

**Assessing Mercury Use, Awareness and Legal Frameworks
in ASGM and Mercury Added Products to Address
Mercury Pollution in Kenya**

By



**Centre for Environment Justice and Development
P. O Box 24464-00100
Nairobi, Kenya
Web: www.cejadkenya.org**

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Acronyms

AAK	Agrochemical Association of Kenya
BATs	Best Available Technologies
BEP	Best Environmental Practice
COP	Conference of the Parties
EMCA	Environmental Management and Coordination Act
GCD	Government Chemist Department
GDP	Gross Domestic Product
GEF	Global Environment Facility
IMKA	Integrated Sound Management of Mercury in Kenya's ASGM
KAM	Kenya Association of Manufacturers
KEBS	Kenya Bureau of Standards
KEMRI	Kenya Medical Research Institute
KIRDI	Kenya Industrial Research Institute
KPA	Kenya ports Authority
KPLC	Kenya Power Lighting Company
KRA	Kenya Revenue Authority
MENR	Ministry of Environment and Natural Resources
NEMA	National Environmental Management Authority
NGO	Non-Governmental Organization
PCPB	Pest Control Products Board
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
WHO	World Health Organization

Executive Summary

Centre For Environment Justice and Development (CEJAD) conducted a study to assess the key sources and levels of mercury releases in the environment. The study focused on possible sources of mercury emissions and releases to the environment, including: energy sources, mercury added products, Artisanal and Small-scale Gold Mining (ASGM), municipal waste, industrial and medical waste dumping in Kenya.

The study approach and methodology used were literature reviews, survey tools such as questionnaires, key informant interviews and general observation during the field visit. Data analysis was done through input of data on the excel sheet according to the completed questionnaires, assessing the present scenario and survey data and compilation information.

Study findings showed that mercury is not produced in Kenya however, mercury and its products are imports of Kenya. Mercury added products include electrical appliances such as switches, batteries, thermometers and bulbs. The mercury releases inventory conducted by the Ministry of Environment and Forestry in the Mercury Initial Activities (MIA), using the UNEP Toolkit for Identification and Quantification of Mercury Releases –Inventory level 2 showed that informal dumping of waste contributes to the highest amount of mercury pollution in the country.

In addition, mercury is largely used in ASGM sites for the gold amalgamation process in Kenya. Women are more vulnerable to mercury pollution since they dominate the processing sites conducting amalgamation and roasting of the gold ores. Mercury is very harmful to human health especially to women of child bearing age. It was also observed that some mine sites, for example Wagusu in Siaya county, is located very near to the Lake Victoria hence chances of mercury pollution in the lake is very high.

Currently the country relies on Environment Management and Coordination Act EMCA, 1999 for regulation of mercury in the country. The regulations under the act includes the Water Quality Regulation which deals with protection of water for domestic use, industrial use and waste effluent discharge and the Waste Management Regulation applying to all categories of waste and outlining requirements for handling them.

The recommendations made from this study include raising awareness on design and implementation of mercury free alternatives, research on and deployment of viable alternatives for gold recovery without the use of mercury and strengthening of legal requirements and institutional frameworks to control entry and safely manage Mercury Added Products (MAPs).

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1. Introduction

1.1. Background

This is a report of a project study conducted by Centre for Environment Justice and Development (CEJAD) between December 2017 and May 2018 with support from IPEN. The purpose of the study was to assess mercury pollution including mercury use and emissions from Artisanal and Small-Scale Gold Mining (ASGM) and Mercury Added Products, key sources listed in the Minamata Convention on Mercury as well as in the regulatory frameworks in Kenya for mercury pollution control. The study was informed by the growing recognition of the threat posed by mercury to human health and the environment.

Mercury is a recognized toxic, mobile and persistent element with documented serious impacts on human health and environment. High doses of organic compounds of mercury, particularly methyl mercury (MeHg), can be fatal to humans, while even small doses affect human nervous system. According to Pacyna et al 2016, mercury has been linked to harmful effects on the cardiovascular, immune, and reproductive systems. Methyl mercury has the ability to pass through the placenta and the blood–brain barrier, thus exposure of women of childbearing age to methyl mercury is of greatest concern.

Mercury emissions can be from both natural sources, as well as anthropogenic sources. Natural sources include volcanic eruptions, emissions from the ocean, and deposits of cinnabar (where mercury is bound with sulphur) and trace amounts in coal. Globally, the main sources of anthropogenic mercury emissions include artisanal and small-scale gold mining (37%), followed by combustion of fossil fuels (mainly coal) in power plants and industrial applications (25%)¹. Mercury has also been used in a wide range of products such as electrical and electronic devices, switches (including certain thermostats) and relays, measuring and control equipment, energy-efficient fluorescent light bulbs, batteries and dental amalgam. Smaller amounts of mercury are used in some laboratory equipment and in some cosmetics, pharmaceuticals, paints and jewelry².

Kenya does not produce mercury. However, mercury is used in different sectors in the country. Key among them is ASGM, as then in products found within the health sector, education, industrial and domestic use. Like most developing countries, Kenya faces significant health and environmental risks associated with mercury pollution. This can be attributed to low awareness about mercury pollution especially at ASGM sites as well limited financial capacity to acquire mercury-free technology in the sector. Other factors include poor waste management practices such as open burning of waste, lack of waste segregation, inadequate facilities for management of hazardous wastes, as well as weakness in enforcement of pollution control regulations. The growing demand for coal in energy generation, as well as the

¹ UNEP Global Mercury Assessment, 2013

² UNEP 2008

discoveries of coal deposits in the country further adds to future risk of increased mercury emissions.

Artisanal gold mining in Kenya has been on the rise, with the gold industry projected to be worth billions of Kenya shillings. In Kakamega County alone, the estimated value of gold by the Acacia Mining Company is quoted at USD 1.65 billion³. This has led to an increased sense of gold rush, attracting more people (rural dwellers) into the sector who work as investors, excavators and processors. However, ASGM is practiced in a manner that is not environmentally sound, thus increasing risk of mercury pollution in the country.

These developments form the basis for this Mercury Country Situation Study report. The study has documented and where possible quantified some of the anthropogenic sources of mercury emissions in Kenya. The findings are expected to help feed into the development and implementation of the National Action Plan (NAP) for addressing mercury pollution in the country.

1.2. Project Study Objectives

The overall objective of the study is to assess the key sources and levels of mercury release into the environment.

Specifically, the objectives of the project study were to:

- I. Assess and profile mercury pollution hotspots the artisanal and small gold mining (article 7) counties in Kenya, especially the main ASGM counties of Kakamega, Siaya and Narok, including trade and supply aspects of mercury to the ASGM miners.
- II. Assess stakeholders' awareness and capacity needs towards preparedness for the implementation article 4 part I of the Convention on mercury added products for phase out.
- III. Review policy, legal and regulatory frameworks relevant to control and management of mercury in ASGM and mercury added products including a study to compile any available data on emissions from key sources such as coal fired power stations, cement kilns and incinerators.

1.3. Study Scope

The project study involved review of literature on possible sources of mercury pollution in Kenya, focusing on the mercury added products, artisanal and small-scale gold mining, municipal and medical waste dumping and industrial processes such as cement manufacturing; review of existing policies and legislations to establish the provisions that relate to control and management of mercury as well as and a compilation of available data on mercury emissions from waste incinerators and cement kilns.

³ Standard newspaper, 28th Feb 2017

The study also involved a survey of trade and supply aspects of mercury in the ASGM sector and the awareness, capacity needs and preparedness among relevant government institutions towards the implementation of article 4 part I of the Minamata Convention on phase out of mercury added products.

1.4. Justification for the Study

Kenya is a signatory to the Minamata Convention, and is currently in the process of its ratification. The convention requires Kenya to endeavour to identify individual stocks of mercury or mercury compounds exceeding 50 metric tons, as well as sources of mercury supply generating stocks exceeding 10 metric tons per year, that are located within its territory and to identify emissions and releases. When the country ratifies the Convention there will be a need to comply with its various provisions. This requires active participation from all relevant stakeholders. The Convention has provision for addressing: Mercury supply sources and trade, environmentally sound interim storage, mercury wastes recovery and contaminated sites.

CEJAD has been actively involved in advocacy work to raise awareness on impacts of chemicals use on the environment and human health. Our work on mercury has entailed working towards the phase down of dental amalgam, phase out of mercury added products targeting the products listed in Annex I of the Minamata Convention and reduction of and eventual elimination of mercury use in ASGM. For the past 4 years, CEJAD has worked closely with government agencies in shaping the policy, legal and regulatory environment touching on sound management of chemicals.

CEJAD was a steering committee member of the Mercury Initial Assessments' (MIA) project in Kenya, completed in 2016. This report is therefore a key component of the CEJAD's work in the area of mercury. The report provides the organization with the required information that can enable us to engage constructively with all stakeholders towards complying with the provisions of the Minamata Convention.

1.5. Organisation of the Report

The report is organised into 4 chapters.

- I. Chapter one gives a brief background on mercury and the situation globally and locally. The chapter gives the objectives as well as the justification for the study
- II. Chapter two details the study approach and methodologies applied to collect data and compile this report.
- III. Chapter three details the key findings of the study. The findings are thematically analysed to give an overview of the various sectors where mercury is used and sources of mercury pollution, handling, and management. Furthermore, the chapter looks at some of the impacts of mercury use that have been documented.

- IV. Chapter four focuses on the synthesis of the findings, giving conclusions and recommendations.

1.6. Study Approach and Methodology

The study was undertaken by in-house personnel at CEJAD. The study focus was on possible sources of mercury release, including: energy sources, mercury added products, artisanal and small-scale gold mining, municipal, industrial and medical waste dumping in Kenya.

Primary information was collected from different sectors, namely: industrial and energy sectors, health care, electronics and electrical equipment, the battery industry, cement and chemical industries. Field visits were made to ASGM sites in western Kenya to collect information on mercury use in gold mining. The data was supplemented with secondary information from various reports and online sources.

Data was collected through:

- *Literature review*: Available reports on baseline data/inventory of mercury and mercury products, as well as reports on mercury and mercury product uses and releases.
- *Survey tools*: Semi-structured questionnaires were prepared for primary data collection from the identified sectors. The tools were deployed during field visits in ASGM areas of Migori and Kakamega.
- *Key informant interviews*: These were conducted for direct observation and to elicit expert opinion. This targeted respondents from institutions such as Ministry of Environment and Forests, National Environment Management Authority (NEMA), Kenya Plant Health Inspectorate Service (KEPHIS), Ministry of Health, Kenya Bureau of Standards (KEBS), Anti Counterfeit Agency, Pest Control Products Board (PCPB), Kenya Revenue Authority (KRA), among others.

1.7. Data Analysis

Quantitative and qualitative data was collected, organised and analysed guided by the study objectives. Identification of the release sources for mercury in Kenya was derived from the UNEP "Toolkit for Identification and Quantification of Mercury Releases" inventory level 2, filed by the Ministry of Environment based on 2004 data.

2. Study Findings

2.1. Mercury Use and Sources of Pollution in Kenya

Mercury is not produced in Kenya, however, mercury and its products are part of the Kenyan chemical imports. Mercury added products that are commonly used in the Kenyan market include measuring devices (thermometers and sphygmomanometers), lighting equipment (compact fluorescent lights - CFLs), dental amalgam and electrical products, among others. The bulk of these products are imported into the country.

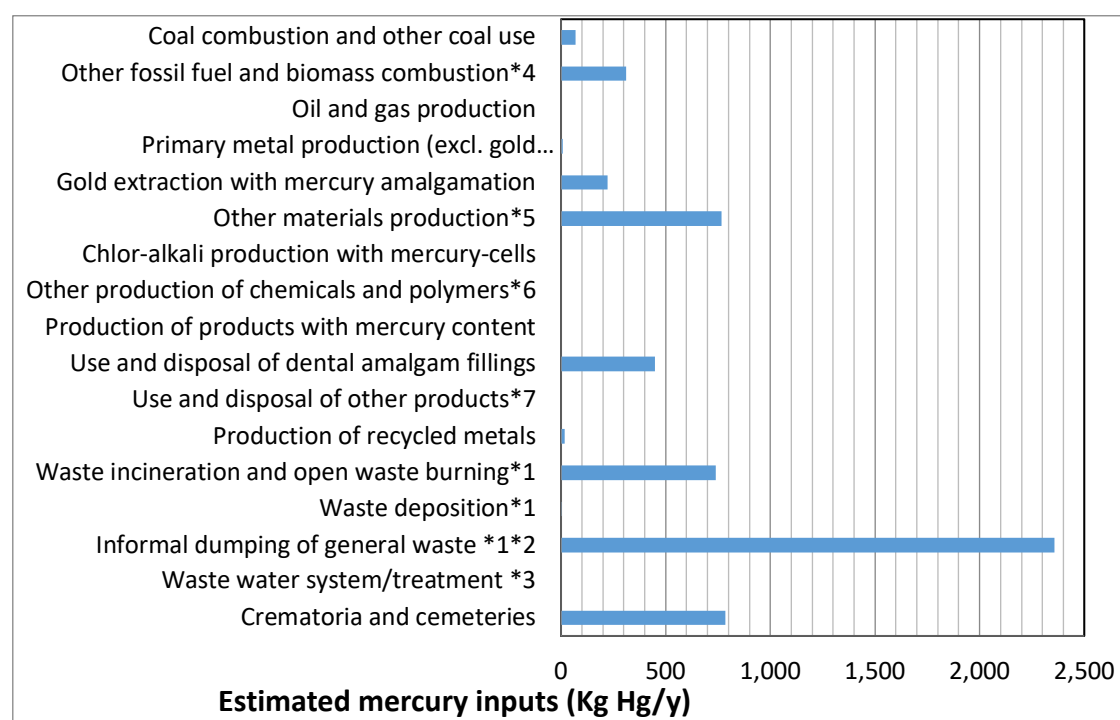
There are no industries that use mercury as a raw material in Kenya, following the closure of the country's largest paper mill. However, artisanal and small-scale gold mining is common in some parts of the country, and relies on mercury for ore amalgamation process, as will be discussed later in this section.

2.2. Levels of Mercury Emissions

Using the UNEP Toolkit for Identification and Quantification of Mercury Releases – Inventory level 2, the government of Kenya through the Mercury Initial Activities (MIA) project made an attempt to quantify mercury emissions from various sources. The results have been summarized in figure 1.

The Assessment was conducted by the Ministry of Environment in September 2016, based on various data for the base year 2014.

Figure 1 Mercury Emission data from different sources



Source: Ministry of Environment and Forestry, 2016

From the toolkit, it's evident that waste management challenge in the country contributes heavily to mercury emissions estimated at 3100 kg/Hg per year (750 kg from incineration and open burning, 2350 kg informal dumping).

High mercury emissions have very serious impacts on human health and the environment as mercury is recognized as toxic, mobile and persistent element which can travel over long distances.

2.3. Analysis of Imports Data for Mercury

Data from Kenya Revenue Authority (KRA) for the year 2014/15 shows that there were several kilograms of mercury imported in to the country by various actors. A summary of import data for mercury is provided in table below. The total findings are an estimate extracted from the various information sources. It's important to note that the data is presented as captured in the import data base (as declared by the importer)

Table 1: Mercury Import Data 2014/15

Product	Quantities (Kgs)
Industrial Mercury	3087
Mercury Metal	14737
Mercury (unspecified)	4102
Total	21,926.00

Source KRA import database

However, it's important to note that, there is unreliable data on import and export of chemicals. There are possibilities of deliberate wrong declaration or classification of chemicals at the port or in import declaration forms.

Table 2: Mercury Import Data

Year	Trade flow	Reporter	Partner	Commodity	Weight (Kg)	Trade Value (USD)
2012	Import	Uganda	Kenya	Mercury	1	2179
2010	Import	Rwanda	Kenya	Mercury	30	97
2008	Import	Uganda	Kenya	Mercury	78	18
2008	Import	United Rep. of Tanzania	Kenya	Mercury	30	684
2007	Import	Rwanda	Kenya	Mercury	66	151

2007	Import	United Rep. of Tanzania	Kenya	Mercury	2	1248
2006	Import	Uganda	Kenya	Mercury	20	68
2005	Import	United Rep. of Tanzania	Kenya	Mercury	10	202
2003	Import	United Rep. of Tanzania	Kenya	Mercury	1500	1069
2002	Import	Uganda	Kenya	Mercury	125	27
2000	Import	Uganda	Kenya	Mercury	42	20
2000	Import	United Rep. of Tanzania	Kenya	Mercury	0	0

Source: <https://www.uncomtrade.org>

2.4. Mercury Added Products in the Kenya Market

Mercury added products include compact fluorescent bulbs, thermometers, and sphygmomanometers. In 2013, Kenya Power and Lighting Company rolled out a program to shift towards energy efficient bulbs, which saw a total of 3.3 million CFLs distributed to consumers. While these bulbs help households and premises to save electricity, they contain mercury which eventually ends up as waste, inappropriately dumped with adverse effects on the environment and human health. Ever since, the uptake of CFLs has been on a steady rise, with a total of 29,471 reported by KRA to have been imported in the financial year 2104/2015.

The country is implementing the Last Mile connectivity program aimed at connecting 70% of Kenyans to electricity by the year 2020. This will further translate to increased uptake of lighting equipment, including CFL, thus increasing the mercury added products stockpile in the country.

Mercury thermometers are used in hospitals and laboratories for research and education purposes. The research found that it is a common practice for health practitioners to give mercury thermometers to women attending antenatal care for self-monitoring purposes at home.

Data on batteries and switches that may contain mercury is not readily available. This is because the products are not labelled as containing mercury thus difficulty in separating mercury added from mercury free products.

Table 2: Mercury Added Products Import 2014/15

Product	Quantities (Units)
Unspecified assorted thermometers	6,172
Mercury thermometers	759
Mercury shygmomanommeters	604
CFL Bulbs	29,471

Source KRA import database

2.5. Human Exposure and Possible Damage Caused by Mercury

There is no publicly available data on health impacts of mercury in Kenya. This is due to the fact that mercury monitoring is not a routine practice in most government facilities. However, from a vulnerability assessment perspective, it's important to note that the ASGM sector is a major exposure point. Mercury is used in ore amalgamation in all ASGM sites. Due to the high levels of division of labour, the process of amalgamation, as well as roasting of amalgam to recover gold is dominated by women. Due to the social construction of the communities and labour allocation at the mines, women are allocated lighter duties such as amalgamation and roasting of amalgam, they are also considered as better skilled in sluicing of ore and in amalgamation using mercury, thus due to their domination in such tasks, hundreds of women work as casuals in the mines daily performing such tasks, at an average pay of Ksh 200 (USD 2) per sack of ore processed. The women are vulnerable to mercury pollution since they interact with the toxic chemical on a daily basis yet earn very little from it.

Roasting of the amalgam (a mixture of gold and mercury) is also dominated by women. Gold buyers have set up small booths around the mines, where roasting and weighing of gold is done prior to payment for the same. These booths are also largely manned by women. An upcoming trend noted is the aspect of employing young beautiful girls to work at the buying booths, so as to attract more men to deliver their gold at these locations. The small nature of the rooms means that these women of child bearing age are more exposed to mercury vapors during the roasting process. This could be evidenced by a study on women of child bearing age carried out in Migori County by CEJAD in 2016. The study found levels above the recommended standard of 1ppm in over 50% of the sampled women.

The sites where sluicing takes place are not well planned, and lack adequate pollution abatement measures. This may lead to some of the contaminated leachates seeping to the ground or water ways, thus the risk of mercury pollution to soil and water. For example, Wagusu mine which is located near the lake. People drink the water mostly untreated and eat the fish from the lake which may result to mercury poisoning. During the field visits, it was noted that the heavy rains, have led to overflowing of some of the holding tanks that may contain mercury contaminated waste water.

A Study by Odumo et al. (2014)⁴ in Migori-Transmara landscape shows high levels of mercury pollution in soils and sediments in the ASGM areas. Mercury concentrations in sediments collected from rivers in Migori to range between 30 and 2,380 $\mu\text{g kg}^{-1}$ with the lowest and the highest levels recorded from the Migori River and the Lolgorian River. Rivers in this region ultimately drain in to the Lake Victoria.

2.6. Artisanal and Small Scale Gold Mining in Kenya (ASGM)

2.6.1. Overview of ASGM

Gold mining in Kenya is dominated by artisanal and small-scale mining. Key counties where ASGM is practiced include Migori, Siaya, Vihiga, Narok, West Pokot, and Kakamega counties. ASGM is however most active in western Kenya; Migori, Siaya and Kakamega Counties since they have many mining sites and high number of people working in the sites.

In Migori County⁵, ASGM is prominent in Masara, Macalder, Masaba, Kitere, Kamwango (Rongo), Kehancha and at the Kuria-Transmara border. In Siaya ASGM takes place majorly in Wagusu in Bondo and Ligega in Ugenya sub counties and Kakamega Counties, ASGM is prominent in Ikolomani and Lurambi (Rosterman area).

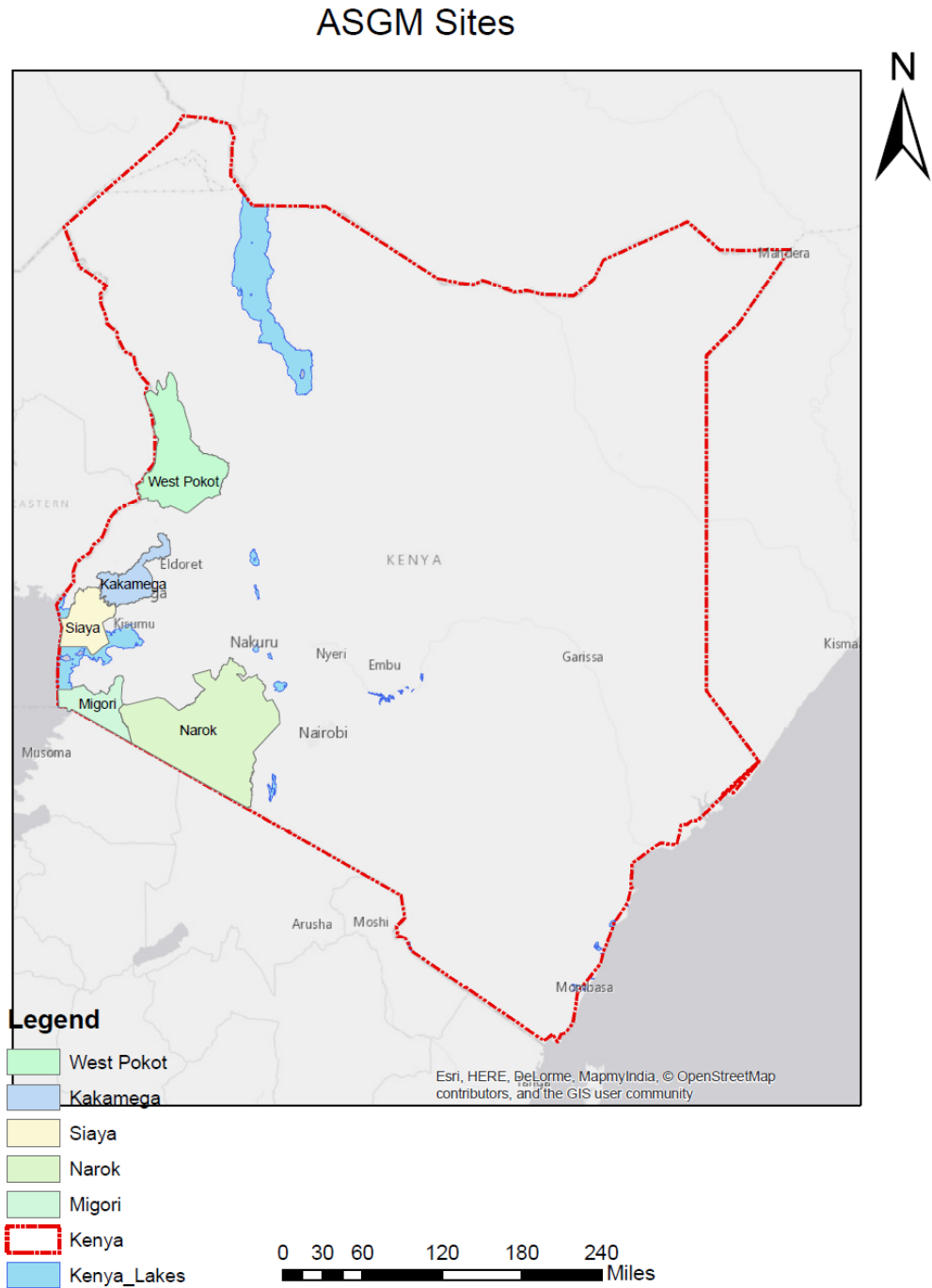
⁴ Odumo et al. 2014: Impact of gold mining associated with mercury contamination in soil, biota sediments and tailings in Kenya

https://www.researchgate.net/publication/263598414_Impact_of_Gold_Mining_on_the_Environmenta

⁵ <http://www.ipen.org/file/cejad-imeap-report-final-pdf>

Some of the ASGM hotspots where mercury is used are illustrated in the figure 2 below.

Figure 2 ASGM sites in Kenya



mining. Ligega mine is located in Ugenya Sub-county of Siaya County. The mine employs about 3000 persons (1800 male and 1200 female).

In Kakamega county, mining is spread across the different sub-counties - key among them Lurambi (Rosterman), Shinyalu and Ikolomani. Rosterman Mines in Kakamega Central is the largest ASGM site, employing an average of 4000 people who are directly engaged at the mine. Kakamega south sub-county has about 1,864 miners.

Table 4: Mine sites visited in Kakamega and Siaya and total miners.

County	Sub county	Mine site	Total miners.	Men	Women
Siaya	Ugenya	Ligega	3000	1800	1200
	Bondo	Wagusu	7000	1500	1500
Kakamega	Kakamega Central	Roasterman	4325	2942	1383
	Kakamega South	Mutao	460	260	200
	Kakamega south	Musire	432	423	9
	Kakamega south	Shikoye	40	38	2

2.6.3. Mercury Use in ASGM

In all the sites visited, mercury is used in ore amalgamation. The mercury is stored in plastic bottles that are readily available, see figure 3. Adoption of sluices at the sites has significantly eliminated the need for whole ore amalgamation. Interview with the miners showed that on average 5 ml of mercury yields 10 grams of gold from 1 sack (long one) carrying an average of 25kg of ore. A study conducted by UNDP⁶ in 2017 in Migori and Kakamega counties estimated that about 5 grams of mercury is used per sack (85 kilograms) of ore.

Women do amalgamation of the gold ore in all ASGM sites because of how the social construction of the communities allocates labour at the mines where they are exposed to toxicity of mercury. Once amalgamation has been done, the mercury is squeezed through a piece of clothing between their fingers and even between their teeth, to recover part of it for recycling purposes this may result to accidental ingestion of mercury when the hands are not washed well or while squeezing through the teeth. Gold is recovered through roasting of the gold mercury amalgam and this process is also done by women. Burning often take place both in open air and in enclosed huts to save the heat that might be blown by wind. See figure 3.

⁶ UNDP IMKA 2017



Figure 3: Mercury stored in a bottle



Figure 3 Women Sluicing Ore



Figure 5: Burning of amalgam



Figure 6: Packed ore awaiting crushing

2.6.4. Sources of mercury (Trade and Flow)

There are different narratives on where miners get the mercury for amalgamation. In Siaya, the miners said that they get mercury from Migori County, supplied by dealers, some of them being the gold buyers. Further probing showed that the dealers import their mercury from China; however the exact path of import was not verifiable since they were not ready to disclose the information.

Mercury is supplied to the owners of sluices by dealers, at an average cost of Ksh 25,000 (USD 250) per kg of mercury. Those who can't afford to buy in large quantities then buy it in small quantities. The mercury is then retailed to the general people in smaller quantities measured in a cork (soda bottle top), at the price of Ksh 2000 (approximately USD 20) per 5ml. It was noted that the responsibility to provide mercury for amalgamation lies with the owner of the sluice beds, who in turn provide it to his/her workers employed at the sluices.

Mercury is a controlled substance in Kenya meaning that it requires various licenses for handling and management. This was not readily available in the ASGM sites,

showing that the mercury is traded informally in the mining sites. Data from Kenya Revenue Authority in table 1 shows some importation of mercury. Some of this may have been diverted to ASGM.

2.6.5. Alternative Technologies

In all ASGM sites, the primary mode of gold extraction is mercury. The ASGM actors claim that they have no access to viable alternatives to gold extractions. Technologies such as retort and shaker tables were completely absent in the sites visited in Siaya and Kakamega counties. Roasting is done using charcoal and in some few instances, using a gas stove.

There has been an increase in number of cyanide leaching plants in the ASGM areas, driven by the huge quantities of tailings that have accumulated over the years. However, these plants are being put up by investors who are not necessarily involved in the mining, but are targeting secondary extraction, the extraction of gold from the tailings. This has opened up an additional revenue stream for ASGM actors who are now selling the tailings.

The main challenge remains that the tailings may contain traces of mercury, thus increasing the risk of double pollution, in the event that tailings containing mercury are leached.

2.7. Legal and institutional Framework

The Constitution of Kenya, 2010 has profound implications for the management of environment including chemicals at the national, regional and county levels. It shapes the laws, policies, institutions and processes by which environment governance is managed in practice.

The preamble of constitution recognises the environment, as Kenya's heritage and calls for its sustenance for the benefit of future generations. Sustainable development is listed as one of the national values and principles of governance (Chapter 2 part 10 (1). Article 42 on environment guarantees the right to a clean and healthy environment for all under the bill of rights which includes the rights to:

- I. To have the environment protected for the benefit of present and future generations through legislative and other measures, particularly those contemplated in article 69 and
- II. To have obligations relating to the environment fulfilled under article 70

Article 69 (1) on obligations in respect of the environment bestows upon the state, the responsibility to:

- I. Ensure sustainable exploitation, utilization, management and conservation of natural resources and to ensure the equitable sharing of accruing benefits
- II. Encourage public participation in the management, protection and conservation of the environment

- III. Establish systems of environmental impact assessment, environmental audit and monitoring of the environment
- IV. Eliminate processes and activities that are likely to endanger the environment
- V. Utilize the environment and natural resources for the benefit of the people of Kenya

However, the Environment Management and Co-Ordination Act (EMCA), 1999 is the primary statute and framework law in Kenya on matters touching on the environment. The Act provides for the establishment of appropriate legal and institutional framework for management of environment and for matters connected therewith and incidental thereto. It establishes the National Environment Management Authority (NEMA) to provide overall supervision and coordination of matters touching on environment, in liaison with other lead agencies.

Therefore, the country relies primarily on EMCA for regulating mercury and all industrial chemicals, as there is no specific law in place to address mercury and chemicals management in general. However, NEMA is in the process of developing chemicals regulations, which will inter-alia address mercury and other heavy metals. The EMCA (Water Quality Regulations of 2006) restricts the discharge of toxic and other pollutants into the aquatic environment and sets out maximum allowable limit of 0.05 mg/l Hg for discharge into public sewer, 0.005 mg/l Hg for discharge into environment.

The Mining Act, 2016, has provisions for ASGM, and bans use of mercury in gold recovery. Section 98 requires the holder of an artisanal permit to observe good mining practices, health and safety rules and pay due regard to environmental protection. In addition, as per the Constitution of Kenya 2010, all Multilateral Environmental Agreements (MEAs) that Kenya is party to are automatically domesticated and form parts of Kenyan Law.

On the institutional framework aspect, the Ministry of Environment and Forestry takes the lead role in the implementation of Minamata Convention. It's supported by other line ministries that adopt a sector approach such as Ministry of Health (Dental amalgam & medical measuring devices); Ministry of Agriculture (agricultural chemicals and inputs) and the Ministry of Trade and Industry among others.

The roles are detailed in table below:

Institution	Role
Ministry of Environment and Forest	Overall policy formulation and implementation
Ministry of Health	Overall Policy on health issues
Ministry of Mining	Regulation of ASGM sector
Ministry of Trade & Industry	Control of substances, setting of standards
Government Agencies	
National Environment Management Authority	Overall Lead agency for environmental protection (regulator)
Customs and Exercise Department	Control Imports at border point
Kenya Ports Authority	Control Imports at border point
Kenya Bureau of Standards	Standards setting and enforcement
Kenya Industrial Research and Development Institute (KIRDI)	Technology research and dissemination
Kenya Medical Research Institute (KEMRI)	Procurement of Mercury Free alternative medical devices
Kenya Plant Health Inspection Services (KEPHIS)	Monitoring
Government Chemist	Monitoring

2.8. Storage of Mercury and Management of Mercury Related waste

Currently there are no specialized facilities for treatment and recovery of mercury in Kenya. In most cases, waste containing mercury ends up in the general waste streams. Waste in Kenya is rarely segregated, and ends up in municipal dumpsites where open burning is common.

The absence of concrete data on generation and disposal of mercury waste is a major hindrance to possible investments on mercury waste management. During the study and key informant interview with one government agency, a situation was established whereby the agency confiscated counterfeit compact fluorescent lamps in the market, but has been unable to dispose them due to the risk of mercury.

2.9. Waste Management Practices

Waste management in Kenya is devolved, therefore falling under the responsibilities of the county governments. The challenge of waste management has been perennial in all major cities in Kenya. Currently no town in Kenya has developed adequate capacity for safe handling and disposal of waste. According to a 2015 report by NEMA, six major towns in the country generate an estimated 5990 tonnes of waste per day (NEMA, 2015). These include; (Nairobi (2400t), Nakuru (250t), Kisumu

(400t), Thika (140t), Mombasa (2200t), and Eldoret (600t). The towns have an average efficiency of waste collection at 50%.

Generally, there is lack of waste separation in all the major towns, with the heaps of mixed wastes ending up in dumpsites. These wastes will include mercury containing products from various sources such as:

- I. Household waste: used/old/obsolete electronics, bulbs, cosmetics
- II. Industrial products. This consists mainly of lighting equipment, mainly fluorescent lamps, and also batteries. Some of these wastes are recycled, while the bulk of it finds their way to the general waste stream.
- III. Hospitals, healthcare and dentistry facilities. These include measuring devices such as thermometers and sphygmomanometer, as well as dental amalgams. Part of healthcare waste is normally burned in incinerators, while others end up in dumpsites for other general waste stream.

The common waste management practice in the major towns is open dumping, and open burning. No single sanitary landfill has been commissioned in the country, thus the risk of contamination of soil, air and water by the dumpsites.

2.10. National Mercury Action Plans on Minamata Convention

The Government of Kenya through the Ministry of Environment and Forestry developed a Minamata Convention Action Plan to guide implementation of the Convention as one of the Minamata Initial Activities Project outputs.

Key highlights of the plan include:

1. Setting National objectives and reduction targets for mercury added products
2. Establishing baseline status of mercury, mercury pollution, and mercury waste stockpiles
3. Putting in place measures targeting the ASGM sector, to ensure:
 - a) Formalization or regulation of the artisanal and small-scale gold mining sector;
 - b) Access to technologies to reduce reliance on mercury
 - c) Steps to reduce exposure by vulnerable populations
 - d) Steps to enhance access to information within the ASGM sector
 - e) A public health strategy on the exposure of artisanal and small-scale gold miners and their communities to mercury. Such a strategy should include, inter alia, the gathering of health data, training for health-care workers and awareness-raising through health facilities.

The action plan has provisions for civil society engagement in its implementation. CEJAD has been involved in the Action Planning process, and is expected to have major roles in creating awareness, education and advocacy on mercury's effect on human health and the environment. Already, the organization has played a key role in these areas towards the implementation of Minamata Convention in Kenya,

and specifically reduction of mercury use in ASGM. For example, there has been increased interest of the media in mercury pollution in ASGM in Kenya primarily as a result of the studies the organization has conducted in the sector.

Other roles by CEJAD and other civil society organisations will include: Supporting artisanal miners to adapt environmentally sound mining practices, and strengthening surveillance of mercury added products. In addition, the Ministry is in the process of preparing ASGM National Action Plan (NAP) to reduce mercury use in the sector.

3. Study Synthesis and Recommendations

The following conclusions can be made from this study

3.1. Sources of Mercury Emissions

Kenya does not have large industrial processes that generate large amounts of mercury emissions due to lack of chlor-alkali industries and the closure of the largest paper mill which existed in the country. Even though there are reports that the paper mill was reopened for operations in 2016⁷. From the mercury releases inventory of Kenya conducted by the Ministry of Environment and Forestry, major sources of mercury emissions are the following among others:

- I. Informal dumping of waste
- II. Waste incineration and open burning of waste
- III. Crematoria and cemeteries

Major waste streams containing mercury are the following

- I. Products discharged from households and industries (fluorescent lamps, batteries etc.)
- II. Products discharged from hospitals and healthcare facilities (thermometers, sphygmomanometer, etc.)
- III. Waste discarded from dentistry (dental amalgam)
- IV. Waste contaminated with mercury at ASGM sites

3.2. Baseline Quantities (Mercury Use, Storage and disposal)

The actual quantities of mercury and mercury added products in Kenya is not known. There is also no accurate data on estimates of waste containing mercury that may be found in the various dumpsites across the country. The lack of proper waste segregation and waste accounting means that all wastes join the general waste stream. This makes it difficult to plan for specialized facilities to manage such wastes. Currently, no facilities for treatment and recovery of mercury exist in Kenya.

3.3. Institutional Capacity

- I. Awareness levels on mercury related issues and the Minamata Convention is generally very low across the different government agencies. This was established during key informant interviews with officers in the various government institutions
- II. The institutional capacity for monitoring mercury emissions is not well developed, thus the need for further investments in knowledge and capacity.

⁷ https://www.the-star.co.ke/news/2016/12/15/uhuru-reopens-webuye-rai-paper-during-western-tour_c1474136

3.4. Legislation

Primary regulation for mercury monitoring is the Environmental Management and Coordination Amendment Act of 1999 (amended in 2015). The act has subsidiary regulations such as Water Quality Regulations which includes protection of sources of water for domestic use, industrial use and effluent discharge and water for agricultural use. Air Quality Regulations, Waste Management Regulations that have provisions touching on mercury, the regulation applies to all categories including industrial, hazardous and toxic waste, pesticide and toxic substance, biomedical waste (for example dental amalgam waste containing mercury). The regulation outlines requirements for handling, storing, transporting, treatment/disposal of all waste categories.

3.5. Mercury Emissions from Key Sources and Monitoring

There are no established systems for mercury monitoring in the country. There are generally low levels of awareness on mercury pollution and the Minamata convention within the main lead agencies in Kenya. Key informant interviews with most government agencies and other institutions such as the cement company we visited, showed that emissions of mercury as a parameter is not monitored or only on rare occasions.

However, in the ASGM sector, a few researchers have carried out isolated studies on mercury pollution from ASGM sites, especially in the Migori - Transmara region⁸.

3.6. Recommendations

- 1) **Baselines:** Need to commission comprehensive, in-depth study on mercury added products and mercury stockpiles in the country, for purposes of establishing a management and disposal plan for the same.
- 2) **Awareness:** develop and initiate sensitization programmes targeting lead agencies that will be in charge of enforcing provisions of Minamata Convention prior to ratification.
- 3) Design and implement sensitization programs targeting consumers to raise awareness on availability of mercury-free alternatives.
- 4) Design awareness programs for communities in ASGM areas on negative impacts of mercury on their health and environment.
- 5) **Technology** (Best Environmental Techniques (BATs) and Best Environmental Practices (BEPs)): research on, and deployment of viable alternatives for gold extraction without using mercury. Design financial strategies to support investment into mercury free technologies

⁸ Odumo et al, 2011: Multielemental analysis of Migori (Southwest, Kenya) artisanal gold mine ores and sediments by EDX-ray fluorescence technique: implications of occupational exposure and environmental impact.

- 6) **Coordination:** Need to harmonize and synchronize the chemicals management infrastructure that is currently distributed according to mandates over various institutions. This should be done at both the national and county levels so that the different agencies understand what other agencies are doing on mercury pollution prevention. This will improve cross learning, reduce duplication of work, and enhance efficiency.

4. Project Outcome

4.1. Activities Implemented

The main activities undertaken by the project included the following.

1. Field visits to the counties of Siaya and Kakamega and conducted participatory environmental profiling of the mercury hotspots in selected ASGM in the counties, assessment of awareness on mercury among stakeholders including the gaps, challenges and opportunities for the control of mercury use and pollution in the ASGM and identified sources and trade of mercury in the those ASGM areas.
2. Key informant interviews with identified relevant stakeholders to; assess the awareness on Minamata Convention including the gaps, challenges and opportunities for the control of mercury use on the mercury added products.
3. Desktop literature review on key sources of mercury emissions and releases in Kenya and compilation of the available data on such sources including the number of possible contaminated sites as well as relevant policies and legal frameworks for the control and management of mercury in ASGM and mercury added products.

4.2. Outreach to Stakeholders

To help realize the project objectives, a number of relevant government ministries and agencies as well as other stakeholders were made aware of the project and groundwork laid for their engagement and cooperation in the project. CEJAD informed the Director of Multilateral Environmental Agreements and also the Minamata Convention on Mercury Focal Point in the Ministry of Environment and Forestry of the project and its envisaged contribution to the implementation of Minamata Convention in Kenya, through a letter dated 26th February 2018 and a bilateral meeting held with the Director, Mr. Richard Mwendandu.

The Ministry welcomed the project and promised to cooperate and support CEJAD in the implementation of the project. This was shown by the Ministry's provision of a cover letter to CEJAD (see annex), to assist in the project data collection, especially key interviews which were held with other government agencies.

Further, CEJAD cooperated with the Ministry of Environment, UPOPs reduction and chemicals mainstreaming project team and conducted a joint field visit to the Export Processing Zone (EPZ) and East Africa Portland Cement Company located in Athi River, Nairobi on Wednesday, 9th May 2018. The main purpose of the visits was to:

- a) Discuss UPOPs reduction and mercury emissions from Cement Company and waste incinerator plants located in the EPZ.

- b) Discuss and sensitize the companies on the UNEP Best Environmental Practices and Best Environmental Guidelines (BAT/BEP) for reducing mercury emissions from cement companies.



Figure 7: Ministry of Environment and CEJAD officials at the meeting in East Africa Portland Cement Company. Photo Credit: CEJAD, Kenya

The Ministry also provided CEJAD with the MIA inventory data on mercury emissions and other relevant documents, which assisted in the development of this report.



Figure 8: CEJAD and NEMA officials at a meeting with EPZ officials

4.3. Communication with National or Local Authorities

This study report will be shared with the Minamata Convention focal point upon finalization and approval. The report is further expected to feed into the development of the ASGM action plan, currently being undertaken as well as contribute to the implementation of the Minamata Convention implementation action plan.

4.4. Communication Efforts

CEJAD conducted outreach to the media with an aim to work closely with the media institutions to raise awareness on the negative impacts of mercury among the Kenyan public and to sensitize them as well as stakeholders on the Minamata Convention on Mercury.

In this regard, CEJAD partnered with Media for Science, Environment, Health and Agriculture (MESHA), an association of journalists and organized a sensitization workshop for the Kenyan journalists/media reporters on the Minamata Convention. The workshop was held on 3rd May 2018 and even though this activity was held under the organization's project on promoting dental amalgam phase down, funded by World Alliance for Mercury Free Dentistry, other topics on the Convention such as impacts of mercury, its use in ASGM and phase out of mercury added products as well as CEJAD's activities on these topics, were discussed. The workshop was attended by 24 participants comprising of journalist/reporters from different media houses in Kenya, MESHA representatives, officials from Ministry of Environment and Forestry and a representative from the Ministry of Health

As a result, a number of journalists got interested in the projects CEJAD is implementing with IPEN for example, the Mercury Country Situation Study and the Study on Mercury in Women of Child Bearing Age which was released in 2017. Specifically, K24 and Ebru TVs have followed up with CEJAD to do a story on the study on impacts of mercury in women in Migori, Kenya. K24 TV conducted a field visit for the mercury impact on women in Migori feature story in the month of May 2018 and interviewed CEJAD's Griffins Ochieng on Saturday, 2nd June 2018.

In addition, China Global Television Network (CGTN) also conducted a field visit to Migori ASGM sites and featured the CEJAD/IPEN Study on Mercury in Women of Child Bearing Age, including interview with CEJAD's Griffins Ochieng. The story titled "informal gold miners in Kenya at risk of mercury" was aired on CGTN on Monday, 4th June 2018. Watch the story on the link:

<https://www.youtube.com/watch?v=Y55OPHSEdWE&feature=youtu.be>

4.5. Outreach to government authorities and industry

CEJAD carried out outreach to several government ministries and agencies to request interviews with the identified relevant institutions for data collection on the implementation of the Minamata Convention on Mercury, specifically on the phase out of mercury added products. The outreach was aimed at sensitizing the institutions on the Minamata Convention MAPs phase out provisions as well as to establish possible opportunities for engagement in the implementation of the organization project activities and the Minamata Convention. CEJAD wrote letters to heads of the institutions and achieved the following outcome.

CEJAD received positive responses and conducted Key Informant Interviews (KII) with 6 out of the 9 government ministries and agencies who were reached to. See annex for the list of the institutions representatives who were met and interviewed.

5. Annexes

Annex 1: Cover letter from Ministry of Environment and Forestry

Annex 2: Data collection tools

Annex 3: List of persons met during KIIs

Annex 1: Cover letter from Ministry of Environment and Forestry



MINISTRY OF ENVIRONMENT AND FORESTRY

Telegrams: "NATURE" Nairobi
Telephone: 0254-20-2730808/9
Email : psoffice@environment.go.ke
Website : www.environment.go.ke

NHIF BUILDING
RAGATI ROAD
P.O. BOX 30126-00100
NAIROBI

Ref: DENR/EMC/9

Date: 26th March 2018

TO WHOM IT MAY CONCERN

Dear Sir/Madam

STUDY TO ASSESS AWARENESS AND PREPAREDNESS ON PHASE OUT OF MERCURY ADDED PRODUCTS TO ADDRESS MERCURY POLLUTION IN KENYA

Kenya is a signatory to Minamata Convention on Mercury. The Convention is a global treaty which aims to protect human health and environment from anthropogenic emissions and releases of mercury and mercury compounds. The Convention requires that country's work towards phasing down/phasing out Mercury Added Products (MAPs) listed under Annex A by year 2020.

As part of the preparatory steps towards ratification/implementation of the Convention and the phasing out/down of mercury added products, the Ministry of Environment and Forestry with Centre for Environment Justice and Development (CEJAD) is conducting the above subject study.

The purpose of this letter is to therefore request your institution to support the process through providing any relevant information your institution may have relating to the use, control, phase out of the MAPs. The products include the following (Button Cells, Soaps, Thermometers Sphygmomanometers, and Florescent Lamps, Cosmetics, Pesticides, Biocides and Topical antiseptics).

We look forward to your support in this process.

Thank you in advance.

A handwritten signature in blue ink, appearing to read 'Richard Mwendandu', is written over a horizontal line.

Richard Mwendandu
For: PRINCIPAL SECRETARY

Annex 2: List of Key Informants interviewed

Name	Designation	Institution	Date of Interview
Dr. John Mumbo	Principal Compliance and Enforcement Officer	National Environment Management Authority (NEMA)	27/03/2018
Lucy M. Namu	Head Quality Assurance And Laboratory Accreditation	Kenya Plant Health Inspectorate Services (KEPHIS)	03/04/2018
Mr.Elijah Ruto	Manager-Research And Policy	Anti –Counterfeit Agency (ACA)	11/04/2018
Dr. Earnest Wanganga	Deputy Director	National Quality Control Laboratory (NQCL)	13/04/2018
Mr. Tom Oduor		Kenya Bureau of Standards (KEBs)	20/04/2018

Annex 3: Study tool (KII guide)

Project: Situational study on mercury use and pollution in Kenya

Key Informant Interview Guide

Mercury is toxic to human health and the environment. However it is still used in various products for specific applications even though Mercury-free alternative products have been produced for many of these same applications. Since 2013, more than 120 countries including Kenya signed on to the Minamata Convention on Mercury, a global treaty which aims to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. The treaty entered into force in August, 2017.

In light of the above context, the NGO; Centre for Environment Justice and Development (CEJAD) is implementing a project “Assessing mercury use, awareness and legal frameworks in ASGM and Mercury Added Products (MAPs) to address mercury pollution in Kenya” in partnership the, International POPs Elimination Network (IPEN).

The project entails conducting a. One of the study objectives is to assess stakeholder’s awareness, capacity needs and preparedness towards the implementation of Minamata Convention; specifically phase down/phase out of mercury added products listed under Annex A part I. The study findings will help inform the implementation of the Minamata Convention Action Plan for Kenya, and provide recommendations for strengthening capacities of the various stakeholders to control mercury use and pollution from MAPs⁹.

Accordingly, CEJAD would be most grateful for your kind participation in gathering the current situation of mercury pollution in Kenya from the MAPs, awareness and preparedness of the stakeholders towards Minamata Requirement of phasing out MAPs by year 2020.

Should you be agreeable to participate in this survey, provided below are several questions we would like you to answer. The interview should take only around 15 minutes to complete

General

Respondent Name

Title.....

Institution Name

.....

Sector/Products under Jurisdiction

Mercury Supply Sources and Trade¹⁰

.....

.....

Mercury Added Products

.....

.....

⁹ Batteries, Switches and Relays, Thermometers, Sphygmomanometers, Compact Florescent Lamps, High Pressure Mercury Vapour Lamps, Cosmetics, Pesticides, Biocides, and Topical antiseptics

¹⁰ Alloys of mercury, with a mercury concentration of at least 95 per cent by weight, Mercury compounds” means mercury (I) chloride (known also as calomel), mercury (II) oxide, mercury (II) sulphate, mercury (II) nitrate, cinnabar and mercury sulphide.

Manufacturing processes in which mercury or mercury compounds are used
.....
.....

- 1. Briefly describe the Mandate of your institution
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.....
.....
- 2. Is your Institution involved in the implementation of Minamata Convention on Mercury?
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.....
.....
- 3. What aspect of the Convention is your institution involved?
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.....
- 4. What measures have you put in place towards implementation of the convention requirement on phase out of mercury added products as listed in annex A part I?
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.....
- 5. Are there any alternative mercury free products that your institution is aware of and recommend in line with the convention requirements to implement the phase out provisions
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.....
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- 6. How prepared are your stakeholders to comply with the implementation of the provisions?
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.....

7. Which areas of support will your institution require to effectively implement the provisions of the Convention?

[illegible]

8. What barriers/challenges do you think will hinder your institution to effectively implement the provisions to phase out MAPs