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World Health
Organization



United Nations Development Programme
Countries: Ghana, Madagascar, Tanzania and Zambia
PROJECT DOCUMENT¹

Project Title:	Reducing UPOPs and Mercury Releases from the Health Sector in Africa
UNDAF Outcome(s):	<p>Ghana UNDAF (2012 – 2016)</p> <p>Thematic Area: Sustainable Environment, Energy and Human Settlements</p> <p>UNDAF/UAF Outcome 5: An additional 2.5% of the population have sustainable use of improved drinking water and sanitation services and practice the three key hygiene behaviours by 2016.</p> <p>Thematic Area: Transparent and Accountable Governance</p> <p>UNDAF/UAF Outcome 11: Ministries, Department Agencies, (MDAs), Local Governments and CSOs have effectively developed, funded, coordinated and implemented national and sectoral policies, plans and programmes aimed at reducing poverty and inequalities, and promote inclusive socio-economic growth by 2016.</p> <p>Madagascar (2008 – 2011)²</p> <p>UNDAF Outcome 4: Living conditions and the productivity of populations in priority zones are improved.</p> <p>Tanzania United Nations Development Assistance Plan - UNDAF (2011 – 2015)</p> <p>Outcome 2: Relevant MDAs, LGAs and Non-State Actors improve enforcement of environment laws and regulations for the protection of ecosystems, biodiversity and the sustainable management of natural resources.</p> <p>Outcome 3: Relevant MDAs, LGAs, and NSAs are prepared, have adequate sectoral capacity and provide an effective intra coordinated response in WASH, Health, Education, Protection, Agriculture, Food Security and Nutrition in emergencies.</p> <p>Outcome 4: Selected MDAs, LGAs and NSAs implement evidence-based HIV prevention programmes.</p> <p>Zambia (2011 – 2015)</p> <p>UNDAF Outcome 3: Vulnerable people living in Zambia have improved quality of life and well being by 2015.</p> <p>3.1 Government and partners improve equitable access of vulnerable groups¹⁸ to quality health, nutrition, water and sanitation services by 2015.</p>
UNDP Strategic Plan Environment and Sustainable Development Primary Outcome: Outcome 1: Growth and development are inclusive and sustainable, incorporating productive	

¹ For UNDP supported GEF funded projects as this includes GEF-specific requirements

² The transitional government of Madagascar has agreed with the UNCT to extend its UNDAF for one more year until the end of 2014. This will provide sufficient time for the new UNDAF/CPD preparations that consider the changed national priorities after the political transition. The original CCF covered 2008 – 2011, while approved extensions covered 2012 – 2013.

capacities that create employment and livelihoods for the poor and excluded.	
Output 1.3. Solutions developed at national and sub-national levels for sustainable management of natural resources, ecosystem services, chemicals and waste.	
UNDP Strategic Plan <u>Secondary Outcome</u>: NA	
Expected CP Outcome(s): <p>Ghana – same as 2012 – 2016 UNDAF outcomes</p> <p>Madagascar Country Programme (2008 – 2011) The environment will be protected within and around priority conservation zones.</p> <p>Tanzania - Common Country Programme Document (2011 – 2015) National and local levels have enhanced capacity to coordinate, enforce and monitor environment and natural resources.</p> <p>Zambia UNDP Country Programme Outcome (2011 – 2015) 1.1.1 Government and partner institutions have technical skills upgraded to revise and implement policies according to the latest guidelines.</p>	
Expected CPAP Output (s) <p>Ghana - Country programme document (2012-2016) - CPAP Outputs: Policy advocacy, advice, and programme implementation informed by analytical work, and key national institutions able to conduct economic planning, management and M&E using quality data.</p> <p>Proposals for policy, institutional and operational reform in the justice sector formulated and actions taken to build consensus among stakeholders.</p> <p>Madagascar – CPAP (2008 – 2011) Outputs: Municipalities and communities are empowered to protect/conservate natural resources in general and biodiversity in particular.</p> <p>The implementation and consideration by centralized and decentralized structures of national policies and sectoral plans in which environmental dimensions have been integrated is improved.</p> <p>Tanzania Support to LGAs to formulate environment plans and strategies in line with EMA</p> <p>Zambia - Country Programme Action Plan (CPAP) 2011 – 2015 Outputs: 4.3.1 Mechanisms upgraded and functional to ratify/domesticate conventions on biodiversity conservation, combating desertification, climate change, ozone depletion substances, water and CITES. 4.3.3 Plans and mechanisms established by Ministry of Lands, Natural Resources and Environmental Protection to promote environmental awareness at national and local levels. 4.3.4 Technical and operational capabilities developed in targeted Government institutions to introduce cleaner production practices and renewable energy alternatives.</p>	
Executing Entity/Implementing Partner:	UNDP
Implementing Entity/Responsible Partners: <p>Ghana: Ministry of Health</p> <p>Madagascar: Ministry of Public Health & Ministry of Environment, Ecology and Forests</p> <p>Tanzania: Ministry of Health and Social Welfare</p> <p>Zambia: Ministry of Lands, Natural Resources and Environmental Protection & Ministry of Health</p>	

Brief Description

The overall objective of this full size GEF funded project, implemented by UNDP in partnership with WHO and the NGO Health Care Without Harm, is to implement best environmental practices and introduce non-incineration healthcare waste treatment technologies and mercury-free medical devices in four Sub-Saharan African countries (Ghana, Madagascar, Tanzania and Zambia) to reduce harmful releases from the health sector.

In each of these four countries, the generation of healthcare waste (HCW) is rapidly increasing. Sub-Saharan countries face particular challenges in dealing with increasing HCW quantities, because HCW treatment technologies that meet international guidelines and fit local circumstances, are simply not available at market prices that facilities and governments can afford. As a result, countries most often opt for low technology incinerators, which result in significant releases of unintentional persistent organic pollutants (UPOPs). Such pollutants are considered to be among the most harmful, persistent, and bio-accumulative global pollutants in the world and therefore controlled under the Stockholm Convention on POPs.

Similarly, Sub-Saharan countries face challenges in handling products and wastes containing Mercury. Mercury, one of the world's most ubiquitous heavy metal neurotoxicants, has been an integral part of many medical devices such as thermometers and sphygmomanometers. When these devices break or leak with regularity, they add to the global burden of mercury in the environment and expose health care workers to the acute effects of the metal itself. Considering the harmful effect of Mercury, the phase-out of such devices by 2020 is anticipated under the recently adopted Minamata Convention.

To help countries meet their obligations under the Stockholm and Minamata Conventions, the project will apply a regional procurement approach, to equip a total of four central treatment facilities covering up to 8,400 beds each, 22 hospitals with an average no. of beds of 150 and two dozen health posts (corresponding to HCW from a total of about 36,900 hospital beds) in the four project countries. The approach will contribute towards creating favourable market conditions, market demand and stimulate the growth of non-incineration HCWM systems and mercury-free technology distributors or manufacturers in Africa. In turn this will make it easier for Sub-Saharan African countries to have access to manufacturers, distributors and maintenance service providers of low cost non-incineration technologies and mercury-free devices as well as technical assistance from a network of national and regional experts.

To support the introduction of such technologies and devices, in each project country the project will:

- Build national capacity to enable the assessment, planning, and implementation of healthcare waste management (HCWM) systems.
- Develop/improve the national policy and regulatory framework pertaining to HCWM (e.g. HCWM national plans, implementation strategies, national policies and regulations).
- Make available affordable non-incineration HCWM systems and mercury-free devices that conform to BAT and international standards.
- Demonstrate HCWM systems, recycling, mercury waste management and mercury reduction at project facilities.
- Establish national HCWM training infrastructures.

Through project interventions in all four project countries the project would be able to reduce UPOPs releases by 31.8 g-TEQ/a and mercury releases by 25.3 kg Hg/yr.

Finally, because the project will improve the entire healthcare waste management chain in supported project facilities through improved classification, segregation, storage, transport and disposal, among else, it is expected that improved HCWM practices will reduce the spread of infections both at healthcare facility level as well as in places where healthcare waste is being handled, reducing human suffering and health care cost associated with improperly managed waste.

Programme Period:	2015 - 2018	Total resources required (US\$):	
Atlas Award ID:		Total allocated resources (US\$):	
Project ID:	4611	GEF	\$6,453,195
Start Date:	Jan 2015	Ghana:	
End Date:	Dec 2018	<i>MoH</i>	\$ 1,610,000
Mgmt Arrangement:	TBD	<i>MoLG</i>	\$ 1,900,000
PAC Meeting Date:	TBD	<i>Zoomlion</i>	\$ 1,250,000
		<i>EPA</i>	\$ 450,000
		Madagascar:	
		<i>MoE</i>	\$ 902,000
		<i>MoH</i>	\$ 246,273
		<i>CHU Tambohobe Fianarantsoa</i>	\$ 70,000
		<i>CHU ME Tsaralalana</i>	\$ 51,999
		<i>Adonis</i>	\$ 347,175
		<i>UNHabitat</i>	\$ 242,237
		<i>CHU JR Befelatanana</i>	\$ 81,880
		<i>CHRD II Manjakandriana</i>	\$ 275,250
		<i>FAA</i>	\$ 1,000,000
		<i>Voahary Salama</i>	\$ 850,450
		<i>WHO – Madagascar</i>	\$ 40,000
		<i>MoH - Service de la Vaccination (GAVI)</i>	\$ 239,500
		<i>World Bank</i>	\$ 340,000
		Tanzania:	
		<i>MoHSW</i>	\$ 500,000
		<i>CDC</i>	\$ 1,200,000
		<i>Agenda</i>	\$ 10,000
		<i>Pasada</i>	\$ 18,000
		<i>Jhpiego</i>	\$ 1,200,000
		Zambia:	
		<i>ZEMA</i>	\$ 624,000
		<i>MoH</i>	\$ 7,500,000
		<i>Waste Master</i>	\$ 90,000
		Global Partners:	
		<i>UNDP / Global Fund</i>	\$ 2,300,000
		<i>HCWH</i>	\$ 2,100,000
		<i>WHO</i>	\$ 3,497,400
		Total Co-financing:	\$ 28,936,164

Agreed by (Government of the Republic of Ghana):

Date/Month/Year

Agreed by (Government of the United Republic of Tanzania):

Date/Month/Year

Agreed by (Government of the Republic of Madagascar):

Date/Month/Year

Agreed by (Government of the Republic of Zambia):

Date/Month/Year

Agreed by (UNDP):

Date/Month/Year

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LIST OF ACRONYMS

ADB	African Development Bank
AIDS	Acquired Immune Deficiency Syndrome
APR/PIR	Annual Project Review / Project Implementation Review
AWP	Annual Work Plan
BAT	Best Available Technologies
BEP	Best Environmental Practices
BMW	Bio-Medical Waste
BTOR	Back to Office Report
CBoH	Central Board of Health
CO	Country Office
CP	Country Programme
CTF	Centralized Treatment Facility
EHO	Environmental Health Officer
GEF	Global Environment Facility
HCWM	Healthcare Waste Management
HC	Health Centre
HCF	Healthcare Facility
HIV/AIDS	Human Immunodeficiency Virus/Auto-Immune Deficiency Syndrome
Hg	Mercury
ICP-IS	Infection prevention and control and injection safety
IPC	Infection Prevention Committee
I-RAT	Individualized Rapid Assessment Tool
IV	Intravenous
JSI	John Snow Inc
M&E	Monitoring and Evaluation
MHMT	Municipal Health Management Team
MMIS	Making Medical Injections Safer
MOE	Ministry of Environment
MOH	Ministry of Health
MoHSW	Ministry of Health and Social Welfare
MoU	Memorandum of Understanding
MSD	Medical Stores Department
MSW	Municipal Solid Waste
NGO	Non-Governmental Organization
NAP	National Action Plan
NIP	National Implementation Plan for the Stockholm Convention
PAC	Project Approval Committee
PA	Project Assistant
PB	Project Board
PC	Project Coordinator
PCDDs	Polychlorinated Dibenzo Dioxins
PCDFs	Polychlorinated Dibenzo Furans
POP	Persistent Organic Pollutant
PPG	Project Preparation Grant
PPE	Personal Protection Equipment
PPP	Public Private Partnership
PPR	Project Progress Report
PRF	Project Results Framework
PTS	Persistent toxic substance

PVC	Polyvinyl Chloride
QPR	Quarterly Progress Reports
RCU	Regional Coordination Unit
SOP	Standard Operating Procedures
TOR	Terms of Reference
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNIDO	United Nations Industrial Development Organization
UNICEF	United Nations Children Education Fund
UTH	University Teaching Hospital
US CDC	United States Center for Disease Control
UDSM	University of Dar es Salaam
VPO	Vice President's Office
WHO	World Health Organization
ZEMA	Zambia Environmental Management Agency

LIST OF DEFINITIONS

Alternative treatment technologies	For the purposes of this document, alternative treatment technologies are non-incineration technologies that are used to disinfect infectious health-care waste, while avoiding the formation and release of dioxins. Depending on the waste being treated, alternative treatment technologies may also render health-care waste unrecognizable, reduce its volume, eliminate the physical hazards of sharps, decompose pathological or anatomical waste and/or degrade chemotherapeutic waste.
Blood borne pathogens	Infectious agents transmitted through exposure to blood or blood products.
Chemotherapeutic waste	Chemotherapeutic waste is waste, resulting from the treatment of cancer and other diseases, that contains chemical agents known to cause cancer, mutations and/or congenital disorders.
Dioxins	For the purpose of this document, dioxins refer generally to polychlorinated dibenzo-p-dioxins, polychlorinated dibenzo furans and other unintentional POPs discussed in Annex C of the Stockholm Convention.
Health-care waste	Health-care waste includes all the waste generated by health-care establishments, medical research facilities and bio-medical laboratories.
Infectious waste	Infectious waste is waste suspected to contain microorganisms such as bacteria, viruses, parasites or fungi in sufficient concentration or quantity to cause disease in susceptible hosts. (Infectious waste is synonymous with bio-medical and bio-hazardous waste.)
Nosocomial infections	Nosocomial infections, also called “hospital-acquired infections,” are infections acquired during hospital care that are not present or incubating upon admission.

LIST OF WEBSITES

UNDP-GEF Global Healthcare Waste Project website	http://www.gefmedwaste.org
World Health Organization	http://www.who.int/water_sanitation_health/medicalwaste/en/
Healthcare Without Harm	http://www.noharm.org

I. SITUATION ANALYSIS

Context and Global Significance

1. The project components as proposed in this document, will be implemented and carried out as an integral part of a regional project entitled “*Reducing UPOPs and Mercury Releases from the Health Sector in Africa*” which will work with four countries, namely the Republic of Ghana (“Ghana”), Republic of Madagascar (“Madagascar”), United Republic of Tanzania (“Tanzania”) and the Republic of Zambia (“Zambia”).
2. The project will promote best practices and techniques for healthcare waste management with the aim of minimizing or eliminating releases of Persistent Organic Pollutants (POPs) to help countries meet their obligations under the Stockholm Convention on POPs. The project will also support these countries in phasing-down the use of Mercury containing medical devices and products, while improving practices for Mercury containing wastes with the objective to reduce releases of Mercury in support of countries’ future obligations under the Minamata Convention. Finally, because the project will improve healthcare waste management systems (e.g. through improved classification, segregation, storage, transport and disposal) the project will also contribute to the reduction of the spread of infections both at healthcare facility level as well as in places where healthcare waste is being handled.
3. The project is being proposed because the generation of healthcare waste (HCW) is rapidly increasing in each of the four project countries, as a result of expanding healthcare systems, increased utilization of single-use items, and poor segregation practices. As an unintended consequence, the resulting larger healthcare waste quantities and their subsequent treatment (often in low technology incinerators), is resulting in increased releases of POPs and Mercury.
4. To reduce the spread of HIV/AIDS and other infectious diseases from healthcare waste, and waste resulting from immunization campaigns, Sub-Saharan countries have started to rely heavily on incineration. In the last few years though, there has been growing controversy over the incineration of health-care waste. Under certain circumstances, in particular when healthcare wastes (which often contain polyvinyl chloride (PVC) plastics) are incinerated at low temperatures (< 800 degrees Celsius), dioxins and furans and other toxic air pollutants (e.g. co-planar Poly Chlorinated Biphenyls - PCBs) are produced as air emissions or end up as solid residues in the bottom or fly ash (WHO, 2011)³.
5. Exposure to dioxins, furans and other toxic air pollutants resulting from the incineration of HCW may lead to adverse health effects. Long-term, low-level exposure of humans to dioxins and furans may lead to the impairment of the immune system, the impairment of the development of the nervous system, the endocrine system and the reproductive functions. Short-term, high-level exposure may result in skin lesions and altered liver function. Exposure of animals to dioxins has resulted in several types of cancer (WHO, 2011).
6. Because dioxins, furans and co-planar PCBs are persistent substances that do not readily break down in the environment, bio-accumulate in the food chain, and are able to travel long distances far away from the place where they were produced, they are considered a global threat to human and environmental health worldwide. For this reason these substances are controlled under the Stockholm Convention on POPs.
7. Sub-Saharan countries face particular challenges because waste treatment technologies that meet the Stockholm Convention’s guidelines on Best Available Technologies (BAT) and Best Environmental

³ WHO, Fact sheet N°281 <http://www.who.int/mediacentre/factsheets/fs281/en/>

Practices (BEP) and fit local circumstances are simply not available at market prices that facilities or their Governments can afford. As a consequence, countries opt for low-cost medical waste incinerators, such as “*De Montfort incinerators*”. Unfortunately, such incinerators, even if they are properly operated, emit significant levels of dioxins and furans, 40 grams of Toxic Equivalent (g-TEQ) in air emissions and in ash residues per kilotonne of waste burned⁴). Unfortunately though, often even these low cost incinerators are badly maintained, and inadequately operated resulting in even lower temperatures, further aggravating the environmental pollution caused by such technologies.

8. Data from the baseline analysis which was conducted during the project’s preparation phase (see section “*UPOPs and Mercury Release Baseline*”) suggests that in the four project countries the healthcare sector releases up to 165 g-TEQ/yr of UPOPs (based on 2007/2006 NIPs) and up to 287 kg Hg/yr⁵. The hospitals that have been pre-selected for project participation currently release up to 31.8 g-TEQ/yr and 25.3 kg/Hg/yr.

9. The proposed regional project therefore aims to reduce the reliance of African countries on heavily polluting low-cost low technology incineration and create a tipping point for the use of non-incineration technologies which will generate significantly less air pollutants than incinerators and other high-heat thermal processes. Secondly, the use of non-incineration technologies can also provide for the opportunity to recycle disinfected waste fractions, in particular plastics, and allow healthcare facilities to reduce their costs for waste treatment, by selling shredded plastics to recyclers.

10. Healthcare facilities (HCFs) are also a significant source of atmospheric releases of Mercury. Mercury spills and the breakage/disposal of Mercury-containing devices, such as thermometers and sphygmomanometers, are the principal ways by which Mercury from health facilities enters the environment. The use of Mercury-containing devices in healthcare is widespread in the African region, mostly due to limited availability of low cost Mercury-free devices, unfamiliarity with their use as well as occasional donations from abroad.

11. Mercury is also used in the healthcare sector in the form of dental amalgam. The use of dental amalgam is a significant source of Mercury discharge into the environment, including scrap amalgam and amalgam waste. In most Sub-Saharan countries such wastes are predominantly discharged with wastewater into the sewerage, as there are often no solutions available to deal with such waste streams⁶.

12. Mercury is a neurotoxin. Mercury exists in various forms, with each of its forms having different severe toxic effects on human and environmental health. Exposure to elemental Mercury, Mercury in food, and Mercury vapors may pose significant health problems including kidney, heart and respiratory problems, tremors, skin rashes, vision or hearing problems, headaches, weakness, memory problems and emotional changes. Like POPs, Mercury remains in the environment for decades, it is transported long distances and is deposited in the air, water, sediments, soil and biota in various forms. Atmospheric

⁴ (UNDP, 2009) Annex B & C “Guidance on estimating Baseline Dioxin Releases for the UNDP Global Healthcare Waste Project”

<http://www.gefmedwaste.org/downloads/Dioxin%20Baseline%20Guidance%20July%202009%20UNDP%20GEF%20Project.pdf>

⁵ Mercury releases from the breakage of Mercury containing medical devices (thermometers and sphygmomanometers) were calculated using an average release factor of 2.8 g/bed/year, based on data from seven countries; “Baseline Mercury Data from the Health-care Sector,” Annex 3B of “Demonstrating and Promoting Best Techniques and Practices for Reducing Health-care Waste to Avoid Environmental Releases of Dioxins and Mercury,” UNDP Project Document, 2007. Assuming that Ghana counts 22,164 beds, Madagascar 8,146 beds, Zambia 26,961 beds and Tanzania 45,207 beds.

⁶ Dental mercury should also be considered a source of air borne emissions from cremation of dental amalgam.

Mercury can be transported long distances, is incorporated by microorganisms and is concentrated up the food chain. It is because of these characteristics, that Mercury is regarded as a global pollutant.

13. Because of the global threats to human health and the environment from Mercury, the Minamata Convention on Mercury, which was adopted in October 2013, aims to reduce releases of Mercury. The Convention aims to reduce Mercury emissions from all sources, including gold mining, dental amalgam, chlor-alkali plants, coal combustion, waste incineration, smelting and many products containing mercury. In particular, the Convention prohibits the manufacture, import and export of mercury thermometers and sphygmomanometers by the phase-out date of 2020.

14. The proposed regional project therefore aims to support project countries in phasing-down/out the use of Mercury containing medical devices, improving practices for Mercury containing wastes (including dental amalgam), and adopting measures in order to reduce releases of Mercury and meet future obligations under the Minamata Convention⁷.

15. In addition to the benefits of reducing UPOPs and Mercury releases, the proposed project also has a number of secondary benefits, in terms of health as well as social and economic benefits.

16. According to WHO (2000), of the approximate 35 million health workers worldwide, about 3 million (8,5%) receive percutaneous exposures to blood borne pathogens each year (e.g. needle stick injuries with contaminated sharps). This can happen as a result of the mishandling of sharps and their wastes as well as bad practices like recapping of used needles.

17. According to these 2000 estimates by WHO, the inadequate disposal, handling and reuse/recycling of contaminated syringes and other waste items result yearly in 21 million Hepatitis B infections (32% of all new infections), 2 million Hepatitis C infections (40% of all new infections) and 260,000 HIV infections globally (5% of all new infections).

18. Nosocomial infections (“hospital-acquired infections”) caused by infectious waste/blood borne waste or contaminated sites, can result in the transmission of pathogens and re-infection of surgical sites.

19. The burden of disease, as well as the cost implications for Governments’ national budget allocations to treat health impacts caused by the inadequate handling, disposal and reuse of infectious healthcare waste is significant, as such practices not only impact the health of medical staff, but also that of hospital patients, their visitors as well as hospital and non-hospital staff and workers involved in the handling and treatment of infectious healthcare waste.

20. As one of the means to reduce harmful releases from the health sector, the project will improve the overall waste management chain at project facilities, which encompasses: improved procurement; waste classification; waste segregation; waste minimization; handling and collection; on-site transport and storage and finally treatment, disposal and recycling. By improving all these aspects of the waste management chain, this will not only result in a reduction of environmental pollution and negative health impacts caused by UPOPs and Hg but also prevent the spread of infections.

21. Improved waste management practices also have important benefits at national level which can include improved human health through a reduction in the spread of water-borne diseases and malaria; improved environmental health due to reduced water and soil pollution of local resources used by nearby

⁷ The Minamata Convention stipulates that i) Each party shall not allow, by taking the appropriate measures, the manufacture, import or export of mercury added thermometers and sphygmomanometers by 2020 (Annex A, Part 1)⁷ and ii) take measures to phase-down the use of dental amalgam by introducing 2 of 8 stipulated measures.

communities or wildlife; creation of job and livelihood opportunities in the area of waste management, treatment and recycling; and finally, a reduction in the overall costs for waste management.

22. Finally, the project will contribute to the achievement of the Millennium Development Goals (MDGs) in particular MDG 4: Reduce Child Mortality and MDG 5: Improve Maternal Health⁸ as improved HCWM reduces mortality resulting from unsafe and unhygienic delivery⁹. But also MDG 6: Combat HIV/AIDS, malaria and other diseases as improved HCWM can reduce the infection rate of Sepsis, HIV/AIDS, TB and other diseases; and finally of course MDG 7: Ensure environmental sustainability, by reducing releases of UPOPs, Mercury, GHGs, improving procurement and waste management practices leading to reduced environmental pollution.

Baseline Analysis – The Case of Ghana, Madagascar, Tanzania and Zambia

23. For each of the participating project countries an individual project document has been prepared to describe in detail the country-specific baseline as well as country specific project activities and interventions¹⁰. In Annexes I (Ghana), II (Madagascar), III (Tanzania) and IV (Zambia), country-specific HCWM baseline information extracted from the four project documents has been presented, summarizing HCWM related aspects such as:

- The healthcare system and HCW situation
- Existing healthcare waste treatment technologies
- Regulatory and policy framework pertaining to HCWM
- State of municipal waste management and recycling programs
- Involvement of the private sector in HCWM
- Mercury use in the health sector

Annexes I, II, III and IV also provide information on:

1. Country specific project activities
2. Pre-Selected Model Facilities

Summary of the threats, fundamental causes and barriers for the environmentally sound management and treatment of healthcare waste and Mercury containing medical devices

24. The baseline presented in each of the country project documents as well as the information provided in Annexes I – IV identified the following challenges pertaining to HCWM that are encountered in the four project countries. Although these challenges vary from country-to-country, in general these challenges can be summarized as follows:

Inadequate Financial Resources Allocated to HCWM:

- Low priority among implementers (e.g. including Ministry of Finance, Ministry of Health, District Councils and HCFs) results in insufficient financial resources being allocated at facility level to manage healthcare waste properly.
- High capital investment for treatment and disposal options for HCW, which meet international BAT/BEP standards.

⁸ Sepsis infection plays a large role in maternal health infections – about 30% seems related to hospital hygiene – including HCWM.

⁹ In Tanzania, sepsis/pneumonia account for high (30%) causes of infant mortality rate.

¹⁰ These individual project documents are available upon request.

- Inadequate human and financial resources allocated to HCWM at facility level (resulting in absence of sharps containers, liners, bins, absence of PPE, absence of safe transportation trolleys, broken down incinerators, lack of fuel to run the incinerator, etc.)
- Many development partners in the health sector are not primarily interested in HCWM. Even though many donors support health sector programs, seldom aspects related to HCWM are taken up in these programs.
- HCFs are often unaware of real HCWM costs, resulting in no budget or a too low budget allocation for HCWM.

Policies and Regulations:

- Absence of a specific national policy on HCWM.
- Lack of legislation/regulations governing the management of HCW and other hazardous discharges, resulting in a reluctance to adhere to HCWM procedures.
- There are no specific fees and penalties instituted for those acting in contrary to national standards and procedures governing HCWM. When these measures exist, they may not be fully enforced.
- Environmental impact assessments (EIAs) are not taken as a priority before engaging in any health related activities.
- National Policy, guidelines, procedures, monitoring plan and posters, related to HCWM, are not available at many HCFs. There is a need for more advocacy and dissemination of awareness raising materials.

Low Priority Given to HCWM by HCFs:

- Often, HCFs leadership is not interested or committed to HCWM (possibly because HCFs are not assessed on their performance related to HCWM) which results in the fact that waste management and infection prevention committees often do not exist and no HCWM policy or plan is put in place.
- Lack of specific staff to deal with HCWM in particular at ward level (or no one is assigned the responsibility of waste management) and instead it is assumed that it is the duty of health officer and waste handlers. Often nurses and nurse assistant then have to deal with indoor collection of HCW and this causes delays and poor quality of work.

Low Awareness & Low Capacity:

- Generally in-country knowledge on HCWM is low.
- Low awareness among health workers on the dangers of infectious waste as well as lack of knowledge and skills on how to manage healthcare waste, resulting in:
 - o Lack of standard segregation procedures (every hospital having their own approach).
 - o Mixing up of color-coding, resulting in bad segregation.
 - o Lack of standardized safe way of collecting sharps using sharps containers, resulting in overfilling and risk of spillage during transportation of waste.
 - o Highly infectious waste not being separated or pretreated before final treatment/disposal.
 - o Waste treatment technologies often being inadequately operated.
- Healthcare providers, even Environmental Health Officers (EHOs), often do not receive formal training on HCWM. Instead they learn by doing at daily work. There is thus a need for good quality pre-service training, training upon entry-into service for new staff, and regular refresher courses for staff.
- Inadequate institutional capacity at national level (e.g. enforcement agencies) to ensure sufficient and adequate oversight and monitoring of HCFs, as well as transportation and disposal companies, to ensure that best HCWM practices are implemented and adhered to.

Mediocre Quality or Absence of Treatment Technologies:

- Good technologies (meeting BAT/BEP requirements) for treating healthcare waste are expensive and not affordable for many health facilities. This results in HCFs disposing of HCW by open burning, or using old-fashioned single chambered burners or dual-chambered incinerators without pollution control equipment resulting in significant UPOPs and Mercury releases. Many of these technologies are poorly maintained and operated thereby exacerbating the problem.
- No standardized methods or guidelines for the treatment of HCW. As a result facilities can construct their own incinerator of any standard.
- Some HCFs simply mix their infectious waste with municipal waste, which subsequently is disposed untreated at a dumpsite meant for municipal waste.

Maintenance and Repair:

- Poor operation, bad maintenance and absence of repair capacity remain some of the main reasons for breakdown and sub-optimal functioning of existing disposal technologies resulting in frequent breakdowns.
- Absence of maintenance teams or low capacity of such teams in terms of manpower, capacity, know-how, spare parts or the funds to undertake regular trips to service and repair technologies, both at national/regional/district level as well as at HCFs level.

Inadequate infrastructure & disposables:

- Often there are no separate storage facilities available on the health facility's premises for infectious and municipal waste, often resulting in the remixing of previously segregated wastes.
- Personal protective equipment is not always available. If available, only of few items of the recommended ones are used – most often not all.
- Absence of segregation posters; even if standard segregation posters have been designed, stocks of hard copies are often depleted.
- Access to incinerators and waste storage points is often not restricted, creating opportunities for unauthorized personnel and animals to access.
- Waste is often placed in the open or next to the incinerator being exposed to the weather (sun, rain, etc.) and scavenging animals.
- Lack of adequate HCWM supplies and equipment as such items are not included in the MoH catalogue.

For more detailed information on the country's baseline situation, please refer to Annexes I – IV or refer to the country specific project documents.

UPOPs and Mercury Release Baseline

25. In order to be able to measure project progress and impact against the GEF POPs Tracking Tools, a baseline needs to be established.

26. In two of the four project countries (Ghana and Tanzania) sufficient time during the project preparation phase was available to assess a number of Healthcare Facilities. The Individualized-Rapid Assessment Tools (I-RAT), developed under the GEF funded UNDP/WHO/HCWH Global Medical Waste project¹¹ was applied to conduct the assessment. The I-RAT is a rapid assessment tool to obtain an initial indication of the level of healthcare waste management at an individual healthcare facility. The tool results in an overall score out of 100 that can be used to compare and rank healthcare facilities for the

¹¹ (UN/GEF Global Health Care Waste Project, 2009) "Individualized Rapid Assessment Tool (I-RAT)" Available at <http://www.gefmedwaste.org/downloads/I-RAT%20May%202009%20UNDP%20GEF%20Project.xls>

purpose of prioritizing interventions, and can also be used as a quick tool to identify possible areas for improvement within a single facility. In Ghana, 12 HCFs were assessed and in Tanzania six. These assessments, in combination with a number of other studies, provided an indication of the UPOPs and Mercury emissions released by the health sector in the countries as a whole, as well as by individual HCFs, on a yearly basis. The detailed results obtained from the I-RAT assessments are presented in the Ghana and Tanzania project documents.

27. Unfortunately there was insufficient time to conduct such HCF assessments in Madagascar and Zambia. In lieu thereof, the project conducted a desk review of available national documents and assessments, and where possible, extracted relevant information to be able to establish a baseline value for UPOPs and Hg releases from the health sector.

28. Available UPOPs and Mercury baseline information, for each of the project countries, has been presented in the respective country project documents. However a summary of the UPOPs and Hg baseline has been presented in Table 2.

29. In only two of the four project countries a Mercury Inventory Level 1 had been conducted. In the other two countries where no inventory had been undertaken, UNEP's Simplified Toolkit for Identification and Quantification of Mercury Releases (Level 1)¹² was applied to estimate Mercury releases based on population size to calculate the amount of Mercury used in dental amalgam (such calculations have been indicated by "***")¹³. Mercury releases from the breakage of Mercury containing medical devices (thermometers and sphygmomanometers) were calculated using an average release factor of 2.8 g/bed/year¹⁴ indicated by "***".

30. If no data was available on the amount of waste incinerated by a healthcare facility, a factor of 0.275 kg/day was used as the average generation rate of infectious healthcare waste per bed for hospitals was applied.

31. The UNDP (2009) "*Guidance on Estimating Baseline Dioxin Releases for the UNDP Global Healthcare Waste Project*"¹⁵ was used to calculate dioxin emissions based on the type of incinerator used and the amount of HCW incinerated. In Table 2 below the type of incinerator or HCW treatment method is described as well as indicated by a number [#], which corresponds to the emission factors presented in Annex XV.

32. It should be noted that during the project's implementation, after the selection of the HCFs has been finalized and MOUs between the HCFs and the project have been signed, the project will undertake Individualized Rapid Assessments for each of the project's HCFs which will provide detailed insights in the amount of UPOPs produced and Mercury released by a HCF on a yearly basis. With the use of the

¹²

<http://www.unep.org/chemicalsandwaste/Mercury/MercuryPublications/GuidanceTrainingMaterialToolkits/MercuryToolkit/tabid/4566/language/en-US/Default.aspx>

¹³ input factor of 0.15 g Hg/year per inhabitant

¹⁴ Based on data from seven countries; "Baseline Mercury Data from the Health-care Sector," Annex 3B of "Demonstrating and Promoting Best Techniques and Practices for Reducing Health-care Waste to Avoid Environmental Releases of Dioxins and Mercury," UNDP Project Document, 2007.

¹⁵ Available at:

<http://www.gefmedwaste.org/downloads/Dioxin%20Baseline%20Guidance%20July%202009%20UNDP%20GEF%20Project.pdf>

Guidance on “*Measurements and Documentation*”¹⁶, as developed under the Global Medical Waste Project, it will be possible to provide a before and after snap-shot of the project’s impact.

UPOPs & Mercury Baseline per Country

Table 1: UPOPs and Mercury Baselines for each of the project countries

GHANA:

UPOPs – National Level							
Total PCDDs/PCDFs releases [g TEQ/year] NIP (2007)							386
PCDDs/PCDFs releases from the Health Sector [g TEQ/year] NIP (2007)							4.68
PCDDs/PCDFs releases from the Health Sector and power generation/heating combined [g TEQ/year] NIP (2007)							14.8
Mercury – National Level							
Mercury containing Medical Devices** [kg/yr]:			62				
Mercury in Dental Amalgam** [kg/yr]:			107				
Ghana - HCF Level							
	Facility 1: 37 Military Hospital	Facility 2: Koforidua Regional Hospital	Facility 3: Komfy Anokye Teaching Hospital (KATH)	Facility 4: Central Regional Hospital	Facility 5: Winneba	Facility 6: Tarkwa	Facility 7: Tamale
No. of beds	518	350	1200	240	135	156	339
Quantity of Incinerated Waste (tonne/yr)	226.3	18.3	439.8	31.0	13.6	15.7	34.0
Type of Incinerator [emission release factor see Annex XV]	2 Dual Chamber incinerators [7]	Single Chamber / De Montfort? [2]	Single Chamber [2]	Dual Chamber [7]	Hydroclave for sharps. Remainder of the waste burned in the open [1]	Hydroclave for sharps. Remainder of the waste burned in the open [1]	Unknown - assumed open burning [1]
Dioxins emitted (Air) [g-TEQ/year]	0.792	0.732	17.592	0.109	0.089	0.103	0.225
Dioxins emitted (Ash) [g-TEQ/year]	0.014	0.004	0.088	0.002	0.008	0.009	0.020
Mercury releases from devices* [kg/yr]	1.45	0.98	3.36	0.67	0.38	0.44	0.95
Project Baseline (although the model facilities might not be final):							
UPOPs: 19.8 g-TEQ/yr							
Mercury: 8.2 kg/yr							

MADAGASCAR:

¹⁶ Not yet available on-line.

UPOPs – National Level				
Total PCDDs/PCDFs releases [g TEQ/year]			334	
PCDDs/PCDFs releases from waste incineration and uncontrolled combustion processes [g TEQ/year]				
Waste incineration [g TEQ/year]			2 (Air)	
NIP (2008)			15.9 (Residue)	
Uncontrolled Combustion Processes [g TEQ/year]			98.9 (Air)	
NIP (2008)			123.9 (Residue)	
Based on yearly HCW volumes [g TEQ/year]			54,71	
Mercury – National Level				
Mercury containing Thermometers (MoEF, 2008) [kg/yr]: 10.6 (min) and 31.6 (max)				
Mercury in Dental Amalgam** [kg/yr]: 176 (min) and 705 (max)				
Madagascar - HCF Level				
	Facility 1: CHU Joseph Raseta Befelatanana	Facility 2: CHU Mère et Enfants de Tsaralalana	Facility 3: CHU Tambohobe Fianarantsoa	Facility 4: CHRD II Manjakandriana
No. of beds	427	70	450	40
Quantity of Incinerated Waste (tonne/yr)	42.9	7.0	45.2	4.0
Type of Incinerator [emission release factor see Annex XV]	De Montfort Incinerator (functioning) used by the TB ward [2]	De Monfort Incinerator (functioning)? [2]	De Montfort Incinerator (functioning) [2]	De Montfort Incinerator (functioning) [2]
Dioxins emitted (Air) [g- TEQ/year]	1.714	0.281	1.807	0.161
Dioxins emitted (Ash) [g- TEQ/year]	0.009	0.001	0.009	0.001
Mercury releases from devices* [kg/yr]	1.20	0.20	1.26	0.11
Project Baseline (<i>although the model facilities might not be final</i>): UPOPs: 4.0 g-TEQ/yr Mercury: 2.8 kg/yr				

TANZANIA:

UPOPs – National Level					
		Total PCDDs/PCDFs releases [g TEQ/year]	PCDDs/PCDFs releases from the Health Sector [g TEQ/year]	Based on yearly HCW volumes [T/a]	
NIP (2007)		517-gTEQ/a (Air) 249 g-TEQ/a (Residue)	112.84 g-TEQ/a (Air)	2821	
Mercury – National Level					
Mercury containing medical Devices*: 16.7 kg Hg/yr.					
Dental Amalgam**: 343 kg Hg/year					
UPOPs and Hg from HCF Level					
	Facility 1: Muhimbili	Facility 2: Kairuki	Facility 3: Mwananyamala	Facility 4: Sinza	Facility 5: Tumbi Special

					Hospitals
Quantity of Incinerated Waste (tonne/yr)	292	28.5	35.1	5.5	31.9
No. of beds	1363	150	330	106	300
Type of Incinerator [emission release factor see Annex XV]	Double Chamber [7]	Nil/open burning [1]	Double Chamber [7]	Single Chamber [2]	Double Chamber [7]
Dioxins emitted (Air) [g-TEQ/year]	1.022	0.188	0.123	0.220	0.112
Dioxins emitted (ash) [g-TEQ/year]	0.019	0.017	0.002	0.003	0.002
No. of sphygmomanometers purchased each year	0	0	0	0	Unknown
Mercury releases from devices* [kg/yr]	3.82	0.42	0.92	0.30	0.84
Amount of capsules used per year	750	250	0	0	Unknown
Project Baseline (although the model facilities might not be final): UPOPs: 1.7 g-TEQ/yr Mercury: 6.3 kg/yr					

ZAMBIA:

UPOPs – National Level						
Total PCDDs/PCDFs releases [g TEQ/year] NIP (2007)			483.1			
PCDDs/PCDFs releases from the Health Sector [g TEQ/year] NIP (2007)			(Air) 29.6 and (Residue) 0.2			
Mercury – National Level						
No. of Mercury containing thermometers sold each year (ZEMA, 2012)			10,197			
Mercury releases from thermometers [kg/yr] (ZEMA, 2012)			5 kg Hg/yr (min) - 15 kg Hg/yr (max)			
Dental Amalgam** (ZEMA, 2012)			1,957 Kg Hg/year			
Zambia – HCF Level						
	Facility 1: University Teaching Hospital	Facility 2: Ndola Central Hospital	Facility 3: Kabwe General Hospital	Facility 4: Kapiri Mposhi District Hospital	Facility 5: Kamuchanga District Hospital	Facility 6: Mukonchi Rural Health Centre
No. of beds	1,863	502	352	48	60	27
Quantity of Incinerated Waste (tonne/yr) ¹⁷	2,720	733	257	18	22	1
Type of Incinerator [emission release factor see Annex XV]	Macro-burn; can exceed 1000°C [9]	60 kg Macro-Burn [9]	Macro-burn [9]	Open air burning [1]	Brick incinerator [2]	Open air burning [1]
Dioxins emitted (Air)	3.808	1.026	0.360	0.119	0.880	0.007

¹⁷ Calculated based on the following rates: 0.1kg/day for health centres, 1kg/day for First level, 2kg/day for second level and 4kg/day for third level hospital

TEQ/year]						
Dioxins emitted (Ash) TEQ/year]	0.054	0.015	0.005	0.011	0.004	0.001
No. of sphygmomanometers in use (ZEMA, 2012)	292	unknown	unknown	unknown	unknown	unknown
Mercury releases from devices* [kg/hr]	5.22	1.41	0.99	0.13	0.17	0.08
Project Baseline (<i>although the model facilities might not be final</i>): UPOPs: 6.3 g-TEQ/yr Mercury: 8.0 kg/yr						

Stakeholder Analysis

33. Generally, there are a significant number of stakeholders that are involved in aspects of HCWM at national level. Throughout the project's preparation phase (PPG) such stakeholders have been consulted through bi-lateral meetings, national stakeholder and consultation meetings, as well as healthcare facility assessments.

34. In each of the country-specific project documents, a list of stakeholders has been taken up, summarizing the stakeholders involved in the area of Healthcare Waste Management as well as their specific roles and responsibilities in this particular field.

35. In summary, stakeholders involved in the implementation of this project are:

Entity	Roles and Responsibilities pertaining to (Healthcare) Waste
Ministry of Health (MoH) <i>Health and Environment Unit</i> Lead executing agency	<ul style="list-style-type: none"> Responsible for organizing a safe and environmentally sound management system for the management of healthcare waste generated by all government, mission, private and health facilities in the country and facilitate and support various measures directed towards managing environmental impacts, from the health sector.
Ministry of Environment (MoE)	<ul style="list-style-type: none"> Responsible for providing policies pertaining to environmental protection e.g. such as National Environmental Policies, Environmental Management Acts and their Regulations, programmes and projects.
Ministry of Local Government (MoLG) and Municipalities/City Councils	<ul style="list-style-type: none"> Regulate and supervise waste management in municipalities/districts/councils. In towns, the urban local authorities are responsible for the provision of containers for waste collection, the transportation of the waste from the point of collection to the disposal site, proper disposal of the waste as well as management of the landfill/disposal site.
Environmental Protection Agency (EPA)	<ul style="list-style-type: none"> Draft environmental regulations and guidelines. Support enforcement and compliance pertaining to environmental protection and pollution control. Review and monitor environmental impact assessments (EIAs), facilitate public participation in environmental decision-making and supervise and co-ordinate environmental management issues.
Pharmacy Board (Chief Pharmacist & National Centralized Procurement Division)	<ul style="list-style-type: none"> The Chief Pharmacist can propose changes to the health specific procurement catalogue and advise the pharmacy board on changes and additions to the current offer of devices/products and supplies for public healthcare facilities (e.g. relevant for the introduction of Hg and PVC-free alternatives).
Healthcare Facilities (HCFs)	<ul style="list-style-type: none"> The heads of health facilities are responsible for the health protection and safety of the staff, patients and visitors and bear the responsibility for the safe disposal of health-care waste generated within their health management systems to safeguard the general public. In HCFs where there is an Environmental Health Technician/Environmental Health Officer, (s)he is responsible for the development of the HCWM plan in the hospital and for the day-to-day operation and monitoring of the waste management system at the hospitals.
National Dental Association (NDA)	<ul style="list-style-type: none"> NDA is a key partner in supporting the development of guidelines for best practices pertaining to Hg/dental amalgam management, disposal practices and dissemination of information related to best amalgam practices and guidelines among dental association members. The NDA can also play an important role in encouraging a ban on the mixing of dental amalgam at dental offices and promoting a shift towards pre-mixed capsules or preferably alternative restorative materials.
Medical Universities, colleges and medical/nursing schools	<ul style="list-style-type: none"> Offer education and training in HCWM at national and facility levels (e.g. diploma courses in Environmental Health for example at a School of Medicine)
Private Sector	<ul style="list-style-type: none"> In many of the project countries, the private sector is engaged – through Public Private Partnerships (PPPs) in the collection and haulage of municipal solid waste, sometimes

	also hospital waste. <ul style="list-style-type: none"> • In Madagascar and Zambia, the private sector is already involved in the collection and centralized treatment of HCW.
Development partners in the health sectors	<ul style="list-style-type: none"> • Donor agencies and international organization support country initiatives through financing, project management and technical expertise in the area of Healthcare Waste Management (e.g. WHO, UNICEF, UNHABITAT, Health Care Without Harm, World Bank, USAID, JSI, Jhpiego, CDC)
NGOs	<ul style="list-style-type: none"> • Supplement government efforts in curbing environmental impacts from hazardous waste practices through targeted interventions at national, regional and global level. • Create awareness on health impact arising from HCW and hazardous substances.

II. STRATEGY

Policy conformity

Stockholm Convention on POPs & National Implementation Plan

36. The participating project countries (Ghana, Madagascar, Tanzania and Zambia) have ratified the Stockholm Convention which calls for “priority consideration” of alternative technologies that avoid the formation of dioxins and furans, such as non-incineration technologies identified in the BAT/BEP guidelines.

37. The countries’ respective National Implementation Plans (NIPs) identify medical waste incineration as a significant source of dioxins/furans and Governments plan to apply BAT/BEP guidelines in keeping with Stockholm Convention obligations. In Table 3 below an overview is provided of the national objectives and action plans related to PCDD/Fs reduction and medical waste disposal/incineration as included in the countries’ existing NIPs.

Table 2: Summary of national priorities pertaining to PCDD/Fs reduction and medical waste incineration as included in participating countries’ NIPs

Ghana:
<p>In the case of Ghana, national objectives and activities related to UPOPs reduction and medical waste disposal/incineration have been described in detail in its 2007 NIP. Medical waste incineration was among the main sources of PCDDs/PCDFs in Ghana in 2002.</p> <p>Measures to reduce releases from unintentional production (as included in the Action Plan) include establishing appropriate policy and legislation for effective regulation and enforcement of prevention of unintentional production of PCDD/F, HCB and PCBs, and eliminating/reducing releases of PCDD/F, HCBs and PCBs from incineration of medical waste by, among others, developing a phase out strategy for all old and existing methods of incineration in hospitals and health centers, and developing institutional and human resource capacity to implement national medical waste management guidelines.</p>
Madagascar:
<p>In the case of Madagascar, national objectives and activities related to UPOPs reduction and medical waste disposal/incineration have been described in detail in its 2008 NIP. Among the action plans included in the NIP, Action plan one (1) of six (6) focusses concern on dioxins and furans. The main objective under this action plan is to “Reduce by 50% UPOPs emissions from Municipal and Hazardous Waste Management in the Analamanga region.”</p> <p>Listed activities to achieve this objective include undertaking a feasibility study to (i) reduce UPOPs emissions from incineration of municipal and medical waste in the Analamanga region, and (ii) mobilizing financial resources and (iii) putting in place the infrastructure, materials and equipment necessary to reduce UPOPs emissions.</p>
Tanzania:
<p>In the case of Tanzania, national objectives and activities related to UPOPs reduction and medical waste</p>

disposal/incineration have been described in detail in its 2005 NIP (VPO, 2005):

The NIP Action Plan for the Reduction of Releases from Unintentional Production of PCDD/PCDFs ranks interventions in the following order of priority:

- i. Establishing a coordination mechanism for management of PCDD/PCDF releases;
- ii. Instituting a mechanism for PCDD/PCDF management control;
- iii. Promoting and encouraging adoption of BAT/BEP;
- iv. Promoting research on alternative materials/technologies
- v. Formulating and implementing training programmes on PCDD/PCDF management;
- vi. Establishing monitoring programmes on emissions of PCDD/PCDF;
- vii. Searching and implementing practical measures to reduce or eliminate PCDD/PCDF at source;
- viii. Assessing and effecting remedial measures/clean-up campaigns of areas suspected to be contaminated with PCDD/PCDF;
- ix. Review of and formulation of policies /regulations on management of PCDD/PCDF in line with the Stockholm Convention;
- x. Creating public awareness on PCDD/PCDF sources and their effects on human health and the environment; and
- xi. Carrying out further inventory in areas not covered in the previous inventory.

Zambia:

Zambia's national objectives and activities related to UOPs reduction and medical waste disposal/incineration has been described in detail in its 2007 NIP:

Objective: Reduction of emissions from medical waste incineration category by 95% of the value in the 2004 base national inventory, through the following activities:

1. Train medical personnel and medical waste handlers in medical waste management to update them on aspects of PCDD/F emissions.
2. Create self sustaining centralized treatment facilities and upgrade incinerator technology.
3. Employ appropriate alternative technologies/apply BAT/BEP from the SC guidance document.

In addition, the 2007 NIP lists as one of the four national priorities with respect to POPs management the strengthening of the existing legal framework in order to address PCDD/F releases. In specific with respect to the sound management of UOPs it also identifies the following issues in order of priority:

1. Set up educational, monitoring and enforcement guidelines.
2. Implement a measurement monitoring programme to enforce set minimum emission levels.
3. Measure data generation and put in place appropriate infrastructure and equipment.
4. Implement policy changes so that guidelines are transposed into legislation.

38. Although Madagascar (through GEF/National Execution), Tanzania (GEF/UNIDO support) and Zambia (GEF/UNIDO) are currently in the process of updating their NIPs, it is expected that the objectives and proposed activities related to HCWM and reduction of UOPs emissions from the health sector, will not vary greatly as the baseline and challenges faced in the area of Healthcare Waste Management have not significantly changed since the preparation of the countries' first NIP.

39. The proposed project will coordinate closely with the expert teams involved in the NIP updates to ensure that data and information obtained by the proposed project complements and supplements information and data obtained as part of the NIP updating process, and vice-versa.

40. It can be concluded that based on the objectives and activities proposed as part of the countries' first NIP, the proposed project is entirely in line with national priorities in this area.

Minamata Convention on Mercury

41. In October 2013, the Governments of the Republic of Madagascar, the United Republic of Tanzania and the Republic of Zambia signed the Minamata Convention on Mercury. The Government of the Republic of Ghana has not (yet) signed the Minamata Convention.

42. None of the project countries have (yet) undertaken a detailed Mercury Inventory (Level 2) or started a Minamata Initial Assessment (MIA), although Madagascar and Zambia undertook a Level 1 Mercury Inventory in 2008 and 2012 respectively. It is expected though that all four project countries will submit, with the support of different GEF Agencies, Enabling Activity (EA) requests to the GEF before the end of GEF-V, in order to undertake MIAs. This is assuming that Ghana will be able to sign the Minamata Convention before the GEF-V deadline elapses.

43. Once the Minamata Convention has been ratified by the four project countries and the Convention has been domesticated, Mercury-added products, such as thermometers and sphygmomanometers, will have to be phased out by 2020 in accordance with Article 4 – paragraph 1. From that date onwards, the manufacture, import and export of Mercury-added products will no longer be allowed. The Convention also expects countries to introduce a minimum of 2 measures with the objective to phase down the use of dental amalgam, in accordance with article 4 – paragraph 3.

44. The proposed project is entirely in line with the objectives of the Minamata Convention as it will support countries in preparing to meet their future commitments under the Convention.

Libreville Declaration on Health and Environment

45. Ministries of Health and Environment in the four project countries are among the 53 African countries that adopted the Libreville Declaration in August 2008 which recognized the problems of poor waste management and toxic substances. In the Declaration, these African Governments committed to develop regional, sub-regional, and national frameworks to address environmental impacts on health through policies and national plans; and build regional, sub-regional, and national capacities to prevent environment-related health problems.

46. In Table 4 below are the actions summarized that the four project countries have taken in support of the Libreville Declaration.

Table 3: National Actions in Support of the Libreville Declaration

Tanzania:
The Ministry of Health and Social Welfare (MoHSW) and the Vice President Office-Division of Environment (VPO-DoE), with the financial and technical support from WHO Tanzania Country Office (WHO-TZ) and technical support of experts from Government sectors, Kenya WHO consultant and representative National Institutions (Country Task Team) conducted a National Situational Analysis and Needs Assessment (SANA) on Health and Environment inter- linkage in 2010.
The MoHSW and VPO-DoE with the financial and technical support from WHO-TZ invited representatives and technical support of experts from government sectors, national institutions and other stakeholders to prepare a National Joint Plan of Action (JPA) which was finalized in 2013 (GoT, 2013).
Madagascar:
The Ministry of Public Health (MoPH) and the Ministry of Environment, Ecology and Forests (MoEEF) with the financial and technical support from WHO, conducted a National Situational Analysis and Needs Assessment (SANA) on Health and Environment inter-linkage in 2010.
Ghana:
The Ministry of Health and the Ghana Environmental Protection Agency with the financial and technical support from WHO conducted a National Situational Analysis and Needs Assessment (SANA) on Health and Environment inter-linkage in 2010. The Ministry of Health's primary mission is the protection of the health of the population.

Safe, efficient and continuous waste management has been taken up as one of the key strategies for quality service provided by medical facilities. However, it is often overlooked as it takes place in healthcare facilities, and in central and rural areas of the country. Indeed, surveys conducted before the crisis showed the necessity to strengthen the medical waste management system which has led to the preparation of development plans including priorities and proposed interventions pertaining to health care waste management

Zambia:

Zambia's current National Health Strategic Plan (MoH) (2011 – 2015) specifically mentions improved Healthcare Waste Management which is covered under:

5.1.2.12.2 Key Strategies:

- 4 Strengthen national healthcare waste management at all levels of care.

The Vision 2030. The health sector vision is “Equitable access to quality healthcare by all by 2030”, while that for HIV/AIDS is “A nation free from the threat of HIV/AIDS by 2030”.

The Sixth National Development Plan “Sustained economic growth and poverty reduction”. One of the objectives of the SNDP under the Health sector is “To provide infrastructure, conducive for the delivery of quality health services”. Among other strategies, the SNDP sets out to “Equip hospitals, health posts and health centres”.

The **National Policy on Environment** has an overarching objective of supporting the government's development priority to eradicate poverty and improve the quality of life of the people of Zambia. In order to achieve this, the policy has a set of strategies some of which are related to (hazardous) waste management) Encourage adoption of systems that sort industrial, clinical, domestic and other waste at source in order to facilitate recycling of materials wherever possible; ii) Encourage privatisation of waste management; iii) Educate the public and local experts on best systems for design and implementation of sanitation projects and approaches to control and ameliorate the spread and impact of HIV/AIDS upon communities; iv) Strengthen the health inspectorate for urban and rural areas in order to assess the risks and consequences of environmentally related health problems; v) Ensure that all hospitals, clinics, public places and residential areas have appropriate sanitation and waste and effluent disposal systems; vi) Strengthen inspections of work environments and improve knowledge of occupational hazards and safety measures.

National Health Policies and Plans

47. The four project countries and HCWM related aspects as taken up in their national health policies and plans, have been summarized and presented in Table 5 below. The proposed project is therefore deemed entirely in line with the country's policies, plans and priorities.

Table 4: National Health Policies and Plans and related HCWM targets

Tanzania:

The 2009 – 2015 3rd Health Sector Strategic Plan (HSSP III)¹⁸ published in 2008 by the Ministry of Health and Social Welfare, is the key policy document for the health sector in Tanzania for the period July 2009 – June 2015. It serves as the guiding document for the development of Council and hospital strategic plans and for annual work plans.

The plan emphasizes the need for HCWM implementation at all levels and indicates that the ministry will speed up implementation of the national HCWM Plan. “6.12 Other Important Issues” (see table below) includes capital investments for existing health infrastructure (including waste disposal), rehabilitation and maintenance of equipment as well as the development of guidelines and standard operating procedures (SOPs).

¹⁸

<https://extranet.who.int/nutrition/gina/sites/default/files/TZA%202009%20Health%20Sector%20Strategic%20Plan%20III.pdf>

Table 5: HCWM related objectives as taken up in Tanzania's HSSP III

6.12 Other important issues			
Capital Investments			
Strategic Objectives	Expected results HSSP III	Indicator	Means of Verification
1. To maintain and improve the existing health infrastructure, equipment and means of transport to meet the demands for service delivery	Guidelines and standard operating procedures for infrastructure maintenance (including waste disposal and water supply) and rehabilitation, for maintenance of equipment as well as for means of transport available in CHMTs and hospitals.	Guidelines and SOPs available	Review RHMT supervision reports
	Councils, hospitals, regions, training institutions MDAs implement ² maintenance and replacement programme, using available financing options	Number of health facilities rehabilitated Number of running vehicles per Council	Review annual district reports
	Zonal workshops provide on-demand services to CHMTs and health facilities in maintenance of equipment	Number of repairs in zonal workshops	Review Zonal workshop reports
Madagascar:			
<p>Madagascar has a Development Plan for the Health Sector (2007- 2012), however its implementation never materialized because of the socio-political situation in the country. The plan is currently being implemented for the period 2015-2019. The Ministry of Health's primary mission is the protection of the health of the population. Safe, efficient and continuous waste management is among one of the key objectives as part of quality services provided by medical institutions. However, it is often overlooked as it is taking place in health facilities, and in rural areas located far away from the Ministry of Health. Indeed, surveys conducted before the crisis showed the necessity to strengthen the system of medical waste management leading to the preparation of development plans including health care waste management.</p>			
Ghana:			
<p>Ghana's National Health Policy "Creating Wealth through Health" (MoH, 2007)¹⁹ identifies that a safe and healthy environment including the quality of air, water and soil has major implications for the health of Ghanaians. However, the air, water and soil are being polluted by littering, improper disposal of waste, emissions from industry and vehicles, and smoke from burning of waste and bush fires. It concludes that the development of infrastructure for waste management has not kept pace with population growth.</p> <p>The NHP proposes a number of policy measures which are related to (Healthcare) waste management, these are: Develop standards and implement programmes and initiatives for promoting healthy settings, as in:</p> <ul style="list-style-type: none"> • Healthy communities, in collaboration with local government, rural development agencies, community leaders and water and sanitation departments to ensure access to safe water and sanitation by <ul style="list-style-type: none"> (i) advocating for public-private collaboration and more private provision and financing of waste management, (ii) scaling-up the WASH (Water, Sanitation and Health) model in deprived communities, and (iii) strengthening the monitoring of water quality, advocating for increased investments in water, and promoting new approaches to water use. • To provide increasing managerial and financial autonomy for public health institutions within a strengthened framework for public accountability, with a view to achieving overall efficiency in service delivery, reducing waste and improving responsiveness to local needs. • Promotion and increase in research and advocacy leading to the adoption of appropriate and cost-effective systems for waste management, including plastic, liquid and solid waste • To advocate for increased financing in health promotion, water and sanitation, including/especially waste management 			
Zambia:			
<p>Zambia's current National Health Strategic Plan (MoH) (2011 – 2015) specifically mentions improved Healthcare Waste Management which is covered under:</p> <p>5.1.2.12.2 Key Strategies:</p> <ul style="list-style-type: none"> ▪ 4 Strengthen national healthcare waste management at all levels of care. 			

¹⁹ (Ghana MoH, 2007) National Health Policy "Creating Wealth through Health" http://www.moh-ghana.org/UploadFiles/Publications/NATIONAL%20HEALTH%20POLICY_22APR2012.pdf

The Vision 2030. The health sector vision is “Equitable access to quality healthcare by all by 2030”, while that for HIV/AIDS is “A nation free from the threat of HIV/AIDS by 2030”.

The Sixth National Development Plan “Sustained economic growth and poverty reduction”. One of the objectives of the SNDP under the Health sector is “To provide infrastructure, conducive for the delivery of quality health services”. Among other strategies, the SNDP sets out to “Equip hospitals, health posts and health centres”.

The **National Policy on Environment** has an overarching objective of supporting the government's development priority to eradicate poverty and improve the quality of life of the people of Zambia. In order to achieve this, the policy has a set of strategies some of which are related to (hazardous) waste management: i) Encourage adoption of systems that sort industrial, clinical, domestic and other waste at source in order to facilitate recycling of materials wherever possible; ii) Encourage privatisation of waste management; iii) Educate the public and local experts on best systems for design and implementation of sanitation projects and approaches to control and ameliorate the spread and impact of HIV/AIDS upon communities; iv) Strengthen the health inspectorate for urban and rural areas in order to assess the risks and consequences of environmentally related health problems; v) Ensure that all hospitals, clinics, public places and residential areas have appropriate sanitation and waste and effluent disposal systems; vi) Strengthen inspections of work environments and improve knowledge of occupational hazards and safety measures.

48. The proposed project is entirely in line with the objectives and targets as taken up in the project countries' national plans and policies pertaining to HCWM.

Project objective

49. The Africa Regional Healthcare Waste Project seeks to:

1. Implement best environmental practices and non-incineration and Mercury-free technologies to help African countries meet their Stockholm Convention obligations and to reduce Mercury use in healthcare;
2. Enhance the availability and affordability of non-incineration waste treatment technologies in the region, building on the outcomes of the GEF supported UNDP/WHO/HCWH Global Medical Waste project.

50. The project intends to achieve these objectives through 6 main project interventions:

1. Build national capacity to enable the assessment, planning, and implementation of healthcare waste management (HCWM) systems.
2. Develop/improve the national policy and regulatory framework pertaining to HCWM.
3. Make available affordable non-incineration HCWM systems and mercury-free devices that conform to BAT and international standards.
4. Demonstrate HCWM systems, recycling, mercury waste management and mercury reduction at project facilities.
5. Establish national HCWM training infrastructures.
6. Create awareness on HCWM.

51. These project interventions will be described in more detail in the section on “*Project Components, Outcomes and Outputs*”.

Non-incineration and Mercury-Free Technologies

52. Considering that in the Sub-Sahara region the use of non-incineration technologies for treating healthcare waste is fairly new or in certain countries even non-existent, this section aims to provide a bit

more information on the treatment of healthcare waste using non-incineration technologies, and the approach the projects aims to apply.

Waste Treatment Approach

53. In general, there are three approaches for the treatment of HCW (see figure 1):

- **On-site (OS)** – A healthcare facility treats its own waste.
- **Cluster treatment (Cluster)** – A hospital treats its waste plus waste from other health facilities in a small area.
- **Central treatment (CTF)** – dedicated treatment plant collects and treats wastes from many health facilities in an urban center or region.

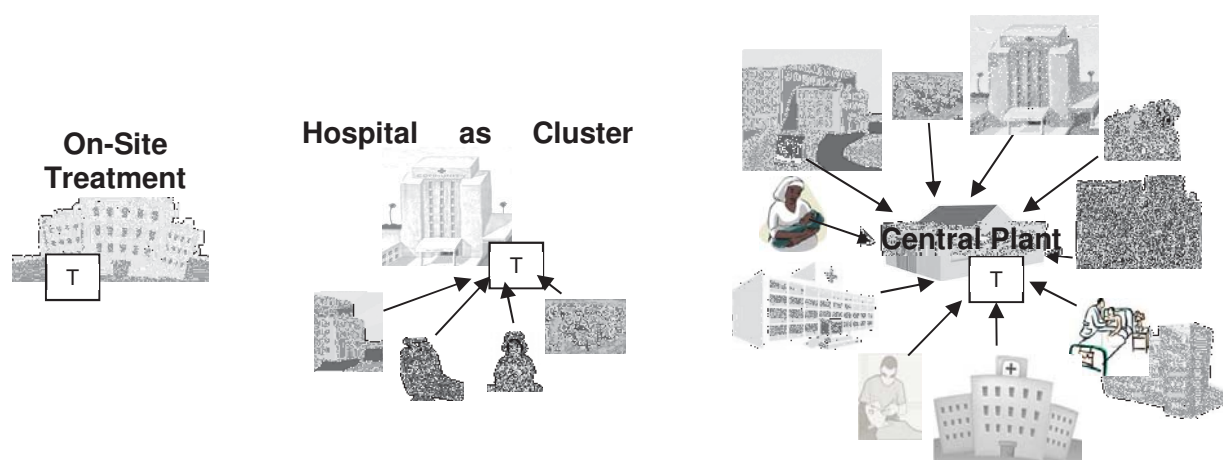


Figure 1: HCW Treatment Approaches

54. In total, the project aims to support a total of four central treatment facilities, 22 hospitals (with an average of 150 beds) and two dozen health posts in the four countries. Initially, in each country, the project will support:

- ☐ **One central/cluster treatment facility**
- ☐ **2 hospitals** (up to 300 hospital beds)
- ☐ **3 rural health posts** or dispensaries

55. *Note:* After the Mid-Term Evaluation (MTE) and based on criteria agreed upon by all the project countries at the first regional project meeting, additional facilities will be supported in the second half of the project's implementation (14 additional hospitals averaging 150 beds each and 12 additional rural health posts). In which country(ies) these facilities will be located – will depend upon the results of the MTE.

56. It should be noted that because the HCWM situation in the four project countries is very different, the size and type of facilities to be supported by the project vary from country to country and so do their locations and the circumstances under which they operate. As such the project will support a different set-up in each of the countries.

57. In Annex I (Ghana), II (Madagascar), III (Tanzania), IV (Zambia) the pre-selected model facilities in each of the project countries have been presented. At the start of the project the project's final approach will be agreed upon with all the project countries.

Non-incineration technologies

58. One of the main project objectives is to *“Implement best environmental practices and non-incineration and Mercury-free technologies to help African countries meet their Stockholm Convention obligations and to reduce Mercury use in healthcare.”*

59. The proposed regional project aims to reduce the reliance of African countries on heavily polluting low-cost low technology incineration and create a tipping point for the use of non-incineration technologies which will generate significantly less air pollutants than incinerators and other high-heat thermal processes. The use of non-incineration technologies can also provide for the opportunity to recycle disinfected waste fractions, in particular plastics, and allow Healthcare facilities to reduce their costs for waste treatment, by selling shredded plastics to recyclers.

60. State-of-the-art non-incineration technologies that are considered cost-effective alternatives to incineration are (WHO, 2013):

- Autoclaves
- Hybrid autoclaves & continuous steam treatment systems
- Microwave technologies
- Frictional heating systems
- Dry heat treatment systems
- Chemical disinfection systems (e.g., ozonation)
- Alkaline hydrolysis technologies (for anatomical waste and animal carcasses)

61. The choice of treatment system involves consideration of waste characteristics, technology capabilities and requirements, environmental and safety factors, and costs – many of which depend on local conditions. Factors to consider include:

<ul style="list-style-type: none"> • Waste characteristics • Quantity of wastes for treatment and disposal • Capability of the health-care facility to handle the quantity of waste • Types of waste for treatment and disposal • Technology capabilities and requirements • Local availability of treatment options and technologies • Capacity of the system • Treatment efficiency • Volume and mass reduction • Installation requirements • Available space for equipment • Infrastructure requirements • Operation and maintenance requirements • Skills needed for operating the technology 	<ul style="list-style-type: none"> • Environmental and safety factors • Environmental releases-care activities • Location and surroundings of the treatment site and disposal facility • Occupational health and safety considerations • Public acceptability • Options available for final disposal • Regulatory requirements • Cost considerations • Equipment purchase cost • Shipping fees and customs duties • Installation and commissioning costs • Annual operating costs, including preventive maintenance and testing • Cost of transport and disposal of treated waste • Decommissioning costs.
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62. It should be noted that no “*one solution fits all*” approach will be supported by the project. Based on the needs and requirements for each of the selected project facilities, technical specifications will be drawn up based upon which international procurement will be undertaken (see also Section VI on procurement).

63. It should be noted that although UNDP has prepared compilations under the GEF/UNDP/WHO/HCW project on non-incineration technology vendors^{20,21,22}, the UNDP GEF project will not endorse any of the technologies, companies or brands in the lists provided and does not claim that this is a comprehensive list of non-incineration treatment technologies. The UNDP GEF project does not make any warranty, expressed or implied, with respect to the use of any of the technologies in those lists and does not assume any liability with respect to their use.

64. Procurement will be based on technical specifications drawn up by the national project teams, under the lead of the Project’s Chief Technical Advisor (CTA) and National Implementing Entity/Responsible Partners in each of the project countries, which are:

- **Ghana:** Ministry of Health
- **Madagascar:** Ministry of Health and Social Welfare & Ministry of Environment
- **Tanzania:** Ministry of Health and Social Welfare
- **Zambia:** Ministry of Health & Ministry of Lands, Natural Resources and Environmental Protection

For more information on the project’s procurement approach, see Section VI.

Mercury Free & PVC Free

65. At national level, efforts will be undertaken to introduce measures to reduce the import and use of Mercury-containing devices as well as minimize the use of PVC containing medical plastics. For nearly all uses of Mercury in healthcare, there are safe, cost-effective non-Mercury alternatives available^{23, 24}. Similarly the healthcare market has responded to concerns about PVC use and is increasingly bringing to market new alternatives. Many of the devices are cost competitive with PVC products²⁵.

²⁰ (UNDP/GEF, 2012) “Compilation of Steam-based Treatment Technology Vendors”. Available at: <http://www.gefmedwaste.org/downloads/COMPILATION%20OF%20VENDORS%20OF%20WASTE%20TREATMENT%20AUTOCLAVE,%20MICROWAVE,%20AND%20HYBRID%20STEAM-BASED%20TECHNOLOGIES%20AUG%202012.pdf>

²¹ (UNDP/GEF, 2012) “Compilation of Vendors of Frictional Treatment Technologies”. Available at: <http://www.gefmedwaste.org/downloads/Compilation%20of%20Vendors%20of%20Frictional%20Treatment%20Technologies%20August%202012.pdf>

²² (UNDP/GEF, 2010) “Compilation of Vendors of Alkaline Hydrolysis Technologies”. Available at: <http://www.gefmedwaste.org/downloads/Compilation%20of%20Vendors%20of%20Alkaline%20Hydrolysis%20Technologies%20August%202012.pdf>

²³ (WHO, 2011) “*Replacement of mercury thermometers and sphygmomanometers in healthcare*” (English, Russian, Spanish) Available at: http://www.who.int/water_sanitation_health/publications/2011/mercury_thermometers/en/

²⁴ (HCWH) “Mercury Elimination Guides for Hospitals” (available in English, Spanish, Portuguese and Chinese)” http://www.who.int/water_sanitation_health/publications/2011/mercury_thermometers/en/

²⁵ A list of PVC-free medical devices can be found at http://www.hcwh.org/lib/downloads/pvc/Alternatives_to_PVC_DEHP.pdf.

66. In the next section, activities pertaining to the phase out/phase-down and waste management of Mercury and PVC containing items will be further described.

Project components, outcomes and outputs

67. The proposed project has five components, as indicated below, with expected outcomes and outputs for each:

Component 1. Disseminate technical guidelines, establish mid-term evaluation criteria and technology allocation formula, and build teams of national experts on BAT/BEP at the regional level [*Regional component*]

Outcome 1.1	Technical guidelines, evaluation criteria and allocation formula adopted Output: Mid-term evaluation criteria and formula for the allocation of technologies among countries agreed upon.
Outcome 1.2	Country capacity to assess, plan, and implement healthcare waste management (HCWM) and the phase-out of Mercury in healthcare built Output: Teams of national experts trained (at the regional level).
GEF funding:	401,172 US\$
Co-financing:	1,800,000 US\$

Outcome 1.1

68. At the start of the project, a regional conference will be organized in one of the project countries or in Istanbul. Country Governments will be represented through the government entity responsible for project implementation (e.g. the Ministry of Health). During the conference the countries will agree on the selection of the beneficiary health-care facilities/Central treatment facilities that will receive the *initial set*²⁶ of non-incineration HCWM systems and Mercury-free devices (see project *Component 3*).

69. For each of the countries, it is expected that the lead Ministry, in accordance with interest expressed by the project beneficiaries (e.g. HCFs and CTFs), will opt for a combination of the following:

- Development of one central or cluster treatment facility.
- Up to two hospitals (up to 300 hospital beds).
- Three rural health posts or dispensaries.

70. During the PPG phase of the project, an initial set of criteria for the selection of HCFs was drafted (see Annex VIII), and adjusted based on discussions with national project stakeholders. After agreement on the criteria was reached, a number of health-care facilities were selected that met the proposed criteria. In Ghana and Tanzania these selected HCFs participated in an initial assessment that was conducted as part of the project's preparation phase. Unfortunately in Madagascar and Zambia the time-frame for conducting such assessments was insufficient. Based on stakeholders consultations, the results from the assessments in Ghana and Tanzania and the selection criteria, agreement was reached with the Ministries of Health of the project countries on a preliminary list of facilities. A description of these facilities is presented in Annex I – IV.

71. During this regional conference, the Governments will also agree on:

²⁶ Based on the findings of the project's MTE, it will be decided in which countries additional HCFs will be selected to receive non-incineration technologies and Mercury-free devices, and which countries need additional support to import BEP/BAT at HCFs support during the first phase.

- A technology allocation formula (“*how many technologies will each country/facility receive*”);
- The criteria for the project’s mid-term evaluation; (“*based on which criteria will the evaluation team decide whether a country is ready to receive additional non-incineration technologies and Mercury-free devices, or whether instead it is better to improve BAT/BEP at already supported facilities*”)?
- An allocation formula for additional technologies (“*how many additional technologies will each country/facility receive in the second half of the project*”)

72. The mid-term evaluation would take place after the project has been in implementation for at least two years. In order to evaluate the progress of the countries and facilities in adopting BEP and BAT, it would be advised that the mid-term evaluation would not take place until the majority of the project beneficiaries has operationalized their non-incineration technologies and has taken to using their Mercury-free devices.

73. Based on the countries’ and facilities’ progress as indicated during the project’s mid-term evaluation, a decision would be made on which countries would be able to accept additional non-incineration and Mercury-free medical devices and which ones would not. The criteria for the decision on which countries would be able to accept more technologies and devices, and if so how many, would need to be taken at the start of the project (also referred to as a “*formula for the allocation of additional HCWM systems and Mercury-free devices*”).

Outcome 1.2:

74. An intensive training workshop will be conducted at regional level to prepare teams of national experts comprised of government personnel (National Project Director) and local consultants (1 National Technical Coordinator and 3 Technical Advisors/Experts) selected by the countries. The teams will undergo comprehensive training in non-incineration HCWM systems, policies, waste assessments, UNDP GEF and WHO tools, national planning, BAT/BEP guidelines, Mercury phase-out, international standards, and other technical guidelines and well as project implementation related activities (Gantt charts, critical path analysis, budgeting, monitoring, etc.)

75. Master trainers will receive intensive training in content, effective teaching methods, evaluation tools, and Training of Trainers programs.

76. The training workshops will bring about a common understanding of project objectives and deliverables; foster regional cooperation and information exchange; reduce project costs; facilitate planning; and ensure consistency with international standards and guidelines.

Component 2. Healthcare Waste National plans, implementation strategies, and national policies in each recipient country [National component]

Outcome 2.1	Institutional capacities to strengthen policies and regulatory framework, and to develop a national action plan for HCWM and Mercury phase-out enhanced Output: National policy and regulatory framework for HCWM and Mercury phase-out.
Outcome 2.2	National Plan with Implementation Arrangement adopted National action plan including the selection of up to 1 central or cluster treatment facility, 2 hospitals, and 3 small rural health posts as models
GEF funding:	423,235 US\$

Outcome 2.1:

77. Upon their return to their respective countries, the national teams will assess and strengthen national policies, regulatory framework, and national plans for HCWM and Mercury. Based on their assessment a detailed proposal for intervention supported by the project on improving the policy and regulatory framework will be made.

78. In each of the country-specific project documents, recommendations for policy and regulatory improvements for each of the project countries have already been taken up.

Outcome 2.2:

79. Based on the agreements reached during the regional conference within the presence of all the project countries, a national plan will be drawn up by each of the project countries. Such a national plan could include a combination of centralized, cluster, and in-premise treatment systems and their corresponding infrastructures; development or integration of recycling networks and safe disposal sites; set-up of centralized and in-premise storage for healthcare Mercury waste; promulgation of standards for Mercury-free devices; and the selection of up to three health posts, two model hospitals and one central or cluster treatment facility partly based on UNDP GEF and WHO rapid assessment tools, costing, and other tools.

80. The team of national experts will prepare the model facilities to receive non-incineration HCWM systems and Mercury-free devices. The preparation will include the following activities:

- Finalizing MOUs with the model HCFs.
- Conducting detailed baseline assessments of each of the project model facilities²⁷ (including waste quantities, types of waste, current segregation, storage, transport and treatment practices, etc.)
- Setting up HCWM committees at each of the HCFs.
- Developing and implementing HCWM policies and procedures (including monitoring) at facility level.
- Developing and implementing HCWM plans (including Mercury Management) for each of the project facilities.
- Training staff in best practices related to HCWM.
- Undertaking staff preference studies to select cost-effective alternatives to Hg (types, features, etc.) and PVC containing products. This will become the basis for procurement of Mercury-free devices under Component 3a.

81. The team of national experts will prepare the central or cluster facilities to receive the large-scale non-incineration technologies. The preparation could include the following activities:

- Finalizing the MOUs with all stakeholders involved in the central/cluster facility, including the HCFs that will be served by it.
- Obtaining data from all the HCFs to be served by the central/cluster facility in order to specify the required capacity for the procurement.

²⁷ These include HCFs that receive treatment technologies from the project – but also those hospitals served by a central treatment facility – which is being supported by the project.

- Working with the HCFs to minimize their waste and improve segregation.
- Working with the landfill operator to recommend improvements in the landfill if needed.
- Conducting routing optimization studies to minimize fuel and other transportation costs, and working with the central/cluster facility on the layout and design of the treatment facility.
- Exploring public-private partnership arrangements if appropriate.
- Providing assistance to the central/cluster facility and stakeholders on an economic cash flow analysis, a business plan including cost recovery through revenues from fees and recycling, a plan for the management and operation of the facility, and other plans to ensure sustainability as appropriate.

Component 3a. Make available in the region affordable non-incineration HCWM systems and Mercury-free devices that conform to BAT and international standards
[Regional component]

Outcome 3a	Favourable market conditions created for the growth in the African region of affordable technologies that meet BAT guidelines and international standards
	Output 3a.1: HCWM systems and Mercury-free devices for at least 3 health posts, 2 hospitals and 1 central or cluster facility procured
	Output 3a.2: Initial set of HCWM systems and Mercury-free devices given to 3 health posts, up to 2 hospitals, and 1 central or cluster treatment facility
GEF funding:	2,792,026 US\$
Co-financing:	12,000,000 US\$

82. A regional approach will be employed to create market demand and stimulate the growth of non-incineration HCWM systems and Mercury-free technology distributors or manufacturers in Africa. The project will adopt specifications developed by the GEF/UNDP/WHO/HCWH Global Medical Waste project for non-incineration HCWH management systems that are consistent with Stockholm Convention BAT/BEP Guidelines.

83. Companies whose technologies meet the BAT/BEP guidelines and international standards, as certified by the regional project, will be selected through a competitive bidding process. The competitive bidding process will be led by the UNDP Nordic Office - Procurement Support Unit – Health, which has extensive experience and expertise in the procurement of such devices and technologies.

84. Non-incineration HCWM systems and Mercury-free thermometers and sphygmomanometers sufficient to equip three (3) small health posts, 2 healthcare facilities (up to 300 hospital beds total) or more, and one central facility (each capable of treating waste up to 8,400 hospital beds or as many as 40 hospitals) will be centrally procured. The size of the purchase and likely future demand will encourage manufacturers and distributors to make these technologies available and affordable in the region.

85. An initial batch of HCWM systems and Mercury-free devices will then be distributed to each country for use in the model facilities.

Component 3b. Demonstrate HCWM systems, recycling, Mercury waste management and Mercury reduction at the model facilities, and establish national training infrastructures *[National component]*

Outcome 3b.1	HCWM systems demonstrated at the model facilities Output 3b.1: BAT/BEP implemented at the model facilities
Outcome 3b.2	Reduction in greenhouse gas emissions through recycling demonstrated Output 3b.1: Recycling programs in the model facilities
Outcome 3b.3:	Outcome 3b.3: Mercury reduction in the model facilities demonstrated Safe storage sites for Mercury and Mercury-free devices used in model facilities
Outcome 3b.4:	Outcome 3b.4: Institutional capacities for national training strengthened Output 3b.4: National training program
GEF funding:	976,470 US\$
Co-financing:	4,196,164 US\$

86. At the country level, the team of national experts will work with each model facility and the central/cluster facility to integrate the non-incineration technology into the overall HCWM system and to deploy the Mercury-free devices. The model facilities will serve as pilot sites to gain experience and as BAT/BEP demonstration sites. Specifically, the work will include the following activities:

- Installation and testing of non-incineration technologies, and training staff in their operation and maintenance at the model facilities and the central/cluster facility.
- Providing support to the central/cluster facility in the implementation of their plans.
- Phasing in of Mercury-free medical devices, and training staff in their use and maintenance²⁸.
- Supporting the establishment and training of local maintenance teams/technicians to ensure that maintenance of new devices/technologies can be ensured in the future.
- Supporting model HCFs in reducing their waste streams by introducing recycling activities (e.g. composting) and connecting them to buyers markets (shredded plastics, e.g. PP and PE).
- For project HCFs that have dental units, the project will also work with these units in improving the waste management of dental amalgam wastes.
- Supporting HCFs in improving the HCWM monitoring.

87. In order to reduce emissions from waste management practices, the project will support facilities to:

- Improve practices surrounding the steps necessary for plastics recycling (e.g. disinfection by autoclave/pressure cooker, sorting, shredding, transport and subsequent hand-over to recyclers). This would reduce the volume of waste to be disposed of and also provide for some income generation.
- Increase composting activities, which will significantly reduce the volume of the waste that needs to be transported to the landfill/dump site. Organic waste makes up the majority of HCF waste. By developing composting activities on the premises, HCFs could reduce waste collection rates charged by the municipal service providers, while generating some additional income through the sale of compost.

²⁸ (UNDP/GEF) Guidance on Maintaining and Calibrating Non-Mercurial Clinical Thermometers and Sphygmomanometers, available at: http://noharm-global.org/sites/default/files/documents-files/1222/Guidance_Hg_UNDP-GEF-2013.pdf

88. As part of Component 3, Mercury baseline assessments will be undertaken for each project facility (as part of the larger HCWM assessment). For each of the facilities, a Mercury management and phase-out plan will be prepared (as part of the development of facility HCWM plans). Mercury waste management improved practices will be implemented, safe storage sites set up and HCFs staff will be trained in the clean-up, storage and safe management of Mercury wastes.

89. At large HCFs, it is Environmental Health Technicians (EHTs) or Environmental Health Officers (EOHs) that assume responsibilities related to HCWM. However, smaller HCFs often do not have EHTs. At national level, training on HCW is available at the School of Medicine, which provides a Masters in Public Health. Most EHTs are educated there. However, as was observed during many of the assessments, most of the healthcare providers apart from EHTs have limited knowledge of proper healthcare waste collection, transportation and disposal.

90. In order to strengthen the institutional capacities for national training, the project will:

- Develop a training video in English and French that shows best practices for HCWM, which can be used for training purposes and refresher courses, and consider other innovative means of conveying the message to the EHTs and to the HCFs in general.
- Establish a national training infrastructure for HCWM by revising and incorporating content for health-care waste management in curricula for Ministry of Education schools and institutions of higher learning (e.g. medical faculties, nursing schools and Environmental Health Schools) to ensure pre-service awareness and training.
- Set up a specialized course on HCWM in order to obtain a competency in HCWM (e.g. a HCWM certificate).
- Establish a training of trainers program for HCWM. Trainers trained at the regional Africa level in *Component 1* will constitute the foundation of the national training-of-trainers programs.

Component 4a. Evaluate the capacities of each recipient country to absorb additional non-incineration HCWM systems and Mercury-free devices and distribute technologies based on the evaluation results and allocation formula
[Regional component]

Outcome: 4a.1	Capacities of recipient countries to absorb additional technologies evaluated Output: 4a.1 Evaluation report for each recipient country including recommendations for improvement
Outcome: 4a.2	Additional technologies distributed depending on evaluated capacities for absorption Output: 4a.2 Additional technologies distributed to countries based on the evaluation and allocation formula
GEF funding:	435,082 US\$
Co-financing:	2,500,000 US\$

91. At the regional level, a mid-term evaluation will be conducted to assess the capacity of each country to absorb additional technologies. The evaluation will examine, among others:

- The promulgation of HCWM and Mercury reduction policies

- Successful implementation of BAT/BEP in the model facilities
- Proper operation and maintenance of the initial batch of non-incineration HCWM systems and Mercury-free devices
- Safe storage of healthcare Mercury waste
- Effective national training programs

92. The evaluation will include recommendations for improvement. Additional HCWM systems and Mercury-free devices will be allocated to countries based on the results of the evaluation and the allocation formula established in *Component 1*.

Component 4b. Expand HCWM systems and the phase-out of Mercury in the recipient countries and disseminate results in the Africa region [National and regional component]

Outcome 4b.1:	HCWM systems expanded to other facilities in the country Output 4b.1: BAT/BEP and related infrastructures improved and expanded in the recipient countries
Outcome 4b.2:	Country capacity to manage Mercury and to phase in Mercury-free devices improved Output 4b.2: More Mercury devices phased out and stored and more Mercury-free devices deployed
Outcome 4b.3:	National training expanded Output 4b.3: More people trained in HCWM and Mercury
Outcome 4b.4:	Information disseminated at environment and health conferences in the region Output 4b.4: Replication tools disseminated
GEF funding:	961,552 US\$
Co-financing:	4,640,000 US\$

93. Following the recommendations from the evaluation, each country will seek to improve its existing system. The work will expand to other healthcare facilities as the country receives additional non-incineration HCWM systems and Mercury-free devices as determined in *Component 4a*. Similarly, the coverage of the national training program will be further expanded. A specific effort will be made so that the national health training curriculum incorporates the materials and recommendations of the project in terms of Mercury and Health care waste management. Participating staff from model HCFs will be requested to come and present their work in national health training centres.

94. Project results and replication tools will be disseminated nationally and regionally through existing conferences on environment and health, such as annual WHO and infection control conferences. In the final year, the national plans for HCWM and Mercury phase-out will be reviewed and updated as needed.

Component 5. Monitoring, learning, adaptive feedback, outreach, and evaluation

Outcome 5:	Project's results sustained and replicated
	Output 5.1: M&E and adaptive management applied to project in response to needs, mid-term evaluation findings with lessons learned extracted
	Output 5.2: Lessons learned and best practices are disseminated at national, regional and global level
GEF funding:	141,000 US\$
Co-financing:	800,000 US\$

95. The component aims at monitoring and evaluation of results achieved to improve the implementation of the project and disseminate lessons learnt at national, regional and international levels.

96. Mid-term and final evaluations will be completed and compiled into reports. Results and lessons learned will be extracted. Best practices will be shared nationally and regionally through a series of workshops and meetings. Reports and Research results will be disseminated globally.

97. Further details are provided in Chapter VII Monitoring Framework and Evaluation.

Project consistency with GEF strategic priorities and operations programs for the Chemicals and Waste focal area as identified in GEF-V

99. The project is fully consistent with the GEF-5 Chemicals focal area strategy, Objective 1: *Phase-out POPs and reduce POPs releases* as well as Objective 3: *Pilot sound chemicals management and Mercury reduction*. The project will contribute to the achievement of GEF's main indicators under GEF-V as follows:

Table 6: Consistency with GEF-V strategic priorities and operations programs

Relevant GEF-5 Strategy Indicator	Project's contribution
Objective 1: Phase out POPs and reduce POPs releases	
Outcome 1.3: POPs releases to the environment reduced	
Indicator 1.3 Amount of un-intentionally produced POPs releases avoided or reduced from industrial and non-industrial sectors; measured in grams TEQ against baseline as recorded through the POPs tracking tool	Significant reductions of UPOPs will be achieved in each country by replacing incineration and open burning, commonly used now for treating healthcare waste, with non-incineration technologies. Stimulating the manufacture and distribution of these technologies will ensure their affordability and accelerate widespread adoption in the African region leading to greater UPOPs reductions in coming years.
Outcome 1.5: Country capacity built to effectively phase out and reduce releases of POPs	
Indicator 1.5.2 Progress in developing and implementing a legislative and regulatory framework for environmentally sound management of POPs, and for the sound management of chemicals in general, as recorded through the POPs tracking tool	Country capacity will be built through the development or enhancement of national policies, regulations, and national plans relative to the management of both healthcare waste and Mercury in healthcare; the strengthening of monitoring and enforcement; the development of a national training program; the demonstration of best environmental and management practices and technologies; and the national dissemination of project results.
Objective 3: Pilot sound chemicals management and Mercury reduction	
Outcome 3.1: Country capacity built to effectively manage Mercury in priority sectors	
Indicator 3.1 Countries implement pilot Mercury management and reduction activities	Country capacity will be built by developing and implementing Mercury phase-out plans, storage of healthcare Mercury waste, adopting standards and demonstrating the use of Mercury-free devices.

Incremental reasoning and expected global, national and local benefits

100. Sub-Saharan countries face particular challenges because healthcare waste treatment technologies that meet BAT/BEP and fit local circumstances are simply not available at market prices that facilities or their Governments can afford. As a consequence, countries opt for low-cost medical waste incinerators, such as the "De Montfort incinerator", which, per tonne of healthcare waste burned, releases approximately 40 g-TEQ in air emissions and in ash residues.

101. Similarly, the use of Mercury-containing devices in healthcare is widespread and due to limited availability of low cost Mercury-free devices as well as unfamiliarity with their use, the breakage and improper disposal of Mercury-containing devices results in significant Mercury emissions.

102. Without funding from the Global Environment Facility (GEF), which will be applied towards a regional approach to create market demand and stimulate the growth of affordable non-incineration HCWM systems and Mercury-free technology distributors and/or manufacturers in Africa, these conditions are very unlikely to change in the near future.

103. Without this project, Sub-Saharan countries will be unable to comply with the Stockholm Convention requirements to implement BEP/BAT healthcare waste treatment technologies to reduce releases of UPOPs and will be unable to transition away from Mercury-containing healthcare devices and improve dental amalgam waste management practices to reduce releases of Mercury.

104. As UPOPs and Mercury are global contaminants, a reduction in their release is not only beneficial for healthcare staff, patients, visitors and surrounding communities but also beneficial for global communities. Without the GEF project, risk groups and local, regional and global communities currently being exposed to UPOPs and Mercury emissions released from the healthcare sector, as well as the global environment, will continue to remain at risk.

105. The initial capital investment costs and “start-up” costs for migrating from current unsafe and environmentally polluting practices to the use and application of non-incineration technologies and the phase-out of Mercury containing devices cannot be covered by national budget allocations and contribution of healthcare facilities alone, due to severe budget constraints at national level in particular in Madagascar and Ghana. It is for this reason that funding from the GEF, in addition to support provided by the project’s co-financiers, will be absolutely critical in putting in place environmentally sound practices for healthcare waste management and treatment.

106. Not only will project activities reduce and eliminate unintentional releases of UPOPs and Hg and support the country in meeting its obligations under the Stockholm Convention and the Minamata Convention, but also allow the countries to continue to improve HCWM practices in the future, which will also have significant infection control benefits. By adopting best HCWM practices, hospital staff and patients, but also waste handlers, recyclers, and communities living near dumpsites, will be better safeguarded from potential infections, such as Hepatitis B, C and HIV.

107. The expected global, regional and local benefits of the project are many and varied. At local level, through good coordination between the project and its co-financiers, the project will be able to provide direct support to 50 facilities (4 CTFs, 22 hospitals with an average number of beds of 150 and 24 health posts), amounting to a total of 36,900 beds. In combination with procurement and import restriction on certain PVC containing medical supplies for which cost-effective alternatives exist and by improving recycling rates of disinfected waste materials (plastics), the project is expected to result in a reduction of UPOPs emissions of about 31.8 g-TEQ/yr.

108. By putting import restrictions on Mercury-containing thermometers and sphygmomanometers and phasing out their use by adopting Mercury-free devices in project facilities, the project would result in reducing Mercury emissions from the healthcare sector by 25.3 kg/yr.

Socio-economic benefits including Gender dimensions

109. Human and Environmental Health Benefits: The health sectors in Ghana, Madagascar, Tanzania and Zambia are one of the main sources of UPOPs emission in these countries (see Table 2) as well as a significant source of other toxic substances (e.g. Mercury), impacting local and global human and environmental health. The project will benefit healthcare workers (such as doctors, nurses and hospital cleaning staff), patients (through infection control as a result of good waste handling practices in HCFs) as well as waste handlers, collectors, recyclers and scavengers who face hazardous working conditions when in contact with infectious and toxic healthcare waste. Communities living close to waste disposal sites (municipal waste dumps and landfills) or incinerators will also benefit.

110. Besides reducing releases of UPOPs and Mercury, infectious waste, especially sharps, pose a risk to anyone who comes into contact with it, in particular when it is not properly managed. By adopting best HCWM practices, hospital staff and patients, but also waste handlers, recyclers, and communities living near dumpsites, will be better safeguarded from potential infections, such as Hepatitis B, C and HIV.

111. Improved HCWM practices in a healthcare facility, generally also reduce the occurrence of hospital-acquired infections (nosocomial infections), reducing human suffering as well as cost implications for national healthcare systems.

112. Gender considerations: This GEF project emphasizes building awareness of the links between waste management and public health (including occupational exposures), with a special focus on the health implications of exposure to dioxins and Mercury for vulnerable populations, such as female workers, pregnant women, and children. In addition to relevant national ministries, hospital, and health clinics, key partners in the program include healthcare professionals, waste workers, and providers of waste management services (among the most vulnerable sub-populations), as well as NGOs and civil society organizations operating in the area of health, women and the environment.

113. Women represent a large portion of workers employed in healthcare services (according to the U.S. Bureau of Labor Statistics, 73% of medical and health service managers are women²⁹). Although similar statistics are not available for Ghana, Madagascar, Tanzania and Zambia, it can be assumed that the majority of healthcare workers are female. Therefore, the “nature” of the target beneficiaries instinctively lends itself to target women as key stakeholders. Additionally, the project will encourage, in the model HCFs, the emergence of ‘champions’ of better HCWM practices. Experience from the Global Medical Waste projects demonstrates that this values-based effort can reinforce women empowerment within the HCF staff and administration.

114. In both developed and developing countries, many healthcare workers (such as nurses) receive low remuneration and face hazardous working conditions, including exposure to chemical agents that can cause cancer, respiratory diseases, neurotoxic effects, and other illnesses. As developing countries strengthen and expand the coverage of their healthcare systems, associated releases of toxic chemicals can rise substantially, magnifying the risks experienced by healthcare workers and the public.

115. As part of this project capacity building, training, curricula, etc. are developed and tailored to different training recipients within the healthcare sector, such as i) Trainers; ii) Medical staff, such as doctors, nurses and paramedical staff, iii) Hospital maintenance and sanitary staff iv) Administrators, etc. Training is also tailored and provided to support services linked to healthcare facilities, such as laundries, waste handling and transportation services, treatment facilities as well as workers in waste disposal facilities. At national level awareness on HCWM issues is created among the general public, patients and family but also among decision makers at national, regional and district level that have significant influence on the development and approval of HCWM related budgets.

116. Economic benefits: A key aspect of the project will be to ensure that HCWM for the project countries will be developed in such a way to keep annual operating/recurring costs (disposable HCWM supplies, electricity, maintenance, transport, etc.) as low as possible, by i) improving waste segregation practices (which allows for composting, sale of disinfected recyclable materials, and reduces the costs for collection of residual waste), ii) by grouping of hospitals in “centralized treatment hubs”, maximizing the use of the waste treatment system, expanding its coverage, in combination with the most efficient

²⁹ Forbes (June, 2012) available at: <http://www.forbes.com/sites/davechase/2012/07/26/women-in-healthcare-report-4-of-ceos-73-of-managers/>

transportation schedules and routes; iii) minimizing costs for HCWM related supplies, by using reusable items where feasible, iv) restricting the use of products with PVC or Mercury to avoid the need and costs to dispose of these later on; and v) establishing national non-incineration maintenance teams to ensure that maintenance costs can be kept low and hospitals have easy access to maintenance teams if they need them.

117. In particular the last point is important, as regular maintenance and national capacity for repair, in combination with budget allocation for HCWM at HCF and MoH level, are the most important aspects for the sustainability of these type of projects.

118. Finally, project efforts will reduce the burden of Mercury and UPOPs exposure on human health and the environment both at national and international level, in turn reducing costs related to abatement activities, healthcare costs and other socio-economic costs resulting from Mercury and UPOPs exposure and pollution. The secondary impacts of the project - improved infection control which results in reduced occupational exposure - lower the number of hospital acquired infections and reduces the risks from needle stick injuries. Otherwise such infections would cause human suffering and have significant cost implications for the national healthcare budget.

Cost-effectiveness

119. Project activities have been designed in such a way that cost-effectiveness should be achieved during project implementation. The implementation will follow standard UNDP rules and regulations and will assure that procurement processes will be open, transparent and competitive, and all larger contracts will be published internationally.

120. Following experiences from the UNDP/GEF/WHO Global Medical Waste project and to ensure that procurement practices are speedy and most cost effective, procurement of non-incineration technologies³⁰ for this project will be assumed by the UNDP Nordic Office (Procurement Support Unit – Health), which has extensive experience and expertise in the procurement of health sector supplies. In 2013, UNDP procured over 300 million US\$ in healthcare supplies functioning as the principal recipient of grants from the Global Fund to fight HIV/AIDS, Tuberculosis and Malaria (GFATM) in 26 countries worldwide. The UNDP Procurement Support Unit – Health, as a Global Fund principal recipient, has previously assumed procurement for HCWM related supplies and technologies for GFATM activities in a number of countries. In doing so it makes use of cost-effective long-term agreements with supplier, and achieves cost reductions as a result of bulk purchasing.

121. The proposed Africa regional project builds upon and takes full advantage of the outcomes of the ongoing UNDP GEF global healthcare waste project. The approach of the proposed project incorporates lessons learned from the current project, including the setting up of more cost-effective central or cluster treatment facilities, regional procurement to ensure quality and reduce costs through bulk purchasing, and providing incentives to improve HCWM practices through additional technology allocation.

122. As part of the ongoing UNDP GEF project, cost data related to HCWM and treatment scenarios have been documented. The funding levels of each of the activities proposed as part of the regional Africa project have been based on actual costs of the ongoing project. The funding level of the proposed project is comparable and proportional to the level of activities planned while considering local conditions.

³⁰ Technical specifications for the technologies will be drawn up by the project, in consultation and agreement with the national working group on injection safety and/or management of HCW, the project facilities under the leadership of the Ministry of Health and other key project stakeholders.

123. Finally, project results will be of interest to all Sub-Saharan African countries, as they face similar issues related to the environmentally sound management of healthcare waste as well as the phase-out of Mercury containing devices. Therefore GEF funding is expected to strengthen HCWM management and disposal practices beyond the participating four countries.

Coordination with other initiatives

124. There are a number of initiatives in Ghana, Madagascar, Tanzania and Zambia (past, on-going and future) that are extremely relevant for the proposed project. For an overview of these activities please refer to Table 9, which has been presented in Annex V.

Sustainability

125. The most important aspects to ensure sustainability of project results for these types of projects are:

- Keeping the recurring and operating costs for HCWM as low as possible by promoting waste reduction and segregation efforts focusing on opportunities like composting and plastics recycling, to keep residual waste disposal costs at a minimum and create opportunities for the resale of plastic waste fractions and compost.
- Introducing of cost-sharing agreements between HCFs (which send their waste for treatment elsewhere) and HCW treatment hubs (which receive HCW from other HCFs for treatment at their facility) to ensure long-term sustainability.
- Ensuring that healthcare facilities have a budget (and budget line) specifically dedicated to HCWM so that they can purchase disposables (e.g. waste bins, liners, sharps boxes, PPE, etc.) as well as cover running and operating costs (e.g. training, electricity/fuel for operation of the treatment technologies, maintenance and repair of the technology, costs related to transport of waste, etc.) to be able to adhere to good HCWM practices.
- Easy access to maintenance and repair experts/teams for healthcare waste treatment technologies.
- Ensure that medical and facility staff have the required knowledge and capacity on how to handle HCW.
- As much as possible, agreements will be made with manufacturers and distributors to ensure the availability of parts and technical support for repair and maintenance of technologies for an extended period of time after equipment procurement (example: insurance against break down for 5 years beyond the project's duration, and maintenance support for a period of 5 years after equipment installation).

126. Other project activities/components, which will contribute to ensure project sustainability, are:

- Introduce restrictions on the import of Mercury-containing medical devices, while at the same time conducting a study on staff preferences on cost-effective Mercury-free alternatives at some of the project HCFs, so that staff have a say in which devices they will use in the future. Mercury-free devices will be procured based on the outcomes of the staff-preference study.
- Introduce restrictions on the import of PVC containing products for which cost-effective alternatives exist and create the necessary awareness to help national and facility decision making processes pertaining to (centralized) procurement.
- Incorporate HCWM modules/training into teaching programmes of medical facilities, nursing schools, environmental health and/or hygiene schools (pre-service).

- Institute HCWM training upon entry into service as well as regular “refresher” training at HCFs to ensure HCWM practices are kept at a sufficiently high level.
- Use reusable HCWM items (e.g. autoclavable waste and sharps containers) where possible.
- Publication and dissemination of lessons-learned, in particular with respect to the costs incurred and saving achieved by hospitals through switching to autoclaving, recycling of plastics, composting, etc.
- Establish (in collaboration with distributors) national maintenance and repair team to provide easy access to facilities when they require support. The project will also ensure that engineering teams of larger hospitals and technology operators are duly trained in day-to-day maintenance and simple repairs.
- The teams of national and regional experts will be encouraged to form a network for the purpose of information exchange, professional development, and assisting the countries in the region.
- Ensure the adoption and approval of updated HCWM strategies, policies, plans and guidelines at national level, which will allow for (or even recommend) the use of non-incineration technologies as one of the options for healthcare waste treatment.

Replicability

127. A regional procurement approach (to equip two dozen health posts, 22 hospitals and four central facilities, corresponding to healthcare waste from a total of about 36,900 hospital beds) will be employed to create favourable market conditions, market demand and stimulate the growth of non-incineration HCWM systems and Mercury-free technology distributors or manufacturers in Africa.

128. The GEF/UNDP Global Medical Waste project, with the support of Health Care Without Harm and FHI360, has been working with manufacturers in South Africa, Tanzania and other countries to develop low-cost non-incineration technologies and related equipment. These manufacturers will be encouraged to participate in the project's open competitive bidding process.

129. Project results and replication tools will be disseminated nationally and regionally through existing conferences on environment and health, such as the World Health Assembly, Annual Meetings of the Safe Injection Global Network (SIGN), Meetings of Partners on the Implementation of the Libreville Declaration on Health and Environment in Africa, as well as other events, through the organization of side-events and presentations by project partners such as WHO and Healthcare without Harm.

130. The teams of national and regional experts, making use of the Healthcare Without Harm and Cisco-supported Media Platform, will be encouraged to form a network for the purpose of information exchange, professional development, and assisting the countries in the region.

131. The replication effect (indirect effect) of the proposed project can prove to be very large, not only because of the dissemination of project results and regional awareness building, but most importantly because project activities will lead to the availability of low-cost non-incineration HCWM systems and Mercury-free technologies in Sub-Saharan Africa.

132. The size of the initial equipment purchase and the future demand established through awareness creation and information dissemination at national and regional level among HCFs and central treatment facilities will encourage manufacturers and distributors to make these technologies available and affordable in the region. Healthcare facilities and central treatment facilities throughout Sub-Saharan Africa will then have access to manufacturers, distributors and maintenance service providers of low cost

non-incineration technologies and Mercury-free devices³¹ (as well as technical assistance from a network of national and regional experts). This effect can entirely change the current market situation, which at present remains one of the most important barriers for the adoption of BAT.

Country Ownership, country eligibility and country drivenness

133. As elaborated upon in Section II – Strategy, the participating project countries have ratified the Stockholm Convention which calls for “priority consideration” of alternative technologies that avoid the formation of dioxins and furans, such as non-incineration technologies identified in the BAT/BEP guidelines.

134. The countries’ National Implementation Plans (NIPs) identify medical waste incineration as a significant source of dioxins/furans and Governments plan to apply BAT/BEP guidelines in keeping with Stockholm Convention obligations.

135. Three of the four participating project countries (Madagascar, Tanzania and Zambia) have signed the Minamata Convention on Mercury, the Government of Ghana has not yet signed the Convention but is expected to do so soon, and most likely before the project enters implementation.

136. Even though the governments of the four countries dispose of limited financial resources, the amount of effort towards improving the management of healthcare wastes over the past few years clearly demonstrates their commitment towards improving the current situation (see Annex V, Table 9). The co-financing commitments provided by the countries’ Governments is another clear indication of their commitment towards the objectives of the proposed project.

³¹ With equivalent accuracy and comparable clinical utility of the substituted product. See WHO (2011) Replacement of mercury thermometers and sphygmomanometers in health care. Available at: http://www.who.int/water_sanitation_health/publications/2011/mercury_thermometers/en/index.html

III. PROJECT RESULTS FRAMEWORK

This project will contribute to achieving the following Country Programme Outcome as defined in CPAP or CPD:

- **Ghana:** (*same as 2012 – 2016 UNDAF outcomes*) Outcome 5: An additional 2.5% of the population have sustainable use of improved drinking water and sanitation services and practice the three key hygiene behaviours by 2016. Outcome 11: Ministries, Department Agencies, (MDAs), Local Governments and CSOs have effectively developed, funded, coordinated and implemented national and sectoral policies, plans and programmes aimed at reducing poverty and inequalities, and promote inclusive socio-economic growth by 2016.
- **Madagascar Country Programme (2008 – 2011):** The environment will be protected within and around priority conservation zones
- **Tanzania - Common Country Programme Document (2011 – 2015):** National and local levels have enhanced capacity to coordinate, enforce and monitor environment and natural resources
- **Zambia UNDP Country Programme Outcome (2011 – 2015): 1.1.1** Government and partner institutions have technical skills upgraded to revise and implement policies according to the latest guidelines.

Primary applicable Key Environment and Sustainable Development Key Result Area (same as that on the cover page, circle one):

Applicable GEF Strategic Objective and Program: GEF-5 Chemicals Focal Area:

Objective 1: Phase-out POPs and Reduce POPs Releases

Objective 3: Pilot Sound Chemicals Management and Mercury Reduction

Applicable GEF Expected Outcomes:

Outcome 1.3: POPs Releases to the Environment Reduced

Outcome 1.5: Country Capacity Built to Effectively Phase-out and Reduce Releases of POPs

Outcome 3.1: Country Capacity Built to Effectively Manage Mercury in Priority Sectors

Applicable GEF Outcome Indicators:

Indicator 1.3: Amount of un-intentionally produced POPs releases avoided or reduced from industrial and non-industrial sectors; measured in grams TEQ against baseline as recorded through the POPs tracking tool

Indicator 1.5.2: Progress in developing and implementing a legislative and regulatory framework for environmentally sound management of POPs, and for the sound management of chemicals in general, as recorded through the POPs tracking tool

Indicator 3.1: Countries implement pilot Mercury management and reduction activities

	Indicator	Baseline	Targets End of Project	Source of verification	Risks and Assumptions
Project Objective³²	Non-incineration and Mercury-free technologies introduced in African countries. Affordable non-incineration technologies available in the African region.	In 2012, there were approximately 115 non-incineration HCW technologies installed throughout Africa. In the project countries, 1 non-working technology was present in Tanzania, 1 working hydroclave in Ghana and none in Madagascar - the status could not be assessed in Zambia (April 2014). Affordable non-incineration technologies are not available to African HCFs.	Non-incineration technologies and Mercury-free medical devices introduced at 4 central treatment facilities, 22 hospitals and 24 health posts.	Photos of HCWM supplies and installed treatment technologies available from all project HCFs.	Lack of effective maintenance mechanism could decrease the achievement of the project objective and the demonstration purpose. Existing manufacturers with limited distribution networks and experience in the Africa market may not be willing to reduce prices sufficiently.

³² Objective (Atlas output) monitored quarterly ERBM and annually in APR/PIR

COMPONENT 1: DISSEMINATE TECHNICAL GUIDELINES, ESTABLISH MID-TERM EVALUATION CRITERIA AND TECHNOLOGY	UPOPs releases from the health sector reduced or avoided.	UPOPs baseline: <u>Ghana</u> : 19.8 g-TEQ/yr (pre-selected hospitals) <u>Madagascar</u> : 4.0 g-TEQ/yr (pre-selected hospitals) <u>Tanzania</u> : 1.7 g-TEQ/yr (pre-selected hospitals) <u>Zambia</u> : 6.3 g-TEQ/yr (pre-selected hospitals)	Amount of UPOPs releases from HCW incinerators reduced by 31.8 (g-TEQ/yr).	The I-RATs that will be conducted for each of the project's HCFs before project interventions will take place will provide insight in the amount of UPOPs produced and Mercury released on a yearly basis.	New manufacturers may not be able to scale up quickly to meet the demand. Assumption: Ministries of Health and model healthcare facilities would be willing to start phasing out low technology incinerators and replacing them with non-incineration alternatives. Risk: Low
	Mercury releases from the health sector reduced.	Mercury baseline: <u>Ghana</u> : 8.2 kg/yr (pre-selected hospitals) <u>Madagascar</u> : 2.8 kg/yr (pre-selected hospitals) <u>Tanzania</u> : 6.3 kg/yr (pre-selected hospitals) <u>Zambia</u> : 8.0 kg/yr (pre-selected hospitals)	Amount of Mercury releases from the health sector reduced by 25.3 (Kg/yr).	Guidance on “ <i>Estimating Baseline Dioxin Releases for the UNDP Global Healthcare Waste Project</i> ” ³³ will be used. Guidance on “ <i>Measurements and Documentation</i> ” ³⁴ , as developed under the Global Medical Waste Project will be used to provide for a before and after snap-shot.	Assumption: Ministries of Trade would be willing to introduce import restriction on Mercury containing medical devices. Risk: Low Assumption: Ministries of Health and model healthcare facilities would be willing to start phasing out Hg-containing thermometers and replacing them with Mercury-free alternatives. Risk: Low
	Country capacity built to effectively phase out and reduce releases of POPs	The regulatory and policy framework in the four project countries do not cover all medical waste management challenges, which the project countries are facing.	Completed draft, revision or adoption of a national policy, plan, strategy, standard and/or guidelines in each country.	Draft, revision or adoption of a national policy, plan, strategy, standard and/or guidelines available.	

³³ <http://www.gefmedwaste.org/downloads/Dioxin%20Baseline%20Guidance%20July%202009%20UNDP%20GEF%20Project.pdf>

³⁴ Not yet available on-line.

ALLOCATION FORMULA, AND BUILD TEAMS OF NATIONAL EXPERTS ON BAT/BEP AT THE REGIONAL LEVEL (GEF: 401,172 US\$; CO-FINANCING: 1,800,000 US\$)					
Outcome 1.1: Technical guidelines, evaluation criteria and allocation formula adopted.	Mid-term evaluation criteria and formula for the allocation of technologies among countries available.	Evaluation criteria and allocation of technologies among project countries not agreed upon.	First Regional Conference organized. Evaluation criteria and allocation of technologies among project countries agreed upon.	Signed meeting notes from the first regional conference.	Assumption: Government representatives of the project countries reach an agreement on the evaluation criteria and allocation of technologies. Risk: Low
Outcome 1.2: Country capacity to assess, plan, and implement HCWM and the phase-out of Mercury in healthcare built.	4 teams of national experts (16 in total) trained at regional level	Some knowledge on Mercury and UPOPs releases from the health sector built during the PPG phase.	16 national experts trained in non-incineration HCWM systems, policies, waste assessments, UNDP GEF and WHO tools, national planning, BAT/BEP guidelines, Mercury phase-out, international standards, and other technical guidelines. Master trainers trained in content, effective teaching methods, evaluation tools, and Training of Trainers programs.	Certificates of training completion and attendance sheets of training sessions.	Assumption: national experts trained by the project will remain supporting the project throughout its entire duration. Risk: Low Assumption: Sufficient national experts interested and available at national level to be trained in HCWM. Risk: Low
COMPONENT 2: HEALTHCARE WASTE NATIONAL PLANS, IMPLEMENTATION STRATEGIES, AND NATIONAL POLICIES IN EACH RECIPIENT COUNTRY (GEF: 423,235; CO-FINANCING: 3,000,000 US\$)					
Outcome 2.1: Institutional capacities to strengthen policies and regulatory framework, and to develop a national action plan for HCWM and Mercury phase-out enhanced.	Ghana: ANNEX I Madagascar: ANNEX II Tanzania: ANNEX III Zambia: ANNEX IV	In each of the project countries the baseline pertaining to the HCWM policy and regulatory framework is different and is summarized in detail in Annex I, II, III, and IV respectively.	Ghana: ANNEX I Madagascar: ANNEX II Tanzania: ANNEX III Zambia: ANNEX IV	Draft of National HCWM Strategies, policies, plans as well as drafts for HCWM related standards and guidelines available.	Assumption: The project has adequately trained experts that are able to develop national HCWM Strategies, policies, plans as well as drafts for HCWM related standards and guidelines. Risk: Low
Outcome 2.2: National plan with implementation arrangements adopted.	Number of National Action Plans for project implementation available.	No National Action Plans for project implementation available. Pre-selection of HCFs has already taken place (see Annex I, II, III, and IV respectively).	1 National Action Plans for each project country developed (including the selection of up to 1 central or cluster treatment facility, 2 hospitals and 3 small rural	Action Plans available. MOUs with selected HCFs and central/cluster facilities Results of I-RAT	Assumption: National Government counterparts and health care facilities reach an agreement on which ones will be supported in the project's

			health posts as models)	assessments, staff preferences on non-Hg devices; facility-level HCWM policies and plans	1 st half and which ones in the 2 nd half. Risk: Low Assumption: HCFs are willing to sign MOUs and the MOU signature process doesn't slow down the launch of HCF HCWM activities. Risk: Low Assumption: All project HCFs are willing to participate in baseline assessments and are open to sharing information related to their current HCWM practices. Risk: Low
COMPONENT 3A: MAKE AVAILABLE IN THE REGION AFFORDABLE NON-INCINERATION HCWM SYSTEMS AND MERCURY-FREE DEVICES THAT CONFORM TO BAT AND INTERNATIONAL STANDARDS (GEF: 2,792,326; CO-FINANCING: 12,000,000 US\$)					
Outcome 3.a.1: Favourable market conditions created for the growth in the African region of affordable technologies that meet BAT guidelines and international standards.	Number of HCWM systems and Hg free devices procured.	In the project countries, 1 non-working technology was present in Tanzania, 1 hydroclave was operational in Ghana and none in Madagascar - the status could not be assessed in Zambia (April 2014).	HCWM systems and Mercury-free devices for at least 12 health posts, 8 hospitals and 4 central or cluster facilities procured. Initial set of HCWM systems and Mercury-free devices given to 3 health posts, up to 2 hospitals and 1 central or cluster treatment facility per country.	Photos of procured Mercury-free devices and non-incineration technologies. Photos of Mercury-free devices in use and non-incineration technologies installed.	Assumption: Procurement of non-incineration technologies through UNDP-PSO-Health doesn't run into major challenges. Risk: medium Assumption: A sufficiently large offer of Mercury-free devices is available at national level to allow procurement processes to run smoothly. Risk: Low
COMPONENT 3B: DEMONSTRATE HCWM SYSTEMS, RECYCLING, MERCURY WASTE MANAGEMENT AND MERCURY REDUCTION AT THE MODEL FACILITIES, AND ESTABLISH NATIONAL TRAINING INFRASTRUCTURES (GEF: 976,470 US\$; CO-FINANCING: 4,196,164)					
Outcome 3.b.1: HCWM systems, recycling, Mercury waste management and Mercury reduction at the model facilities demonstrated and national training infrastructures established <i>[National component]</i>	Number of project HCFs that have introduced BEP. Number of HCF staff trained in BEP & BAT.	No BAT/BEP in place at most of the model HCFs. No recycling programmes in place at any of the HCFs.	• HCF staff trained in BEP & BAT. • BAT/BEP implemented at all (24) the model facilities. • Recycling programs	• Certificates of training completion and attendance sheets of training sessions.	Assumption: Treatment hubs and satellites located in the zone supported by the project are willing to sign cost-sharing agreements for

	<p>Number of project HCFs that have operational BAT.</p> <p>Number of project HCFs that have recycling programmes in place.</p> <p>No. of project countries that have storage sites for phase-out Hg-containing devices.</p> <p>Number of Mercury-free project HCFs.</p> <p>Number of institutions that offer HCWM training/certificate courses.</p>	<p>No storage sites for Mercury or Medical devices containing Mercury available in any of the project countries.</p> <p>Some project HCFs already use some Mercury-free medical devices, but none of the HCFs is Mercury-free.</p> <p>In most project countries, training programme for waste management exist, but training programmes for HCWM need to be established/improved (see Annex I, II, III, and IV respectively).</p>	<p>started in each of the model facilities.</p> <ul style="list-style-type: none"> Safe storage sites for Mercury containing medical devices established for each of the project countries. Mercury-free devices used in each of the model facilities. At least one national HCWM training programme established in each of the project countries. 	<ul style="list-style-type: none"> Monitoring and Progress reports HCF visit reports Photos of recycling practices. Photos of installed and operational technologies. Photos of Mercury-free devices in use. 	<p>the treatment of their infectious waste.</p> <p>Risk: Medium</p> <p>Assumption: As co-financing, facilities allocate adequate storage space for interim Hg-waste storage, appoint waste management committee members, and allocate staff time to participate in training on BEP/BAT, recycling and the use of Hg-free alternatives and non-incineration technologies.</p> <p>Risk: Low</p> <p>Assumption: The Ministry of Health and national medical training institutions are open and willing to revise the national training modules.</p> <p>Risk: Medium</p>
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COMPONENT 4A: EVALUATE THE CAPACITIES OF EACH RECIPIENT COUNTRY TO ABSORB ADDITIONAL NON-INCINERATION HCWM SYSTEMS AND MERCURY-FREE DEVICES AND DISTRIBUTE TECHNOLOGIES BASED ON THE EVALUATION RESULTS AND ALLOCATION FORMULA (GEF: 435,082 US\$; CO-FINANCING: 2,500,000 US\$)

<p>Outcome 4.a.1: Capacities of project countries to absorb additional technologies evaluated.</p>	<p>Evaluation report (including recommendations for each project country and HCF) available.</p>	<p>Not applicable</p>	<p>Evaluation conducted of all the 4 project countries and all the HCFs, which have received project support.</p> <p>Additional HCWM systems and Mercury-free devices procured and distributed, based on the evaluation results and allocation formula.</p>	<ul style="list-style-type: none"> Evaluation Report 	<p>Assumption: One or more of the project countries are sufficiently advanced by project mid-term, that they are ready to receive additional support, technologies and devices.</p> <p>Risk: Low</p>
<p>Outcome 4.a.2: Additional technologies distributed depending on evaluated capacities for absorption.</p>	<p>Number of HCWM systems and Hg free devices procured.</p>				

COMPONENT 4B: EXPAND HCWM SYSTEMS AND THE PHASE-OUT OF MERCURY IN THE RECIPIENT COUNTRIES AND DISSIMINATE RESULTS IN THE AFRICAN REGION (GEF: 961,552 US\$, CO-FINANCING: 4,000,000 US\$)

<p>Outcome 4.b.1: HCWM systems expanded to other facilities in the country</p>	<p>Number of HCFs supported in addition to the initial set of HCFs.</p>	<p>Not applicable</p>	<p>14 additional HCFs with an average of 150 beds or a total of about 2,100 beds supported</p>	<ul style="list-style-type: none"> Monitoring and Progress reports HCF visit reports 	<p>Assumption: Sufficient HCFs are eager to participate in the</p>
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			as well as an additional 12 rural health posts.		project's second phase. Risk: Low
Outcome 4.b.2: Country Capacity to Manage Mercury and to phase-in Mercury-free devices improved.	Number of Mercury-free project HCFs in addition to the initial set.				
Outcome 4.b.3: National Training Expanded.	Number of people trained in addition to the initial set of trained HCF personnel.		HCF staff of the additional HCFs trained in BEP/BAT.	<ul style="list-style-type: none"> Certificates of training completion and attendance sheets of training sessions. 	
Outcome 4.b.4: Information disseminated at environment and health conferences in the region.	List of environment and health conferences in the region			<ul style="list-style-type: none"> List and copy of presentations 	Assumption: Sufficient travel budget is available to allow for participation in such meetings by the project international or national consultants/experts. Risk: Medium
COMPONENT 5: MONITORING, ADAPTIVE FEEDBACK, OUTREACH AND EVALUATION (GEF: 141,000 US\$; CO-FINANCING: 800,000 US\$)					
Outcome 5.1 Project's results sustained and replicated	Number of high quality monitoring and evaluation documents prepared during project implementation.	Not applicable	<p>1 annual APR/PIR submitted to UNDP each year.</p> <p>1 Mid-term project review. M&E results and insights are applied to provide feedback to the project coordination process, and have informed/redirected the design and implementation of the second phase of the project.</p> <p><u>The MTE will inform on how many additional technologies would have to be purchased and how much additional capacity building would have to be carried out in the second half of the project.</u></p> <p>1 Final evaluation.</p> <p>MTE and FE must include a lessons learned section and a strategy for dissemination of project results.</p> <p>Lessons learned and best practices are accumulated, summarized and replicated at</p>	<p>4 QORs available for each project year.</p> <p>APR/PIR available for each project year.</p> <p>Mid-Term Evaluation Report available.</p> <p>Mid-Term Evaluation Report available.</p> <p>Lessons-learned from the project easily accessible and searchable on-line.</p> <p>Project related documentation, photos and videos posted on the project's website and Facebook page.</p> <p>Reports submitted to UNDP</p>	Assumptions: It is assumed that the regional and national project technical coordinators will prepare all the reports that are required by the GEF and UNDP. Risk: Low

				the country level.

IV. TOTAL BUDGET AND WORKPLAN

GEF Outcome/Atlas Activity	Responsible Party/ Implementing Agent	Fund ID	Donor Name	Atlas Budgetary Account Code	ATLAS Budget Description	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Total (USD)	See Budget Note:
Component 1 [Regional component - implemented by UNDP Istanbul] Disseminate technical guidelines, establish mid-term evaluation criteria and technology allocation formula, and build teams of national experts on BAT/BEP at the regional level Duration of 4 months	UNDP RSC Istanbul	62000	GEF	71200	International Consultants	\$110,925	\$0	\$0	\$0	\$110,925	1
				71300	Local Consultants	\$76,647	\$0	\$0	\$0	\$76,647	2
				71600	Travel	\$139,400	\$0	\$0	\$0	\$139,400	3
				72100	Contractual Services	\$56,000	\$0	\$0	\$0	\$56,000	4
				74200	Translation Costs	\$18,200	\$0	\$0	\$0	\$18,200	5
					Sub-total GEF	\$401,172	\$0	\$0	\$0	\$401,172	
					Total Component 1	\$401,172	\$0	\$0	\$0	\$401,172	
Component 2 [National component] Health Care Waste National plans, implementation strategies, and national policies in each recipient country <i>Implemented 5 months after Completion of Component 1 .</i>	MoH	62000	GEF	71300	Local Consultants	\$153,294	\$229,941	\$0	\$0	\$383,235	6
				71600	Travel	\$14,000	\$0	\$0	\$0	\$14,000	7
				75700	Conferences & Workshops for dissemination	\$26,000	\$0	\$0	\$0	\$26,000	8
					Sub-total GEF	\$193,294	\$229,941	\$0	\$0	\$423,235	
					Total Component 2	\$193,294	\$229,941	\$0	\$0	\$423,235	
Component 3A [Regional]	UNDP RSC Istanbul	62000	GEF	71200	International Consultants	\$20,880	\$125,280	\$10,440	\$0	\$156,600	9

component - implemented by UNDP Istanbul] Make available in the region affordable non-incineration HCWM systems and mercury-free devices that conform to BAT and international standards Implemented 15 months after completion of component 1.				71600	Travel	\$0	\$119,700	\$0	\$0	\$119,700	10
				72100	Contractual Services	\$0	\$240,000	\$0	\$0	\$240,000	11
				72200	Equipment	\$0	\$1,254,444	\$1,021,282	\$0	\$2,275,726	12
					Sub-total GEF	\$20,880	\$1,739,424	\$1,031,722	\$0	\$2,792,026	
					Total Component 3A	\$20,880	\$1,739,424	\$1,031,722	\$0	\$2,792,026	
Component 3B [National component] Demonstrate HCWM systems, recycling, mercury waste management and mercury reduction at the model facilities, and establish national training infrastructures <i>Implemented 10</i>				71300	Local Consultants	\$0	\$689,823	\$76,647	\$0	\$766,470	13
				71600	Travel	\$0	\$20,000	\$0	\$0	\$20,000	14
				75700	Conferences & Workshops for dissemination	\$0	\$190,000	\$0	\$0	\$190,000	15
					Sub-total GEF	\$0	\$899,823	\$76,647	\$0	\$976,470	

Component 5 Monitoring, learning, adaptive feedback, outreach, and evaluation	UNDP RSC Istanbul	62000	GEF	71200	International Consultants	\$0	\$28,000	\$0	\$28,000	\$56,000	24			
				71300	Local Consultants	\$0	\$0	\$4,000	\$4,000	\$8,000	25			
				71600	Travel	\$0	\$28,500	\$0	\$28,500	\$57,000	26			
				72100	Contractual Services	\$5,000	\$5,000	\$5,000	\$5,000	\$20,000	27			
					Sub-total GEF	\$5,000	\$61,500	\$9,000	\$65,500	\$141,000				
					Total Component 5	\$5,000	\$61,500	\$9,000	\$65,500	\$141,000				
PMC				71200	International Consultant (RAA)	\$9,000	\$9,000	\$9,000	\$9,000	\$36,000	28			
				71200	International Consultant (RTC)	\$27,669	\$45,613	\$12,716	\$12,467	\$98,464	29			
				74100	Audit fees	\$0	\$0	\$20,000	\$0	\$20,000	30			
				74500	Direct Project Costs and Rent	\$3,600	\$3,600	\$3,600	\$43,610	\$54,410	31			
				74599	UNDP Copenhagen				\$113,785	\$113,785	32			
					Sub-total GEF	\$40,269	\$58,213	\$45,316	\$178,862	\$322,659				
					Total Management costs	\$40,269	\$58,213	\$45,316	\$178,862	\$322,659				
				PROJECT TOTAL					\$660,615	\$2,988,900	\$2,208,488	\$595,192	\$6,453,195	

See Budget Note:	
1	1 CTA (Chief International Technical Advisor), 2 (ICs) International Consultants and 1 (IC) International consultant for regional training/planning session only (all part-time)
2	Per country (1 month): 1 NTA (National Technical Coordinator); 1 NAA (National Administrative Assistant), 3 TAs (Technical Advisors) - all part-time

3	<p>Regional Project Steering Committee Meeting (3 day meeting): Participants will be: NPD - National Project Director (MoH?) for each country; RTC (Regional Technical Coordinator); CTA (Chief International Technical Advisor); UNDP/WHO/HCWH and NTC (National technical coordinator) for each country</p> <p>Travel Regional Training Meeting (14 days). Participants will be: RTC; CTA; (ICs) International Consultants. Plus from each of the countries: NTC (National technical coordinator) and TAs (Technical Advisors)</p>
4	WHO - 1 month contribution (6,000 US\$) - HCWH - 50,000 US\$
5	13 days of 2 interpreters full time translating for each of 4 the project countries
6	One per country of each (5 months) in each of the countries: 1 NTC (National Technical Coordinator); 1 NAA (National Administrative Assistant); 3 TA (Technical Advisors
7	Local travel in each of the project countries for the: NTC - (National technical coordinator) and 3 TAs.
8	Local meetings including for each of the project countries: 1 NPSC - National Project Steering Committee Consultations (4x over the duration of the project)
9	1 CTA (Chief International Technical Advisor) 6 months; 2 International Consultants - 3 months (all part-time)
10	International travels to provide technical assistance to countries: 2 missions/country by CTA, 1 week per mission; 1 missions/country by RTC, 1 week per mission; 3 missions/country by ICs on model hospitals, 2 wks/mission; 1 travel by CTA, an IC and RTC for bid review/select, 3 days
11	WHO (145,000 US\$) - they need to work on the ground to help the 4 countries implement Component 3b HCWH (95,000 US\$) - they need to work on the ground to help the 4 countries implement Component 3b

12	<p>PHASE I: GHANA: Limit phase 1 to only ONE model HCF as a small cluster and choose only between Koforidua or Central. CTF: Cover only \$220,000 of the \$350,000 cost of the Hydroclave MADAGASCAR: Limit phase 1 to only ONE model HCF if they choose Joseph Raseta or Tambohobe. Or they can choose TWO model HCFs if they choose Mere et Enfants and Manjakandriana. 1 CTF: in collaboration with Adonis, either in Antananarivo or Tamatave. TANZANIA: Limit phase 1 to about 300 beds. Therefore the only possibilities are: Mwananyamala, or Tanga (Bombo) or Tumbi or Kairuk AND Sinz. 1 CTF in Dar-es-Salaam ZAMBIA: Limit phase 1 to about 300 beds. Therefore the only possibilities are Kapiri Mposhi, Central (Cluster) and also treat Mukonchi or Kamuchanga, Copperbelt and only treat government HCFs: Butondo, Chibolya, Clinics 1, 3 and 5, Kafironda, Kamuchanga clinic, Kamuchanga District, Kansuswa, Kawama west, Luansobe, Mokambo, Mupena, Murundu, Mutundu, Ronald Ross General and HAHC, Taung-up. 1 CTF in Lusaka (UTC)</p> <p>PHASE II: ADDITIONAL treatment systems: (total 14 hospitals of about 150-beds each divided among 4 countries) plus extra funds to equip larger hospitals Medium autoclaves, shredders, etc.: 420,000 US\$ Waste management equipment for the 14 hospitals: 462,932 US\$ Non-mercury devices and related equipment: 17,850 US\$ Storage and security: 20,000 US\$ Extra funds: 100,500 US\$</p> <p>Total includes (78,300 US\$) in storage and shipment costs.</p>
13	<p>Per Country (10 months - part-time): 1 NTC - (National technical coordinator); 1 NAA (National Administrative Assistant) and 3 TAs</p>
14	Local travel
15	<p>Per country: 2 Master trainings 5 Training workshops 1 National Project Steering Committee Meetings</p>
16	1 RTC (Regional Technical Coordinator) - ca. 4 months; 1 CTA (Chief International Technical Advisor) 4.5 months; 2 International Consultants - 2.16 months (all part-time)
17	<p>Travel for the participation in the 2nd regional project steering committee meeting (21,800 US\$). With the following participants:</p> <ul style="list-style-type: none"> - NPD - National Project Director (MoH?) - one per country - RTC (Regional Technical Coordinator) - CTA (Chief International Technical Advisor) - IAEA/WHO
18	WHO - 145,000 US\$ and HCWH - \$145,000 -- to help the 4 countries on the ground implement Component 4b and to conduct regional/global dissemination
19	Interpreters for the 3 days during the 2nd regional project steering committee meeting.

20	Venue for 3 days for the 2nd regional project steering committee meeting
21	Per Country (all part time): 1 NTC - (National technical coordinator) - 16 months; 1 NAA (National Administrative Assistant) - 16 months and 3 TAs (TA 1 and 2 11 months and TA 3 4 months)
22	Local Travel
23	Per country: 3 Training workshops 2 National Project Steering Committee Meetings
24	Mid-Term Evaluation and Final Evaluation cost each: 5 work days in each country = 20 + 20 days report writing (700 US\$/day) = 28,000 US\$
25	For each project country, for the MTE and TE need to hire a nat. consultant for 1000 US\$/country to support the evaluation
26	Travel costs for evaluations (8,800 US\$ back-to-back airfare to 4 countries plus 5,500 US\$ in DSA for both the MTE and TE) + Travel costs to participate in international events (15,000 US\$)
27	Website maintenance and updating
28	1 RAA (Regional administrative assistant);
29	1 RTC (Regional Technical Coordinator);
30	Audit of the 5 components (1 regional and 4 national) for US\$4,000 each
31	Direct Project Support Costs calculated based on number of contracts, hires, payments etc.: 6,125 US\$/country (total: 24,500 US\$) + 15,509 US\$ for the regional component. Additionally, rent fees of US\$3,600 per year have been included.
32	Cost recovery estimated amount for UNDP Copenhagen to undertake procurement of HCWM supplies and technologies

V. MANAGEMENT ARRANGEMENTS

137. The project will be implemented by the United Nations Development Programme (UNDP), under the guidance of the UNDP Montreal Protocol Unit/Chemicals, which will provide project oversight through the UNDP Regional Service Centre (RSC) currently located in Bratislava, which will move to Istanbul in July 2014.

138. The regional project components (as indicated in the project document) will be executed applying the Direct Implementation Modality (DIM) through the UNDP Regional Service Centre in Istanbul in close collaboration with the UNDP Nordic Office and its Global Procurement Unit-Health (GPU). The latter will assume the procurement of the non-incineration technologies for each of the project countries and healthcare facilities supported by the project.

139. National Project Components (as indicated in the project document) will be executed applying the National Implementation Modality (NIM) and will be implemented by the project's national implementing entities which are the following:

- **Ghana:** Ministry of Health
- **Madagascar:** Ministry of Public Health and Ministry of Environment, Ecology and Forests
- **Tanzania:** Ministry of Health and Social Welfare
- **Zambia:** Ministry of Health

Regional Project Board

140. Full Project implementation will be carried out under the guidance of a **Regional Project Board (RPB)** whose members include one representative from each of the following:

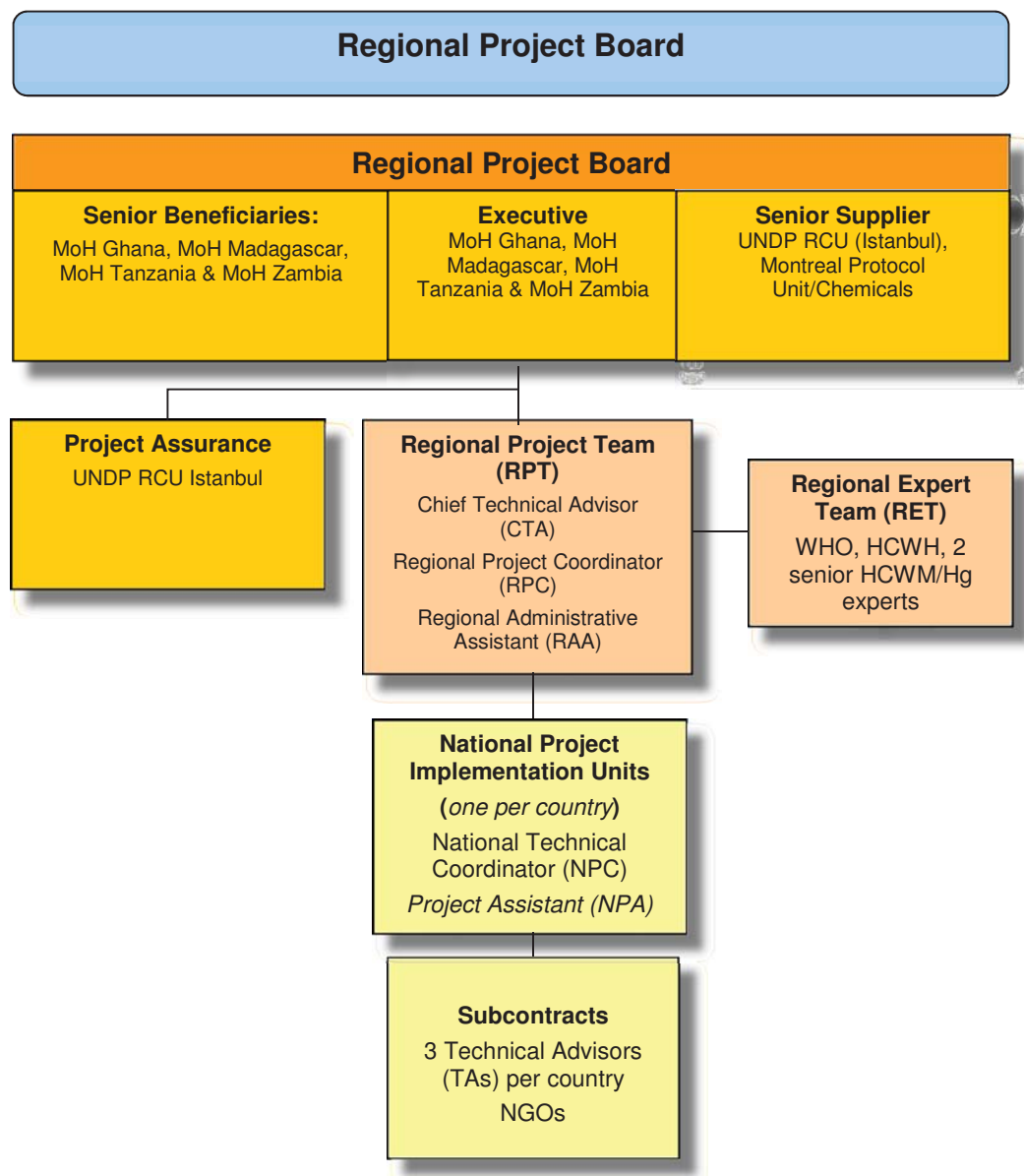
- UNDP as Project Implementing Agency
- A senior level official designated by each of the Project Participating Governments
- A representative from HCWH as Principal Cooperating Agency
- A representative from WHO as Principal Cooperating Agency

141. Other major donors and partners, if any might also participate. Representatives from UNDP Country Offices in the participating countries, as well as other GEF IA/EAs and the Stockholm Convention and the Basel Convention Secretariats will be invited to participate in the Steering Committee, although no project budget allocations will be made available to reimburse incurred travel expenses.

142. The Regional Project Board will contain three distinct roles:

- *Executive Role:* This individual will represent the project “owners” and will chair the group. This role will rest with the Project Participating Governments, and will be represented by the Ministries of Health of each of the project countries.
- *Senior Supplier Role:* This requires the representation of the interests of the funding parties for specific cost sharing projects and/or technical expertise to the project. The Senior Supplier's primary function within the Board will be to provide guidance regarding the technical feasibility of the project. This role will rest with UNDP-MPU/Chemicals represented by the **Regional Technical Adviser from the Montreal Protocol Unit/Chemicals based at the UNDP Regional Service Centre in Istanbul.**
- *Senior Beneficiary Role:* This role requires representing the interests of those who will ultimately benefit from the project. The Senior Beneficiary's primary function within the Board will be to

ensure the realization of project results from the perspective of project beneficiaries. This role will rest with the institution that represents the facilities supported by the project, which in most cases fall under the management of the Ministries of Health of the respective countries.

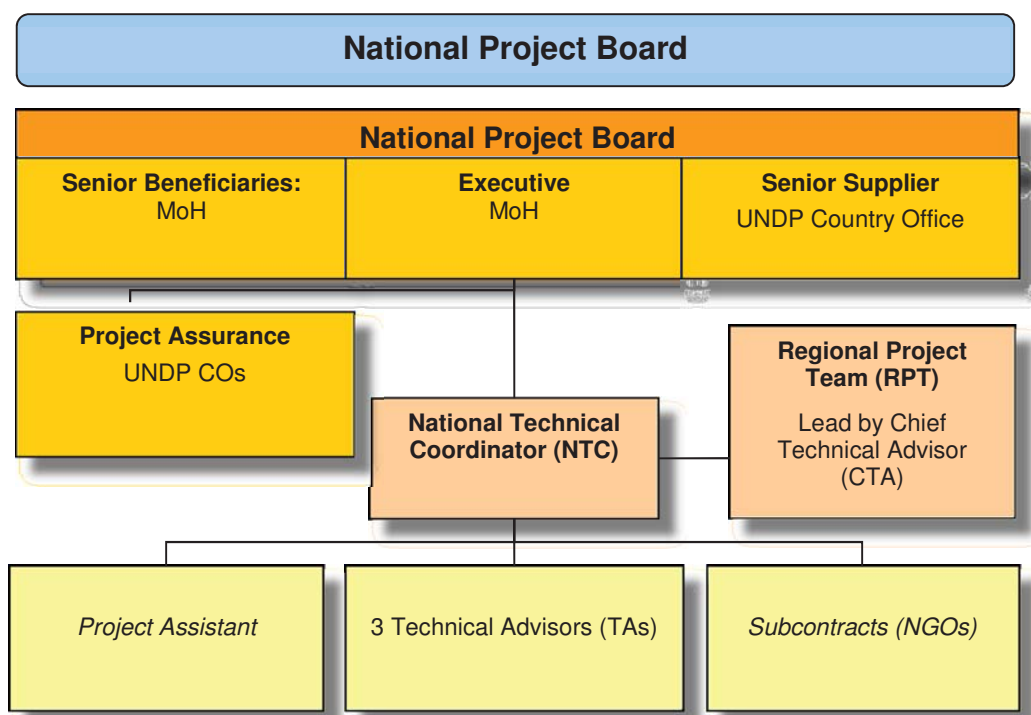


Note: items indicated in italic are not yet certain

National Project Board

143. The National Project Board (PB) will be responsible for making management decisions for the project at national level, in particular when guidance is required by the National Technical Coordinator. It will play a critical role in project monitoring and evaluations by assuring the quality of these processes and associated products, and by using evaluations for improving performance, accountability and

learning. The National Project Board will ensure that required resources are committed. It will also arbitrate on any conflicts within the project and negotiate solutions to any problems with external bodies. In addition, it will approve the appointment and responsibilities of the National Technical Coordinator and any delegation of its Project Assurance responsibilities. Based on the approved Annual Work Plan (AWP), the Project Board can also consider and approve the quarterly plans and approve any essential deviations from the original plans. The project will be subject to Project Board meetings at least twice every year. The first such meeting will be held within the first 6 months of the start of full implementation. At the initial stage of project implementation, the PB may, if deemed advantageous, wish to meet more frequently to build common understanding and to ensure that the project is initiated properly.



Note: items indicated in italic are not yet certain

144. To ensure UNDP's ultimate accountability for project results, National Project Board decisions will be made in accordance with standards that shall ensure management for development results, best value for money, fairness, integrity, transparency, and effective international competition. In case consensus cannot be reached within the Board, the final decision will rest with the Programme Specialist, Montreal Protocol Unit/Chemicals, based at the UNDP Regional Service Centre in Istanbul.

145. Members of the National Project Board will consist of key national government and non-government agencies, and appropriate local level representatives. The UNDP Country Office and WHO Office will also be represented on the Project Board, which will be balanced in terms of gender. Potential members of the Project Board will be reviewed and recommended for approval during the Project Appraisal Committee (PAC) meeting.

Potential Composition of the National Project Board (NPB)

146. The exact composition of the NPB will vary from country to country depending on custom, practice and/or law. In general, the NPB will be a policy body that will include high-level, government officials with overall responsibility for the areas in which the Project will carry out activities. Typically, the NPB will include a designated senior representative from the Health and Environment Ministries and from the Ministry in which the GEF Operational Focal Point is located if different from Ministry of Health or Ministry of Environment. If not already covered by the above, the NPB should include a representative or a liaison from each of the authorities responsible for the implementation of the Stockholm Convention, Minamata Convention and Basel Convention (if not based in the same authority). The NPB will also include representation from the national healthcare sector, the WHO office and the UNDP country office, as well as one or more appropriate representative from national NGOs with demonstrated concern and activity in matters associated with health-care waste management.

147. The National Project Board will contain three distinct roles:

- *Executive Role:* This individual will represent the project “owners” and will chair the group. This role will rest with the Ministries of Health of the four project countries.
- *Senior Supplier Role:* This requires the representation of the interests of the funding parties for specific cost sharing projects and/or technical expertise to the project. The Senior Supplier’s primary function within the Board will be to provide guidance regarding the technical feasibility of the project. This role will rest with the UNDP Country Office.
- *Senior Beneficiary Role:* This role requires representing the interests of those who will ultimately benefit from the project. The Senior Beneficiary’s primary function within the Board will be to ensure the realization of project results from the perspective of project beneficiaries. This role will rest with the other institutions (key national governmental and non-governmental agencies, and appropriate local level representatives) represented on the Project Board, who are stakeholders in the project. This role will rest with the institution that represents the facilities supported by the project, which in most cases fall under the management of the Ministries of Health of the respective countries.

148. Project Assurance: The Project Assurance role supports the Project Board Executive by carrying out objective and independent project oversight and monitoring functions. The Project Assurance role will rest with the UNDP Country Office.

149. The National Technical Coordinator will be responsible for the coordinating of all activities to achieve the objectives, outcomes and outputs set forth in this project. The National Technical Coordinator will report to the National Project Director in the Ministry of Health, to the Project’s Chief Technical Advisor and ultimately to Senior Specialist Montreal Protocol Unit/Chemicals based at the UNDP Regional Service Centre in Istanbul.

150. As the provider of the funds for this project, the GEF logo will appear on all project Publications, along with other donor logos. Any quote appearing publication of GEF funded projects must also acknowledge GEF’s participation. The UNDP logo will be equally or more visible and separate from the GEF logo.

151. In its role as GEF Implementing Agency (IA) for this project UNDP shall provide project cycle management services as defined by the GEF Council.

152. The Government of the Republic of Ghana, Government of the Republic of Madagascar, Government of the United Republic of Tanzania and the Government of the Republic of Zambia shall

request UNDP to provide direct project services specific to project inputs according to its policies and convenience. These services – and the costs of such services - are specified in the Letters of Agreement in Annex X, XI, XII and XIII. In accordance with GEF Council requirements, the costs of these services will be part of the executing entity's Project Management Cost allocation identified in the project budget. UNDP and the Government of the Republic of Ghana, Government of the Republic of Madagascar, Government of the United Republic of Tanzania and the Government of the Republic of Zambia acknowledge and agree that these services are not mandatory and will only be provided in full accordance with UNDP policies on recovery of direct costs.

Regional Expert Team

153. A project **Chief Technical Advisor (CTA)** will have overall responsibility for Project implementation. The CTA will be assisted by a Regional Project Coordinator and Regional Administrative Assistant; a Senior Public Health Advisor provided by WHO; and a Senior Advisor provided by HCWH. The CTA will additionally be assisted by 2 Senior Experts on Healthcare Waste Management Systems. The above will constitute the Project **Regional Expert Team (RET)**.

154. During the implementation of the Project, the **Regional Expert Team (RET)** will provide technical and policy expertise and will have joint responsibility to assure that Project activities are successfully implemented. The RET will oversee regional coordination and management under the overall policy direction provided of the Regional Project Board (RPB), the day-to-day guidance of the Chief Technical Advisor (CTA) and in consultation with the HCWH and WHO Advisors. The RET members include the Project CTA, the Regional Technical Coordinator, Senior Advisors from HCWH and WHO respectively and 2 senior HCWM experts.

National Technical Working Group (NTWG)

155. The **National Technical Working Group (NTWG)** will be composed of individuals from appropriate ministries, agencies and stakeholder groups who have practical involvement or interest in day-to-day Project activities. The exact composition and mode of operation of the NWG will vary from country to country depending on need and circumstance. The NWG may include representatives from UNDP (Country Offices), WHO, health, environment and other appropriate ministries, NGOs, training institutions, health-care facilities, medical and municipal waste service providers, and health-care related associations. In general, the NWG will advise the National Project Board and will assist the team of National Consultants by providing expertise and advice on project-related policy, economic, scientific and technical issues and by assisting in networking.

National Consultants (NCs)

156. **National Consultants (NCs)** will be hired as necessary to coordinate and implement Project activities. Consultation arrangements will vary country to country based on need, available expertise, and country workplan. The National Consultants will be comprised of a National Technical Coordinator and three Technical Advisors working as a national team. National Consultants will report jointly to the Regional Technical Coordinator, The Chief Technical Advisor and a designee of the National Project Board.

Principal Cooperation Agencies and other Project Partners

157. The Project has two Principal cooperating Agencies: the World Health Organization, on behalf of the WHO member states participating in the Project, and the international NGO coalition Healthcare Without Harm.

158. The **World Health Organization** (WHO) is the United Nations specialized agency on health with the objective of attainment of the highest possible level of health by all peoples. WHO's guiding principles related to health-care waste management include promoting sound health-care waste management policies and practices; preventing health risks to patients, workers and the public associated with exposure to health-care wastes; support for implementation of the Stockholm Convention on Persistent Organic Pollutants and the Minamata Convention on Mercury; and minimization of human exposure to toxic pollutants. WHO will provide support to Project activities through its headquarters offices and through its WHO field offices.

159. **Healthcare Without Harm** (HCWH) is an international coalition of 443 organizations in 52 countries working to transform the healthcare industry so it is no longer a source of harm to people and the environment. HCWH seeks to do this without compromising patient safety or care with the aim of achieving health-care delivery systems that contribute to overall ecological sustainability. HCWH works to phase-out medical waste incineration and Mercury devices in health care, minimize the amount and toxicity of all waste generated, promote safer waste treatment practices and secure a safe and healthy workplace for all healthcare workers.

VI. TECHNOLOGY PROCUREMENT ARRANGEMENTS

160. Presently, UNDP is the principal recipient of Global Fund grants to fight HIV/AIDS, Tuberculosis and Malaria (GFATM) in 26 countries worldwide. In 2013 alone, UNDP provided procurement assistance to these 26 countries, amounting to nearly 400 million US\$. The majority of this procurement assistance (67%) is provided to countries in the African region. Although most of the funds are allocated for pharmaceuticals and commodities to prevent the spread of infectious diseases, support is also provided in the procurement of Healthcare Waste Management and infection prevention related supplies and in certain cases healthcare waste treatment technologies. Although UNDP is not the principal recipient of the GFATM in Ghana, Madagascar and Tanzania, it is the principal recipient in Zambia, which in 2013 amounted to health procurement in the order of 70 million US\$.

161. On behalf of UNDP, it is the Global Procurement Unit (GPU Health), which assumes the responsibility of procurement for the countries where UNDP is the principal recipient. In doing so it makes use of long-term agreements with vendors as well as procurement arrangements with UNICEF and WHO in order to gain access to the right medical supplies and commodities at reduced costs.

162. Because of its experience and expertise related to international procurement and bidding procedures, as well as its access to long-term agreements, and possibilities of economies of scale, UNDP GPU Health will support the project with the procurement of healthcare waste management treatment technologies. It is thought that by streamlining such procurement support through GPU Health, this will significantly reduce the time and human resources spent on procurement related activities in support of GEF funded Healthcare Waste Management projects.

VII. MONITORING FRAMEWORK AND EVALUATION

163. The project will be monitored through the following M&E activities. The M&E budget is provided in the table below.

Project start:

164. A Project Inception Workshop will be held within the first 2 months of project start with those with assigned roles in the project organization structure, UNDP country office and where appropriate/feasible regional technical policy and programme advisors as well as other stakeholders. The Inception Workshop is crucial to building ownership for the project results and to plan the first year's annual work plan.

165. The Inception Workshop should address a number of key issues including:

- a) Assist all partners to fully understand and take ownership of the project. Detail the roles, support services and complementary responsibilities of UNDP CO and RCU staff vis à vis the project team. Discuss the roles, functions, and responsibilities within the project's decision-making structures, including reporting and communication lines, and conflict resolution mechanisms. The Terms of Reference for project staff will be discussed again as needed.
- b) Based on the project results framework and the relevant GEF Tracking Tool if appropriate, finalize the first annual work plan. Review and agree on the indicators, targets and their means of verification, and recheck assumptions and risks.
- c) Provide a detailed overview of reporting, monitoring and evaluation (M&E) requirements. The Monitoring and Evaluation work plan and budget should be agreed and scheduled.
- d) Discuss financial reporting procedures and obligations, and arrangements for annual audit.
- e) Plan and schedule Project Board meetings. Roles and responsibilities of all project organisation structures should be clarified and meetings planned. The first Project Board meeting should be held within the first 12 months following the inception workshop.

166. An Inception Workshop report is a key reference document and must be prepared and shared with participants to formalize various agreements and plans decided during the meeting.

Quarterly:

- Progress made shall be monitored in the UNDP Enhanced Results Based Management Platform.
- Based on the initial risk analysis submitted, the risk log shall be regularly updated in ATLAS. Risks become critical when the impact and probability are high. Note that for UNDP-GEF projects, all financial risks associated with financial instruments such as revolving funds, microfinance schemes, or capitalization of energy services companies are automatically classified as critical on the basis of their innovative nature (high impact and uncertainty due to no previous experience justifies classification as critical).
- Based on the information recorded in Atlas, a Project Progress Reports (PPR) can be generated in the Executive Snapshot.
- Other ATLAS logs can be used to monitor issues, lessons learned etc. The use of these functions is a key indicator in the UNDP Executive Balanced Scorecard.

Annually:

- Annual Project Review/Project Implementation Reports (APR/PIR): This key report is prepared to monitor progress made since project start and in particular for the previous reporting period (30 June to 1 July). The APR/PIR combines both UNDP and GEF reporting requirements.

The APR/PIR includes, but is not limited to, reporting on the following:

- Progress made toward project objective and project outcomes - each with indicators, baseline data and end-of-project targets (cumulative)
- Project outputs delivered per project outcome (annual).
- Lesson learned/good practice.
- AWP and other expenditure reports
- Risk and adaptive management
- ATLAS QPR
- Portfolio level indicators (i.e. GEF focal area tracking tools) are used by most focal areas on an annual basis as well.

Periodic Monitoring through site visits:

UNDP CO and the UNDP RCU will conduct visits to project sites based on the agreed schedule in the project's Inception Report/Annual Work Plan to assess first hand project progress. Other members of the Project Board may also join these visits. A Field Visit Report/BTOR will be prepared by the CO and UNDP RCU and will be circulated no less than one month after the visit to the project team and Project Board members.

Mid-term of project cycle:

The project will undergo an independent Mid-Term Evaluation at the mid-point of project implementation. The Mid-Term Evaluation will determine progress being made toward the achievement of outcomes and will identify course correction if needed. It will focus on the effectiveness, efficiency and timeliness of project implementation; will highlight issues requiring decisions and actions; and will present initial lessons learned about project design, implementation and management. Findings of this review will be incorporated as recommendations for enhanced implementation during the final half of the project's term. The organization, terms of reference and timing of the mid-term evaluation will be decided after consultation between the parties to the project document. The Terms of Reference for this Mid-term evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF. The management response and the evaluation will be uploaded to UNDP corporate systems, in particular the [UNDP Evaluation Office Evaluation Resource Center \(ERC\)](#).

The relevant GEF Focal Area Tracking Tools will also be completed during the mid-term evaluation cycle.

End of Project:

An independent Final Evaluation will take place three months prior to the final Project Board meeting and will be undertaken in accordance with UNDP and GEF guidance. The final evaluation will focus on the delivery of the project's results as initially planned (and as corrected after the mid-term evaluation, if any such correction took place). The final evaluation will look at impact and sustainability of results, including the contribution to capacity development and the achievement of global environmental benefits/goals. The Terms of Reference for this evaluation will be prepared by the UNDP CO based on guidance from the Regional Coordinating Unit and UNDP-GEF.

The Terminal Evaluation should also provide recommendations for follow-up activities and requires a management response which should be uploaded to PIMS and to the [UNDP Evaluation Office Evaluation Resource Center \(ERC\)](#).

The relevant GEF Focal Area Tracking Tools will also be completed during the final evaluation.

During the last three months, the project team will prepare the Project Terminal Report. This comprehensive report will summarize the results achieved (objectives, outcomes, outputs), lessons learned, problems met and areas where results may not have been achieved. It will also lay out recommendations for any further steps that may need to be taken to ensure sustainability and replicability of the project's results.

Learning and knowledge sharing:

Results from the project will be disseminated within and beyond the project intervention zone through existing information sharing networks and forums.

The project will identify and participate, as relevant and appropriate, in scientific, policy-based and/or any other networks, which may be of benefit to project implementation through lessons learned. The project will identify, analyze, and share lessons learned that might be beneficial in the design and implementation of similar future projects.

Finally, there will be a two-way flow of information between this project and other projects of a similar focus.

Communications and visibility requirements:

Full compliance is required with UNDP's Branding Guidelines. These can be accessed at <http://intra.undp.org/coa/branding.shtml>, and specific guidelines on UNDP logo use can be accessed at: <http://intra.undp.org/branding/useOfLogo.html>. Amongst other things, these guidelines describe when and how the UNDP logo needs to be used, as well as how the logos of donors to UNDP projects needs to be used. For the avoidance of any doubt, when logo use is required, the UNDP logo needs to be used alongside the GEF logo. The GEF logo can be accessed at: http://www.thegef.org/gef/GEF_logo. The UNDP logo can be accessed at <http://intra.undp.org/coa/branding.shtml>.

Full compliance is also required with the GEF's Communication and Visibility Guidelines (the "GEF Guidelines"). The GEF Guidelines can be accessed at: [http://www.thegef.org/gef/sites/thegef.org/files/documents/C.40.08_Branding the GEF%20final 0.pdf](http://www.thegef.org/gef/sites/thegef.org/files/documents/C.40.08_Branding_the_GEF%20final_0.pdf). Amongst other things, the GEF Guidelines describe when and how the GEF logo needs to be used in project publications, vehicles, supplies and other project equipment. The GEF Guidelines also describe other GEF promotional requirements regarding press releases, press conferences, press visits, visits by Government officials, productions and other promotional items.

Where other agencies and project partners have provided support through co-financing, their branding policies and requirements should be similarly applied.

Table 7: M & E Work Plan and Budget

Type of M&E activity	Responsible Parties	Budget US\$ <i>Excluding project team staff time</i>	Time frame
Regional Conference and Report	<ul style="list-style-type: none"> Chief Technical Advisor (CTA) 2 Senior Experts Regional Technical Coordinator (RTC) Regional Administrative Assistant (RAA) UNDP RSC 	Indicative cost: 139,400 US\$	Within first two months of project start up
Measurement of Means of Verification of project results.	<ul style="list-style-type: none"> UNDP RSC National Project Directors (MoH) CTA <p>Will oversee the hiring of specific studies and institutions, and delegate responsibilities to relevant team members.</p>	To be finalized in Inception Phase and Regional Conference.	Start, mid and end of project (during evaluation cycle) and annually when required.
Measurement of Means of Verification for Project Progress on <i>output and implementation</i>	<ul style="list-style-type: none"> Oversight by National Project Director and Regional and National Project team 	To be determined as part of the Annual Work Plan's preparation.	Annually prior to ARR/PIR and to the definition of annual work plans
ARR/PIR	<p>Regional Components</p> <ul style="list-style-type: none"> Chief Technical Advisor (CTA) Regional Technical Coordinator (RTC) UNDP RSC <p>National Components:</p> <ul style="list-style-type: none"> Project Director and National Project Implementation Units (NPIUs) UNDP CO 	None	Annually
Periodic status/ progress reports	<p>Regional Components</p> <ul style="list-style-type: none"> Chief Technical Advisor (CTA) Regional Technical Coordinator (RTC) UNDP RSC <p>National Components:</p> <ul style="list-style-type: none"> Project Director and National Project Implementation Units (NPIUs) UNDP CO 	None	Quarterly
Mid-term Evaluation	<ul style="list-style-type: none"> External Consultants (i.e. evaluation team) <p>Regional Components</p> <ul style="list-style-type: none"> Chief Technical Advisor (CTA) Regional Technical Coordinator (RTC) UNDP RSC <p>National Components:</p> <ul style="list-style-type: none"> Project Director and National Project Implementation Units (NPIUs) UNDP CO 	Indicative cost: 32,000 US\$	At the mid-point of project implementation.
Final Evaluation	<ul style="list-style-type: none"> External Consultants (i.e. evaluation team) <p>Regional Components</p> <ul style="list-style-type: none"> Chief Technical Advisor (CTA) Regional Technical Coordinator (RTC) UNDP RSC <p>National Components:</p> <ul style="list-style-type: none"> Project Director and National Project Implementation Units (NPIUs) UNDP CO 	Indicative cost: 32,000 US\$	At least three months before the end of project implementation
Project Terminal Report	<ul style="list-style-type: none"> External Consultants (i.e. evaluation team) <p>Regional Components</p> <ul style="list-style-type: none"> Chief Technical Advisor (CTA) Regional Technical Coordinator (RTC) UNDP RSC <p>National Components:</p> <ul style="list-style-type: none"> Project Director and National Project 	None	At least three months before the end of the project

Type of M&E activity	Responsible Parties	Budget US\$ <i>Excluding project team staff time</i>	Time frame
	<ul style="list-style-type: none"> Implementation Units (NPIUs) UNDP CO 		
Audit	<ul style="list-style-type: none"> UNDP RSC UNDP COs 	Indicative cost: 5,000 US\$	Once throughout the project's duration
Visits to field sites	<ul style="list-style-type: none"> UNDP COs UNDP RSC (as appropriate) Government representatives 	For GEF supported projects, paid from IA fees and operational budget	Yearly
TOTAL indicative COST Excluding project team staff time and UNDP staff and travel expenses		US\$ 208,400 (+/- 5% of total budget)	

VIII. LEGAL CONTEXT

This document together with the Country Programme Action Plan (CPAP) signed by the Government of the Republic of Ghana, Government of the Republic of Madagascar, Government of the United Republic of Tanzania and the Government of the Republic of Zambia and UNDP, which are incorporated by reference, constitute a Project Document as referred to in the Standard Basic Assistance Agreement (SBAA), as such all CPAP provisions apply to this document.

Consistent with the Article III of the Standard Basic Assistance Agreement, the responsibility for the safety and security of the implementing partner and its personnel and property, and of UNDP's property in the implementing partner's custody, rests with the implementing partner.

The implementing partner shall:

- a) Put in place an appropriate security plan and maintain the security plan, taking into account the security situation in the country where the project is being carried out;
- b) Assume all risks and liabilities related to the implementing partner's security, and the full implementation of the security plan.

UNDP reserves the right to verify whether such a plan is in place, and to suggest modifications to the plan when necessary. Failure to maintain and implement an appropriate security plan as required hereunder shall be deemed a breach of this agreement.

The implementing partner agrees to undertake all reasonable efforts to ensure that none of the UNDP funds received pursuant to the Project Document are used to provide support to individuals or entities associated with terrorism and that the recipients of any amounts provided by UNDP hereunder do not appear on the list maintained by the Security Council Committee established pursuant to resolution 1267 (1999). The list can be accessed via <http://www.un.org/Docs/sc/committees/1267/1267ListEng.htm>. This provision must be included in all sub-contracts or sub-agreements entered into under this Project Document.

Multi country and regional project

This project forms part of an overall programmatic framework under which several separate associated country level activities will be implemented. When assistance and support services are provided from this Project to the associated country level activities, this document shall be the "Project Document" instrument referred to in: (i) the respective signed SBAA's for the specific countries; or (ii) in the Supplemental Provisions attached to the Project Document in cases where the recipient country has not signed an SBAA with UNDP, attached hereto and forming an integral part hereof.

National Project Components will be implemented by the Ministry of Health of the four project countries in accordance with its financial regulations, rules, practices and procedures only to the extent that they do not contravene the principles of the Financial Regulations and Rules of UNDP. Where the financial governance of an Implementing Partner does not provide the required guidance to ensure best value for money, fairness, integrity, transparency, and effective international competition, the financial governance of UNDP shall apply.

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ANNEX 1: GHANA: COUNTRY-SPECIFIC HCWM BASELINE INFORMATION & PROJECT COMPONENTS

1. Description of the Health-Care system and HCW Situation
<p>Ghana is endowed with a large number of healthcare facilities, whose activities, size and generation of waste vary. In 2009 there were 3,217 healthcare facilities with a total of 22,164 beds in Ghana (MoH/Ghana Health Service (GHS), 2010).³⁵</p> <p>Healthcare facilities in Ghana are categorized as follows (MoG/GHS, 2010):</p> <ul style="list-style-type: none"> • Hospitals; government-owned, private, quasi/governmental, Islamic or owned by Christian Health Organization of Ghana (CHAG) • Teaching hospitals; government-owned • Regional hospitals; government-owned • Psychiatric hospitals; government-owned • Poly-clinics; government-owned • Health centres and clinics; government-owned, private, quasi/governmental, Islamic or owned by Christian Health Organization of Ghana (CHAG) • Community-based Health Planning and Services (CHPS); government-owned • Maternity homes; private <p>In 1992, the waste management department of Accra Metropolitan Assembly estimated the healthcare waste generation rate as 1.2kg/bed/day for six major hospitals (EPA-Gh, 2002; National Policy on HCWM, 2006). A study by Wilson et al (2006) estimated the total hospital generation rate for Komfo Anokye and Korle-Bu Teaching hospitals (KATH and KBTH) as 1.55 kg/bed/day and 2.90 kg/bed/day respectively. A recent study by Bamfo-Tanor & Owusu-Agyei, (2013) indicated that Korle-Bu generates about 24,000 kg of waste per day using average daily generation rate of 1.5 kg/cap/day. They concluded that healthcare waste in Ghana has been managed without the necessary infrastructure, knowledge, finance and legal framework.</p> <p>Using the average generation rate for the two hospitals to represent the national average, bed utilisation rate of 64% and total number of beds as 22,164 as estimated by the GHS annual report for 2010, it can be estimated that Ghana generates approximately 31.2 tons of healthcare waste per day. This means annually, Ghana generates about 136,656 tons of healthcare waste. Based on an assumption that 25% of the waste in of a hazardous or infectious nature, this amounts to the generation of 34,260 tons of hazardous waste on a yearly basis.</p>
2. Existing Healthcare Waste Treatment Technologies
<p>Incineration:</p> <ul style="list-style-type: none"> • The most common way to treat of HCW across the country has been incineration. Below an overview is provided on the incinerators in place and those that are planned:

³⁵ (MoH/GHS, 2010) “*The Health Sector in Ghana – Facts and Figures*” available at http://www.moh-ghana.org/UploadFiles/Publications/GHS%20Facts%20and%20Figures%202010_22APR2012.pdf.

Type of technology	Quantity	Remarks
De-Montfort incinerator	157	May only be used for sharps
Modified De-Montfort	28	Capacities not available
Pyrolytic incineration or controlled air incineration or double-chamber incineration	8	Not all may be working
Mobile incinerators for health-care waste	30	Some are stationary now due to operational challenges
Sterilisation and shredding (non-burnt technology)	2	One in operation/ the other yet to be commissioned
Bio-digesters for liquid waste	5	Some may not be working
Approved proposed construction of new incinerators	62	Funded by GAVI through EPI (administered by WHO and UNICEF)

- In the assessment, which was undertaken in preparation for this project, it was observed that almost all the visited healthcare facilities are using De-Montfort incinerators or its modified version, while some HCFs use temperature controlled incinerators. The De Montfort incinerators are mostly used for the incinerator of sharps. Most of the used incinerators lack proper air cleaning control and temperature control and are therefore contributing to UPOPs and Mercury being released into the environment.
- Since HCFs do not really dispose of a specific budget for HCWM, the breakdown of an incinerator can lead to open burning practices since the process of repairing it will be slow without funds to do it. In other cases, in such situations, infectious waste is simply mixed with regular household waste and collected and disposed at the landfill /dumpsite by waste collection companies.

Non-Incineration:

- Some of the health facilities especially the regional hospitals have autoclaves that are used for disinfecting and sterilizing various equipment and materials. They are either used at the laundry units, dental unit or Central Sterilization Centres within the facilities. In case of a breakdown, the maintenance division of the health facilities attends to them and in some cases the supplier comes to service the autoclave. This implies that the facilities are already aware of the disinfection power of autoclave so introduction of similar technology should not present major challenges to them.
- Further, the Ministry of Health, recently started the construction of 3 new hospitals (Winneba, Tarkwa and Tamale). In the development plans of these hospitals, budgets were included for the on-site treatment of infectious healthcare waste, to be applied towards the procurement of Hydroclaves as well as their installation and maintenance.
- The 3 hydroclaves have already been procured (one has already been installed in Winneba and is in operation while the other 2 have been commissioned). The distributor is an Israeli company that collaborates with a local maintenance company, which ensures maintenance throughout the warranty period (5 yrs.). Unfortunately the hospitals have not been trained in HCWM practices, classification, segregation, transport etc. as the funding only covered the technology components of the treatment not the capacity building components. This has resulted in Winneba using the hydroclave only once a week to treat sharps waste. After shredding, disinfected waste is sent to the incinerator. Clearly the hospital is not making full use of the installed technology, nor does it need to incinerate the disinfected waste.
- Zoomlion, the municipal waste collection company (see section on private sector involvement) is also planning to purchase a 350,000 US\$ hydroclave, but they are still deciding where it would be installed. Discussions on this have been ongoing since 2010 and they are waiting for some (financial) commitment of the MoH in order to cover the costs for collection and treatment of HCW from public HCFs.

3. Relevant laws and guidelines

- In Ghana the Polluter Pays Principle (PPP) makes the individual institution, hereby also healthcare facilities, responsible for their own waste and the management and treatment of this. This policy is an agreement between the Ministry of Local Government and Rural Development and the Environmental Protection Agency (EPA).
- The management of Healthcare Waste is guided by two policies:
 - Healthcare Waste Management Policy and Guidelines for Health Institutions (MoH, 2006)
 - Revised National Environmental Sanitation Policy (Ministry of Local Government and Rural Development, 2010) and Ghana EPA published in 2002 guidelines for healthcare waste management (EPA, 2002).
- The Healthcare Waste Management Policy and Guidelines for Health Institutions (2006), based on EPA's 2002 HCWM guidelines, includes all the necessary steps in HCWM; generation, segregation, color-coding system, storage, transportation, treatment and final disposal as well as training of staff, right equipment and records of the waste management. It should be followed by all HCFs, regardless of their ownership.
- UPOPs are not mentioned in the policy, but the importance of the correct use of incinerators is included. Furthermore the correct way to handle Mercury-spills is included in the policy.
- There is no specific law on HCWM in Ghana, but there are numerous laws and regulations which are relevant for waste management, therefore also for HCWM (see table below).

Title of Regulation	Acts and Year of Enactment
The Constitution of the Republic of Ghana	1992
The Environmental Protection Agency Act	Act 490 , 1994
Environmental Assessment Regulations	LI 1652, 1999
Public Health Act	Act 851, 2012
The Local Government Act	Act 462, 1993
National Building Regulation	LI 1630, 1996
Town and Country Planning	Cap 84, 1944
Vaccination Ordinance	Cap 76
Quarantine Ordinance	Cap 77
Mosquito Ordinance	Cap 75
Infectious Disease Ordinance	
Food and Drugs Law	305b (1992)
Mortuaries and Funeral Facilities Act	Act 563, 1998
The Criminal Code	Act 29, 1960
Mercury	ACT 1989 (PNDCL 217)

- The Mercury importation, usage and handling is regulated by the Mercury Act, which is generally pointed towards the mining industry. The act restricts the amounts of Mercury one is allowed to trade with, but does not concern handling or buying equipment that contains Mercury. Ghana has no official plan or policy for a phase-out of Mercury-containing equipment such as thermometers in the healthcare sector. Mercury contained in products in the health sector, makes up approximately 11,7 % of the total Mercury releases.

4. State of municipal waste management and recycling programs

- In Ghana, Public Private Partnerships (PPPs) in municipal waste collection, transport and management of landfill/disposal site have been in operation since quite some time.
- Specifically, Zoomlion Ghana limited is involved in the haulage and disposal of municipal waste. However, as it services a significant number of HCFs, which do not dispose of working treatment technologies, it often happens that Zoomlion handles waste containers in which infectious waste is mixed into municipal waste.
- As was mentioned in the previous section, ZoomLion might in the future procure, install and operate a hydroclave, and based on a fee treat HCW for HCFs. ZoomLion also runs the “Africa Institute of Sanitation and Waste Management (AISW AM)” which could be an excellent partner for including a certificate course on HCWM.

5. Training and Capacity Building related to HCWM

- Most healthcare facilities have a responsible person for managing healthcare waste at the facility. Most of these are Environmental Health Officers (EHOs) who have been trained by the School of Hygiene, except for the Holy family Municipal Hospital which had the duties footed by the Estate Manager. Komfo-Anokye Teaching (KATH) and 37 Military Hospitals had a number of staff working in the Environmental health unit with the unit heads holding Masters in Environmental Science and Environmental Management respectively. All the other staff either had a certificate or diploma from the School of Hygiene, which trains Environmental Health Officers for the country.
- The Officers indicated that their training at the School of Hygiene was on waste management in general but did not include details on healthcare waste; therefore, they learn mostly about HCWM on the job. This was confirmed by the Principal of the Accra School of Hygiene who said that, “detailed training on healthcare waste is a specialised field which is reserved for higher degree which they have developed (Degree and Masters) but at diploma level the students are taken through waste management in general.
- About five of the health facilities have not had any training on waste management for the past year and for some, the training took place more than 5 years ago. They however indicated that they have had HIV/AIDS infection prevention training in February 2013 in which the use of safety protective equipment and safe waste handling were included. KATH and Holy Family Hospitals indicated that they have had some training on waste management but could not show any training document or list of participants as a proof.
- Facilities that have not had such training receive constant information on segregation from the Environmental Health Officers during their routine inspection. All the facilities indicated that new staffs were trained during the usual orientation for new staff. Most of the facilities did not receive refresher training, at least once a year, except for KATH.

6. Mercury Use in the Health Sector

- In Ghana, Mercury is used mostly in the mining sector for gold processing. It is also used by laboratories in research institutions and universities, healthcare facilities and the textile industries. Importation of Mercury into Ghana is regulated by law, which is referred to as the MERCURY ACT 1989 (PNDCL 217)³⁶. This law basically regulate the importation, usage and handling with regards to the mining sector. The law gives right to engage in Mercury trading with restrictions on quantities, issuing of license for trading, transfer of Mercury and sanctions for offenders of the law. The law does not cover or restrict the use of Mercury-containing equipment.
- Quantities used by the sectors are as follows; the mining sector (80.4%), health sector (11.7%) and education (7.8%). Most of the research works done on Mercury focuses on releases from mining activities into the environment. There are no written plans or strategies to reduce or stop using Mercury-containing equipment in the health delivery system (Amfu-Out et al., 2014)³⁷.
- The hospital assessment also looked at the use of Mercury-containing devices and products in the Health

³⁶ <http://hseqsolutions.com.gh/en/files/hseq/MERCURY%20ACT,1989.pdf>

³⁷ Final Report on Initial Assessment of the Levels of UPOPs and Mercury Releases into the Environment Resulting from HCWM in Ghana (Amfu-Otu/MoH/GHS/UNDP, 2014)

Sector. It concluded that none of the HCF can be said to be Mercury-free, because they either use Mercury field thermometers or Mercury-based sphygmomanometers for pressure measurement, or both. At the same time these HCFs might also be using Mercury-free thermometers and sphygmomanometers.

- It was found that though there is no policy in place to ban Mercury-based equipment, most regional and district hospitals are changing from Mercury thermometers to digital ones. In most cases, HCFs use digital thermometers but they continue to use the Mercury-based sphygmomanometer. It was observed that some healthcare facilities used the Mercury field sphygmomanometers alongside the aneroid or digital type or both.
- District, regional and university hospitals also house dental units. Often they make use of dental amalgam as well as composites, depending on the means of the patients (although part of the costs of composites are also covered through the national insurance scheme). The challenge dental units face is mostly related to the disposal of Mercury-containing wastes. One dental unit was observed to store Mercury-containing amalgam waste in plastic bottle containers with water.

7. Ghana Specific Project Activities

Policy and Regulatory Framework:

- The HCWM guidelines and policy would need to be adjusted in such a way that non-incineration technologies can be used for HCWM treatment, and should be reviewed in light of current global and national standards.
- A holistic national standard for HCWM should be developed as well as a National Action Plan to make sure all HCFs are able to manage their waste in a responsible way.
- National Legislation on HCWM is needed to empower regulatory bodies for better law enforcement (e.g. through the issuance of a ministerial / Government degree set-up a National Task Force/Committee on HCWM, which can ensure the monitoring HCFs, and issue penalties/fees. Such a National Task Force could be made up of national experts, drawn from EPA, MoLG, MoH, GHS, etc.).
- Develop a standard assessment sheet for regulatory entities to assess HCFs to facilitate inspections, and institute a point system.
- Develop an import ban for Mercury-containing equipment.
- Develop and implement minimum standards for incineration technologies.
- Develop a degree/regulation that requires HCFs to treat their infectious waste. This will help create the enabling policy environment for the private sector to assume HCWM, help with tariff setting, etc.
- Establish standards for the operation of HCWM by the Private Sector

HCW treatment technologies:

- Support the 3 hospitals, which have Hydroclaves installed so that the GEF project can support technical assistance to the hospital. This will ensure proper use and maintenance of these technologies, and ensure that their operation will be optimised (used more frequently and for more waste than just sharps), while improving overall HCWM practices in these hospitals. Considering the technologies will be in place when the project starts it will be an excellent demonstration opportunity for non-incineration technologies.
- Support a number of HCFs in installing non-incineration technologies, preferably HCFs that also treat the waste of surrounding HCFs or would have the possibility to do so, in a region where it is not yet financially viable to get involved for the private sector to take on this role.
- Ensure that technologies are purchased with an extended warranty period and extended maintenance period and that technologies are procured from distributors and companies that have technical teams available in the country/region.
- Train HCF technicians and HCW operators in the maintenance and repair of non-incineration technologies.
- Possibly introduce needle cutters to minimize breakdown of shredders.
- Engage a training institution to set-up a certification course for autoclave maintenance and repair men and train engineers. A list of certificate holders can be posted on a website for easy access to the MoH/GHS and HCFs.
- Engage a training institution to design a vocational education course so that on a continuous basis people

can be trained on maintenance and repair of pressure vessels.

Private Sector Involvement:

- If the private sector embarks on the installation of a hydroclave, the project can provide support to ensure proper handling and treatment of HCW (e.g. waste tracking, tariff setting, etc.), or as an alternative option, the technology can be hosted by a hospital but operated by the private sector, with technical assistance provided by the project.
- It will be important to assist hospitals that receive non-incineration technologies as part of the project, to gain access to plastic buyers markets, in particular for PVC containing plastics, as there are fewer companies that purchase PVC containing raw materials as compared to PP and PE plastics.
- Explore with Private Sector Partners engaged through PPPs in MSWM whether they can assume a control and monitoring function - e.g. refuse to pick up infectious HCW, when it is mixed with municipal waste.
- Establish a HCWM certificate course at AISW AM and incorporate HCWM modules in other training courses.

Mercury:

- Conduct a staff preference study for Mercury-free medical devices.
- Conduct awareness raising/training on waste management and alternatives.
- Include Mercury-free devices in procurement catalogues.
- Establish standards/minimum requirements for Mercury-free equipment to avoid the use of sub-standard devices.
- Development of a phase-down/out plan for Mercury-containing medical devices and dental amalgam.
- Introduce an import ban on Mercury containing medical equipment, which will not only reduce the use of Hg containing products in the country but also halt the donation of Mercury containing medical devices by foreign donors.
- Support public HCFs and their dental offices in improving management practices for Mercury containing wastes - Disposal of Mercury containing waste, such as broken devices and Mercury containing amalgam waste as generally these thrown out with regular waste without any special precaution.
- Identify long-term storage/disposal solutions for Mercury containing wastes. By conducting an assessment on best solutions for the storage of Mercury wastes and put in place temporary storage options until final disposal/treatment solutions have been identified.

Training:

- Develop a training video, to facilitate conducting training at HCFs.
- Provide support to medical- and nursing- schools, review their curricula and incorporate HCWM and Hg modules/training into their curriculum.
- Provide support to the School of Hygiene, which trains EHO, review its curricula and ensure that modules on HCWM and Hg are incorporated into the curricula.
- Develop a Trainer-of-Trainer programme to target a wider audience than has been done up to date. By using a ToT approach it would be possible to target all HCFs in the country – or at least a large part of it.
- Train HCF managers and administrators on their responsibility in planning, budgeting, implementing and monitoring HCWM activities.
- Train new staff on HCWM upon entry into service.
- Ensure that HCF staff receives a HCWM refresher course every year.
- Provide regular training on HCW for HCF staff and waste handlers to ensure proper HCWM practices, proper operation of HCW treatment technologies and their maintenance.
- Provide training on Mercury effects, handling, clean-up, storage and disposal.
- Establish a HCWM certificate course at AISW AM and incorporate HCWM modules in other training courses.

8. Pre-Selected Model Facilities

In Ghana the project aims to support 3 types of Model Facilities:

- I. Three (3) HCFs that already have or will install non-incineration technologies of which the purchase, installation and maintenance costs are assumed by the MoH/GHS.
- II. Two (2) large healthcare facilities, which will function as a hub treatment cluster for surrounding healthcare Facilities, in installing non-incineration technologies.
- III. One (1) centralized treatment facility.

I. In total seven (7) hospitals have been preselected in consultation with the GHS based on a number of criteria, which are presented in Annex IV. Of those seven hospitals, one (1) hospital is already equipped with a non-incineration technology (Hydroclave) to treat sharps waste, two (2) additional hospitals will also be receiving non-incineration technologies (Hydroclaves). The costs of the technologies, its installation and 5 year maintenance plan are being covered by the Ministry of Health, and are counted as co-financing to the project.

The Ghana project component will support these 3 hospitals by introducing Best Environment Practices pertaining to HCWM to ensure that the overall management of healthcare Waste is improved (segregation, storage, transport, etc.). At the same time the project will also support these three hospitals in ensuring that these non-incineration technologies will be used in the best possible manner, in terms of maximum usage, proper operating procedures, introducing recycling practices, among else.

These three hospitals are:

- **Winneba** (hydroclave already operational)
- **Tarkwa**
- **Tamale**

Winneba

The facility is a newly constructed facility for dealing with trauma cases and other specialised health delivery services. The hospital has a 135 bed capacity with an average OPD attendance of 94 per day.

Organisation of healthcare waste management

The hospital does not have any written plan or policy for managing healthcare waste generated by the facility. The hospital has a responsible Environmental Health Officer who is in charge of handling healthcare waste and works hand in hand with the head of the Estate Department who has been trained in healthcare waste management. A Training of trainers workshop has been organised for some selected members of the hospital to in turn train other staff. The Head of Estate has participated in a previous pilot in the Central Region implemented by GHS, as such his knowledge on the subject is quite advanced. According to the Estate officer, healthcare waste is classified into general, sharps and biological waste.

Waste segregation and colour coding

There is a concerted effort to implement waste separation with well-labelled waste bins and colour coding. Sometimes colour codes are mixed up making the separation not effective. Sharps are well segregated for treatment using the hydroclave. No posters were found at the wards or other places demonstrating how segregation should be done.

Data on healthcare Waste

The hospital does not have any data on quantity of healthcare waste generated because there is no weighing facility to be used for the purpose. Even the sharps that are hydroclaved are not weighed but the treatment facility provides data on the amount treated. At the time of data collection, the officer in-charge was not available to provide such information.

Waste treatment

The hospital has a functioning hydroclave installed since two years which was planned for during the design and construction of the facility, and costs as part of the entire hospital facility budget. The company that installed it has an agreement to service the hydroclave for five years.

Mercury free status

The hospital is not mercury free because some of the thermometers and sphygmomanometers being used contain mercury. The digital type of thermometers was also in use. At the dental section, amalgam is used but the mixing is done by machines.

Tarkwa Government Hospital

The municipal hospital has a 105 bed capacity with an average monthly bed occupancy rate of 82% (end of 2012). The average OPD attendance for the year 2012 stood at 162 per day. A new site was acquired for the construction a new hospital facility, which became operational in November 2013 has 156 bed capacity.

Healthcare waste management

The hospital has no written plan or policy for managing healthcare waste generated by the facility. The hospital has a responsible Environmental Health Officer who is in charge of handling healthcare waste. The Municipal assembly assisted the hospital with obtaining a central container for waste storage and haulage to disposal by Zoomlion Ghana limited. An attempt to implement waste separation was not effective. The hospital did not have any data healthcare waste quantities generated, even after moving into the newly constructed facility. Before moving to the new facility, waste was treated using the De-Montfort incinerator but the new facility has a functional hydroclave installed for treating infectious waste. As waste separation is still not well practiced, this presents is a threat to the efficient performance of the installed hydroclave. The hospital is not mercury free because it makes use of mercury containing sphygmomanometers for measuring pressure of patients.

Tamale Teaching Hospital

The hospital has a bed capacity of three hundred and thirty-nine (339) and a workforce, which is currently about one thousand, five hundred and ninety-seven (1,597). The Hospital is undergoing major rehabilitation works and is expected to have a total bed capacity of six hundred (600) when work is completed (<http://www.tamaleteachinghospital.org/about-us/>).

II. In addition, a total of 12 hospitals have been assessed, as part of the PPG preparatory phase of the proposed project. Of these 12 hospitals assessed, 4 hospitals have been pre-selected for participation in the project, and it is expected that ultimately 2 of the pre-selected hospitals will be retained.

When the project will be approved by the donor, an official application process for these Healthcare Facilities will be launched. After selection and inclusion in the project, a Memorandum of Understanding (MoU) between the Heath Care Facility and the project, based an example developed as part of the Global Medical Waste Project³⁸ will be signed.

Assessment results of the 4 preselected hospitals (Amfu-Otu, 2013)

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<http://www.gefmedwaste.org/downloads/MOU%20template%20for%20the%20model%20facility%20June%202009%20UNDP%20GEF%20Project.pdf>

Ghana - HCF Level							
	Facility 1: 37 Military Hospital	Facility 2: <u>Koforidua</u> Regional Hospital	Facility 3: <u>Komfy</u> <u>Anokye</u> Teaching Hospital (KATH)	Facility 4: Central Regional Hospital	Facility 5: <u>Winneba</u>	Facility 6: <u>Tarkwa</u>	Facility 7: Tamale
No. of beds	518	350	1200	240	135	156	339
Quantity of Incinerated Waste (tonne/yr)	226.3	18.3	439.8	31.0	13.6	15.7	34.0
Type of Incinerator [emission release factor see Annex XV]	2 Dual Chamber incinerators [7]	Single Chamber / De Montfort? [2]	Single Chamber [2]	Dual Chamber [7]	<u>Hydroclave</u> for sharps. Remainder of the waste burned in the open [1]	<u>Hydroclave</u> for sharps. Remainder of the waste burned in the open [1]	Unknown - assumed open burning [1]
Dioxins emitted (Air) [g-TEQ/year]	0.792	0.732	17.592	0.109	0.089	0.103	0.225
Dioxins emitted (Ash) [g-TEQ/year]	0.014	0.004	0.088	0.002	0.008	0.009	0.020
Mercury releases from devices* [kg/yr]	1.45	0.98	3.36	0.67	0.38	0.44	0.95

The assessment was conducted by making use of an Individualized-Rapid Assessment Tools (I-RAT), developed under the GEF funded UNDP/WHO/HCWH Global Medical Waste project³⁹. The I-RAT is a rapid assessment tool to obtain an initial indication of the level of healthcare waste management at an individual healthcare facility. The tool results in an overall score out of 100 that can be used to compare and rank healthcare facilities for the purpose of prioritizing interventions, and can also be used as a quick tool to identify possible areas for improvement within a single facility.

III. Centralized Treatment Facility (CTF):

- Zoomlion, the municipal waste collection company is planning to purchase a 350,000 US\$ hydroclave, but they are still deciding where it would be installed (either on the premises of a larger hospital, with the technology being operated by Zoomlion, or alternatively installed on a particular piece of land allocated by the MoLG, to Zoomlion for the purpose of installing and operation a centralized CTF.
- Discussions on this have been ongoing since 2010 and they are waiting for some (financial) commitment of the MoH in order to cover the costs for collection and treatment of HCW from public HCFs. The costs of the hydroclave will be assumed by Zoomlion and have been provided as co-financing to the project.
- When an agreement is reached with the MoH and the MoLG on where the technology would be operated the project could support Zoomlion with capacity building elements.

Note: small rural Health Clinics that will be supported by the project will only be selected once the selection process of the larger hospitals has been concluded. To ensure that the project remains cost-effective, these latter need to be in relatively close vicinity of the hospitals, either to have their waste treated there – or to ensure that project experts minimize national/local travel time.

³⁹ (UN/GEF Global Healthcare Waste Project, 2009) “Individualized Rapid Assessment Tool (I-RAT)” Available at <http://www.gefmedwaste.org/downloads/I-RAT%20May%202009%20UNDP%20GEF%20Project.xls>

ANNEX II: MADAGASCAR – COUNTRY SPECIFIC HCWM BASELINE AND PROJECT COMPONENTS

1. Description of the Health-Care system and HCWM Situation

Madagascar counts approximately 8146 hospital beds, combining university, district and regional hospitals (Source: National Inventory of Mercury Wastes – 2008). The public health system follows a “pyramid hierarchy”. In total there are 3260 healthcare facilities:

- 1016 Health Centers Base Level I (CSBI) of which 898 are public (functional 804) and 121 private.
- 2058 Health Centers Base Level II (CSB II) of which 1614 are public (functional in 1570) and 444 private.
- 60 Hospitals Reference District Level I (CHRD I) of which 56 are public.
- 90 Referral Hospital Centres - District Level II (CHRD II) of which 29 are public.
- 16 Regional Referral Hospital Centres (CHRR): all public
- 20 University Hospital Centers (CHU)

In Madagascar, efforts to improve injection safety and waste management are being gradually intensified. In order to establish a baseline of the current situation, assessments were conducted from 2002 to 2004 at the University Hospital (CHU), Regional Referral Hospitals (CHRR), District Referral Hospitals (CHRD), basic health centers (CSB). In summary these assessments concluded that:

- Awareness on the risk of HCW is not very high among staff of health facilities.
- Segregation is not systematically practiced or done in an efficient manner, mostly due to a lack of awareness, resources, procedures and organization.
- There exist no national standards for disposal.

In April 2004, an assessment pertaining to injection safety was undertaken at 80 Health Units, following a WHO/SIGN methodology. The results indicated that:

- More than 60% of the health facilities assessed practiced open burning and/or bury waste.
- Syringes and needles were seen lying around on the grounds of approximately 25% of the health facilities assessed.

Finally, in July 2004 a survey was conducted among 24 healthcare waste producers in Antananarivo (CHU, clinics, laboratories, etc.) both public and private facilities. The survey concluded that:

- 58 % of health facilities surveyed have introduced segregation, but only 33% master it.
- 42 % practice incineration, 42% apply open burning and 16% makes use of removal services provided by the municipality (e.g. the HCF waste goes to dumpsite).

Results from the evaluation of the implementation of the National Policy on Waste Management in 95 health facilities (conducted in 2011)⁴⁰ concluded that:

⁴⁰Ministry of Public Health (MoPH) “Report on the Evaluation of the experiences and Monitoring in the area of Waste Management in Madagascar (April 2011). Ministère de la Santé Publique (MSP) Rapport de Capitalisation des Expériences et Suivi en Matière de Gestion de Déchets à Madagascar, Avril 2011

- 16% of staff has been trained.
- 28% of the HCFs have a waste management plan, of which 59.55 % validated it.
- 25% of the health centers have a healthcare Waste management committee, of which 25% is functional.
- 64% practices segregation at source.

2. Existing Healthcare Waste Treatment Technologies

Incineration and open burning is the most widely used and known disposal technology for HCW in Madagascar. In the country, various approaches to the treatment of HCW are being applied:

- Mixing with municipal waste followed by haulage undertaken by the municipality and disposal at an open dumpsite.
- Open or pit burning.
- Two chamber De Montfort incinerators:
 - 11 of which have been installed at facilities to treat TB related waste (World Bank funding) – incinerators have been installed in the 5 regions of Madagascar covered by the “*Projet de Financement Additionnel*” and the project “*PAUSENS*”⁴¹.
 - An additional 57 De Montfort incinerators have been installed with the technical and financial support of partners like the AfDB, AFD, WHO, UNICEF and the NGO EAST.
- “Artisanal Incinerators” which have been commissioned by institutions themselves and have been constructed by local companies. Often these are small box-type batch incinerators with no afterburner. Approximately 200 small burners for health centers were rehabilitated under the project “Health Sector Support – second phase (CRESANII)”.
- Two chamber incinerators using gasoil or diesel as fuel. 2 of such incinerators seem to have been installed (one at Sanahshou and one at Ramagurva). However it was questioned whether these were still in operation, because of the high costs of fuel.
- High technology incinerator(s) used by the recycling enterprise Adonis (one installed on the outskirts of Antananarivo and one additional high technology incinerators will soon be installed in Tamaka).

It should be mentioned that the overall the state of incinerators seems to be very poor. Most are in disrepair. The major challenge with respect to HCWM seems to be that HCFs do not dispose of a high enough budgets to ensure the proper management of HCW. It is because of such restraints that ultimately technologies break down and are not repaired.

Although no extensive in country assessment was conducted to find out whether there are non-incineration technologies in use for the treatment of healthcare Waste in Madagascar, based on the desk review of available reports and assessments, and a report prepared on the availability of non-incineration technologies in the African Region⁴², for now it will be assumed that there are no non-incineration technologies in use for the treatment of Healthcare Waste.

3. Relevant laws and guidelines

⁴¹Ils sont localisés au niveau des établissements sanitaires suivants : CHRR Manakara, CHRR Farafangana, CHD1 Ikongo, CHD1Ambalavao, CHD1 Ambohimahasoia, CHD1 Fandriana,CHRR Ambovombe, CHD 2 Ifanadiana, CHRR Ambositra, CHD 1 Manandriana, CHD 2 Ambatofinandrahana.

⁴²Medical Waste Treatment Technology Options for Africa: Past, Present and Future (Ruth Stringer, HCWH & Jorge Emmanuel, UNDP GEF Global Healthcare Waste Project). Third IPCAN Conference, Windhoek, Namibia 31 October - 3 November 2011

The Ministry of Public Health (MoPH), as well as the Ministry of Environment, Ecology and Forests (MEEF), have a number of legal provisions that are directly or indirectly related to the HCWM. MEEF is responsible for providing policies pertaining to environmental protection, while the Department of Pollution Management (“Le Department de la Gestion de Pollution”) is responsible for environmental control and compliance.

The Malagasy government has developed several laws and texts, which have a bearing on the management of medical waste:

- ✚ Law No. 2011-002 of 15 July 2011 Health Code (Issues of waste management are included in the Health Code)
- ✚ Law No. 90-033 of 21 December 1990. The Malagasy Environment Charter, as amended by Act No. 97-012 of 6 June 1997
- ✚ Law No. 98-029 of 20 January 1999 Water Code
- ✚ Act No. 97-041 of 2 January 1998 on the protection against the dangers of ionizing radiation and radioactive waste management in Madagascar
- ✚ Decree No. 2010-960 of 30 November 2010 establishment and organization of the Madagascar Pharmaceutical Agency
- ✚ Decree 2004-167 amending certain provisions of Decree 99-954 of 12.15.99 on Environmental Compatibility with Investments (MECIE)
- ✚ Inter-ministerial Decree No. 8092/2012 on the destruction of obsolete or damaged pharmaceuticals and health products
- ✚ Order No. 991/CUA/CAB on the regulation of waste management by the municipality of Antananarivo.
- ✚ Degree No. 900/2012. Portant interdiction, d’importation, de distribution, de vente, d’utilisation et de production de quelques matières actives de pesticides en agriculture et de produits chimiques relevant du secteur industriel dans le cadre de l’application de la convention de Rotterdam et de la convention de Stockholm
- ✚ Arrêté interministériel N° 28831/2013 du 24 septembre 2013 fixant la liste des produits interdits par le décret 2012/900
- ✚ Décret 2005/512 du 03 août 2005 portant ratification de la convention de Stockholm
- ✚ Law No. 98-022 of 20 January 1999 authorizing the ratification of the Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention)
- ✚ Décret No. 99-141 du 22 Février 1999, portant la ratification de Madagascar a la convention de Bâle sur le contrôle de mouvements transfrontières des déchets dangereux et de leur élimination.
- ✚ Degree No. 36802/13/MEEF Establishment of the National Commission for the implementation of the Minamata Convention on Mercury in Madagascar (30 December 2013).
- ✚ Décret No. 2012-754 Fixant Procédures de Gestion des Produits en fin de vie, sources de Déchets et des Déchets dangereux nuisibles à l’Environnement dans le cadre de la mise en œuvre de la Convention de Bâle.

In order to harmonize the management of medical waste the following documents have developed:

Policies and strategies:

- ✚ La Politique Nationale de Gestion des Déchets des Etablissements de Soins et de Sécurité des Injections (PNGDESSI) – 2014 (remplaçant la politique de 2005) était mis à jour et il est prévu que cette politique soit validée le 21 Février 2014.
- ✚ Stratégie nationale pour la gestion de la pollution à Madagascar (MEEF)

Guidance documents:

- ✚ Fiche Technique de la Sécurité de la vaccination (recommends that wastes are disposed of by open burning, burning in barrel incinerators or buried)

An official memorandum from the Secretary General of MoH has been addressed to all heads of HCFs (in 2007) to take costs related to HCWM up in their annual budgets.

4. Private Sector Involvement in the Treatment of HCW

- In Antananarivo, a private sector company (Groupe Adonis Environnement S.A.), which has approximately 25 employees, is involved in the management of healthcare waste, although most of the companies focus is on the recycling of other types of waste.
- In terms of HCWM, the enterprise has a few clients: Institute Pasteur (which is a laboratory), CTB, Mérieux & 2 to 3 pharmacies. The company provides HCW boxes, which it has designed itself and which are produced in Madagascar (outer side made of carton, with a plastic liner inside). Two different types of boxes are available for infectious waste (large and small) as well as a brown colored box for regular household waste. It should be noted that the collected waste doesn't contain any syringes or needles. These boxes are picked up approximately 2 / 3 times a week, by a van owned and driven by Adonis. The vehicle is clearly marked with biohazard signs and workers wear PPE.
- Upon arrival at Adonis, the infectious waste is fed to an incinerator, which reaches approximately 800 – 900 degrees Celsius (according to the company itself). The HCW is mixed with other types of wastes to ensure that the calorific value of the waste is high enough to sustain the intended temperatures. The amount of waste collected and treated by Adonis is available in the Madagascar Country Project Document.
- For its second location in Tamatave (~ 300 km from the capital, where most oil/extractive industries are located), Adonis has recently ordered a large incinerator. This incinerator will be used for the disposal of various types of hazardous waste, both solid as well as liquid. The incinerator costs ~ 250,000 € (~300 000 \$SD) and is able to reach a temperature of 1200 degrees Celsius.
- There are a number of challenges that Adonis is running into though. The first and most important one is related to the fact that the HCFs do not have the funds to be able to make use of the services of Adonis. The few that do are mostly privately run or do have more funds at their disposal for HCWM. Secondly, the market for recovered plastics doesn't seem to be very well developed.

5. Training and Capacity Building related to HCWM

- In April 2011, an assessment was conducted by the Ministry of Public Health (MoPH) of which the results were presented in the “*Report on the Evaluation of the experiences and Monitoring in the area of Waste Management in Madagascar*” (April 2011)⁴³.
- The HCFs that were assessed (and surrounding Health Centers (CSB)) had been equipped with De Montfort incinerators, which had been funded by “le Project Multisectoriel de Prevention du Sida (PMPS)”. All different types and levels of HCFs were represented in the assessment, including: CHU, CHRR, CSB and CHD that had been or had not been trained in waste management. The assessed HCFs were distributed geographically in 21 of the 22 regions of Madagascar.
- The assessment concluded that approximately 16% of personnel had been trained in aspects related to healthcare Waste management as well as Infection Prevention, while 84% had not received any training.
- A number of national initiatives have been carried out to improve training opportunities in HCWM (see below) unfortunately these are supported occasionally (often when external donor funding is made available for particular hospitals or a particular period), which impacts the sustainability of efforts.
- Under the “*Plan National 2013 – 2016 en Gestion des Déchets de Soins des Etablissements de Sante*” it is planned to implement a medical waste management program in health centers receiving support from the World Bank. Also, in addition to the maintenance of 11 incinerators, interventions will focus on providing support to 347 basic health centers. Among these, 143 centers will be funded under the Additional Fund (FA) and one part provided by PAUSENS (2013 to 2014) for supervision as well as maintenance of a number of existing incinerators. Regarding the rest of the interventions, financial support will be provided by PAUSENS (Projet d'Appui d'Urgence au Services d'Education de Nutrition

⁴³Ministère de la Sante Publique (MSP) “*Rapport de Capitalisation des Expériences et Suivi en Matière de Gestion de Dechets a Madagascar*”, Avril 2011

et de Santé). The medical waste management plan, integrating FA and PAUSENS support extends from 2013 to 2016.

- Overall, from 2013 to 2016, 347 training interventions are planned in 18 public health district health services (SRHR) in 5 of the most vulnerable regions (Androy, Amoron'iMania, Haute Matsiatra, Atsimo Antsinanana, Vatovavy Fitovinany).

6. Mercury Use in the Health Sector

Mercury Containing Medical Devices:

- In October 2008, the Madagascar Ministry of Environment, Ecology and Forests, prepared the "Initial Mercury inventory for Madagascar", making use of the UNEP Chemicals toolkit.
- Because no Mercury baseline was undertaken in the case of Madagascar as part of the project's preparation, due to time constraints, information from the 2008 National Mercury Inventory was reviewed and used to paint a picture of the Mercury emissions in Madagascar, due to the breakage of thermometers.
- In 2005 the number of thermometers used was at 22,436, the 51.60% of them were being direct reading thermometers. In 2006 this value was 22 798. According to the distributors, Mercury thermometers are most widely used in industry, while in hospitals, about 80% of the thermometers are Mercury based. Annually Madagascar imports over 4000 electronic thermometers.
- Per year, on average 18,000 Mercury containing thermometers are used, of which 88% is destined for the health sector.

Dental Amalgam:

- At the time of writing of the project document, no data was available on the extent to which dentist offices and public health facilities make use of dental amalgam capsules; mixing and preparing dental amalgam themselves; or use composites.
- The 2008 National Inventory concluded that Mercury In summary, on a yearly basis, between 176 and 705 kg of Mercury is used for the preparation of dental amalgam filling. Following the use of dental amalgam, it was estimated by the National Mercury Inventory that between 285 and 1,415 kg of Mercury are emitted to various media, making up 0.64 -2.09% of total national releases.

7. Pre-Selected Model Facilities

Out of 11 proposed health-care facilities four hospitals have been preselected in consultation with the Madagascar Ministry of Health and Social Welfare based on a number of criteria, which are presented in Annex IV. Due to time constraints these hospitals have not yet been assessed.

When the project is approved by the donor, an official application process for these Healthcare Facilities will be launched. After selection and inclusion in the project, a Memorandum of Understanding (MoU) between the Health Care Facility and the project, based an example developed as part of the Global Medical Waste Project⁴⁴ will be signed.

Preselected Hospitals (not yet assessed).

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<http://www.gefmedwaste.org/downloads/MOU%20template%20for%20the%20model%20facility%20June%202009%20UNDP%20GEF%20Project.pdf>

Madagascar - HCF Level				
	Facility 1: CHU Joseph Raseta Befelatanana	Facility 2: CHU Mère et Enfants de Tsaralalana	Facility 3: CHU Tambohobe Fianarantsoa	Facility 4: CHRD II Manjakandriana
No. of beds	427	70	450	40
Quantity of Incinerated Waste (tonne/yr)	42.9	7.0	45.2	4.0
Type of Incinerator [emission release factor see Annex XV]	De Montfort Incinerator (functioning) used by the TB ward [2]	De Montfort Incinerator (functioning)? [2]	De Montfort Incinerator (functioning) [2]	De Montfort Incinerator (functioning) [2]
Dioxins emitted (Air) [g- TEQ/year]	1.714	0.281	1.807	0.161
Dioxins emitted (Ash) [g- TEQ/year]	0.009	0.001	0.009	0.001
Mercury releases from devices* [kg/yr]	1.20	0.20	1.26	0.11

Note: small rural Health Clinics that will be supported by the project will only be selected once the selection process of the larger hospitals has been concluded. To ensure that the project remains cost-effective, these latter need to be in relatively close vicinity of the hospitals, either to have their waste treated at the larger hospitals – or to ensure that project experts minimize national/local travel time.

ANNEX III: TANZANIA: COUNTRY-SPECIFIC HCWM BASELINE & PROJECT COMPONENTS

1. Description of the Health-Care system
Tanzania counts 5987 healthcare facilities (Annual Health Statistics Report, 2009), of which 30% are private, NGO, faith-based or para-statal, and 70% are public HCFs.
2. Existing Healthcare Waste Treatment Technologies
<ul style="list-style-type: none"> • Incineration is the most widely used and known disposal technology for HCW in Tanzania. In 2003, the Ministry of Health, with the support of WHO, installed 13 medical waste incinerators (De-Montfort type) in regional and district hospitals in Tanzania. Later on, the programme was expanded and 43 additional incinerators were constructed, of which 11 in Regional hospitals and the rest in District Hospitals (MoHSW & WHO, 2007). In 2007, with support of the WHO, an assessment of the operation of the De Montfort incinerators was carried out. • Out of 26 incinerators found during the assessment only 2 (7.6%) were not De Montfort models. Keeping De Montfort incinerators functioning appeared to be the main challenge. The study found that out of the 24 incinerators assessed, 7 (29%) were had not been operating for a period varying of 2 months to 3 years, mainly due to structural defects, which seemed caused by the non-adherence of contractors to use recommended construction materials, and particular specifications and designs for De Montfort incinerator to operate properly and at the right temperature. The study revealed that all of the 7 non-functioning incinerators had been constructed of burnt bricks obtained locally rather than the recommended firebricks. • The assessment also looked at the combustion efficiency of the incinerators, by undertaking a smoke analysis. The analysis was conducted using a combustion analyzer instrument from TIRDO. The results of the testing of two incinerators (Morogoro and Korogwe hospitals), pollutant levels of CO, SO₂ and NO_x exceeded US EPA emission standards, except for NO_x. The level of CO emissions was 52 times higher than the US EPA emission standard (5047.04 mg/m³ as compared to the US EPA emission standard of 97.9 mg/m³). High CO emissions are an indication of incomplete combustion, which in this regard suggest that the incinerators were not burning healthcare Waste at high enough temperatures (700- 800 degrees Celsius based on design specifications). This suggests a very high possibility of toxic and bio-accumulative gas emitted by the incinerators assessed. • In addition to “De Montfort” incinerators there is a number of other type of burning structures present in Tanzania, these are located at about 75 District Hospitals and 15 Regional Hospitals. In those locations HCW is generally burned in masonry single chamber incinerators, which have been built by local construction companies. The combustion is often initiated by adding fuel, usually kerosene or charcoal and air inflow is based on natural ventilation. Most of these incinerators are in bad shape and operate at low temperatures (often less than 400 °C), which is not able to sustain full combustion of waste and results in high emissions of UPOPs. • Following the results of De Montfort incinerators and the burning units, the University of Dar-es-Salaam, under the leadership of Prof. Manyele, designed a two burning chamber incinerator. Since then approximately 20 hospitals have installed this dual chamber technology.
3. Relevant laws and guidelines

- The Vice Presidents Office – Department of Environment and the Ministry of Health and Social Welfare (MoHSW) have a number of legal provisions that are directly or indirectly related to the HCWM. The role of the Department of Environment is to provide and coordinate environmental management issues while the National Environment Management Council (NEMC) is responsible for ensuring enforcement and compliance.
- A list of relevant policy and regulatory documents having a bearing on HCWM has been provided below and is discussed/analyzed in more detail in the individual country project documents:
 - National Environmental Policy (1997)
 - Environmental Management Act. (2004), regulation 2009 (Part 4)
 - Environmental Health Practitioners (Registration) Act of 2007
 - Public Health Act (2009)
 - Healthcare Waste Management Regulations (2013 –Draft)
 - National Health Policy (2007)
 - Healthcare Waste Management National Policy Guidelines (2006)
 - National Standard and Procedure for Healthcare Waste Management in Tanzania (2006).
 - Healthcare Waste Management Monitoring Plan (2006)
 - National Action Plan for HCWM in Tanzania (2009 – 2015)
 - Tanzania National Healthcare Waste Management Plan (2007)
 - National Infection Prevention and Control Guidelines for Healthcare Services in Tanzania (2004)

4. State of municipal waste management and recycling programs

- In Tanzania and in particular in Dar-es-Salaam, Public Private Partnerships (PPPs) in municipal waste collection and transport have been in operation since 1993.
- In 2001 a PPP was developed with a South-African Company (“Dispotech”) that treated HCW for HCFs. The company was contracted by the city from 2001 – 2003. The company installed an incinerator, but encountered many challenges,
- Although it is uncertain whether this initiative is going to be implemented – private sector enterprises like EnviroServe (South-African Company), SMS and RAMKY (both Indian), have also expressed an interest in establishing a centralized treatment facility for HCWM.
- Thus, at present the private sector is not involved fully in aspects related to HCWM. However the private sector is involved in the recycling of plastics, and in certain cases of HCW related plastics.
- Although it is unclear in what kind of condition and after what type of disinfection practices these HCW plastics are being supplied to the recycling company, it is encouraging to know that there is a market for PVC containing plastics. Furthermore, there are a number of recycling companies that buy PP and PE plastics⁴⁵. It should be noted that in the past Bagamoyo hospital struggled to find plastic recycling companies which could purchase the disinfected plastics as the market prices for plastics were very low at the time.
- X-ray films are currently being collected from HCFs by a dealer from S.A. who buys X-ray films to extract the silver from the film. It is unclear however, how the remaining waste is being dealt with and disposed of. The X-ray department of the MoHSW provided the company with a license to undertake these activities.

5. Training and Capacity Building related to HCWM

- As part of the assessment carried out during the preparatory phase of the project, HCWM training opportunities for healthcare facility staff were also assessed by establishing whether training had been provided to participants. During the assessment 9 (15%) out of 58 respondents reported that they had training on HCWM at the college and 28 (48%) had received on-job training on HCWM.
- In most cases, healthcare providers have received no formal training on HCWM prior to entry into service. In most HCFs that were assessed, no regular formal training on HCWM is provided; service providers usually get on-the-job orientation on HCWM mainly with regard to segregation and use of waste bin containers from their co-workers. This means that if bad practices are in place, new recruits/staff also easily adapt to these bad practices. The assessment also noted that health officers fall back on the knowledge they had acquired during their training in college, but as indicated only 15% had received such training at college.

⁴⁵ Some of the more known recycling facilities are: Chemicotex and Azam.

- The fact that most HCW generators and handlers have not received any training, they do not have appropriate knowledge on handling and disposal of HCW, which results in bad segregation and transportation practices.
- At HCFs it is the Environmental Health Officers (EHOs) who oversee HCWM. EHO are trained at the following facilities:
 - Muhimbili University of Health and Allied Sciences (School of Allied Sciences). Most EHOs that are trained here are environmental engineers.
 - Herbert Kairuk Memorial University – alliance with Kairuk Hospital. Most EHOs that are trained here have a medical background.
 - Tanga School of Hygiene
 - Mpwapwa School of Hygiene, Dodoma
- In addition to the above mentioned training institutes, MoHSW and donors are also supporting different HCWM related training workshops; A number of initiatives have been carried out though to improve training opportunities in HCWM unfortunately these are supported occasionally (often when external donor funding is made available for particular hospitals or a particular period, which impacts the sustainability of efforts.

6. Mercury Use in the Health Sector

Mercury Containing Medical Devices:

- Most of the surveyed HCFs use both Mercury and Mercury-free containing sphygmomanometers and thermometers. The equipment is supplied by the Medical Stores Department (MSD) as well as through private registered supply vendors.
- In the HCFs that were assessed as part of the project's preparation, most of the Mercury containing sphygmomanometers were defective and were stored either in the ward or the HCFs main store with no plan for disposal. Broken Mercury containing thermometers were normally discarded along with municipal or infectious waste. In certain situations, staff does collect defective Mercury containing devices (mostly sphygmomanometers) and stores them for future repair or maintenance purposes.
- None of the HCFs assessed had any plan to phase out/down Mercury containing equipment, and indicated that they would continue their use as long as the Government/MSD would continue to supply them. Table 1 above summarizes the findings of the six (6) hospital assessments, including the number of thermometers and sphygmomanometers in use as well as the number procured per year. The latter generally corresponds (on average) with the number of Mercury containing devices that are broken on a yearly basis.
- In terms of baseline information, Agenda, a local NGO, supported a project on "Mercury estimation in Educational, Health and Small Scale Gold Mining sector in Tanzania". As part of this project, education and awareness raising posters on the use and dangers of Mercury were prepared and disseminated.

Dental Amalgam:

- In Tanzania it is common for dentists who work in the healthcare facilities (public and private) to make use of amalgam capsules. In most cases, capsules are distributed by MSD but also by private supply vendors⁴⁶.
- Of the 6 hospitals assessed, two of them (Hospital A & B) used dental amalgam (the other 4 hospitals did not have a dentistry unit).
- One of the two hospitals has been participating in a regional UNEP/WHO Programme, entitled the "East Africa Dental Amalgam Phase-Down Project (EADAP)" which aimed to demonstrate phase-down approaches of dental amalgam use, through training and workshops. At the project hospital, Mercury waste was collected in a special container labelled "Mercury Waste" and stored in a specific room. At the same hospital a Mercury separator was installed, which separate Mercury from wastewater during the dental amalgam filling process. Wastewater flowing out of the separator is free of Mercury. When the container, which captures the Mercury, is full it is sealed and replaced by another container. The recovered Mercury is then put into storage.
- In the other hospital, which most likely more accurately reflect the more common situation in Tanzania, no special containers to collect amalgam waste were in place and neither was a mechanism to filter the amalgam waste from the wastewater. At this hospital Mercury waste was discarded along with other types of wastes and often flushed away with running tap water.

¹⁸ In the latter of amalgam capsule use by private practices the Revenue Authority might have records available on import quantities.

7. Pre-Selected Model Facilities

Nine hospitals have been preselected in consultation with the MoHSW based on a number of criteria, which are presented in Annex IV. Of those nine hospitals, four have been assessed as part of the PPG preparatory phase of the proposed project (the results of which are presented in the first table). The other hospitals have not yet been assessed and their descriptions are presented in the second table.

When the project will be approved by the donor, an official application process for these Healthcare Facilities will be launched. After selection and inclusion in the project, a Memorandum of Understanding (MoU) between the Health Care Facility and the project, based on an example developed as part of the Global Medical Waste Project⁴⁷ will be signed.

Table X: Results of the pre-selected hospitals and their assessment results (Msasu, 2013)

UPOPs and Hg from HCF Level					
	Facility 1: Muhimbili	Facility 2: Kairuki	Facility 3: Mwananyamala	Facility 4: Sinza	Facility 5: Tumbi Special Hospitals
Quantity of Incinerated Waste (tonne/yr)	292	28.5	35.1	5.5	31.9
No. of beds	1363	150	330	106	300
Type of Incinerator [emission release factor see Annex XV]	Double Chamber [7]	Nil/open burning [1]	Double Chamber [7]	Single Chamber [2]	Double Chamber [7]
Dioxins emitted (Air) [g-TEQ/year]	1.022	0.188	0.123	0.220	0.112
Dioxins emitted (ash) [g-TEQ/year]	0.019	0.017	0.002	0.003	0.002
No. of sphygmomanometers purchased each year	0	0	0	0	Unknown
Mercury releases from devices* [kg/yr]	3.82	0.42	0.92	0.30	0.84
Amount of capsules used per year	750	250	0	0	Unknown

The assessment was conducted by making use of an Individualized-Rapid Assessment Tools (I-RAT), developed under the GEF funded UNDP/WHO/HCW Global Medical Waste project⁴⁸. The I-RAT is a rapid assessment tool to obtain an initial indication of the level of healthcare waste management at an individual healthcare facility. The tool results in an overall score out of 100 that can be used to compare and rank healthcare facilities for the purpose of prioritizing interventions, and can also be used as a quick tool to identify possible areas for improvement within a single facility.

Note: small rural Health Clinics that will be supported by the project will only be selected once the selection process of the larger hospitals has been concluded. To ensure that the project remains cost-effective, these latter need to be

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<http://www.gefmedwaste.org/downloads/MOU%20template%20for%20the%20model%20facility%20June%202009%20UNDP%20GEF%20Project.pdf>

⁴⁸ (UN/GEF Global Healthcare Waste Project, 2009) "Individualized Rapid Assessment Tool (I-RAT)" Available at <http://www.gefmedwaste.org/downloads/I-RAT%20May%202009%20UNDP%20GEF%20Project.xls>

in relatively close vicinity of the hospitals, either to have their waste treated there – or to ensure that project experts minimize national/local travel time.

ANNEX IV: ZAMBIA: COUNTRY-SPECIFIC HCWM BASELINE INFORMATION & PROJECT COMPONENTS

1. Description of the Health-Care system and HCW Situation

Zambia is endowed with a large number of health facilities, 1,674 in total (MoH, 2013), whose activities vary in nature, and thus the quantities and types of waste that are being generated vary greatly as well.

The health service delivery system in Zambia falls into five main categories, which are:

- **Health Posts (HPs) and Health Centres (HCs)** at community level;
- **Level 1 hospitals** at district level;
- **Level 2 general hospitals** at provincial level; and,
- **Level 3 tertiary hospitals** at national level (MoH, 2011).

Combined, these 1,674 health facilities have a potential of generating up to 30 tonnes of **infectious** healthcare waste per day (MoH, 2013). The table below presents a summary of the existing type of health facilities in Zambia as well as estimated waste generation per level per bed per day.

Estimate of waste generation in health facilities (MoH, 2013)

Facility type	Health Facilities and Ownership			Number of Beds and Cots			Waste Generation / Day	
	GRZ	Private	Mission	Beds	Cots	Total	Rate in kg/day	Amount in kg/ day
Community Based Health Worker *	-	-	-	-	-	-	-	-
Health Posts	161	8	2	198	11	209	0.1	20.9
Health Centres	913	53	6	1814	300	2,114	0.1	211.4
	252	22	77	9224	559	9,783	0.1	978.3
First Level Hospital	39	4	29	6016	859	6,875	1	6,875
Second Level Hospital	13	5	3	4204	827	5,031	2	10,062
Third Level Hospital	5	0	0	2532	417	2,949	4	11,796
Total								29,943.6

* *Note:* Neighbourhood Health Committees (NHCs) (although not in the health delivery system) facilitate linkages between communities and the health system. This is achieved through Community Health Assistants, Community Health Workers (CHW) and trained Traditional Birth Attendants (TBAs) who generate a minimal amount of wastes.

In the past few years, three comprehensive HCWM assessments have been carried out, which have lead to useful findings, conclusions and recommendations. It is the findings of these assessment reports, which constitute the baseline for the proposed project. The results of these assessments is described in detail in the individual country project documents.

1. Report of the Auditor General on Medical Waste Management in Zambia,⁴⁹ which assessed 85 health institutions (Auditor General, 2010).

⁴⁹<http://afrosai-e.org.za/sites/afrosai->

2. Healthcare Waste Management Assessment Report on WHO/UNICEF funded Macro-burn Incinerators at 22 Health Facilities (Ministry of Health, 2010).
3. Assessment carried out in 2013 in Lusaka, Copperbelt, Northern, Muchinga and Southern Provinces by the Ministry of Health in preparation for the National HCWM Plan (2014 – 2016) which covered two (2) level III hospitals, six (6) level II hospitals, three (3) level I hospitals, seven (7) health centres and one (1) health post.

2. Existing Healthcare Waste Treatment Technologies

Incineration:

The most common way to treat of HCW in Zambia is by incineration. The project's preparation phase in Zambia started relatively late, though – as a result thereof the total number of incinerators in the country was not known at the time of the project document's development.

However some information on the type and number of incinerators present in the country was obtained through a desk review of relevant documents as well as discussions with national project partners.

- Of the 1,800 health facilities, only a few have incinerators that meet ZEMA standards⁵⁰. Of the incinerators that meet ZEMA standards, 33 are of the macro-burn type. Of those 33 incinerators, 25 are non-functional (77%) (ZEMA, xxxx).

In 2010, WHO conducted a “Healthcare Waste Management Assessment on WHO/UNICEF funded Macro-burn Incinerators at 22 Health Facilities”, which had been installed with WHO and UNICEF financial support in 2004. The assessment concluded that:

- Since their installation, the macro-burn incinerators only worked for a short period. This was thought to be due to inadequate training of incinerator operators which was to be provided by the contractor, absence of a manual on how to operate it, and well as in certain cases incomplete/imperfect installation, or installation with defective parts.
- The fuel consumption was rather high, sometimes at 60 litres a day (e.g. Senanga), while it was reported that airlocks developed in certain incinerators, which caused them not to work.
- At the time of the assessment, most of the hospital had returned to using brick lined/ ordinary incinerators, which often had serious defects such as cracks, crumbling walls, etc.
- Some facilities had not fenced off the incinerators and there was no warning sign affixed to alert the public.
- Generally there was no evidence of ownership of the incinerators.

Centralized Incineration:

In and around Lusaka, where a large number of HCFs are located (~ 240), HCW treatment approach is rather different. A private sector entity, Waste Master (Z) Ltd., assures for approximately half of these (~ 120) collection services for infectious healthcare waste. The waste, for a fee, is collected and transported to one of the three 3 large incinerators in Lusaka and incinerated. Most of the infectious healthcare waste is taken to the University Teaching Hospital (UTH), but waste is also taken to incinerators installed at Kalingalinga and Ngwerere.

In addition, another private sector waste collector, Zorbit, owns an incinerator, which has been installed at the Lusaka City Council Chunga landfill. The incinerator runs on electricity and is used 2/3 times a week to incinerate HCW, expired pharmaceuticals and narcotics, according to the Lusaka City Council.

3. Relevant laws and guidelines

e.org.za/files/reports/Medical%20Waste%20Management%20%282010%29.pdf

⁵⁰ “Minimum Specifications for HCWM Incineration” (ZEMA, xxxx), available at: http://www.zema.org.zm/index.php/publications/doc_details/14-minimum-specifications-for-health-care-waste-Pincineration

- The Ministry of Health, as well as the Ministry of Lands, Natural Resources and Environmental Protection (MoLNREP) have a number of legal provisions that are directly or indirectly related to the HCWM. MoLNREP is responsible for providing policies pertaining to environmental protection, while ZEMA (Zambia Environmental Management Agency) is responsible for the development and implementation of law and standards as well as inspections.
 - The Vision 2030
 - The Sixth National Development Plan (2011 – 2015)
 - The National Policy on Environment (NPE)
 - The Environmental Management Act - EMA (No 12 of 2011)
 - The Environmental Management Act (Licensing) Regulations, Statutory Instrument (SI) 112 of 2013
 - The National Health Strategic Plan, 2011 – 2015
 - The National Solid Waste Management Strategy for Zambia
 - The Technical Guidelines on Sound Management of Healthcare Waste
 - The Minimum Specifications for HCWM Incineration
 - The Public Health Act, Cap 295. Part IX
 - The Pharmacy and Poisons Act. Cap 299
 - The Ionization Radiation Act, Cap 311
 - The Local Government Act, Cap 281
 - National Strategic Plan for Infection Prevention 2005 – 2007 & Zambia National Infection Prevention Guidelines
 - 2013 Guidelines on Hazardous Waste
 - Infection Safety Policy
 - HCWM guidelines (2008 / 2007?)

4. State of municipal waste management and recycling programs

- The advantage in Zambia is that the recycling market for plastics has been developed quite well⁵¹, markets for PE and PP plastics are available, there even is a recycling company that produce shoe soles from recycled PVC.

5. Training and Capacity Building related to HCWM

- At large HCFs, it is Environmental Health Technologists (EHTs) or Environmental Health Officers (EHOs) that assume responsibilities related to HCWM. However smaller HCFs do not have EHTs. At national level, the School of Medicine provides a first degree in Environmental Health and Masters in Public Health with component in HCW.
- Other learning institutions, such as Evelyn Hone College (EHC) and Chainama College of Health Sciences (CCHS), offer diploma courses in Environmental Health. EHTs are trained at trained at EHC and CCHS while EHOs are trained at the School of Medicine of the University of Zambia. However, as was observed during many of the assessments, most of the healthcare providers apart from EHTs and EHOs have limited knowledge of proper healthcare waste collection, transportation and disposal.

6. Mercury Use in the Health Sector

In the Health Sector, it is thought that most public healthcare facilities continue to use Mercury-containing medical devices, such as thermometers and sphygmomanometers while the use of dental amalgam is also common practice. The use of Hg-free medical devices is thought to be more common in private sector healthcare facilities. Although it has not been an official policy decision, bit-by-bit HCFs are phasing out Mercury containing medical devices.

⁵¹ ZIEM – a Zambian NGO – is currently undertaking an assessment of waste practices to determine how big this problem is, focusing on plastics. They will organize a conference which is expected to take place in Lusaka in May 2014.

Mercury containing thermometers:

With respect to Mercury containing thermometers, according to the Zambia Medical Store Department⁵², approximately 10,197 Medical Hg containing thermometers are sold each year, which implies that a similar amount of thermometers break on a yearly basis, **at a minimum this results in a release of 5 kg Hg/yr and at a maximum 15 kg Hg/yr.**

However, based on international averages, an average of 2.8 g of Hg per bed/yr, is released in countries where Hg containing thermometers are used. Based on the number of hospital beds in Zambia which is around 28,490 (Nat. HCWM Plan: 2008-2010), this would amount to estimated Mercury releases from thermometers of approximately ~ **80 kg of Hg/yr.** Which is significantly higher than the 15 kg Hg/yr calculated as part of the Mercury inventory.

Mercury containing sphygmomanometers:

The data for the use of Mercury containing sphygmomanometers was extrapolated based on the use of the largest hospital in Zambia (University Teaching Hospital - UTH), which has a bed capacity of 1863 and has 292 sphygmomanometers in use at any given time. Based on the country's bed capacity, it was estimated that in the country a total number of 4,062 sphygmomanometers are in use. However in the Mercury Inventory, it is assumed that per year 4,062 are actually sold (and thus broken) resulting in Mercury emissions of about **325 kg Hg/yr.** It is thought that this number is very likely an overestimation.

Dental Amalgam:

The Mercury Inventory, which Zambia completed with UNEP and UNITAR support in 2012, concluded that based on the number of inhabitants in Zambia (13,046,508), using an input factor of 0.15 g Hg/year per inhabitant, the total use of dental amalgam amounts to **1,957 Kg Hg/year.**

It would be necessary at the start of the project to conduct a quick Mercury baseline in each of the HCFs to establish the actual baseline for breakage of Mercury-containing thermometers and sphygmomanometers and the use of Dental Amalgam.

7. Pre-Selected Model Facilities

In consultation with the Ministry of Health and the Ministry of Community Development, seven (7) Healthcare Facilities were preselected based on a number of criteria, which are presented in Annex IV. Due to time constraints during the project's development phase these hospitals have not yet been assessed.

When approved by the donor (GEF), an official application process for these Healthcare Facilities will be launched. After selection and inclusion in the project, a Memorandum of Understanding (MoU) between the Health Care Facility and the project, based on an example developed as part of the Global Medical Waste Project⁵³ will be signed.

The provinces selected for project inclusion were **Lusaka, Central and Copperbelt**, all within easy reach to allow for frequent monitoring and the provision of technical assistance on a continuous basis. Other provinces were excluded because of the presence of many health related bi-lateral projects.

In Zambia the project aims to support 3 types of Model Facilities:

⁵² www.medstore.com.zm

⁵³

<http://www.gefmedwaste.org/downloads/MOU%20template%20for%20the%20model%20facility%20June%202009%20UNDP%20GEHuhuF%20Project.pdf>

- IV. One (1) centralized treatment facility to be located at the **University Teaching Hospital**.
- V. Up to three (3) large healthcare facilities, which will function as a hub treatment clusters for surrounding healthcare Facilities.
- VI. Up to six (6) smaller rural health facilities.

Preselected Hospitals (not yet assessed)

Zambia – HCF Level						
	Facility 1: University Teaching Hospital	Facility 2: Ndola Central Hospital	Facility 3: Kabwe General Hospital	Facility 4: Kapiri Mposhi District Hospital	Facility 5: Kamuchanga District Hospital	Facility 6: Mukonchi Rural Health Centre
No. of beds	1,863	502	352	48	60	27
Quantity of Incinerated Waste (tonne/yr) ¹⁷	2,720	733	257	18	22	1
Type of Incinerator [emission release factor see Annex XV]	Macro-burn; can exceed 1000°C [9]	60 kg Macro-Burn [9]	Macro-burn [9]	Open air burning [1]	Brick incinerator [2]	Open air burning [1]
Dioxins emitted (Air) TEQ/year]	3.808	1.026	0.360	0.119	0.880	0.007
Dioxins emitted (Ash) TEQ/year]	0.054	0.015	0.005	0.011	0.004	0.001
No. of sphygmomanometers in use (ZEMA, 2012)	292	unknown	unknown	unknown	unknown	unknown
Mercury releases from devices* [kg/yr]	5.22	1.41	0.99	0.13	0.17	0.08

Note: small rural Health Clinics that will be supported by the project will only be selected once the selection process of the larger hospitals has been concluded. To ensure that the project remains cost-effective, these latter need to be in relatively close vicinity of the hospitals, either to have their waste treated at the larger hospitals – or to ensure that project experts minimize national/local travel time.

ANNEX V: COORDINATION ACTIVITIES

There are a number of initiatives in Ghana, Madagascar, Tanzania and Zambia as well as at regional and global level (past, on-going and future) that are relevant for the proposed regional project. For an overview of these activities please refer to Table 9 below. More detailed information is provided in the country specific project documents.

Table 8: Overview of relevant HCWM related programmes and projects (past, on-going and planned).

Entity / Organization	Activities	Period
GHANA		
WHO Ghana	The WHO Office in Ghana, supports the Ministry of Health in putting in place a GAVI Alliance supported Expanded Program on Immunization (EPI). WHO/GAVI is supporting activities that aim to improve HCWM, in particular waste resulting from immunization campaigns, through the procurement of 32 incinerators.	On-going
Ministry of Health	Activities carried out with WHO and World Bank support included: Orientation at meetings of district health directors, health administrators, regulators, etc. (2005-2009); Training of trainers at national level (2009); Integration with training on Occupational health & safety: Eastern & Central regions (2010); Establishment of 2 pilot facilities, Central Region; Training manual and HCWM training supported by Abidjan Lagos Corridor (ALCO) Project	2005 - 2010
UNICEF Ghana	The UNICEF Office in Ghana, supports the Ministry of Health in putting in place a GAVI Alliance supported Expanded Program on Immunization (EPI). As part of this funding, UNICEF/GAVI is supporting activities that aim to improve the management of Health-Care Waste, in particular waste resulting from immunization campaigns through the procurement of 35 incinerators.	2014 - 2015
Zoomlion Ghana limited	Involved in the haulage and disposal of municipal waste. However, as it services a significant number of HCFs, which do not dispose of working treatment technologies, it often happens that Zoomlion handles waste containers in which infectious waste is mixed into municipal waste. ZoomLion might in the future procure, install and operate a hydroclave, and treat HCW for HCFs on a fee basis.	On-going
EPA / UNDP	Capacity for PCB elimination (3,500,000 US\$).	Under implementation
MADAGASCAR		
MEF (national execution)	Enabling Activities to review and update the National Implementation Plan (NIP) for the Stockholm Convention on Persistent Organic Pollutants (POPs) – 150,000 US\$.	CEO approved
UNIDO	<ul style="list-style-type: none"> Promotion of BAT and BEP to Reduce UPOPs Releases from Waste Open Burning in the Participating African Countries of COMESA-SADC Subregions (6,615,000 US\$). Including: Botswana, Ethiopia, Lesotho, Madagascar, Mozambique, Sudan, Swaziland, Tanzania, Uganda and Zambia. UNEP is currently preparing a regional MIA project, which will also include Madagascar. The PIF has not yet been prepared/submitted. 	CEO PIF Clearance
European	The EU has made emergency funds available (as most donor funds have	June 2013 - June

Union	been halted) to allow for the collection and transport of municipal waste to the dumpsite in the capital Antananarivo.	2015
UNHabitat	UN Habitat, October 2011 study on "Identifying opportunities for recycling and rapid assessment of the solid waste management sector in Antananarivo, Madagascar"/"Identification des possibilités de recyclage et évaluation rapide du secteur de la gestion des déchets solides à Antananarivo, Madagascar"	October 2011
GAVI	The Ministry of Public Health's Vaccination Services (Service de la Vaccination), functions as the national coordination unit for GAVI funds. GAVI/VS has just developed a proposal for Medical Waste Management activities which includes: <ul style="list-style-type: none"> • Rehabilitation of old incinerators (650,000 US\$) • Installation of new incinerators (100,000 US\$) 	It is unclear if this proposal has already been funded.
AFD Agence Française pour le Développement	<ul style="list-style-type: none"> • L'AFD finance des programmes multisectoriels (Santé, Agriculture – Rural, Economie, ...). Chaque secteur a son échéance de financement : l'échéance pour la santé a été en 2008 pour 4 ans. Ainsi, L'AFD avec la Banque mondiale ont conclu le financement du Programme d'Appui Conjoint au Secteur Santé (PACS) en 2009. Montant : 80 million de \$ (BM : 60 million US\$; AFD : 20 million de US\$). • L'évènement politique de 2009 a influencé la mise en œuvre du programme. Les financements sont suspendus surtout pour la banque mondiale. AFD a utilisé une partie de ses fonds pour financer le Ministère de la santé dans l'installation des incinérateurs, supervision et suivi (12 million d'Euros). • Le biais du Ministère de la santé qui a été financé pour l'installation des incinérateurs au niveau des Formations sanitaires et les suivis des fons de AFS sont encore encours d'utilisation. 	2008 - 2011
CNLS Conseil National de Lutte contre le Sida	Leur principal bailleur est La Banque Mondiale par l'intermédiaire de l'Unité de Gestion de Projets (UGP). Actuellement le projet en cours est le Projet Multisectoriel de Prévention du Sida (PMPS) : le projet prend fin vers le mois de septembre Dans le passé, le projet a contribué dans le cadre de la prévention du SIDA dans l'appui aux équipements d'incinérateurs des centres de santé.	va finir dans 6 mois
USAID	Information sur les projets financés actuellement et en cours de mise en œuvre: Projet Mahefa/JSI : santé communautaire (Région nord : Diana, Sofia, Betsiboka); Projet Mikolo; IPM: Institut Pasteur de Madagascar. USAID s'est engagé surtout sur la prise en charge des renforcements des connaissances (formations) dans les projets qu'il soutient. Projets focalisés surtout pour la santé communautaire et au niveau des CSB et au niveau du secteur privé.	
Groupe Adonis Environnement (S.A.)	Private sector company involved in HCWM, which has a few clients in Antananarivo. For its second location in TAMAKA (~ 300 km from the capital, where most oil/extractive industries are located), Adonis has recently ordered a large incinerator. This incinerator will be used for the disposal of various types of hazardous waste, both solid as well as liquid. The incinerator costs ~ 250,000 US\$ and is able to reach a temperature of 1200 degrees Celsius.	On-going
UNHabitat	«City Development Strategy for Antananarivo, Infrastructure Development, Urban Services Improvement and City Poverty Strategy» Cost: US\$ 286,000 (US\$ 83,000 implemented by UN-HABITAT). Local Authorities: Municipality of Antananarivo, Funding Institution: Cities Alliance, Implementing Organizations: Cities Alliance, UN-HABITAT. More information available at: http://www.unhabitat.org/content.asp?cid=674&catid=212&typeid=13&su	

	bMenuId=0	
Work Bank	<p>Has supported the construction of De Montfort incinerators through the ONN (Office National de Nutrition), specifically for TB hospitals/units.</p> <p>It also appears as if the World Bank will provide funds for the installation of an incinerator at the blood bank, which is located on the same premises as the “Hopital Universitaire Joseph RAVOAHANGY ANDRIANAVALONA” which would allow the blood bank as well as the hospital to make use of an improved infrastructure (~ 346,000 US\$)</p>	
PACT	A investi ~ 50 million d'ariary dans la GDM dans le passé (~ 22,000 US\$).	
OMS	<ul style="list-style-type: none"> • A contribué dans l'installation des incinérateurs à travers le Service de la vaccination - GAVI • OMS travaille avec le Ministère de la santé à travers le Programme National de Lutte contre le Paludisme: Test de Diagnostic Rapide (TDR), distribution de moustiquaire imprégné de longue durée. • Appui technique du Ministère de la santé dans l'élaboration de la Politique Nationale de gestion des déchets des soins médicaux, et d'autres documents officiels 	
TANZANIA		
NGO AGENDA	<ul style="list-style-type: none"> • Project on “Mercury Measuring in Educational, Health and Artisanal and Small Scale Gold Mining in Tanzania” • Non-Incineration Medical Waste Treatment Pilot Project at Bagamoyo District Hospital, Tanzania. 	
Ministry of Health and Social Welfare (MoHSW) & World Bank	<p>The Government of the United Republic of Tanzania, has obtained through the World Bank a loan in the amount of 100 million US\$ for a “Basic Health Services Project” which will be implemented over the period December 20, 2011 to June 30, 2015.</p> <p>The project also contains a component (no. 3 (c)), which is intended to support the implementation of the National Action Plan for Healthcare Waste Management (2009 – 2013), developed by the MoHSW, through the provision of funding to support priority interventions in the National Action Plan to help improve the overall status of HCWM in Tanzania (indicative cost \$0.5 million).</p> <p>For more information: http://www.worldbank.org/projects/PI25740/basic-health-services-project?lang=en</p>	June 2013 - June 2015
WHO, MoHSW, VPO – DoE, Ministry of Water	<p>3-year Project entitled “<i>Building adaptation to climate change in LDC through resilient WASH</i>”, which has the following sub-activities:</p> <p>WHO is also supporting a number of other initiatives relation to environment & Health:</p> <ul style="list-style-type: none"> • Support monitoring compliance with the norms and standards defining environmental and occupational health. • Support MOHSW to convene stakeholders’ meetings on the public health issues in the environment. • Support MOHSW to convene stakeholders’ meetings to review national provisions in line with the regional initiatives and multilateral agreements and conventions on environment and sustainable development. 	2014 - 2015
Jhpiego	<p>“<i>Strengthening Infection Prevention and Control (IPC) through Technical Assistance to MOHSW of Tanzania program</i>” funded by CDC and PEPFAR. The goal of the programme is to improve the quality of Infection Prevention Control (IPC) practices in Tanzanian hospitals to</p>	2010 - 2015

	<p>reduce the rate of biomedical HIV transmission and other infections.</p> <p>Through the programme, Jhpiego provides technical assistance to MOHSW as well as other partners addressing IPC in their respective programs and activities, focusing on interventions that have a high impact on the reduction of infections. HCWM is a critical area of intervention as part of this programme. In its entirety, the HCWM component of the 5-year Jhpiego programme is of the level of US\$ 1,200,000.</p>	
PASADA	<p>“Optimizing Comprehensive HIV and AIDS Services in Tanzania” funded by the US Government, through PEPFAR and the US Mission in Tanzania, with the following Program Goal: To strategically and sustainably optimize access to comprehensive and cost-effective HIV and AIDS prevention, care and treatment services. HCWM is a critical area of intervention as part of this programme.</p>	2011 – 2015
Americares	<p>“Health Workers Safety Initiative” Programme.</p>	2009 - 2012
GIZ / KfW	<p>Project on sterilization of waste-water and reduction of heavy metals (Silver from X-ray developers and films) at Bombo hospital, Tanga, Tanzania.</p>	2005 - 2009
HCWH, MMIS, JSI, AGENDA, GEF, UNDP	<p>Non-Incineration Medical Waste Treatment Pilot Project at Bagamoyo District Hospital, Tanzania. The main objective of the pilot project was to install, demonstrate and evaluate existing off-the-shelf non-incineration medical waste treatment technologies at Bagamoyo District Hospital in Tanzania. Link to the project’s description: http://www.gefmedwaste.org/downloads/Non-Incineration%20Medical%20Waste%20Treatment%20Pilot%20Project%20at%20Bagamoyo%20District%20Hospital,%20Tanzania%20%20.pdf</p>	2008 – 2010
University of Dar-es-Salaam, GEF, UNDP, WHO, HCWH	<p>The UNDP/WHO/HCWH GEF funded Global Medical Waste Project assisted seven countries - Argentina, India, Latvia, Lebanon, Philippines, Senegal and Vietnam - in developing and sustaining best healthcare waste management practices in a way that is both locally appropriate and globally replicable. An additional project component in Tanzania, in partnership with the University of Dar-es-Salaam, worked on the development, testing and dissemination of affordable and effective alternative healthcare waste treatment technologies for appropriate use in small and medium-size facilities in sub-Saharan Africa, and preparation and dissemination of manuals for their manufacture, installation, operation, maintenance and repair.</p>	2008 - present
VPO, UNIDO	<p>Enabling Activities to Review and Update the National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (POPs).</p>	2012 – on-going
Tanzania Dentists Association, UNEP, WHO	<p>“East Africa Dental Amalgam Phase-Down Project (EADAP)” in Kenya, Uganda, and Tanzania aimed to demonstrate the phase-down approach of dental amalgam use. For more on this project go to: http://www.unep.org/chemicalsandwaste/Mercury/PrioritiesforAction/Products/Activities/EastAfricaDentalAmalgamPhase-DownProject/tabid/105844/Default.aspx</p>	December 2012 – December 2013
Chief Gov. Chemist Office, UNIDO/	<p>It is anticipated that the Chief Government Chemist will apply for GEF funding through UNIDO and the VPOs office to address Mercury exposure from Artisanal and Small Scale Gold Mining (ASGM).</p>	Anticipated

VPO		
ZAMBIA		
ZEMA/ UNIDO	Enabling Activities to Review and Update the National Implementation Plan for the Stockholm Convention on Persistent Organic Pollutants (POPs) - 170,000	2014 – 2015 CEO Approved
Ministry of Health World Bank	<ul style="list-style-type: none"> The (not yet approved) Zambia Health Improvement Program will be supporting 5 project sites. HCWM components have been integrated into it. The World Bank also provided financial support for conducting a HCWM assessment, as well as the review and printing of the Zambia National Healthcare Waste Management Plan (2014 – 2016), which was prepared in June 2013. In 2009/2010 the World Bank provided financial support to the installation of 32 incinerators (including the Macro-burn incinerator) at the University Teaching Hospital (UTH) in Lusaka. The World Bank also provided some funds for capacity building, which initially were intended for the establishment of a HCWM course, but ultimately resulted in a BSc. Course on Environmental Health (SANARAA). National HCWM Plans (2004 – 2006 and 2008-2010) were developed with support of the World Bank under the “Malaria Booster Project”. 	2015 2013 2009/2010
Ministry of Health / GFATM	In 2013, UNDP was the principal recipient for the Global Fund in Zambia, which amounted to 70 million US\$ in financing.	
Ministry of Health, WHO, UNICEF	<ul style="list-style-type: none"> In July 2004, WHO and UNICEF contracted ABEL INVESTMENTS Ltd to install 22 macro-burn incinerators as part of the Ministry of Health’s Sub-Sector Programme. In 2008, WHO and UNICEF conducted training of health staff from all health facilities in the country. The training started with the training of Provincial Health Officers at national level, which was followed by the training of District Officers located in the provinces with the help of the Ministry of Health. In turn, the District Officers were expected to train the rural health centres. In 2010, WHO contracted national consultants to assess the HCWM situation in Zambia, assess the status of the installed 22 macro-burn incinerators and develop a healthcare waste management plan. 	2004 2008 2010
NGO Zecohab	At Makeni Hospital, an NGO called Zecohab, also has recently installed an incinerator for HCW.	
REGIONAL & GLOBAL INITIATIVES		
UNDP/WHO /GEF	Demonstrating and Promoting Best Techniques and Practices for Reducing Health-Care Waste to Avoid Environmental Releases of Dioxins and Mercury in Argentina, India, Latvia, Lebanon, Philippines, Senegal, Tanzania and Viet Nam (GEF Grant: 10,326,455 US\$)	
UNIDO	Environmentally Sustainable Management of Medical Waste in China (GEF Grant: 11,650,000 US\$)	
UNIDO	Environmentally Sound Management of Medical Wastes in India (GEF Grant: 10,000,000 US\$)	
IBRD	Demonstrating and Promoting Best Techniques and Practices for Managing Healthcare Waste and PCBs in Tunisia (GEF Grant: 5,500,000 US\$)	
UNEP Africa	Disposal of PCB Oils Contained in Transformers and Disposal of Capacitors Containing PCB in Southern Africa (Botswana, Lesotho,	Council Approved

institute GEF	Madagascar , Malawi, Mauritius, Mozambique, Namibia, Seychelles, Swaziland, Tanzania , Zambia , Zimbabwe), 7,710,000 US\$ - Africa Institute (South-Africa)/UNEP	
UNIDO	Promotion of BAT and BEP to Reduce uPOPs Releases from Waste Open Burning in the Participating African Countries of COMESA-SADC Subregions (Botswana, Ethiopia, Lesotho, Madagascar , Mozambique, Sudan, Swaziland, Tanzania , Uganda, Zambia), 6,615,000 US\$ - UNIDO	Council Approved
UNEP	Continuing Regional Support for the POPs Global Monitoring Plan under the Stockholm Convention in the Africa Region (DR Congo, Egypt, Ethiopia, Ghana , Kenya, Mali, Morocco, Mauritius, Senegal, Tanzania , Togo, Tunisia, Uganda and Zambia), 4,208,000 US\$ - UNEP.	Council Approved
UNEP UNITAR Norway Switzerland	Mercury Level 1 Inventory: Zambia , Mali and Tanzania , undertook a Mercury Inventory using UNEPs simplified Toolkit for Identification and Quantification of Mercury Releases (Level 1). Supported by UNEP, with the assistance of GroundWorks, UNITAR and financial assistance provided by the Governments of Norway and Switzerland.	2011 - 2012
UNEP/GEF	A Mercury Initial Assessment (MIA) regional project. Although the countries have not yet been confirmed, it is likely that the countries to partake in this initiative are Cameroon, Ethiopia, South-Africa, Tanzania and Zambia .	Under development
WHO	WHO study on availability of Mercury-free medical devices in Tanzania and Ghana .	Under implementation
WHO & Healthcare Without Harm	WHO-HCWH Global Initiative to substitute Hg-based Medical Devices in Healthcare	

ANNEX VI: RISK ANALYSIS AND RISK MITIGATION MEASURES

Table 9: Overview of the Risks, Assumptions and Mitigation Measures

Risks/ Assumptions	Level	Mitigation measures
1. Lack of clarity of the roles and responsibilities of the two key ministries (Ministry of Health and the Ministry of Environment/National Environment Protection Agency) related to aspects of HCWM resulting in no leadership, conflicting decisions, duplication, or slow implementation of project components.	M	All project stakeholders have been involved in the project's proposal planning phase during which their roles and responsibilities have been clarified and agreed upon.
2. Slow or no enhancement, adoption and implementation of national policies, plans and strategies (including guidelines and standards) on HCWM which are key in creating an enabling environment for replication of BAT/BEP across the country.	M	The project will support project stakeholders in reviewing and strengthening the national policy and regulatory framework with respect to HCWM, and as such influence and facilitate the creation of an enabling environment.
3. Slow or poor implementation of BAT/BEP practices in healthcare facilities, related infrastructures, technologies, Mercury phase-out, and/or training programs.	M	MoUs with HCFs that will be supported by the project will outline responsibilities and timelines. The evaluation project component will identify problems and recommend improvements (e.g. the midterm review will evaluate implementation of the "first phase", and make recommendation for implementation of the "second phase"). The evaluation and technology allocation formula will also incentivize healthcare facilities to implement project activities successfully and efficiently considering HCFs and project countries that have best and fastest institutionalized best practices will be prioritized.
4. Technology procurement beset by delays, inadequate equipment, wrong specifications, lack of transparency, or non-compliance with UN bidding requirements and procedures.	L	<p>The competitive bidding process for the non-incineration technologies will be centralized for all project countries and implemented making through UNDP's Nordic Office Procurement Support Unit - Health (to ensure economies of scale, to allow the use of long-term agreements, etc.), will be transparent and adhere strictly to UN requirements and procedures. The project will ensure that technologies meet BAT/BEP and other standards.</p> <p>Considering UNDP is the principal recipient for the Global Fund in Zambia and in 26 countries worldwide, it has previously assumed procurement for HCWM related supplies and technologies for GFATM activities in a number of countries. To ensure that procurement practices are transparent, speedy and most cost effective, the project will ensure that procurement of non-incineration technologies is undertaken by UNDP Copenhagen, based on technical specifications drawn up by the project, in consultations and agreement with a national working group on injection safety /management of HCW, the HCFs themselves under the leadership of the Ministry of Health.</p>
5. Healthcare Facilities discontinue the use of Best Environmental Practices after the project comes to an end, and discontinue the maintenance of BAT resulting in their ultimate breakdown and return to open burning and incineration.		<p>The most important aspect of the success of these types of projects, is whether HCFs are able to keep up the best environmental practices they take up as part of the project and are able to ensure that newly installed technologies are regularly maintained and serviced so that they keep operating long beyond the project's duration.</p> <p>The single most important aspect of sustainability in the area of</p>

Risks/ Assumptions	Level	Mitigation measures
		<p>HCWM, is keeping the HCWM expenditures as low as possible, ensuring that high quality maintenance capacity is available at local and national level, and ensuring that HCFs continue to be committed to HCWH and have at their disposal a budget line exclusively for HCWM.</p> <p>The project will ensure that: i) non-incineration technologies are procured with a maintenance and insurance scheme for a minimum of 5 years beyond the project's duration; ii) at national level, with the help of distributors, maintenance teams are set-up and trained upon which the HCFs can call when technologies require maintenance or repair; iii) maintenance teams and operators at HCFs are training in day-to-day maintenance procedures; iv) At national, provincial and district level, the project will advocate for (and include in national policies and regulations) the compulsory allocation of a HCWM budget.</p> <p>As much as possible, agreements will be made with manufacturers and distributors to ensure the availability of parts and technical support for repair and maintenance of technologies. The regional project will establish a certification program under which accredited parties can certify the quality of non-incineration technologies and their conformance with BAT/BEP and international standards. The teams of national and regional experts will be encouraged to form a network for the purpose of information exchange, professional development, and assisting the countries in the region.</p> <p>The project will also support HCFs in improving segregation, and recycling (of disinfected plastic waste fractions, composting, etc.) in order for the amount of waste that needs to be treated will be kept at a minimum, while HCFs are also able to resell recyclable wastes to recyclers, allowing them to recover some of their HCWM budget.</p> <p>When hospitals are committed to HCWM, proud of their clean premises, low infection rates and can show-case well maintained treatment technologies, it has been shown in similar project that these HCFs continue to keep up BEP/BAT practices long beyond the project's duration.</p>
6. Insufficient number of technology suppliers involved in the bidding and/or high purchase costs.	M	Ensuring sufficient outreach to vendors, also conducted within the scope of other UNDP/GEF/HCWM projects, will ensure sufficient vendors. Centralized high-volume procurement will help lower prices. Procurement facilitated by UNDP Copenhagen will ensure that long-term agreements with various international suppliers can be relied upon.
7. Little confidence of healthcare facilities and providers in non-incineration and Mercury-free technologies, resulting in continued use of inadequate incinerators and Mercury devices.	L	<p>The project will share technical specifications, standards, test results, and experiences from the former UNDP/WHO/HCWM Global Medical Waste project. "Recipients facilities" that are successfully using non-incineration technologies will provide decision-makers at HCFs, national and regional level with information on their experiences with non-incineration and Mercury-free technologies.</p> <p>In order to help HCFs phase-out the use of Mercury containing medical devices, the project will conduct a staff preference study on cost-effective Mercury-free alternatives at some of the project HCFs, which allows staff to choose and use the Mercury-free device of their liking.</p>
8. The open burning of HCW at landfills or hospital sites creates greenhouse gas (GHG) emissions in the form of CO ₂ , CH ₄ , etc. In addition, the transportation of large amounts of	L	The implementation of HCWM plans, training and BEP at HCFs will include components related to improved recycling rates and practices, based on the results of a feasibility report on the recycling of medical wastes. Improved waste

Risks/ Assumptions	Level	Mitigation measures
<p>HCW waste to landfill and dump sites, due to insufficient segregation practices, results in additional unnecessary GHG emissions. Finally, certain hospitals sell PVC containing medical plastics to recyclers, however inadequate thermal processes, both practiced at healthcare facilities and by recyclers, are sources of GHGs releases. All these aspects contribute to climate change risks.</p>		<p>segregation and minimization practices, as well as improved recycling rates and practices will result in a significant reduction of waste volumes, and indirectly in GHG and dioxin emissions. Clusters will be served by treatment technologies installed on the premises of the most suitable facility within that cluster. In this manner, the most efficient set-up (minimum transportation requirements and optimum operation of centralized technologies) will enable to keep GHGs emission as a result of transportation and operation of technologies at a minimum and minimize costs. Non-incineration technologies to be installed, will be energy efficient and depending on the type of equipment selected, the use of renewable energy sources will be explored (in connection with climate change mitigation programmes implemented by municipalities in the project areas). Unrecyclable disinfected health-care waste, will be transported to the municipal landfill site, where two decentralized shredders will further reduce waste volumes and waste will be disposed of in a dedicate landfill space/cell to ensure that it's not burned in the open, further eliminating UPOPs and GHG emissions.</p>
Overall Risk Rating	L	

ANNEX VII: OVERVIEW OF CO-FINANCING

Table 10: Status of co-financing at the time of project submission for CEO endorsement (co-financing letters have been submitted separately to the GEF)

Name of Entity	Type of Entity	In-kind (US\$)	Cash (US\$)	Total (US\$)
Ghana				
1. Ghana Ministry of Health	National Government	762,000	848,000	1,610,000
2. Ghana Ministry of Local Government and Rural Development	National Government	1,900,000		1,900,000
3. Zoomlion Ghana Limited	Private Sector	800,000	450,000	1,250,000
4. EPA	National Government	450,000	0	450,000
Madagascar				
5. Direction Générale de l'Environnement	National Government	902,000	0	902,000
6. Ministère de la Santé Publique (MSP) - Direction de la Promotion de la Santé - Service de Santé et Environnement	National Government	75,818	170,455	246,273
7. MSP - Centre Hospitalier Universitaire (CHU) Tambohobe FIANARANTSOA	National Government	30,000	40,000	70,000
8. Hôpital Universitaire Mères Enfants TSARALALANA	National Government	51,999	0	51,999
9. Groupe Adonis Environnement S.A.	Private Sector	0	347,175	347,175
10. UNHABITAT	Other Multi-Lateral Agencies	242,237	0	242,237
11. MSP - Hospital Universitaire Joseph Raseta BEFELATANANA	National Government	22,080	59,800	81,880
12. MSP - Centre Hospitalier de Référence de District MANJAKANDRIANA	National Government	36,614	238,636	275,250
13. Fonds d'Appui pour L'Assainissement (FAA) Madagascar	Foundation	1,000,000	0	1,000,000
14. Voahary Salama	CSO	850,450	0	850,450

15. MSP - Service de la Vaccination (GAVI)	National Government	239,500	0	239,500
16. OMS Madagascar	Other Multi-Lateral Agencies	40,000	0	40,000
Tanzania				
17. Jhpiego	CSO	1,200,000	0	1,200,000
18. Agenda for Environment and Responsible Development	CSO	10,000	0	10,000
19. MoHSW/World Bank	National Government	0	500,000	500,000
20. PASADA	CSO	18,000	0	18,000
21. Department of Health & Human Services - Centers for Disease Control and Prevention (CDC)	Bi-lateral Aid Agency	1,200,000	0	1,200,000
Zambia				
22. Zambia Environmental Management Agency (ZEMA)	National Government	624,000	0	624,000
23. Ministry of Health	National Government	4,921,056	2,578,944	7,500,000
24. Waste Master Zambia Limited	Private Sector	90,000	0	90,000
Global				
25. UNDP - Procurement Support Office (PSO)	GEF Agency	2,300,000	0	2,300,000
26. Health Care Without Harm (HCWH)	NGO	0	2,100,000	2,100,000
27. WHO	International Organization	2,514,400	983,000	3,497,400
TOTAL		20,280,154	8,316,010	28,596,164

ANNEX VIII:

PROJECT SELECTION CRITERIA FOR HCFs

The selection of the model facilities/hospitals and treatment modalities should take the following criteria into consideration (criteria are listed in random order):

- The selection of model facilities should be consistent with the priorities of the **National Healthcare Waste Management Plan** (from here on referred to as “the National Plan”)⁵⁴ and/or a **HCWM roadmap**².

A National Plan generally includes planned treatment approaches in the country (i.e., the combinations of urban centralized, peri-urban centralized or decentralized, peri-urban clusters, rural clusters, remote decentralized, etc.).

A roadmap is the planning for implementation of the NHCWMP. As such it determines the priorities - not just priorities in terms of treatment approaches, but also geographic priorities, priorities related to types and sizes of hospitals, priorities regarding specific types of waste (e.g., sharps), priorities based on landfill plans, etc.

- **Build on and link to other health systems strengthening efforts:** Often facilities are (or have been/will be) participating in activities that have a bearing on healthcare waste management, such as injection safety and infection prevention and control efforts. Linking such efforts (possibly supported by the MoH, WHO, etc.) to HCWM activities under the proposed project can be mutually beneficial.
- **Large waste generators with an underdeveloped HCWM system:** To achieve the most significant improvements in terms of UOPs and Mercury emission reductions (and from quantitative health risks assessment perspective), most effort according to the Pareto principle should be placed on facilities that produce large quantities of waste and have an underdeveloped healthcare waste management system in place. For most countries, the vast majority of healthcare waste is produced by hospitals⁵⁵.
- **Commitment to the project’s mission, vision and values:** Demonstration by hospital management and staff of commitment to the project’s mission, vision and values (*e.g. at a minimum with a letter of intent and a letter of co-financing*).
- **Hospital’s ability and readiness to:**
 - (a) Contribute financially and logistically to set up a healthcare waste management system comprised of best HCWM practices and a non-combustion treatment technology;
 - (b) Allocate human resources for co-operation with the project;
 - (c) Remove from use any batch type and poor quality incinerators to be replaced by a non-combustion treatment method;

⁵⁴ Presumably, national plans and strategic roadmaps already take into account the development of transportation, recycling, landfill disposal, wastewater disposal, chemical waste treatment, and other relevant infrastructures.

⁵⁵ Perhaps there might be opportunities where the system of support between rural and district facilities can be strengthened to build capacity and accountability, while focus remains on the larger/hospital sites.

(d) Monitor and document HCWM practices and the treatment process in order to meet benchmarks set by the project; and

(e) Sustain good HCWM practices or its on-site system during and beyond the duration of the project's duration.

Note 1: The existing draft Memorandum of Understanding (MOU)⁵⁶ between a GEF/UNDP HCWM project and a model healthcare facility, which outlines the roles and responsibilities of a healthcare facility participating in this type of projects, would preferably be shared with potential HCFs so they will be fully informed of the facilities responsibilities in the future project.

Note 2: The GEF UNDP project reserves the right to transfer the equipment to another facility if the hospital does not meet the benchmarks set by the project or does not maintain the HCWM system.

- **Hospital's willingness to implement a Mercury reduction program** and to become a Mercury-free healthcare facility.
- **Potential to implement a recycling program for non-hazardous waste.**
- **Highly visible and influential hospitals:** Status of leadership of the hospital within the health sector and its ability to influence or effect change in other hospitals. Preferably, highly regarded hospitals at national or regional level are selected so its participation in the project is expected to positively influence the rest of the health sector. The hospital should be able to serve as a point of learning and dissemination for other facilities (*for example a teaching hospital*).
- **Experience in the type of monitoring and reporting that would be desired for this project**, for example through activities implemented with external funding modalities (other than the national central budget agency), such as international agencies (UN, INGOs) or bi-lateral aid agencies (PEPFAR, Global Fund, GAVI, etc.).
- **Established work safety practices;**
- **Multi-profile hospitals.**

⁵⁶ Prepared as part of the GEF/UNDP/WHO/HCWH Global Medical Waste Project can be downloaded from here:
<http://www.gefmedwaste.org/downloads/MOU%20template%20for%20the%20model%20facility%20June%202009%20UNDP%20GEF%20Project.pdf>

ANNEX IX: EXISTING NON-INCINERATION TECHNOLOGIES IN AFRICA⁵⁷

Existing Non-Incineration Technologies in Africa (as of early 2012)

TECHNOLOGY	VENDOR (country of origin)	COUNTRY (with installations)	# Units
Autoclaves & shredders	Acmas (India)	Tanzania	1
	Bondtech (USA)	South Africa	1
	Matachana (Spain)	Egypt	2
	Shivani (India)	Senegal	5
	UNDP GEF Project	Tanzania	4+
Hybrid autoclaves with internal shredders/mixers	Ecodas (France)	Algeria, Egypt, Gabon, Ghana, Libya, Mauritania, Morocco, Nigeria, Reunion Island, Sudan, Tunisia	64
	Hydroclave (Canada)	Egypt, Niger, South Africa	21
Continuous steam units	LogMed (Germany)	Egypt	1
Microwave systems	Meteka (Austria)	Ethiopia, Nigeria	2
Microwave systems	AMB EcoSteryI (Belgium)	Magreb countries	1+
Microwave (low freq)	Stericycle (USA)	South Africa	1
Frictional heating systems	Newster (Italy)	Egypt, Tunisia	10
	Ompeco (Italy)	Botswana, South Africa	2
TOTAL			115+

⁵⁷ (Jorge Emmanuel, 2009) Presentation made at the Annual Meeting of the Safe Injection Global Network Meeting, Windhoek Namibia 2009.

**ANNEX X: STANDARD LETTER OF AGREEMENT BETWEEN UNDP AND THE
GOVERNMENT OF THE REPUBLIC OF GHANA FOR THE PROVISION OF
SUPPORT SERVICES**

Dear [*name of government official*],

1. Reference is made to consultations between officials of the Government of *the Republic of Ghana* (hereinafter referred to as “the Government”) and officials of UNDP with respect to the provision of support services by the UNDP country office for nationally managed programmes and projects. UNDP and the Government hereby agree that the UNDP country office may provide such support services at the request of the Government through its institution designated in the relevant programme support document or project document, as described below.
2. The UNDP country office may provide support services for assistance with reporting requirements and direct payment. In providing such support services, the UNDP country office shall ensure that the capacity of the Government-designated institution is strengthened to enable it to carry out such activities directly. The costs incurred by the UNDP country office in providing such support services shall be recovered from the administrative budget of the office.
3. The UNDP country office may provide, at the request of the designated institution, the following support services for the activities of the programme/project:
 - (a) Identification and/or recruitment of project and programme personnel;
 - (b) Identification and facilitation of training activities;
 - (c) Procurement of goods and services;
4. The procurement of goods and services and the recruitment of project and programme personnel by the UNDP country office shall be in accordance with the UNDP regulations, rules, policies and procedures. Support services described in paragraph 3 above shall be detailed in an annex to the programme support document or project document, in the form provided in the Attachment hereto. If the requirements for support services by the country office change during the life of a programme or project, the annex to the programme support document or project document is revised with the mutual agreement of the UNDP resident representative and the designated institution.
5. The relevant provisions of the [*Insert title and date of the UNDP standard basic assistance agreement with the Government*] (the “SBAA”), including the provisions on liability and privileges and immunities, shall apply to the provision of such support services. The Government shall retain overall responsibility for the nationally managed programme or project through its designated institution. The responsibility of the UNDP country office for the provision of the support services described herein shall be limited to the provision of such support services detailed in the annex to the programme support document or project document.
6. Any claim or dispute arising under or in connection with the provision of support services by the UNDP country office in accordance with this letter shall be handled pursuant to the relevant provisions of the SBAA.

7. The manner and method of cost-recovery by the UNDP country office in providing the support services described in paragraph 3 above shall be specified in the annex to the programme support document or project document.

8. The UNDP country office shall submit progress reports on the support services provided and shall report on the costs reimbursed in providing such services, as may be required.

9. Any modification of the present arrangements shall be effected by mutual written agreement of the parties hereto.

10. If you are in agreement with the provisions set forth above, please sign and return to this office two signed copies of this letter. Upon your signature, this letter shall constitute an agreement between your Government and UNDP on the terms and conditions for the provision of support services by the UNDP country office for nationally managed programmes and projects.

Yours sincerely,

Signed on behalf of UNDP
[Name]
[Title: Resident Representative]

For the Government
[Name/title]
[Date]

Attachment

DESCRIPTION OF UNDP COUNTRY OFFICE SUPPORT SERVICES

1. Reference is made to consultations between [*insert name of Designated institution*], the institution designated by the Government of *the Republic of Ghana* and officials of UNDP with respect to the provision of support services by the UNDP country office for the nationally managed project “Reducing UPOPs and Mercury Releases from the Health Sector in Africa (PIMS # 4611)”, “*the Project*”.

2. In accordance with the provisions of the letter of agreement signed on [*insert date of agreement*] and the project support document, the UNDP country office shall provide support services for the Project as described below.

3. Support services to be provided:

Support services (insert description)	Schedule for the provision of the support services	Cost to UNDP of providing such support services (where appropriate)	Amount and method of reimbursement of UNDP (where appropriate)
1. Identification and/or recruitment of project and programme personnel			
2. Identification and facilitation of training activities;			
3. Procurement of goods and services;			

4. Description of functions and responsibilities of the parties involved:

**ANNEX XI: STANDARD LETTER OF AGREEMENT BETWEEN UNDP AND THE
GOVERNMENT OF THE UNITED REPUBLIC OF TANZANIA FOR THE
PROVISION OF SUPPORT SERVICES**

Dear [name of government official],

1. Reference is made to consultations between officials of the Government of *the United Republic of Tanzania* (hereinafter referred to as “the Government”) and officials of UNDP with respect to the provision of support services by the UNDP country office for nationally managed programmes and projects. UNDP and the Government hereby agree that the UNDP country office may provide such support services at the request of the Government through its institution designated in the relevant programme support document or project document, as described below.

2. The UNDP country office may provide support services for assistance with reporting requirements and direct payment. In providing such support services, the UNDP country office shall ensure that the capacity of the Government-designated institution is strengthened to enable it to carry out such activities directly. The costs incurred by the UNDP country office in providing such support services shall be recovered from the administrative budget of the office.

3. The UNDP country office may provide, at the request of the designated institution, the following support services for the activities of the programme/project:

- (a) Identification and/or recruitment of project and programme personnel;
- (b) Identification and facilitation of training activities;
- (c) Procurement of goods and services;

4. The procurement of goods and services and the recruitment of project and programme personnel by the UNDP country office shall be in accordance with the UNDP regulations, rules, policies and procedures. Support services described in paragraph 3 above shall be detailed in an annex to the programme support document or project document, in the form provided in the Attachment hereto. If the requirements for support services by the country office change during the life of a programme or project, the annex to the programme support document or project document is revised with the mutual agreement of the UNDP resident representative and the designated institution.

5. The relevant provisions of the [Insert title and date of the UNDP standard basic assistance agreement with the Government] (the “SBAA”), including the provisions on liability and privileges and immunities, shall apply to the provision of such support services. The Government shall retain overall responsibility for the nationally managed programme or project through its designated institution. The responsibility of the UNDP country office for the provision of the support services described herein shall be limited to the provision of such support services detailed in the annex to the programme support document or project document.

6. Any claim or dispute arising under or in connection with the provision of support services by the UNDP country office in accordance with this letter shall be handled pursuant to the relevant provisions of the SBAA.

7. The manner and method of cost-recovery by the UNDP country office in providing the support services described in paragraph 3 above shall be specified in the annex to the programme support document or project document.

8. The UNDP country office shall submit progress reports on the support services provided and shall report on the costs reimbursed in providing such services, as may be required.

9. Any modification of the present arrangements shall be effected by mutual written agreement of the parties hereto.

10. If you are in agreement with the provisions set forth above, please sign and return to this office two signed copies of this letter. Upon your signature, this letter shall constitute an agreement between your Government and UNDP on the terms and conditions for the provision of support services by the UNDP country office for nationally managed programmes and projects.

Yours sincerely,

Signed on behalf of UNDP
[Name]
[Title: Resident Representative]

For the Government
[Name/title]
[Date]

Attachment

DESCRIPTION OF UNDP COUNTRY OFFICE SUPPORT SERVICES

1. Reference is made to consultations between [*insert name of Designated institution*], the institution designated by the Government of *the United Republic of Tanzania* and officials of UNDP with respect to the provision of support services by the UNDP country office for the nationally managed project “Reducing UPOPs and Mercury Releases from the Health Sector in Africa (PIMS # 4611)”, “*the Project*”.

2. In accordance with the provisions of the letter of agreement signed on [*insert date of agreement*] and the project support document, the UNDP country office shall provide support services for the Project as described below.

3. Support services to be provided:

Support services (insert description)	Schedule for the provision of the support services	Cost to UNDP of providing such support services (where appropriate)	Amount and method of reimbursement of UNDP (where appropriate)
2. Identification and/or recruitment of project and programme personnel			
2. Identification and facilitation of training activities;			
4. Procurement of goods and services;			

4. Description of functions and responsibilities of the parties involved:

ANNEX XII: STANDARD LETTER OF AGREEMENT BETWEEN UNDP AND THE GOVERNMENT OF THE REPUBLIC OF MADAGASCAR FOR THE PROVISION OF SUPPORT SERVICES

Dear [*name of government official*],

1. Reference is made to consultations between officials of the Government of *the Republic of Madagascar* (hereinafter referred to as “the Government”) and officials of UNDP with respect to the provision of support services by the UNDP country office for nationally managed programmes and projects. UNDP and the Government hereby agree that the UNDP country office may provide such support services at the request of the Government through its institution designated in the relevant programme support document or project document, as described below.

2. The UNDP country office may provide support services for assistance with reporting requirements and direct payment. In providing such support services, the UNDP country office shall ensure that the capacity of the Government-designated institution is strengthened to enable it to carry out such activities directly. The costs incurred by the UNDP country office in providing such support services shall be recovered from the administrative budget of the office.

3. The UNDP country office may provide, at the request of the designated institution, the following support services for the activities of the programme/project:

- (a) Identification and/or recruitment of project and programme personnel;
- (b) Identification and facilitation of training activities;
- (c) Procurement of goods and services;

4. The procurement of goods and services and the recruitment of project and programme personnel by the UNDP country office shall be in accordance with the UNDP regulations, rules, policies and procedures. Support services described in paragraph 3 above shall be detailed in an annex to the programme support document or project document, in the form provided in the Attachment hereto. If the requirements for support services by the country office change during the life of a programme or project, the annex to the programme support document or project document is revised with the mutual agreement of the UNDP resident representative and the designated institution.

5. The relevant provisions of the [*Insert title and date of the UNDP standard basic assistance agreement with the Government*] (the “SBAA”), including the provisions on liability and privileges and immunities, shall apply to the provision of such support services. The Government shall retain overall responsibility for the nationally managed programme or project through its designated institution. The responsibility of the UNDP country office for the provision of the support services described herein shall be limited to the provision of such support services detailed in the annex to the programme support document or project document.

6. Any claim or dispute arising under or in connection with the provision of support services by the UNDP country office in accordance with this letter shall be handled pursuant to the relevant provisions of the SBAA.

7. The manner and method of cost-recovery by the UNDP country office in providing the support services described in paragraph 3 above shall be specified in the annex to the programme support document or project document.

8. The UNDP country office shall submit progress reports on the support services provided and shall report on the costs reimbursed in providing such services, as may be required.

9. Any modification of the present arrangements shall be effected by mutual written agreement of the parties hereto.

10. If you are in agreement with the provisions set forth above, please sign and return to this office two signed copies of this letter. Upon your signature, this letter shall constitute an agreement between your Government and UNDP on the terms and conditions for the provision of support services by the UNDP country office for nationally managed programmes and projects.

Yours sincerely,

Signed on behalf of UNDP
[Name]
[Title: Resident Representative]

For the Government
[Name/title]
[Date]

Attachment

DESCRIPTION OF UNDP COUNTRY OFFICE SUPPORT SERVICES

1. Reference is made to consultations between [*insert name of Designated institution*], the institution designated by the Government of *the Republic of Madagascar* and officials of UNDP with respect to the provision of support services by the UNDP country office for the nationally managed project “Reducing UPOPs and Mercury Releases from the Health Sector in Africa (PIMS # 4611)”, “*the Project*”.

2. In accordance with the provisions of the letter of agreement signed on [*insert date of agreement*] and the project support document, the UNDP country office shall provide support services for the Project as described below.

3. Support services to be provided:

Support services (insert description)	Schedule for the provision of the support services	Cost to UNDP of providing such support services (where appropriate)	Amount and method of reimbursement of UNDP (where appropriate)
3. Identification and/or recruitment of project and programme personnel			
2. Identification and facilitation of training activities;			
5. Procurement of goods and services;			

4. Description of functions and responsibilities of the parties involved:

ANNEX XIII: STANDARD LETTER OF AGREEMENT BETWEEN UNDP AND THE GOVERNMENT OF ZAMBIA FOR THE PROVISION OF SUPPORT SERVICES

Dear [*name of government official*],

1. Reference is made to consultations between officials of the Government of *Zambia* (hereinafter referred to as “the Government”) and officials of UNDP with respect to the provision of support services by the UNDP country office for nationally managed programmes and projects. UNDP and the Government hereby agree that the UNDP country office may provide such support services at the request of the Government through its institution designated in the relevant programme support document or project document, as described below.

2. The UNDP country office may provide support services for assistance with reporting requirements and direct payment. In providing such support services, the UNDP country office shall ensure that the capacity of the Government-designated institution is strengthened to enable it to carry out such activities directly. The costs incurred by the UNDP country office in providing such support services shall be recovered from the administrative budget of the office.

3. The UNDP country office may provide, at the request of the designated institution, the following support services for the activities of the programme/project:

- (a) Identification and/or recruitment of project and programme personnel;
- (b) Identification and facilitation of training activities;
- (c) Procurement of goods and services;

4. The procurement of goods and services and the recruitment of project and programme personnel by the UNDP country office shall be in accordance with the UNDP regulations, rules, policies and procedures. Support services described in paragraph 3 above shall be detailed in an annex to the programme support document or project document, in the form provided in the Attachment hereto. If the requirements for support services by the country office change during the life of a programme or project, the annex to the programme support document or project document is revised with the mutual agreement of the UNDP resident representative and the designated institution.

5. The relevant provisions of the [*Insert title and date of the UNDP standard basic assistance agreement with the Government*] (the “SBAA”), including the provisions on liability and privileges and immunities, shall apply to the provision of such support services. The Government shall retain overall responsibility for the nationally managed programme or project through its designated institution. The responsibility of the UNDP country office for the provision of the support services described herein shall be limited to the provision of such support services detailed in the annex to the programme support document or project document.

6. Any claim or dispute arising under or in connection with the provision of support services by the UNDP country office in accordance with this letter shall be handled pursuant to the relevant provisions of the SBAA.

7. The manner and method of cost-recovery by the UNDP country office in providing the support services described in paragraph 3 above shall be specified in the annex to the programme support document or project document.

8. The UNDP country office shall submit progress reports on the support services provided and shall report on the costs reimbursed in providing such services, as may be required.

9. Any modification of the present arrangements shall be effected by mutual written agreement of the parties hereto.

10. If you are in agreement with the provisions set forth above, please sign and return to this office two signed copies of this letter. Upon your signature, this letter shall constitute an agreement between your Government and UNDP on the terms and conditions for the provision of support services by the UNDP country office for nationally managed programmes and projects.

Yours sincerely,

Signed on behalf of UNDP
[Name]
[Title: Resident Representative]

For the Government
[Name/title]
[Date]

Attachment

DESCRIPTION OF UNDP COUNTRY OFFICE SUPPORT SERVICES

1. Reference is made to consultations between [*insert name of Designated institution*], the institution designated by the Government of *Zambia* and officials of UNDP with respect to the provision of support services by the UNDP country office for the nationally managed project “Reducing UPOPs and Mercury Releases from the Health Sector in Africa (PIMS # 4611)”, “*the Project*”.

2. In accordance with the provisions of the letter of agreement signed on [*insert date of agreement*] and the project support document, the UNDP country office shall provide support services for the Project as described below.

3. Support services to be provided:

Support services (insert description)	Schedule for the provision of the support services	Cost to UNDP of providing such support services (where appropriate)	Amount and method of reimbursement of UNDP (where appropriate)
4. Identification and/or recruitment of project and programme personnel			
2. Identification and facilitation of training activities;			
6. Procurement of goods and services;			

4. Description of functions and responsibilities of the parties involved:

ANNEX XIV: EMISSION FACTORS FOR DIFFERENT COMBUSTION METHODS FOR HEALTHCARE WASTE

#	Combustion Method	Emission Factor (ug TEQ/tonne)	Emission Factor (ug TEQ/tonne)
		AIR	RESIDUE
1	Open burning	6,600	600
2	Small box-type batch incinerator with no afterburner	40,000	200
3	Small box-type batch incinerator with no afterburner but used only for burning cardboard boxes with non-PVC syringes	330	200
4	Single-chamber metal incinerator with no afterburner	5,900	200
5	Drum or barrel incinerator	4,900	200
6	Multi-chamber excess air incinerator	3,600	20
7	Dual chamber incinerator with an afterburner and very low residence time (<1 second) in the secondary chamber	3,500	64
8	Tubular incinerator with two burners (800-1000°C)	2,600	200
9	Dual chamber controlled air incinerator with low residence time (between 1 to 2 seconds) in the secondary chamber but good temperature control (primary chamber 700-900°C, secondary chamber 870-1300°C)	1,400	20
10	Dual chamber incinerator with low residence time, poor temperature control (primary chamber goes below 650°C, secondary chamber goes below 750°C) but gas goes through an alkaline wash – residue accounts only for bottom ash	1,300	300
11	Rotary kiln incinerator operating at low temperatures (700°C) and low residence times (1 sec) in the secondary chamber, with minimal pollution control	1,000	300
12	Dual chamber pathological waste incinerator or crematory with afterburner, poor temperature control and no pollution control	970	1
13	General batch type incinerator with good residence time, good temperature control, and electrostatic precipitator or baghouse filter	525	920
14	Dual chamber controlled air incinerator with high residence time (2 seconds) in the secondary chamber, good temperature control, and a cyclone separator	270	920
15	Rotary kiln incinerator operating at high temperatures (900°C) and high residence time (3 seconds) in the secondary chamber with minimal pollution control	130	60
16	Pathological waste incinerator or crematory with good temperature control (above 850°C), no burning of plastics, and dust removal (filter or cyclone)	110	28
17	Dual-chamber controlled air incinerator with high residence time (2 seconds) in the secondary chamber, very good temperature control (870-980°C in the primary chamber, 980-1100°C in the secondary chamber), heat-recovery boiler and baghouse filter	100	64

18	Dual chamber controlled air incinerator with high residence time (2 seconds) in the secondary chamber, very good temperature control, and a dry scrubber	77	920
19	Dual chamber controlled air incinerator with high residence time (2 seconds) in the secondary chamber, very good temperature control, and a wet scrubber	13	64
20	State-of-the-art pathological waste incinerator with optimal combustion control and sophisticated air pollution control	4	28
21	Dual chamber controlled air incinerator with high residence time (2 seconds) in the secondary chamber, very good temperature control, and a dry scrubber with activated carbon injection	2	150
22	High technology, continuous, computer controlled incinerator with high turbulence and very high residence time (at least 2 seconds) in the secondary chamber, very good temperature control (primary chamber at 850°C or higher including during feeding of waste, secondary chamber operating at 1100°C), and sophisticated air pollution control	1	150