

PROJECT REPORT

For

**AWARENESS RAISING ON HUMAN EXPOSURE AND MONITORING
OF MERCURY EMISSIONS FROM HOTSPOTS USING LUMEX
MERCURY MONITORING AS WELL AS ANALYSIS OF MERCURY
CONTENT IN SKIN LIGHTENING PRODUCTS IN AFRICA.**



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Acronyms and abbreviations

ASGM -	Artisanal small scale gold mining
INC -	Intergovernmental negotiating committee
NGOs -	Non governmental organizations
CREPD -	Research and Education Center for Development
KNH -	Kenyatta National Hospital
UNEP -	United Nations Environment Programme

1.0 INTRODUCTION

Mercury is a neurotoxic element that is atmospherically transported around the world and deposits both near and far from the sources where it is released. It is never broken down in the environment. Instead, it accumulates in our air, water, and food supply, becoming more concentrated as it moves up the food chain.

Once deposited, the mercury form is changed by microbial metabolism to methyl mercury, which bio-accumulates up the food chain, especially in the aquatic food chain (fish & marine mammals) and is the primary source of mercury in food. When it is in the form of methyl mercury, it is highly toxic to humans. Human embryos, fetuses, infants, and children are particularly vulnerable because mercury interferes with neurological development even at low levels of exposure. Mercury is additionally present in human breast milk which exposes infants early in life.

Mercury is released to the environment from many sources including: mercury-containing products and devices, product manufacturing sites, industrial processes, mining activities, metal refining, coal combustion, cement kilns, waste dumps and incinerators, contaminated sites, crematoria and many others. Large quantities of mercury are also used in artisanal and small scale gold mining.

Elemental mercury in air is equally dangerous and capable of causing damage to the human body. Absorption of mercury by inhalation of mercury vapor is quick and complete. It is absorbed quickly through the membranes of the lungs and becomes 100% bio-available for uptake by the bloodstream.

Long-term, low-level exposure to elemental mercury vapor, like eating food contaminated with organic mercury, affects the nervous system most adversely, causing depression, anxiety, insomnia, constant fatigue, tremor, and behavioral disturbance. On the other hand, acute high-vapor exposure directly hits the lungs. Such cases have caused irreversible damage to the lung tissue, leading to respiratory dysfunction, failure and progressing to death.

iLima organization with financial support from European Environmental Bureau in collaboration with Zero Mercury Working Group carried out a project titled "Awareness raising on human exposure and monitoring of mercury emissions from hotspots using Lumex mercury monitoring

as well as analysis of mercury content in skin lightening products in Africa". The projects main objectives were to:

1. To monitor and measure mercury emissions in artisanal and small-scale mining ASGM in Migori District, Nyanza province in Kenya, and medical devices, waste dumpsites including hospital incinerators and hospital storage of thermometers, and other products containing mercury, including areas where these are calibrated, within Nairobi
2. To raise awareness on human exposure to mercury in Kenya highlighting exposure of the following sectors: waste pickers, ASGM miners, hospitals workers and patients.
3. To gather skin lightening products from six different African countries for mercury content pre-testing using the Lumex instrument and thereafter forwarding the ones that pass for high content to the laboratory for analysis in Nairobi.
4. Utilize Lumex to help policymakers understand the issue of mercury and help in shaping Kenya's position for the INC negotiations.

The project targeted communities and individuals affected by mercury pollution from hotspots such as miners in artisanal small scale gold mining, communities living near waste dumpsites and hospital incinerators and dental hospitals using dental amalgam.

2.0 METHODOLOGY

2.1 Mercury content analysis in Skin lightening products

2.1.1 Identification of sampling countries

This entailed identification of the countries known to have widespread use of products containing hazardous chemicals for skin lightening. It also entailed identification of the NGOs to collaborate with iLima in collecting and gathering samples of skin lightening products from the countries in Africa and reaching out to the organizations to send to Kenya skin lightening products samples. A total of six countries were identified and collaborated in the project.

A sampling protocol was developed to assist the NGOs in the sampling and specifically identified the types of products for sampling required. A project activity of memorandum was also developed and shared with the organizations specifying timelines for which the activities are to be completed and the scope of the activities. The following countries and organizations in the table below were identified and participated in the project.

Table 1:

No.	Country	Organization
1.	Uganda	National association of professional environmentalists (NAPE)
2.	Ivory Coast	JVE
3.	Nigeria	Sustainable Research and Action for Environmental Development
4.	Cameroon	CREPD
5.	South Africa	Groundworks
6.	Tanzania	AGENDA organization

2.1.2 Samples Preparation/collection/gathering

This involved gathering and purchase of identified brands of different skin lightening products from the six participating countries. The identified brands were then collected by the different NGOs as samples for shipment to iLima in Kenya for analysis of mercury content. In addition to the six identified countries, samples were also gathered from Kenya.

This was carried in two phases in which the first phase involved purchase of three different brands of the products; However more samples than the requested number were received from the countries. The second phase involved request for additional samples, of the brands that were identified to contain mercury.

2.1.3 Samples screening using Lumex instrument

A total of 85 skin-lightening products were screened using Lumex mercury analyzer for determination of mercury content. These were from first and second batches of samples received from the participating countries. The samples were different brands of skin lightening products sold in markets from the countries which participated in the project. These were available brands of the products purchased from pharmacies and beauty stores in the local markets of the countries.

Eight brands of the products indicated mercury content on screening using the Lumex mercury analyzer from the first batch of the products received. Results of these were also data logged by Lumex and results attached as appendices to this report. Additional brands of samples received from the second request were further screened using the Lumex and one sample indicated mercury content. In total, eleven samples were then taken for laboratory content analysis for further mercury content analysis at the Kenya Industrial Research and Development Institute (KIRDI) laboratories. A summary of the total skin lightening products received and screened is in the tables below.

Table 2: 1st batch, Number of cosmetic products screened by Lumex Mercury Analyzer

Country	Creams	Soaps	Lotions	Body Scrubs	Gels
Kenya	1	3	NONE	1	1
Ivory Coast	2	7	NONE	NONE	NONE
Cameroon	3	2	1	NONE	NONE
Uganda	8	4	NONE	NONE	NONE
Tanzania	3	NONE	NONE	NONE	NONE
South Africa	4	3	2	NONE	NONE
Nigeria	6	6	NONE	NONE	NONE
Totals	27	25	3	1	1

Grand Total	57
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Table 3: 2nd batch, Number of cosmetic products screened by Lumex Mercury Analyzer

Country	Creams	Soaps	Lotions	Body Scrubs	Oils	Gels
Kenya	1	NONE	NONE	NONE		NONE
Ivory Coast	7	2	NONE	NONE	1	NONE
Cameroon	3	2	NONE	NONE		NONE
Uganda	3	2	NONE	NONE		NONE
Tanzania	4	NONE	NONE	NONE		NONE
Nigeria	4	1	NONE	NONE		NONE
Totals	20	7	0	0	1	0
Grand Total		28				

2.1.4 Laboratory Analysis

The laboratory mercury content analysis was done for nine skin lightening products samples which indicated mercury content using the Lumex mercury analyzer. The samples included creams, soaps and lotions as in the table below;

Country	Samples taken for laboratory analysis	Sample type
Uganda	4	2 Creams, lotion and soap
Cameroon	3	2 Soaps and cream
Nigeria	1	Cream
South Africa	1	Cream

2.2. Project target mobilization

At the beginning of the project, iLima mobilized various stakeholders for collaboration in implementation of the project. This involved identification of relevant stakeholders to partner with the organization for successful implementation of the project. In this regard, the University of Nairobi, Kenyatta National Hospital and the City Council of Nairobi were identified and formal requests through letters of collaboration were written to the institutions.

The institutions granted request for collaboration and partnership in implementation of the project and nominated key staff to liaise and work with iLima throughout the implementation of the project period. In addition, local communities' representatives were also identified particularly in the gold mining areas of Migori who assisted iLima in mobilization of miners in the mining areas.

2.3 Monitoring and measuring of mercury emissions in hotspots

2.3.1 Data Collection

The mercury emissions data was carried out using Lumex RA-915+ mercury spectrophotometer, an instrument that detects and measures the amount of elemental mercury vapor in the air, measuring mercury vapor concentrations that are as low as 2 nanograms per cubic meter (ng/m³) collecting real-time readings continuously and a maximum limit of 200,000 ng/m³ (one nanogramme equals one billionth of a gramme).

During measuring, readings were taken every second, and averaged over every period of ten seconds using also the Lumex accompanying Data Logger software for long term measurements. The mercury emissions data measurements were carried out in different sites of the targeted emission hotspots of ASGM, KNH incinerator, Nairobi municipal dumpsite and dental hospital.

1. Artisanal small scale gold mining

The measurements in the ASGM sector were carried out in Masara Division of Migori district. The first data recording was conducted at the processing stage of the gold amalgamation. At this stage, the mercury is scrubbed with the alluvial gold to amalgamate the gold inside a bucket full of water. The process is risky since bare hands are used in scrubbing the mixture besides being carried out by more vulnerable groups such as women. The second data recording was

conducted at the second site. At this site, the gold – mercury amalgam is burned in a process of separating mercury from the amalgam.

2. Kenyatta National Hospital (KNH)

Kenyatta National Hospital is the largest referral and teaching hospital in the Kenya with a capacity of 1800 beds and has over 6000 staff member. It covers an area of 45.7 hectares and within the KNH complex are College of Health Sciences (University of Nairobi); the Kenya Medical Training College; Kenya Medical Research Institute and National Laboratory Service (Ministry of Health).KNH has 50 wards, 22 out-patient clinics, 24 theatres (16 specialized) and Accident & Emergency Department. Out of the total bed capacity of 1800, 209 beds are for the Private Wing.

Using Lumex mercury analyzer, mercury emissions monitoring were carried out by iLima with the help of KNH staff. Emissions data recorded were carried out in selected areas of the hospital in which mercury containing products such as thermometers, blood pressure cuffs and fluorescent bulbs were used or stored. These areas included the Masanduku dumpsite located near the KNH staff houses, the hospital incinerator plant, equipments stores and the biomedical laboratory within the premises of the main building.

3. Dandora Municipal Dumpsite

Dandora municipal dumpsite started in 1986 as a quarry which was owned by Asians for mining of building stones. Thereafter, the City Council of Nairobi started filling in the quarry with waste from households which grew to become the Dandora dumpsite. The actual area then was 2 hectares and due to improper machinery to control dumping led to dumping in other areas leading to increase in size of the dumpsite. Currently, the dumpsite covers an area of 26.5 hectares.

Initially, medical waste used to be brought to Dandora but the council managed to liaise with hospitals to discourage and liaise with big hospitals to use their waste disposal facilities. However, the challenge still lies in small clinics sneaking hospital waste into the dumpsite. The other challenge is the electronic waste particularly brought about by the shift to digital world and which has resulted in a lot of e-waste ending up at the site. The scavengers face health challenges particularly children due to exposure to heavy metals and also to other toxic chemicals such as dioxins and furans as a result of open burning of wastes which includes

plastics¹. The scavengers also burn tyres in such of metals and other recyclables ending burning waste at the site. Also sporadic fires occur due to accumulation of methane gas.

2.2 Data Processing

Data is retrieved from the Lumex mercury analyzer using the DataLogger software. For each monitoring, the program produces a graph plotting the instantaneous mercury vapor concentration per second for the entire period. The minimum, maximum, and average mercury concentration is also given automatically

2.3 Awareness raising on mercury exposure from emissions hotspots

This entailed development of awareness and education materials in the form of posters and fliers targeting miners and communities living around the ASGM sites as well as at the Dandora municipal dumpsite.



An awareness raising session at Masara gold mine

The posters contained information on adverse effects of mercury to human health and the environment, risk exposure to mercury practices including alternative best available techniques and environmental practices for gold mining targeting communities living near mining areas and the miners

¹ Environmental Pollution and Impact to Public Health; Implication of the Dandora Municipal Dumping Site in Nairobi, Kenya: A PILOT STUDY REPORT by NJOROGE G. KIMANI In cooperation with THE UNITED NATIONS ENVIRONMENT PROGRAMME (UNEP)

Fliers were also developed and produced targeting communities living near the dumpsites and contained information on sources of mercury exposure from mercury containing wastes found in municipal dumpsites.

During the awareness session in the ASGM sites, the community including miners of approximately 100 persons both men and women came together in a group. In the group, the miners were shown use of Lumex in a demonstration as well as measuring the mercury levels in their bodies by breathing in the machine. This was to help raise awareness on how the miners can help protect themselves from mercury exposure when they see mercury levels in their bodies. The sessions also involved a forum in which the miners would ask questions and to hear comments from the community on the use of mercury. This was to collect views of the community for sharing with the delegates at the INC, this was to ensure that the communities views are reflected in the negotiations of the policies aimed at protecting their health and environment from mercury pollution.

The miners mainly highlighted issues of ailments they undergo from what they suspect is as a result of use of mercury and longer hours of exposure to mercury. These included ailments such as abnormal and blurred vision, general body aches and itching. The miners emphasized that they would be willing to embrace use of mercury free technological methods however they have not seen use of any method locally.

At KNH hospital and dental clinic, iLima spoke to the hospital staff from the maintenance department which is in charge of hospital incinerator and stores in which mercury emission measurements were conducted. iLima explained to the staff the objectives of the project particularly on the awareness on mercury and its effects on health and environment including the need for the staff to protect themselves from exposure to mercury. The staff welcomed the initiative and was willing to take part in showing iLima some of the hotspots where mercury containing devices are stored and disposed. The staffs were enthusiastic since they were eager to know the amount of mercury emissions from the hotspots in order to know what levels they are exposed to, which then they can raise with the hospital administration if the levels are high.

2.4 Dissemination of awareness and education information materials

This involved dissemination of the awareness materials containing information on protection of human from mercury exposures covering all the ten mining sites in the area of Masara and Macalder as well as the communities living near the Dandora Dumpsite.

At the ASGM site in Migori, posters were disseminated through the miners association and community leaders for wider dissemination. Dissemination of fliers in the municipal dumpsite area also was done with the help of the City Council of Nairobi staff assigned to the dumpsite.

2.5 Video recordings of mercury emissions measurements in hotspots

Mercury emissions measurements and awareness raising sessions in the gold mining, Dandora dumpsite, KNH and dental clinic sampling areas were video recorded and produced for dissemination. The video was screened at the Zero Mercury Working Group booth at the third session of INC on mercury treaty which was held at the UNEP complex in Gigiri, Nairobi from 31st October to 4th November 2011.

Many delegates who watched the video were interested in having copies of the video. In addition, it prompted interest in data on mercury for instance extent of the mercury problem in ASGM in Kenya, number of people involved, protective measures being employed and awareness levels on the dangers the workers are exposed to due to Hg exposure. Many also asked about the government's intervention in the mining activity and its stand on the use of Hg in the industry.

Majority of the delegates were also interested to know the source of mercury for use in the sectors as well as any presence of Hg contamination casualties. Another key concern, especially from the Kenyan delegates, was Hg in lighting bulbs. This is due to the ongoing campaign encouraging the shift to the Hg-containing, energy-saving bulbs in the country.

3.0 RESULTS AND OBSERVATIONS

3.1 Mercury Content in skin lightening products

The results of the laboratory mercury determination of the skin lightening products are as shown in the attached results table. As can be seen, the mercury content of ten analyzed skin lightening products this included two samples purchased in Kenya, concoctions sold in the black market in downtown Nairobi, was less than the method's detection limit using a mercury spectrometer (1 ppb) of the Kenya Industrial Research and Development Institute (KIRDI) laboratories.

The results showed no mercury detection using the detection limit varying in the range of 1.0×10^{-11} and 5.0×10^{-12} indicating very insignificant amount of mercury. Therefore, as per the Kenyan standards, the results met requirements for cosmetics and related products in the country.

3.1 Mercury emissions in ambient air

Mercury emissions measurements in ambient air were carried out in few different sampled areas within Nairobi and western part of Kenya. The sampled areas were classified as potential mercury emitting sources due to use of mercury and mercury containing products in the areas. These included:

3.1.1 Artisanal Small scale gold mining

1. Masara, Migori District

Gold was discovered in the Migori Gold belt in 1920 and by 1927 about 100 kg of gold had been recovered. In the 1930s there was renewed gold interest in the district. Discovery of new gold deposits in the district was at Masara, Kehancha, and Macalder.

Artisan gold mining is a dangerous activity as the heavy metals, mainly mercury is released to the environment. Mercury as a pollutant in artisan mining is due mainly to gold processing, when mercury is used to amalgamate gold, leading to sources of mercury emissions into the air. Using the Lumex mercury analyzer, iLima carried out mercury vapour emissions monitoring in Masara gold mining sites. The measurements were carried out in the area where practice of open burning of the amalgam takes place. The mercury - gold amalgam is burned to separate the mercury from the amalgam. . During the burning process, the color of the amalgam changes from silvery to golden at which point it's removed and weighed.

At the burning process, there were approximately 10 people; these were mainly miners who are selling their gold and buyers. The burning is conducted in a one-roomed house with few windows and one main door. In some sites, burning is carried out in the open close to the panning and exaction sites. This exposes a lot of communities and miners to mercury as the fumes are emitted into the atmosphere. There seemed to be little care on the toxicity of mercury to the miners when explained to, the effects of the level of exposure and the practice they were conducting.

Data recordings were conducted using the Lumex during the burning process. From the data recordings in the Lumex display unit, levels of mercury were high in the room where the burning was taking place.

Table 1: Showing recorded Lumex mercury analyzer display unit readings in Masara².

Location	Sampling Time	Resulting value (ng/m3)	Relative deviation (%)
Masara Town	October 17, 17;03	7735	361
Mukuro	October 17, 16.06	3476	132%
Mukuro	October 17, 16.02	922	48%

3.1.2 Dandora Waste Dumpsite

This dumpsite acts as a reservoir for all waste collected within the city and its environs. Dandora dumpsite covers an area of 26.5 hectares and started in 1986 as a quarry by Asians and the council started filling in the quarry with waste. The actual area then was 2 hectares and due to improper machinery to control dumping led to dumping in other areas leading to increase in size of the dumpsite.

The waste varies from organic, municipal waste and medical waste. Some of the mercury containing wastes like broken bulbs, fluorescent tubes and electronics among others were of focus in this project as they are likely sources of mercury emissions to the air and the neighboring Nairobi River near this dumpsite.

² ON STREAM Lumex Analyzer data readings as recorded displayed on the Lumex display unit

Initially, medical waste was brought to Dandora but the council managed to liaise with big hospitals to incinerate their medical waste and the smaller ones to work with their counterparts to discourage dumping.

However, Small clinics sneaking hospital waste into the dumpsite and electronic waste arising from the shift to digital world poses the greatest challenge to the site. The scavengers face health issues and particularly children have heavy metals in their bodies from a research done by UNEP.

The council is currently working with the Japanese government to come up with a modern landfill at Ruai as well as establish 3 transfer stations for sorting of wastes. There is also an initiative to promote waste segregation at source; the CCN will be able to sensitize Nairobi residents on the same.

Open burning of waste at the site is as a result of the scavengers burning tyres in search of metals and other recyclables. Sporadic fires also occur due to accumulation of methane gas.

Table 2: Showing recorded Lumex mercury analyzer display unit readings in Dandora Dumpsite.

Sample Location	Sampling Date/Time	Resulting value (ng/m3)
Site 1: Area with newly dumped waste	September, 29; 15.06	<2
Site 2: Area with waste which have stayed for longer period	September 29; 15.15	<2

3.1.3 Kenyatta National Hospital

Mercury in healthcare institutions such as KNH is found in measuring devices such as thermometers, blood pressure cuffs and other wastes such as fluorescent bulbs. iLima in collaboration with KNH and with help of its staff measured mercury levels in different areas of the hospital as sampling sites. Mercury emissions were measured in selected sampling areas of the hospital in which mercury containing products such as thermometers, blood pressure cuffs and fluorescent bulbs were used or stored. These areas included the Masanduku dumpsite

located near the KNH staff houses, the hospital incinerator plant and the biomedical laboratory within the premises of the main building.



Plate 2: spilled mercury on the floor at KNH



Plate 3: broken thermometers in RSD at KNH

Of note from the Lumex analyzer readings, were the levels found in the biomedical laboratory where thermometers and blood pressure cuffs are stored and used and at the equipment store. Upon inspection, in the biomedical laboratory there were spills of mercury from the broken thermometers and also old batteries and broken thermometers were also found at the equipments stores. The hospital staffs were warned that the spills subjected the staff to exposure to mercury and were advised to handle with care the mercury containing devices.

Table 3: Showing recorded Lumex mercury analyzer datalogger zero cut processed data readings at KNH sampling sites.

Location	Sampling Date	Average reading (ng/m3)	Maximum reading (ng/m3)
Returned store	September 30	1,363.5	1,472.5

department			
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3.2.4 University of Nairobi Dental Clinic

Mercury emissions measurements at the dental hospital were carried out at the University of Nairobi dental clinic. At the clinic the readings were recorded at various stage of preparation of dental amalgam which releases mercury in the air. The first recording was conducted at the preparatory stage of the amalgam for use in the patients and the second reading was conducted at the disposal of the used amalgam.

Table 4: Showing recorded Lumex mercury analyzer datalogger zero cut processed data readings at UON dental clinic.

Sampling Location	Sampling Date/Time	Average reading (ng/m3)	Maximum reading (ng/m3)
Dental amalgam disposal site	September 30	1363.5	1472.5

4.0 STANDARD REFERENCE LEVELS AND EVALUATION

As early as 1991, the World Health Organization has already recognized the harmful effects of mercury to human health, saying that there is no established “safe level” for mercury exposure, below which no adverse effects occur. However, because of the presence and persistence of mercury in environmental media, concerned agencies in the United States have established standard reference levels for mercury exposure.

4.1 United States (US) Environmental Protection Agency (EPA) – for homes

Action level 1	Immediate evacuation	10,000 ng/m ³
Action level 2:	Schedule relocation as soon as possible	Between 1,000 and 10,000 ng/m ³
Action level 3:	Safe re-occupancy	Below 1,000 ng/m ³

4.2 US Department of Health and Human Services - Agency for Toxic Substances and Disease Registry (ATSDR)

Home evacuation level: 10,000 ng/m³

4.3 US Department of Labor – Occupational Safety and Health Administration (OSHA)

Maximum permissible exposure limit; 100,000 ng/m³ (level for workplace setting 8-hour workday).

Locally, the Clean Air Act also created a maximum permissible limit of 5 milligrams per Newton centimeter (mg/Ncm) of elemental mercury at the point of emission, with respect to any trade, industry, process and fuel-burning equipment or industrial plant emitting air pollutants.

The mercury emission monitoring showed that there is continue source of mercury releases into the air from some of the areas where there is continued use of mercury and mercury containing products. The areas with significant releases were ASGM sites particularly at the mercury –gold amalgamation burning inside a poorly ventilated house with miners. The average concentrations of mercury vapour concentrations measured was between 1000 and 10,000 ng/m³, which is within the US EPA threshold for population relocation within homes. This means that the populations of miners practicing the burning continue to be exposing themselves to high level of mercury daily.

4.0 CONCLUSION

From this mercury monitoring findings in all the five main areas of the study, it's very clear that there are significant sources of mercury emissions into the air as results of the continued use of mercury and mercury containing products in the areas. The level of mercury emissions in some areas for example in ASGM sites and KNH sites were relatively higher due to the fact that some of the mercury containing products such as broken fluorescent bulbs and thermometers were generally spotted in dumpsites and storage rooms which points that there could have been mercury spillages as a result of inadequate and poor handling of these products.

In the ASGM sites, the mercury levels in air are higher as result of the open burning practices of gold-mercury amalgam. This practice is widespread in all the mining sites with majority of miners and communities continue to be long exposed to the mercury emitted as a result of the burning process and practices. In addition, this also showed that there is low level of awareness from the miners and communities on the dangers of exposure to mercury.

In other sites such as KNH, handling and disposal of mercury containing products is very poor due as can be seen from the large number of broken products such as thermometers and fluorescent bulbs in dumping sites and waste collection points. There is also low level of awareness on such exposure routes among workers as can be seen from the poor handling on use of the products and their wastes.

The project was welcomed by a large number of stakeholders in Kenya from the overwhelming cooperation and collaboration received during the implementation of the project. In addition, it was noted that the project can help motivate carrying out of a mercury inventory in Kenya.

5.0 RECOMMENDATIONS

In order reduce mercury emissions into the air from mercury use and products in the country:

1. The government should initiate measures to carry out national continuous monitoring of mercury emissions in areas where there is use of mercury containing products.
2. The staff and workers in institutions such as hospitals, clinics among others still using mercury containing devices should be trained on safe use and handling of these products in case there are breakages which may lead to mercury spillages
3. There should be proper labeling of products and equipment that contain mercury, especially if there are no mercury-free alternatives that are available.
4. There is need for proper enforcement of relevant environmental regulations such as air quality regulations of 2008 to reduce mercury emissions into the air
5. There should be continuous awareness raising and education to the general public and workers in sectors such as ASGM on dangers of mercury.
6. Promotion of mercury free technologies and products in all sectors currently using mercury and mercury containing products

6.0 REFERENCES

Jason S. Ogola, Winnie V. Mitullah and Monica A. Omulo: 18 July 2001: IMPACT OF GOLD MINING ON THE ENVIRONMENT AND HUMAN HEALTH: A CASE STUDY IN THE MIGORI GOLD BELT, KENYA.

Ban toxics: February, 2011: CHASING MERCURY: Measuring Mercury Levels in the Air across the Philippines.

ANNEX: Skin Lightening Products Laboratory Analysis Report

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Our Ref:

Date:

LABORATORY REPORT

Material.....SKIN CREAMS & SOAPS.....

Laboratory No...191-200/11/12.....Analysis Date.....04/10/2011.....

SENDER

Date Received.....27/09/2011.....Sampled by:.....

Received from.....ILIMA ORGANIZATION

RESULTS OF ANALYSIS

Lab. No.	191/11/12	192/11/12	193/11/12	194/11/12	195/11/12	196/11/12	197/11/12	198/11/12	199/11/12	200/11/12
Sender's Ref. No	Extra Clair	Sivocclair	Topclair plus	Skin Toning cream	Diva Max Tone	Movate cream	Super baby face	Bio-Carotte	PEAU CLAIR	MEKAKO
Parameters-										
MERCURY (mg/L)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Actual value	4.0×10^{-12}	3.0×10^{-12}	5.0×10^{-12}	1.1×10^{-11}	4.7×10^{-11}	1.0×10^{-11}	4.0×10^{-12}	3.3×10^{-11}	3.0×10^{-12}	4.0×10^{-12}

Note: ND :- Not Detected

The above results show Mercury content in terms of parts per Billion and therefore all meet the standard requirements for cosmetics and related products.

ILIMA ORGANIZATION
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Z.M. Mwaghadi
For: Director.

- The results apply to the sample received
- The signed copy of this report is kept by LSC for at least two years
- LSC takes no responsibility for electronically transferred version of this report

DOC.NO: LSC-FDS-003	Restricted	REV. NO. 01	Effective date: 18/8/2008	Retention Period
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