REPUBLIC OF KENYA

MINISTRY OF ENVIRONMENT, WATER AND NATURAL RESOURCES

STATE DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES

&

MINISTRY OF HEALTH

REPORT OF THE IMPLEMENTATION OF THE UNEP/WHO/GOVERNMENT OF KENYA EAST AFRICA DENTAL AMALGAM PHASE-DOWN PROJECT

Dental Cavity

Mercury

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Principal Secretary
Ministry of Environment, Water and Natural Resources
P. O. Box 30126, Nairobi, Kenya
Telephone:254 020 273808
Email: saicm@environment.go.ke

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The convention regulates mercury supply sources and trade; mercury-added products; manufacturing processes in which mercury or mercury compounds are used; artisanal and small-scale gold mining; emissions; releases; mercury wastes and contaminated sites. Some of the negative impacts to health from exposure to mercury for vulnerable populations, especially women, children, and, through them, future generations. As part of interim preparations, it is desirous for Kenya to ratify

The convention identified use of mercury in dental almagam as one of the principal emission sources of mercury that can be addressed early.

The Ministry of Environment, Water and Natural Resources is grateful for the cooperation with UNEP Chemicals Branch, the World Health Organisation and Kenya Federation of Dentists in implementing the East Africa Dental Amalgam Phase down Project (EADAP).

Special thanks go to the UNEP team led by Desiree Narvaez of UNEP Chemicals Branch Geneva who has kept the Ministry informed on the project progress with the team of international experts and the entire University of Nairobi Dental School led by Dr Bernina Kisumbi who has been the lead technical person for the project.

With three separators now installed in the university, Mathari Hospital and in a private clinic, Kenya is on the way to starting on the long journey of implementing the Minamata Convention on Mercury

The project also is a clear manifestation of the kind of joint action required to implement the joint activities between the sectors of environment and Health as required by the Libreville declaration on human health and the environment.

Mr Richard Mwendandu
Director Multilateral Environmental Agreements
Ministry of Environment, Water and Natural Resources

EXECUTIVE SUMMARY

At its twenty-fourth session in February 2007, the Governing Council of the United Nations Environment Programme (UNEP) adopted decision 24/3, recognising that further long-term international action was required to reduce the risks posed by mercury to human health and the environment. A a diplomatic Conference was held on 6 -11October, 2014 in Minamata Japan. Kenya was one of the 90 State signatories that committed itself to prepare for ratification, of this bidding instrument dubbed the Minamata Convention on Mercury. Its overall objective is to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. The Convention provides controls across a range of mercury products, manufacturing, mining, energy where mercury is used, released or emitted.

Kenya is a signatory to the Convention. Mercury is a potent neurotoxin and a major public health hazard whose transboundary migration makes it a global concern. The Convention calls on parties to control and reduce mercury emissions to the air, from a number of industry as well as certain products and specifically mentions phase-down of dental amalgam.

Mercury exposure is a major public health threat. Children and Women of child bearing age are particularly vulnerable as mercury affects development. The international community concluded negotiations on the Minamata in January 2013 and it was opened for signature in October 2013. Kenya signed.

The project oh phase-down approach was conceived to assist countries address the use of mercury in dental amalgam. It involved stakeholders in environment, health and dental practitioners. The project helped Kenya understand better Article 4 of the Convention on Mercury added products and specifically dental amalgam. The project also addresses the concern of the Kenya dental association for a structured move from dental amalgam that contains mercury.

The project implementation included a trade and waste survey, stakeholder consultations, installation of waste separators and the understanding of how to implement part 1 of Article 4 paragraph 3 of the convention.

The report has eight 8 sections. A background to mercury, a description of the phase-down approach, main activities in project implementation, a situational analysis, capacity building and elements of a stakeholder workshop.

The report has 14 conclusions and specific assignments for the stakeholders of dental amalgam.

ABBREVIATIONS

BMP	Best Management Practices
EADP	East African dental Amalgam Project
EMCA	Environment management and Coordination Act
ESM	Environmentally Sound Management
FDI	Federation of Dental International
IDM	International Association of Dental Manufacturers
KEBs	Kenya Bureau of Standards
MEWNR	Ministry of Water and Natural Resources
MOH	Ministry of Health
POPs	Persistent Organic Pollutants
UNEP	United Nations Environment programme
UON	University of Nairobi
WHO	World Health Organisation

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1.0 BACKGROUND AND INTRODUCTION

Mercury is recognized as a toxic and persistent element, and it is documented that it has serious impacts on human health and environment. When released it is transported globally in the atmosphere and is as such a global problem. To reduce the risk from anthropogenic mercury releases to human health and the environment the UNEP governing council decided in 2009 to develop a global legally binding convention on mercury. Kenya supported the decision and has been an active participant in the Intergovernmental Negotiating Committee formed by UNEP.

Information on releases of mercury is important to inform the national policy-making towards the current negotiations, to identify priority mercury sources in the countries and to provide a baseline for national mercury management.

Mercury used in manufacturing of batteries, in electronic devices such as switches, fluorescent bulbs, medical devices and in dental amalgam fillings, etc. Dental amalgam is a major source of mercury contamination especially if the dental amalgam is not properly handled. Up to 260 – 340 metric tons are released to the environment from the use of dental amalgam. Most dentists in Kenya prefer to use dental amalgam because it is is cheap, user friendly and durable when compared to other dental restorative materials. According a WHO 2009 report on best practices in the use of amalgam, where some developed countries have phased out the use of dental amalgam. In developing countries, a phase down rather than a phase out approach is suggested.

It is therefore important that safe handling procedures for mercury (dental amalgam) are put in place to minimize / eliminate exposures to mercury. For this reason, UNEP and WHO global Oral health program will be collaborating to phase down of the use of dental amalgam in developing countries. The other collaborators will be the governments of the participating countries, Federation of Dentists International (FDI), International Dental Management, Zero mercury working group and World alliance for mercury free dentistry.
In the Anglophone region the selected countries are Kenya, Uganda and Tanzania where demonstration projects will be carried out, hence her visit to meet the Kenya team to discuss the project details. Dr. Desiree represents UNEP and Dr Poul Eric Petersen represents WHO.

1.1 Mercury Negotiations

Kenya recognises the need to protect its citizens' health and products both agricultural and fishery. In that content where monitoring is needed it will be stepped up. Where there is need for review of water and air quality standards, they will be reviewed in line with recommendations of the WHO.
However it is important to recognise key area where exemption or delay in implementation will be a necessary prerequisite for developing countries such as on issues of use dental amalgams, lighting and batteries among others. The convention was concluded in Minamata Japan. It provided for the phase-down approach of dental almalgam.

1.1.1 Dental Amalgams

The Global Mercury Partnership was mandated by the UNEP Governing Council to be a vehicle for immediate actions to reduce mercury pollution. Dental amalgam is one category of mercury-added products that is being addressed by the Global Mercury Partnership. Dental

amalgam, a restorative material that contains mercury, has been widely used for some 150 years. Dental amalgam use represents more than one-fourth of total global mercury consumption in products or approximately 8% of global mercury consumption. In 2007, an estimated 250-350 metric tons of mercury were used globally in this sector. In the past decades, the awareness and recognition of the environmental implications of mercury have increased and development and use of alternative materials for dental restoration has become increasingly important.

In 2009, a WHO meeting in collaboration with UNEP was held in Geneva to highlight the future use of materials for dental restoration. Strengthening of disease prevention and health promotion is the most relevant approach to reduce the need for restorative care and it may be prudent to consider "phasing down" instead of "phasing out" dental amalgam at this stage. The approach promotes best professional practice incorporating preventive care along with the research and development of quality alternative materials for dental restoration. In the meantime, dental clinics will to have to deal with amalgam waste from dental care and will need to promote measures to reduce environmental releases of amalgam.

1.2 National Mercury Inventories

In the lead to the negotiations for the legally bidding instrument on mercury, countries were encouraged to carry out own inventories on Mercury. National inventories are important in supporting the verification of global mercury release inventories.Kenya has undertaken a desktop inventory on POPs. Possible sources of mercury included the following categories;

- Coal combustion in large power plants;
- Production of copper from concentrates
- Preparation of fillings at dental amalgam clinics
- Disposal Hg thermometers from hospitals and schools
- Mercury thermometers and their disposal
- Controlled and uncontrolled land fill /deposits

In addressing the individual mercury release sub-categories contributing with the highest mercury inputs are as shown in Table 1

Table 1. Sources of Mercury in Kenya

	Sources	**kg/A**
i.	Use and disposal of other products	
ii.	Use and disposal of dental amalgam fillings	5,700
iii.	Other material production	998.50
iv.	Crematoria and cemetery	255.00
v.	Production of recycled metals	419.00
vi.	Waste incineration and open burning	30,014
vii.	Informal dumping of general waste	

Source: Kenya Mercury inventory 2011, MEWNR

From the inventory it is estimated that the treatment and disposal of dental amalgam waste represent substantial flows of mercury. The origin of the mercury in the waste is products and materials with intentional mercury use which are disposed without any form of segregation. There are also small concentrations of mercury impurities in large-volume waste (paper, plastic, organics, etc.). These are distributed in an environment that has low natural sources of mercury.

Medical waste has been identified as a hazardous waste in the dental amalgam waste category in the individual mercury release sub-categories; contributing with the highest mercury releases to the atmosphere including waste incineration.

i. Informal and open burning of general waste

ii. Use and disposal of products containing mercury

iii. Other materials production; primarily cement production.

iv. It is recognised that the inventory faced major data gaps including availability of recent data and accurate figures for emission sources. This is because there is currently no legal requirement for it to be collected and documented. However before mercury got attention due to the UNEP Governing Council decision, waste water treatment plans, incinerators or waste disposal facile ties were not been monitored. The project on phase-down therefore came at the right time.

1.3 Actions already taken on Mercury

The negotiations created some amount of awareness. It must however be noted that even before the Minamata convention came into being, Kenya had taken measures to address use of mercury. For example:

- Kenya Bureau of Standards (KEBs) had legislated on cosmetic and products with mercury
- Most new projects with potential mercury releases have to undergo an Environmental Impact Assessment
- Open burning of waste is being discouraged through EMCA
  Contaminated sites such as Dandora are already being phased out ostensibly to address toxic chemicals especially mercury.

The Kenya Dental Association was very vocal that the dental amalgam should not be phased out without affordable cost effective alternatives.

2. PROJECT ON MERCURY PHASE DOWN APPROACH OF DENTAL AMALGAM

Considering that use of mercury in dental amalgam constitute one of the greatest sources of mercury in municipal waste, it attracted the attention of UNEP chemicals. UNEP Chemicals Branch through funding by the Norway Overseas Development Agency developed a project for piloting the phase down approach of mercury use in dental amalgam for the East African Countries of Kenya Uganda and Tanzania.

The project brought in the University of Nairobi Dental School, ILima Kenya, Kenya Dental Association, World Health Organisation and Ugandan and Tanzanian counterparts

The Norway Overseas Development Agency 2012 project dealt with those stages of the life-cycle of dental amalgam pertinent to UNEP's mandate in particular its potential for environmental release during trade and supply; its environmental release from dental clinics, and its environmentally sound management as waste. WHO endeavoured to strengthen oral health promotion and disease prevention through raising awareness. In clinical dental care, there are available alternative materials which may be recommended for dental restoration provided there are pure clinical indications or criteria and a positive response from the patient. UNEP Chemicals and WHO Oral Health Programme is jointly coordinating the project implementation by bring together international experts in the field of dental amalgams, waste management and oral health.

The project was carried out in 2011-2013

2.1 Objectives

The objectives of the EADAP project were:

i. To explore essential conditions for a phase down in the use of dental amalgam,
ii. Investigate the current supply and trade of dental amalgam and materials alternative to amalgam and make recommendations for future information systems.
iii. Assess the current dental waste management practices in the three East African countries.
iv. Create awareness of preventive dental care
v. encourage a switch to appropriate alternatives to dental amalgam, when clinically indicated, among dentists and patients, and
vi. Demonstrate environmentally sound management of dental restoration materials waste in selected dental facilities in the three countries.

2.2 Components and Activities:

The project main activities were:

i. To carry out a trade study of dental amalgam and its alternatives as well as survey of dental amalgam waste management practices
ii. Development of awareness raising materials on available alternatives for dental restoration
iii. Holding a Inception, and results workshops
iv. Pilot Demonstration activities at country level

The project activities were carried out by the following institutions;

(i) Ministry of Environment, Water and Natural Resources, Department of Multilateral Environmental Agreements
(ii) Ministry of Health, Department of Dental Health
(iii) University of Nairobi, Dental School

(iv) Kenya Dental Association
(v) Mathari Hospital
(vi) Ilima Kenya

Figure below shows the initial project coordinating team.

From left - Dr. Matheka, Mr. Francis Kihumba , Dr. Lucina Koyio, Dr. Desiree Narvaez, Dr. Jane Wamai, Prof. Abdouraman Bary(hidden), Dr. Stephen Irungu, Dr. Elizabeth Dimba, Dr. Tom Ocholla

2.3 Methodology

The project was carried out under the coordination of the Ministry of Health and Ministry of environment in close cooperation with the UNEP chemical Branch and WHO. The methodology included

i. Stakeholders'/interagency meetings to collect and present the trade and waste survey results for a proposed demonstrations in the phase down approach;
ii. Selection of 3 demonstration dental health clinics (one representing government hospital/facility, one private clinic, one University/teaching hospital) based on criteria set by the International Association of Dental manufacturers (IDM);
iii. Coordination with local waste management provider/company;
iv. Training of trainers he dental health sector in the environmentally sound management of dental materials waste, using training materials developed by WHO, World Dental Federation (FDI) and IDM ;
v. Demonstration of best practices in the environmentally sound management of dental amalgam waste: source reduction, use of dental amalgam separators, collection of waste, take back of contaminated capsules by manufacturers/recyclers, on-site storage, and, where treatment facilities exist, the treatment of contaminated sludge;
vi. Awareness raising activities to promote preventive dental care and encourage appropriate use of alternative materials for dental restoration amongst patients and dentists.

Funding was through the Ministry of Environment, Water and Natural Resources.

2.4 Project Expected Outputs

The project had the following expected outputs:

- Report on supply and trade flow data of all dental restorative materials and recommendations for future information systems developed by iLIMA Kenya
- Report on dental waste management practices of all dental restorative materials , of the participating countries
- Fora to raise awareness amongst patients and dentists on preventive dental care and use of clinically relevant alternative materials for dental restoration
- Selection and equipping with separators three sites for demonstration of best dental waste management practices for dental restorative materials
- Report of lessons learned providing recommendations for promoting the 'phase down' approach in developing countries, including process analysis share on the three countries.

3. PROJECT IMPLEMENTATION

Project activities include;

- Trade Study
- Inception Workshop
- Community Involvement
- Training in Uganda and Tanzania
- Installation of separators
- Stakeholder workshops

Below is the detailed discussion of the implementation stages

3.1 Trade Study

3.1.1. Trade and Waste Survey

A trade survey on current waste management practices of dental amalgam and its alternatives in East Africa, Kenya, Uganda and Tanzania was conducted with the following specific objectives;

- To assess dental amalgam trade flows and its alternatives in the three selected countries, Kenya, Uganda and Tanzania
- To assess the current practices of dental amalgam waste management and its alternatives in the three countries.
- To estimate the environment cost externalities/avoidance costs with non amalgam use

The study design was cross-sectional survey targeting importers and suppliers of dental almagams, public and private consumer facilities and professional organisations such as dental associations.
Study populations was all dentists and traders in dental materials in the three countries. This included all 1054 dentists registered with respective regulatory bodies and all 31 traders.
Data collection tools were two self administered questionnaires administered online mode (Using survey monkey).
An offline mode was later introduced which was a printed version
Data analysis: SPSS version 17.0

3.1.2 Results of waste management survey

The response rate was Kenya 8.5% while for Uganda it was 1.7% and Tanzania 7.9%. Thus the overall response rate was 6.5%. It was noted that online response not favourable especially in Tanzania. Key observations was that;

- 70.6% held Bachelors degree with 84% being graduates of local universities.
- More dental extractions are done than restorations
- Amalgam ,composite resins & GIC restorations the more popular restoration materials
- Only 48.5% of the dentists had concern on use of amalgam, 22.1% had concerns about non amalgam materials, Concerns related to biological safety, none had concerns on environment, need for training on risks with emphasis on environmental risks.

- On handling of amalgam, most dentists use capsulated amalgam but 10.3% used mercury liquid and powder. Only 11.8% had calibrated amalgamators. There is a high risk of mercury exposure in dental settings.
- On handling of amalgam alternatives, 88.2% dentists used light cured resin composite 89.7% dentists mixed GIC manually,7.3% used computer aided design for ceramics,25% used fired ceramics. Modern technology needs to be developed among dentists*
- On handling of waste amalgam, there is systematic way of disposing used amalgam capsules, extracted teeth with amalgam fillings are discarded with other infectious waste. Majority of dentists, 77.9%, did not separate contact amalgam and non contact amalgam. 16.2% decontaminate content of contact amalgam and non contact amalgam
- Only one dentist knew of commercial company that disposes contact amalgam and non amalgam waste.
- Only 5 of the facilities had a plan for disposal of amalgam waste.
- Only 27.9% planned to install amalgam separators
- 48.5% mentioned using the minimal amount of amalgam for each restoration.
- 54.4% use amalgam capsules.
- 55.9% mentioned stocking of amalgam capsules in variety of sizes
- On protection the use of latex gloves, face masks and eye glasses was universal
- Most knew of at least one way of keeping minimum use of amalgam
    - Challenges in waste management were were,Poor handling of amalgam waste due to lack of guidelines and policy;
    - Inadequate knowledge and training on waste management; and
    - Lack of seriousness and compliance on amalgam waste management

3.2 Inception Workshop

An inception meeting was held on 18-19 December, 2012 at the Kenya Institute of Education, Nairobi. Its principal aim was aimed at giving stakeholders a better understanding and role clarification on the EADAP project objectives, methodology, outputs and outcome and how to involve them in exploring essential conditions for a phase down in the use of dental amalgam in East Africa. Representatives came from the governments (environment, health, and other relevant agencies), national dental associations, Nongovernmental Organisations (NGOs), industry and other relevant stakeholders in Kenya, Tanzania, Uganda, UNEP Chemicals; UNEP Regional Office of Africa; Ministry of Environment and Mineral Resources (MEMR) Government of Kenya. UNEP Chemicals, WHO, iLima, World Dental Federation (FDI) and the International Association of Dental Manufacturers (IDM) will **p**resent their respective contributions to the project. National project coordinators (Kenya, Tanzania, and Uganda) will present their respective project work plans. Mercury negotiations and partnerships. Project objectives, components, expected output:

- WHO policies on oral health and dental restoration
- Results, analysis, conclusions of survey regarding trade and waste management of dental amalgam and its alternatives
- Criteria for selection of dental facilities, provision of amalgam separators, logistical requirements.
  Training of dental personnel on the best management practices (BMP) / environmentally sound management (ESM) of waste (amalgam and its alternatives)

- Awareness raising materials developed by the University of Copenhagen- WHO Collaborating Centre for Oral Health.

The main topics discussed are in Annex 1.

The full participant list is Annex 2

3.3 Community involvement

The dental community was involved at five different levels.

- Situational Analysis
- The training of dentist at the Inception and stakeholder workshops
- Review of dental waste management
- Installation of waste separators and
- Training of Trainers.

4.0 DENTAL ALMAGAM SITUATION ANALYSIS IN KENYA

The situation of dental amalgam in Kenya was discussed in the context of validation of the dental amalgam waste practices and trade and supply of restorative dental materials**.** The need for restorative materials is a reality as the oral health promotion has not attained a caries free global population. As illustrated by results of the completed 2012 Desk top survey on Kenya, Uganda and Tanzania, dental amalgam is used in majority of the dental facilities. Moreover, the use of both resin composites and glass ionomer cements is equally high among the dentists. In general, management of waste dental amalgam was poor though the dentists were concerned about contributing to the overall mercury released to the environment by anthropogenic activities.

A descriptive cross-sectional study was carried out. The questionnaire was reformatted from the existing EADAP desk top survey questionnaire to be shorter and anonymous. The project team held several meetings to discuss study process as well as participated in data collection. Self administered questionnaires were sent by email to the dentals public hospitals by the Ministry of Medical Services Dental Department. In addition hard copies were delivered to dental facilities in Nairobi. The returned and collected questionnaires were analysed and data summarised.

4.1 Dental Restorative Waste Management Practices

A sample of 25 dentists and 9 dental material suppliers completed the questionnaire. Majority of the respondents were anonymous and those who opted to give contacts hailed from Nairobi, Kiambu, Vihiga and Siaya.

4.1.1 Type of Restorative Materials in use

Out of the targeted dental facilities, twenty five completed the questionnaire, four (16%) on-line and 21 (84%) off-line. All the dentists 25 (100%) reported using resin composites, where as 52% use dental amalgam.

Table2: Types of restorative materials used

Material used	Number	Percentage
Dental amalgam	13	52
Resin Composite	25	100
Glass ionomer cements	24	96
Compomers	7	28
Ceramics	7	28

On the type of dental amalgam used by the dentists, 23 (92%) reported using capsulated amalgam whereas 4 (16%) reported using Mercury liquid and alloy powder. One (4%) did not use dental amalgam. The capsule sizes available in the facilities were from the most to the least F2 23 (92%), F1 14 (56%) and F3 8 (32%).

4.1.2 Protective equipment and dental clinic set up

Majority of the respondents reported the use of gloves 23 (92%) and masks 23 (92%) while handling amalgam and non-amalgam restoratives as shown in Table 2.

Table3: Personal Protective equipments used

Protective Equipment	Number	Percentage
Gloves	23	92
Masks	23	92
Eye wear	16	64
No response	2	8

More than half 16 (64%) reported that they have adequate ventilation in the dental clinics, 1 (4%) did not have adequate ventilation and 8 (52%) did not respond to the question. No dentist used carpets in their clinics and 22 (88%) stated that they do not have floor carpets. However, 3 (12%) did not respond to this question.

4.1.3 Practice guidelines and standardisation

The presence of written guidelines for handling both health care waste and restorative materials waste did exist in 21(84%) of the facilities Table 3. Similarly, 24 (96%) of the dentists did not have certificate for amalgamator calibration. Only one (4%) had calibration certificate.

Table 4. Presence of written health care guidelines in the dental facilities

Guideline	Number	Percentage
No Health care management guideline	21	84
Health care management guideline present	4	16

4.1.4 Handling of dental amalgam and dental amalgam waste

Majority of the dentists used capsule mixing amalgamators 22 (88%) where as 4 (12%) used mercury liquid and alloy mixing devices.

Less than half 11 (44%) of the respondents reported that they had containers designated for waste dental amalgam, seven (28%) did not have such containers and a similar number declined to answer the question.

Facilities that had containers for storing waste restorative materials practiced the following

Table 5. Disposal of waste restorative materials

Practice		Number	Percentage
Resorative waste containers labelled?	Yes	8	32
	No	8	32
	No response	7	28
Do the containers have a tight seal	Yes	8	32
	No	11	44
	No response	6	24
Storage of surplus accumulated waste amalgam	No	1	4
	Yes	22	88
	No response	2	8

With regard to trapping waste amalgam particles in waste water, ten (40%) responded that they had chair side traps in their clinics, 2 (8% vacuum filters and one (4%) had installed an amalgam separator.

4.1.5 Trade and Supply of Restorative Materials

Nine dental material suppliers completed the questionnaire.

4.1.6 Stocking and supply of restorative materials

Almost all the traders stocked Dental amalgam, Resin composite and Glass ionomer cements as shown in Table 5

Table 5. Types of dental materials stocked

Material stocked	Number	Percentage
Dental amalgam	8	88.9
Resin Composite	8	88.8
Glass ionomer cements	9	100
Compomers	3	12
Ceramics	5	55.6

The most types sold most by the suppliers is dental amalgam 4 (44.4%), followed by non-amalgam alternatives 2 (22.2%). Two (22.2%) indicated that they sell both types equally.
Of the amalgam stocked by the suppliers, 66.7%) sold capsulated version, 2 (22.2%) elemental mercury and alloy powder and one (11.1%) did not stock amalgam. With regard to type of dental amalgam sold, demanded more 8 (88.8%) indicated capsulated version whereas one (11.1%) it was elemental mercury and alloy powder. No supplier repackaged dental amalgam.
The traders imported restorative materials from the companies shown in Table 6.

Table 6. Source of restorative materials by the traders

Dental amalgam source	Non-dental amalgam source
Medespa (Spain)	PSP Dental
Incidental (Turkey)	Dentsply (UK)
Dentam (UK)	GC Fuji
BMS (Italy)	3M ESPE
Citem (Dubai)	Henry Schein
Quale (UK)	PD Switzerland
SDI (Australia)	SDI Australia
Dentsply (UK)	Ivoclar Germany
Utradent (USA)	

Traders 9 (100%) sold the restorative materials in both urban and rural parts of the country.

Only 3 (33.3%) sold internationally to eight countries. Of the suppliers who sold filling materials internationally, all (100%) sold to Tanzania, whereas two thirds 2 (66.7%) sold to Uganda Table 7.

Table 7. Number of Suppliers in the Region

Country	Number of	Percentage

	suppliers	
Tanzania	3	100
Uganda	2	66.7
Rwanda	1	96
Zambia	1	33.3
Nigeria	1	33.3
Malawi	1	33.3
Ethiopia	1	33.3
Burundi	1	33.3

Table7. Distribution of countries sold to by the traders

The most demanded capsule size of dental amalgam was F2 6 (66.7%), followed by F1 and F3 by 5 (55.6%).
Of the sample five responded when asked the amount of dental amalgam materials stocked; 25kgs, 25gs, 20Kgs, 10 kgs, 5kgs, 4kgs a total of 89Kgs. Only one supplier stocked mercury liquid 20Kgs and Alloy powder 5 Kgs.

With regard to the amount of dental amalgam sold per month, six suppliers responded to the question. The amount ranged from 1-25Kgs with a total of 51Kgs. The one supplier who stocked mercury liquid and alloy powder sold 4 Kg each per month.

4.2 Observtions

Within the limitations of this study several conclusions can be made such as:

- The use of alternatives is high as realised in the baseline. All clinics that do restorations were the high and 100% in the facilities.
- BMP is known to professionals theoretically but practiced by a few.
- Traders stock and sell mostly capsulated but some still liquid mercury and alloy powder. The demand for it still exists!

The results of this validation were also shared in the results workshop in Tanzania which was attended by Dr Kisumbi and Dr Irungu.

5. CAPACITY BUILDING ACTIVITIES

5.1 Need for Capacity Building to Address Phase-down of Mercury in Dental Amalgam

Almost all countries use dental amalgam: Alternatives are more expensive and have technical limitations.WHO 2009 technical meeting, co-supported by UNEP, recommended a phase down be pursued by:

- Promoting disease prevention and alternatives to amalgam
- Research and development of cost-effective alternatives
- Education of dental professionals and raising public awareness
-

For this reason capacity is required to be built.

5.2 Capacity Building Workshop

A capacity building workshop held in Uganda on 6th to 7th March 2013.

5.2.1 Background

The workshop and the subsequent data collection process concluded that appropriate train the trainer sessions be held so that knowledge can be disseminated to those institutions that participated in the inception workshop.

The project management team selected team that it felt would form the nuclear of TOTs for the dental amalgam who would disseminate this knowledge widest.
The following members attended and participated in the workshop. Training was done in the respective areas of the EADAP shown below;

- Dr B.K Kisumbi – Phase-down of dental amalgam and alternative dental materials
- Dr Patricia Mwere –Clinical Prevention of dental caries
- Mr Godffrey Makhanu – Best waste management practice and installation of separators.

The training of trainers workshop was held on 6th and 7th March 2013 at the School of Public Health, Uganda. FDI met the travel and accommodation cots. The workshop was successful and the Ugandan team was very hospitable.
The following members attended and participated in the workshop. Training was done in the respective areas of the EADAP shown below;
A report on status of the EADAP in Kenya was presented by Dr Kisumbi.

The details of the curriculum were as stipulated below;

5.2.2 UNEP-WHO-IDM-FDI curriculum on dental amalgam Best Management Practices (BMP), prevention and alternative materials

This curriculum is aimed for dental educators, waste management personnel, local trainers in Eastern Africa (Kenya, Tanzania, Uganda) . Capacity building, training and education were provided on

- Mercury life cycle and global health and the UNEP mandate
- BMP on dental restorative materials usage and environmentally sound waste management

- Information on alternative dental filling materials
- Clinical preventive dentistry

The curriculum could be used by local trainers to train local oral health care professionals and waste management personnel at the 3x3 pilot sites.
The course could be based on hands-on skills development and organised at a dental school, involving also a few patients for practical training of the participants.

5.2.3 Mercury life cycle and global health, and the Minamata Convention

Delivered by a highly specialised team of Jean-Luc Eiselé Federation of Dentists International and Dr. Desiree Montecillo of UNEP Chemicals, supported and using UNEP toolkit: Mercury a priority for action; modular approach and the Minamata Convention / UNEP treaty on mercury the course covered the below wide ranging topics :

- Mercury life cycle and global health and the UNEP political mandate
- What is mercury, mining, life cycle, physical and chemical properties
- Current usage in industry, gold mining, healthcare and dentistry
- Toxic forms of mercury and toxic effects
- Mercury in products and wastes
- Why and how reducing the global use of mercury
- What are practical consequences of the Minamata Convention

5.2.4 BMP on dental amalgam usage and environmentally sound waste management

This subject was delivered by another highly experienced team of Dr Shunichi Honda (Ministry of Environment, Japan; Pam Clark (Australia); Morten Rykke (Norway) who have wide experience on dental amalgam. It covered topics such as:

- Protecting the patients, dentists, health care professionals
- Set-up, chair, suction, filters
- Preparation of dental amalgam
- Protecting the patient during intervention, including polishing
- Handling of unused amalgam
- Handling of amalgam particles
- Handling of the restored extracted tooth
- Biosepsis measures
- Use of separator, replacement of cartridge
- Amalgam waste management- waste prevention and minimization, handling, separation, collection, packaging, labeling, transportation and storage, environmentally sound disposal including recycling and recovery

The team used latest information and awareness creation materials such as:

- WHO: Future use of materials for dental restoration, 2010 available at www.who.int/oral_health
- Technical guidelines for the environmentally sound management of wastes consisting of elemental mercury and wastes containing or contaminated with mercury available at

http://www.basel.int/Portals/4/Basel%20Convention/docs/techmatters/mercury/guidelines/UNEP-CHW-10-6-Add_2_rev_1.pdf

- Australian Dental Association, 2012, Policy statement 6.11 & Guidelines to amalgam waste management
- American Dental Association, 2007, Best management practices for amalgam waste
- FDI policy statements 2006, Waste management; 2007, Mercury hygiene guidance; 2007 Safety of Dental Amalgam
- http://www.homesteadschools.com/dental/courses/dentalamalgamonlineslides/amalgam.ppt;Pam Clark's presentation
- UNEP Kenya guidelines

5.3 Alternative materials for dental restoration

Participants were also exposed to latest information on the following:

a. Dental caries- type, severity of lesion, complexity of dental care
b. Why do we need dental restoration
c. Why do we need alternative materials
d. Available alternative restorative materials
e. Clinical conditions
f. ART approach
g. Safety: Pros and Cons
h. Technical requirements: Pros and Cons
i. Costs & insurance: Pros and Cons
j. Time requirements: Pros and Cons
k. Durability and wear resistance and fracture resistance: Pros and Cons
l. Challenges in waste management
m. Information to patients
n. Patient oriented care: clinical decision making
o. The quality needed of new materials

It can be concluded that a wide range of experts were trained by highly experienced experts using latest up to date information to allow Kenya to move to the next level in phase-down of dental amalgam .

5.4. Installation of Separators and Demonstration Pilot Sites

The coordinating team selected three sites for demonstration. These were Mathare Hospital; University of Nairobi and a Private Clinic.

The separators were shipped to Kenya from Australia.

The amalgam separators to be used in this project are known as sedimentation separators and are certified as compliant to ISO 11143 Amalgam Separators

- To receive this ISO certification the separator must achieve a minimum efficiency of capturing 95% of the standard amalgam sample.
- The standard amalgam sample consists of a range of particle sizes, ranging from 100 micron down to 1 micron of amalgam.
- At the site three training sessions were held

6. STAKEHOLDERS WORKSHOP

A stakeholder's workshop was held on at Kenya Institute of Education on 29th October 2013.

6.1 Stakeholders

A total of 56 participants attended the workshop from University of Nairobi, Ministry of Health, Ministry of Environment, Water and Natural Resources, NEMA and Dental Materials Suppliers.

The full list of participants is in Annex 1. Its objectives were:

- To brief the stakeholders on the project.
- To create awareness of preventive dental care and encourage phase-down of amalgam use.
- To discuss and explore the use of alternative dental materials
- To develop future actions and sustainability of Amalgam phase-down.

6.1.2 Briefing on Minamata Convention

The workshop updated participants on the Minamata Mercury convention/financial framework/waste management highlighting:

- Text of the Minamata Convention.
- Dental amalgam is listed as a mercury added product and thus listed as one of the products to be phased down.
- Article 6 on the exemptions available to a state party on written request was elaborated to the stake-holders.
- An explanation of Article 8 on reduction of mercury emissions was made. There was concern raised on improper incineration and open burning of medical waste which could also include mercury waste in some public health facilities
- Reduction of levels of mercury released to the environment and the use of best available techniques in this process was elaborated as proposed in article 9.
- The role of Global Mercury Partnership was explained to the stakeholders.
- That Global Environmental Facility Trust Fund (GEF) was available under article 13 of the Minamata convention on Financial Resources and mechanisms to help in capacity building and in technology transfer.
- Suppliers were also informed of their role in funding research and capacity building.

In response there emerged the following concerns:

- The question of budgetary implications on the central government due to the phase-down of dental amalgam and the use of the more expensive alternative dental materials.
- The lack of a national recycling facility for dental amalgam waste.
- National Environment Management Authority(NEMA representatives raised doubts on the feasibility of such an undertaking considering the low volumes of dental amalgam waste generated by the dental clinics in the country and the cost involved.
- It was also noted that the cost of the alternative dental materials may discourage the poor citizens from seeking dental treatment and thus leading to an increase in disease burden in the country.

6.1.3 Dental amalgam, alternative filling materials/ best waste management practice by Dr. Kisumbi

The following were the key points in the presentation:

- A brief history on the use of dental amalgam was presented.
- The composition of dental amalgam was also explained in detail.
- It was noted that according to a recent study conducted among dentists in East Africa, the use of these alternative materials was on the rise. This was attributed to increased demand for aesthetic fillings, increased mechanical properties and due to the controversy of dental amalgam.
- Alternative materials to dental amalgam were said to have the following limitations: Reduced strength compared to dental amalgam, higher cost and increased technique sensitivity. These limitations leave the dentist with no better filling material than dental amalgam.
- Stakeholders noted that a majority of clinicians do not segregate extracted teeth that have amalgam fillings but instead discard them with the general pathological waste.
- The high failure rate of alternative filling materials was said to be a reason why most clinicians still prefer to use dental amalgam.

6.1.4 Prevention of dental caries in light of dental amalgam phase-down by Dr. Mwere

Dr Were who was one of the TOT and in charge of one of the stations where there are separators gave a detailed discussion on prevention of dental caries. These were the highlights:

- Dental caries is a progressive irreversible microbial disease affecting the hard tissues of tooth resulting in demineralization of inorganic constituents and dissolution of organic constituent, thereby leading to cavity formation.
- The following are responsible for prevention of dental caries
- The individual
- The oral health worker/dental personnel
- Other health personnel
- Parents and guardians of underage children, and adults with disabilities
- The government
- Other stake holders: faith based health facilities, manufacturers of dental care items, WHO, professional bodies.
- The levels of prevention are primordial, primary, secondary and tertiary.
- The individual is involved both actively and passively.
- Ideally the individual should attend regular checkups for preventive dental care.
- Due to the current shortage in the number of dentists, there is a high disease burden and the cost of treatment is high.
- According to the Alliance for Cavity Free Future (ACFF), health promotion, health literacy, patient education and risk assessment should be the best way forward.
- Good oral hygiene, fluorides, vaccination against caries, prophylaxis, pits and fissure sealants, a traumatic restorative treatment and diet counselling go a long way in prevention of caries.
- Innovative ways of prevention of caries was emphasized.

6.2. Dental amalgam waste in the dental clinic by Mr. Makhanu

He elaborated the technical details and specifications for dental amalgam separators and the installation requirements were elaborated. (Mr. Makhanu asked to insert bullets on 3 key issues discussed)
There was concern raised as pertains to the use of hypochlorite in disinfecting the units. This practice was said to lead to conversion of amalgam to soluble form. The detail of his presentation is one of the annexes.

6.3 Interactive discussions with Stakeholders

Stakeholders were divided into five (5) groups and each group assigned a number of questions as follows:
Group 1: Accidental exposure to mercury in a dental clinic and the systemic effects of such an exposure.
Group 2: Recycling of dental amalgam and environmentally sound management of mercury waste.
Group 3: Collection and storage on amalgam in the clinic.
Group 4: Behavioral change towards amalgam waste management.
Group 5: Steps towards sound mercury waste management.

The results from these groups were readout by the group leaders and later discussed by all the stakeholders.

6.4 Demonstration of clinical management of dental caries in light of dental amalgam phase-down by Dr. Kisumbi

The management of dental caries in light of amalgam phase-down was discussed and the following were agreed on as the determinants of the choice of a filling material.

a) Size of the cavity
b) The position of the tooth
c) The tooth involved
d) Patient habits
e) The dentition involved
f) Patient preference

As a general rule the smaller the cavity and the more anterior the tooth, the more one can use an alternative material. The bigger the cavity, the more posterior the tooth amalgam is recommended. Patients should also be educated on filling materials.

7. CONCLUSIONS

In line with the project objectives, the project had the outcomes and conclusions detailed below:

i. On technology transfer, Kenya received through UNEP and WHO expert trainer in oral and dental health in four occasions. At the Inception (in Nairobi), at capacity training (In Uganda and at the stakeholders workshop in dares Salaam.

ii. The stakeholders share the latest information on alternatives to mercury, a logical phase-down approach, information on best way to conserve mercury, information on alternatives and information tailored at specific audiences

iii. At the end of the project the following was achieved

iv. Sensitization of key policy makers and scientists is on the Minamata convention on Mercury in general

v. Sensitization of over 60 dentists, technician's trainers and policy makers and 10 waste technologies on the aspects of mercury in dental amalgam and why it should be phase-down.

vi. Nairobi and Moi universities dental schools as the lead training institutions fully sensitised

vii. Joint implementation of the project between Ministry of Health, Environment ensured that Kenya will find it easy to implement the relevant sections of the convention

viii. Kenya Dental Association which was a proponent of the phase-down approach fully involved and sensitised

ix. Core train the trainers (ToT) team on prevention and waste management formed for the three countries

x. Three clinics selected as demonstration centres and they received state of the art separators while the information on alternatives was disseminated to 30 personnel on the ground in Mathare, University of Nairobi Hospitals

xi. Information gathered about current setup of dental clinics and local waste management systems

xii. Health Personnel at the three sites trained on best Management Practices(BMP) on dental amalgam waste

xiii. Environmentally sound Management of dental restoration waste materials demonstrated

xiv. The usefulness of Kenya's guidelines for Medical Waste put into practice for the dental waste

8. WAY FORWARD

The following were the action points for the way forward as proposed by the stakeholders during the workshop:

8.1. Ministry of Environment, Water and Natural Resources

- Awareness to the relevant stakeholders and the public on Minamata Convention on Mercury
- Liaise with the ministry of trade(write in full) on quantifying the volumes of mercury imported
- Coordinate the development of a proposal to GEF on funding of start-up activities before ratification of the treaty
- Support and research on feasibility of a national recycling plant for dental amalgam

8.2. Ministry of Health

- Domestication of the guidelines on dental amalgam
- Enforcement of guidelines
- Research on quantities of amalgam and mercury waste generated by hospitals
- Create awareness on mercury waste management and phase down of amalgam
- Involve Ministry of education in educating students on oral health
- Incorporate oral health in all Maternal and Child Health projects
- Procure early caries detection equipment for health facilities
- Ensure only encapsulated amalgam is procured
- develop a protocol and policy for use of dental amalgam
- Revise the National Solid Medical Waste Management Policy to include dental amalgam waste
- Develop policy and implement guidelines of school oral health
- Support and Research on feasibility of a national recycling plant for dental amalgam
- Policy on data collection from private facilities

8.3. Ministry of Education

- Curriculum development on oral health
- Encourage research on amalgam related issues
- Create awareness on good oral hygiene

8.4 Universities

- Research on amalgam related issues
- Curriculum development to incorporate the Minamata Convention
- Create awareness to the students ,staff and the public on effects of mercury waste
- Community outreach programmes
- Train and practice Best Waste Management Practice

8.5. Hospitals

- Adoption of the Minamata convention guidelines on mercury waste management
- Research on alternatives to dental amalgam
- Awareness creation on amalgam phase-down
- Best waste management practice
- Create awareness on Minamata convention guidelines

8.6. Kenya Medical Practitioners and Dentists Board and Kenya Dental Association

- Create awareness on policy guidelines in private clinics
- Create awareness on alternative materials to amalgam
-

8.7. East Africa Dental Amalgam Phase down (EADAP)

- Lobby for extension of duration of the phase down of dental amalgam
- Disseminate report and results of the project
- Monitor and evaluate the EADAP project
- Research on dental amalgam issues

8.8. Private clinics

- Use of separators
- Education of the patients
- Embrace alternative materials to dental amalgam

8.9. Suppliers

- Stop the importation of free Mercury
- Encourage use of encapsulated amalgam
-
- Create awareness to the dentist on availability of alternatives to amalgam
- Conform to the policy guidelines

Annex 1:Timetable of Inception workshop.

Time	Item	Content of Presentation	Responsible
Day1:18Dec			
9.00-9.30	Welcome and Opening Introduction of Participants		Kenya MEMR, UNEP Chemicals, UNEP ROA, WHO
9.30-10.15	Project overview	Mercury negotiations and partnerships. Project objectives, components, expected output.	Desiree Narvaez, UNEP Chemicals
10.15-11.00	WHO Oral Health Programme	WHO policies on oral health and dental restoration	Poul Erik Petersen, WHO Oral Health Programme
11.00-11.30	Break		
11.30-13.00	Dental amalgam and its alternatives trade and waste management practices survey	Results, analysis, conclusions of survey regarding a)trade b)waste management of dental amalgam and its alternatives	Cecilia Nganga, Bernina Kisumbi iLima, NGO
13.00-14.00	Lunch		
14.00-15.30	Selection of pilot dental facilities	Criteria for selection of dental facilities, provision of amalgam separators, logistical requirements	PamClark, International Association of Dental Manufacturers
15.30-16.00	Break		
16.00-17.30	Training of dental personnel)	Training of dental personnel on the best management practices (BMP) / environmentally sound management (ESM) of waste (amalgam and its alternatives)	Jean-Luc Julian Fisher, World Dental Federation
17.30	Closure of day 1		

Time	Item	Content of Presentation	Responsible
Day 2 (19 December)			
9.00-9.30	Recap of day 1		Kenya MEMR
9.30-10.15	Awareness raising on the alternatives and BMP of dental amalgam waste and its alternatives	Awareness raising materials developed by the University of Copenhagen- WHO Collaborating Centre for Oral Health	Poul Erik Petersen, WHO Oral Health Programme
10.15-11.00	Case studies demonstrating phase down approach	Results and analysis of survey conducted in 10 countries that have demonstrated phase down of dental amalgam	Michael Bender, Mercury Policy Project OR Desiree Narvaez, UNEP Chemicals
11.00-11.30	Break		
11.30-13.00 13.00-14.00	Role clarification of national project coordinator ; Action planning by country Lunch		Desiree Narvaez, UNEP Chemicals;
14.00-15.30	Continuation of workshop by country	Action planning for actual project implementation	National project coordinators; All 3 countries
15.30-16.00	Break		
16.00-17.30	Presentation of workplans by country	Presentations and comments from participants	All
17.30	Closure of the meeting		Kenya MEMR, UNEP Chemicals, UNEP ROA, WHO

Annex 2 List of participants at the Inception Workshop

No.	Name of Participant	Institution	Email Address	Telephone No.
1	Dr. Desiree Narveez	UNEP	Desiree.navaez@unep.org	
2.	Mr. Bary Abdouraman	UNEP	Abdouraman.bary@unep.org	020 7623495
3	Dr. Jean Luc Eiseli	FDI		
4	Dr. P. E. Petersen	WHO HQ.	petersenpe@who.int	+41227913574
5	Mr. Francis Kihumba	MEWNR	kihumban@environment.go.ke	0722 431110
6	Dr. Stephen Irungu	MOHS	smirungu@yahoo.com	0722 637655
7.	Prof. Febronia Kahabuka	MUHAS (Tanzania)	kokuhabuka@yahoo.com	+255 754538084
8.	Dr. Margaret Wandera	UDA	Mawandy5002@yahoo.com	+256 772415291
9.	Alex K. Winyi	NEMA, Uganda	awinyi@nemaug.org	@256 772345693
10.	Dr. Linus Ndegwa	KDAenya Dental Association	ndegwachira@yahoo.com	0722 830849
11.	Dr. Jane Manyasi	Muranga District Hospital	namasayaoti@yahoo.com	0721 590121
12	Godfrey Makhanu	Dental School, UON	goddymakhanu@gmail.com	0722 832833
13.	Dr. Stella Kiragu	Machakos Level V Hosptial	skmimo@yahoo.com	0724 946776
14.	Dr. Patricia Mwere	Mathari Hospital	mwerepatricia@gmail.com	0721 335382
15.	Dr. Kerich Elijah	Ministry of Medical Services	keakerich@yahoo.com	0722 657453
16.	Dr. David I. Mwangi	Coast General Hospital	Davemwa80@yahoo.com	0722 742449
17.	Dr. John Kihama	Ministry of Medical Services	jmkihama@gmail.com	0722 360646
18.	Dr. Wamai Jane	Kenya Dental Association	jgachambi@yahoo.com	0722822337
19.	Dr. B. N. Muia	University of Nairobi	muailinize@yahoo.com	0722 278295
20.	Fredrick Ngeno	Ministry of Medical	Ngenosoi62@yahoo.com	0720802308

		Services		
21.	Dr. Kyule S. P.	Kitui Dental (MED)	smlkyule@yahoo.com	0723 062323
22	Abby Abuya	Baragoi Girls High School	abbyabuya@ymail.com	0722 671983
23	Dr. Elizabeth Onyiego	Ministry of Medical Services	wanguoonyiego@yahoo.co.uk	0722 664689
24	Cecilia Nganga	Ilima Organisation	ceciliannganga@ilimakenya.org	0725 535940
25	Dr. B. K. Kisumbi	University of Nairobi	bkisumbi@yahoo.com	0722 487096
26.	Dr. Makau Matheka	Ministry of Medical Services	Dr.makau@yahoo.com	0720 891929
27	Dr. Ondiwa M. A.	Ministry of Medical Services	mollyondiwa@ymail.com	0722 724223
28.	Dr. Muchai A. N.	Provincial General Hospital, Nyeri	antonmuchai@yahoo.com	0722 301891
29	Dr. Lucina Koyio	Ministry of Public Health and Sanitation	koyiolucina@yahoo.co.uk	0722 851289
30	Mr. James Otiende	City Council of Nairobi	Jotiende2004@yahoo.com	0727 463463
31	Dr. Lillian Apedet	Kenya Medical Research Institute	apadet@yahoo.com	0721 513477
32	Dr. Linda Kangara	Kenya Dental Association	drlkingara@yahoo.com	0722 699677
33	Lolem Lokolile	Ministry of Public Health and Sanitation	lokolile@gmail.com	0722 589995
34	Cyrus Mageri	Ministry of Environment and Mineral Resources	Cyrus.mageria@environment.go.ke	0727 640589
35	David Ongare	NEMA	dongare@nema.go.ke	0722 844420
36	Dr. Toroitch Christine	Rift Valley Provincial General Hospital	drtoroitich@gmail.com	0722 235952
37	Dr. Kevin J. K.	Mama Lucy Kibaki Hospital	karirijames@yahoo.com	0722 869473
38	Patrick K.	Ministry of	Wafulapatrick87@yahoo.com	0725 986476

	Wafula	Medical Services		
39	Dickson Njora	NEMA	dnjora@nema.go.ke	0722 287283
40	Priscilla Kamau	Ministry of Medical Services	Wanjiku2009@yahoo.com	0721778881
41	Dr. David Gesicho	Ministry of Medical Services	biasharayork@yahoo.com	0722 552191
42	Dr. Jeniffer Ober	Ministry of Medical Services	ober.oluoch@gmail.com	0722 829625
43.	Mercy Kimani	Ministry of Environment and Mineral Services	mkimani@environment.go.ke	0721 876692
44.	Rachel Malela	Ministry of Environment and Mineral Resources	rachelmalela@yahoo.com	0722 575269
45	Henry Simiyu	Ministry of Medical Services	hnsimiyu@yahoo.com	0722 307262
46	Dr. Caroline Kibosia	Moi University School of Dentistry	carobib@gmail.com	0722 645066
47	Griffins Ochieng	ILima	ogriffins@yahoo.com	0726 931310
48	Evans Wanyama	Dentmed (k) Ltd		0727 981957
49	Mang'u K. Karen	Ministry of Environment and Mineral Resources	Karenkm82@yahoo.com	0711 552398

Annex 3 List of Participants –Review Meeting At Dr. Irungu's Office on 27th January 2014

S.NO	NAME	ORGANIZATION	TEL .NO	EMAIL ADDRESS
1.	Dr. Wamai Jane	K.D.A.	0722822337	jgashambi@yahoo.com
2.	Dr. MakauMatheka	M.O.H. Oral Health Unit	0720891929	orachealthunit2014@gmail.com
3.	Mr. Godfrey Makhamu	UON	0722832833	goddymakhamu@gmail.com
4.	Dr. Onyiego E.W	MOH	0722664689	oralhealthunit2014@gmail.com
5.	Mr. Fredrick Ngeno	MOH. Oral Health Unit	0720802308	oralhealthunit2014@gmail.com
6.	Mr. Francis Kihumba	MEWNR	0722431110	kihumbafn@yahoo.com
7.	Dr. BeninaKisumbi	UoN	0722487096	bkisumbi@yahoo.com bkisumbi@uonbi.ac.ke
8.	Dr. Stephen Irungu	MOH. Oral Health Unit	0722637655	smirungu@yahoo.com
9.	Mr. Patrick Wafula	MOH. Oral Health Unit	0725906476	Oralhealthunit2014@gmail.com

Annex.4 Relevant text of the Convention

From the Text of the Convention on Dental Amalgam the project usefulness can be assessed.

The project has helped Kenya start the journey towards implementing the convention.

The following are the measures

The measures to be taken by Kenya a Party to phase down the use of dental amalgam shall take into account the Party's domestic circumstances and relevant international guidance and shall include two or more of the measures from the following list:

- Setting national objectives aiming at dental caries prevention and health promotion, thereby minimizing the need for dental restoration;
- Setting national objectives aiming at minimizing its use;
- Promoting the use of cost-effective and clinically effective mercury-free alternatives for dental restoration;
- Promoting research and development of quality mercury-free materials for dental restoration;
- Encouraging representative professional organizations and dental schools to educate and train dental professionals and students on the use of mercury-free dental restoration alternatives and on promoting best management practices;
- Discouraging insurance policies and programmes that favor dental amalgam use over mercury-free dental restoration;
- Encouraging insurance policies and programmes that favor the use of quality alternatives to dental amalgam for dental restoration;
- Restricting the use of dental amalgam to its encapsulated form;
- Promoting the use of best environmental practices in dental facilities to

Except for the articles on insurance, the project has initiated the requirements taken verbatim from the convention.
Institutions can take the lessons learnt to the next level. A large number of dentists shared highly professional information and were exposed to the cream in dental practice
The Project was therefore a resounding success.