.2	86.5	86.3
House-holds	Using electricity as main source of lighting	4.3	10.8	19.8	27.1	39.9
	Using firewood as main cooking fuel	88.2	86.3	83.3	79.9	77.7
	Using charcoal as main cooking fuel	7.9	10.6	15.2	17.4	17.5
	Using crop waste as main cooking fuel	2.7	2.3	0.8	0.6	0.5
	Using improved drinking water source	70.3	74.2	84.8	87.4	89.2
	Using improved sanitation	58.5	74.5	83.4	86.2	89.6
Health	Average time to reach a healthcare centre (minutes, walk)	95.1	61.4	56.5	49.9	47.3
	Prevalence of health insurance	43.3	68.8	70.0	73.9	87.3

Rwanda's economy remains largely agriculture-based (Table I.2). However, as from 2014, the industrial sector has been growing significantly, notably because of increasing manufacturing activities (NISR, 2015[30]; 2021[31]). Between 2018 and 2020, the construction industry showed significant growth, largely due to government efforts to attract foreign investments. From 2020, Rwanda has also experienced the global economic recession due the outbreak of COVID-19. The GDP of Rwanda in 2020 amounted to RWF9, 746 billion, equivalent to USD 10.18 -13824[32] as shown in Table I.2.

TABLE I.2 RWANDA MACRO-ECONOMIC AGGREGATES

Sector	Gross Domestic Product										
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
National (billion RwF at year* prices)	3,323	3,846	4,435	5,837	5,619	5.837	6,842	7,694	8,302	9,315	9,746
Agriculture, Forestry and Fishing (%)	33	32	33	33	25	24	25	26	25	24	26
Industry (%)	13	14	14	15	14	17	17	17	17	19	19

30 *NISR (2015) Rwandan Integrated Household Living Conditions Survey 2013/14, Main Indicators Report, National Institute of Statistics of Rwanda (NISR), Kigali. https://www.statistics.gov.rw/file/4445/download?token=9YG7-2UO*

31 *NISR (2021) Rwanda Statistical Yearbook 2021, December 2021. National Institute of Statistics of Rwanda (NISR), Kigali, 173 pp.*

32 *World Bank*

Sector		Gross Domestic Product										
		2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
of which	Mining and quarrying (%)	1	2	2	2	2	1	2	2	2	1	1
	Manufacturing (%)	5	5	5	5	5	5	7	8	8	8	9
	Electricity (%)	<1	<1	<1	<1	<1	<1	1	1	1	1	1
	Water and waste management (%)	<1	<1	<1	<1	<1	<1	1	<1	<1	1	1
	Construction (%)	6	7	7	7	7	7	7	6	6	8	8
Services (%)		48	47	47	47	47	47	49	48	50	49	46

*Source: NISR, 2015[30]; 2021[31]; *2010-2015 using 2016 prices; 2016-2020 using 2021 prices*

1.3.3. Energy

This section examines Rwanda's energy resources in a general context in terms of the country's energy mix, and more specifically on energy resources related to mercury stocks and supply for Rwanda. The mercury inventory system accounts for mercury emissions and releases from the extraction and use of both fossil and biomass fuels, and from geothermal energy uses. Other forms of energy, such as hydropower and solar, could be important clean forms of energy, reducing both greenhouse gas and mercury emissions, but they are not considered in the inventory compilation process.

The country's energy mix for electricity generation has decreased its reliance on diesel by 47% over the period 2016-2021 in favour of other energy sources, particularly hydro and methane from Lake Kivu (Table I.3). Use of hydro power does not result in emissions or releases of mercury or releases of mercury (besides those linked to the construction of dams and other hydroelectric infrastructure), and therefore the increase in its use may be seen as a positivedevelopment in terms of mitigation against mercury. The use of the solid fossil (peat) increased 22-fold between 2015 and 2021, even if the 2021 consumption remains marginal in the total energy mix. This development has likely led to increased mercury emissions in air, particularly if the peat used contains considerable traces of mercury and no measures to control air pollution are taken.

TABLE I.3 RWANDA ENERGY MIX FOR ELECTRICITY GENERATION (2016-2021)

Primary energy source	Energy generated by reporting year (GWh)					
	2016	2017	2018	2019	2020	2021 (%)
Hydro	271.9	277.2	333.8	337.5	387	494.4 (51.8)
Methane	114.5	197.6	195	213.1	213.6	206.8 (21.7)
Diesel	174.5	129.6	138.7	158.7	135.9	92.7 (9.7)
Solar	13.9	14.5	16.9	18.1	17.7	18.1 (1.9)
Peat	1.4	14.3	15.3	31	19	30.6 (3.2)
Import	56.9	22.9	31.5	32	31.95	29.7 (3.1)
Shared	18.9	56	50.2	63.9	69.2	82.3(8.6)
Total	652.1	712.1	781.4	854.2	872.6	954.7 (100)

Source REG (2021) [33]

33 REG (2021) Annual report For Rwanda Energy Group of the Year 2020-2021. Rwanda Energy Group (REG), Kigali. https://www.reg.rw/fileadmin/REG_ANNUAL_REPORT_2020-2021_V3.pdf

In 2016, electricity accounted for only 2% of energy use in Rwanda (MINIFRA, 2018)[34] and, out of the 872.6 GWh of electricity generated in 2020 (Table I.3), 18.7% is put to residential use, while the remainder is used in manufacturing, construction, agriculture, mining and service industries (RURA, 2020)[35]. Solid biomass (including, firewood, charcoal, crop residue, livestock manure, sawdust and wood shavings) and biogas methane account for 85% of all energy consumed in Rwanda (MINIFRA, 2018)[34]. Of the listed biomass resources, about 78% of the households in Rwanda use firewood as their main cooking fuel, followed by charcoal (17.5%) and gas (4.2%) (NIRS, 2021)[36]. Other primary sources of energy include petroleum (13% of energy consumed in Rwanda, MINIFRA, 2018)[34]. Petroleum is used in transport (as motor gasoline and diesel oil), electricity generation (as diesel oil and residual fuel oil), and cooking (as liquid petroleum gas, LPG). The burning of fossil fuels and biomass is known to contribute to mercury emissions to air and is therefore a risk for e human health and the environment in Rwanda.

According to MINIFRA (2018)[34] and REG (2021)[37] Rwanda's geothermal potential is yet to be proven; however, studies have identified Karisimbi, Kinigi, Gisenyi and Bugarama as promising areas, with potential to generate about 120 MWe (+/- 50MWe) in Rwanda. Geothermal systems, if exploited, can be anthropogenic sources of mercury that may be emitted to air.

Mining and construction industry

The mercury inventory system accounts for mercury emissions and releases from the production of primary minerals (ferrous and non-ferrous metals), cement clinker production, lime production, light weight aggregates production. While Rwanda has some ore deposits for the non-ferrous metals zinc (Zn), copper (Cu) and lead (Pb), these metals together with aluminium (Al) are not being mined. Primary gold production in Rwanda increased considerably between 2010 and 2020. The extraction and processing of cassiterite, coltan and wolfram are the most dominant mining activities in Rwanda. The mining of limestone and production of cement increased 6 and 4-fold, respectively, between 2010 and 2020. Rwanda also has deposits of iron ores that are not mined.

1.4. ENVIRONMENTAL PROFILE

The key drivers of environmental change in Rwanda are population, industries (including mining and manufacturing industries), agriculture, tourism and climate change (REMA, 2021)[38]. Pressure on the environment increases with population growth as this corresponds to increasing need for infrastructure, goods and services.

Population growth also results in fast-growing waste generation and high demand in public services including solid waste management services. Domestic solid waste management in Rwanda includes compositing on own property, disposal in the household fields or bushes, disposal through rubbish collection services, dumping in water bodies such as rivers and lakes, dumping at publicly managed

34 *MINIFRA (2018) Energy sector strategic plan 2018/2019 – 2023/2024. Ministry of Infrastructure (MINFRA), Kigali*
35 *RURA (2020) Statistics in electricity sub-sector as of December of year 2020. Rwanda Utilities Regulatory Authority (RURA), Kigali. https://rura.rw/fileadmin/Documents/Energy/Statistics/Report_for_Electricity_Statistics_as_of_December_2020__1_.pdf*
36 *NISR (2021) Rwanda Household Survey 2019/2020 report, March 2021 National Institute of Statistics of Rwanda (NISR), Kigali. https://www.statistics.gov.rw/file/9703/download?token=4JqM-Qbz*
37 *REG (2021) Least Cost Power Development Plan: 2019-2040. Rwanda Energy Group (REG), Kigali. https://www.reg.rw/fileadmin/user_upload/Least_Cost_Power_Development_Plan_2020-2024.pdf (accessed 26/05/2022)*
38 *REMA (2021) Rwanda state of environment and outlook report 2021: Summary for policymakers, Kigali https://www.rema.gov.rw/fileadmin/user_upload/Rwanda_SOER_-_Summary_for_Policy_Makers_Final-HR.pdf/*

refuse areas and burning of the waste (NISR, 2015[39]; NISR, 2018[40]; NISR, 2021[41]). The national surveys show that between 2010 and 2020 the largest proportion of domestic solid waste is composted on own property (47 – 59%), followed by disposal in household's field or bushes (31 – 47%), rubbish collection services (5 - 10%), dumped on publicly managed refuse areas (about 2%), and other methods (>1%). Potential mercury sources in domestic waste include broken and disused light sources with mercury (including fluorescent bulbs), electronic devices, batteries, packaging material including those for some cosmetics and pesticides. Without proper handling, the majority of waste management options have high potential to expose populations to mercury.

The burning of domestic waste is not widespread in Rwanda; however, it is a common practice for medical and other hazardous industrial wastes. Burning waste containing traces of mercury without effective air pollution control results in emission of mercury into the air and may leave some mercury in bottom ash of the waste.

Rwanda has a national electronic waste management policy (RoR, 2018)42 and, at the beginning of 2020, the country opened its first e-waste recycling and refurbishing facility called Enviroserve. The facility has the capacity to process about 10,000 tons of waste annually by recovering materials and refurbishing of electronic items for resale. Some electronic wastes are associated with mercury as a constituent and these include wastes of disused personal computers, air conditioners, televisions, refrigerators, washing machines, microwaves, and home driers.

Mercury was also identified in a policy brief by a group of medical practitioners in Rwanda (Hackely et al., 2020)43 as a major component of dental amalgam that requires to be substituted as the placement and removal of the amalgam generates mercury-containing waste. The medical practitioners recommended reducing mercury waste from dental amalgams by using mercury-free restorative materials, such as resin composite.

39 *NISR (2015) Rwandan Integrated Household Living Conditions Survey 2013/14, Main Indicators Report, National Institute of Statistics of Rwanda (NISR), Kigali. https://www.statistics.gov.rw/file/4445/download?token=9YG7-2UO*

40 *NISR (2018) EICV5 Main Indicators Report, November 2018. National Institute of Statistics of Rwanda (NISR), Kigali. https://www.statistics.gov.rw/file/7279/download?token=ns9PQDK8*

41 *NISR (2021) Rwanda Household Survey 2019/2020 report, March 2021 National Institute of Statistics of Rwanda (NISR), Kigali. https://www.statistics.gov.rw/file/9703/download?token=4JqM-Qbz*

42 *RoR (2018) National e-waste management policy. Republic of Rwanda, Kigali. https://www.eaco.int/admin/docs/reports/RW-04_National_E_waste_Policy_2018_Revision.pdf*

43 *Hackley, D., Ndisanze, A. Mu, J. and Ntakirutimana, T. (2020) Brief: waste management considerations for oral health professionals in Rwanda. Harvard School of Dental Medicine, Massachusetts (USA). https://hsdm.harvard.edu/files/dental/files/policy_brief_rwanda_-_final_jan_28_2020_1.pdf*

CHAPTER II: MERCURY INVENTORY AND IDENTIFICATION OF SOURCES

2.1. INTRODUCTION

The MIA has been developed in a bid to assist the Government of Rwanda to prepare for the implementation of the Minamata Convention on Mercury. Its goal is to enable the Government to determine the national requirements and needs for fulfilling the obligations under the Minamata Convention. It helps to define national priorities for implementing the Convention, to explore the implications of the conventionon the Parties, and to sets out an education, awareness-raising and capacity building strategy. By addressing these national requirements and priorities, the Government will be better poised to implement the requirements of the Convention in a sustainable manner. Such efforts will set the country on a trajectory to meet its obligations under the Minamata Convention.

Mercury (Symbol Hg) is a naturally occurring element that can be released to the environment from both geo-genic and anthropogenic processes. Natural processes such as the slow weathering of mercury-containing rocks, forest fires, volcanic activity or geothermal activities result in the release of mercury. There are three major types of anthropogenic mercury releases and emissions, namely:

1. Mercury traces in raw materials such as fossil fuels; to a larger extent from coal and to a lesser extent gas, oil and other minerals;

2. Mercury in products. Mercury is intentionally used in certain products and processes, due to releases during manufacturing, leaks, disposal or incineration of mercury containing products; and

3. Historic anthropogenic mercury releases previously deposited in soils, sediments, water bodies, landfills and mine tailings.

These three broad processes can be further broken down into 10 Source Categories as presented in Table II.1. These source-categories are listed in the Mercury Inventories toolkit and were used during the preparation of the MIA.

TABLE II.1 **EXISTENCE OF MERCURY SOURCES IN RWANDA BY CATEGORY**

Toolkit Ref.	Source Category	Existence in Rwanda
5.1	Extraction and use of fuels / energy sources	YES
5.2	Primary (virgin) metal production	YES
5.3	Production of other minerals and materials withmercury impurities	YES
5.4	Intentional use of mercury in industrial processes	NO
5.5	Consumer products with intentional use of mercury	YES
5.6	Other intentional products / process uses	YES
5.7	Production of recycled metals ("secondary" metalproduction)	YES
5.8	Waste incineration	YES
5.9	Waste deposition / landfilling and waste water treatment	YES
5.10	Crematoria and cemeteries	YES

These source categories are further sub-divided into 53 subcategories that can result in the anthropogenic releases of mercury into the environment.

2.2. METHODOLOGY

2.2.1. General Overview

The UNEP Toolkit for Identification and Quantification ofMercury Releases (Version 2.1, UN Environment, 2019)[44], hereafter referred to as the Toolkit, was used to guide the development of the inventory and in particular to identify sources and quantify consumption, emissions and releases of mercury from these sources.

The inventory was developed using the level 2 and the quantities of mercury releases andemissions in Rwanda were computed based on mass balance approach as provided for by the toolkit. National, regional and international information sources were used to collect mercury related data for the identified sources of mercury, completed by field visits to verify and assess processes and technologies that are currently being applied in Rwanda. Data sources included the UN Comtrade, U.S. Geological Survey (USGS), FAO's reports and the International Energy Agency's database among others. Stakeholders were engaged through key informant interviews and solicitations of expert judgement (see Annex C) to collectrelevant qualitative and quantitative data. The approach is summarised in Table II.2. Data collected included: (1) Mercury release source types present, (2) Mercury inputs to society, (3) Mercury releases, (4) Mercury stockpiles, and supply and trade.

TABLE II.2 RWANDA MIA INVENTORY APPROACH

Task	Methodological approach
Engagement of specific targeted groups e.g., Industry, Schools, Colleges, Universities, Institutions, Churches, Villages, Communities	Stakeholders were engaged throughout the process to ensure their inputs, comments and concerns were captured. The use of various engagement platforms was employed to ensure adequate participation. These included meetings, telephonic interviews, face-to-face interviews, surveys and use of email data requests.
Development of a qualitativeand quantitative inventory ofall mercury sources and releases (Use of the toolkit)	**Quantifications of mercury releases and emissions** • Information from document reviews, surveys, key informant interviews and solicitations of expert judgement were used to develop the quantitative aspects of the inventory. • The UNEP mercury inventory toolkit was used in quantitative inventory processes. Activity data rate was obtained from national and international sources. The data was used in the inventory toolkit to calculate the estimated quantity of mercury released or emitted from specific sub-categories. The summation of the various totals from the sub-categories provided the total amount of mercury released in Rwanda. **Field Visits:** • Field level observations and findings formed the basis for the qualitative part of the inventory. Some of the primary data collected was used to validate the activity data rate that was used in the quantification of mercury releases and emissions.

2.2.2. Field Visits

A preliminary site investigation and initial site screening was undertaken by REMA covering all provinces of Rwanda. The visits provided an indication of sites prioritized by the consultants for detailed assessment. The consultants visited key sites that were important for the development of the inventory based on the 10 subcategories of the UNEP toolkit. Figure II.1 shows the location of sites visited by REMA and the consultants during the preparation of the mercury inventory for

44 *UN Environment (2019). Toolkit for Identification and Quantification of Mercury Sources. Guideline for Inventory Level1, Version 2.1. UN Environment Chemicals and Health Branch, Geneva, Switzerland*

Rwanda. The purpose of the field visits was to identify key mercury sources in Rwanda, to identify the processes that exist in Rwanda in relation to the releaseand emission of mercury as well as to gather qualitative information that would be needed to explainthe finding of the inventory.

1.2.3. Quantification of Mercury Releases

The mercury inventory was conducted based on standard methodological approaches developed and documented in the Toolkit. There are two levels for conducting mercury inventories, Level 1 and Level 2. Level 1 is simple, less detailed and uses default input factors, which cannot be modified by experts. Level 2 inventory is more detailed and flexible, giving experts the opportunity to use country specific factors. This inventory was based on Level 2.

Mercury, as an element, cannot be formed nor destroyed during this life cycle, but it can change form. In preparing the inventory, a life-cycle approach, was therefore considered, which assumes that mercury releases may occur at all stages of the life cycle of a mercury-added product or process. The processapproach was essential in determining the quantity of mercury releases and emissions in Rwanda.

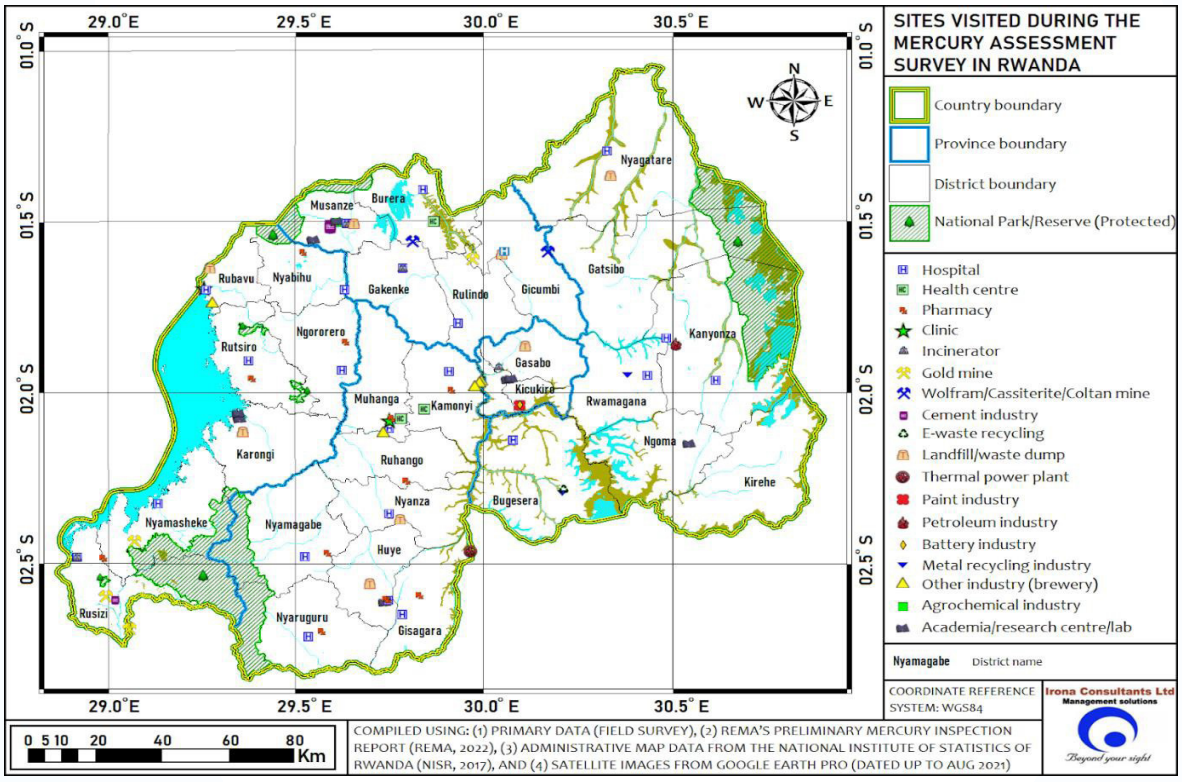


Figure II 2. Sites visited during the mercury assessment survey in Rwanda

A consideration of the inputs, processes and outputs of individual processes was key in informing the inventory. Thus, to estimate mercury releases and emissions for a specific process, one first calculates the initial mercury input, which is the total amountof mercury generated bv that activity, and then distributes that mercury input to the various release pathways during the d -cycle stages of the particular product or process. Noting this approach, the Toolkit ther s with the parameters "mercury input" and "output distribution". Due to differences in processes, not all the stages in the life cycle have equal potential to release mercury. Differences in the way processes are conducted, the use of different technologies, including pollution control devices, significantly determine the quantity of mercury that is released into the environment via a certain release pathway.

The Toolkit uses activity rates, input factors and output distribution factors in the calculation ofthe total amount of mercury released or emitted from a particular process or product, for any particular process or product. The activity rate is the amount of feed material processed or product produced per unit of time (e.g., tonnes or pieces per year). The input factor is the mercury content (e.g., in grams of mercury) per unit of feed material processed or per item of productproduced or used. The activity rate and the input factor are multiplied together to get the mercury input, which is a measure of the total mercury that can be released from a processor product. Ideally, the input factor for a particular process or product should be site-specific to take into account local parameters. However, site-specific input factors have not been developed for most countries, including Rwanda, and, for such cases, the Toolkit provides default input factors. For Rwanda, an input factor from the region (South Africa) was used for large scale gold production instead of the intermediate default input factor.

Once the mercury input has been calculated, it is multiplied by output distribution factors to determine the amount of mercury (output) that is released through each pathway (air, water, land,product, general waste, or sector specific waste treatment). Different processes or products may be subjected to various pollution abatement systems (referred to as output scenarios), which will result in different mercury output distributions. The most complex systems will generally result in reduced mercury outputs to the atmosphere. The amount of mercury released from a particular process or product to a certain pathway may therefore be calculated as shown in Equation 1:

Equation 1:

$$Estmated\ Mercury\ release\ to\ pathway = Activity\ rate * Input\ Factor * Output\ distribution\ factor$$

Where:

- *Activity rate = the amount of mercury containing material fed into the system*
- *Input factor = general data on the mercury concentration in the feed material*
- *Output distribution factor = determine how the mercury output is spread into various release pathways based on available data on how the releases are generally spread in a particular sector*

Data on activity rate was collected using interview guides and questionnaires for the different sources which had been identified as being present in Rwanda. The questionnaires were sent out, and followed up by telephone, email, and in some cases, face to face meetings. Data on activity rate was collected for 2018, as this was selected to be the base year. In some cases, data from various years were used when data for 2018 was not available. In such cases, the report specifically mentions the year that was used. Where the year is not mentioned, it should be assumed that such data is for 2018.

2.3. SUMMARY OF ASSUMPTIONS

TABLE II.3 SHOWS THE ASSUMPTIONS MADE DURING THE PREPARATION OF THEINVENTORY.

Toolkit Ref.	Mercury Source Category	Assumptions(s)
All	All	Rwanda's environmental settings do not significantly differ from those of other countries in the region An electrification rate of 50% was used noting that these are the people connected to the main grid A national population of 12,089,712 was used based on estimates by the NISR

5.1	Extraction and use of fuels/energy sources	Methane extracted from lake Kivu is not fossil
5.2	Primary (virgin) metal production	The amount of gold reported by NISR is all from primary metal production There is no country specific mercury input factor to estimate mercury emitted or released as a result of non-ferrous metal extraction and therefore these emissions were not accounted for
5.3	Production of other minerals and materials with mercury impurities	There is no paper production that is done from trees in Rwanda Filters from air pollution control devices are managed in an environmentally sound manner
5.5	Consumer products with intentional use of mercury (whole life cycle)	The formal figures reported are reflective of the flows of products The quantities of products that were unaccounted for and those obtained informally were assumed to be insignificant
5.8	Waste incineration and burning	All medical waste generated is incinerated and there is no illegal dumping of medical waste
5.10	Crematoria and cemeteries	The number of bodies cremated is negligible

***Table II.3** Summary of assumptions*

2.4. SUMMARY OF MERCURY RELEASES AND EMISSIONS IN RWANDA

The mercury inventory in Rwanda revealed that a total of 19,558.85 kg/year of mercury could be emitted or released from the 10 source categories. It is important to note that in the event that Rwanda develops country specific input factors in a bid to improve the accuracy of the mercury inventories, the total amount of mercury released annually may vary from the current figure, which was obtained using default input factors.

The total amount of mercury emissions and releases is distributed as follows; 2,396.58 kg are emitted to air, 544.01 kg are released to water, 13,480.66 kg are released to land, 600.41 kg are partitioned to by-products and impurities, 2,415.00 kg are released to general waste and 122.19kg are released into sector specific treatment or disposal. The main potential source of mercury releases and emissions in Rwanda appears to be the extractive industrial sector (Primary metal production), which is consistent with findings from other countries in the region. Primary metal production accounts for 75.0 % of total mercury emissions and releases in Rwanda. Consumer products with intentional use of mercury account for 12.2% of mercury releases and emissions, while waste management contribute 10.3%. The remaining 2.5% comes from other sources; ***Table II.4*** refers.

TABLE II.4 SUMMARY OF MERCURY RELEASES AND EMISSIONS

Source category	Calculated Hg output, Kg/y							
	Air	Water	Land	By-products and impurities	General waste	Sector specific treatment /disposal	Total releases by source category	Percent of total releases*3*4
5.1: Extraction and use of fuels/energy sources	77.41	1.38	-	3.45	-	1.17	83.42	0.43%
5.2: Primary (virgin) metal production	586.37	293.19	13,193.39	586.37	-	-	14,659.32	74.95%

5.3: Production of other minerals and materials with mercury impurities*1	31.75	-	-	10.58	-	10.58	52.92	0.27%
5.4: Intentional use of mercury in industrial processes	-	-	-	-	-	-	-	0.00%
5.5: Consumer products with intentional use of mercury (whole life cycle)	107.18	21.61	84.63	-	2,175.82	-	2,389.23	12.22%
5.6: Other intentional product/process use*2	4.01	116.70	-	-	123.80	108.68	353.19	1.81%
5.7: Production of recycled metals	-	-	-	-	-	-	-	0.00%
5.8: Waste incineration and burning	1,476.76	-	-	-	-	1.75	1,478.51	7.56%
5.9: Waste deposition/ landfilling and waste water treatment*3*4	113.10	1,153.64	1,085.04	-	115.83	-	2,467.61	2.74%
5.10: Crematoria and cemeteries	-	-	6.49	-	-	-	6.49	0.03%
SUM OF QUANTIFIED RELEASES*3*4	2,396.58	544.01	13,480.66	600.41	2,415.00	122.19	19,558.85	100.00%

Table notes:

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

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

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

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

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

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

2.3.1. Mercury Releases; Source type present

The onset of the MIA inventory process was marked with the identification of the source categories present in Rwanda. It was found that of the 53 source sub- categories known as releasing or emitting mercury into the environment, 26 are present in Rwanda. Table II.5 shows which sources are present in Rwanda.

TABLE II.5 MERCURY SOURCE CATEGORIES PRESENT IN RWANDA

Toolkit Category Ref.	Toolkit Subcategory Ref.	Description	Status of Existence in Rwanda
5.1		Source category: Extraction and use offuels/energy sources	

Toolkit Category Ref.	Toolkit Subcategory Ref.	Description	Status of Existence in Rwanda
	5.1.1	Coal combustion in power plants	N
	5.1.2.1	Coal combustion in coal fired industrial boilers	Y
	5.1.2.2	Other coal use	N
	5.1.3	Mineral oils - extraction, refining and use	Y
	5.1.4	Natural gas - extraction, refining and use	Y
	5.1.5	Other fossil fuels - extraction and use	Y
	5.1.6	Biomass fired power and heat production	Y
	5.1.7	Geothermal power production	N
5.2		Source category: Primary (virgin) metalproduction	
	5.2.1	Mercury (primary) extraction and initial processing (a	N
	5.2.2	Gold (and silver) extraction with mercuryamalgamation processes	N
	5.2.3	Zinc extraction and initial processing	N
	5.2.4	Copper extraction and initial processing	N
	5.2.5	Lead extraction and initial processing	N
	5.2.6	Gold extraction and initial processing by methodsother than mercury amalgamation	Y
	5.2.7	Aluminium extraction and initial processing	N
	5.2.8	Other non-ferrous metals - extraction and processing	Y
	5.2.9	Primary ferrous metal production	N
5.3		Source category: Production of other minerals andmaterials with mercury impurities	
	5.3.1	Cement clinker production	Y
	5.3.2	Pulp and paper production	N
	5.3.3	Production of lime and light weight aggregates	Y
5.4		Source category: Intentional use of mercury inindustrial processes	
	5.4.1	Chlor-alkali production with mercury-technology	N
	5.4.2	VCM production with mercury catalyst	N
	5.4.3	Acetaldehyde production with mercury catalyst	N
	5.4.4	Other production of chemicals and polymers withmercury	N
5.5		Source category: Consumer products withintentional use of mercury	
	5.5.1	Thermometers with mercury	Y
	5.5.2	Electrical switches and relays with mercury	Y
	5.5.3	Light sources with mercury	Y
	5.5.4	Batteries with mercury	Y
	5.5.5	Polyurethane with mercury catalysts	Y
	5.5.6	Biocides and pesticides with mercury	N
	5.5.7	Paints with mercury	N
	5.5.8	Pharmaceuticals for human and veterinary uses	N
	5.5.9	Cosmetics and related products	N

Toolkit Category Ref.	Toolkit Subcategory Ref.	Description	Status of Existence in Rwanda
5.6		Source category: Other intentionalproduct/process use	
	5.6.1	Dental mercury-amalgam fillings	Y
	5.6.2	Manometers and gauges with mercury	Y
	5.6.3	Laboratory chemicals and equipment with mercury	Y
	5.6.4	Mercury metal use in religious rituals and folkloremedicine	N
	5.6.5	Miscellaneous product uses, mercury metal uses, andother sources	N
5.7		Source category: Production of recycled metals("secondary" metal production)	
	5.7.1	Production of recycled mercury ("secondaryproduction")	N
	5.7.2	Production of recycled ferrous metals (iron and steel)	Y
	5.7.3	Production of other recycled metals	Y
5.8		Source category: Waste incineration	
	5.8.1	Incineration of municipal/general waste	N
	5.8.2	Incineration of hazardous waste	N
	5.8.3	Incineration of medical waste	Y
	5.8.4	Sewage sludge incineration	N
	5.8.5	Informal waste burning	Y
5.9		Source category: Waste deposition/landfilling andwaste water treatment	
	5.9.1	Controlled landfills/deposits	Y
	5.9.2	Diffuse disposal under some control	N
†	5.9.3	Informal local disposal of industrial production waster	N
	5.9.4	Informal dumping of general waste	Y
	5.9.5	Waste water system/treatment	Y
5.10		Source category: Crematoria and cemeteries	
	5.10.1	Crematoria/cremation	Y
	5.10.2	Cemeteries	Y

Note:

Only source categories positively identified as present were included in the quantitativeassessment.

2.3.2. Summary of Mercury Inputs to Society and their distribution into various pathways

a. A summary of mercury inputs to the Rwandan society is provided in Error! Reference source not found.4. The table presents assessed mercury quantities released by anthropogenic activities in Rwanda. The following source sub categories made the largest contributions to mercury inputs to society: Primary (virgin) metal production – contributing 74.95% of the total releases of mercury annually.

b. Consumer products with intentional use of mercury - contributing 12.2% of the total mercury releases annually.

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

a. Waste deposition/landfilling and wastewater treatment – contributing 2.74% of the total releases of mercury annually.

a. Waste incineration – contributing 7.56% of the total releases of mercury annually.

The mercury inputs to society presented were further analysed considering the various output distribution factors into air, water, land and other release pathways (Figure II.2). It was noted that 12.25% of the total mercury input is released into the atmosphere, 2.78% into water and 68.92% into land, 12.35% will be released into general waste and the remaining 3.69% will be released into other release pathways which include sector specific, by-products and impurities. Figure II.5 shows the distribution of mercury releases by different release pathways. The major release pathways were noted to be to (a) Land, (b) General Waste, (c) Air and (d) Water. Table II.6 shows the Toolkit results of Mercury releases to the various release pathways for Rwanda by subcategories.

Figure II.2 Summary of mercury releases by release pathway

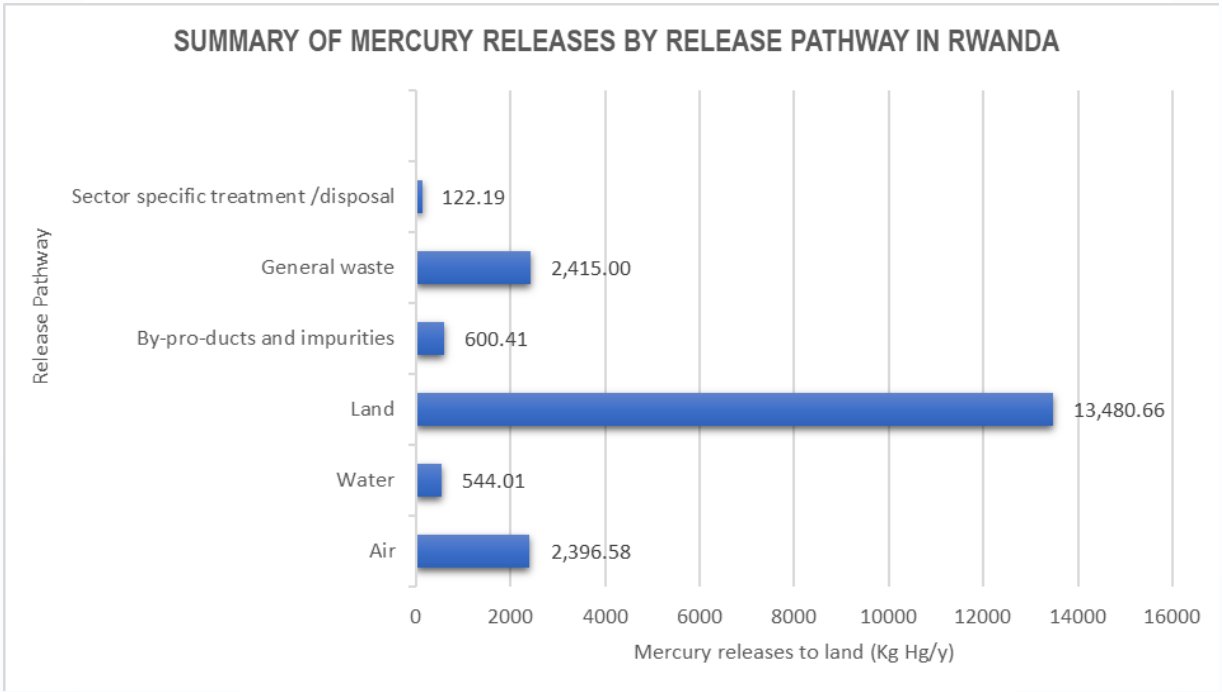


Figure II 3. Summary of mercury releases by release pathway

TABLE II.6 **RWANDA MERCURY RELEASES INTO VARIOUS RELEASE PATHWAYS**

Sub-C	Source category	Calculated Hg input to society	Calculated Hg output, Kg/y					
			Air	Water	Land	By-pro-ducts and impurities	General waste	Sector specific treatment/disposal
	Source category: Extraction and use of fuels/energy sources							
5.1.1	Coal combustion in power plants	0	0	0	0	0	0.0	0
5.1.2.1	Coal combus-tion in coal fired industrial boilers	8	8	0	0	0	0	0
5.1.2.2	Other coal use	0	0	0	0	0	0	0
5.1.3	Mineral oils - extraction, refining and use	1	1	0	0	0	0	0
5.1.4	Natural gas - extraction, refining and use	56	50	1	0	3	0	1
5.1.5	Other fossil fuels - extraction and use	0	0	0	0	0	0	0
5.1.6	Biomass fired power and heat production	19	19	0	0	0	0	0
5.1.7	Geothermal power production	0	0	0	0	0	0	0
	Source category: Primary (virgin) metal production							
5.2.1	Mercury (primary) extraction and ini-tial processing (a	0	0	0	0	0	0	0
5.2.2	Gold (and silver) extraction with mercury amalga-mation processes	0	0	0	0	0	0	0
5.2.3	Zinc extraction and initial processing	0	0	0	0	0	0	0
5.2.4	Copper extraction and initial processing	0	0	0	0	0	0	0
5.2.5	Lead extraction and initial processing	0	0	0	0	0	0	0
5.2.6	Gold extraction and initial process-ing by methods other than mercury amalgamation	14659	586	293	13193	586	0	0
5.2.7	Aluminum extraction and initial processing	0	0	0	0	0	0	0
5.2.8	Other non-ferrous metals - extraction and processing	0	0	0	0	0	0	0

Sub-C	Source category	Calculated Hg input to society	Calculated Hg output, Kg/y					
			Air	Water	Land	By-pro-ducts and impurities	General waste	Sector specific treatment/disposal
5.2.9	Primary ferrous metal production	0	0	0	0	0	0	0
	Source category: Production of other minerals and materials with mercury impurities							
5.3.1	Cement clinker production	53	32	0	0	11	0	11
5.3.2	Pulp and paper production	0	0	0	0	0	0	0
5.3.3	Production of lime and light weight aggregates	0	0	0	0	0	0	0
	Source category: Intentional use of mercury in indus-trial processes							
5.4.1	Chlor-alkali production with mercury-tech-nology	0	0	0	0	0	0	0
5.4.2	VCM pro-duction with mercury catalyst	0	0	0	0	0	0	0
5.4.3	Acetaldehyde production with mercury catalyst	0	0	0	0	0	0	0
5.4.4	Other produc-tion of chemicals and polymers with mercury	0	0	0	0	0	0	0
Source category: Production of other min-erals and materials with mercury impurities								
5.5.1	Thermometers with mercury	42	4	13	0	-	25	0
5.5.2	Electrical switches and relays with mercury	846	85	0	85	-	677	0
5.5.3	Light sources with mercury	5	0	0	0	-	4	0
5.5.4	Batteries with mercury	1315	0	0	0	-	1315	0
5.5.5	Polyurethane with mercury catalysts	181	18	9	0	-	154	0
5.5.6	Biocides and pesti-cides with mercury	0	0	0	0	-	0	0

Sub-C	Source category	Calculated Hg input to society	Calculated Hg output, Kg/y					
			Air	Water	Land	By-products and impurities	General waste	Sector specific treatment/disposal
5.5.7	Paints with mercury	0	0	0	0	-	0	0
5.5.6	Pharmaceuticals for human and veterinary uses	0	0	0	0	-	0	0
5.5.9	Cosmetics and related products with mercury	0	0	0	0	-	0	0
	Source category: Other intentional product/process use							
5.6.1	Dental mercury-amalgam fillings (b	21	1	8	0	0	6	6
5.6.2	Manometers and gauges with mercury	30	3	9	0	0	18	0
5.6.3	Laboratory chemicals and equipment with mercury	302	0	100	0	0	100	103
5.6.4	Mercury metal use in religious rituals and folklore medicine	0	0	0	0	0	0	0
5.6.5	Miscellaneous product uses, mercury metal uses, and other sources	0	0	0	0	0	0	0
	Source category: Production of recycled metals (“secondary” metal production)							
5.7.1	Production of recycled mercury (“secondary production”)	0	0	0	0	0	0	0
5.7.2	Production of recycled ferrous metals (iron and steel)	0	0	0	0	0	0	0
5.7.3	Production of other recycled metals	0	0	0	0	0	0	0
	Source category: Waste incineration*3							
5.8.1	Incineration of municipal/ general waste	0	0	0	0	0	0	0
5.8.2	Incineration of hazardous waste	18	16	0	0	0	0	2
5.8.3	Incineration of medical waste	1459	1459	0	0	0	0	0

Sub-C	Source category	Calculated Hg input to society	Calculated Hg output, Kg/y					
			Air	Water	Land	By-pro-ducts and impurities	General waste	Sector specific treatment/disposal
5.8.4	Sewage sludge incineration	0	0	0	0	0	0	0
5.8.5	Informal waste burning	2	2	0	0	0	0	0
	Source category: Waste deposition/landfilling and waste water treatment							
5.9.1	Controlled land-fills/deposits*3	198	2	0	196	0	0	0
5.9.2	Diffuse disposal under some control	0	-	-	-	-	-	-
5.9.3	Informal local dis-posal of industrial production waste	0	0	0	0	-	-	-
5.9.4	Informal dump-ing of general waste*1*3	1111	111	111	889	-	-	-
5.9.5	Waste water sys-tem/treatment*2	1158	0	1043	0	0	116	0
	Source category: Crematoria and cemeteries							
5.10.1	Crematoria/ cremation	0	0	0	0	-	0	0
5.10.2	Cemeteries	6	0	0	6.49	-	0	0
		18982	2397	544	13481	600.40	2415	122

Note: *:

The sum of inputs shown here is the sum of inputs to source categories, This corresponds to a total net input of mercury to society at 18,982 kg Hg/y, taking into consideration that some mercury contribute to releases and emissions in several life cycle steps (use phase + waste treatment phase).

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

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

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

**3: 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.*

**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.*

2.3.3. Summary of mercury releases to Air

A total of 2,396.58 kg of mercury is released into air every year from the various release source categories in Rwanda. The majority of releases emanates from the incineration and burning of waste as shown in Figure II.3. Most incineration facilities in Rwanda, and in particular medical incineration facilities, are equipped with burning chambers that facilitate complete combustion, but lack adequate pollution control devices filtering toxic impurities like mercury from the flue gas. As such, during waste incineration, mercury is released into the environment as part of the fumes. The second major subcategory that contributes to release to air is the Primary (virgin) metal production which contributes 586.4 kg of mercury every year. The other subcategories all contribute below 200 kg of mercury per year.

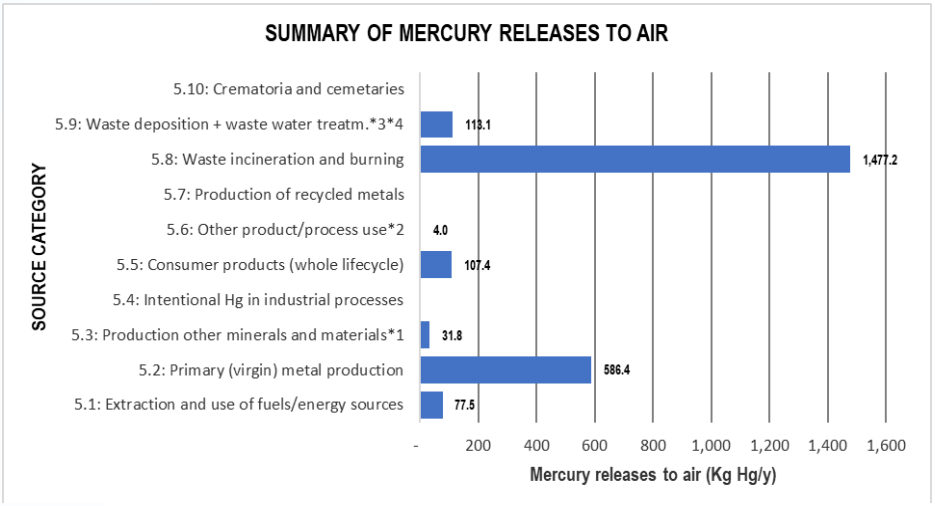


Figure II 4. *Mercury releases into air*

2.3.4. Summary of mercury releases to Water

A total of 567 kg of mercury is released from the various mercury release source categories into water annually. The majority of the releases emanates from the waste and wastewater treatment facilities as shown in Figure II.4. The absence of properly engineered sanitary disposal facilities leaves underground water sources vulnerable to mercury pollution. Mercury from the slow degradation of waste containing mercury is released into water sources, in particular in the waste dumping areas. The primary (virgin) metal production sub-category is also a major contributor to releases to water. A total of 293.2 kg of mercury per year is released from the sub-category. Similarly, the other sub-categories that remain all contribute less than 200.00 kg of mercury per year.

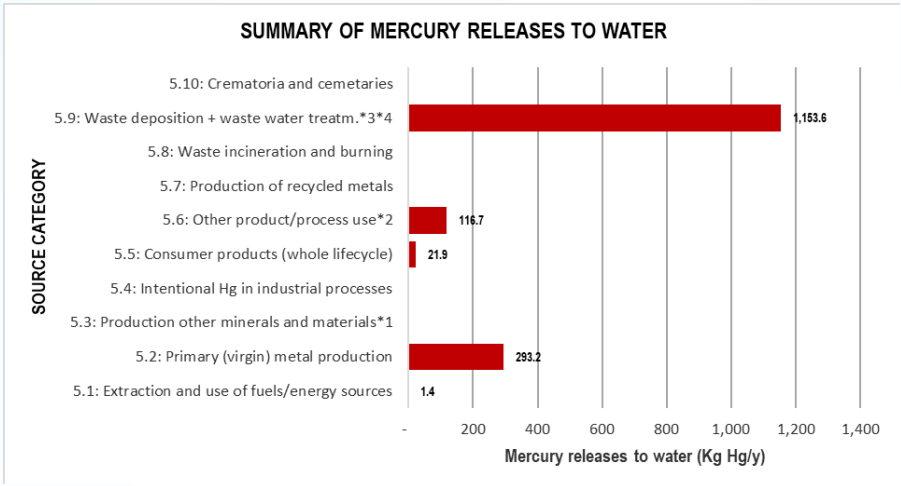


Figure II 5. *Mercury releases into water*

2.3.5. Summary of mercury releases to Land

The releases of mercury onto land are primarily from Primary metal production and waste deposition and wastewater treatment. A total of 13,480.66 kg of mercury is released to land annually. Most of the releases are from the primary metal production sector as shown in Figure II.5. Mercury emission in this sector is because of the extraction of ore for mineral extraction. During the MIA, the use of mercury for amalgamation of gold could not be observed. However, more detailed results will be provided during the NAP. Thus, the releases of mercury quantified under this MIA are for extraction processes in which mercury is not used. A total of 1,085.0 kg of mercury is released to land from the waste deposition and wastewater treatment subcategory indicating a relatively significant contribution compared to the other subcategories that contribute less than 100 kg of mercury per year.

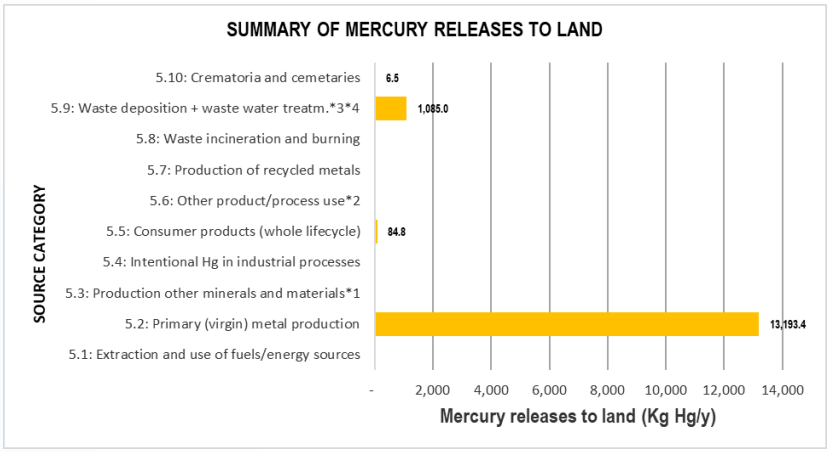


Figure II 6. Mercury releases to land

2.3.6. Summary of mercury releases to by-products and impurities

Mercury releases into by-products and impurities were found to mainly originate from the primary metal production sector, Figure II.66 refers. According to the findings of the mercury inventory, a total of 600.41 kg of mercury is released to by-products and impurities annually. The major contributing sub-category is the primary metal production, which releases 586.4 kg of mercury per year. All other sub-categories together contribute less than 20 kg of mercury per year.

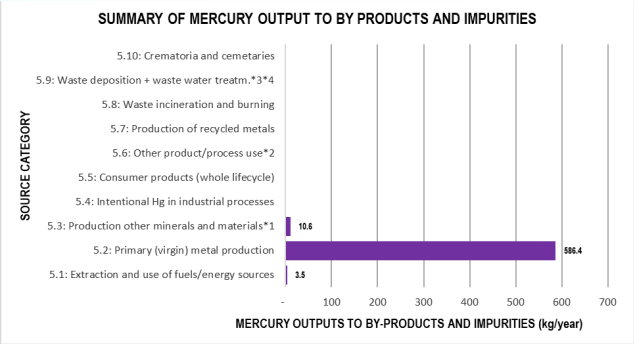


Figure II 7. Mercury outputs to by-products and impurities

2.3.7. Summary of mercury releases to general waste

Mercury releases into general waste were found to be mainly from the consumer products sector, Figure II.7 refers. According to the findings of the mercury inventory, a total of 2,415.0 kg of mercury is released annually. In Rwanda, the segregation of waste is not yet fully implemented and mercury containing products are processed together with the main waste stream. The decomposition of this waste stream results in the slow release of mercury into the environment. The situation is exacerbated by the fact that the disposal facilities are not properly engineered to control and manage leachate.

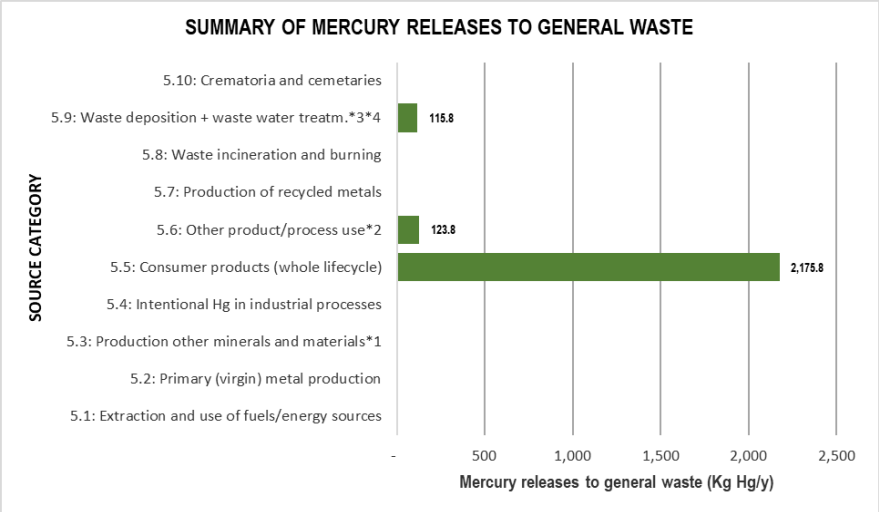


Figure II 8. Mercury releases to general waste

2.3.8. Summary of mercury releases to Specific Waste treatment and disposal

Mercury releases to specific waste treatment and disposal were found to be mainly from other product/process use sector, Figure II.8 refers. According to the findings of the mercury inventory, a total of 122.19 kg of mercury is released annually. The majority, 112.6 kg of mercury, is released from other product/process uses, with the other remaining sub-categories contributing less than 20 kg of mercury per year.

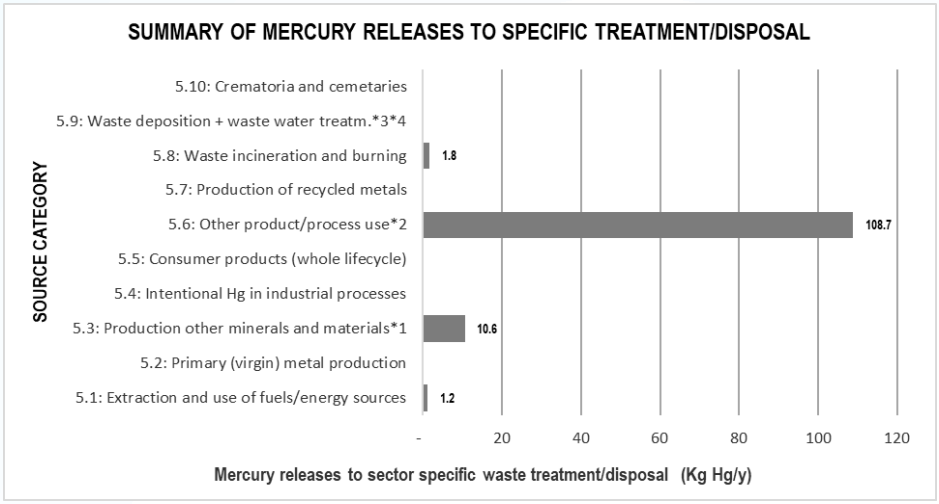


Figure II.8 Mercury releases to specific waste treatment and disposal

2.4. DETAILED INVENTORY OF MERCURY SOURCES

This section provides detailed information on how each of the sub-categories contributes to the overall mercury releases and emissions in Rwanda. The inventory focused on documenting the origin of data on mercury releases and emissions including how the data was analysed. Focus was put on describing the various unique technologies that are used in processes that contribute to the release ofmercury. Furthermore, pollution control devices and pollution abetment technologies currently used in the various industrial sectors were described to provide a clear picture of the various release and emission source sub-categories present in Rwanda.

2.4.1. Extraction and Use of Fuels/Energy Sources

Extraction and use of fuels, including electricity production (Figure II.9), is one of the categories that contributes to the release and emission of mercury in Rwanda. Table II.88 shows the key contributing sectors under this sub-category. Unlike many countries, Rwanda does not use coal for electricity generation. However, coal is used in industries, particularly in the firing of boilers. Gas extraction is one of the major contributing sectors under this sub category. Biomass burning in Rwanda is the most important source of energy, contributing to more than 80% of the country's total energy demands. As such, emission of mercury from combustion of biomass, though relatively low when looking at the individual level, is significant at the national level and widely spread across the entire country.

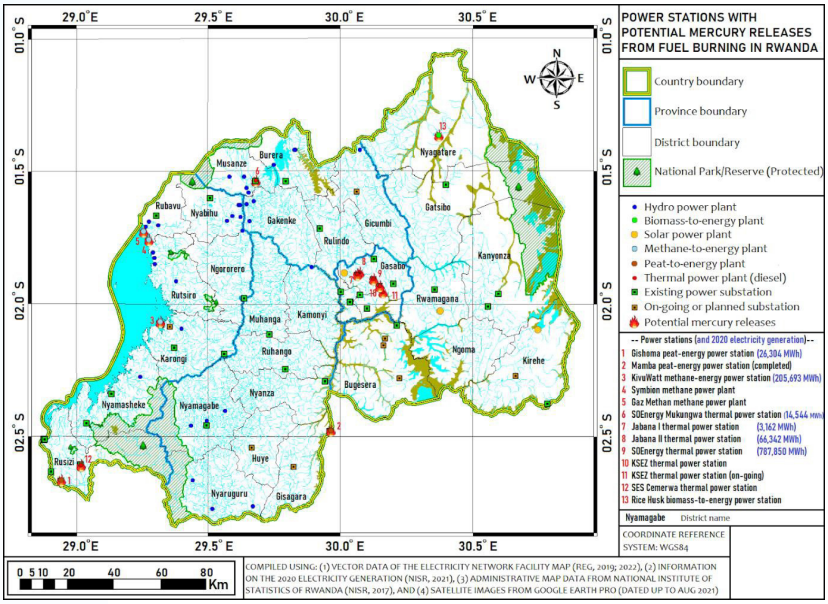


Figure II.9 Power stations with potential mercury releases from fuel combustion

TABLE II. 8 OVERVIEW OF THE EXTRACTION AND USE OF FUELS/ENERGY SOURCES

Sub-C	Source category: Extraction and use of fuels/energy sources	Calculated mercury input to source category (kg/year)	Calculated mercury output (kg/year)					
			Air	Water	Land	By-products and impurities	General waste	Sector specific treatment/ disposal
5.1.1	Coal combustion in power plants	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.1.2.1	Coal combustion in coal fired industrial boilers	8.24	7.76	0.00	0.00	0.00	0.00	0.48
5.1.2.2	Other coal use	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.1.3	Mineral oils - extraction, refining and use	0.87	0.87	0.00	0.00	0.00	0.00	0.00
5.1.4	Natural gas - extraction, refining and use	55.76	50.24	1.38	0.00	3.45	0.00	0.69
5.1.5	Other fossil fuels - extraction and use	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.1.6	Biomass fired power and heat production	18.54	18.54	0.00	0.00	0.00	0.00	0.00
5.1.7	Geothermal power production	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS		83.42	77.41	1.38	0.00	3.45	0.00	1.17

2.4.1.1. Source Sub-Category: Coal Combustion in coal fired industrial boilers

Activity rate: The activity takes place in Rwanda but activity rate at the national level could not be determined. As such, the activity rate data was obtained from the UN Comtrade database. Rwanda is not using coal for power production; thus, it was assumed that all the coal imported is used by the industry. The assumption was bolstered by the fact that use of coal for other domestic purposes was deemed negligible because coal is not locally produced and the general population in Rwanda relies on biomass for energy. 54,926 tonnes of coal are consumed by the industry in Rwanda every year (UNComtrade, 2022)[45].

Input factor: Because Rwanda did not have country specific input factors, the default input factor of 0.15 g of mercury per tonne was used to calculate the mercury input from the combustion of coal in Industries.

The activity rate and the input factor were used in the UNEP toolkit and theestimated mercury input from coal combustion in coal fired industrial boilers is 8.36 kg/year. It was noted during field visits that the industry in Rwanda has adopted the use of pollution control devices in particular the use of bag house filters. The use of such control devices reduces the mercury emissions to air by 5% resulting in the release of 7.6 kg/year into air and the 0.4 kg/year into sector specific treatment/ disposal.

2.4.1.2. Natural gas - extraction, refining and use

Activity rate: 69,019,712 Nm3/yr. was used as the activity rate for the Natural gas extraction and refining sub-category (USGS, 2021)[46]. 488,599,987 Nm3/yr. was used as the activity rate for the use of natural raw or precleared gas (REG, 2020)[47].

Input factor: The average default input factor of 100 ug Hg/Nm3 of raw or only pre-cleaned gas from the Toolkit was used.

The activity rate and input factor values were used in the UNEP toolkit and the mercury input for this subcategory was estimated to be 55.76 kg/year. The 55.76 kg of mercury are distributed into various release pathways as follows: 50.24 kg/year (air); 1.38 kg/year (water); 3.45 kg/year (by-products); and 0.69 kg/year (sector specific).

2.4.1.3. Biomass fired power and heat production

Activity rate: Activity rate of 511,849.65 ton/dry weight/yr. for biomass-fired power and 26,571.37 ton/dry weight/yr. for charcoal produced were used (MINIFRA, 2019)48. The biomass value was composed of sum of Firewood, Pellets, Cow dung, Crop residues, Papyrus and Sawdust.

45 *UNComtrade (2022) United Nations Comtrade Database: International Trade Statistics, Import/Export. https://comtrade.un.org/data/*
46 *USGS (2021) The mineral industry of Rwanda in 2017–2018. In: 2021 minerals yearbook. United States Geological Survey (USGS).*
47 *REG (2020) Rwanda Energy Group 2019 Annual report*
48 *MINIFRA (2019) Biomass energy strategy: A sustainable path to clean cooking. 2019-2030. Ministry of Infrastructure (MINIFRA), Kigali. https://www.rfa.rw/fileadmin/user_upload/RFA/Publications/Biomass_Energy_Strategy_-_Rwanda_-_October_2019.pdf*

Input factor: Default values of 0.03 g Hg/ton dry weight for biomass fired power generation and 0.12 g Hg/ton dry weight charcoal produced were used.

The above values were applied to the UNEP toolkit and the mercury input for this subcategory was estimated to be 18.54 kg/year for both biomass-fired power and for Charcoal combustion. The total mercury emission for the sub-category was estimated to be 18.54 kg/year and this was emitted to air only.

2.4.1.4. Summary

The total mercury inputs from different fuels are as follows: 8.36 kg/year (coal); 0.87 kg/year; Mineral-oil extraction, 55.76 kg/year (gas); and 18.54 kg/year (biomass). In terms of distribution of mercury from coal into various environmental pathways, the releases are as follows: 77.53 kg/year (air); 1.38 kg/year (water), 3.45 kg/year (By-pro-ducts and impurities) and 1.18 kg/year (sector specific treatment/disposal). The total mercury releases from this category were negligible, accounting for 83.54 kg/year, which constituted 0.35% to the total mercury annual emissions and releases in Rwanda.

2.4.1.5. Primary (Virgin) Metal Production

In Rwanda, as in any other country with a significant mining industry, the primary metal production sub-category is the largest contributor to mercury release and emission. Gold extraction is the sector that contributes the most to the release on mercury in Rwanda as shown in Table II.9. However, according to the findings of the MIA, the recovery of gold in Rwanda does not involve use of mercury for amalgamation. Mercury amalgamation is a common approach in Africa and around the world. Rwanda is instead using other methods, such as shaking table, to recover gold without use of mercury. Hence, mercury release in primary metal production is from the geogenic occurrences in the gold ore rather than from the amalgamation process.

TABLE II.9 OVERVIEW OF THE PRIMARY (VIRGIN) METAL PRODUCTION

SUB-C	SOURCE CATEGORY: PRIMARY (VIRGIN) METAL PRODUCTION	CALCULATED MERCURY INPUT TO SOURCE CATEGORY (KG/YEAR)	CALCULATED MERCURY OUTPUT (KG/YEAR)					
			AIR	WATER	LAND	BY-PRODUCTS AND IMPURITIES	GENERAL WASTE	SECTOR SPECIFIC TREATMENT/DISPOSAL
5.2.6	Gold extraction and initial processing by methods other than mercury amalgamation	14659.32	586.37	293.19	13193.39	586.37	0.00	0.00
5.2.8	Other non-ferrous metals - extraction and processing	0	0	0	0	0	0	0
TOTALS		14,659.32	586.37	293.19	13,193.39	586.37	0.00	0.00

2.4.1.6. Gold extraction and initial processing by methods other than mercury amalgamation

Activity Rate: 9,772,881.356 tonnes of gold ore extracted per year was used as the activity rate. The amount of gold ore was obtained through the conversion of gold production of Rwanda that was recorded at 11.532 tonnes in 2021 (NISR, 2021)[49].

Input factor: The default input factor value of 5.5 g Hg/ton was not used. For this inventory, an input factor of 1.5 g Hg/ore ton was instead used, based on the gold sector studies that were conducted in other African countries including South Africa and Zimbabwe. It was found that, as in other African countries, the use of default input factors for this category results in a distortion of the inventory findings and creates an outlier. Using the default input factor of 5.5 g Hg/ton, the sector would account for 93% of the mercury releases and emissions of Rwanda. Thus, it is recommended to develop country specific input factors forsuch sub-categories to improve the findings of the inventory.

The activity rate and the input factor values were inputted into the UNEP toolkit and theMercury input for this subcategory was estimated to be 14,659.32 kg/year.

2.4.1.7. Other non-ferrous metals - extraction and processing

The extraction and processing of cassiterite, coltan and wolfram is the most dominant mining activities in Rwanda, with an average of 6,672,238 ton/year extracted (NISR, 2021)[50]. However, there have not been any studies to show if the mining of these minerals results in mercury emissions and there is currently no mercury input factor to estimate mercury emitted or released because of such operations. It is therefore assumed that the emissions are not occurring. Rwanda has also some ore deposits of aluminum, zinc, copper and lead, but these metals are not exploited.

2.4.1.8. Summary

The 14,659 kg of mercury were distributed into various release pathways as follows: 586.37 kg/year (air); 293.19 kg/year (water); 13,193.39 kg/year (land); and 586.37 kg/year (by-products). The country is involved in the mining of cassiterite, coltan and wolfram, however there is no data on the input factor for the non-ferrous ores, and this inventory could only identify the quantity of the ores produced annually (6,672,238 ton/year). There is a need to carry out studies to determine the input factor for such ores so that the inventory can be improved.

2.4.1.9. Primary ferrous metal production

Rwanda has unexploited deposits of iron ores and therefore there are no mercury emissions from extracting and processing of the primary ferrous metals in Rwanda.

49 NISR (2021) Rwanda Statistical Yearbook 2021, December 2021. National Institute of Statistics of Rwanda (NISR), Kigali, 173 pp. https://www.statistics.gov.rw/publication/statistical-yearbook- 2020
50 NISR (2021) Rwanda Statistical Yearbook 2021, December 2021. National Institute of Statistics of Rwanda (NISR), Kigali, 173 pp. https://www.statistics.gov.rw/publication/statistical-yearbook 2020; Accessed in February 2022

2.4.1.10. Production of Other Minerals and Materials with Mercury Impurities

Mercury exists as a trace element embedded in the raw materials that are involved in the cement manufacturing process. It is this geogenic mercury that accounts for the emissions and releases of mercury in the cement manufacturing industry, as shown in Table II.10. The CIMERWA cement manufacturing company produces their own clinker, while Prime Cement imports processed clinker for cement manufacturing. For the estimation of mercury releases from the sector, only the CIMERWA cement manufacturing company was considered. It was also noted that the company use various pollution control devices including the use of bag-house filters.

TABLE II.10 OVERVIEW OF OTHER MINERALS AND MATERIALS WITH MERCURY IMPURITIES

SUB-C	SOURCE CATEGORY: PRODUCTION OF OTHER MINERALS AND MATERIALS WITH MERCURY IMPURITIES	CALCULATED MERCURY INPUT TO SOURCE CATEGORY (KG/YEAR)	CALCULATED MERCURY OUTPUT (KG/YEAR)					
			AIR	WATER	LAND	BY-PRODUCTS AND IMPURITIES	GENERAL WASTE	SECTOR SPECIFIC TREATMENT/DISPOSAL
5.3.1	Cement clinker production	52.92	31.75	0.00	0.00	10.58	0.00	10.58
5.3.2	Pulp and paper production	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.3.3	Production of lime and light weight aggregates	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS		52.92	31.75	0.00	0.00	10.58	0.00	10.58

2.4.1.11. Cement clinker production

Activity rate: The CIMERWA cement manufacturing plant reported that it produced 420,000 tonnes/year of cement (Cimerwa, 2021)[51]. The production figure was used as the activity rate in the quantification of mercury releases from cement production.

Input Factor: The default input factor of 0.11 g/Hg/ton of cement produced from nationally produced clinker was used.

The activity rate and the input factor values were used in the UNEP toolkit and the estimated mercury input for this subcategory was estimated to be 52.92 kg/year.

2.4.1.12. Summary

The total input for the production of other minerals and materials with mercury impurities was found to be 52.92 kg of mercury per year. These were distributed into various release pathways as follows: 31.750 kg/year (air); 10.58 kg/year (by-products) and 10.58 kg/year (sector specific treatment and disposal).

51 CIMERWA (2021) 2020 Annual Report. The figure used is for CIMERWA because it is the only cement production plant that is locally producing Clinker

1.4.2. Consumer Products with Intentional Use of Mercury

The intentional use of mercury in the production of certain products and devices relies on the physical and chemical properties of mercury. Examples include the ability of mercury to expand and contract uniformly withtemperature changes, which has made its use popular in thermometers; and the ability to conduct electricity,thus its use in switches. Mercury is also used in lamps such as mercury vapour, High Pressure Sodium and Metal Halide, and Neon lamps.

Mercury in consumer products is one of the sectors that contributes to the release and emission of mercury in Rwanda. Table II.41 refers. Although mercury is usually stable in most products, it is released once the products are subjected to various environmental factors such as combustion or the slow degradation at disposal facilities.

Paint, biocides and pharmaceuticals containing mercury were not identified in Rwanda. Companies interviewed during inventory indicated that their raw material for pain manufacturing do not contain mercury. A review of the Safety Data Sheets (SDSs) for the chemicals used in paint manufacturing was done and it was confirmed these chemicals did not contain mercury. All the companies visited provided the SDS for the chemicals stored and used. The application of the GHS in Rwanda is evident especially in the classification and labelling of chemicals. The requirements are very similar to the requirements of the GHS. However, there remains an opportunity for further alignment with the requirements of the GHS in the control of hazardous substances in Rwanda. Focus should be put on the labelling of conveyance vehicles, containers and the adoption of the 16point SDS in all sectors.

TABLE II.41 OVERVIEW OF CONSUMER PRODUCTS WITH INTENTIONAL USE OF MERCURY

SUB-C	SOURCE CATEGORY: CONSUMER PRODUCTS WITH INTENTIONAL USE OF MERCURY	CALCULATED MERCURY INPUT TO SOURCE CATEGORY (KG/YEAR)	CALCULATED MERCURY OUTPUT (KG/YEAR)					
			AIR	WATER	LAND	BY-PRODUCTS AND IMPURITIES	GENERAL WASTE	SECTOR SPECIFIC TREATMENT/ DISPOSAL
5.5.1	Thermometers with mercury	42.68	4.36	12.81	0.18	-	25.35	0.00
5.5.2	Electrical switches and relays with mercury	846.28	84.63	0.00	84.63	-	677.02	0.00
5.5.3	Light sources with mercury	4.69	0.23	0.00	0.00	-	4.46	0.00
5.5.4	Batteries with mercury	1,315.00	0.00	0.00	0.00	-	1,315.00	0.00
5.5.5	Polyurethane with mercury catalysts	181.35	18.13	9.07	0.00	-	154.14	0.00
TOTALS		2389.23	107.18	21.61	84.63		2175.82	0.00

2.4.2. 1. Thermometers with mercury

Activity rate: The importation of medical related materials including thermometers is centrally controlled in Rwanda through the RMS. Thus, quantities of mercury containing thermometers were obtained after consulting the RMS databases to identify the amount of thermometers imported in Rwanda. A total of 40,934 medical thermometers and 250 ambient air thermometers was identified

during the MIA inventory and was used as the activity rate for the thermometers with mercury sub-category (RMS 2022[52]; UNComtrade, 2022[53]). The data was verified by checking international databases like the UNComtrade database.

Input factor: The default input factors of 1 g Hg/item from the Toolkit for medical thermometers and 3.5 g Hg/item for ambient air thermometers were used. The activity rates and input factors were inputted into the UNEP toolkit and the estimated mercury input for this subcategory is 42.68 kg/year of mercury distributed into various release pathways as follows: 4.18 kg/year (air); 12.54 kg/year (water); and 25.09 kg/year (general waste).

2.4.2.2. Electrical switches and relays with mercury

Activity rate: The population of Rwanda, estimated at 12,089,712 people, was used as the activity rate (NISR, 2021)[54]. This was adjusted after taking into consideration the Rwanda electrification rate of 50% (REG, 2021)[55].

Input factor: The default input factor of 0.14 g Hg/(year*inhabitant) from the Toolkit was used.

The activity rate and the input factor values were used in the UNEP toolkit and the Mercury input for this subcategory is estimated to be 846.28 kg/year. The 846.28kg of mercury were distributed into various release pathways as follows: 84.63 kg/year (air); 84.63 kg/year (land); and 677.02 kg/year (general waste).

2.4.2.3. Light sources with mercury

Activity rate: 586,539 items was used as the activity rate for the light sources with mercury sub-category (UNComtrade, 2022)[53].

Input factor: The default input factor of 8gmg Hg/item from the Toolkit was used. The activity rate and input factor values were used in the UNEP toolkit and the estimated mercury input for this subcategory was estimated to be 4.69 kg/year. The 4.69 kg of mercury were distributed into various release pathways as follows: 0.23 kg/year (air); and 4.46 kg/year (general waste).

2.4.2.4. Batteries with mercury

Activity rate: 0.009 ton/year was used as the activity rate for the Zinc-air button cells sub-category and 263 tons/year (UNComtrade, 2022)[56] was used for the alkaline button cells. The activity rate for alkaline button cells actually overestimates mercury input since it covers all types of alkaline cells but specific data could not be obtained.

Input factor: The default input factor of 5 kg Hg/ton/batteries for alkaline button cells used.

52 *RMS (2022) Materials inventory for non-moving products. Rwanda Medical Supplies, Kigali*
53 *UNComtrade (2022) United Nations Comtrade Database: International Trade Statistics, Import/Export. https://comtrade.un.org/data/*
54 *NISR (2021) Rwanda Statistical Yearbook 2021, December 2021. National Institute of Statistics of Rwanda (NISR), Kigali, 173 pp. https://www.statistics.gov.rw/publication/statistical-yearbook 2020; Accessed in February 2022*
55 *REG (2021) Electricity access. Rwanda Energy Group (REG), Kigali https://www.reg.rw/what-we-do/access/news/rwandas-100-electrification-target-by-2024-receives-frw-821- billion-financingoost/?tx_news_pi1%5BoverwriteDemand%5D%5Bcategories%5D%20=%2017%2C35%2C32&cHash=cce-4cf899b30b7e8181003c9bdb6659f#:~:text=To%20date%2C%2069.68%25%20of%20Rwandan,is%20100%25%20access%20by%202024. Accessed, January 2022*
56 *UNComtrade (2022) United Nations Comtrade Database: International Trade Statistics, Import/Export. https://comtrade.un.org/data/*

The activity rate and the input factor values were used in the UNEP toolkit and the mercury input for this subcategory was estimated to be 1,315.00 kg/year. The 1,315.00 kg of mercury were all distributed into general waste. National level information on mercury containing batteries could not be obtained and international sources of data were instead used. It was noted that the levels of mercury emissions for the sub-category were unusually high compared to other countries in the region. In view of this, there is a need to improve collection of data on mercury containing batteries at the national level to ensure a more accurate estimation of mercury releases and sources from the sub-category.

2.4.2.5. Polyurethane with mercury catalysts

Activity rate: The population of Rwanda, estimated at 12,089,712 people, was used as the activity rate (NISR, 2021)[57]. This was adjusted after taking into consideration the Rwanda electrification rate of 50% (REG, 2021)[58].

Input factor: The default input factor of 0.03 g Hg/(year*inhabitant) from the Toolkit was used.

The activity rate and the input factor values were used in the UNEP toolkit and the estimated mercury input for this subcategory is estimated to be 181.35 kg/year.

2.4.2.6. Summary

The total input from consumer products with intentional use of mercury are as follows: 42.68 kg/year (thermometers with mercury); 846.28 kg/year (electrical switches and relays with mercury); 4.69 kg/year (light sources with mercury); 1315.00 kg/year (batteries with mercury) and 181.35 kg/year (polyurethane with mercury catalysts). The total mercury input for the sub-category was found to be 2,390.00 kg of mercury per year. The 2,390.00 kg of mercury were distributed as follows; 107.35 kg/year (air), 21.87 kg/year (water), 84.80 kg/year (land) and 2,175.97 kg/year (general waste).

2.4.3. Other Intentional Uses

The source category "Other intentional uses", which includes measuring devices, equipment and dental amalgams containing mercury, also contributes to the release of mercury in Rwanda. See Table II.52. Although Rwanda does not manufacture any of these products, it imports them. During the mercury inventory field visits, it was noted that the use of mercury containing devices has significantly reduced in Rwanda.

57 NISR (2021) Rwanda Statistical Yearbook 2021, December 2021. National Institute of Statistics of Rwanda (NISR), Kigali, 173 pp. https://www.statistics.gov.rw/publication/statistical-yearbook 2020; Accessed in February 2022

58 REG (2021) Electricity access. Rwanda Energy Group (REG), Kigali https://www.reg.rw/what-we-do/access/news/rwandas-100-electrification-target-by-2024-receives-frw-821- billion-financingoost/?tx_news_pi1%5BoverwriteDemand%5D%5Bcategories%5D%20=%2017%2C35%2C32&cHash=cce-4cf899b30b7e8181003c9bdb6659f#:~:text=To%20date%2C%2069.68%25%20of%20Rwandan,is%20100%25%20access%20by%202024. Accessed, January 2022

TABLE II.52 OVERVIEW OF OTHER INTENTIONAL USES

Sub-C	Source category: other intentional uses	Calculated mercury input to source category (kg/year)	Calculated mercury output (kg/year)					
			Air	Water	Land	By-products and impurities	General waste	Sector specific treatment/ disposal
5.6.1	Dental mercury-amalgam fillings	20.72	0.99	7.89	0.00	0.00	5.92	5.92
5.6.2	Manometers and gauges with mercury	30.22	3.02	9.07	0.00	0.00	18.13	0.00
5.6.3	Laboratory chemicals and equipment with mercury	302.24	0.00	99.74	0.00	0.00	99.74	102.76
5.6.4	Mercury metal use in religious rituals and folklore medicine	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.6.5	Miscellaneous product uses, mercury metal uses, and other sources	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TOTALS		353.19	4.01	116.70	0.00	0.00	123.80	108.68

2.4.3.1. Dental mercury-amalgam fillings

Activity rate: The population of Rwanda, estimated at 12,089,712 people, was used as the activity rate (NISR, 2021)60. This was adjusted after taking into consideration the number of dentists which stood at 0.0169199 per thousand inhabitants in Rwanda (UN, 2019)[59].

Input factor: The default input factor of 0.2 g Hg/(year*inhabitant) from the Toolkit was used. The activity rate and the input factor values were used in the UNEP toolkit and the estimated Mercury input for this subcategory was estimated to be 49.34 kg/year.

2.4.3.2. Manometers and gauges with mercury

Activity rate: The population of Rwanda, estimated at 12,089,712 people, was used as the activity rate (NISR, 2021)[60].

This was adjusted after taking into consideration the Rwanda electrification rate of 50% (REG, 2021)[61].

Input factor: The default input factor of 0.005 g Hg/(year*inhabitant) from the Toolkit was used.

The activity rate and input factor values were used in the UNEP toolkit and the estimated mercury input for this subcategory was estimated to be 30.22 kg/year.

59 UN (2019) World Population Prospects 2019. United Nations (UN) Department of Economic and Social Affairs, Geneva. https://population.un.org/wpp/DataQuery/

60 NISR (2021) Rwanda Statistical Yearbook 2021, December 2021. National Institute of Statistics of Rwanda (NISR), Kigali, 173 pp. https://www.statistics.gov.rw/publication/statistical-yearbook 2020; Accessed in February 2022

61 REG (2021) Electricity access. Rwanda Energy Group (REG), Kigali https://www.reg.rw/what-we-do/access/news/rwandas-100-electrification-target-by-2024-receives-frw-821- billion-financingoost/?tx_news_pi1%5BoverwriteDemand%5D%5Bcategories%5D%20=%2017%2C35%2C32&cHash=cce-4cf899b30b7e8181003c9bdb6659f#:~:text=To%20date%2C%2069.68%25%20of%20Rwandan,is%20100%25%20access%20by%202024. Accessed, January 2022

2.4.3.3. Laboratory chemicals and equipment with mercury

Activity rate: The population of Rwanda, estimated at 12,089,712 people, was used as the activity rate (NISR, 2021)[62]. This was adjusted after taking into consideration the Rwanda electrification rate of 50% (REG, 2021)[63].

Input factor: The default input factor of 0.01g Hg/(year*inhabitant) from the Toolkit was used for laboratory chemicals and 0.04g Hg/(year*inhabitant) from the Toolkit was used for equipment with mercury. The activity rate and input factor values were inputted into the UNEP toolkit and the estimated mercury input for this subcategory was computed to be 302.24 kg/year for laboratory chemicals.

2.4.3.4. Summary

The total input from other intentional product/process use is as follows: 49.34 kg/year (dental mercury-amalgam fillings); 30.22 kg/year (manometers and gauges with mercury); and 302.24 kg/year (laboratory chemicals and equipment with mercury).

2.4.3.5. Waste Incineration and Burning

Waste incineration, and in particular the incineration of medical waste, is another sector that contributes to the release of mercury in Rwanda. The predominant type of incinerators used in Rwanda has primary and secondary combustion chambers, however they are not affixed with pollution control devices like scrubbers. Thus, the combustion will not prevent the discharge of mercury. The incineration of medical waste accounts for the release of 1,479 kg Hg/year (Table II.63).

TABLE II.63 OVERVIEW OF WASTE INCINERATION AND BURNING

Sub-C	Source category: Waste Incineration and Burning	Calculated mercury input to source category (kg/year)	Calculated mercury output (kg/year)					
			Air	Water	Land	By-products + impurities	General waste	Sector specific treatment/ disposal
5.8.1	Incineration of municipal/ general waste	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.8.2	Incineration of hazardous waste	17.52	15.77	0.00	0.00	0.00	0.00	1.75
5.8.3	Incineration of medical waste	1458.60	1458.60	0.00	0.00	0.00	0.00	0.00
5.8.4	Sewage sludge incineration	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5.8.5	Informal waste burning	2.39	2.39	0.00	0.00	0.00	0.00	0.00
TOTALS		1478.51	1476.76	0.00	0.00	0.00	0.00	1.75

62 NISR (2021) Rwanda Statistical Yearbook 2021, December 2021. National Institute of Statistics of Rwanda (NISR), Kigali, 173 pp. https://www.statistics.gov.rw/publication/statistical-yearbook-2021. Accessed in February 2022

63 REG (2021) Electricity access. Rwanda Energy Group (REG), Kigali https://www.reg.rw/what-we-do/access/news/rwandas-100-electrification-target-by-2024-receives-frw-821- billion-financingoost/?tx_news_pi1%5BoverwriteDemand%5D%5Bcategories%5D%20=%2017%2C35%2C32&cHash=cce-4cf899b30b7e8181003c9bdb6659ff#:~:text=To%20date%2C%2069.68%25%20of%20Rwandan,is%20100%25%20access%20by%202024. Accessed, January 2022

Activity rate: 60,775 ton/year was used as the activity rate for the Incineration of medical waste sub-category (REMA, 2021)[64].

Input factor: The default input factor of 24 g Hg/ton/medical waste incinerated was used.

The activity rate and input factor values were used in the UNEP toolkit and the estimated mercury input for this subcategory is estimated to be 1,459 kg/year of which all of it is released into the atmosphere.

It was noted during the inventory that the incinerators in medical facilities were predominantly equipped with secondary burners to promote complete combustion of organic materials and flue gasses.

Figure II.10 shows the general layout of the predominant type of incinerators in Rwanda. In some cases, stacks are not high enough to dissipate air pollutants because they are surrounded by trees or are lower than the tallest buildings in the medical facilities. It is recommended that the design of stack considers the modelling parameters for the adequate dispersion of pollutants. The stake height can be determined after taking into consideration the aerodynamic forces and how they are disrupted by obstacles such as building, vegetation and terrain.

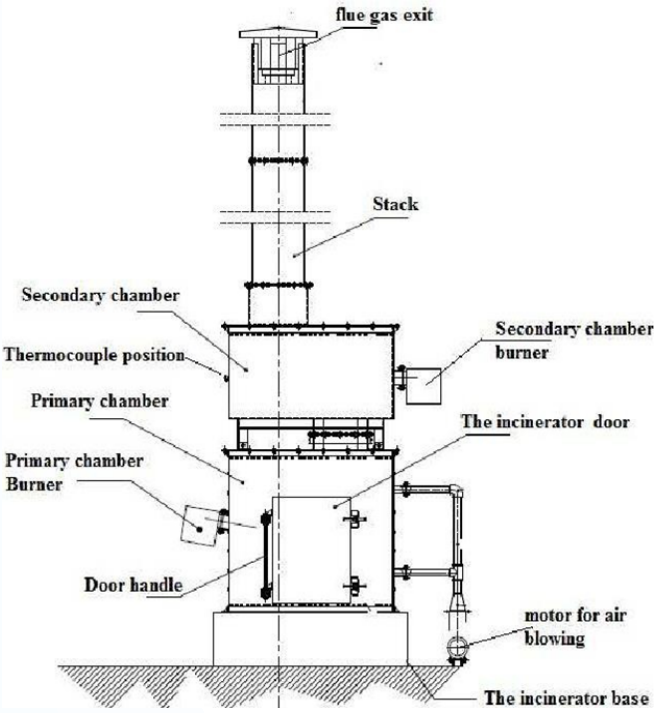


Figure II.10 *The predominant Medical Incinerator type in Rwanda*

2.4.3.6. Open burning of municipal waste

Rwanda is reported to have a strict waste management regime minimizing open waste burning. However, a minimal amount of waste is estimated to be burnt in the open. Based on indicative data, the waste amounts burned were estimated at 2,389 tonnes/year based on the use of the average per capita generation of 0.57 kg/waste per day and a population of 12,089,712 inhabitants (Kabera, 2020[65]; NISR, 2021[66]). This information was used to estimate the total waste generated in Rwanda

64 REMA (2021) Rwanda State of the Environment and Outlook Report. Rwanda Environment Management Authority (REMA), Kigali
65 Kabera, T., (2020). Solid waste management in Rwanda: Status and challenges. In Sustainable Waste Management Challenges in Developing Countries (pp. 287-305). IGI Global.
66 NISR (2021) Rwanda Statistical Yearbook 2021, December 2021. National Institute of Statistics of Rwanda (NISR), Kigali, 173 pp. https://www.statistics.gov.rw/publication/statistical-yearbook 2020; Accessed in February 2022

annually using equation 2 hereafter. The determination of the waste burnt was done using percentage distribution figures presented in the Rwanda household Survey report, which estimated that 0.1% of the waste generated is burnt (NISR, 2021)66. A default input factor of 1 g Hg/ton waste was applied.

Equation 2:

Where:

- *Per-capita waste generation rate refers to the average amount of waste produced by an individual per day;*
- *Population = the number of inhabitants in Rwanda in 2018;*
- *365 = The number of days on annually, not taking into account leap years*

2.4.3.7. Summary

The total input from Waste incineration is as follows: 1,458.60 kg/year (incineration of medical waste); and 18 kg/year (incineration of hazardous waste). All the mercury is released into air.

1.4.4. Waste Disposal, Deposition/Landfilling and Wastewater Treatment

Mercury is released from the slow degradation of waste containing mercury. 1, 98.15 kg Hg/year are released from the controlled landfills, while 1,158 kg Hg/year and 1,111 kg Hg/year are released from wastewater systems and informal dumping of general waste respectively, Table II.74 refers. The waste management practices in Rwanda do not fully implement the segregation of waste and mercury containing waste can find its way into disposal facilities. Thus, the release of mercury to air, if the landfill is not lined, soil and underground water is inevitable in the long run.

TABLE II.74 OVERVIEW OF WASTE DISPOSAL/LANDFILLING AND WASTEWATER TREATMENT

SUB-C	SOURCE CATEGORY: WASTE DISPOSAL/ LANDFILLING AND WASTEWATER TREATMENT	CALCULATED MERCURY INPUT TO SOURCE CATEGORY (KG/ YEAR)	CALCULATED MERCURY OUTPUT (KG/YEAR)					
			AIR	WATER	LAND	BY-PRODUCTS AND IMPURITIES	GENERAL WASTE	SECTOR SPECIFIC TREATMENT/DISPOSAL
5.9.1	Controlled landfills/deposits	198.15	1.98	0.02	196.15	0.00	0.00	0.00
5.9.2	Diffuse disposal under some control	0.00	-	-	-	-	-	-
5.9.3	Informal local disposal of industrial production waste	0.00	0.00	0.00	0.00	-	-	-
5.9.4	Informal dumping of general waste	1111.12	111.11	111.11	888.89	-	-	-
5.9.5	Waste water system/treatment	1158.35	0.00	1042.51	0.00	0.00	115.83	0.00
TOTALS		2467.61	113.10	1153.64	1085.04	0.00	115.83	0.00

2.4.4.1. Controlled landfills/deposits

Activity rate: The activity rate of 198328.7ton/year based on the per-capita generation rate of 0.57 kg/day (Kabera, 2020[67], REMA, 2021)[68].

Input factor: The default input factor of 1 g Hg/ton of waste generated was used. The activity rate and the input factor values were used in the Toolkit and the mercury input for this subcategory was estimated to be 198kg/year. The 198kg of mercury were all distributed as follows 1.98kg/year (air); 0.02 kg/year (water); and 196.15 kg/year (land).

2.4.4.2. Informal dumping of municipal waste

Rwanda is reported to have a strict waste management regime minimizing informal dumping of waste. However, a moderate amount of waste is estimated to be informally dumped. Based on indicative data, the amount of waste informally dumped was estimated at 1,111 tonnes/yr. The figure was derived from the estimation of annual waste generation using the average per-capita waste generation rate and the distribution percentages reflected in the Rwanda household survey report (NISR, 2021)[69]. A default input factor of 1 g Hg/ton waste was applied. The activity rate and the input factor values were used in the Toolkit and the mercury input for this subcategory was estimated to be 1,111 kg of mercury per year. The 1,111 kg of mercury were all distributed as follows 111.11 kg/year (air); 111.11 kg/year (water); and 888.89 kg/year (land).

2.4.4.3. Wastewater system/treatment

The activity rate of 220,637,244 ton/year was used based on the average per-capita generation rate of 50 L/capita/day (Mbateye et al., 2010)[70].

Input factor: The default input factor of 5.25 mg Hg/m3 wastewater generated was used.

The activity rate and the input factor values were inputted into the UNEP toolkit and the estimated mercury input for this subcategory was computed to be 1,158.35 kg/year. The 1,158.35 kg of mercury were all distributed as follows 1,042.51 kg/year (water); and 115.83 kg/year (general waste).

2.4.4.4. Summary

The mercury total input from waste deposition/landfilling and wastewater treatment was 2,468 kg/year, which is distributed as follows; 113.1 kg/year (air), 1,153.6 kg/year (water), 1085.0 kg/year (land) and 115.8 kg/year (general waste).

67 Kabera, T., (2020). Solid waste management in Rwanda: Status and challenges. In Sustainable Waste Management Challenges in Developing Countries (pp. 287-305). IGI Global.
68 REMA., (2021) Rwanda State of the Environment and Outlook Report
69 NISR, (2021) National Institute of Statistics of Rwanda (NISR), Rwanda Household Survey 2019/2020 report, March 2021
70 Mbateye FA, U., Wali, U.G. and Banadda, N., 2010. Assessment of wastewater management practices in Kigali City, Rwanda. The Open Environmental and Biological Monitoring Journal, 3(1).

2.4.4.5. Crematoria and Cemeteries

The primary source of mercury releases in cemeteries is coming from dental amalgam fillings. Data on the death rate for Rwanda was obtained from NISR, which gave the crude death rate 7.7%, which implies that on a daily basis 218 people die in Rwanda. Using this activity rate and the default input factor, the mercury input for this activity was calculated to be 6.49 kg/year. Default output distribution factors were used to calculate the mercury output. Using the given values, the mercury output from cemeteries to the various release pathways was calculated. The assumption that the number of bodies cremated was negligible was also applied. The results are given in Table II.85.

TABLE II.85 OVERVIEW OF CREMATORIA AND CEMETERIES

Sub-C	Source category: waste disposal/ landfilling and wastewater treatment	Calculated mercury input to source category (kg/year)	Calculated mercury output (kg/year)					
			Air	Water	Land	By-products and impurities	General waste	Sector specific treatment/ disposal
5.10.1	Crematoria/ cremation	0	0	0	0	-	0	0
5.10.2	Cemeteries	6.49	0	0	6.49	-	0	0
TOTALS		6.49	0	0	6.49	-	0	0

2.4.4.6. Cemeteries

Activity rate: The crudedeath rate of 7.7% was used to compute the average number of people buried annually. The recorded crude death rate implies that 218 people die on a daily basis in Rwanda (NISR 2021)[71]. The number of deaths per day was multiplied by 365 gave the number of deaths per year which was found out to be 79,570 and was used as the activity rate.

Input factor: The default input factor of 4g Hg/corpse buried was used. The activity rate and the input factor values were inputted into the UNEP toolkit and theestimated mercury input for this subcategory was estimated to be 6.49 kg/year.

2.4.4.7. Summary

The total input from Crematoria and cemeteries is as follows: 6.49 kg/year and all of it is released to land.

2.5. HOT-SPOTS OF MERCURY CONTAMINATION

2.5.1. Identification of contaminated sites

No contaminated sites were identified as mercury hot spots in the country. Further analysis needs to be carried out in order to confirm these preliminary results. Article 12 of the Minamata Convention on Mercury contains provisions on contaminated sites, including the identification and assessment of sites and the adoption of guidance on the management of contaminated sites. In Ministerial Order No 003/2021 of 08/02/2021 determining the list of chemicals and other polluting substances that

71 NISR (2021), RPHC4 Thematic Report: Mortality; https://www.statistics.gov.rw/publication/rphc4-thematic-report- mortality; (NISR, 2021) Statistical Year Book

are not permitted, Rwanda has listed mercury compounds, including inorganic mercury compounds, and alkoxy-alkyl and aryl mercury compounds. The local permissible limits of mercury in different environments are given in Table II.96.

TABLE II.96 MERCURY PERMISSIBLE LIMITS IN DIFFERENT ENVIRONMENTAL COMPARTMENTS

Compartment	Permissible limit	Test method	Reference
Air	-	-	-
Soil	-	-	-
Natural and treated water(mg/L)	0.001	ISO 12846	RSB (2017)[72]
Wastewater discharge (mg/L)	0.002	ISO 5666	RSB (2017)[73]
Solid waste	-	-	-
Fish	-	-	-

UNEP guidelines on the management of mercury contaminated sites defines the term "contaminated site" as "a site where there is a confirmed presence, caused by human activities, of mercury and mercury compounds at such level(s) as to be considered by a party as posing a significant risk to human health or the environment" (UNEP, 2019)[74]. The Convention therefore allows Parties to have their own definition of contaminated sites in their legislation. Once a definition for "mercury contaminated site" is established, the next step is to conduct preliminary investigations and initial site screening to identify priority sites.

A preliminary site investigation and initial site screening was undertaken by REMA under the framework for management of contaminated sites given by UNEP. Figure II.3 shows the sites visited in the Western and Southern Provinces, and Table II.107 lists the sites visited in the City of Kigali, Northern and Eastern Provinces. The location of sites visited by REMA and the Consultant combined was shown earlier in Figure II.1. The full list of sites visited in the Southern and Western provinces is provided in Annex E.

The framework and initial decision tree for management of mercury-contaminated sites followed the UNEP guidelines (Figure II.42). The key guiding questions that were used to solicit data and information is given in ANNEX D. The same information was also requested through emails and telephone interviews. For medical facilities, medical practitioners were also asked if they were aware of any cases of mercury poisoning in their districts and how they went about diagnosing such cases.

Sites at which some studies were conducted involving mercury and mercury-related issues were mapped and their locations analysed for proximity to any potential sources of mercury. Other means of identifying potentially mercury-contaminated sites were followed during the field visits as recommended by UNEP (2019)[74] which include: (a) asking for records identifying past industrial or other activities at the site, (b) visual

observation of the site conditions, (c) visual observation of manufacturing or other operations known to have used or emitted a particularly hazardous contaminant, (d) observed adverse effects in humans, flora or fauna possibly caused by their proximity to the site, (e) existing physical or analytical results showing contaminant levels, (f) community reports to the authorities regarding suspected releases.

72 RS (2017) Rwanda Standards RS EAS 12 Potable water specification, 3rd Edition, Rwanda Standards Board, Kigali
73 RS (2017) (2017). Rwanda Standards RS 110 Water quality – Discharged, 2nd Edition. Rwanda Standards Board, Kigali
74 UNEP (2019) Guidance on the management of contaminated sites. United Nations Environment Programme (UNEP), Geneva. https://www.mercuryconvention.org/sites/default/files/documents/forms_and_guidance_document/Guidance_Contaminated_Sites_EN.pdf

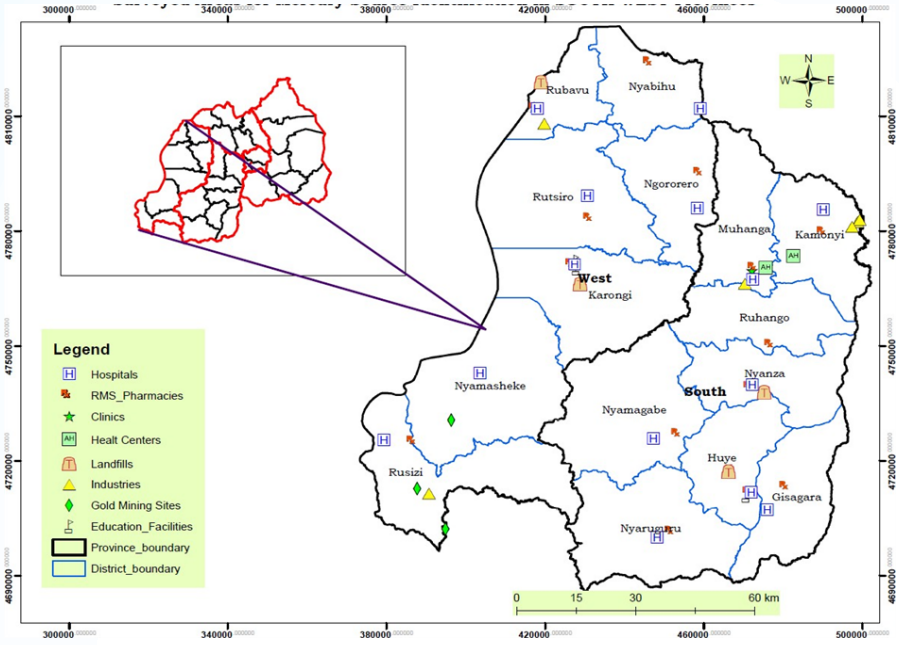


Figure II.11. *Preliminary survey on mercury in the Southern and Western Provinces, Source: REMA (2022)*[75]

TABLE II.107 PRELIMINARY SURVEY ON MERCURY IN KIGALI CITY, EASTERN AND NORTHERN PROVINCES

No.	Visited facility name	Location
1	Butaro Hospital	Burera District, Butaro Sector, Rusumo Cell
2	EUCL branch	Burera District, Butaro Sector, Rusumo Cell
3	University of Global Health Equity	Burera District, Butaro Sector
4	Rwerere Health Center	Burera District, Rwerere Sector
5	Ruhengeri Hospital	Musanze District, Muhoza Sector
6	AGROPY	Musanze District, Muhoza Sector
7	UR-CAVM Busogo campus	Musanze District, Busogo Sector
8	INES Ruhengeri	Musanze District
9	Musanze dump site	Musanze District, Cyuve Sector
10	NEMBA Hospital	Gakeke District, Nemba Sector
11	NEMBA Health Center	Gakeke District, Nemba Sector
12	IPRC Tumba	Rulindo District
13	Ngali Mining Ltd	Gicumbi District, Miyove Sector
14	U.H Mining company	Gicumbi District, Ruvune Sector
15	Gicumbi Hospital	Gicumbi District, Byumba Sector
16	Gicumbi dumpsite	Gicumbi District, Byumba Sector
17	Nyagatare landfill	Nyagatare District, Nyagatare Sector
18	Nyagatare District Hospital	Nyagatare District, Nyagatare Sector
19	Mount Meru Soyco	Kayonza District, Mukarange Sector
20	Gahini Hospital	Kayonza District, Gahini Sector
21	Rwinkwavu Hospital	Kayonza District, Rwinkwavu Sector
22	Rwamagana Hospital	Rwamagana District
23	Imana Steel	Bugesera District, Gashora Sector

75 REMA (2022) Inspection report- mapping mercury sources. Rwanda Environment Management Authority (REMA, Kigali

No.	Visited facility name	Location
24	Enviroserve	Bugesera District, Gashora Sector
25	Bugesera Hospital	Bugesera District, Nyamata Sector
26	Incinerator by Depot Kalisimbi	Nyarugenge District, Nduba Sector
27	Incinerator at Gatsata	Gasabo District
28	Nduba dumpsite	Gasabo District, Nduba Sector
29	UR, College of Science and Technology (CST)	Nyarugenge Dstrict
30	UR, College of Medicine and Health Sciences	Gasabo District
31	AMACO Paints	Kicukiro District, Gahanga Sector

Source: REMA (2022)[76]

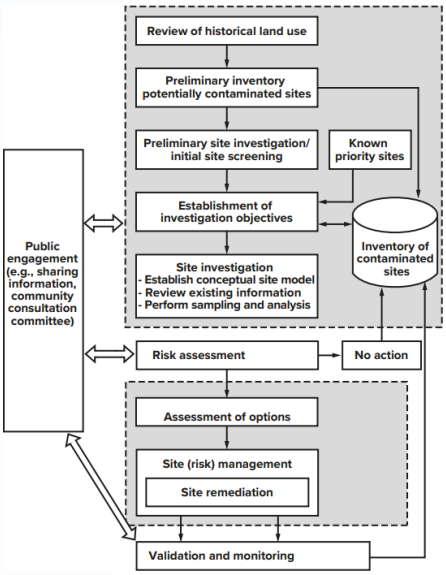


Figure II.12 Initial decision tree for management of mercury contaminated sites (Source: UNEP, 2019) [77]

Table II.118 summarises the findings on mercury contaminated sites in Rwanda based on the information available during the desk research and field visits, and the UNEP (2019)[77] definition of a mercury contaminated site.

TABLE II.118 RESULTS ON CONFIRMED MERCURY CONTAMINATED SITES

Category of evidence source	Confirmed sites	Remark
1. Records identifying past industrial or other mercury related activities at a site	none	Capacity of national laboratories to include mercury as a parameter for monitoring environmental quality is required
2. Observed adverse effects in humans, flora or fauna possibly caused by their proximity to a site	none	There is a need to capacitate expert in the health and environmental sectors to assess and monitor for mercury pollution in potential sites

76 REMA (2022) Inspection report- mapping mercury sources. Rwanda Environment Management Authority (REMA, Kigali
77 UNEP (2019) Guidance on the management of contaminated sites. United Nations Environment Programme (UNEP), Geneva. https://www.mercuryconvention.org/sites/default/files/documents/forms_and_guidance_document/Guidance_Contaminated_Sites_EN.pdf

Category of evidence source	Confirmed sites	Remark
3. Existing physical or analytical results showing mercury levels	none	Capacity of national laboratories to include mercury as a parameter for monitoring environmental quality is required
4. Community reports to the authorities regarding suspected releases of mercury	none	An education and awareness strategy to capacitate communities to identify and report activities that have the potential to release mercury

2.5.2. Potential areas for future assessment based on existing literature

Figure II.53 shows selected historical sampling locations for water and fish, including Rwanda's existing water quality monitoring stations. The map also shows the location of selected small-scale aquaculture production in Rwanda from a study by Rurangwa and Kabagambe (2018)[78].

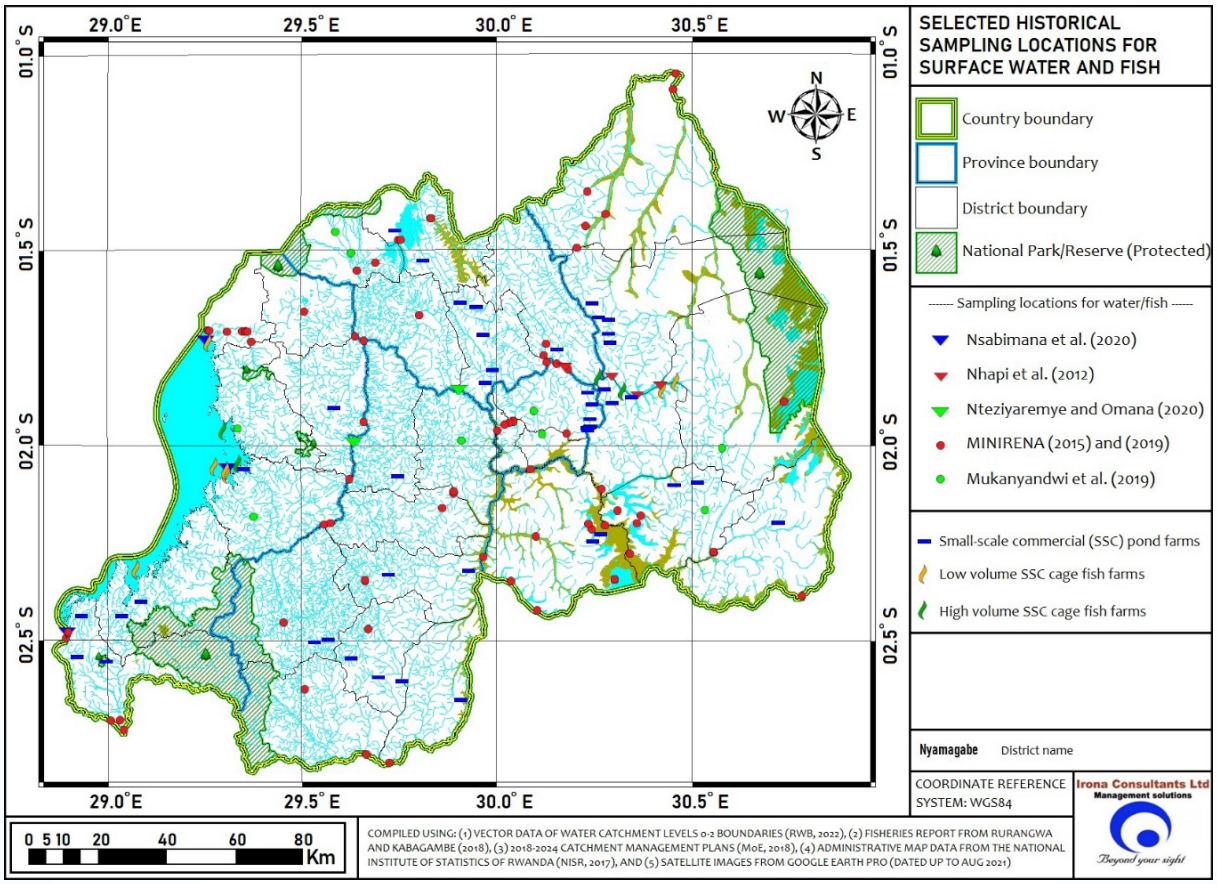


Figure II.13 *Selected historical sampling locations for surface water and fish*

TABLE II.129 PROVIDES THE RESULTS OF THESE STUDIES AND THEIR IMPLICATIONS ON MERCURY CONTAMINATION OF THE SITES.

78 *Rurangwa, E. and Kabagambe, J.B. (2018) Review and analysis of small-scale aquaculture production in East Africa: Part 2, Rwanda. Centre for Development Innovation, Wageningen University and Research. Report WCDI-18-022, Wageningen. https://edepot.wur.nl/466985*

Study	Compartment	Mercury measured	Remarks/Exposure pathway
Nsabimana et al. (2020)[79]	Lake Kivu	Yes	0.0008 - 0.0335 µg Hg/L at the surface; 0.0085 - 0.046 µg Hg/L at 40 m depth; Mercury concentration exceeded the USEPA maximum permissible limit (0.025). Author attributed mercury to possible erosion of the upland soil, discharge of waste from chemical production facilities, volcanic eruptions and emissions, and mining. Recommended further studies with extensive sampling and assessing heavy metals in fish
Nhapi et al. (2012)[80]	River water	No	Zn was 0.041±0.045 mg/L, Cd 0.026±0.029 mg/L, Pb 0.292±0.442 mg/L, Fe 0.756±0.734 mg/L, and Mn 0.340±0.336 mg/L, while Cr was not detected in the water samples. Cd, Fe and Pb far exceeded recommended levels for aquatic life at all sampling points. Attributed the loads to "uncontrolled agriculture, urban runoff and mining activities around the Lake".
Nteziyaremye and Omana (2020)[81]	Water and Fish	No	Heavy metals at Ruliba station and Kirinda bridge: Fe (0.63 ± 0.02 and 1.61 ± 0.03 mg/kg), Mn (0.53 ± 0.002 mg/kg), Cr (0.06 ± 0.002 mg/kg at Kirinda bridge), Cd (0.106 ± 0.002 mg/kg at Ruliba station) and Pb (0.75 ± 0.02 and 0.051 ± 0.01 mg/kg). Edible muscles of Protopterus annectens contained 336.0 ± 0.70, 302.6 ± 1.22, 6.4 ± 0.26, 44.7 ± 0.20, 138.2 ± 0.17 and 302.4 ± 1.50 mg/kg of Fe, Mn, Cu, Zn, Cr and Pb Kirinda bridge; and 272.8 ± 0.36, 292.2 ± 0.25, 8.8 ± 0.36, 135.2 ± 0.15, 148.0 ± 0.21 and 432. 0 ± 0.50 mg/kg of the same at Ruliba station Author concluded that "Nyabarongo river water and fish are polluted with heavy metals with Pb being the major pollutant in concentrations exceeding permissible levels". Recommended protection of river from mining and agricultural activities along its banks

79 *Nsabimana, A., Habimana, V. and Svetlana, G. (2020) Heavy metal concentrations in water samples from Lake Kivu, Rwanda. Rwanda Journal of Engineering, Science, Technology and Environment, 3 (2), 53-62 https://doi.org/10.4314/rjeste.v3i2.3*

80 *Nhapi, I., Wali, U.G., Usanzineza, D., Kashaigili, J.J.. Banadda, N. and Kimwagae, R. (2012) Distribution of heavy metals in Lake Muhazi, Rwanda. The Open Environmental Engineering Journal, 5, 96-102*

81 *Nteziyaremye, P. and Omara, T. (2020) Bioaccumulation of priority trace metals in edible muscles of West African lungfish (Protopterus annectens Owen, 1839) from Nyabarongo River, Rwanda, Cogent Environmental Science, 6:1, 1779557, DOI: 10.1080/23311843.2020.1779557*

Study	Compartment	Mercury measured	Remarks/Exposure pathway
MINIREMA (2015) [82]	Surface water	No	"Very high sediment loads and turbidity, due to mining and traditional farming methods, high loads of Escherichia coli and coliform bacteria (and others not measured) from untreated sewage, and high organic loads"
MINIREMA (2019) [83]			High Cd, Fe, Pb in Lake Muhazi (exceed recommended levels for aquatic life). Attributed to riparian land use practices such as agriculture, urban runoff, and mining activities around the lake
Mukanyandwi et al. (2019)[84]	River water	No	Heavy metals (Fe, Mn, Cu, Zn) found with metal indices higher than 1; concluded that sites were getting the threshold of warning; Author attributed heavy metals to possible transportation into water bodies during the rainy season in urban and rural areas

Table II.129 *Results summary of some studies related to water quality in Rwanda*

2.6. SUMMARY OF MERCURY STOCKPILES

Rwanda is one of the leading countries in Africa in terms of sound management of e-waste. The sole formal e-waste recycling facility of the country, Enviroserve, collected 3,611 tonnes in 2020 and 2021 (Enviroserve, 2021)[85] of e-waste. Using the emission factor of 0.22 g/kg of e-waste, the country could release 794.42 kg of mercury as stockpile from e-waste (Ari, 2016)[86].

It was noted during the inventory that Rwanda has successfully phased out the use of mercury containing thermometers in the medical industry. Consultations with officials in the medical sector revealed that there are remaining stocks of disused clinical thermometers containing mercury. The estimated quantities in stock were reported to be approximately 4,000 boxes with 10 units each. Using the emission factor of 1 g/unit (UNEP 2019)[87], it is estimated that 40 kg of mercury are stockpiled inthe form of clinical thermometers.

In addition, a total of 250 ambient air monitoring thermometers have been identified as stockpiles in various laboratories across the country, with less than 50 currently in use. Using the emission factor of 3.5 g/unit[88], it is estimated that 0.875 kg of mercury is stockpiled inthe form of ambient air thermometers.

A coordinated way of collecting all the obsolete mercury containing equipment remains key in ensuring the sound management of mercury in Rwanda. Institutions have reported that some mercury containing products were in the past being incinerated, especially medical waste. The practice has since been stopped and institutions are stockpiling mercury containing waste pending further guidance from REMA. The education, training and capacity building of relevant personnel

82 MINIRENA (2015) Rwanda national water resources master plan. Ministry of Environment and Natural Resources (MINIRENA), Kigali
83 MINIRENA (2019) IWRM Programme: Rwanda water quality monitoring in Rwanda final report. Ministry of Environment and Natural Resources (MINIRENA), Kigali
84 Mukanyandwi, V., Kurban, A., Hakorimana, E., Nahayo, L., Habiyaremye, G., Gasirabo, A. and Sindikubwabo, T. (2019) Seasonal assessment of drinking water sources in Rwanda using GIS, contamination degree (Cd), and metal index (MI). Environmental Monitoring and Assessment, 191 (734), https://doi.org/10.1007/s10661-019-7757-9
85 Enviroserve (2021) Electronic Waste Management: https://enviroserve.rw/; accessed in May 2022
86 Ari, V. (2016) A review of technology of metal recovery from electronic waste. E-Waste in transition—From pollution to resource.
87 UNEP (2019) Mercury Inventory Toolkit for the identification and quantification of mercury releases and emissions. United Nations Environment Programme (UNEP), Geneva
88 EPA (2022) Mercury thermometers. U.S. Environmental Protection Agency (EPA), Washington DC. https://www.epa.gov/mercury/mercury-thermometers accessed May 2022

in institutions storing obsolete mercury containing equipment will go a long way in ensuring the sound management of mercury. Such institutions include medical facilities, research institutions and universities.

2.7. SUMMARY CONCLUSION AND RECOMMENDATIONS

The study presented findings of the mercury inventory for Rwanda as part of the MIA. The study was conducted as part of the country's efforts to meet the obligations of the Convention. The objective of the inventory was to identify emissions and releases from the 10 categories as guided by the Toolkit. The mercury releases sub-categories contributing with the highest mercury releases to the environment are: Primary metal production, waste management and consumer products with the intentional use of mercury.

Major gaps identified are the following:

a. **Lack of country specific input factors**

b. **Inadequate capturing of activity data rate by institutions including lack of information on emissions of various air emission points.**

c. **Data on water, sediment, soil and air emission monitoring from potential mercury receptor sites does not include mercury as part of the scope of analysis.**

d. **Level of awareness of stakeholder on mercury issues was noted to as relatively low**

The main priorities for further assessment include:

a. **Carrying out studies on the determination of country specific input factors for major mercury releasing categories specifically for the Primary metal production,**

b. **Development of a coordinated harmonised data gathering system on mercury emissions. The system may include mandatory recording of activity data rate and emissions data at source**

CHAPTER III: POLICY, REGULATORY AND INSTITUTIONAL FRAMEWORK REVIEW

3.1. INTRODUCTION

In 2017, the Republic of Rwanda submitted notification of its consent to be legally bound by the Minamata Convention. The country's obligations are defined by the provisions of both the Convention and the country's domestic legal framework. The main objective of the legal and institutional capacity assessment was to assess policies, laws, regulations and institutions of direct or indirect relevance to mercury in Rwanda in order to establish the policy, regulatory and institutional capacity gaps and needs to meet the obligations under the Convention. This assessment will assist the country in putting in place necessary measures for an early implementation of the Convention. The specific objectives were:

a. Analyse and review existing policies, laws and regulations across all relevant sectors that regulate issues of relevance to any provision of the Convention.

b. Identify gaps in the policies, laws and regulations needed to implement the provisions of the Convention.

c. Identify legal and administrative actions that need to be taken in order to address these gaps, including a list of necessary policies, laws and regulations.

d. Identify relevant national institutions and stakeholders, their mandate and their capacities (including gaps and barriers) to implement the Convention.

e. Provide recommendations for building the institutional (and other) capacity required to implement the Convention, taking into account the socio-economic development priorities and vulnerable populations.

3.2. METHODOLOGY

The general approach used for the review of Rwanda's national policies, regulations and institutional capacity was guided by the Minamata Convention text (UNEP, 2013)[89] and the chapter guidelines from UNDP-IOMC (2020)[90]. The legal and institutional capacity assessments were conducted using information from desk review and stakeholder consultations. Desk review focused on the collection of information from websites of different institutions and in official gazettes. Stakeholder consultations focused on the collection of information through key informant interviews and solicitations of expert judgement. In evaluating some of the existing gaps in the legal framework, reference was made to the checklist of legal authorities to implement the Minamata Convention on Mercury (NRDC, 2016)[91]. The ratification and implementation manual (Lennett and Gutierrez, 2015)[92] and the modular approach to awareness raising (UNEP, 2007)[93] were also used to assess and report the institutional capacity gaps and needs.

89 UNEP (2013) Minamata Convention on Mercury: Text and annexes. United Nations Environment Programme (UNEP), Geneva. https://wedocs.unep.org/handle/20.500.11822/8541

90 UNDP-IOMC (2020) Minamata Initial Assessment report: Suggested structure and contents. October 2020. United Nations Development Programme (UNDP) in collaboration with the Inter-Organization Programme for the Sound Management of Chemicals (IOMC), Geneva. https://www.undp.org/sites/g/files/zskgke326/files/publications/2020%20MIA%20Guidance.pdf (accessed 22 May 2022)

91 NRDC (2016) NRDC checklist of legal authorities to implement Minamata Convention on Mercury. Natural Resources Defence Council (NRDC), http://www.nrdc.cn/Public/uploads/2016-12-04/5843ca7f7fcf7.pdf (accessed 22 May 2022)

92 Lennett, D. and Gutierrez, R. (2015) Minamata Convention on Mercury: Ratification and implementation manual. Zero Mercury Working Group. http://www.zeromercury.org/phocadownload/Developments_at_UNEP_level/minamatamanual_eng_january%202015%20final.pdf (accessed 22 May 2022)

93 UNEP (2007) Awareness raising: a modular approach. United Nations Environment Programme (UNEP), Geneva. https://www.mercuryconvention.org/en/documents/awareness-raising-modular-approach (accessed 22 May 2022)

3.3. LEGAL REVIEW

3.3.1. The hierarchy of laws

The review of the legal framework of Rwanda showed that the hierarchy of laws is as follows: The Constitution (Supreme Law in Rwanda); Laws; International Treaties and Agreements; and Orders (Presidential, Prime Minister's and Ministerial Orders). The publication of texts under this hierarchy, including their statutory instruments (official rules and regulations), is done through Official Gazette of the Republic of Rwanda (OGRR), which is the primary source of legislation. The management of mercury, including handling, storage, use and disposal, is not specifically aligned to a single piece of legislation, and some pieces of legislation may have direct or indirect implication on mercury management, even though there do not explicitly mention mercury.

3.3.2. Legislation relevant to mercury

The Constitution of the Republic of Rwanda (RoR, 2015)[94] is the highest level of legal reference in the country and contains various key elements which highlight the importance of the environment through; definitions, responsibilities, systems and compliance. More specifically, article 22 states that everyone has the right to live in a clean and healthy environment and Article 53 outlines that every Rwandan citizen has the duty to protect, safeguard and promote the environment. Furthermore, article 169 of the Constitution prohibits international agreements which permit the transit or dumping of toxic waste and other hazardous materials capable of endangering public health and the environment. This is a proactive and commendable gesture which promotes the national planning and implementation of various programmes, including the Minamata Convention on Mercury.

Table III.1 shows selected Laws with direct or indirect implications on mercury management in Rwanda. Detailed analysis of these laws is given in Section 3.3.3. Some of the Laws look at the environment holistically and cover multiple sectors, while others are specific to either an economic sector or to an environmental dimension.

TABLE III.1 SELECTED ENVIRONMENTAL LAWS

Law	Key mandate
Law N° 64/2021 of 14/10/2021 Governing Biological Diversity	Governing biological diversity, including conserving, management, protect and promoting biological diversity
Law N° 48/2018 of 13/08/2018 on Environment	Modalities of protection, conservation and promotion of the environment
Law N° 49/2018 of 13/08/2018 Determining the Use and Management of Water Resources in Rwanda	Use and management of water resources and insights on water resources in the country
Law N° 58/2018 of 13/08/2018 on Mining and Quarry Operations	Exploration, exploitation, processing or trading of any mineral or quarry
Law Nº 39/2017 of 16/08/2017 Establishing the National Fund for Environment and Determining its Mission, Organisation and Functioning	Establishment, organization, functioning and mission of the National Fund for Environment
Law N°18/2016 of 18/05/2016	Preservation of air quality and prevention of air pollution

94 RoR (2015) The Constitution of the Republic of Rwanda of 2003 revised in 2015. Republic of Rwanda (RoR), Kigali. https://www.rwandabar.org.rw/attached_pdf/Constitution%20of%20the%20Republic%20of%20Rwanda-1608275353.pdf

Law	Key mandate
Law N° 63/2013 of 27/08/2013 Determining the Mission, Organization and Functioning of Rwanda Environment Management Authority	Mission, organization and functioning of Rwanda Environment Management Authority
Law N° 30/2012 of 01/08/2012 on Governing of Agrochemicals	Governing agrochemicals manufacturing, importing, distribution, use, storage, sale and disposal

With regard to international engagement to address global environmental challenges, the Republic of Rwanda has to-date signed a total of 18 international treaties, including the 10 given in Table III.2. The Conventions listed, such as the United Nations Framework Convention on Climatic Changes and its proceeding Paris Agreement, affect mercury management as some activities (e.g. reducing emissions from fossil fuel combustion) aimed at climate change mitigation are also expected to reduce mercury releases to society.

TABLE III.2 SELECTED MULTILATERAL ENVIRONMENTAL AGREEMENTS TO WHICH RWANDA IS A PARTY

Convention (year signed)	Key aim/objective
Minamata Convention on Mercury (2017)	Protection of human and environment from anthropogenic emissions and releases of mercury and mercury compounds
† Montreal Protocol on Substances that Deplete the Ozone Layer (1987)	Protection of the ozone layer by phasing out the production of numerous substances that are responsible for ozone depletion
Bamako Convention (1991)	Ban import into Africa and control of trans-boundary movement of hazardous wastes within Africa
Convention on Biological Diversity (1995)	Conservation of biological diversity, sustainable use of its components and the fair and equitable sharing of benefits arising from genetic resources
United Nations Framework Convention on Climatic Changes (1998)	Combating dangerous human interference with the climate system, in part by stabilizing greenhouse gas concentrations in the atmosphere
United Nations Convention on Desertification (1998)	Creating a resilient livelihood base for people living in areas affected by desertification, land degradation and drought
Stockholm Convention (2002)	Safeguard human health and environment from chemicals that persist in the environment and affect the well-being of humans as well as wildlife
Ramsar Convention on Wetlands (2003)	Halting worldwide loss of wetlands and conserving, through wise use and management of those remaining
Rotterdam Convention (2004)	Commercial transactions of agricultural pesticides and other poisonous products
Basel Convention (2004)	Control of trans-boundary movements of hazardous wastes and their disposal

The Basel Convention is also applicable to trans-boundary movements of mercury waste. Article 11 of the Minamata Convention requires Parties to the Basel Convention to manage mercury waste in an environmentally sound manner, taking into account the guidelines developed under the Basel Convention. Annex 1 of the Bamako Convention lists wastes containing mercury or mercury compounds as a hazardous waste whose import into Africa is prohibited. Conventions on conservation of biodiversity and reducing loss of wetlands can as well be linked to mercury management as mercury is one of the chemical poisons known to reduce biodiversity. Exploited wetlands can be a significant mercury exposure pathway through the human food chain, particularly when contaminated with mercury due to poor waste management practices and land use change. Organic and inorganic mercury compounds, including alkyloxyalkyl and aryl mercury compounds are known persistent organic pollutants listed under the Stockholm Convention.

Table III.3 shows selected Ministerial Orders with direct and indirect implications on mercury, hazardous substances, wastes and pollution management. Orders provide detailed modalities or requirements and procedures for establishing and undertaking specific activities usually emanating from domestic laws or provisions of international treaties.

TABLE III.3 SELECTED MINISTERIAL ORDERS WITH IMPLICATIONS ON MERCURY

Ministerial Order	Key mandate
N° 003/2021 of 08/02/2021 Determining the List of Chemicals and other Polluting Substances that are not Permitted	Prohibits mercury compounds (including alkyloxy-alkyl and aryl- mercury) use, purchase, sold, import, export, transit, storage and pile or distribution.
N° 013/MOJ/AG/19 OF 16/07/2019 Determining Requirements for Granting Authorisation to Import, Manufacture, Transport, Trade in and Use Dynamites in Mining and Quarry Operations	Sets requirements for granting authorization to import, manufacture, transport, trade and use dynamites in mining and quarryoperations.
N°20/38 of 26/02/2016	Determines the list of cosmetics whose use is prohibited in Rwanda. The list includes cosmetics which contain mercury and mercury compounds.
N° 002/11.30 of 14/07/2016	Sets regulations governing agrochemicals. Mercury compounds including inorganic Mercury compound, and alkyloxyalkyl and aryl mercury compounds are listed as prohibited agrochemicals.
N° 005/03 of 27/12/2013 Preventing Air Pollution Caused by Vehicular Emissions and Machines Using Petroleum Products in Rwanda	Aims to prevent air pollution caused by vehicular emissions and machines using petroleum products
N° 003/16.01 of15/07/2010 Preventing Activities that Pollute the Atmosphere	Prevents activities that pollute the atmosphere. Mercury emissions are not covered.
N° 006/16.01 of 15/07/2010 Establishing Special Regulations Relating to Burying Toxic Wastes	Establishing special regulations relating to burying toxic wastes. Burying of controlled wastes including mercury containing waste is subject to prior authorization by the Minister in charge of the environment
N° 004/MINIFOM/2010 of 14/09/2010 Determining the Modalities of Environment Conservation in Mining and Quarry Extraction	Sets the modalities forenvironment conservation in mining and quarry extraction
N° 008/16.01 of 26/11/2010 Establishing Internal Rules and Procedures for Rwanda Environment Management Authority	Sets the rules and procedures for Rwanda Environment Management Authority.
N° 004/2008 of 15/08/2008 Establishing the List of Works, Activities and Projects that have to Undertake an Environment Impact Assessment	Establishes the list of works, activities and projects that have to undertake an environment impact assessment before being executed. These include the construction of industries, factories and activities carried out in those industries, as well as works of extraction of mines
N° 005/2008 of 15/08/2008 Establishing Modalities of Inspecting Companies or Activities that Pollute the Environment	Sets the modalities of inspecting companies or activities that pollute environment. Authorities can conduct inspection in companies or activities to make sure the environment is conserved and protected
N° 003/2008 of 15/08/2008 Relating to the Requirements and Procedure for Environmental Impact Assessment	Defines requirements and procedure for environmental impactassessment

Ministerial Order	Key mandate
N° 26/03 of 23/10/2008 Determining a List of Prohibited Drugs unless Authorized or Temporarily Permitted	Determines the list of chemicals and other prohibited pollutants. Mercury compounds are not listed.
N° 006/2008 of 15/08/2008 Regulating the Importation and Exportation of Ozone Layer Depleting Substances Products and Equipment Containing such Substances	Sets the requirement for importation and exportation of ozone layer depleting substances, products and equipment containing such substances. Ozone depleting substances and their alternatives do not contain mercury, but switches found in old appliances may.

Policies and regulations are critical in governing environmental issues, including anthropogenic releases and emissions of mercury to the environment. The National Environmental and Climate Change Policy (MoE, 2019)[95] sets provisions for environmental and natural resources management systems and plans. It provides strategic directions and responses to emerging issues and critical challenges in environmental management and climate change mitigation and adaptation. The policy seeks to provide measures and solutions to issues such as high population density, environmental pollution, global warming and waste management. Other related policies of relevance to mercury management are given in Table III.4. These policies may be revised so that they include aspects of hazardous chemicals handling, storage and transportation, and the subsequent waste disposal.

TABLE III.4 SELECTED SECTOR-SPECIFIC POLICIES AND STRATEGIC PLANS

Policy (and year enacted)	Key aim/objective/mandate
National Agriculture Policy (2018)	Aims to ensure food and nutrition security, modern agribusiness technologies professionalizing farmers in terms of production, commercialisation of the outputs and the creation of a competitive agriculture sector.
National E-waste Management Policy (2018)	Minimizes the adverse effects of E-waste on the environment and human health through appropriate legal and regulatory framework for E-waste management; e-waste management facilities promotion.
ICT Sector Strategic Plan (2018-2024)	Aims at fast tracking transformation to a knowledge-based society, through broadband for all, Government digital transformation for all essential transactions online, and digital literacy for all regardless of their socio-economic-political stature by 2024.
Medical Waste Management Plan (2017)	Introduces measures to prevent the spread of infection and reduce the exposure of health workers, patients and the public to the risks from medical waste.
National Forestry Policy (2017)	Recognises need to manage forest resources to support the development goals for sustainable, low-carbon and climate resilient growth to improve livelihoods of present and future generations.
National Sanitation Policy (2016)	Aims to ensure sustainable, equitable and affordable access to safe sanitation and waste management services as a contribution to poverty reduction, public health, economic development and environmental protection.
National Water Supply Policy (2016)	Aims to ensure sustainable, equitable, reliable and affordable access to safe drinking water, as a contribution to improving public health and socio-economic development.
Energy Policy (2015)	Recognises the need to shift consumption from biomass-based energies to clean energies to reduce pressure on forest resources. It also focuses on renewable energy infrastructure as one strategy to fight global warming through reductions in greenhouse gas emissions.

95 MoE (2019) National environment and climate change policy. Ministry of Environment (MoE), Kigali. http://www.fonerwa.org/sites/default/files/2021-06/Rwanda%20National%20Environment%20and%20Climate%20Change%20Policy%202019.pdf

Policy (and year enacted)	Key aim/objective/mandate
Health Policy (2014) and Health Sector Strategic Plan (2012–2018)	Define strategies to reduce the burden of disease of the most important health problems in Rwanda – i.e., maternal and child health problems, infectious diseases and non-communicable diseases through access to primary health care. Both prevention and treatment and care services are included in these programmes, as well as interventions aimed at improving important health-determining factors, such as behaviour change communication, promotion of adequate nutrition, environmental health and sanitation, and access to safe water.
Wildlife Policy (2013)	Acknowledges that wildlife protected areas significantly contribute to the production of global public goods and services, and stresses that any adverse impacts on the ecosystems can dramatically and negatively alter humans' capacity to survive.
National Industrial Policy (2011)	Creates an enabling environment for industrialisation; Increase domestic production for local consumption; Improve export competitiveness.
Biodiversity Policy (2011)	Considers the rehabilitation of degraded ecosystems as an urgent and major task that requires the commitment of significant resources from both national budgets and other sources.

Key regulations related directly or indirectly to mercury management in Rwanda include those given in **Table III.5**.

TABLE III.5 SELECTED REGULATIONS GOVERNING KEY SECTORS AND ENVIRONMENTAL MATTERS

Regulation	Relationship with mercury
N°001/LPG/R/GP-EWS/RURA/2018 of 10/01/2018 Governing Liquefied Petroleum Gas Business	Combustion of the Liquefied Petroleum Gas (LPG) emits traces of mercury to the atmosphere
N°003/R/GPEWATSAN/RURA/2017 of 04/09/2017 Governing the Installation, Upgrade and Operation of Petrol Service Stations	Traces of mercury in petrol may be emitted into the atmosphere during storage (fugitive emissions) and combustion of the fuel
N°07/R/GP-EWS/RURA/2021 of 25/02/2021 Governing Aboveground Petroleum Storage Facilities and Importation of Fuel	Traces of mercury in petrol may be emitted into the atmosphere during storage (fugitive emissions) and combustion of the fuel
N°001/MINES/RMB/2019 of 18/07/2019 Determining the Nature, Amount and Deposit of Environmental Rehabilitation Guarantee	
N°005/MINES/RMB/2019 of 18/07/2019 Determining Potential Mining Areas, Criteria for Categorization of Mines, Modalities and Requirements for Mineral Licence Application, and for Tenders	There may be a need for key considerations in the selection of mining sites with potentially high traces of mercury, considering the characteristics and behaviour of mercury
N°002/MINES/RMB/2019 of 18/07/2019 Determining the Provisions of Services Relating to Mining and Quarry Operations	
N° 003/2018 of 9/02/2018, article 8 Governing the Registration of Pesticides, Laboratory and CleaningChemicals	Some pesticides are known to contain mercury as a trace ingredient
N°002/EWASTAN/SW/RURA/2015 of 24/04/2015 Governing Solid Waste Recycling	Some solid waste may contain traces of mercury from disposed consumer products containing mercury
N°0002 of 14/02/2020 Determining Modalities of the Open Air Burningwith an Aim of Solving Particular Problems	Open air burning of waste is one of the key sources of mercury emissions into the atmosphere
N°002/R/SANEWATSAN/RURA/2017 of 01/03/2017 Governing the Provision of Services of Hazardous Waste Management	Hazardous waste containing mercury require specialised handling services considering the characteristics and behaviour of mercury
N°004/R/SANEWS/RURA/2016 of 10/11/2016 Governing DecentralizedWaste Water Treatment Systems	Wastewater treatment is one of the sources of release of trace amounts of mercury to the environment

Regulation	Relationship with mercury
N°007/R/SAN-EWS/RURA/2021 of 04/05/2021 Governing Solid WasteCollection and Transportation Services	Solid waste containing traces of mercury require specialised handling and transportation considering the characteristics and behaviour of mercury
N°005/R/SAN-EWS/RURA/2016 Governing Liquid Waste Collection and Transportation	Wastewater treatment is one of the sources of release of trace amounts of mercury to the environment
N°002 of 26/4/2018 Governing E-Waste Management in Rwanda	Governing E-Waste Management in Rwanda

The policy and regulatory framework review could not identify any regional regulations that would be applicable to the management of mercury or protection of human health from its harmful effects.

3.3.3. Legislative analysis of the Constitution

Any law or custom in conflict with the Constitution of the Republic of Rwanda (RoR, 2015)[96] is null and void to the extent of its inconsistency. As stated before, Article 22 of the Constitution provides for the right to live in a clean and healthy environment, while Article 53 provides for the protection of the environment as the duty of everyone and the country to ensure the protection of the environment. The Articles of the Constitution relates well with Articles of the Convention, including Article 1 that provided for the protection of human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. As such, there were no gaps noted within the Constitution, and therefore no recommendation is passed to amend the Constitution.

3.3.4. Analysis of the legal framework in relation to the Convection

There are several activities targeted in the Minamata Convention which do not currently exist in the country. As a result, not all the Articles of the Convention are relevant to Rwanda. The mercury related activities that are not taking place in Rwanda are:

- Primary mercury mining and initial processing (Article 3, paragraphs 3 and 4)
- Manufacturing processes in which mercury or mercury compounds are used (Article 5, paragraph 2)
- Artisanal and small-scale gold mining and processing in which mercury amalgamation is used (Article 7)
- Coal-fired power plants (Annex D)
- Smelting and roasting processes used in the production of non-ferrous metals (zinc, copper, lead and aluminium) (Annex D)

The analysis of existing pieces of legislation in relation to the provisions of the Convention is summarised in Table III.6.

96 RoR (2015) Rwanda's Constitution of 2003 with amendments through 2015. Republic of Rwanda (RoR), Kigali. https://www.constituteproject.org/constitution/Rwanda_2015.pdf?lang=en

TABLE III.6 POLICY AND REGULATORY MEASURES IN PLACE AND REMAINING GAPS

Article 3: Mercury supply sources and trade		
Description of Article:		
Convention provisions applicable to Rwanda	Not allow new primary mercury mining (paragraph 3) Only allow primary mercury mining that was being conducted within its territory at the date of entry into force of the Convention for it for a period of up to fifteen years after that date (paragraph 4) Mercury from such mining shall only be used in manufacturing of mercury-added products in accordance with Article 4, in manufacturing processes in accordance with Article 5, or be disposed in accordance with Article 11, using operations which do not lead to recovery, recycling, reclamation, direct re-use or alternative uses (paragraph 4) Obtain information on stocks of mercury or mercury compounds >50 tons, and mercury supply generating stocks >10 tons/yr. (paragraph 5a) Restrict import and use of excess mercury from decommissioning chlor-alkali plants (paragraph 5b) Not allow the export of mercury unless the importing country provides written Consent and the mercury is for an allowed use under the convention or environmentally sound storage, and all other conditions are met (paragraph 6) 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 paragraph 3 or paragraph 5 (b) (paragraph 8) Include in its reports submitted pursuant to Article 21 information showing that the requirements of this Article have been met. (paragraph 11)	
Legislation in place to comply with provisions of Article 3 of the Minamata Convention		
Legal instruments	**Aspects of the Minamata Convention addressed**	**Outstanding gaps to be addressed/developed**
Ministerial Order N° 003/2021 of 08/02/2021 List of chemicals and other polluting substances that are not permitted	Mercury compounds, including inorganic mercury compounds, and alkyloxy alkyl and aryl mercury compounds are on the list of prohibited chemicals Prohibits mercury compounds use, purchase, sold, import, export, transit, storage and pile or distribution for free	None
Law N° 48/2018 of 13/08/2018 Modalities of protection, conservation and promotion of the environment	Law (Article 45) prohibits the purchase, sell, import, export, transit, store and pile chemicals, diversity of chemicals and other polluting or dangerous substance and import of toxic waste and any other product harmful to human health and environment. Mercury indirectly implied in the Article	Effective implementation of Article 45 is lacking Mercury is implied but not specifically mentioned or targeted
Law N° 58/2018 of 13/08/2018 Exploration, exploitation, processing or trading of any mineral or quarry	Sets requirements for exploitation, processing or trading of any mineral or quarry	Does not ban primary mining of mercury
Recommendations under Article 3		

Ban new primary mercury mining. Issue legal instruments restricting imports (e.g., based on Law N° 48/2018 of 13/08/2018) and exports of mercury. Awareness raising and training of the public, workers and professionals on the revised legal instruments is also recommended.	
Article 4: Mercury added products	
Description of Article:	
Convention provisions applicable to Rwanda	Prohibit the manufacture, import and export of mercury-added products (Annex A): Part I: To be phased out by 2020 (batteries, switches and relays, compact fluorescent lamps, high pressure mercury vapour lamps, mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps, cosmetics including skin lightening soaps and creams, pesticides, biocides and topical antiseptics, non-electronic measuring devices such as barometers, hygrometers, manometers, thermometers and sphygmomanometers). (paragraph.1) Part II: Phase down and phase out use of dental amalgam by implementing 2 or more of 9 proposed measures by the convention (paragraph 3) Take measures to prevent the incorporation of products listed in Part I of Annex A into larger, assembled products (paragraph 5) Discourage the manufacture and distribution of new mercury product types (paragraph 6)

Legislation in place to comply with provisions of Article 4 of the Minamata Convention		
Legal instruments	**Aspects of the Minamata Convention addressed**	**Outstanding gaps to be addressed/developed**
Law N° 30/2012 of 01/08/2012 Governing agrochemicals manufacturing, importing, distribution, use, storage, sale and disposal	Prohibits unauthorised handling of agrochemicals without certification by the Registrar of agrochemicals Provides for a Ministerial Order to publish list of prohibited agrochemicals	Effective implementation is lacking Limited capacity to test for mercury in agrochemicals
Ministerial Order N° 002/11.30 of 14/07/2016 determining regulations governing agrochemicals	Mercury compounds, including inorganic mercury compounds, and alkyloxy alkyl and aryl mercury compounds are on the list of prohibited chemicals	
N° 003/2018 of 9/02/2018, article 8 (FDA) Governing the registration of pesticides, laboratory and cleaning chemicals	Provisions for registration of pesticides and other chemicals, thereby indirectly discourage the manufacture and distribution of new mercury product types Compliance to Good Manufacturing Practices to fulfil the requirements of laboratory quality tests which may control mercury as a poisonous chemical substance.	Does not explicitly mention mercury based agrochemicals

Law N° 52/2018 of 13/08/2018 modifying Law N° 21/2011 of 23/06/2011 governing electricity	None	Lacks specific provisions that regulates the use and elimination of batteries, Does not cover switches and relays, compact fluorescent lamps, high pressure mercury vapour lamps, mercury in cold cathode, fluorescent lamps and external electrode fluorescent lamps
Ministerial Order N° 20/38 of 26/02/2016 determining the list of cosmetics whose use is prohibited	Prohibits the manufacture, import and export of cosmetics including skin lightening soaps and creams Mercury and its compounds are on the list of cosmetics whose use is prohibited Effective implementation of this order may control mercury and its compounds use in cosmetics	Effective implementation is lacking Lack of capacity to test for mercury in cosmetic products Lack of capacity to deal with import and export clearing activities involving products with mercury
Law N° 47/2012 of 14/01/2013 relating to the regulation and inspection of food and pharmaceutical products	Cosmetics must be free of toxic substances and meet quality standards applicable in the country and be prepared in compliance with relevant principles of good preparation practice. Prohibits manufacture, importation, storage, exhibition, sale or dispensing of cosmetics unless they meet requirements under this Law (Article 16) Prohibits manufacture, storage, sell and distribution of toxic cosmetics or those that may cause adverse effects to the users (Article 19)	
Recommendations under Article 4		
There is a need to ban the manufacture, import and export of mercury added products listed in Part I of Annex A, except where an exclusion is specified in Annex A, or where Rwanda has a registered exemption pursuant to Article 6 of the convention and proposes mercury free alternatives. There is need to establish a control on the import and export of dental amalgams in order to phase-down their use. A legal instrument should be developed to discourage future manufacture and distribution of new mercury product types. Awareness raising and training of the public, workers and professionals on the revised legal instruments is also recommended.		
Article 7: Artisanal and small-scale gold mining (ASGM)		
Description of Article:		

Convention provisions applicable to Rwanda	Parties with ASGM to take steps to reduce and where feasible eliminate the use of mercury in such mining and its release to the environment from mining and processing (paragraph 2). For Parties where artisanal and small-scale gold mining and processing is more than insignificant, develop and implement a National Action Plan, to be submitted to the Secretariat no later than three years after the notification to the Secretariat, and provide a review every three years of the progress made in meeting its obligations under this Article and include such reviews in its reports submitted pursuant to Article 21 (paragraph 3 in accordance with Annex C).

Legislation in place to comply with provisions of Article 7 of the Minamata Convention		
Legal instruments	**Aspects of the Minamata Convention addressed**	**Outstanding gaps to be addressed/developed**
Law N° 58/2018 of 13/08/2018 Exploration, exploitation, processing or trading of any mineral or quarry	Mining licence holders to conduct environmental and social impacts assessment prior to commencement of mining operations (Article 39) Effective impact assessments contribute to the control of mercury in gold mining and processing under the ASGM sector	Absence of provisions on managing intentional and unintentional mercury releases to the environment from gold mining activities
Law N° 48/2018 of 13/08/2018 Modalities of protection, conservation and promotion of the environment	Law (Article 45) prohibit the purchase, sell, import, export, transit, store and pile chemicals, diversity of chemicals and other polluting or dangerous substance and import of toxic waste and any other product harmful to human health and environment. Mercury indirectly implied in the Article	Effective implementation of Article 45 is lacking

Recommendations under Article 7

There is a need to enforce existing regulations to ensure no diversion of mercury and mercury compounds from other sectors to ASGM. There is a need to develop a strategy to ensure that mercury amalgamation is not introduced in the ASGM sector in Rwanda. Awareness raising and training of the public, miners and professionals on the revised legal instruments is also recommended.

Article 8: Emissions

Description of Article:

Convention provisions applicable to Rwanda	Identify one or more measures to control/reduce mercury emissions from existing sources listed in Annex D (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). (paragraphs 4 and 5) Require monitoring/reporting and otherwise develop and maintain an inventory of emissions from relevant sources (paragraphs 7 and 11).

Legislation in place to comply with provisions of Article 8 of the Minamata Convention		
Legal instruments	**Aspects of the Minamata Convention addressed**	**Outstanding gaps to be addressed/developed**

Law N° 18/2016 of 18/05/2016 Preservation of air quality and prevention of air pollution	Prohibits emission of chemicals, materials, gas or hazardous substances unless such emission is authorized by the National Authority in charge of the protection of environment (Article 6) Articles (10, 11, 12, 13) regulate emissions from construction, storage of objects, waste incineration and from other sources such as power plants, gas extraction, plants, boilers, generators, and furnace. The sources must avoid causing emission of air pollutants by complying with the relevant quality standards regulations.	Effective implementation lacking Absence of provisions on smelting and roasting processes used in the production of non-ferrous metals and cement clinker production facilities No definition of mercury emission sources Absence of control measures on mercury emission sources
Ministerial Order N° 02/2018 of 17/09/2018 relating to air pollutants emissions	Regulates machines using petroleum products as a source of energy Application for air pollutants emission permit; by specifying the type and origin of pollutants	Absence of provisions on point sources as defined in Annex D of the Convention
National Environment and Climate Change Policy	Compliance with air quality standards in urban and rural areas and strengthen enforcement capacity Strengthens and implements existing environmental guidelines, standards and develop new ones, where necessary, to control emissions from motor vehicles, power plants and industries Supports the development of guidelines and standards to control emissions from motor vehicles, power plants and industries	Limited progress in generating supporting regulations, guidelines and standards covering mercury emissions
Recommendations under Article 8		
All activities that are potential sources of mercury emissions should be regulated through: (1) elaboration of mercury emissions limits from relevant sources; (2) requiring the use of best available techniques and best environmental practices to control emissions from relevant sources; (3) developing a multi-pollutant control strategy that would deliver co-benefits for control of mercury emissions; (4) proposing alternative measures to reduce emissions from relevant sources; (5) developing and maintaining an inventory of emissions from relevant sources. In addition, the country is bordered by territories in which considerable mercury emissions have been reported, largely from ASGM activities. Routine ambient air monitoring may also assist to assess the impacts of trans-boundary pollution that may have significant impact on human health and the environment.		
Article 9: Releases		
Description of Article:		

Convention provisions applicable to Rwanda	Controlling and, where feasible, reducing releases of mercury and mercury compounds to land and water from the relevant point sources not addressed in other provisions of the Convention. Parties to identify relevant point source categories (paragraph 3) Parties to take measures to control releases and to prepare, if desired, a national action plan setting out measures (paragraph 4) Control releases shall include one or more of the following, as appropriate (paragraph 5): Release limit values to control and, where feasible, reduce releases from relevant sources; The use of best available techniques and best environmental practices to control releases from relevant sources; A multi-pollutant control strategy that would deliver co-benefits for control of mercury releases; Alternative measures to reduce releases from relevant sources; Each Party shall establish, as soon as practicable and no later than five years after the date of entry into force of the Convention for it, and maintain thereafter, an inventory of releases from relevant sources (paragraph 6) Each Party shall include information on its implementation of this Article in its reports submitted pursuant to Article 21, in particular information concerning the measures it has taken in accordance with paragraphs 3 to 6 and the effectiveness of the measures (paragraph 8)

Legislation in place to comply with provisions of Article 9 of the Minamata Convention		
Legal instruments	**Aspects of the Minamata Convention addressed**	**Outstanding gaps to be addressed/developed**
Ministerial Order N° 004/16.01 of 24/05/2013 determining the list of water pollutants	Article 1: Determines the list of water pollutants defined as any substance that may contaminate a water body which is directly or indirectly discharged into such a water body and produces harmful effects to aquatic life. Article 2: Water pollutants referred to in this Order shall be determined in accordance with the national standards established by a competent authority Article 3: The list of water pollutants is annexed to this Order and may be modified whenever considered necessary by a competent authority Mercury is listed as inorganic water pollutant Vinyl chloride is listed as organic water pollutant	Absence of elemental mercury and organic mercury on the list Absence of mercury standards in soil, waste and sediments No definition of mercury release sources Absence of control measures on mercury release sources
Agricultural liming materials - Specification (RSB, 2015)[97]	Release limit values to control and, where feasible, reduce releases from relevant sources Allowable level of mercury for agricultural liming materials (2 mg/kg)	Enforcement of standard largely inadequate
Recommendations under Article 9		

97 RSB (2015) Agricultural liming materials — Specification. Rwanda Standards Board (RSB), Kigali

All activities that are potential sources of mercury releases should be regulated through: (1) elaboration of mercury releases limits from relevant sources; (2) requiring the use of best available techniques and best environmental practices to control emissions from relevant sources no later than 5 years after entry into force; (3) developing a multi-pollutant control strategy that would deliver co-benefits for control of mercury emissions; (4) proposing alternative measures to reduce emissions from relevant sources; (5) developing and maintaining an inventory of emissions from relevant sources.

Article 10: Environmentally sound interim storage of mercury, other than waste	
Description of Article:	
Convention provisions applicable to Rwanda	Each Party shall take measures to ensure that the interim storage of mercury and mercury compounds intended for a use allowed to a Party under this Convention is undertaken in an environmentally sound manner, taking into account any guidelines, and in accordance with, adopted pursuant to paragraph 3 (paragraph 2). Parties shall cooperate, as appropriate, with each other and with relevant intergovernmental organizations and other entities, to enhance capacity-building for the environmentally sound interim storage of such mercury and mercury compounds (paragraph 4)

Legislation in place to comply with provisions of Article 10 of the Minamata Convention

Legal instruments	Aspects of the Minamata Convention addressed	Outstanding gaps to be addressed/developed
Law N° 48/2018 of 13/08/2018 Modalities of protection, conservation and promotion of the environment	None	Establish new legal provisions for interim storage of mercury and mercury compounds
Ministerial Order N° 003/2021 of 08/02/2021 List of chemicals and other polluting substances that are not permitted	None	
Law N° 30/2012 of 01/08/2012 Governing agrochemicals manufacturing, importing, distribution, use, storage, sale and disposal	None	
Ministerial Order N° 002/11.30 of 14/07/2016 determining regulations governing agrochemicals	None	

Recommendations under Article 10
Adopt regulation and institutional mechanisms for the regulation of interim storage of mercury and mercury compounds, other than mercury wastes. This policy instrument should consider key mercury using sectors and must stipulate provisions for interim storage facilities.
Article 11: Mercury waste
Description of Article:

Convention provisions applicable to Rwanda	Take measures to manage mercury wastes in an environmentally sound manner, taking into account guidelines developed under the Basel Convention and in accordance with COP requirements to be developed (paragraph 3.a) Take measures to restrict mercury derived from the treatment or re-use of mercury waste to allowed uses under the Convention or environmentally sound disposal (paragraph 3.b) Take appropriate measures so that mercury waste is, for Parties to the Basel Convention, not transported across international boundaries except for the purpose of environmentally sound disposal in conformity with this Article and with that Convention. In circumstances where the Basel Convention does not apply to transport across international boundaries, a Party shall allow such transport only after taking into account relevant international rules, standards, and guidelines (paragraph 3.c)

Legislation in place to comply with provisions of Article 11 of the Minamata Convention		
Legal instruments	**Aspects of the Minamata Convention addressed**	**Outstanding gaps to be addressed/developed**
Law N° 48/2018 of 13/08/2018 Modalities of protection, conservation and promotion of the environment	Law (Article 45) prohibits the importation of toxic waste and any other product harmful to human health and environment. Mercury indirectly implied in the Article	Effective implementation lacking
Ministerial Order N° 006/16.01 of 15/07/2010 establishing special regulations relating to burying toxic wastes	This Order determines the modalities of safe disposal of toxic wastes (article 1). It prohibits to bury toxic wastes referred to in the annex of this order, except in accordance with the provisions of this Order (article 2)	Waste that contains mercury or mercury compounds are on the list of prohibited waste to bury except under authorization in accordance with this order.
N° 002/R/SANE-WATSAN/RURA/2017 Governing the provision of services for hazardous wastes management	Defines characteristics of hazardous waste (article 4), Segregation of hazardous waste (article 5), packing material for hazardous waste (articles 6, 7, 8, 9), Requires appropriate manner of Collection of hazardous waste including of personal protective equipment to avoid any physical contact with waste (article 10) Sets requirements for hazardous waste collection and transportation (article 11), storage facilities (article 13), treatment (article 14) This regulation may cover mercury waste according to the provided characteristics of hazardous waste	Effective implementation lacking
N° 002 of 26/4/2018 Governing electronic waste management	Indicates technical requirements of e-waste collection and transportation: The applicant for e-waste including equipment and source segregation Article 9: indicates technical requirements of e-waste dismantling and refurbishing Article 10: indicates technical requirements for e-waste recycling	Provisions for e-waste not explicit on mercury for unique handling and management

Handling and Disposal Code of Practice (RSB, 2020)[98]	Platform for phasing down and phase out mercury containing products through waste minimisation strategies	Code does not show how mercury containing wastes will be treated taking into account the properties and behaviour of mercury in the environment No provisions provided for dental amalgam waste
National E-Waste Management Policy for Rwanda (2018)	Promotes the establishment of E-waste management facilities (dismantling facilities, collection centres and E-waste drop off points) to ensure proper collection, transportation, dismantling, disposal and recycling of E-waste Develops and enforces relevant laws and regulations for E-waste management, with adequate considerations of the existing legal and regulatory instrument Develops and promotes E-waste management standards, regulations and operational guidelines for the sorting, collection, transportation, treatment and disposal of E-waste	Provisions for e-waste facilities not explicit on mercury for unique handling and management
National Environment and Climate Change Policy (2019)	Develops an integrated national waste management strategy Promotes infrastructure and human capacity development for medical waste and hazardous waste management systems Promotes the sound management of chemicals and hazardous wastes in accordance with agreed international frameworks (such as the Stockholm, Basel and Rotterdam Conventions) Sets up waste management information systems Domesticates chemical and chemical waste Multilateral Environmental Agreements	Limited progress in generating supporting regulations, guidelines and standards covering mercury waste Not explicitly indicate mercury wastes for unique handling and management
National Sanitation Policy (2016)	Ensures safe management of e-waste, industrial waste, radioactive waste and health-care waste Declares the need to develop of a specific industrial waste management policy, regulations as well as industrial waste management guidelines by the concerned ministries/institutions/authorities Declares the need to have special disposal sites for health care waste given their speciality.	Absence of specific industrial waste management policy, regulations as well as industrial waste management guidelines Lack of the list of selected disposal sites for healthcare waste

98 RSB (2020) Waste within healthcare facilities: Handling and disposal code of practice. RS 209: 2020. Rwanda Standards Board (RSB), Kigali. http://www.puntofocal.gob.ar/notific_otros_miembros/rwa290_t.pdf

Instructions No 0002 of 14/02/2020 determining modalities of the open air burning with an aim of solving particular problems	Prohibits open air burning or use in burning process for hazardous substances including but not limited to batteries, household chemicals, pesticides, asbestos, used oil, gasoline, paints, varnishes, and solvents; treated construction and demolition waste or materials including roofing materials, treated or painted wood Prevents the burning of hazardous substances or waste and these may likely contain mercury such as batteries, chemicals, pesticides, paints, solvents, construction waste	Not explicitly indicate mercury wastes for unique handling and management
Medical Waste Management Plan (2017)	Categorizes mercury, batteries, Led, and E-waste as special waste that shall be segregated into the appropriate waste category.	Does not specify appropriate way to treat mercury waste after collection and separation Does not specify about dental amalgam waste and measuring equipment
Recommendations under Article 11		
Mercury waste requires a policy instrument to ensure it is managed in an environmentally sound manner. This instrument will include SOP for sound handling and storage of mercy waste, and will facilitate the establishment of dedicated storage facilities. There is also a need to plan the identification of all the types of mercury wastes (consisted of mercury, containing mercury, and contaminated with mercury) generated in Rwanda, as well as their sources or generators. Control measures should be established. There is a need to include mercury waste in all the legal instruments to address the uniqueness of mercury properties This entails recognising that mercury is very volatile and soluble and can travel over long distances via air and water.		
Article 12: Contaminated sites		
Description of Article:		
Convention provisions applicable to Rwanda	Develop appropriate strategies for identifying and assessing mercury/mercury compound contaminated sites (paragraph 1) If risk reduction activities are taken at contaminated sites, they are taken in an environmentally sound manner, incorporating risk assessment where appropriate (paragraph 2) Parties are encouraged to cooperate in developing strategies and implementing activities for identifying, assessing, prioritizing, managing and, as appropriate, remediating contaminated sites (paragraph 4)	
Legislation in place to comply with provisions of Article 12 of the Minamata Convention		
Legal instruments	**Aspects of the Minamata Convention addressed**	**Outstanding gaps to be addressed/developed**
Rwanda Standards RS EAS 12 Potable water specification (RSB, 2017)[99]	Mercury permissible limits in natural and treated water (0.001 mg/L) as part of risk assessment and identification of contaminated sites	Enforcement of standard largely inadequate No legislation about strategies for identifying and assessing sites contaminated by mercury or mercury compounds. No guidelines on managing contaminated sites and reducing the risks posed by such sites to human health and the environment
Rwanda Standards RS 110 Water quality –Discharged (RSB, 2017)[100]	Mercury permissible limits in wastewater discharge (0.002 mg/L) as part of risk assessment and identification of contaminated sites	

99 RSB (2017) Rwanda Standards RS EAS 12 Potable water specification, 3rd Edition, Rwanda Standards Board, Kigali
100 RSB (2017) Rwanda Standards RS 110 Water quality – Discharged, 2nd Edition. Rwanda Standards Board, Kigali

Recommendations under Article 12		
There is a need to develop and adopt legislation and strategies for identifying and assessing sites contaminated by mercury or mercury compounds.		
Article 13: Financial resources and mechanism		
Description of Article:		
Convention provisions applicable to Rwanda	Access domestic resources as may be needed to implement Convention obligations (paragraph 1) Access financial resources available under the Convention financial mechanism and other resources available from multilateral, regional, and bilateral funding sources (paragraphs 1 and 5) All Parties, within their capabilities, are invited to contribute to the Mechanism (paragraph 12)	
Legislation in place to comply with provisions of Article 13 of the Minamata Convention		
Legal instruments	**Aspects of the Minamata Convention addressed**	**Outstanding gaps to be addressed/developed**
Law Nº 39/2017 of 16/08/2017 Establishing the National Fund for Environment and determining its mission, Organisation and functioning	The National Fund for Environment (FONERWA) has responsibilities (article 6) to: Mobilise and manage resources used in financing activities aiming at protecting and preserving environment and natural resource Collect and manage funds from public, private, through a bilateral and multi-lateral partnership to achieve the country's objectives Advance national priorities in the field of environment to support public organs, associations and individuals for environment protection and conservation, research Collaborate with other national regional and international institutions with the same mission	No specific provisions on the protection of environment against mercury effects Limited progress in establishing the Ministerial Order that shall specify the list of activities and projects to be financed by FONERWA
Recommendations under Article 13		
Development of ministerial order establishing the list of activities and projects to be financed by FONERWA by taking into consideration the provisions of Minamata Convention. Development of a resource mobilization strategy to address mercury pollution and impacts in Rwanda.		
Article 14: Capacity-building, technical assistance and technology transfer		
Description of Article:		
Convention provisions applicable to Rwanda	Cooperate to provide/receive capacity-building and technical assistance (paragraph 1) Promotion and facilitation of environmentally sound alternatives technologies to strengthen their capacity to effectively implement this Convention (paragraph 3)	
Legislation in place to comply with provisions of Article 14 of the Minamata Convention		
Legal instruments	**Aspects of the Minamata Convention addressed**	**Outstanding gaps to be addressed/developed**

Law N° 48/2018 of 13/08/2018 Modalities of protection, conservation and promotion of the environment	None	Provisions on human, technical/technological capacity building on mercury issues, including environmental learning strategy Inclusion of research strategy provisions covering environmentally sound alternatives
National Environment and Climate Change Policy (2019)	Policy statement 4: Enhance environment, weather and climate information use and climate change awareness and education among the Rwandan	
Recommendations under Article 14		
There is a need to put in place strategies, including a legislative framework if appropriate, to foster capacity-building, technical assistance and technology transfer to comply with the provisions of the Convention.		
Article 16: Health aspects		
Description of Article:		
Convention provisions applicable to Rwanda	Promote the development and implementation of strategies to identify and protect populations at risk (paragraph 1a) Promote occupational exposure educational and prevention programs (paragraph 1b) Promote prevention, treatment, and care services for affected populations (paragraph 1c) Establish and strengthen, as appropriate, the institutional and health professional capacities for the prevention, diagnosis, treatment and monitoring of health risks related to the exposure to mercury and mercury compounds (paragraph 1d)	
Legislation in place to comply with provisions of Article 16 of the Minamata Convention		
Legal instruments	**Aspects of the Minamata Convention addressed**	**Outstanding gaps to be addressed/developed**
Health Sector Policy (2015)	Informing and mobilising the general population about risk factors such as unhealthy contaminated diet, and environmental pollution. Different interventions will be established in collaboration with the Ministry having Labour under its responsibilities including prevention programs to ensure Safety and Health at Workplaces Occupational Safety and Health (OSH) related risks assessment and coming up with appropriate preventive measures Qualifying Occupational diseases, raising awareness on OSH among Health Sector Workers Conducting medical check-ups for Workers, promoting more extensive reporting on OSH, Integrating OSH into different Health Sector legislations and develop OSH specific regulations for Health Sector	Priority areas of intervention do not explicitly talk about occupational exposure to mercury waste in health sector

Law N° 47/2012 of 14/01/2013 relating the regulation and inspection of food and pharmaceutical products	Food safety Cosmetics must be free of toxic substances and meet quality standards applicable in the country and be prepared in compliance with relevant principles of good preparation practice. An Order of the Minister shall set out the list of cosmetics whose use is prohibited within the country (article 15) No person shall manufacture, import, store, exhibit, sell or distribute medical devices that contain or consist of parts likely to be harmful to health when they are used (article 23) This law requires food products free of toxic substances and prohibit manufacture, import, store, exhibit, sale or dispense cosmetics or distribute pharmaceutical devices that contain or consist of parts likely to be harmful to health when they are used which may protect people the effects of mercury defined as a toxic substance by the Convention	Lack of Ministerial Order that sets out instructions regulating food products and their composition (article 5) including food safety against heavy metals such as mercury among others
National Food and Nutrition Policy (2014)	Strategic Direction 3: Promote services and practices that result in improved household food security Strategic Direction 4: Prevention and management of all forms of malnutrition including the prevention and control of nutrition-related non-communicable diseases Promote the prevention and control of nutrition-related non- communicable diseases	Lack of provisions on proper food safety systems including food safety of fish and other imported sea food which likely may be contaminated by polluted water with mercury and other heavy metals
Recommendations under Article 16		
There is a need for revising the health sector legal framework to ensure that the sector takes a precautionary role in preventing, diagnosing and treating the hazard of mercury poisoning. Legal reforms could be aligned towards empowering the health practitioners to undertake studies on mercury levels in humans as well as foods. There is a need to set up minimum permissible limits of mercury in human diet and to further improve inspection of food for mercury contamination. There is a need to develop and implement strategies and programmes to identify and protect populations at risks of exposure to mercury, including dental amalgam and other mercury containing devices in the health sector and other sectors that will be identified by the inventory (e.g. Health and Gender mainstreaming strategy in NAP); There is a need to develop and implement science-based educational and preventive programmes on occupational exposure to mercury by taking into consideration different physiological, socio and economic implications of mercury pollution for men and women;		
Article 18: Public information, awareness and education		
Description of Article:		

Convention provisions applicable to Rwanda	Each Party shall, within its capabilities, promote and facilitate: (a) Provision to the public of available information on: (I) The health and environmental effects of mercury and mercury compounds; (ii) Alternatives to mercury and mercury compounds; (iii) The topics identified in paragraph 1 of Article 17; (iv) The results of its research, development and monitoring activities under Article 19; (v) Activities to meet its obligations under this Convention; (b) Education, training and public awareness related to the effects of exposure to mercury and mercury compounds on human health and the environment in collaboration with relevant intergovernmental and non-governmental organizations and vulnerable populations, as appropriate (paragraph 1) 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 (paragraph 2)

Legislation in place to comply with provisions of Article 18 of the Minamata Convention

Legal instruments	Aspects of the Minamata Convention addressed	Outstanding gaps to be addressed/developed
Law N° 53 bis/2013 of 28/06/2013 establishing the National Institute of Statistics of Rwanda (NISR) and determining its mission, organisation and functioning	Collect and disseminate information on annual activity data to facilitate estimation of quantities of mercury releases to society	Need to extend the scope of surveys and data collection to include activity rate data that allows for effective computation of the mercury inventory
Ministerial Order N° 001/MINEDUC/2021 of 20/10//2021 determining standards in education	Article 40 of this order states that a university, a polytechnic, a specialized Institute, a college, or a professional institute must undertake impactful fundamental and applied research and demonstrate dissemination of research output in the community and how it informs teaching and learning.	Need to extend the scope of research to cover mercy issues as very limited data and information is currently available
Ministerial OrderN° 002/MINEDUC/2021 of 20/10/2021 establishing curriculum in general, Professional and technical and vocational basic education	This order provides chemistry as a lesson in lower and upper secondary education, in TVETs and higher leaning institutions while Safety Health and Environment at Workplace is a lesson in TVETs Promotes chemistry and Safety Health and Environment courses	Need to extend the scope of education to cover mercy issues as the current curriculum is very thin on mercury issues

Ministerial Instructions N ° 0003/2010 of 09/12/2010 regulating research activities	Provides for application for authorisation to undertake research activities to the General Directorate of Science, Technology and Research in the Ministry in charge of research. Authorisation to carry out research in a protected zone like a national park and prisons shall be sought from a competent authority. Authorisation to carry out research on a human being shall be sought from the sole subject of research or the guardian in case of a minor Students, lecturers and researchers in public and private institutions of learning as well as public servants and staff of public and private research institutions, when undertaking research activities in the framework of their duties, shall not be required to seek prior authorisation from the Directorate General in charge of Science Technology and Research of the Ministry in charge of Research.	Need to extend the scope of research to cover mercy issues as very limited data and information is currently available
Law N° 63/2013 of 27/08/2013 Mission, organization and functioning of Rwanda Environment Management Authority	Gives a role to REMA in research and awareness raising	None
Recommendations under Article 18		
Develop strategies to promote research on mercury related topics; Develop strategies on promotion of mercury related topics under chemistry and Safety Health and Environment courses; Develop a strategy to promote research on non-communicable disease (including those known to be caused by exposure to mercury), their causes and preventive measures; Develop awareness raising and learning strategy that cover mercury issues. Develop governmental coordination mechanism to collect information about mercury from different ministries and authorities and inform the public. Consider the establishment of 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.		
Article 21: Reporting		
Description of Article:		
Convention provisions applicable to Rwanda	Report to the Conference of the Parties, through the Secretariat, on the measures it has taken to implement the provisions of this Convention and on the effectiveness of such measures and the possible challenges in meeting the objectives of the Convention (paragraph 1) Include in its reporting the information as called for in Articles 3, 5, 7, 8 and 9 of this Convention (paragraph 2)	
Legislation in place to comply with provisions of Article 21 of the Minamata Convention		
Legal instruments	**Aspects of the Minamata Convention addressed**	**Outstanding gaps to be addressed/developed**

Law N° 48/2018 of 13/08/2018 Modalities of protection, conservation and promotion of the environment	None	Put in place strategies to build local capacity to participate in negotiations related to the Convention
National Environment and Climate Change Policy (2019)	Policy is framed in the context of recent international and regional developments that call for domestication of the relevant conventions, protocols, agreements, laws and treaties, including the Minamata Convention	
Recommendations under Article 21		
Establish strategies to build local capacity to participate in negotiations related to the Convention.		

3.4. INSTITUTIONAL CAPACITY ASSESSMENT

3.4.1. The hierarchy of institutions

The Government of the Republic of Rwanda has three independent but complementary branches, namely the Executive, the Legislature and the Judiciary. The Cabinet implements national policies through in 2022 a total of 20 Ministries that fall under the Chief of Cabinet. Table III.7 shows selected Government Ministries and their affiliated Agencies whose role in mercury issues is critical.

TABLE III.7 SELECTED GOVERNMENT INSTITUTIONS CONCERNED WITH MERCURY ISSUES

Ministry	Role in mercury issues	Selected affiliated agency/departments
Environment (MOE)	Legal compliance, enforcement, research and management	Rwanda Environment Management Agency (REMA)
		Rwanda Green Fund (FONERWA)
		Rwanda Land Management and Use Authority (RMUA)
Health (MOH)	Mercury in products, health impacts, treatment and research	Rwanda Biomedical Centre (RBC)
		Food and Drug Authority (FDA)
		Centre Hospitalier Universitaire de Kigali (CHUK)
		University Teaching Hospital of Butare (CHUB)
Infrastructure (MINIFRA)	Mercury in energy sector, research and management	Rwanda Energy Group (REG)
		Water and Sanitation Corporation (WASAC)
		Rwanda Housing Authority (RHA)
Finance and Economic Planning (MINECOFIN)	Funding strategies	Rwanda Revenue Authority (RRA)
		National Institute of Statistics of Rwanda (NISR)
Education (MINEDUC)	Awareness raising and training, research on alternatives to mercury	University of Rwanda (UR)
		Rwanda Basic Education (RBE)
		Rwanda Polytechnic (RP)
Public Service and Labour (MIFOTRA)	Training on mercury in public service and negotiations	Rwanda Management Institute (RMI)

Ministry	Role in mercury issues	Selected affiliated agency/departments
Justice (MINIJUST)	Legal compliance, enforcement and management	Rwanda Law Reform Commission (RLRC)
		National Public Prosecution Authority (NPPA)
		Rwanda National Police
ICT and Innovation (MINICT)	Mercury in electronic equipment and waste	Rwanda Utilities Regulatory Authority (RURA)
		Rwanda Development Board (RDB)
Trade and Industry (MINICOM)	Mercury standards and measurements	Rwanda Standards Board (RSB)
		Rwanda Inspectorate, Competition and Consumer Protection Authority (RICA)
		National Industrial Research and Development Agency
Gender and Family Promotion (MIGEPROF)	Vulnerable populations and mercury	National Women Council (NWC)
		National Child Development Agency (NCDA)
Local Government (MINALOC)	Awareness raising and training, vulnerable populations	Rwanda Broadcasting Agency (RBA)
		National Council of Persons with Disabilities (NCPD)
Agriculture and Animal Resources (MINAGRI)	Food and nutritional quality and security	Rwanda Agricultural Board (RAB)

3.4.2. Institutional capacity analysis

The institutional capacity review section seeks to outline the specific mandates of government institutions and private organizations. It also aims to analyse and understand their ability to manage mercury, and makes recommendations on identified gaps and needs (Table III.8).

TABLE III.8 INSTITUTIONAL CAPACITY ANALYSIS

Article 3: Mercury supply sources and trade			
Description of Article:			
Convention provisions	Not allow new primary mercury mining (paragraph 3) Only allow primary mercury mining that was being conducted within its territory at the date of entry into force of the Convention for it for a period of up to fifteen years after that date (paragraph 4) Mercury from such mining shall only be used in manufacturing of mercury-added products in accordance with Article 4, in manufacturing processes in accordance with Article 5, or be disposed in accordance with Article 11, using operations which do not lead to recovery, recycling, reclamation, direct re-use or alternative uses (paragraph 4) Obtain information on stocks of mercury or mercury compounds >50 tons, and mercury supply generating stocks >10 tons/yr. (paragraph 5a) Restrict import and use of excess mercury from decommissioning chlor-alkali plants (paragraph 5b) Not allow the export of mercury unless the importing country provides written Consent and the mercury is for an allowed use under the convention or environmentally sound storage, and all other conditions are met (paragraph 6) 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 paragraph 3 or paragraph 5 (b) (paragraph 8) Include in its reports submitted pursuant to Article 21 information showing that the requirements of this Article have been met. (paragraph 11)		
Institutional capacity in place to comply with provisions of Article 3 of the Minamata Convention			
Institution	**Role of the Institution under Article 3**	**Institutional capacity in place for Article 3**	**Remaining capacity gaps to be addressed/ developed**

Ministry of Trade and Industry (MINICOM) *and the affiliated agency RICA and RRA*	Sets rules for the importation/ exportation of different commodities, including those with mercury Inspection of harmful chemicals at the port of entry through the Rwanda Inspectorate Competition and Consumer Protection Authority (RICA) and the Rwanda Revenue Authority (RRA) affiliated to MINICOM	Competent inspectors of chemical products or materials Access to a laboratory for samples analysis to detect dangerous substances	Lack of skills to effectively control illegal import under the Convention of elemental mercury and mercury-based products Very limited laboratory opportunities and capacities for state analysis/ expertise of unidentified chemicals or chemicals concerned, including elemental and mercury-based products Weak capacity of inspectors to detect illegal trade under the Convention of elemental mercury and mercury-based products such as pesticides and cosmetics.
Rwanda Mines, Petroleum and Gas Board (RMB)	Implements national policies, laws and strategies related to mines, petroleum and gas Designs Policy and strategies, Issuing of Mining and Quarry licenses, laws and regulations elaboration and supervision Supervises and monitors public or private entities conducting mining, trade and value addition of minerals operations	Capacity to control mining sites to prevent illegal mercury mining or processing	

Recommendations at national level under Article 3

There is a need to for the country to specify which institution shall control the mercury supply sources and trade under Article 3 of the Minamata Convention. RICA could be well placed to take this role and effectively perform it. There is a need to increase the capacity of RICA and the custom department at RRA to identify and control imports and exports of elemental mercury.

Article 4: Mercury added products

Description of Article:

Convention provisions	Prohibit the manufacture, import and export of mercury-added products (Annex A): Part I: To be phased out by 2020 (batteries, switches and relays, compact fluorescent lamps, high pressure mercury vapour lamps, mercury in cold cathode fluorescent lamps and external electrode fluorescent lamps, cosmetics including skin lightening soaps and creams, pesticides, biocides and topical antiseptics, non-electronic measuring devices such as barometers, hygrometers, manometers, thermometers and sphygmomanometers) (paragraph 1). Part II: Phase down and phase out use of dental amalgam by implementing 2 or more of 9 proposed measures by the convention (paragraph 3) Take measures to prevent the incorporation of products listed in Part I of Annex A into larger, assembled products (paragraph 5) Discourage the manufacture and distribution of new mercury product types (paragraph 6)

Institutional capacity in place to comply with provisions of Article 4 of the Minamata Convention

Institution	Role of the Institution under Article 4	Institutional capacity in place for Article 4	Remaining capacity gaps to be addressed/ developed

Ministry of Infrastructure (MINIFRA)	Infrastructure development covering transport, energy, water supply and sanitation, housing and human settlement sectors Supervises the implementation of quality standards and norms, cost effectiveness, response to environmental sustainability, safety and cross-cutting issues in infrastructure development Orients and supervises the functioning and management of public institutions, agencies and companies under MINIFRA	Has the capacity to identify sources of mercury and quantify mercury added products	Limited capacity and means to propose and use best techniques and best environmental practices to control releases and emissions to land, water and atmosphere from relevant sources
Rwanda Housing Authority (RHA) under MINIFRA	Improves quality of life through planning, organizing and spearheading rural settlement, urban settlement, public building construction, affordable housing; management of public office space and Government Assets; and regulation of the construction industry Participates in the formulation of policies and laws governing urban planning, human settlement, housing and building activities	Has the capacity to identify sources of mercury and quantify mercury added products Shifted to the use of new lamps that contain less mercury and the 3–4 mg versions are sold as low-mercury types. A typical 2006-era 4 ft (122 cm) T-12 fluorescent lamp (i.e., F34T12) contains about 5 milligrams of mercury (<5 mg recommended by the convention, see Annex A).	Lack the capacity to propose technological developments, economically and technically feasible mercury free alternatives Lack of access on the market to mercury free alternatives
Rwanda Energy Group-Energy Development Company Ltd (REG-EDCL) under MINIFRA	Provides innovative and sustainable energy solutions through energy generation, distribution. Sources of energy generated includes hydro, methane, thermal, imported petroleum, solar, peat and biomass	The sources of mercury and mercury added products were identified during environmental Impact assessment (EIA)	Lack of capacity and means to propose and use best techniques and best environmental practices to control emissions to land, water and atmosphere from relevant sources

Ministry of Agriculture and Animal Resources (MINAGRI)	Protects agriculture, livestock, public health and environment through preventing the introduction and spread of pests and other hazardous materials resulting from trade through inspection and certification Enforces the sanitary laws, monitoring and surveillance of animal diseases, and animal inspection and certification and contribution to the preparation and the implementation of agrochemical law	Competent inspectors of chemical products or materials Access to a laboratory for samples analysis to detect dangerous substances	Lack of capacity to control that pesticides, biocides and topical antiseptics are mercury free
Rwanda Food and Drugs Authority (FDA) under Ministry of Health (MOH)	Protects public health through regulation of human and veterinary medicines, vaccines and other biological products, foods, poisons, medicated cosmetics, medical devices, household chemical substances, tobacco and tobacco products.	Competent inspectors of chemical products or materials Access to a laboratory for samples analysis to detect dangerous substances	Limited capacity to take measures to prevent the incorporation of products listed in Part I of Annex A into larger, assembled products
Rwanda Inspectorate Competition and Consumer Protection Authority (RICA) and Rwanda Revenue Authority (RRA) under MINICOM	Annual inspections, sensitization campaigns and training to increase compliance with competition and consumer protection law and other relevant laws Ensures the quality of Agriculture inputs (Seeds & Agrochemical) as well as, coordinating Sanitary and Phyto-sanitary (SPS) activities to ensure market access for Agriculture products and prevention of spread of pest and diseases Ensures production and importation of goods under its mandate meant for public use or consumption are conducted in accordance with standards and regulations in force. Regulation of products and services to protect health and safety of the population, plant and animal health as well as the environment while ensuring fair trading practices	Inspects all other products or materials (e.g., constructions, electronic) registered under its mandates except food and drugs Has access to a laboratory equipped with machines and personnel that are able to detect mercury contained in products	Only inspect regulated and registered products under its mandates and yet non registered products may illegally enter the consumption chain and market

Rwanda Standards Board (RSB) under MINICOM	Provides standards based solutions for Consumer Protection and Trade promotion for socio-economic growth in a safe and stable environment through standards development, training of stakeholders, quality testing, calibration and verification, certification of management systems and products	Has the capacity to identify sources of mercury, mercury waste and quantify mercury added products Is able to propose technological developments, economically and technically feasible mercury free alternatives	Lack of capacity and means to reduce the use of mercury in any products listed in Part I of Annex A Lack of capacity to prevent or reduce the use, manufacture, import, export of mercury-added products listed in Part II of Annex A Lack of capacity and rights to restrict the use of mercury or mercury compounds in the processes listed in Part II of Annex B Lack of capacity, and means to propose and use best techniques and practices to control emissions to land, water and atmosphere from relevant sources

Recommendations national level under Article 4

There is a need to elaborate on the list of mercury added products imported and used through a more detailed inventory that involves measurements of mercury in the products. There is a need to increase the capacity of RICA and the custom department at RRA to identify and control imports and exports of mercury-added products.

There is also a need to build technical and financial capacity of these stated institutions to be able to shift from the use of mercury added products to mercury free products where feasible, or to ease penetration of alternatives on the national market. Finally, there is a need to build the capacity of REMA and the Ministry of Industry to control manufacturing process in which mercury could be used.

Article 7: Artisanal and small-scale gold mining (ASGM)

Description of Article:	
Convention provisions	Parties with ASGM to take steps to reduce and where feasible eliminate the use of mercury in such mining and its release to the environment from mining and processing (paragraph 2). Develop and implement a National Action Plan to be submitted to the Secretariat no later than three years after the notification to the Secretariat and provide a review every three years of the progress made in meeting its obligations under this Article and include such reviews in its reports submitted pursuant to Article 21(paragraph 3 in accordance with Annex C).

Institutional capacity in place to comply with provisions of Article 7 of the Minamata Convention			
Institution	**Role of the Institution under Article 7**	**Institutional capacity in place for Article 7**	**Remaining capacity gaps to be addressed/ developed**
Rwanda Mines, Petroleum and Gas Board (RMB)	Supervises and monitors public or private entities conducting mining, trade and value addition of minerals operations Issuing of mining licences under large scale, small scale and artisanal categories	Mandated to control ASGM sites	Intensification of efforts needed to promote continued use of mercury-free mining and processing activities in ASGM Support the development and research of mercury-free mining and mineral processing alternatives
National Federation Mining Cooperatives (FECOMIRWA)	Provides mining services of minerals exported as raw materials without transformation Improves and promote the organization of the activities of the artisanal mining co-operatives and increase substantially their productivity Introduces new techniques of mining and observes the standards of environment protection Gives a judicious estimate of the reserves for permits exploited by co-operatives Makes mining co-operatives be aware and familiar with the laws in force in the mining industry, including health and safety, environment protection	Raises awareness and makes inspection to enforce the new mining law among its cooperatives Has the capacity, means and willingness to protect people, particularly vulnerable groups that including pregnant women, children, and teenager, elder, poor people and people living with disability or other diseases) from exposure to potential sources of mercury.	
Recommendations national level under Article 7			
There is a need to improve capacity in the ASGM sector and strengthen the prohibition and absence of mercury use in ASGM through development of a national action plan (NAP) for ASGM and gender mainstreaming strategy into the NAP.			
Article 8: Emissions			
Description of Article:			
Convention provisions	Identify one or more measures to control/reduce mercury emissions from existing sources listed in Annex D (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). (paragraphs 4 and 5) Require monitoring/reporting and otherwise develop and maintain an inventory of emissions from relevant sources (paragraphs 7 and 11).		

Institutional capacity in place to comply with provisions of Article 8 of the Minamata Convention			
Institution	**Role of the Institution under Article 8**	**Institutional capacity in place for Article 8**	**Remaining capacity gaps to be addressed/ developed**
Ministry of Environment (MOE), Rwanda Environment Management Authority	Ensures protection and conservation of the environment Develops and disseminate environment laws and regulations to ensure protection of the environment and conservation of natural ecosystems Mobilises necessary resources for the development, protection and conservation of the environment Responsible for compliance with the Minamata Convention on Mercury through REMA	Capacity to raise awareness on mercury issues at national level covering all key sectors Has mandate and resources to implement the provision, and in particular to carry out environmental impact assessment	Limited capacity to identify sources of mercury and quantify mercury; Limited capacity to control the emissions of mercury and mercury compounds (total mercury) to the atmosphere from the point sources falling within the source categories listed in Annex D No capacity, and means to propose alternative measures to reduce emissions of mercury to the atmosphere from relevant sources No capacity, and means control and, where feasible, reduce the release of mercury and mercury compounds (total mercury) to the atmosphere from the relevant point sources No capacity, and means to propose and use best techniques and best environmental practices to control emissions to the atmosphere from relevant sources
Rwanda Utilities Regulatory Authority (RURA)	Development of the public utilities sectors such as consumer affairs, radiation protection, energy, water and sanitation, transport and ICT	Capacity to raise awareness to public, workers and professionals as a measure to control mercury emissions at power stations, mining sites and other industrial sites	Limited capacity to collect information on mercury Limited capacities to regulate utilities

Enviros-erve Rwanda Green Park	Collects all types of electrical and electronic waste including: Small and large household appliances, IT and telecommunications equipment Consumer equipment, Solar products and lighting equipment, Electrical and electronic construction tools, Toys, leisure and sports equipment, Medical devices, Monitoring and control instruments, Batteries, Metals, Plastics, and more Separates materials that can be refurbished and recycled, while others are disposed of in an eco-friendly manner Recognizes that E-waste contains hazardous substances (e.g. lead, mercury, cadmium, batteries, brominated flame retardants, chlorofluorocarbons) with potential toxicity leading to negative health and environmental impacts and therefore ensures human and environment protection	Reports on quantities of E-waste collected and isolation of parts containing mercury for storage Shipment of e-waste for recycling in Dubai (at the Enviroserve headquarter) the mercury containing parts (waste) for further treatment	Mercury containing parts from collected e-waste are selected only based on previous knowledge from literature or labelling Does not incinerate mercury containing waste because it does not have best available techniques and best environmental practices to control emissions from incineration of mercury containing waste
Depot Kalisimbi	Collects, transports and treats both hazardous and solid waste Landfill Management, Landfill operation and landfill maintenance Incinerator owner and operator Waste recycling	Has the capacity and means to dispose of mercury or mercury containing products/waste in an environmental sound manner Has tools to measure emissions and invest more in measuring and controlling of heavy metals emissions	Does not have adequate capacity to identify sources of mercury and quantify mercury Does not have best available techniques and best environmental practices to control emissions from incineration of mercury containing waste.
Recommendations national level under Article 8			
The stated institutions need to be aware of mercury emissions point sources as defined by the Minamata Convention and take the lead in regulating activities that emit mercury. Human, technical and financial capacity of MoE and RURA shall be strengthened to achieve the above recommended actions. The capacity of environmental inspectors shall be strengthened to be able to control mercury emissions from relevant sources. The capacity of agencies or companies whose activities are potential sources or mercury emissions shall be strengthened to comply with Article 8 of the Minamata Convention.			
Article 9: Releases			
Description of Article:			

Convention provisions	Controlling and, where feasible, reducing releases of mercury and mercury compounds to land and water from the relevant point sources not addressed in other provisions of the Convention. Parties to identify relevant point source categories (paragraph 3) Parties to take measures to control releases and to prepare, if desired, a national action plan setting out measures (paragraph 4) Control releases shall include one or more of the following, as appropriate (paragraph 5): Release limit values to control and, where feasible, reduce releases from relevant sources; The use of best available techniques and best environmental practices to control releases from relevant sources; A multi-pollutant control strategy that would deliver co-benefits for control of mercury releases; Alternative measures to reduce releases from relevant sources; Each Party shall establish, as soon as practicable and no later than five years after the date of entry into force of the Convention for it, and maintain thereafter, an inventory of releases from relevant sources (paragraph 6) Each Party shall include information on its implementation of this Article in its reports submitted pursuant to Article 21, in particular information concerning the measures it has taken in accordance with paragraphs 3 to 6 and the effectiveness of the measures (paragraph 8)

Institutional capacity in place to comply with provisions of Article 9 of the Minamata Convention			
Institution	**Role of the Institution under Article 9**	**Institutional capacity in place for Article 9**	**Remaining capacity gaps to be addressed/ developed**

Ministry of Environment (MOE)	Ensures protection and conservation of the environment Develops and disseminates environment laws and regulations to ensure protection of the environment and conservation of natural ecosystems Mobilises necessary resources for the development, protection and conservation of the environment	Collaborates with other institutions and affiliated agencies about mercury control and management of mercury releases to the environment: REMA, RICA, RSB, RBC/ MoH/Hospitals Responsible for compliance with the Minamata Convention on Mercury through REMA Capacity to raise awareness on mercury issues at national level covering all key sectors	Need to establish release limit values to control and, where feasible, reduce releases from relevant sources; Coordinate and collaborate in research on best available techniques and best environmental practices to control releases from relevant sources; Apply a multi-pollutant control strategy that would deliver co-benefits for control of mercury releases; Establish alternative measures to reduce releases from relevant sources;
Rwanda Environment Management Authority(REMA)	Ensures national environmental protection, conservation, promotion and overall management, including advisory to the government on all matters pertinent to the environment under MoE supervision; Monitors and assesses development programs to ensure compliance with the laws on environment during their preparation and implementation Monitors and supervises impact assessment, environmental audit, strategic environmental assessment and any other environmental study. REMA may authorize in writing, any other person to analyse and approve these studies	Responsible for compliance with the Minamata Convention on Mercury Capacity to raise awareness on mercury sources and impacts in key sectors of the economy	
Recommendations national level under Article 9			
The stated institutions need to be aware of mercury releases point sources as defined by the Minamata Convention and take the lead in regulating activities that release mercury. The capacity of environmental inspectors shall be strengthened to be able to control mercury releases from relevant sources. The capacity of agencies or companies whose activities are potential sources or mercury releases shall be strengthened to comply with Article 9 of the Minamata Convention			
Article 10: Environmentally sound interim storage of mercury, other than waste			
Description of Article:			

Convention provisions	Each Party shall take measures to ensure that the interim storage of mercury and mercury compounds intended for a use allowed to a Party under this Convention is undertaken in an environmentally sound manner, taking into account any guidelines, and in accordance with, adopted pursuant to paragraph 3 (paragraph 2). Parties shall cooperate, as appropriate, with each other and with relevant intergovernmental organizations and other entities, to enhance capacity-building for the environmentally sound interim storage of such mercury and mercury compounds (paragraph 4)

Institutional capacity in place to comply with provisions of Article 10 of the Minamata Convention

Institution	Role of the Institution under Article 10	Institutional capacity in place for Article 10	Remaining capacity gaps to be addressed/ developed
Ministry of Environment (MOE) Rwanda Environment Management Authority(REMA	Ensures protection and conservation of the environment Develops and disseminates environment laws and regulations to ensure protection of the environment and conservation of natural ecosystems Mobilises necessary resources for the development, protection and conservation of the environment	Has mandate to regulate storage of mercury Has mandate and inspectors to control polluting activities	Absence of any regulation and relevant institutional mechanisms for regulation of interim storage of mercury and mercury compounds, other than mercury wastes (needs verification by mercury inventory and stakeholders). Lack of capacity to enforce regulations
Ministry of Trade and Industry (MINICOM)	Develops, disseminates and coordinates the implementation of sector policies, strategies and programs related to trade and industry Regulates the trade and industry sector and all other attached Sectors Develops institutional and human resources capacities in the industrial and commercial sector Oversees the institutions under its supervision Mobilizes the necessary resources for implementing programs	Has the capacity and mandate to regulate the trade and industry sectors and all other attached sectors	Absence of the list of industries that use mercury or mercury compounds for allowed purposes within the convention. Absence of the inventory of the stock of mercury for use for allowed purposes from all sectors and records Lack of capacity to enforce regulations

Rwanda Medical Supplies (RMS)	Health commodities procurement on behalf of the Ministry of Health and other health facilities Warehouse and distribution Quantification and stock monitoring of medical supplies Sales and marketing Medical production	Has a storage facility for mercury containing equipment, including thermometers and manometers with mercury Engages waste disposal facilities like Depot Kalisimbi to dispose of mercury containing and other hazardous wastes	Lack of capacity to provide standard operating procedures for managing mercury containing waste Lack of capacity to coordinate collection and storage of mercury containing equipment that is being phased out
Recommendations national level under Article 10			
Identify industries potentially using mercury for allowed purposes within the convention; Make an inventory of the stock of mercury for use for allowed purposes from all sectors and keep records. Enhance the regulatory and technical capacity for building and managing environmentally sound interim storage facilities of mercury and mercury compounds.			
Article 11: Mercury waste			
Description of Article:			
Convention provisions	Take measures to manage mercury wastes in an environmentally sound manner, taking into account guidelines developed under the Basel Convention and in accordance with COP requirements to be developed (paragraph 3.a) Take measures to restrict mercury derived from the treatment or re-use of mercury waste to allowed uses under the Convention or environmentally sound disposal (paragraph 3.b) Take appropriate measures so that mercury waste is, for Parties to the Basel Convention, not transported across international boundaries except for the purpose of environmentally sound disposal in conformity with this Article and with that Convention. In circumstances where the Basel Convention does not apply to transport across international boundaries, a Party shall allow such transport only after taking into account relevant international rules, standards, and guidelines (paragraph 3.c)		
Institutional capacity in place to comply with provisions of Article 11 of the Minamata Convention			
Institution	**Role of the Institution under Article 11**	**Institutional capacity in place for Article 11**	**Remaining capacity gaps to be addressed/ developed**

Ministry of Environment (MOE) Including REMA	Ensures protection and conservation of the environment Develops and disseminates environment laws and regulations to ensure protection of the environment and conservation of natural ecosystems Mobilises necessary resources for the development, protection and conservation of the environment	Collaborates with other institutions and affiliated agencies about mercury waste management: REMA, RICA, RSB, RBC/ MoH/Hospitals Responsible for compliance with the Minamata Convention on Mercury through REMA Awareness raising on mercury waste issues at national level covering all key sectors	Does not have the capacity to control or manage products or materials or waste that are likely to contain mercury
Rwanda Utilities Regulatory Authority (RURA)	Development of the public utilities sectors such as consumer affairs, radiation protection, energy, water and sanitation, transport and ICT		Limited capacity to collect information on mercury waste
Enviroserve Rwanda Green Park	Collects all types of electrical and electronic waste including: Small and large household appliances, IT and telecommunications equipment Consumer equipment, Solar products and lighting equipment, Electrical and electronic construction tools, Toys, leisure and sports equipment, Medical devices, Monitoring and control instruments, Batteries, Metals, Plastics, and more Separates materials that can be refurbished and recycled, while others are disposed of in an eco-friendly manner Recognizes that E-waste contains hazardous substances (e.g., lead, mercury, cadmium, batteries, brominated flame retardants, chlorofluorocarbons) with potential toxicity leading to negative health and environmental impacts and therefore ensures human and environment protection	Reports on quantities of E-waste collected and isolation of parts containing mercury for storage Shipment of e-waste for recycling in Dubai (at the Enviroserve headquarter) the mercury containing parts (waste) for further treatment	Mercury containing parts from collected e-waste are selected only based on previous knowledge from literature or labelling Does not incinerate mercury containing waste because it does not have best available techniques and best environmental practices to control emissions from incineration of mercury containing waste

Depot kalisimbi	Collects, transports and treats both hazardous and solid waste Landfill Management, Landfill operation and landfill maintenance Incinerator owner and operator Waste recycling	Have the capacity and means to dispose of mercury or mercury containing products/waste in an environmental sound manner Have tools to measure emissions and invest more in measuring and controlling of heavy metals emissions	Do not have adequate capacity to identify sources of mercury and quantify mercury waste Does not have best available techniques and best environmental practices to manage mercury waste as incineration is not the appropriate method
Recommendations national level under Article 11			
Put in place a laboratory designed to test the presence of mercury and other hazardous substances in generated waste by different sectors; Upgrade the existing hazardous waste elimination facilities to allow treatment of mercury wastes; Apply technical guidelines on the environmentally sound management of wastes consisting of, containing or contaminated with mercury or mercury compounds developed under the Basel Convention; Capacity building of inspectors, engineers and technicians.			
Article 12: Contaminated sites			
Description of Article:			
Convention provisions	Develop appropriate strategies for identifying and assessing mercury/mercury compound contaminated sites (paragraph 1) If risk reduction activities are taken at contaminated sites, they are taken in an environmentally sound manner, incorporating risk assessment where appropriate (paragraph 2) Parties are encouraged to cooperate in developing strategies and implementing activities for identifying, assessing, prioritizing, managing and, as appropriate, remediating contaminated sites (paragraph 4)		
Institutional capacity in place to comply with provisions of Article 12 of the Minamata Convention			
Institution	**Role of the Institution under Article 12**	**Institutional capacity in place for Article 12**	**Remaining capacity gaps to be addressed/ developed**

Rwanda Environment Management Authority(REMA)	Ensures national environmental protection, conservation, promotion and overall management, including advisory to the government on all matters pertinent to the environment under MoE supervision; Monitors and assess development programs to ensure compliance with the laws on environment during their preparation and implementation Monitors and supervises impact assessment, environmental audit, strategic environmental assessment and any other environmental study. REMA may authorize in writing, any other person to analyse and approve these studies	Monitors and inspects sectors that likely release or use mercury containing products such as health sector (dental services, pharmaceuticals services), agriculture sector (agrochemicals), manufacturing/ industry sector (lamps, recycling companies.) Recommends different sectors to separate organic, non-organic solid, liquid, toxic and non-toxic waste and dispose into separated waste bin and seek advice before their treatments	Lack of technical capacity to identify sites contaminated with mercury sources and quantify mercury Lack of guidelines on how to dispose mercury containing waste Lack of capacity to control and manage mercury containing waste Lack of capacity to identify the effects/ impacts of mercury on the biological environment (plants, animals and microorganisms) and on the physical environment (atmosphere, soil/land, water bodies) Lack of capacity and means to protect the biological environment (plants, animals and microorganisms) and the physical environment (atmosphere, soil/land, water bodies) against mercury effects/impacts
Recommendations national level under Article 12			
Develop guidelines for identification, characterization and remediation of mercury contaminated sites; Build technological capacity to characterize mercury contaminated sites and in particular laboratory capacities Strengthen operational capacities, including infrastructure for collection, treatment, storage and disposal/elimination of hazardous wastes soils, particularly for mercury contaminated soil.			
Article 13: Financial resources and mechanism			
Description of Article:			
Convention provisions	Access domestic resources as may be needed to implement Convention obligations (paragraph 1) Access financial resources available under the Convention financial mechanism and other resources available from multilateral, regional, and bilateral funding sources (paragraphs 1 and 5) All Parties, within their capabilities, are invited to contribute to the Mechanism (paragraph 12)		
Institutional capacity in place to comply with provisions of Article 13 of the Minamata Convention			
Institution	**Role of the Institution under Article 13**	**Institutional capacity in place for Article 13**	**Remaining capacity gaps to be addressed/ developed**

Rwanda Green Fund (FONERWA)	Mobilises and manage resources used in financing activities aiming at protecting and preserving environment and natural resource Collects and manages funds from public, private, through a bilateral and multi-lateral partnership to achieve the country's objectives to advance national priorities in the field of environment Supports public organs, associations and individuals for environment protection and conservation, research Collaborates with other national regional and international institutions with the same mission	Funds activities and projects that seek to rehabilitate, restore, conserve and protect the environment	Lacks a focus on mercury related issues as specified in the Convention
Rwanda Environment Management Authority(REMA	Ensures national environmental protection, conservation, promotion and overall management, including advisory to the government on all matters pertinent to the environment under MoE supervision;		
Recommendations national level under Article 13			
Strengthen REMA and FONERWA to prepare grant proposals as a way of mobilising financial resources to support adoption of technologies that support the subsequent reduction in the use of mercury or the complete substitution of mercury processes and mercury containing products; REMA should form partnerships with local NGO in developing fundable Small Grant Programmes (SGP) that can be funded under the GEF/UNDP SGP. REMA should also be capacitated to develop eco-labelling frameworks that will differential gold and other products produced with and without mercury use.			
Article 14: Capacity-building, technical assistance and technology transfer			
Description of Article:			
Convention provisions	Cooperate to provide/receive capacity-building and technical assistance (paragraph 1) Promotion and facilitation of environmentally sound alternatives technologies to strengthen their capacity to effectively implement this Convention (paragraph 3)		
Institutional capacity in place to comply with provisions of Article 14 of the Minamata Convention			
Institution	**Role of the Institution under Article 14**	**Institutional capacity in place for Article 14**	**Remaining capacity gaps to be addressed/ developed**

Ministry of Environment (MOE)	Ensures protection and conservation of the environment Develops and disseminates environment laws and regulations to ensure protection of the environment and conservation of natural ecosystems Mobilises necessary resources for the development, protection and conservation of the environment	Enhancing environment information use and facilitate awareness and education through the implementation of the National Environment and Climate Change Policy (2019) Resources mobilisation for capacity building through UNITAR and other programmes	Lack of specific strategies to build partnerships oriented to the implementation of the Minamata Convention.
Recommendations national level under Article 14			
Establish (a) focal point(s) for international cooperation with other countries or international organizations to improve the capacity to reduce and where feasible eliminate the use of mercury in Rwanda.			
Article 16: Health aspects			
Description of Article:			
Convention provisions	Promote the development and implementation of strategies to identify and protect populations at risk (paragraph 1a) Promote occupational exposure educational and prevention programs (paragraph 1b) Promote prevention, treatment, and care services for affected populations (paragraph 1c) Establish and strengthen, as appropriate, the institutional and health professional capacities for the prevention, diagnosis, treatment and monitoring of health risks related to the exposure to mercury and mercury compounds (paragraph 1d)		
Institutional capacity in place to comply with provisions of Article 16 of the Minamata Convention			
Institution	**Role of the Institution under Article 16**	**Institutional capacity in place for Article 16**	**Remaining capacity gaps to be addressed/ developed**

Ministry of Health (MOH)	Provides and continually improves affordable promotive, preventive, curative and rehabilitative health care services of the highest quality Strengthens the health systems building blocks (strengthen policies, resources and management); Develops, disseminates and coordinates the implementation of health policies, strategies and programs through: elaboration of national health policies, strategies and programs; coordination and elaboration of policies, strategies and programs of the institutions under its supervision; Regulates the health sector through: drafting and disseminating laws, regulations and instructions to promote the health sector; setting up and disseminating standards applicable to health sector; authorizing private health institutions; Monitors and evaluates the implementation of policies, strategies and programs of health sector and related sectors; Develops institutional and human resources capacities in health sector through: overseeing the premises and equipment of public and private health facilities and those of pharmacies	Promotes the development and implementation of strategies to identify and protect populations at risk, such as developing fish consumption guidelines Promotes occupational exposure educational and prevention programs	Needs strategy to promote prevention, treatment, and care services for mercury affected populations Lack of strategies and programmes to identify and protect populations at risks of exposure to mercury in dental amalgam, in cleaning services, manufacturing industries…etc. Lack of science-based educational and preventive programmes on occupational exposure by taking into consideration the different physiological, socio and economic implications of chemical pollution for men and women are recognized at workplace Capacity of relevant staff to prevent, treat and provide care services for mercury affected populations can be further improved There is a lack of equipment to prevent, treat and provide care services for mercury affected populations
International Labour Organization (ILO)	Promotes social justice and internationally recognized human and labour rights, through a decent work agenda. Addresses child labour issues	Occupational safety and health department works with Rwanda on workers' rights to a decent work and advocacy against child labour Work with Private sector and Rwanda Worker's trade union confederation (CESTRAR) on decent work for workers	Does not have specific data on mercury exposure in Rwanda due to the high level of informality

Ministry of Public Service and Labour (MIFOTRA)	Develops, disseminates and coordinates the implementation of policies, strategies and programs; Mobilises resources for the development of public institutions and labour sector and related programs	Concerned with the occupational safety and health at work place aware of different laws/ regulation and policies related to workers protection against dangers of chemical pollution	Lack the capacity to identify the sources of mercury and contamination pathways Lack the ability to link the workers diseases to mercury pollution and toxicity Lack of knowledge about different physiological, socio and economic implications of chemical pollution for men and women
Recommendations national level under Article 16			
Promote appropriate health-care services for prevention, treatment and care for people likely exposed to mercury and consider different physiological, socio and economic implications of mercury pollution for men and women; Strengthen institutional, technical and health professional capacities for prevention, diagnosis, treatment and monitoring relevant to Rwanda given known health impacts within communities likely exposed to mercury; Capacity building of health care personnel to diagnose and treat diseases related to mercury poisoning; implement science-based educational and preventive programmes on occupational exposure to mercury; Identify mercury effects on workers' health likely exposed to mercury release and emissions from relevant sectors for further prevention and protection interventions and consider different physiological, socio and economic implications of mercury pollution for men and women.			
Article 18: Public information, awareness and education			
Description of Article:			
Convention provisions	Each Party shall, within its capabilities, promote and facilitate: (a) Provision to the public of available information on: (I) The health and environmental effects of mercury and mercury compounds; (ii) Alternatives to mercury and mercury compounds; (iii) The topics identified in paragraph 1 of Article 17; (iv) The results of its research, development and monitoring activities under Article 19; (v) Activities to meet its obligations under this Convention; (b) Education, training and public awareness related to the effects of exposure to mercury and mercury compounds on human health and the environment in collaboration with relevant intergovernmental and non-governmental organizations and vulnerable populations, as appropriate (paragraph 1) 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 (paragraph 2)		
Institutional capacity in place to comply with provisions of Article 18 of the Minamata Convention			
Institution	**Role of the Institution under Article 18**	**Institutional capacity in place for Article 18**	**Remaining capacity gaps to be addressed/ developed**

Ministry of Education (MINEDUC)	Promotes the teaching, learning, and the good use of Information and Communication in Education Develops, reviews and guides education sector for institutional development and capacity	Develops curriculum that include chemistry and occupational health and safety for secondary and Rwanda Polytechnic schools Disseminates knowledge and innovations	Insufficient awareness on mercury and its effects/impacts Limited capacity to collect information on mercury and package it into the education curriculum
Rwanda Environment Management Authority(REMA)	Ensures national environmental protection, conservation, promotion and overall management, including advisory to the government on all matters pertinent to the environment under MoE supervision;	Trained inspectors who can disseminate information on the environment including mercury issues	Lack of mercury learning strategy
University of Rwanda (UR) and its centres of excellence	Develops interdisciplinary, problem-based academic programmes aligned with development needs Creates applied, evidence-driven, research centres focused on problem solving, aligned with development needs Develops continuous education programs for upgrading skills and knowledge	Conducts research on heavy metals including mercury Coordinating training for a regional centre of excellence Teaching and research in the field of natural products, and in charge of laboratory service and linkage to industries	Limited research and publications on mercury Does not have so far the capacity, and means promote research into sustainable non-mercury alternative
National Industrial Research Development Agency (NIRDA)	Enables a generation of industrial innovators to become competitive through technology monitoring, acquisition, development and transfer & applied research	Has the ability to propose technological developments, economically and technically feasible mercury free alternatives Has the capacity, means and willingness to promote research into sustainable non-mercury alternative through awareness raising Raises awareness of stakeholders with regards to the use of mercury in the private sector to avoid its related adverse impacts	Does not conduct or support research on mercury related topics
Recommendations national level under Article 18			

Raise awareness on mercury and other heavy metals; Develop revised curriculums that encompass basic understanding on the properties of mercury, sources of mercury, effects of mercury, management and disposal of mercury containing waste, and remediation of mercury contaminated sites within the chemistry subject and also environmental courses in secondary schools, Rwanda Polytechnic schools and Universities; Develop and implement awareness and educational programmes on mercury and its risks; Promote research on mercury and its impacts/effects on human health, on biological diversity and on the physical environment and dissemination of results; Promote and conduct research on mercury related topics and disseminate results; Conduct education, training and public awareness related to the effects of exposure to mercury and mercury compounds			
Article 21: Reporting			
Description of Article:			
Convention provisions	Report to the Conference of the Parties, through the Secretariat, on the measures it has taken to implement the provisions of this Convention and on the effectiveness of such measures and the possible challenges in meeting the objectives of the Convention (paragraph 1) Include in its reporting the information as called for in Articles 3, 5, 7, 8 and 9 of this Convention (paragraph 2)		
Institutional capacity in place to comply with provisions of Article 21 of the Minamata Convention			
Institution	**Role of the Institution under Article 21**	**Institutional capacity in place for Article 21**	**Remaining capacity gaps to be addressed/ developed**
Rwanda Environment Management Authority(REMA)	Advise Government on policies, strategies and legislation related to the management of the environment as well as the implementation of environment related international conventions, whenever deemed necessary Conduct studies, research, investigations and other relevant activities in the field of environment and publish the findings	Has taken initiatives to implement the Convention Establishment of the NSG as a potential coordination mechanism to report on the implementation of the Convention	Lacks technical and financial means to conduct research and report research-based information on mercury.
Recommendations national level under Article 21			
Build the capacity of REMA to be able to report research based-information on mercury.			

CHAPTER IV: IDENTIFICATION OF POPULATIONS AT RISKS AND GENDER DIMENSIONS

4.1. INTRODUCTION

Mercury is one of the most toxic chemicals. People can be exposed to mercury and mercury compounds, for example in their diet (especially in fish), through inhalation at workplaces or during cooking using biomass fuel at home. They can also be exposed to mercury from dental amalgams. These exposure pathways are relevant to populations depending on factors such as diet, cultural settings and occupational health and safety practices. Table IV.1 gives a comparison of long-range transport potential, exposure around the world, and sources of mercury compared to other heavy metals, according to UNEP (2020)[101]. In addition to the listed exposure pathways, some agrochemicals, electric equipment, batteries, lamps, paints, skin lightening creams and soaps may contain mercury, exposing workers and consumers.

TABLE IV.1 COMPARISON OF MERCURY WITH OTHER HEAVY METALS

Parameter	Mercury	Arsenic	Cadmium	Lead
1. Long-range transport potential				
Via natural currents	Very volatile	Non-volatile, but high potential via small to fine particles on which they are adsorbed		
Via trade	Widespread	Widespread		
2. Exposure around the world	Prevalent	Prevalent		
3. Natural sources, e.g. volcanic activity, vegetation exudates, windblown dusts, biomass burning	Yes	Yes		
4. Anthropogenic sources				
Unintentional, e.g.	Yes (major source to air) through fossil fuel combustion, metal smelting, cement, mining	Yes (major source to air)		

101 UNEP (2020) An assessment report on issues of concern: Chemicals and waste issues posing risks to human health and the environment. United Nations Environment Programme (UNEP), Geneva

Intentional production, use disposal and recycling including:	Yes Polyurethane production, Sodium or Potassium Methylate or Ethylate production, Chlor-alkali and VCM production, artisanal and small-scale goldmining, fluorescent and vapour lamps, batteries, dental filings, switches and relays, cosmetics, paints, agrochemicals and measuring devices	Wood preservatives, pesticides, alloys, animal feed additives and pharmaceuticals, electronics and semiconductor industries	Nickel-cadmium batteries, alloys, coatings and plating, pigments, solar cells, PVC stabilizers	Lead-acid batteries, lead sheets, pigments, enamels and ceramics, PVC stabilizers, ammunition, alloys, cable sheathing

According to WHO-UNEP (2008)[102], risk assessment consists of four main steps, namely: hazard identification; hazard characterization, including dose-response assessment; exposure assessment; and, risk characterization. Gender dimensions are essential in mercury risk management. Gender discriminations are recognised as the results of a social and cultural construct, which values men and women, and girls and boys, and their attributes differently (NISR, 2014) [103]. The analysis of gender-based roles and related attributes helps to understand "*how commonly shared practices legitimise discrepancies between sexes, including expectations held aboutthe characteristics, aptitudes and likely behaviours of both women and men*" (femininity and masculinity). This would then mean that men and women generally expect each other to assume certain prescribed roles in society.

102 WHO-UNEP (2008) Guidance for identifying populations at risk from mercury exposure. UNEP DTIE Chemicals Branch and the WHO Department of Food Safety, Zoonoses and Foodborne Diseases, Geneva, Switzerland

103 NISR (2014) Rwanda Fourth Population and Housing Census. Thematic Report: Labour force participation. National Institute of Statistics of Rwanda (NISR), Ministry of Finance and Economic Planning (MINECOFIN), Kigali

4.2. METHODOLOGY

A preliminary review of potential populations at risk was conducted based on the analysis of existing literature and field observations. The other three recommended steps of the WHO-UNEP (2008)[104] risk assessment criteria, namely: (1) hazard characterisation including dose-response assessment, (2) exposure assessment, and (3) risk characterization were not undertaken because of the limited scope of the study. These steps would have required collection of human tissue samples from populations that are potentially at risk of mercury exposure. These assessments would need more resources and preferably a separate programme with financial and technical support similar to the Global Mercury Project (UNIDO-UNEP, 2008)[105].

The preliminary assessment of risks was conducted using the WHO/UNEP Guidance for Identifying Populations at Risk from Mercury (WHO-UNEP, 2008)[105]. Both desk and field studies were used to identify mercury releases hotspots in Rwanda, and this was done concurrently with the compilation of the data for the mercury inventory as well as for the identification of mercury contaminated sites.

Assessment of potential gender dimensions related to the management of mercury could not provide a complete picture as participation of women managers, gender experts and scientists remained limited. It was also not possible to conduct Focus Group Discussions as the measures to reduce the spread of COVID-19 were still in effect. There was therefore limited interpretation of the specific gender roles that may increase the exposure of a particular sex to mercury poisoning, apart from those roles based on the review of literature and the researchers' personal experience of societal norms at national and regional levels. Despite these challenges, reference was made to the following frameworks on: (1) "Mainstreaming Gender into UNDP GEF Projects on Chemicals and Waste" (UNDP, 2017)[106], and (2) "Incorporating Gender Dimensions into National Strategy Setting in Chemicals Management" (UNEP, 2021)[107]. Collected information relating to direct and indirect exposure to mercury and risk management was disaggregated by gender.

4.3. FINDINGS

Table IV.2 summarizes the findings of the preliminary identification of populations at risk and related gender issues.

TABLE IV.2 **SUMMARY OF FINDINGS ON POPULATIONS AT RISKS AND GENDER ISSUES**

104 WHO-UNEP (2008) Guidance for identifying populations at risk from mercury exposure. UNEP DTIE Chemicals Branch and the WHO Department of Food Safety, Zoonoses and Foodborne Diseases, Geneva, Switzerland
105 UNIDO-UNEP (2008) Global mercury project: Results of the awareness campaign and technology demonstration for artisanal gold miners (Summary Report), United Nations Industrial Development Organization (UNIDO), Vienna Https://archive.iwlearn.net/globalmercuryproject.org/documents/non_country%20specific/UN_Final_GMP%20Synopsis%20Report.pdf
106 UNDP (2017) Mainstreaming gender into UNDP GEF projects on chemicals and Waste. United Nations Development Programme, Geneva.
107 UNEP (2021) Incorporating gender dimensions into national strategy setting in chemicals management for Minamata Convention National Action Plans for Artisanal and Small-scale Gold Mining and Stockholm Convention National Implementation Plans. Economy Division, Chemicals and Health Branch Knowledge and Risk Unit, United Nations Environment Programme (UNEP), Geneva.

Population at risk	Estimated extent of risk	Source category	Issues noted	Gender dimensions	Possible intervention
Women using traditional cook stoves	78 and 18% of households use fuelwood and charcoal as main cooking fuel, respectively (NIRS, 2021)[108] Over 7,800 premature deaths annually from indoor house air pollution (Nyaga et al., 2021)[109]	Biomass fired heat production for domestic use	Biomass is the primary energy source About 19 kg of mercury emitted into the air annually from burning of biomass, see Chapter II. In almost all cooking done at home there is no protection from inhaling the fumes "*Household air pollution causes over 5,000 deaths per year in Rwanda, more than HIV/AIDS, and rates as having one of the highest burdens of disease in the country*" (MoI, 2015)[110]	Cooking is traditionally women (and girls) dominated, making them more vulnerable than their male counterparts	There are already efforts by the Government of Rwanda to increase adoption of improved cook stoves. There may be a need to ensure improved designs of kitchens to ensure that the flow of flue gas from cooking does not recirculate in the kitchen so as to reduce possible inhalation of fumes containing traces of mercury Monitoring of mercury levels in charcoal and fuelwood by geological units
ASGM and other gold mining communities	There are 21 active gold mining concessions, employing on average 500 per concession; About 25 % of miners in ASGM sector are aged above 36 while the majority (65%) are between 20-35; about 1% of the miners are female (REMA, 2022)[111]	Gold extraction and initial processing by methods other than mercury amalgamation	Gold extraction and processing is rapidly increasing in Rwanda (Error! Reference source not found.) Estimated mercury input to the society of about 14,659 kg/annum see Chapter II	Gender roles in Rwanda gold mines will need a detailed assessment to determine breakdown of responsibilities between women and men and respective exposure risks	There is a need to analyse the ores from which gold is extracted in Rwanda for traces of mercury so that the operations are reviewed to address possible risk of mercury poisoning. Need to raise awareness of potential mercury dangers in gold extraction and processing

108 NISR (2021) Rwanda Household Survey 2019/2020 report, March 2021 National Institute of Statistics of Rwanda (NISR), Kigali. https://www.statistics.gov.rw/file/9703/download?token=4JqM-Qbz
109 Nyaga, H.N., Ndayishimiye, I., Saulve, D.N. and Alonso, J.B. (2021) Policy and market review for modern energy cooking in Rwanda. Working paper June 2021. Energy 4 Impact (E4I) and Modern Energy Cooking Services (MECS), UK. https://mecs.org.uk/wp-content/uploads/2021/10/Policy-and-market-review-for-
110 MoI (2015) Sustainable energy for all Action Agenda. Final draft for Cabinet Approval, 3 March 2015. Ministry of Infrastructure (MoI), Kigali
111 REMA (2022) Rwanda National Action Plan for the Artisanal and Small Scale Gold Mining (ASGM) Sector. Rwanda Environment Management Authority (REMA), Kigali (in preparation)

Population at risk	Estimated extent of risk	Source category	Issues noted	Gender dimensions	Possible intervention
Consumers of beauty care and dental products	No information is currently available	Dental mercury-amalgam filings	Estimated mercury input to the society of about 2,389.23 kg/annum, see Chapter II. Mercury is a major component of dental amalgam When amalgam is placed and removed, mercury waste is generated Improper disposal of the mercury is a major concern	Dental amalgam filling may contain approximately 50% of metallic mercury Human placenta does not represent a real barrier to the transport of elemental mercury Women and foetus exposure occurs as a result of maternal exposure to mercury	Consider mercury-free restorative materials, such as resin composites and glass ionomers Continuous monitoring of dental services is required to ensure the smooth phasing out of mercury containing services Educational reforms targeting management of mercury containing waste
Waste workers and communities living close to incineration sites	No information is currently available	Waste incineration	Estimated mercury input to society of about 1,478.51 kg/annum, see Chapter II. There are communities in the vicinity of waste incineration sites, particularly where medical waste incineration is involved No pollution control devices to remove mercury No inspection or monitoring of air quality from incinerators No technologies to treat waste from ash pits at medical facilities when full	Mercury contaminated air affects both gender types Medical facilities at relatively low altitudes such those in Kigali City and Eastern Province likely to have less mercury dispersion in air and more immediate dry deposition of mercury containing particulate matter	Pollution control devices that remove mercury from flue gas Regular inspection of and monitoring of air quality at the points of discharge Enforcement of air quality standards

Population at risk	Estimated extent of risk	Source category	Issues noted	Gender dimensions	Possible intervention
Waste workers and communities living close to landfill sites	No information is currently available	Controlled landfills and solid waste deposits sites	Estimated mercury input to society of about 198 kg/annum from controlled landfills/deposits.	Women and children involved in waste scavenging at waste disposal sites	Centralised active treatment of wastewater Improved waste collection by trained personnel with adequate PPE Waste segregation at source
Waste workers and communities living close to wastewater treatment facilities and mercury emitting industries	No information is currently available	Wastewater system/treatment facilities	Estimated mercury input to society of about 1,158 kg/annum from wastewater treatment Waste disposal has been attributed to heavy metal contamination of rivers Solid waste and wastewater have potential to introduce Hg into human food chain Common wastewater treatment method is passive, lagoons Waste collected to disposal facilities <10% About half of domestic solid waste is composted at household level Use of PPE not common		

CHAPTER V: AWARENESS/UNDERSTANDING OF WORKERS AND THE PUBLIC

5.1. INTRODUCTION

Public awareness is crucial to ensure a successful implementation of the Convention. Sensitization and training of relevant professionals and vulnerable persons are also needed to protect human health and the environment from the harmful effect of mercury in terms of Article 18 of the Minamata Convention, parties are required to:

Promote and facilitate provision to the public of available information on:

- The health and environmental effects of mercury and mercury compounds;
- Alternatives to mercury and mercury compounds;
- The results of its research, development and monitoring activities;
- Activities to meet its obligations under this Convention;

Educate, train and undertake public awareness related to the effects of exposure to mercury and mercury compounds on human health and the environment in collaboration with relevant inter-governmental and non-governmental organizations and vulnerable populations including women and children, as appropriate.

Furthermore, as per Articles 17 and 18, Parties are required to facilitate the provision to the public of information on;

1. Scientific, technical, economic and legal information concerning mercury and mercury compounds, including toxicological, eco-toxicological and safety information;

2. Information on the reduction or elimination of the production, use, trade, emissions and releases of mercury and mercury compounds;

3. 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.

4. Epidemiological information concerning health impacts associated with exposure to mercury and mercury compounds, in close cooperation with the World Health Organization and other relevant organizations, as appropriate.

In this chapter we present the findings of the MIA relating to the level of awareness of various stakeholders on mercury issues. A details survey was not carried out; however, during various activities in the development of the MIA, some assessment of how much people are knowledgeable about mercury was done.

5.2. METHODOLOGY

Awareness raising was done through face-to-face meetings with the members of the steering committee, virtual training and awareness raising on the Minamata Convention, mercury andthe mercury inventory processes.

In addition, face-to-face interactions with stakeholders during the process of data collection enabled dissemination of information about the Minamata Convention and mercury. Interactions during the inventory provided an opportunity for a deep dive on sector specific mercury discussions with relevant experts and other stakeholders.

A total of 70 stakeholders (see Annex B) were engaged during the preparation of the inventory under the MIA process in Rwanda. The majority (77%) of the stakeholders were male. Stakeholders were drawn from various industry sectors and consulted through key informant interviews and solicitations of expert judgement (see Annex C). Information on the level of awareness of the stakeholders regarding mercury, mercury releases and emissions including general knowledge on the Minamata Convention was assessed.

5.3. FINDINGS

It was noted that more than 90% of the stakeholders had limited knowledge on mercury, mercury releases and emissions. Knowledge about the Minamata Convention was found to be relatively limited among stakeholders. Stakeholders pointed out for example that they were not aware of the dangers of mercury and mercury compounds. It was also observed that most stakeholders ignored that their industrial processes lead to the release and emission of mercury. Stakeholders perceived that because they do not use elemental mercury in their processes there was no way by which their processes could contribute to mercury releases and emissions. This revealed that there is a lack of knowledge on the understanding of mercury sources, releases and emissions among different sectors of industry. The learning needs in Rwanda can be summarized by stakeholder category as presented in Table V.1.

TABLE V.1 **MERCURY LEARNING NEEDS FOR RWANDA BY STAKEHOLDER GROUP**

Stakeholder Group	Learning needs
Policy Makers	An understanding of the mercury situation in Rwanda in a bid to inform policy formulation An understanding of the impact of mercury Regional and International Overview on mercury issues Knowledge about alternatives to mercury Best available technologies in the region to provide for the sound management of mercury

Stakeholder Group	Learning needs
Regulators and Law enforcing agencies	Regional and International trends in the control of mercury and mercury compounds Mercury release and emissions monitoring tools and equipment Best available technology for the management of mercury Alternatives to the use of mercury and mercury products Extent and information about areas and populations at risk regarding potential mercury contamination in Rwanda Levels of mercury in air, water and soil in identified potential hot spots
Industry	To understand if their processes really involve the release of mercury To be aware of the dangers of mercury To get Information on the pollution abetment technologies available for industry To understand the available technologies to replace mercury in various industrial processes
Populations at risks	To be aware of mercury and its effects on human health and the environment To understand who is at risks in terms of mercury pollution in Rwanda To be aware of the steps that can be taken to reduce exposure to mercury
Research groups, Academic Institutions	To be aware of the research gaps in terms of mercury management, releases, emissions and exposure in Rwanda
Health Practitioners	Protocols for identification and tracking of mercury intoxication Treatment of mercury poisoning cases Management of mercury containing medical waste

CHAPTER VI: IMPLEMENTATION PLAN AND PRIORITIES FOR ACTION

6.1. NATIONAL OBJECTIVES AND MERCURY REDUCTION TARGETS

6.1.1. Overall Goals and Objectives of the Implementation Plan

The overall goal of the Implementation Plan is to set the objectives and implementation modalities to fulfil the obligations of the Convention and to protect human health and the environment through from the adverse impacts of mercury.

The objectives of the implementation plan are given in Table VI.1

TABLE VI.1 OBJECTIVES OF THE IMPLEMENTATION PLAN

Objectives	Budget	
	USD	%
Building and strengthening capacity of the gold processing industries and regulatory authoritiesto protect miners and communities from intentional and unintentional releases of mercury from gold mining and processing activities	620,000	54
Reducing mercury releases to society from the importation and consumption of products with intentional use of mercury	90,000	8
Improving solid waste and wastewater management to reduce potential risks of exposure to mercury	138,000	12
Reducing the exposure of vulnerable populations, particularly women of child-bearing ages, pregnant women and children, to unintentional releases of mercury from biomass burning, dental amalgams and waste	55,000	5
Developing and adopting technologies for the safe handling, storage and disposal of mercury waste	247,000	21
Total budget	**1,150,000**	**100**

6.1.2. Strategy

A set of interrelated and mutually supportive actions are proposed to support the concrete implementation of the identified objectives (Table VI.2).

TABLE VI.2 OBJECTIVES, STRATEGIES AND TARGETS OF THE IMPLEMENTATION PLAN

OBJECTIVE 1 Building and strengthening capacity of the gold processing industries and regulatory authorities to protect miners and communities from intentional and unintentional releases of mercury from gold mining and processing activities	
Problem statement: Baseline study and stakeholder consultations revealed that there is no gold processing in Rwanda that uses mercury amalgamation methods. Thus, there would be no intentional mercury release to society from gold processing. The estimated unintentional mercury input to society was about 14,659.32 kg/annum, of which: 4% is emitted to air during storage and processing of ore, 2% is released to water sources as surface run-off during rains, 90% is released on land as rock waste, overburdenmaterial, tailings during operations and rehabilitation, and 4% remains as impurities in the processed gold, which may be released to air during further refinery processes. With the rapid increase in the gold production, there is a need to strengthen technological interventions that ensure existing extraction methods continue to be competitive and far outweighing methods involving mercury use. The case of Rwanda gold industry should be maintained as a good example to transform the gold mining communities in the region that perceive that there is no cheaper alternative to mercury use during gold recovery than mercury amalgamation.	
Action	Target
1.1 Increase the capacity of REMA and RMB to efficiently conduct regular inspections at miningpremises to ensure that miners continue to use mercury-free methods of gold processing.	All RMB and REMA inspectors received training on investigating mercury use in gold processing and assessing mercury-free gold technologies by 2025
1.2 Raise awareness among the gold miners andsurrounding communities on the potential risks of unintentional release of mercury during goldextraction and processing.	Conduct one detailed baseline risk assessment of vulnerable populations in Rwanda At least 10 awareness campaigns held in each gold mining province per year by 2025
1.3 Promote a diversity of mercury-free technologies through impact research and industrialisation of proven technologies	Technological needs assessment conducted by 2023 At least three (3) additional mercury-free technologies developed/adopted in gold processing by 2024 At least 20% of miners/processors using improved mercury-free technologies by 2025
1.4 Assess and reduce exposure of miners and communities through unintentional release of mercury from gold extraction and processing	Capacity of REMA increased at least one equipment to measure mercury concentrations in the environment by 2025 Maximum permissible limits for mercury in soil introduced and adopted and enforced by 2025;
OBJECTIVE 2 Reducing mercury releases to society from the importation and consumption of products with intentional use of mercury	
Problem statement: Consumer products with intentional use of mercury ranked second largest contributor of mercury input to society at 2,389.23 kg/annum (12.22% of total), which 1315 kg/annum were released from batteries with mercury, 846 kg/annum from electrical switches and relays with mercury, 181 kg/annum from polyurethane with mercury catalysts, and 42 kg/annum from thermometers with mercury. About 91% of these estimated mercury inputs from consumer products were partitioned in general waste, while less than 5% were emitted to air and the remainder partitioned to land and water.	
Action	***Target***
2.1 Legislative update to prohibit the importation of all Annex A list 1 products	Products containing mercury listed for prohibition by 2024

2.2 Raise public awareness on the risk of consuming products containing mercury	At least five (5) awareness campaigns per year to educate the public on the risks of consuming products (focusing on skin lightening creams, biocides and paints) containing mercury by 2024[112]
2.3 Increase the capacity of regulatory authorities	All regulatory authority personnel at the port of entry trained ondetection of products containing mercury by 2025
2.4 Strengthen importation control measures at ports of entry for mercury containing products	Linkages between national and international regulatoryauthorities to curb smuggling of mercury containing products through MOUs and bilateral agreements by 2025; At least fiveexchange visits by 2025
OBJECTIVE 3 Improving solid waste and wastewater management to reduce potential risks of exposure to mercury	
Problem statement: The baseline survey and stakeholder consultations revealed that waste management ranked the third largest contributor of mercury to society at 1,478.51 kg/annum from waste incineration and 2,467.61 kg/annum from waste disposal and waste water treatment. Waste disposal has been attributed to heavy metal contamination of rivers in Rwanda; Solid waste and wastewater have potential to introduce mercury into human food chain; Common wastewater treatment method is passive, lagoons; Waste collected to disposal facilities <10% of the total; About half of domestic solid waste is composted at household level; Use of personal protective equipment is not common.	
Action	***Target***
3.1 Legislative update to facilitate the segregation of used batteries at source	At least one new regulation on used battery segregation atsource by 2024 At least three facilities for segregation of used batteries at source functioning by 2025
3.2 Raise awareness of waste management personnel and communities near waste disposal sites on the potential risks of release of mercury from waste management facilities	At least 10 awareness campaigns held in each province per year by 2025
3.3 Capacitate waste handlers to characterise waste, including mercury concentrations in waste	At least one (1) technician at each waste management facility trained onwaste characterisation including assessment of mercury in waste
3.4 Promotion of source segregation of waste	At least 75% of waste generated by industries to undergo source segregation by 2025
OBJECTIVE 4 Reducing the exposure of vulnerable populations, particularly women of child-bearing ages, pregnant women and children, to unintentional releases of mercury from biomass burning, dental amalgams and waste	
Problem statement: Biomass is the primary energy source in Rwanda; About 19 kg of mercury are released into the air annually from burning of biomass; Cooking is women (and girls) dominated making them more vulnerable than their male counterparts; In almost all cooking done at home there is no protection from inhaling the fumes; Estimated mercury input to society from dental amalgamation was 49 kg/annum (1 kg to air, 22 kg to water, 4 kg to land, 3 kg to by-products and impurities, 10 kg to general waste and 10 kg to sector specific disposal). Dental amalgam fillings may contain approximately 50% of metallic mercury; Human placenta does not represent a real barrier to the transport of elemental mercury; Women and foetus exposure occurs as a result of maternal exposure to mercury hence they are more vulnerable than men; Women and children involved in waste scavenging at waste disposal sites	
Action	Target

112 Based on trends in the region on the use of skin lightening creams, it is recommended that Rwanda focuses on educating its citizens of the dangers that might be encountered from the chemical formulations of some of these chemicals

4.1 Establishment of operational networks of women againstmercury to support women in environments exposing them to potential mercury poisoning	At least one network of women against mercuryestablished by 2025.
4.2 Enhance the promotion and adoption of cooking technologies without biomass use and with low exposure to smoke that may contain mercury	Number of households using biomass as primary fuel for cooking reducedfrom the 2019 baseline of 77% to 50% by 2025.
4.3 Legal reforms towards mainstreaming gender issues inreducing mercury related risks	At least one regulation/policy on reducing exposure to mercury of women and children by 2025.
4.4 Phasing out of mercury containing dental amalgam	Use of dental amalgam to be completely phased out by 2025
OBJECTIVE 5 Developing and adopting technologies for the safe handling, storage and disposal of mercury waste	
Problem statement: The baseline survey and stakeholder consultations revealed that the mercury in disused and phased out products such as mercury containing thermometers does not currently have a disposal facility or the standard operating procedures for safe handling and storage. There are also no temporary storage facilities for mercury containing waste at industrial sites and other commercial areas. Potentially mercury containing waste disposal sites are not lined and therefore the current waste disposal systems pose risks to human health and the environment.	
Action	Target
5.1 Establish standard operating procedures for environmentally sound storage/disposal facilities for mercury containing waste	Technologies and procedures for storage of mercury and disposal of waste containing mercury identified and tested by 2024.
5.2 Establish pilot hubs for handling mercury containing waste at facilities of economic development	At least one hub for handling mercury containing waste established 2024
5.3 Promote adoption of environmentally sound storage/disposal facilities for mercury containing waste	At least 50% of the waste disposal facilities adopt technologies by 2025

6.2. OVERALL SCHEDULE OF IMPLEMENTATION

The Ministry of Environment, through REMA, will operationalize the implementation plan as a multi-sector platform coordinated by the National Steering Committee within a period of five (5) years (2023-2028). Six project implementation sub-units will be established to cover the six identified objectives and the lead from each unit will report to the National Steering Committee that will in turn report to REMA Directorate. Specific terms of reference will be given to each unit in line with the expected target, and the Steering Committee will ensure coordination of activities and sharing of information among the units.

The multi-sector platform will comprise of members from: Ministry of Health; Ministry of Infrastructure; Ministry of Finance and Economic Planning; Ministry of Lands and Forestry; National Institute of Statistics for Rwanda; Ministry of ICT and Innovation; Ministry of Justice; Ministry of Trade and Industry; Ministry of Local Government; Ministry of Education; Civic Society Organisations; relevant parastatals aligned to state Ministries; and development partners.

6.3. WORK PLAN AND BUDGET

The work plan and proposed budget for the implementation plan are given in Table VI.3

TABLE VI.3 **WORK PLAN AND BUDGET**

Actions	Priority	Activity lead (in Bold)	Timeline			Funding source	Budget notes	Activity cost (USD)	Expected output	Indicator
			2023	2024	2025					
1.1 Increase the capacity of REMA and RMB to efficiently conduct regular inspections at mining premises to ensure that miners continue to use mercury-free methods of gold processing.	1	MoE REMA RMB	X			FONERWA MINICOFIN GEF	Exchange visits for 3 officers @$10,000 each International conference @$15,000 Local training workshops @20,000	65,000	Inspection SOPs Technologies inventories	Number of inspection Number of Hg-free technologies adopted Educational material, reports,Monitoring reports
1.2 Raise awareness among the gold miners and surrounding communities on the potential risks of unintentional release of mercury during gold extraction and processing.	1	REMA RMB MoE	X	X	X	FONERWA MINICOFIN GEF	Outreach programmes @$50,000 Miners training on rehabilitation @ 25,000 Miners training on Environmental Management Systems @$20,000	95,000	Learning strategy Committees on environmental awareness	Number of trained miners Outreach reports Risk levels Education material,
1.3 Promote a diversity of mercury-free technologies through impact research and industrialisation of proven technologies	1	UR REMA RMB MoE		X	X	FONERWA MINICOFIN GEF	Needs assessment Survey,@$250,000 Training workshops,@$15,000 equipment procurement @$100,000 Research on Hg-free technologies@$25,000	390,000	New Hg- free technologies Tax rebate on Hg free technology Publications	Number of technologies Adoption rates Hg risk levels Number of technologies with tax exemption

1.4 Assess and reduce exposure of miners and communities through unintentional release of mercury from gold extraction and processing	1	REMA RMB MoE		X	X	FONERWA MINI-COFIN GEF	Generation and testing of risk assessment tools and standards @ $30,000 Procurement of equipment $30,000 demonstration sites, surveys on adoption rates @$10,000	70,000	Mercury standards SOPs for reducing Hg contamination at mining sites	Workshops report; Survey reports on adoption rates; Monitoringreports
2.1 Legislative update to prohibit the importation of all Annex A List 1 products	1	REMA RRA	X			FONERWA MINI-COFIN GEF	International trade legislative review	5,000	Regulationson prohibition of mercury containing products	Number of new regulations
2.2 Raise public awareness on the risk of consuming products containing mercury	1	REMA	X	X		FONERWA MINI-COFIN GEF	Awareness campaigns Engagement meetings	10,000	Mercury Learning Strategy Campaigns	Campaign reports;
2.3 Increase the capacity of regulatory authorities	1	REMA Law enforcement Authorities	X	X		FONERWA MINI-COFIN GEF	Equipment purchasing @$50,000 Training of technicians @10,000	60,000	Equipped REMA labs ASGM Formalization Strategy	Workshop reports; Consultantreport Number of equipment bought
2.4 Strengthen importation control measures at ports ofentry for mercury containing products	1	REMA RRA		X	X	FONERWA MINI-COFIN GEF	Engagement meetings Training workshops	15,000	Improved controls at the borders	Number of border personnel trained, listof screening equipment procured,

3.1 Legislative update to facilitate the segregation of used batteries at source	2	District REMA Enviroserve	X			FONERWA MINI-COFIN GEF	Legal review @$5,000 Engagement meetings with stakeholders @$10,000	15,000	Waster segregation at source	Number ofnew regulation Inspection reports
3.2 Raise awareness to the waste management personnel and communities near waste disposal sites onthe potential risks of release of mercury from waste management facilities	1	District REMA Enviroserve	X	X	X	FONERWA MINI-COFIN GEF	Engagement meetings Awareness campaigns	15,000	Improved security atwaste disposal facilities Reduced exposure risks	Awareness materials Inspection reports
3.3 Capacitate waste handlers to characterise waste, including mercury concentrations in waste	1	TC/ REMA/ MoMMD	X	X		FONERWA MINI-COFIN GEF	Training workshops	108,000	Knowledgeable LAs	Number of personnel Trained Monitoringreports
4.1 Establishment of operational networks ofwomen against mercury to support women in environments exposingthem to potential mercury poisoning	2	REMA		X		FONERWA MINI-COFIN GEF	Awareness campaigns, and lobbying	10,000	Established networks	Minutes,
4.2 Enhance the promotion and adoption of cooking technologies without biomass use and with low exposure to smoke that maycontain mercury	3	REMA MINIFRA	X	X	X	FONERWA MINI-COFIN GEF	Training workshops Technology needs assessment Research on alternative fuel sources	30,000	Improved technologies	Number of improved technologies adoption rate

4.3 Legal reforms towards mainstreaming gender issues in reducing mercury related risks	1	REMA	X			FONERWA MINI-COFIN GEF	Engagement meetings Training workshops on gender mainstreaming	15,000	Policy on mercury and genderrelated issues	Number ofnew policies
5.1Establish standard operating procedures for environmentally sound storage/disposal facilities for mercury containing waste	1	REMA RMS MINI-COM	X			FONERWA MINI-COFIN GEF	Engagement meetings Workshops	50,000	Improved phasing down and phasing out process	Number of SOPs
5.2 Establish pilot hubs for handling mercury containing waste at facilities of economic development	1	REMA RMS MINI-COM	X	X		FONERWA MINI-COFIN GEF	Exchangevisits, @$20,000 Pilot hubs @200,000	220,000	Reduced mercury in society	Number of hubs
5.3 Promote the pilot hubs for environmentally sound storage/disposal of mercury containing waste	1	REMA RMS MINI-COM		X	X	FONERWA MINI-COFIN GEF	International conferences @$7,000 Training workshops @15,000	22,000	Reduced mercury risks	Quantity of mercury waste collected
TOTAL								1,195,000		

6.4. MONITORING AND EVALUATION MECHANISMS

Independent evaluation activities will be carried out using the targets outlined in the plan and the criteria and indicators agreed upon by stakeholders. When appropriate, evaluation activities will alsocover assessment of the reduction of mercury contamination in mining areas, waste treatment facilities and in areas downstream.

Evaluation will employ a combination of: (a) formal and informal surveys, (b) semi-structured interviews, (c) key informant interviews, (d) focus group discussions, (e) community meetings, (f) case studies, (g) participatory rural appraisal, (h) direct observation, (I) analysis of written documents, and (j) review of implementation methods.

Monitoring and evaluation for this project will rely on several levels of review, quality control and feedback. The National Steering Committee will meet annually to: (a) review and approve the annual work plan, (b) assess progress against monitoring and evaluation targets as indicated in the Project Results Framework, (c) approve interim and final reports, and (d) assess any gaps or weakness and make appropriate adaptive management decisions based on progress and achievements.

Work plan for the second year will be based on the results achieved in the first year, including associated budget allocations. International experts will be invited to participate in monitoring and evaluation. The terms of reference for the evaluator will be developed with the support of UN Environment.

ANNEXES

ANNEX A INTRODUCTORY LETTER FOR FIELD STUDIES

Republic of Rwanda

RWANDA ENVIRONMENT MANAGEMENT AUTHORITY (REMA)

REMA
OUR ENVIRONMENT OUR FUTURE

Kigali,on 11 FEB 2022
N°...0402.../DECE/2022

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

This is to inform you that the Government of Rwanda (GoR) through Rwanda Environment Management Authority (REMA) has embarked on the process of developing the National Mercury Inventory and Minamata Initial Assessment as part of implementation of the Minamata convention on mercury;

Minamata convention on Mercury is a multilateral environmental agreement that addresses specific human activities which are contributing to widespread of mercury pollution. Rwanda accessed this convention in 2017.

For the better implementation of this convention, Rwanda received financial support from Global Environmental Facility (GEF) under project titled "Minamata Initial Assessment (MIA) and National Action Plan (NAP) for Rwanda". One of the project activities include a consultancy to develop National Mercury Inventory and development of MINAMATA Initial Assessment (MIA).

Therefore, as part of achieving the above mentioned assignment, the consultancy firm (IRONA Consultants Ltd) will visit different institutions and projects, for data collection and assessment regarding mercury sources in the Country. It is in this framework that any assistance rendered to consultants from IRONA consultants Ltd in collecting relevant data and information by using questionnaires, checklists, interviews and other tools where necessary will be highly appreciated. This assignment will cover a period of 4 months counted from February 2022 to April 2022.

Thank you for your usual cooperation.

Sincerely,

For

Kabera Juliet
Director General

MUNYAZIKWIYE
DDG

Inyota House, KG 7 AVE | P.O. Box 7436 Kigali - Rwanda | Tel (+250) 738503663, Hotline: 3989
Website: www.rema.gov.rw, Email: info@rema.gov.rw | Twitter: @ REMA_ Rwanda

ANNEX C GUIDING QUESTIONS FOR KII AND SEJ

GUIDING QUESTIONS FOR KEY INFORMANT INTERVIEWS (KII) AND SOLICITATION OF EXPERT JUDGEMENT (SEJ)

SOLICITATION OF EXPERT JUDGEMENT

Introduction

This questionnaire is intended to find out about the type of judgements that you make with respect to mercury in Rwanda. These answers will be used, together with other available information, to prepare the Rwanda Minamata Initial Assessment for the following purposes:

- Facilitating informed decision making by the Government of the Republic of Rwanda on mattersregarding of mercury management.
- Reporting to the Minamata Convention on Mercury as part of the country's obligations to thisConvention.

The assessment is expected to answer the following key questions: (1) *Are the mercury* stocksand supply sources significant in Rwanda (i.e. stocks >50 t and supply >10t/year)? (2) Do we have mercury contaminated sites and populations at risk of mercury poisoning? (3) Is our legal framework firm and effective in managing Hg and its effects? (4) Does Rwanda have cleaner production technologies and alternatives to Hg?

We are interested in whether or not your job requires you to make probabilistic judgements, and how you make such judgements. In addition, we are interested to find out what sort of aids you use in making judgements.

Part A: General description of your job/occupation

1. Your names and email	
2. What is the title of your job	
3. What would you describe your area of epertise?	
4. How many years of experience do you have in your area of expertise	

5.	Would you describe your experience to be:	Yes/N o
5.1 Wholly practical and/or field-based		
5.2 Mostly practical and/or field-based but some theoretical and/or lab-based		

5.3 About equally practical/theoretical and field/ lab-based		
5.4 Mostly theoretical and/or lab-based		
5.5 Wholly theoretical and/or lab-based		

Part B: Specific Questions [ENERGY SECTOR]

B1 MERCURY SOURCES IN ENERGY SECTOR

Do we have the following in Rwanda? You may answer "Yes", "No", or I do not know "?"

Cat. no.	Source category	Source present (Yes/ No/?)
	Energy consumption	
5.1.1	Coal combustion in large power plants	
5.1.2	Other coal uses	
5.1.3	Combustion/use of petroleum coke and heavy oil	
5.1.3	Combustion/use of diesel, gasoil, petroleum, kero-sene, LPG and otherlight to medium distillates	
5.1.4	Use of raw or pre-cleaned natural gas	
5.1.4	Use of pipeline gas (consumer quality)	
5.1.6	Biomass fired power and heat production	
5.1.6	Charcoal combustion	
	Fuel production	
5.1.1	Coal extraction	
5.1.3	Oil extraction	
5.1.3	Oil refining	
5.1.4	Extraction and processing of natural gas	

B2 AIR POLLUTION CONTROL IN ENERGY SECTOR

What proportion of the fuel extracted or used has air pollution control measures? You may answer in percentages, "100" being all and "0" being none. The percentages should add up to 100%, and excludes hydro-, solar- and other clean energy sources. You are also encouragedto provide an overall level of uncertainty within your response where possible, e.g. ±10% being almost certain and ±90% being some wild guess.

Cat. no.	Source category	Proportion(%)
	Energy consumption	
5.1.1	Coal combustion in large power plants	
	Level 0: No Air Pollution Control (APC)	

	Level 1: Particulate matter (PM) simple APC: ESP/PS/CYC	
	Level 2: Particulate matter (Fabric filter (FF)	
	Level 3: Efficient APC: PM+SDA/wFGD	
	Level 4: Very efficient APC: PM+FGD+SCR	
	Level 5: Mercury specific filters	
5.1.2	**Other coal uses**	
	Level 0: No Air Pollution Control (APC)	
	Level 1: Particulate matter (PM) simple APC: ESP/PS/CYC	
	Level 2: Particulate matter (Fabric filter (FF)	
Cat. no.	**Source category**	**Proportion(%)**
	Level 3: Efficient APC: PM+SDA/wFGD	
	Level 4: Very efficient APC: PM+FGD+SCR	
	Level 5: Mercury specific filters	

Cat. no.	Source category	Proportion(%)
	Energy consumption	
5.1.3	Combustion/use of diesel, gasoil, petroleum, kero-sene, LPG and otherlight to medium distillates	
	All Uses	
	Oil Combustion Facility with no emissions controls	
	Oil Combustion Facility with PM control using an ESP or scrubber	
	Power plants with cESP and FGD	
	Electricity generation	
	Oil Combustion Facility with no emissions controls	
	Oil Combustion Facility with PM control using an ESP or scrubber	
	Power plants with cESP and FGD	
	Combined heat and power generation	
	Oil Combustion Facility with no emissions controls	
	Oil Combustion Facility with PM control using an ESP or scrubber	
	Power plants with cESP and FGD	
	Heat Plants	
	Oil Combustion Facility with no emissions controls	
	Oil Combustion Facility with PM control using an ESP or scrubber	
	Power plants with cESP and FGD	
	Manufacturing industries and construction	
	Oil Combustion Facility with no emissions controls	
	Oil Combustion Facility with PM control using an ESP or scrubber	
	Power plants with cESP and FGD	
	Road Transport	
	Oil Combustion Facility with no emissions controls	

	Oil Combustion Facility with PM control using an ESP or scrubber	
	Power plants with cESP and FGD	
	Railway Transport	
	Oil Combustion Facility with no emissions controls	
	Oil Combustion Facility with PM control using an ESP or scrubber	
	Power plants with cESP and FGD	
	Waterborne navigation	
	Oil Combustion Facility with no emissions controls	
	Oil Combustion Facility with PM control using an ESP or scrubber	
	Power plants with cESP and FGD	
	Other Sector: Commercial Institutional	
	Oil Combustion Facility with no emissions controls	

Cat. no.	Source category	Proportion(%)
	Oil Combustion Facility with PM control using an ESP or scrubber	
	Power plants with cESP and FGD	
	Other Sector: Residential	
	Oil Combustion Facility with no emissions controls	
	Oil Combustion Facility with PM control using an ESP or scrubber	
	Power plants with cESP and FGD	
	Other Sector: Agriculture/Forestry/Fishing/Fish Farms – Stationary	
	Oil Combustion Facility with no emissions controls	
	Oil Combustion Facility with PM control using an ESP or scrubber	
	Power plants with cESP and FGD	
	Other Sector: Agriculture/Forestry/Fishing/Fish Farms – Off road vehicles and othermachinery	
	Oil Combustion Facility with no emissions controls	
	Oil Combustion Facility with PM control using an ESP or scrubber	
	Power plants with cESP and FGD	
	Other Sector: Agriculture/Forestry/Fishing/ Fish Farms – Fishing (mobilecombustion)	
	Oil Combustion Facility with no emissions controls	
	Oil Combustion Facility with PM control using an ESP or scrubber	
	Power plants with cESP and FGD	
	Fuel production	
5.1.4	**Extraction and processing of natural gas**	
	Gas processing without mercury removal	
	Gas processing with mercury removal	

B3 ENERGY-RELATED LEGAL PROVISIONS

What is your comment on the energy-related legal provisions in relation to mercurymanagement? You may use the space below

Part C: Specific Questions [INDUSTRIAL PROCESSES AND PRODUCTS USE]

C1 MERCURY SOURCES IN INDUSTRIAL PROCESSES AND PRODUCTS USE

Do we have the following in Rwanda? You may answer "Yes", "No", or I do not know "?"

Cat. no.	Source category	Source present (Yes/No/?)
	Primary metal production	
5.2.1	Mercury (primary) extraction and initial processing	
5.2.3	Production of zinc from concentrates	
5.2.4	Production of copper from concentrates	
5.2.5	Production of lead from concentrates	
5.2.6	Gold extraction by methods other than mercury amalgamation	
5.2.7	Alumina production from bauxite (aluminium production)	
5.2.9	Primary ferrous metal production (pig iron production)	
5.2.2	Gold extraction with mercury amalgamation - without use of retort	
5.2.2	Gold extraction with mercury amalgamation - with use of retorts	
5.2.8	Other non-ferrous metals - extraction and processing(Tin/Tantalum/Tungsten)	
	Other materials production	
5.3.1	Cement production	
5.3.2	Pulp and paper production	
	Production of chemicals	
5.4.1	Chlor-alkali production with mercury-cells	
5.4.2	VCM production with mercury catalyst	
5.4.3	Acetaldehyde production with mercury catalyst	
	Production of products with mercury content	
5.5.1	Hg thermometers (medical, air, lab, industrial etc.)	
5.5.2	Electrical switches and relays with mercury	
5.5.3	Light sources with mercury (fluorescent, compact, others: see guideline)	
5.5.4	Batteries with mercury	
5.6.2	Manometers and gauges with mercury	
5.5.5	Biocides and pesticides with mercury	
5.5.6	Paints with mercury	
5.5.7	Skin lightening creams and soaps with mercury chemicals	
	Use and disposal of products with mercury content	
5.6.1	Dental amalgam fillings ("silver" fillings)	
5.5.1	Thermometers	
5.5.2	Electrical switches and relays with mercury	
5.5.3	Light sources with mercury	
5.5.4	Batteries with mercury	
5.5.5.	Polyurethane (PU, PUR) produced with mercury catalyst	
5.5.7	Paints with mercury preservatives	

5.5.8	Skin lightening creams and soaps with mercury chemicals	
5.6.2	Medical blood pressure gauges (mercury sphygmomanometers)	
5.6.2	Other manometers and gauges with mercury	
5.6.3	Laboratory chemicals	
5.6.3, 5.6.5	Other laboratory and medical equipment with mercury	
	Production of recycled of metals	
5.7.1	Production of recycled mercury ("secondary production")	
5.7.2	Production of recycled ferrous metals (iron and steel)	

C2 AIR POLLUTION CONTROL IN IPPU SECTOR

What proportion of primary metal production has air pollution control measures? You may answer in percentages, "100" being all and "0" being none. The percentages should add up to 100%. You are also encouraged to provide an overall level of uncertainty within yourresponse where possible, e.g. ±10% being almost certain and ±90% being some wild guess.

Cat. no.	Source category	Proportion(%)
	Primary metal production	
5.2.3	Production of zinc from concentrates	
	Smelter with no filters or only coarse, dry PM retention	
	Smelters with wet gas cleaning	
	Smelters with wet gas cleaning and acid plant	
	Smelters with wet gas cleaning, acid plant and Hg specific filter	
5.2.4	Production of copper from concentrates	
	Smelter with no filters or only coarse, dry PM retention	
	Smelters with wet gas cleaning	
	Smelters with wet gas cleaning and acid plant	
	Smelters with wet gas cleaning, acid plant and Hg specific filter	
5.2.5	Production of lead from concentrates	
	Smelter with no filters or only coarse, dry PM retention	
	Smelters with wet gas cleaning	
	Smelters with wet gas cleaning and acid plant	
	Smelters with wet gas cleaning, acid plant and Hg specific filter	
5.2.8	Production of tin from concentrates	
	Smelter with no filters or only coarse, dry PM retention	
	Smelters with wet gas cleaning	
	Smelters with wet gas cleaning and acid plant	
	Smelters with wet gas cleaning, acid plant and Hg specific filter	
5.2.8	Production of tungsten from concentrates	
	Smelter with no filters or only coarse, dry PM retention	
	Smelters with wet gas cleaning	
	Smelters with wet gas cleaning and acid plant	
	Smelters with wet gas cleaning, acid plant and Hg specific filter	

5.2.8	Production of tantalum from concentrates	
	Smelter with no filters or only coarse, dry PM retention	
	Smelters with wet gas cleaning	
	Smelters with wet gas cleaning and acid plant	
	Smelters with wet gas cleaning, acid plant and Hg specific filter	

5.2.2	Gold extraction with mercury amalgamation	
	Extraction from whole ore (no retort use)	
	Extraction from whole ore and with use of retorts and mercuryrecycling	
	Extraction from concentrate (no retort use)	
	Extraction from concentrate (retort use)	

What proportion of cement production has air pollution control measures? You may answerin percentages, "100" being all and "0" being none. The percentages should add up to 100%.

Cat. no.	Source category	Proportion (%)
	Other materials production	
5.3.1	Cement production	
	Clinker production	
	Without co-incineration of waste	
	With co-incineration of waste	
	Sometimes with and other times with-out co-incineration of waste	
	Air pollution control	
	With no filters	
	With filters an no filter dust recycling:	
	Simple particle control (ESP / PS / FF)	
	Optimized particle control (FF+SNCR / FF+WS / ESP+FGD /optimized FF)	
	Efficient air pollution control (FF+DS / ESP+DS / ESP+WS /ESP+SNCR)	
	Very efficient Hg pollution con-trol (wetFGD+ACI /FF+scrubber+SNCR)	

C3 INDUSTRIAL PROCESSES AND PRODUCTS-RELATED LEGAL PROVISIONS

What is your comment on the industrial-related legal provisions in relation to mercurymanage-ment? You may use the space below

Part D: Specific Questions [WASTE SECTOR]

D1 MERCURY SOURCES IN WASTE SECTOR

Do we have the following in Rwanda? You may answer "Yes", "No", or I do not know "?"

Cat. no.	Source category	Source present (Yes/No/?)
	Waste incineration	
5.8.1	Incineration of municipal/general waste	
5.8.2	Incineration of hazardous waste	
5.8.3	Incineration and open burning of medical waste	
5.8.4	Sewage sludge incineration	
5.8.5	Open fire waste burning (on landfills and informally)	
	Waste deposition/landfilling and waste water treatment	
5.9.1	Controlled landfills/deposits	
5.9.4	Informal dumping of general waste	
5.9.5	Waste water system/treatment	
	Crematoria and cemeteries	
5.10.1	Crematoria	
5.10.2	Cemeteries	

D2 AIR POLLUTION CONTROL IN WASTE SECTOR

What proportion of waste incineration has air pollution control measures? You may answer in percentages, "100" being all and "0" being none. The percentages should add up to 100%. You are also encouraged to provide an overall level of uncertainty within your response where possible, e.g. ±10% being almost certain and ±90% being some wild guess.

Cat. no.	Source category	Source present (Yes/No/?)
	Waste incineration	
5.8.1	Incineration of municipal/general waste	
	No emission reduction devices	
	PM reduc, simple ESP, or similar	
	Acid gas control with limestone (or similar acid gas absorbent) anddownstream high efficiency FF or ESP PM retention	
	Mercury specific absorbents (and downstream FF)	
5.8.2	Incineration of hazardous waste	
	No emission reduction devices	
	PM reduc, simple ESP, or similar	
	Acid gas control with limestone (or similar acid gas absorbent) anddownstream high efficiency FF or ESP PM retention	
	Mercury specific absorbents (and downstream FF)	
5.8.3	Incineration and open burning of medical waste	
	No emission reduction devices	
Cat. no.	Source category	Source present (Yes/No/?)
	PM reduc, simple ESP, or similar	

	Acid gas control with limestone (or similar acid gas absorbent) anddownstream high efficiency FF or ESP PM retention	
	Mercury specific absorbents (and downstream FF)	
5.8.4	Sewage sludge incineration	
	No emission reduction devices	
	PM reduc, simple ESP, or similar	
	Acid gas control with limestone (or similar acid gas absorbent) anddownstream high efficiency FF or ESP PM retention	
	Mercury specific absorbents (and downstream FF)	
	Waste deposition/landfilling and waste water treatment	
5.9.1	Controlled landfills/deposits	
5.9.4	Informal dumping of general waste	
5.9.5	Waste water system/treatment	
	No treatment; direct release from sewage pipe	
	Mechanical treatment only	
	Mechanical and biological (activated sludge) treatment; no landapplication of sludge	

What proportion of wastewater is treated? You may answer in percentages, "100" being alland "0" being none. The percentages should add up to 100%.

Cat. no.	Source category	Source present (Yes/No/?)
5.9.5	Waste water system/treatment	
	No treatment; direct release from sewage pipe	
	Mechanical treatment only	
	Mechanical and biological (activated sludge) treatment; no landapplication of sludge	

D3 WASTE-RELATED LEGAL PROVISIONS

What is your comment on the waste-related legal provisions in relation to mercurymanagement? You may use the space below

ANNEX D MERCURY INVENTORIES INTERVIEW GUIDE

TOOLKIT INVENTORY REF.	TOOLKIT CATEGORY TO BE MAPPED	Existence in Rwanda (Yes/No)	SPECIFIC INFORMATION REQUIRED PER CATEGORY AS PER THE MERCURY INVENTORY TOOLKIT	
			LEVEL 2 INVENTORY[1]	LEVEL 1 INVENTORY
	Extraction and use of fuels/ energy sources			
5.1.1	Coal combustion in power plants		Quantity of Coal used per year by coal type. Anthracite (hard) coal bituminous (hard) coal sub-bituminous (brown) coal lignite (brown) coal Proportion of coal receiving pre-treatments before combustion e.g. Coal washing Proportion of coal combusted under air pollution control devices used e.g. Electrostatic precipitators Country specific emission/release factor	Annual coal consumption (t/yr)
5.1.2	Other coal use		Quantity of Coal used per year by coal type. Anthracite (hard) coal bituminous (hard) coal sub-bituminous (brown) coal lignite (brown) coal NB: Such processes may include Coke production from coal, Coal combustion for other processes Country specific emission/release factor	Annual coal consumption (t/yr)
5.1.3	Mineral oils - extraction, refining and use		Quantity of Heavy fuel: Oil extracted Refined Heavy Fuel (HF) combustion facilities Amount of HF combusted per year State is air pollution control devices are installed and state the type Use of gasoline, diesel, light fuel oil, kerosene, LPG and other light to medium distillates Transportation and other uses other than combustion Residential heating with no controls Other oil combustion facilities Country specific emission/release factor	Annual consumption/ use of petroleum coke and heavy oils (t/yr) Annual consumption/ use of diesel, gasoil, petroleum, kerosene, LPG and other light to medium distillates Oil extraction (t/yr) Oil refining (t/yr)

1 In instances where there is limited data, collect inventory level 1 data

TOOLKIT INVENTORY REF.	TOOLKIT CATEGORY TO BE MAPPED	Existence in Rwanda (Yes/No)	SPECIFIC INFORMATION REQUIRED PER CATEGORY AS PER THE MERCURY INVENTORY TOOLKIT	
			LEVEL 2 INVENTORY[1]	LEVEL 1 INVENTORY
5.1.4	Natural gas - extraction, refining and use		Quantity of Natural gas: Extracted per year Refined per year Proportion of gas pre cleaned	Annual raw or pre-cleaned natural gas consumed (Nm^3/yr) Annual cleaned gas/ consumer quality consumed (Nm^3/yr) Annual extracted and processed natural gas (Nm^3/yr)
5.1.5	Other fossil fuels - extraction and use		Quantity of Natural gas: Extracted per year Used per year Country specific emission/release factor	Annual amount extracted (t/yr) Annual amount used
5.1.6	Biomass fired power and heat production		Quantity of biomass used per year Amount of Charcoal combusted per year Are there any pollution control devices used for biomass and charcoal burned Country specific emission/release factor	Annual biomass burned for power and heat production (t/yr) Annual charcoal burned (t/yr)
5.1.7	Geothermal power production		Capacity of geothermal plants	Sub-category not included in Level 1 inventory
	Primary metal production			
5.2.1	Gold (and silver) extraction with mercury amalgamation processes sites/plants		Amount of gold or silver extracted with mercury amalgamation processes by category as follows: Whole ore amalgamation From concentrates From concentrates with the use of retorts Country specific emission/release factor	Gold ore used (t/yr) Gold extracted using retorts (t/yr)
5.3.3	Zinc extraction and initial processing plants		Amount of Zinc produced by smelters Proportion of concentrate used under specific pollution control devices	Annual amount of concentrate used (t/yr)
5.3.4	Copper extraction and initial processing plants		Amount of copper produced by smelters Proportion of copper produced under specific pollution control devices	Annual amount of concentrate used (t/yr)
5.3.5	Lead extraction and initial processing plants		Amount of lead produced by smelters Proportion of lead produced under specific pollution control devices	Annual amount of concentrate used (t/yr)

TOOLKIT INVENTORY REF.	TOOLKIT CATEGORY TO BE MAPPED	Existence in Rwanda (Yes/No)	SPECIFIC INFORMATION REQUIRED PER CATEGORY AS PER THE MERCURY INVENTORY TOOLKIT	
			LEVEL 2 INVENTORY[1]	LEVEL 1 INVENTORY
5.3.6	Gold extraction and initial processing by methods other than mercury amalgamation		Amount of god ore used	Annual amount of gold ore used (t/yr)
5.3.7	Aluminium extraction and initial processing sites and plants		Amount of bauxite used Amount of alumina produced	Annual amount of bauxite used (t/yr)
5.3.8	Other non-ferrous metals - extraction and processing		Amount of ore used Amount of ferrous metal produced	Annual amount of ore used (t/yr)
5.3.9	Primary ferrous metal production sites/plants		Amount of pig iron produced per year	Annual amount of pig iron produced (t/yr)
	Production of other minerals and materials with mercury impurities			
5.3.1	Cement production plants		Amount of cement produced without co-incineration of waste Amount of cement produced with co-incineration of waste	Annual amount of cement produced (t/yr)
5.3.2	Pulp and paper production Plants		Amount of biomass used in the production of pulp and paper Amount of paper and pulp produced	Annual amount of biomass used (t/yr)
5.3.3	Production of lime and light weight aggregates sites		Amount of lime and light weight aggregates used in the production of pulp and paper Amount of lime and light weight aggregates produced Are there any pollution control devices used	Annual amount of lime used
	Intentional use of mercury in industrial processes			
5.4.1	Chlor-alkali production with mercury-technology		Are there any Chlor-alkali plants (Use of mercury cells in the production of caustic soda and chlorine)	Annual amount of chlorine produced (t/yr)
5.4.2	VCM production with mercury catalyst		Amount of VCM produced	Annual amount of VCM produced (t/yr)
5.4.3	Acetaldehyde production with mercury catalyst		Amount of Acetaldehyde produced	Annual amount of acetaldehyde produced (t/yr)

TOOLKIT INVENTORY REF.	TOOLKIT CATEGORY TO BE MAPPED	Existence in Rwanda (Yes/No)	SPECIFIC INFORMATION REQUIRED PER CATEGORY AS PER THE MERCURY INVENTORY TOOLKIT	
			LEVEL 2 INVENTORY[1]	LEVEL 1 INVENTORY
5.4.4	Other production of chemicals and polymers with mercury		Amount of chemicals produced	Sub-category not included in Level 1 inventory
	Consumer products with intentional use of mercury			
5.5.1	Thermometers with mercury		Number of thermometers produced by category: Medical thermometers Ambient air thermometers Industrial and special thermometers Other glass Hg thermometers Number of thermometers Used by category: Medical thermometers Ambient air thermometers Industrial and special thermometers Other glass Hg thermometers Number of thermometers disposed by category: Medical thermometers Ambient air thermometers Industrial and special thermometers Other glass Hg thermometers Is there any waste separation at source that is carried out?	Annual amount of mercury used for production (kg/year)
5.5.2 5.5.3	Electrical switches and relays with mercury Light sources with mercury (fluorescent, compact, others (as indicated in the guidelines) National Statistics Agency/ Revenue Authority/REMA Suppliers and Importers		Percentage of people with access to electricity Waste management processes; Waste separation at source facilities Amount of Fluorescent tubes (double end) imported/exported, and supplied Amount of Compact fluorescent lamp (CFL single end) imported/exported, and supplied Amount of High pressure mercury vapour lamps imported/exported, and supplied Amount of High pressure sodium vapour lamps imported/exported, and supplied Amount of Metal halide lamps imported/exported, and supplied	Annual amount of mercury used for production (kg/year)

TOOLKIT INVENTORY REF.	TOOLKIT CATEGORY TO BE MAPPED	Existence in Rwanda (Yes/No)	SPECIFIC INFORMATION REQUIRED PER CATEGORY AS PER THE MERCURY INVENTORY TOOLKIT	
			LEVEL 2 INVENTORY[1]	LEVEL 1 INVENTORY
5.5.4	Batteries with mercury		Quantities of batteries produced by category Mercury oxide (all sizes); also called mercury-zinc cells Zinc-air button cells Alkaline button cells Silver oxide button cells Alkaline, other than button cell shapes Quantities of batteries disposed by category Mercury oxide (all sizes); also called mercury-zinc cells Zinc-air button cells Alkaline button cells Silver oxide button cells Alkaline, other than button cell shapes	Annual amount of mercury used for production (kg/year)
5.5.6	Biocides and pesticides with mercury production plants		Quantity of mercury used in the production of Biocides and pesticides	Annual amount of mercury used for production (kg/year)
5.5.7	Paints with mercury producing plants		Quantity of mercury used in the production of paints Quantity of paint produced per year Quantity of paint imported/ exported containing mercury	Annual amount of mercury used for production (kg/year)
5.5.8	Cosmetics and related products with mercury		Quantity of mercury used in the production of cosmetics Quantity of cosmetics produced per year Quantity of cosmetics imported/ exported containing mercury	Annual amount of mercury used for production (kg/year)
	Other intentional product/ process use			
5.6.1	Dental mercury-amalgam fillings (b		Dental mercury-amalgam fillings (Preparations of fillings at dentist clinics; share of current mercury supply for amalgam fillings) Is mercury supply for dental amalgam fillings	Number of dental persons per 1000 inhabitants

TOOLKIT INVENTORY REF.	TOOLKIT CATEGORY TO BE MAPPED	Existence in Rwanda (Yes/No)	SPECIFIC INFORMATION REQUIRED PER CATEGORY AS PER THE MERCURY INVENTORY TOOLKIT	
			LEVEL 2 INVENTORY[1]	LEVEL 1 INVENTORY
5.6.2	Manometers and gauges with mercury		Quantities used : medical blood pressure gauges Manometers U-shaped manometers Manometers for milking systems Manometers and barometers used for measuring air pressure Barometers Environmental manometers Pressure valves in district heating plants Pressure gauges Quantities disposed medical blood pressure gauges Manometers U-shaped manometers Manometers for milking systems Manometers and barometers used for measuring air pressure Barometers Environmental manometers Pressure valves in district heating plants Pressure gauges	Items sold per annum
5.6.4	religious sites that use mercury metal in rituals and folklore medicine		Amount of mercury used	Annual amount of Hg used
	Production of recycled metals ("secondary" metal production)			
5.7.1	Production of recycled mercury ("secondary production")		Mercury production from recycling	Mercury produced (kg/year)
5.4.2	Production of recycled ferrous metals (iron and steel)		Quantity of recycled ferrous metals (iron and steel)	Annual number of vehicles recycled
5.4.2	Production of other recycled metals		Quantity of other recycled metals	Amount recycled (t/yr)
	Waste incineration Plants			

TOOLKIT INVENTORY REF.	TOOLKIT CATEGORY TO BE MAPPED	Existence in Rwanda (Yes/No)	SPECIFIC INFORMATION REQUIRED PER CATEGORY AS PER THE MERCURY INVENTORY TOOLKIT	
			LEVEL 2 INVENTORY[1]	LEVEL 1 INVENTORY
5.8.1	Incineration of municipal/ general waste		Amount of general waste incinerated Proportion of waste under specific pollution control devices	Annual amount of waste incinerated (t/yr)
5.8.2	Incineration of hazardous waste		Amount of hazardous waste incinerated Proportion of waste under specific pollution control devices	Annual amount of waste incinerated (t/yr)
5.8.3	Incineration of medical waste		Amount of medical waste incinerated Proportion of waste under specific pollution control devices	Annual amount of waste incinerated (t/yr)
5.8.4	Sewage sludge incineration		Amount of sewage sludge incinerated Proportion of waste under specific pollution control devices	Annual amount of waste incinerated (t/yr)
5.8.5	Informal waste burning		Extent of proliferation of illegal dumpsites Amount of waste openly burned	Annual amount of waste burned (t/yr)
	Waste deposition/landfilling and waste water treatment			
5.9.1	Controlled landfills/deposits sites		Amount of waste disposed	Annual amount of waste landfilled (t/yr)
5.9.2	Diffuse disposal under some control		Amount of waste disposed	Annual amount of waste (t/yr)
5.9.3	Informal local disposal of industrial production waste sites		Amount of waste disposed	Annual amount of waste (t/yr)
5.9.4	Informal dumping of general waste sites		Amount of waste disposed	Annual amount of waste (t/yr)
5.9.5	Waste water system/treatment facilities		Amount of waste treated	Annual amount of waste (m^3/yr)
	Crematoria and cemeteries			
5.10.1	Crematoria/ cremation		Number of corpses cremated Country specific average mass of Hg per corpse	Annual corpses cremated
5.10.2	Cemeteries		Number of corpses buried Country specific average mass of Hg per corpse	Annual corpses buried

ANNEX E FIELD VISIT ITINERARY AND INTERVIEW GUIDES

PROVINCE	DISTRICT	INSTITUTION	DATE	INTERVIEW QUESTION GUIDE BY SOURCE CATEGORY				
Northern	Musanze	UR-Cavm Busogo Campus	11 February 2022	All				
	Musanze	Ruhengeri Hospital		5.5	5.6	5.8	5.10	
	Burera	Prime Cement Limited	TEAM 1	5.3				
	Musanze	INES Ruhengeri		All				
	Musanze	Pharmacy		5.5	5.6			
	Musanze	Agropy	Night Base Musanze	5.5				
	Burera	Butaro Hospital	12 February 2022	5.5	5.6	5.8	5.10	
	Burera	Gifurwe Mining		5.2				
	Gakenke	Nemba Hospital	TEAM 1	5.5	5.6	5.8	5.10	
	Gakenke	Pharmacy	Night Base Gakenke	5.5	5.6			
	Rulindo	IPRC Tumba	13 February 2022	All				
	Rulindo	U.H Mining Company	TEAM 1	5.2				
	Gicumbi	Ngali Mining Ltd		5.2				
	Gasabo	Nduba Dumpsite	Night Base Kigali	5.8	5.9			
Eastern	Kayonza	Rwinkwavu Hospital	14 February 2022	5.5	5.6	5.8	5.10	
	Ngoma	Pharmacy		5.5	5.6			
	Ngoma	Kibungo Hospital	TEAM 1	5.5	5.6	5.8	5.10	
	Kayonza	Mount Meru Soyco						
	Kayonza	Gahini Hospital	Night Base Kigali	5.5	5.6	5.8	5.10	
Eastern/ Kigali	Bugesera	Imana Steel	15 February 2022	5.7				
	Bugesera	Enviroserve		5.8	5.9			
		Kigali Cement Company	TEAM 1	5.3				
	Kicukiro	Amaco Paints		5.5				
	Kicukiro	Ministry of Health		5.5	5.6	5.8	5.10	
	Kicukiro	Master steel		5.7				
	Kicukiro	University of Rwanda	Night Base Kigali	All				
	Kicukiro	Kanombe Hospital		5.5	5.6	5.8	5.10	
	Kicukiro	Pharmacy		5.5	5.6			
	Kamonyi	Pharmacy	11 February 2022	5.5	5.6			
	Muhanga	Pharmacy		5.5	5.6			
	Muhanga	Kabgayi Hospital	TEAM 2	5.5	5.6	5.8	5.10	
	Nyanza	Nyanza Hospital		5.5	5.6	5.8	5.10	
	Huye	CHUB	Night Base Huye	5.5	5.6	5.8	5.10	
	Huye	Pharmacy		5.5	5.6			
	Gisagara	Gisagara thermal power station		5.1				

PROVINCE	DISTRICT	INSTITUTION	DATE	INTERVIEW QUESTION GUIDE BY SOURCE CATEGORY				
South/ Western	Nyamagabe	Kigeme gold mine	12 February 2022	5.2				
	Rusizi	Bweyeye Gold Mining	TEAM 2	5.2				
	Rusizi	Cimerwa		5.3				
	Rusizi	Nyungwe Gold mine		5.2				
	Rusizi	Gishoma	Night Base Rusizi	5.1				
	Rusizi	Gihundwe Hospital		5.5	5.6	5.8	5.10	
	Karongi	Kibuye Referral Hospital	13 February 2022	5.5	5.6	5.8	5.10	
	Karongi	Kivuwatt	TEAM 2	5.1				
	karongi	Kibuye power plant		5.1				
	Karongi	Pharmacy	Night Base Kigali	5.5	5.6			
	Nyarugenge	Depot Kalisimbi Incinerator	14 February 2022	5.8				
	Nyarugenge	Rwanda Medical Supply	TEAM 2	5.5	5.6			
	Nyarugenge	Rwanda Mining Board		5.1	5.2	5.3		
	Gasabo	Rwanda Revenue Authority		All				
	Gasabo	Rwanda Food and Drug Authority		5.5	5.6			
	Gasabo	Gatsata Incinerator		5.8				
	Gasabo	Min. of Trade and Industry	15 February 2022	5.5				
	Gasabo	Safintra ltd	TEAM 2	5.7				
	Gasabo	Rwanda Agriculture Board		5.5				
	Gasabo	Ministry of local Government		All				
	Gasabo	Rwanda Natural Resources Agency		All				
	Gasabo	UR, College of Medicine and Health Science		All				
	Gasabo	Kacyiru Hospital	16 February 2022	5.5	5.6	5.8	5.10	
	Gasabo	Kibagabaga Hospital		5.5	5.6	5.8	5.10	
	Gasabo	REMA	TEAM 1&2	All				
	Nyarugenge	Rwanda Energy Group		5.1				
	Nyarugenge	National Institute of Statistics of Rwanda		All				
	Nyarugenge	Rwanda Forestry and Water Board		5.1				
	Nyarugenge	UR, College of Science and Technology		All				
	Nyarugenge	CHUK		5.5	5.6	5.8	5.10	
	Nyarugenge	Pharmacy		5.5	5.6			