

Republic of Zambia



MINISTRY OF HEALTH

**NATIONAL HEALTH-CARE WASTE  
MANAGEMENT PLAN  
2015 – 2019**



Directorate of Disease Surveillance, Control and Research  
Supported by World Bank

## Foreword

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This document has been developed as a guide to all institutions producing health care waste in planning and implementation of interventions that will reduce mismanagement of hazardous waste in Zambia.

The National Health-Care Waste Management Plan for 2015 to 2019 provides an overview of the situation analysis, the proposed activities and the health care facility waste generating processes in Zambia and presents options for minimizing health-care waste generation through source reduction. The hazardous wastes generated by health care facilities are a challenge in Zambia as handling, storage, transportation and final disposal leaves much to be desired.

There is a need for concerted efforts to involve the Local Authority and Zambia Environmental Management Agency (ZEMA) in the management of Health Care waste in Zambia. This will enhance waste reduction, recycling, transportation and adequate final disposal of health care waste. Additionally, all other stakeholders should be involved for effective management of health care waste management. The Ministry of Health and other stakeholders should put Health Care Waste Management (HWCM) as a priority in order to safe guard the staff and community from infections, injuries and ill health arising from poor Health Care Waste management.

In order to make this document meaningful, financing for all the proposed interventions in the plan is of paramount importance.

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## *Abbreviations / Acronyms*

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CEHO - G	Chief Environmental Health Officer-General
CBOH	Central Board of Health
CHW	Community Health Worker
CMEO	Chief Medical Equipment Officer
CPs	Cooperating Partners
DC	District Commissioner
DCMO	District Community Medical Officer
DDCC	District Development Coordinating Committee
DDDSC&R-EOH	Deputy Director Diseases Surveillance Control and Research- Environmental Health
ECZ	Environmental Council of Zambia
EMA	Environmental Management Act
EPPCA	Environmental Protection and Pollution Control Act
HBV	Hepatitis B virus
HC	Health Centre
HCF	Health Centre Facility
HCV	Hepatitis C Virus
HCW	Health Care Waste
HCWM	Health Care Waste Management
HIV	Human Immune Deficiency Virus
HMIS	Health Management Information System
HP	Health Post
IAEA	International Atomic Energy Agency
IP	Infection Prevention
LDC	Less Developed Countries
MCDMCH	Ministry of Community Development Maternal and Child Health
MLGH	Ministry of Local Government and Housing
MLNREP	Ministry of Lands, Natural Resources and Environment Protection
MoH	Ministry of Health
NHC	Neighbourhood Health Committees
NHCWP	National Health Care waste Plan
PMO	Provincial Medical Officer
POPs	Persistent Organic Pollutants
PPP	Public Private Partnership
SI	Statutory Instrument
SMS	Senior Medical Superintendent
SOPs	Standard Operating Procedures
TBAs	Traditional Birth Attendants
WB	World Bank
WHO	World Health Organization
ZEMA	Zambia Environmental Management Agency



## *Executive Summary*

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The National Health Care Waste Management Plan (HCWM) attempts to provide the current status, conditions and important issues existing in HCWM in the country. It gives guidance on HCWM while providing a collection of activities that require to be implemented at all levels of the health care system in the Ministry of Health (MoH), Ministry of Community Development Mother and Child Health (MCDMCH), Ministry Local Government and Housing (MLGH) in order to reverse the conditions and issues precipitating poor HCWM, creating potential risks of communicable diseases and frequent audit queries in HCWM.

Although several isolated attempts have been made to improve the situation in some of the medical institutions in Zambia, HCWM remains below minimum national and international standards, resulting in significant risks to health care providers. The hygiene conditions linked to the handling, storage and disposal of HCW cannot guarantee a satisfactory control on the transmission of nosocomial and hepatitis infections within the Health Care Facilities (HCFs).

The backstopping and monitoring capacities of the national, Provincial and District Medical Office to support the health institutions remain limited without sustained budget lines. Furthermore, Standard Operating Procedures (SOP) and the legal framework are not timely revised. Direct and indirect costs resulting from this situation are difficult to estimate but are significantly high. A standardized HCWM system should be developed for the country with commensurate resources set aside. The health care facilities must be provided with appropriate equipment to implement safer procedures. The differentiation of the HCW streams within the health institutions in Zambia must be progressively upgraded taking into consideration plans to expand the Provincial General Hospitals and other health institutions.

This plan is therefore intended for use by health facility managers, Environmental Health practitioners, District Medical Office managers and ward supervisors including the frontline health workers in urban, rural health centers and health posts. The plan has suggested options that take into account the delineation of the mandates of the two Ministries: MoH and MCDMCH. The document is amenable to the private sector health and research institutions in trying to promote private sector participation. It further provides guidance in planning, implementation, monitoring and evaluation of activities of HCWM in health facilities through regular assessments and use of indicators.

The government of Zambia is committed to providing its health services under the principles of the 3Cs (Clean environment, Caring system and Competent work force). In the provision of health care services, there is generation of various types of waste materials, which are loosely defined here as garbage, refuse, sludge and other discarded materials. This waste may be categorized as either hazardous or non-hazardous. It is estimated that, globally, about 20% of the total waste generated in HCFs is hazardous (WHO, 2011). This small component of waste is

termed “special health-care waste.” Key among these is infectious waste contaminated with Human Immunodeficiency Virus (HIV), hepatitis B and C viruses. The direct impact of such waste on human beings or the environment poses occupational health safety risks and consequences of undesirable environmental pollution. However, because the current HCW from HCFs is generated without strict observation of operational procedures and guidance document on HCWM, the public and environment may be affected. The risks of polluting the environment are severe because the leachate seeps in the underground and contaminates the water table with Persistent Organic Pollutants (POPs). Therefore, this calls for a deliberate action programme for HCW in Zambia (World Bank Report, 2004-2006).

The goal is to establish a sustainable HCWM system that takes into account environmentally sound practices, principles and commitments including organizing technically, socially, economically, affordable and acceptable HCWM options which will reduce transmission of communicable diseases through appropriate disposal of health-care waste at health care facility and dump sites.

The overall objective of the plan is to develop a National Health-Care Waste Management Plan (NHCWP) that will mobilize resources and build capacity for reducing health risks in a sustained manner, while at the same time being open to technological options that promote sustainable development. Specifically this plan has been developed to:

- Create an enabling environment in which compliance to the legal, policy and administrative framework and SOPs on HCW is adhered to and sustained for the protection of both the patients, workers and communities.
- Ensure that health facilities comply to health management through the development of sense of ownership and exercise the “polluter pay principle”
- Regularly conduct assessment and examine gaps in management of HCWM practices in hospitals, clinics, other health care facilities and local authority disposal sites by the year 2016.
- Quantify the amount of HCW generation in HCFs,
- Provide appropriate equipment and materials for HCWM systems ie generation, storage, collection, treatment and disposal in order to ensure minimal risks (or no risk at all)
- Enhance access to efforts of Private Public Partnership (PPP) in HCWM.
- Refocus the traditional methods and broaden the technological options of dealing with HCWM in line with the MoH vision of upgrading health facilities.
- Explore the options of dealing with health care waste management that are climate change sensitive.
- Prepare a costed HCWM plan while taking into consideration of public and private sector partnerships in relation to cost recovery based on the polluter pays principle by the year 2016.

Several assessments have been conducted on HCWM in Zambia by several institutions; the World Bank HCWM Study in Zambia (2004-2006); WHO HCWM assessment (2011), Auditor General’s report findings (2009) and MoH HCWM Assessment (2013). The recommendations on HCWM and state of HCW in Zambia have been made while taking into consideration

findings from previous studies on the same subject. Additional information was also captured during the consultative meeting with stakeholders drawn from all provinces during the assessments and when developing the plan. Due to common cause variations, the problems of HCWM are systematic and should be very easy to resolve with a deliberate strategy to change the situation. The findings therefore are applicable to the entire country.

The following are some of the main findings:

- The existing legislation with an exception of Statutory Instrument (SI) No. 112 of 2013 does not adequately address issues of HCWM. In this respect SI No.112 of 2013 can in the meantime be used while appropriate legislation is being developed.
- HCW at the source of generation is not classified according to its type for easy treatment and final disposal.
- Many HCFs do not take due responsibility for the waste they generate and the impact it has on the environment and the public to ensure safe, efficient, sustainable and culturally acceptable methods for collection, storage, transportation, pre-treatment and final disposal both within and outside their premises.
- Local authorities do not have sound managerial approaches for dumpsites and the use of appropriate technologies, which would minimise health risks that result from inadequate management of hazardous health-care waste. Scavenging is allowed to take place at all dumpsites without taking necessary measures to abate it. There is urgent need to develop technical guidelines under the National Waste Management Strategy being developed by ZEMA.
- The level of theoretical and practical knowledge among those involved in handling hazardous health-care waste is low especially among those outside the health care facility who either finds them handling or exposed to such waste due to careless management practices.

The findings from the World Bank study, recommended the following for immediate implementation:

- Develop the National Environmental Health policy and strategies with necessary statutory instruments governing HCWM being reviewed to strengthen regulation of HCWM.
- Ensure that all basic environmental permits and licenses be obtained, for large HCFs that will help to deal with environmental impacts of HCW including among others the following; air pollution, land degradation/soil pollution, health impacts and water pollution
- Develop a HCWM code of practice or SOP.
- Review and incorporate HCWM in school curricula for Ministry of Education
- Facilitate research in HCW characterization related to waste quantities and composition
- Conduct the Situation Analysis Needs Assessment on impacts of poor management of HCWM on health and the environment.
- Incorporate HCW generation into existing Health Management Information Systems (HMIS) and establish HCW inventories for each HCFs.
- Integrate HCWM plans into existing National, District and all medium Term Expenditure Framework plans.

- Develop a culture in all HCFs that will facilitate behavioural change among health workers
- Ensure that all HCFs have in place appropriate, reliable and sustainable technologies for hazardous waste collection, storage, transport, pre-treatment, treatment and final disposal sites in close consultation with stakeholders
- Ensure that HCW is segregated at service level and accorded according to colour of the container
- Develop monitoring indicator and reporting on waste generation

A holistic approach has been recommended from the analysis of the findings of the assessments to include, clear delineation of responsibilities, occupational health and safety issues and having sustained funding. The running budget for effectively implementation of this plan is estimated at **US\$ 43,056,644.58**

## CHAPTER ONE: BACKGROUND INFORMATION

### 1.0. Introduction

The National Health Care Waste Management Plan (NHCWP) for 2015 to 2019 is a roadmap that aims at putting in place a sustainable Health Care Waste Management (HCWM) system in Zambia. The plan recommends safe, efficient, sustainable, affordable and culturally acceptable methods for the treatment and disposal of health-care waste (HCW), both within and outside health-care facilities. The plan is based on the principles of the National Solid Waste Management Strategy (NSWMS) for Zambia (2004), Environmental Management Act of 2011 (EMA 2011) and Public Health Act Cap 295 (PHA Cap 295) to mention but a few. Three comprehensive studies on HCWM have been conducted in Zambia namely; National study (2004- 2006) which was part of the World Bank's multi-sectoral HIV/AIDS programme for African Region (MAP); Auditor General's Office Assessment Report (2009) and Ministry of Health (MoH) (June 2013). The studies demonstrated that the country requires a well-funded sustainable strategies and safe systems that support the development agenda for proper HCWM.

The World Health Organisation (WHO, 2001), estimates that 80% of generated waste is general while 20% is infectious or hazardous waste. The composition of infectious waste in a waste stream is as follows; Sharps 1%, 1% body part, 3% chemical or pharmaceutical and less than 1% radioactive and cytotoxic waste or broken thermometers (WHO, 2011). An assessment conducted by WHO in 22 developing countries revealed that 18% to 64% health care facilities do not use proper waste disposal methods (WHO, 2001).

Improper disposal of HCW in health facilities poses direct and indirect health impacts on those working in health facilities, surrounding communities, and the environment. During the handling of HCW health providers and general workers can be injured due to improperly stored waste. Sharps are considered as one of the most dangerous category of waste despite comprising a smaller proportion of infectious waste. Unintentional injuries may occur due to exposure of improperly discarded sharps leading to life-threatening infections such as; Hepatitis B Virus (HBV), Hepatitis C Virus (HCV) and Human Immune Virus (HIV) (World Bank, 2000; DHHS, 2010). There is substantial evidence that indiscriminate HCWM impacts negatively on the environment as well. HCW which contains polyvinyl chloride (PVC), if these plastics are incinerated at low temperatures (less than 800°C), 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 disperse in the air contributing to climate change (WHO, 2011). Additionally, mercury spills and the breakage/disposal of mercury-containing devices, such as thermometers and sphygmomanometers, are some of the principal ways by which mercury from health facilities enters the environment.

In order to address minimal exposure to HCW, particular attention is paid to basic processes and technologies, though sophisticated or advanced methods are often addressed in less detail. It is

recommended that health centers in remote locations or with very limited resources may wish to confine to options that are suitable for them. The selected practices should ensure that health and safety requirements are met and acceptable levels of hazard protection are achieved. However, the recommendations should not be viewed as a substitute for ideal procedures for HCWM in large health institutions. Due to inadequate resources health facilities have often struggled to maintain a steady supply of HCW. Under adverse circumstances where resources (financial, human and material) are limited, planning is hampered and health facilities resort to using inappropriate methods to manage waste. In addition, health care providers work without personal protective equipment in treatment and waste disposal. In order to ensure that the agenda for HCWM raised in Zambia, a significant budget need to be set aside for capacity building, procurement, maintenance and repair of equipment. Further, involvement of private public partnerships and technical support would be key to the successful implementation of the HCWM system. Additionally, HCWM system will be strengthened by the establishment of the HCWM National Steering Committee (NSC) headed by MoH Permanent Secretary (PS).

Zambia has adopted WHO's recommended use of safety boxes for the containment of all sharps generated in health care settings and the construction of macro burn incinerators supported by WHO and United Nations Children's Emergency Fund (UNICEF). The country has HCWM guidelines developed by the Zambia Environmental Management Agency (ZEMA) in collaboration with MoH. These guidelines have resulted in increased awareness by health facilities and some institutions adopting environmentally sound management practices. Evidence from MoH (2013) assessment, established that it was necessary to review the Waste Management Plan (WMP, 2008-2010). The plan spelt out both long and short term goals for safe HCWM.

The preparation of this plan therefore, was based on the assessment done in previous evaluation by WHO (2011), Auditor General's Office (2009) and MoH assessment (2013). The results from the assessment done by MoH in six out of ten provinces as shown in Table 2, were analyzed by the technical working group on HCWM. The recommendations from the assessment have been factored in the plan as action points and costed. Broadly, this plan suggests that funding be mobilized under the treasury to comprehensively resolve the problems of planning, resource allocation and improving practice of health worker's behaviors in HCWM. The implementation of this plan will require the involvement of key stakeholders namely; private sector, Cooperating Partners such as UNICEF, World Bank (WB), WHO, the mining firms, MoH, MCDMCH, ZEMA, Ministry of Local Government and Housing (MLGH) and Ministry of Agriculture and Livestock Services.

### **Health care waste Financing**

The strategic plan is expected to be implemented with financial support from the Government Republic of Zambia (GRZ). Other funding sources will be supplemented by the World Bank, Zambia, Water Supply, Sanitation and Healthcare Waste (WSSH) Project for Public Health Facilities, EIB- UNDP and cooperating partners: European Investment Bank (EIB), Zambia Health Services Improvement Project (ZHSIP), GEF, UNICEF, World Health Organisation

(WHO). It is envisaged that in order to ensure sustainability of the HCWM system, institutions will be required include HCWM financing in their annual actions plans.

## 1.1. Zambian Situation

HCW is viewed from both public health and environmental management context. Such different perspectives may lead to gaps in visions, understanding and even definitions. For the purpose of this document HCW would be defined as all the waste generated by health care activities which include diagnosis, preventive, curative and palliative treatment in the field of human and veterinary medicine. HCW is composed of infectious, hazardous and non hazardous materials.

### 1.1.1. Organisation of the health system

The health service delivery system in Zambia fall into five main categories and these are; Health Posts (HPs), and Health Centres (HCs), at community level, Level 1 hospitals at district level, Level 2 general hospitals and Level 3 tertiary hospitals at national level (MoH, 2011) as shown in Table 1 below.

**Table 1: Health Service Delivery System in Zambia**

Description	Central	Copperbelt	Eastern	Luapula	Lusaka	Northern	north-western	Southern	Western	Zambia
A), By level										
Level 3 hospital	0	3	0	0	3	0	0	0	0	6
Level 2 hospital	2	9	2	1	0	2	2	2	1	21
Level 1 hospital	6	8	8	5	15	6	10	14	12	84
Urban health centre	32	137	8	1	182	14	18	34	10	436
Rural health centre	113	53	156	125	47	145	120	174	127	1060
Health posts	35	25	53	10	32	49	17	30	24	275
Total	188	235	227	142	279	216	167	254	174	1882

Source: MOH, NHSP 2011.

- **Health Posts:** Intended to cater for populations of 500 households (3,500 people) in rural areas and 1,000 households (7,000 people) in the urban areas.



- **Health Centres:** These facilities include Urban Health Centres (RHC), which are intended to serve a catchment population of 30,000 to 50,000 people, and Rural Health Centres (RHC) servicing a catchment area of 29 km radius or with a population of 10,000.
- **First Level or Referral Hospitals:** These are found in most districts and are intended to serve a population of between 80,000 and 200,000 with medical, surgical, obstetric and diagnostic services, including all clinical services to support referrals from lower levels.
- **Second Level Hospitals:** These are general hospitals at provincial level and are intended to cater for a catchment area of 200,000 to 800,000 people, with services in internal medicine, general surgery, paediatrics, obstetrics and gynaecology, dental, psychiatry and intensive care services. These hospitals are also referral centres for the first level institutions, including the provision of technical back-up and training functions.
- **Third Level Hospitals:** These are central and specialist hospitals for catchment populations of above 800,000. They have sub-specializations in internal medicine, surgery, paediatrics, obstetrics, gynaecology, intensive care, psychiatry, training and research. These hospitals are referral centres for second level hospitals.

## 1.2 HCW in Zambia

Out of 1882 health facilities in Zambia, 1674 facilities were assessed to verify the health care waste generation capacity per day. It was estimated that, health facilities have the potential of generating upto 30 tonnes of infectious health care waste per day (MoH, 2013).

Currently the estimated waste generation is at 29,943.6 kg/day, this is expected to increase by the end of 2015 when 650 Health Posts under construction will be completed. this plan should budget for HCW segregation, storage, collection, pre-treatment, transportation and disposal

The table below shows a summary report of 1674 facilities visited in 6 out of 10 provinces, with estimated waste generation per level, per bed, per day.

**Table 2: Estimate of waste generation in HCF**

Facility type	Health Facilities and Ownership			Number of Beds and Cots			Waste Generation / Day		
	GRZ	Private	Mission	Beds	Cots	Total	Rate in kg/bed/day	Amount in kg/ day	
CBHWs *	-	-	-	-	-	-	-	-	
Health Posts	161	8	2	198	11	209	0.1	20.9	
Health Centres	Rural	913	53	6	1814	300	2,114	0.1	211.4
	Urban	252	22	77	9224	559	9,783	0.1	978.3
1 <sup>st</sup> Level hospital	39	4	29	6016	859	6,875	1	6,875	
2 <sup>nd</sup> level hospital	13	5	3	4204	827	5,031	2	10,062	
3 <sup>rd</sup> level hospital	5	0	0	2532	417	2,949	4	11,796	
Total									29,943.6

(Source: Mundia and Mbewe, 2003)

- **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 based volunteers (CBV) such as Community Health Assistants, Community Health Workers (CHW) and Safe Motherhood Action Groups (SMAGs) who generate a minimal amount of wastes.



### **1.2.1 Management of healthcare waste**

HCWM depends on the commitment of both managerial and technical staff within a health care facility (HCF) through policy and HCWM guidelines. Due to lack of policy and revised guidelines on HCWM, hospitals and other health care establishments are using the provisions of the laws (Public Health Act - Cap 295, Waste Management Act, 2011) to establish HCWM in their facilities to ensure that there are no adverse health and environmental impacts during the generation, handling, storage, collection, pre-treatment transportation and final disposal of HCW. The introduction of improved HCWM such as segregating waste within the HCF and bin colour coding could result in reduction of substantial amount of waste requiring special treatment and disposal costs. The common method for disposal of hazardous HCW is incineration. The use of incinerators has, however, several weaknesses as often observed, the HCF are not able to operate and maintain the equipment due to high costs and therefore non incineration methods are being considered in this plan.

Through this plan, health care establishments and other institutions that generate HCW will be able to institute more appropriate waste management systems that could provide such benefits as:

- Review of HCWM guidelines
- Protection of human health by reducing the exposure of care providers, general workers, patients and the entire community to hazardous HCW in the work environment;
- Environmental protection of air, land and water pollution.
- Healthier and safer work environment.
- Periodic Health Risk Assessment on HCWM
- Improve the funding of HCWM activities
- Introduction of non incineration methods

### **1.2.2 Current Situation in the Management of healthcare waste**

According to the MoH assessment (2013), HCWM is generally unsatisfactory at all levels of health care delivery. The assessment was done in Lusaka, Copperbelt, Northern, Muchinga and Southern Provinces (Annex 1). The assessment revealed that many HCF do not take the due responsibility for the waste they generate to ensure safe, sustainable and environmentally acceptable methods for segregation, storage, collection, pre-treatment and transportation, and final disposal for both within and outside their premises. With increasing population and a corresponding increase in the number of HCF, the amount of waste generated has increased thereby exerting pressure on the available disposal facilities. These facilities are either inadequate, non-existent or the technology used is not appropriate. Many large hospitals have incinerators for disposing of HCW while rural-based facilities use pits or burning chambers for disposal. Many of these incinerators do not meet environmentally acceptable standards and legal requirements for air emissions or waste disposal. Therefore, untreated HCW has been seen at disposal sites for general waste where scavenging is practiced without taking necessary measures to control or abate (CBoH, 2003).

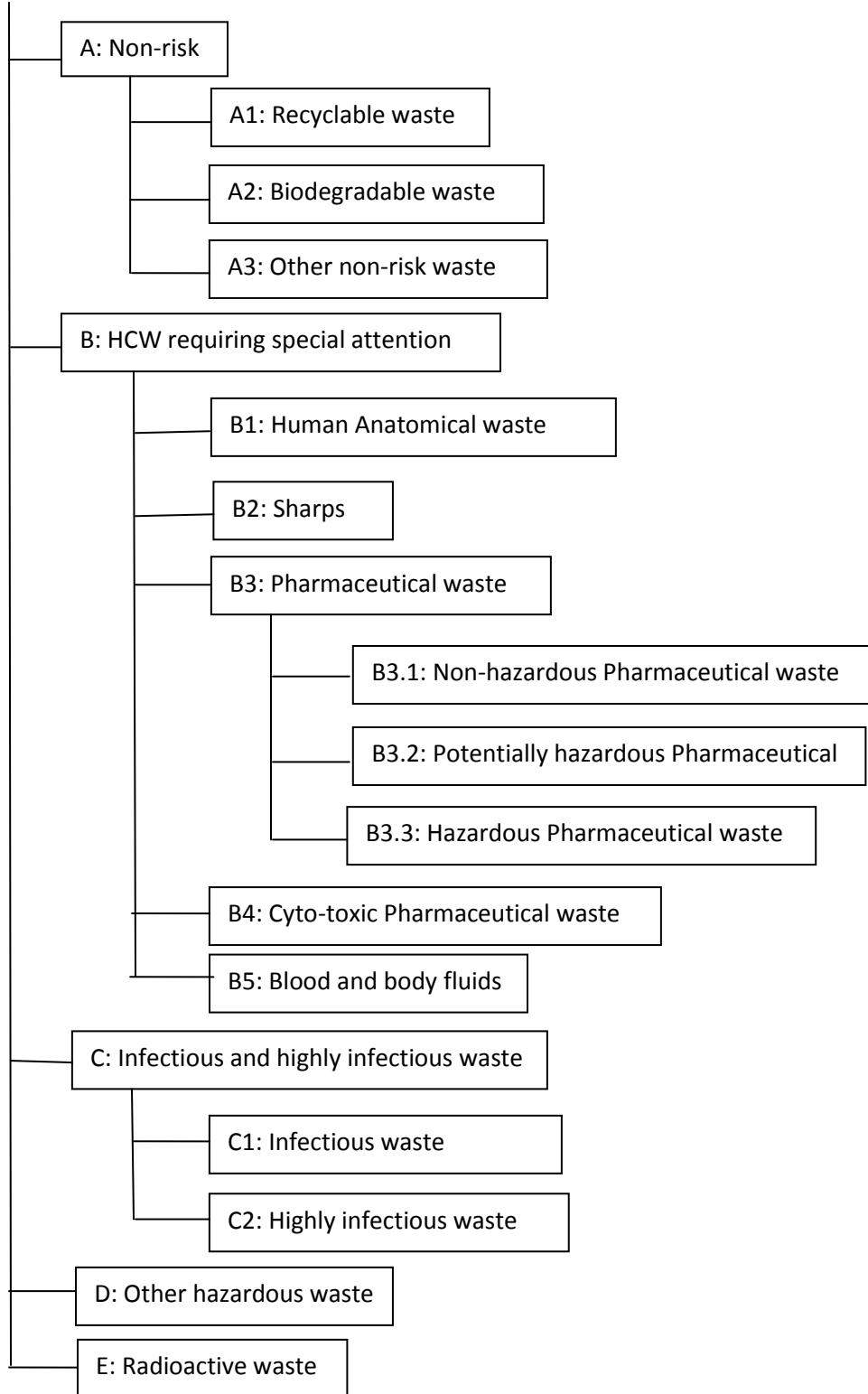
Incineration is the common disposal method of HCW in Zambia. This is because incineration of HCW offers the benefits of sterilization, reduction in volume and rendering the waste unrecognizable. However, in recent years, public acceptance of incineration has been declining and environmental regulations of incineration are becoming increasingly more stringent. Further, there are methods of treatment and disposal of HCW that are non-incineration based. MoH is in the process of upgrading HF from one level to another. It is therefore, anticipated that there will be unprecedented increase in generation of HCW. HCWM will also include specialized methods of segregation, storage, collection, pre-treatment, transportation and disposal of cancer and veterinary waste.

According to WHO, HCW is classified into five main categories. These include:

- A. Non-risk HCW
- B. HCW requiring special attention.
- C. Infectious and highly infectious waste.
- D. Other hazardous waste
- E. Radioactive waste

This classification is shown in the diagram below.

## WHO Classification of healthcare waste



**Figure 1: Classification of HCW (WHO, 2002)**

### 1.3. Non-risk HCW

Non-risk HCW includes all the waste that has not been infected such as general office waste, packaging or leftover food. They are similar to normal household or municipal waste and can be managed by the municipal waste services. They represent between 75% to 90% of the total amount of HCW generated by HCF (WHO, 2009). These fall in three categories:

**a) A1: Recyclable waste**

It includes paper, cardboard, non-contaminated plastic or metal, cans or glass that can be recycled.

**b) A2: Biodegradable HCW**

This waste comprises putrescible or compostable materials eg leftover food or garden waste.

**c) A3: Other non-risk waste**

These include all the non-risk waste that do not belong to categories A1 and A2.

### 1.4 Biomedical and health-care waste requiring special attention

**a) B1: Pathological and anatomical waste**

This category of waste comprises infectious pathological and anatomical waste e.g body parts, organs, tissues and blood bags. This waste may not be infectious unless the status is known, it is treated as though it were (WHO, 2003) . This excludes animal parts that are duly certified for human consumption arising from food processing plants.

**Examples of such wastes:** tissue waste, removed organs, amputated body parts, placentas, etc...

**b) B2: Sharps**

Sharps are all objects and materials that are closely linked with health-care activities and pose a potential risk of injury and infection due to their puncture or cut property. For this reason, sharps are considered as one of the most hazardous waste generated in the HCF and they must be managed with the utmost care.

**Examples of such wastes:** all types of needles, broken glassware, ampoules, scalpel blades, lancets, vials without content

**c) B3: Pharmaceutical waste**

The term "pharmaceutical" embraces a multitude of active ingredients and types of preparations. The spectrum ranges from teas through heavy metal containing disinfectants to highly specific medicines. Waste management therefore requires the use of a differentiated approach. This category of waste comprises expired pharmaceuticals or pharmaceuticals that are unusable for other reasons (e.g. call-back campaign). Pharmaceutical wastes are divided into three classes. Their management occurs in a class-specific manner (see below).

**d) B31: Non-hazardous pharmaceutical waste**

This class includes pharmaceuticals such as camomile tea or cough syrup that pose no hazard during intermediate storage, collection, transportation and disposal. , and .They are not considered hazardous wastes and should be managed jointly with municipal waste.

**e) B32: Potentially hazardous pharmaceutical waste**

This class embraces pharmaceuticals that pose a potential hazard when used improperly by unauthorised persons. They are considered as hazardous wastes and their management must take place in an appropriate waste disposal facility.

**f) B33: Hazardous pharmaceutical waste**

Class B33 pharmaceutical waste comprises heavy metal containing and unidentifiable pharmaceuticals as well as heavy metal containing disinfectants, which owing to their composition require special management. They must be considered as hazardous wastes and their management must take place in an appropriate waste disposal facility.

**g) B4: Cytotoxic pharmaceutical waste**

Cytotoxic pharmaceutical wastes are wastes that can arise by use (administration to patients), manufacture and preparation of pharmaceuticals with a cytotoxic (antineoplastic) effect. These chemical substances can be subdivided into six main groups: alkylated substances, antimetabolites, antibiotics, plant alkaloids, hormones, and others. A potential health risk to persons who handle cytotoxic pharmaceuticals results above all from the mutagenic, carcinogenic and teratogenic properties of these substances. Consequently, these wastes pose a hazard, and the measures to be taken must also include those required by occupational health and safety provisions.

**Examples of such wastes:** Discernible liquid residues of cytotoxic concentrates, post-expiration-date cytotoxic pharmaceuticals and materials proven to be visibly contaminated by cytotoxic pharmaceuticals must be disposed of as cytotoxic pharmaceutical waste.

#### **h) B5: Blood and body fluids waste**

It includes wastes that are not categorised as infectious waste but are contaminated with human or animal blood, secretions and excretions. It is warranted to assume that these wastes might be contaminated with pathogens.

**Examples of such wastes:** Dressing material, swabs, syringes without needle, infusion equipment without spike, bandages, waste from postmortem activities and among many other clinical wastes.

### **1.5 Infectious waste**

Infectiousness is one of the hazard characteristic listed in annex II of the Basel Convention and defined under class H6.2. Special requirements regarding the management of infectious wastes must be imposed whenever waste is known or – based on medical experience – expected to be contaminated by causative agents of diseases and when this contamination gives cause for concern that the disease might spread. In this category two groups can be considered depending on the degree of infectiousness that is expected.

#### **a) C1: Infectious waste**

This class comprises all biomedical and health-care waste known or clinically assessed by a medical practitioner or veterinary surgeon to have the potential of transmitting infectious agents to humans or animals. Waste of this kind is typically generated in the following places: isolation wards of hospitals; dialysis wards or centres caring for patients infected with hepatitis viruses (yellow dialysis); pathology departments; operating theatres; medical and animal health practices and laboratories which mainly treat patients suffering from the diseases specified above. It includes:

- Discarded materials or equipment contaminated with blood and its derivatives, other body fluids or excreta from clinically confirmed infected patients, postmortem activities or animals with hazardous communicable diseases. Contaminated waste from patients known to have blood-borne infections undergoing haemodialysis (e.g. dialysis equipment such as tubing and filters, disposable sheets, linen, aprons, gloves or laboratory coats contaminated with blood);
- Carcasses as well as litter and animal faeces from animal test laboratories, if transmission of diseases is to be expected.

**Examples of such wastes:** Blood from patients contaminated with HIV, viral hepatitis, brucellosis, Q fever. Faeces from patients infected with typhoid fever, enteritis, cholera. Respiratory tract secretions from patients infected with TB, anthrax, rabies, poliomyelitis...

## b) C2: Highly infectious waste

It includes:

- All microbiological cultures in which a multiplication of pathogens of any kind has occurred. They are generated in institutes working in the fields of hygiene, microbiology and virology as well as in medical laboratories, medical and animal health practices and similar establishments;
- Laboratory waste (cultures and stocks with any viable biological agents artificially cultivated to significantly elevated numbers, including dishes and devices used to transfer, inoculate and mix cultures of infectious agents and infected animals from laboratories).

**Examples of such wastes:** Sputum cultures of TB laboratories, contaminated blood clots and glassware material generated in the medical analysis laboratories, high concentrated microbiological cultures carried out in medical analysis laboratories.

## 1.6 Other hazardous waste

This category of waste is not exclusive to the health-care sector. They include: gaseous, liquid and solid chemicals, waste with high contents of heavy metals such as batteries, pressurized containers, etc

Chemical waste consists of discarded chemicals that are generated during disinfecting procedures or cleaning processes. Not all of them are hazardous but some have toxic, corrosive, flammable, reactive, explosive, shock sensitive, cyto- or genotoxic properties. They must be used and disposed of according to the specifications provided with each type of chemical.

Waste with high contents of heavy metals and derivatives are potentially highly toxic. They are considered as a sub-group of chemical waste but should be treated specifically.

Pressurised containers consist of full or emptied containers or aerosol cans with pressurised liquids, gas or powdered materials.

**Examples of such wastes:** thermometers, blood-pressure gauges, photographic fixing and developing solutions in X-ray departments, halogenated or non-halogenated solvents, organic and in-organic chemicals.

### 1.6.1 Radioactive HCW

Radioactive waste includes liquids, gases and solids contaminated with radionuclides whose ionizing radiations have genotoxic effects. The ionizing radiations of interest in medicine include X- and  $\gamma$ -rays as well as  $\alpha$ - and  $\beta$ - particles. An important difference between these types of radiations is that X-rays are emitted from X-ray tubes only when generating equipment is switched on whereas  $\gamma$ -rays,  $\alpha$ - and  $\beta$ - particles emit radiations continuously.

The type of radioactive material used in health-care facilities results in low level radioactive waste. It concerns mainly therapeutic and imaging investigation activities where Cobalt ( $^{60}\text{Co}$ ), Technetium ( $^{99\text{m}}\text{Tc}$ ), iodine ( $^{131}\text{I}$ ) and iridium ( $^{192}\text{Ir}$ ) are most commonly used.

**Examples of such wastes:** Radioactive waste includes solid, liquid and gaseous waste contaminated with radionuclides generated from in vitro analysis of body tissue and fluid, in vivo body organ imaging and tumour location, and investigative and therapeutical procedures.

### 1.6.1. Veterinary Health care System

Zambia is made up of both public and private animal health facilities. Each district has a public animal health facility that provides veterinary health care (VHC) to the owning public. The organisational structure involves district veterinary office headed by the district officer that manages several veterinary camps. The Public Animal Health Facilities are also responsible for large scale vaccination efforts by GRZ against disease of national economy importance. PAHF are also present in many urban areas as well as large commercial farming blocks that good private veterinary services to clients. The livestock farming community is also a large generator of health care waste since livestock farmers often carry out extensive, therapeutic and prophylactic activities on their own under the supervision of a veterinary professional

### 1.7 Conclusion

This plan intends to address gaps identified in the current HCWM practices through:

- Rationalization of the HCWM practices within the HCFs of the country
- Dedication of specific financial resources to HCWM
- Launch capacity-building and training measures/programs
- Reduction of the pollution associated with HCWM
- Improved HCW information system within the context of Health Management Information System (HMIS)
- Enhanced public awareness in HCWM
- Improved monitoring and evaluation of HCWM
- Improve funding for HCWM activities



## CHAPTER TWO: SITUATION ANALYSIS

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### 2.1. Introduction

This chapter has identified levels of HCWM that are relevant in helping implement and enforce environmentally sound, technically feasible, economically viable and culturally acceptable systems in Zambia. In tackling this subject, literature review was conducted on the legal and administrative frameworks that govern both local and global HCWM.

The following were the outcomes:

### 2.2. Legal and regulatory framework

The current Zambian legal provision regarding management of HCW are provided according to the sector of application and control as listed below:

#### 2.2.1. The Public Health Act, Cap 295 of 1995

The Public Health Act Cap 295, part IX deals with control of infectious diseases, sanitation and housing. This Act places responsibility on local authorities to take measures and maintain their areas in a clean and sanitary condition. It also prevents the occurrence of nuisances and aspires to remedy them or other conditions liable to be injurious or dangerous to health. In addition, Section 67 defines a nuisance as one which includes any accumulation or deposit of refuse which is offensive or which is injurious or dangerous to health.

It is instructive that the provisions in Public Health Act do not explicitly deal with health care waste. However, these provisions address the conditions which render premises dangerous to health. There are circumstances in which the danger to health arises from the handling of infectious health care waste, in which case the provisions of the Public Health Act can be used.

#### 2.2.2. The Environmental Management Act No. 12 of 2011

The principal law on Environmental Management is EMA No. 12 of 2011 of the Laws of Zambia. The Act empowers ZEMA:

- To give specific or general directions to local authorities regarding collection and disposal of waste.
- To formulate and provide standards and regulations for the sound management of waste.

### **2.2.3. Environmental Management (licensing) Regulation (Statutory Instruments No. 112 of 2013)**

Part IV of this Statutory Instrument has been promulgated to amplify the provisions of the EMA. These regulations control and monitor the generation, collection, storage, transportation, pre-treatment, treatment, disposal, and trans-boundary movement of hazardous waste.

In these regulations hazardous waste includes;

- Waste from pharmaceuticals
- Waste from clinics and other related wastes (medical, veterinary, investigations and research). It excludes office and kitchen wastes and has the following characteristics:

#### **a) Infectious substances**

These are substances or wastes containing viable micro-organisms or their toxins which are known or suspected to be capable of causing disease in humans and animals.

#### **b) Toxic (Delayed or chronic)**

These are substances or waste which, if inhaled. Ingested or penetrate the skin, may cause delayed or chronic effects, including carcinogenicity.

The Fifth and Sixth Schedules prescribe the type of waste which is regulated and includes the following:

- **Waste Streams:** Clinical waste from hospitals, health centres, clinics and includes pharmaceutical waste.

Part III of SI 112 of 2013 governs the reclamation, reuse, recovery, recycling, transport, disposal and trans-boundary movement of industrial, commercial, domestic waste which is non-hazardous.

### **2.2.4. Medicines and Allied Substances Act No. 3 of 2013**

This Act provides for licensing of Medicines and allied substances Act in relation to the registration of Pharmacists, Agro veterinary shops and health shops. The provisions of these guidelines describe a series of steps that need to be followed in order to dispose unwanted pharmaceuticals. The steps required include; identification of pharmaceutical waste, sorting of pharmaceutical waste by category, filling the relevant forms to seeking authority from ZEMA and the Director General among other persons for disposal of such waste.

### **2.2.5. Ionizing Radiation Protection Act No.19, of 2011**

The Ionizing Radiation protection No.19, of 2011, aims to control the; import, export, possession and use of radioactive substances and irradiating apparatus. Under this Act, a license is required to handle any radioactive substances or irradiating apparatus from the Radiation Protection Authority. The Act mandates the method of disposal of radioactive waste products, transportation of radioactive materials, storage, use and maximum working hours that employees are expected to work with radioactive materials. Under this Act also, institutions generating this category of waste shall be expected to apply for a license from the same Authority.

### **2.2.6. Local Government Act, Cap 281 of 1991**

This Act provides for the establishment of city, municipal, district, township councils or management boards and Local Government Service Commission and defines their functions and powers including the acquisition of land.

Section 61 defines the functions of Local Authorities as read in Second Schedule No. 51 which states that Local Authority should establish and maintain sanitary services for the removal and destruction of, or otherwise dealing with all kinds of refuse and effluent, and compel the use of such services. Second schedule No. 52 states that Local Authorities shall establish and maintain drains, sewers and works for the disposal of sewage and refuse. The statutory instrument No.100 of 2011, addresses the issue of the municipal solid waste

### **2.2.7. National Strategic Plan for Infection Prevention**

The mission statement of this plan is to ensure safety of health workers, patients, and the community and to maintain a safe environment through the promotion of safe injection practices and proper management of medical waste.

The policy objectives spell out the need to advocate for support and implementation of proper management of medical waste among others. Some of the guiding principles for the implementation of this policy include:

- The need for environmental protection through appropriate waste disposal methods.
- Minimization of risks to patients, health workers, communities and the environment through application of safer injection devices and sharps waste disposal methods.
- Strengthening of the necessary human resource capacity through training and sensitization for safe waste disposal.
- Develop logistic system that will address the sustained supplies and equipment of HCWM. This will require a commensurate investment to comply with HCWM requirement.

Therefore, a unique strategy is recommended for the advocacy of best waste management practices through behaviour change with communication as a key element in the strategy.

### **2.2.8. International Conventions**

#### **a) The Stockholm convention on Persistent Organic Pollutants**

The Stockholm Convention is an international environmental Treaty, signed in 2001 and became effective in May 2004. It aims to eliminate or restrict the production and use of Persistent Organic Pollutants (POPs). Key elements of the Convention include the requirement that developed countries provide new and additional financial resources and measures to eliminate production and use of intentionally produced POPs, eliminate unintentionally produced POPs where feasible, and manage and dispose of POPs wastes in an environmentally sound manner.

#### **b) The Basel Convention**

The Basel Convention on the Control of Trans-boundary Movements of Hazardous Wastes and Disposal is an international Treaty that was designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries (LDCs). It does not, however, address the movement of radioactive waste. The Convention is also intended to minimize the amount and toxicity of wastes generated, to ensure their environmentally sound management as closely as possible to the source of generation, and to assist LDCs in environmentally sound management of the hazardous and other wastes they generate.

In addition to conditions on the import and export of the above wastes, there are stringent requirements for notice, consent and tracking for movement of wastes across national boundaries. It is worth to note that the convention places a general prohibition on the exportation or importation of wastes between parties and non-parties.

#### **c) Minamata convention 1**

This is a new multilateral environmental agreement that addresses specific human activities that are contributing directly to mercury pollution. This convention was as result of deaths of many people in Minamata in Japan who had been exposed to Mercury from the mines which accumulated in the fish in the Minamata bay.

The convention resolved the following:

1. Reduce the use of clinical thermometers and BP machines and other detecting devices
2. Reduction in mercury mining
3. Vaccines which use mercury as preservatives
4. Reduce the use of mercury batteries
5. Phase out mercury manufacturing and processes i.e. soaps, cosmetics, dental filings
6. Safe storage and disposal of all mercury related products after their removal from the market

7. Phase out or control mercury air emissions from coal fired power plants, industrial boilers, cement production etc

### **2.2.9. Auditor General's Report Findings**

The 2009 General Auditor's report on medical waste management in the health institutions revealed serious weaknesses in the prevailing HCWM practices. It was observed that the following areas were not handled according to available laws of Zambia and the regulations; generation, handling, storage and transportation to the final disposal point. Notable findings included the following:

- a) Most Health facilities did not maintain records of the quantities of waste generated contrary to ministry policy, legislation or regulations.
- b) Colour coding and labelling not followed by some Health institutions.
- c) Transportation and disposal not done according to ZEMA guidelines.
- d) Improper and ineffective treatment of HCW
- e) Lack of HCWMP
- f) Most Health facilities did not orient members of staff in HCWM

### **2.2.10. Field Assessment Findings**

A national assessment was done in June, 2013 to assess legislative, institutional and infrastructural challenges, being encountered in the field on HCWM in the country. The assessment was done in Lusaka, Copperbelt, and Southern, North-Western, Northern and Muchinga provinces. The assessment covered two level III hospitals, six level II hospitals, three level I hospitals, thirteen health centres and one health post. The assessment focused on generation, storage, transportation, and final disposal, knowledge gap for members of staff and expenditure for HCWM. Summary of findings per province assessed is as follows:

#### **a) Southern Province**

The districts assessed were; Mazabuka, Monze, Choma, Kalomo and Livingstone. In each of them, the health institutions were assessed and the following is a summary of the findings:

- i. The institutions had no HCWM committees in place.
- ii. Most health facility action plans had no budget line specific for HCWM
- iii. The Mazabuka and Monze District Health Offices plans had budget lines only for maintenance of incinerators and other logistics such as bin and bin liners. The maintenance of microburn incinerators was subcontracted to Abel Investment. The average cost for maintenance was around K9000.
- iv. The ordinary incinerator is commonly used even where there is an existing macro burn incinerator due to high operational cost and inadequate handling capacity of macro burn incinerators, handling only 10 to 20 kg of waste at a given time. The average generation rate at hospital level is about 70kg per day for general hospitals. Therefore, the capacity

of most macro burns incinerators is very inadequate to handle the waste generated at the hospital. Hence the option of using the ordinary incinerators or open burning in the pit is a common practice in the facilities where the assessment was conducted.



**Figure 2: Open pit with medical waste at a hospital**



**Macro burn incinerator at Monze Hosp.**

**Figure 3: Macro burn incinerator at a hospital**

It was also observed that all the hospitals in Southern Province indicated having no SOP for HCWM. Additionally it was revealed that all members of staff are not trained in HCWM. Furthermore, knowledge on HCWM was scanty for Doctors, Nurses, clinical officers and support staff. The Environmental Health staff indicated adequate knowledge but lamented the lack of support by management for HCWM. Generally, all the institutions had inadequate Bins, bin liners and colour coding was not being implemented. Transportation of waste was mainly manual without aid.



### **b) Copperbelt Province (Ndola and Kitwe districts)**

There were no committees in place to look into issues regarding HCWM. This in turn attributed to the level of non-prioritization of HCWM in their budgets at planning level. However, evidence of expenditure on HCWM was there especially on operational costs like fuel, waste bin and bin liners. There were no contract service and maintenance schedule for the incinerators as a result most of the macro burn incinerators were reported broken down.

The report also indicated that logistics for HCW were in short supply due to inadequate funding and lucky of prioritization for HCWM. HCW transportation is a challenge as evidenced in the use of Open van vehicles not suitable for HCW transportation. The institutions had Technical guidelines for Health Care Waste (ECZ, 2000) in place apart from the Infection Prevention Manual which covers issues of safety precautions from needle stick pricks and other infectious materials to Health care service providers.



**Figure 4: Commingled waste from private HCF for incineration**

Poor waste collections, storage methods at points of waste generation are being practiced. Storage of HCW is another challenge in most of the institutions as evidenced in Ndola where waste is stored for more than 24 hours before it's taken for final disposal.



**Figure 5: Macro burn incinerator at a hospital**

**c) Northern and Muchinga Provinces**

In Northern and Muchinga Provinces the assessment was done at Kasama General Hospital, Kasama Urban, Mungwi Baptist Health Centre, Chilonga Mission Hospital. The gaps identified include inadequate training and experience in HCWM. While most of the visited institutions had inadequate bins and bin liners for proper waste segregation. The low capacity of macro burn incinerators was also noticed,

At management level, almost all the institutions assessed had not prioritized HCWM and did not have a specific budget for HCWM for specific institutions. Standard operating procedures were not in place apart from the guidelines on infection prevention. There was poor segregation of waste at the point of generation as most of the receptacles were found with both infectious and non-infectious waste. Control of scavengers was another challenge as most of the disposal sites were not fenced

In Kasama, it was noted that the annual budget of K100, 000 for HCWM was spread across all the health centres in the district and was administered at the District Health Office. The hospital in Mpika had a brick lined incinerator which was not effectively used whilst sharps and other infectious waste (placentas) were disposed off in the ordinary pit.





**Figure 6: Disposal of placentas**

The biggest challenge experienced by staff at Chilonga Mission Hospital was segregating waste according to different colour codes



**Figure 7: Final disposal site at a hospital**

## 2.2.11 Strengths Weaknesses Opportunities Threats analysis

Table 3: SWOT analysis

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Availability of trained personnel</li> <li>• Availability of some legislation related to HCWM (Public Health Act, Environmental Management Act, Ionizing Radiation Act).</li> <li>• Increase in the number of HCW treatment options for Health facilities.</li> <li>• Existence of National documents (guidelines on HCW, incinerator specifications, National HCWM-plan, laboratory safety manuals)</li> </ul>	<ul style="list-style-type: none"> <li>• Poor attitude of persons charged with the task of HCWM</li> <li>• Inadequacy in legal provisions of HCWM</li> <li>• Non availability of policy on HCWM</li> <li>• Weak legal enforcement of pieces of legislation</li> <li>• High maintenance cost of the available HCW disposal options.</li> <li>• Dissemination of available documents on HCWM not widely done and not operationalized (except for labs)</li> <li>• Lack of coordination of players in HCWM</li> <li>• Inadequate supplies HCW tools/equipment</li> <li>• Non availability of HCWM committees</li> <li>• Inadequate funding towards HCWM</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>• Political will</li> <li>• Good will from partners</li> <li>• Availability of training institutions</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of capacity by local authorities to handle HCW</li> <li>• Lack of prioritization of HCW by management</li> </ul>

The analysis in the table above indicates that there are many strengths such as availability of trained personnel, availability of legislation, increase in the number of incinerators for Health facilities and existence of National documents (guidelines on HCW, incinerator specifications, National HCWM-plan laboratory safety manuals). These strengths can facilitate the improvements in HCWM if all levels prioritized HCWM.

## 2.2.12. Health Care Waste Handling Practices

### a) The Practice of Waste Segregation

The key to minimization and effective management of HCW is identification and segregation of the waste. It ensures that the correct disposal procedures are taken, personnel safety is maintained, environmental harm is minimized and recycling consumes the least resources. Segregation of HCW should be done according to the following categories; infectious or clinical waste (hazardous waste), non-infectious or general waste, highly infectious waste, and sharps. Segregating waste according to type minimizes the costs of HCW collection and treatment. Correct and efficient segregation will only be achieved through rigorous training and education of employees, supervisors and managers. Staff must also be aware of the rationale for segregation as well as colour codes for containers and bags used for different types of wastes.

For effective HCWM the following shall be the HCW segregation practices:

- i. Segregation shall be carried out by the health care worker or any other person generating waste. This shall be done as close to the point of generation as possible. (i.e. in all clinical areas, traditional health practices and home based care environments)
- ii. HCW receptacles shall be readily available at the point of generation, located away from patient areas to avoid cross infections;
  - Be safe and guarantee the absence of infectious microorganism in the domestic waste flow;
  - Be well understood and well known by the medical and other health staff of the HCFs;
  - Be regularly monitored to ensure that the procedures are respected.
- iii. Suitable HCW receptacles of appropriate size and number, to accommodate the different waste types being generated, shall be used.
- iv. The personnel involved in HCW management shall ensure that the waste bags are removed and sealed when they are not more than three-quarters full. The preferred method of sealing shall involve a plastic sealing tag of the self-locking type and stapling shall never be encouraged.
- v. Health care providers and any other personnel shall not sort through waste by correcting errors of segregation. If general and hazardous waste are accidentally mixed, the mixture should be treated as hazardous HCW.
- vi. Segregation system shall be uniformly applied throughout the whole country and shall be maintained throughout the entire waste stream up to disposal;
  - Be simple to implement for the medical and other health workers and applied uniformly throughout the country or facility.

### **b) Packaging**

In general, the waste shall be packaged in sealed bags or receptacles to prevent spilling during handling and transportation. The bags or containers shall be resistant to their content (puncture-proof for sharps, resistance to chemicals reaction) and to normal conditions of handling and transportation such as vibration and changes in temperature, humidity or pressure (resulting from altitude).

### **c) Colour coding**

For effective HCWM the following shall be the HCW colour coding practices:

- i. Colour coding for the bin liners shall always correspond or match with the waste containers both at the internal and external storage sites. Colour coding will reduce the risks of cross contamination and occupation health hazards and enhance identification of types of HCW.
- ii. Bins and bin-liners, containers and bio-hazard bags shall be either black or brown and yellow to reinforce the separation of types of waste. See annex 9 for colour coding guide.

#### **d) Labelling**

Labelling is important in order to:

- i. Identify the source of HCW or date of generation in case of an accident or improper segregation of the waste.
- ii. Ensure that the workers responsible for HCW management handle the different types of wastes safely.
- iii. Ensure that each staff member feels more responsible for what they put into the bag/receptacle
- iv. Ensure that segregation is done properly
- v. Ensure that Medical Departments gather data on the amount of waste produced in each department.

### **2.2.13. Storage, Collection and Transportation of HCW**

#### **a) Storage**

Storage is classified into internal and external. Consideration for storage must be based on the classification or type of waste being dealt with and the potential risk of infection to health-care workers and waste disposal staff.

##### **i. Internal (Primary) Storage**

Internal storage is the temporary placement of waste at the point of generation before transfer to external storage points. A storage location for the HCW should be designated inside the HCF. The waste in the bin-liners or containers should be stored in a separate area, room or building appropriate to the quantity of waste produced bearing in mind the frequency of collection.

Segregation of hazardous waste from general waste should be maintained in storage. They should be planned periodic cleaning and disinfection of temporary storage areas and the containers. The storage time for HCW before it's transferred to external storage facilities should ensure that during cold/rain season 48 hours and during hot season 24 hours.

##### **ii. External (Secondary) Storage**

External storage refers to the transit point where waste is stored after removal from primary storage to the time it is collected and transported for treatment and final disposal. These are locations in special areas or in the grounds of a HCF where larger containers are used to store waste until it goes for final disposal either on or off-site. The external storage is usually situated within the HCF. The frequency of removal of waste stored depends on the volume and nature of waste generated.

For effective HCWM the following shall be the HCW external storage practices:

- To ensure that waste is kept separated, the central storage receptacles for each colour coded bags shall be placed in similarly colour coded receptacles.
- There shall be one or more external storage points for hazardous and non-hazardous waste depending on the layout and size of each HCF.
- The external storage point(s) for the hazardous and non-hazardous waste shall be geographically separate at a HCF.
- Waste from the separate external storage points for general waste and potentially infectious waste shall go to different final disposal facilities.
- Facilities for external storage shall be sited away from the kitchen, laundry, ward etc. but within the precincts of the facility and shall be easily accessible to collection vehicles;
- The facility shall be enclosed and surrounded by an impervious wall of appropriate height and provided with a gate and lock;
- The walls and floors shall be smooth, without cracks, impervious, easy to clean and disinfect
- The site shall be spacious, well ventilated and lit;
- All loading and unloading of waste shall take place within the designated collection area around the storage point;
- Larger volume waste bins should be available at the external storage facility to receive waste containers from the internal storage points.

These bins shall be marked for ease of identification of content and the markings must correspond with the colour code used for polythene bags in internal storage;

- HCW shall not be compressed during storage;
- Waste bins shall be washed and disinfected each time they are emptied;
- The storage area shall have water supply for cleaning purposes; waste water from the storage area must be drained into septic tanks, soak ways and municipal sewer system and must not be allowed to drain off into storm water drainage or streams;

Adequate spill kit and protective clothing such as gloves, overall, nose masks etc.; must be provided at the storage sites. The kit sites must include absorbent materials, disinfectant, buckets, and shovels for staff to clean up any spills and must be easily accessible.

- Provision shall be made for wash/room facilities for those who handle these waste e.g. basins, shower, water and soap/detergents etc;
- External storage facilities must meet certain basic standards for the type of waste stored e.g. the temperature of refrigeration of body parts must be such as to prevent further decomposition or multiplication of pathogens;
- Only authorised persons shall have access to external storage area.

- Bio-hazard symbols (as indicated in annex for symbols) and other warning signs shall be conspicuously posted on the door to prevent people from unnecessarily gaining access to the area

### **iii. Waste storage, treatment and disposal of cytotoxic waste**

Cytotoxic waste should be managed separately from other types of special waste and from other waste generated in a clinical setting that are not assessed or classified as hazardous waste.

Cytotoxic waste should be transported to a dedicated, secure storage area and await collection for disposal and treatment. Bins should be sealed or otherwise secure prior to waste collection and not re-open while on-site. Waste treatment must render the cytotoxic waste non-infectious and unrecognizable. Currently, thermal destruction treatment (1100° C or higher) is the only acceptable technology for treating cytotoxic waste. If the waste consists of a mixture of cytotoxic and other waste, it should be incinerated at the temperature recommended for cytotoxic waste.

### **iv. Radioactive waste**

Radioactive waste should be stored in containers that prevent dispersion, behind lead shielding. Waste that is to be stored during radioactive decay should be labelled with the type of radionuclide, the date, and details of required storage conditions. Further information is provided in the National guidelines.

## **b) Collection of health care waste**

For effective HCWM the following shall be the HCW collection practices:

- Collection and transportation of HCW from HCFs shall be integrated into the general waste management plan of the local authority.
- At the institutional level, all HCW shall be sorted on site before collection and transportation. This will bring about easy identification of content of containers thus preventing careless handling and the risk of secondary infection.
- There shall be a fixed schedule for the collection of waste bags and containers from each medical department. This is to ensure the regular removal of waste from each location and to ensure coordination between medical staff and cleaning or housekeeping staff. The minimum frequency of waste removal should be once a day and preferably at least once per working shift.
- No bags shall be removed without labelling indicating the point of generation (hospital and ward) and content;
- Health care workers shall immediately replace the bags or containers with new ones of the same type.
- There shall be separate schedules and separate collection times for different colour coded containers. Separate trolleys shall be used for different types of waste. This is to avoid increased possibilities of wastes becoming mixed and being transported along inappropriate disposal routes.



- The use of closed wheeled trolleys with lids is recommended and shall not be used for any other purpose. The use of wheeled trolleys, containers that are user friendly (easy to load, no sharp edges and easy to clean) is recommended for transportation within the healthcare establishment.
- Vehicles shall be disinfected and cleaned daily or at the end of each haulage with an appropriate disinfectant at an appropriate site where wastewater will be properly disposed off.
- Waste ducts that convey sacks of waste by gravity shall not be used, as they tend to scatter wastes at the exits of the chutes, and are subject to fouling by the wastes, leading to nuisances such as smell and insects.
- Carts and vehicles used to transport the waste shall be carefully designed so that they are stable, quiet in operation, and so that transportation can be achieved with the minimum of effort and inconvenience.
- Trolleys or carts shall be large enough so that waste is not piled up on them in an unsafe way.
- Waste bags shall not be hand carried around the HCF, since it increases the risk of injury to the legs, arms and torso from incorrectly disposed of sharps or other items.
- Where the facility is not equipped to carry out on-site treatment and disposal of HCW the institution shall appoint a waste management contractor licensed by ZEMA to collect and transport its wastes to a designated site for treatment and final disposal. Wastes from HCFs shall be packaged and transported separately based on the adopted colour codes.

### **c) Transportation of Health Care Waste**

The general requirements for the transportation of HCW shall observe the following HCW transportation practices:

- It shall only be done by accredited waste management contractors and certified by the local authority and ZEMA.
- All necessary care must be taken to prevent odour nuisance to the neighbourhoods during transportation.
- Where hazardous wastes and other wastes have been mixed, they must be considered hazardous and managed as such.
- HCW must be transported directly to the disposal or treatment site within the shortest possible time.
- Vehicles used for transportation of HCW must be so constructed as to prevent the scattering of packaged wastes, odour nuisance, and must be leak proof.
- The transportation shall be undertaken according to approved times on approved routes and in approved vehicles with approved bio-hazard labels.

- The transporter shall provide for security of the vehicle and an emergency procedure plan.
- Waste must not be compacted or subjected to any other treatment that could cause bags or containers to rupture.
- Labels shall be firmly attached to containers so that they do not become detached during transportation and handling.
- Specific routes shall be planned through the HCF to minimize the passage of loaded carts through patient care and other clean areas.
- Vehicles and trolleys used for moving HCW through the HCF should be designed to prevent spills, and should be made of materials able to withstand exposure to common cleaning agents. These shall not be used to transport any other materials other than HCW.

They should have the following attributes:

- Easy loading and offloading;
- No sharp edges, which could damage waste bags or containers during loading and offloading;
- Easy to clean.
- The vehicles and trolleys should be cleaned regularly and as soon as possible if the waste material leaks or spills in order to prevent odour and minimize infection.
- The facility's infection prevention (IP) committee or other appointed person should be consulted about the frequency of cleaning and the type of cleaning agent to be used.

#### **d) Transportation of Radioactive Waste Containers**

The requirements for the transportation of radioactive wastes shall observe the following radioactive HCW transportation practices:

- Radioactive waste containers must be brightly coloured (yellow) and shall be marked 'Radioactive Waste'.
- All radioactive waste packages or containers should have labels bearing the radiation symbol on them.
- The label should be completed and signed by the officer in charge of waste management in the organization.
- The printing on the labels should be permanent and legible for the entire storage period.
- Radioactive waste should be adequately packaged and contained for transport to ensure safety, not only of those involved in the transport operation, but also for those who could be affected as a result of transport operations in accordance with the International Atomic Energy Agency (IAEA) Regulations for the Safe Transport of Radioactive Material. (Requirements, 1996, Safety Standards Series ST-1, IAEA, Vienna).
- Drivers transporting radioactive material have to be suitably trained and carry contingency plans on the vehicle detailing action to be taken in the event of an accident.



- Radioactive waste material shall be managed in accordance with the Ionising Radiation Act number 16 of 2005), as read with the Ionising Radiation Protection Regulations and Part IX of EPPCA.
- The containers should bear the International Radioactive Symbol to distinguish it from containers meant to receive other types of waste.

**Table 4: Synopsis of HCW stream**

Step	Location	Health Care	Key Points
0		Waste Minimization	Purchasing policy Stock management recycling of certain types of waste
1	In medical unit	<pre> graph TD     A[Generation] --&gt; B[Segregation at source]     B --&gt; C[Collection + on-site transport]     C --&gt; D[On-site Storage]     D --&gt; E[On-site treatment/disposal]     D --&gt; F[Off-site transport]     F --&gt; G[Off-site treatment/disposal]           </pre>	One of the most important steps to reduce risks and amount of hazardous waste
2	In health facility		Protective equipment; sealed containers; Specific easy to wash trolleys.
3	Outside of health facility		Lockable easy to clean storage room: Limited storage time of 24-28hrs
4			Adequate storage room, limited time of max 48hrs
5			Appropriate vehicle and consignment note; HCF is informed about final destination
6			Appropriate vehicle and consignment note to ensure delivery to disposal site
7			

**Table 5: Summary of types of treatment and disposal of HCW**

Method	Advantages	Disadvantages
<b>Double chamber/rotary kiln incineration</b>	<ul style="list-style-type: none"> <li>▪ Elimination of health risks due to the complete destruction of the waste</li> <li>▪ Fully destroys microorganisms and sharps</li> <li>▪ Reduces volume and weight of waste</li> <li>▪ Destroys all types of organic waste (liquids, pharmaceuticals, and other solids)</li> </ul>	<ul style="list-style-type: none"> <li>▪ High investment and operation costs</li> <li>▪ Requires skilled staff to operate</li> <li>▪ Emit toxic flue gases</li> <li>▪ Generates residues that need safe land-filling</li> </ul>
<b>Single chamber or drum/brick incineration</b>	<ul style="list-style-type: none"> <li>▪ Good disinfection efficiency</li> <li>▪ Reduces volume and weight of waste</li> <li>▪ No need for highly trained operators</li> </ul>	<ul style="list-style-type: none"> <li>▪ Emission of atmospheric pollutants</li> <li>▪ Need for periodic removal of slag and soot</li> <li>▪ Inefficient in destroying thermally resistant chemicals and drugs</li> </ul> <p>No destruction of sharps</p>
<b>Autoclaving</b>	<ul style="list-style-type: none"> <li>▪ Relatively simple to operate</li> </ul>	<ul style="list-style-type: none"> <li>▪ Relatively expensive to install and operate</li> <li>▪ Requires boiler and stack emissions controls</li> <li>▪ Relatively high maintenance costs</li> <li>▪ Generates contaminated wastewater that needs treatment</li> </ul>
<b>Microwave irradiation</b>	<ul style="list-style-type: none"> <li>▪ The shredding process reduces the volume of the waste</li> <li>▪ Once treated, waste can be land filled with other municipal waste</li> <li>▪ No air pollution</li> </ul>	<ul style="list-style-type: none"> <li>▪ Highly sophisticated and complex</li> <li>▪ High investment and running costs</li> <li>▪ Only solids can be treated and only when shredded</li> <li>▪ Cannot be used to treat pharmaceutical and cytotoxic waste</li> <li>▪ Highly skilled operators required</li> <li>▪ No reduction of the weight of the waste treated</li> </ul>
<b>Chemical disinfection</b>	<ul style="list-style-type: none"> <li>▪ The shredding process reduces the volume of the waste</li> </ul>	<ul style="list-style-type: none"> <li>▪ Cannot be used to treat pharmaceutical and cytotoxic waste</li> <li>▪ Skilled operators required</li> <li>▪ Chemicals used are themselves hazardous and require special precautions when used</li> </ul>
<b>Encapsulation</b>	<ul style="list-style-type: none"> <li>▪ Simple, low cost and safe</li> <li>▪ May be used for sharps</li> <li>▪ Reduces the risk of scavengers gaining access to the waste</li> </ul>	<ul style="list-style-type: none"> <li>▪ Generates hazardous waste water that needs treatment</li> </ul>
<b>Inertisation</b>	<ul style="list-style-type: none"> <li>▪ Simple, low cost and safe</li> <li>▪ May be used for pharmaceutical waste</li> </ul>	<ul style="list-style-type: none"> <li>▪ Not applicable to infectious waste</li> </ul>
<b>Refuse pit</b>	<ul style="list-style-type: none"> <li>▪ Simple to operate</li> </ul>	<ul style="list-style-type: none"> <li>▪ Practically for limited periods of time and amount of waste</li> <li>▪ Possibility of groundwater pollution</li> </ul>

- |  |  |  |
|--|--|--|
|  |  | ▪ Risky HCW is not treated and remains hazardous |
|--|--|--|

#### **i) Shredding**

Shredders cut sharps into small pieces. This technology requires a worker skilled in the operation and maintenance of heavy-duty, rotating equipment. Simple shredders can be made from a manually operated grain mill. Due to the presence of workers during operation, only disinfected needles and syringes should be processed.

#### **2.2.15. Training strategy for health care personnel.**

A policy for the management of health care waste cannot be effective unless it is applied carefully, consistently and universally. It is through training that standardization of waste handling practices and its management can be achieved.

#### **d) Employees to be trained**

Training activities should be targeted at the following main categories of health care personnel both from the public sector and the private sector.

- Health facility managers and administrative staff responsible for the implementation of health care waste management plans and regulations.
- Medical doctors
- Environmental Health Staff.
- Nurses, Clinical Officers, Biomedical Scientists/Technologists, Radiographers, Physiotherapists, Pharmacists, Orthopaedic staff, Dental staff, Dietician, Cooks and any other staff.
- Cleaners, porters, auxiliary staff, incinerator operators and waste handlers.
- Pre-service students from Health training institutions.

#### **e) Training package for HCWM**

The content of staff education on infection prevention and health care waste management programme should contain the following:

- Justification for all aspects of HCW policy;
- Explanation of the role and responsibilities of each health facility staff member in implementing the policy.

Technical instructions relevant for the target group under some or all of the following headings;

- Definition of HCW
- Importance of proper waste disposal
- Classification of HCW
- Handling HCW
- Segregation of HCW
- Safety measures when handling HCW

- Recording and reporting accidents
- Health care waste disposal methods
- Laws relating to waste management.
- Personal Protective Equipment (PPEs)
- Occupational Health and Safety
- Education of health risks associated with bio-medical waste to health workers and members of the public through Information Education and Communication (IEC) materials in all media.
- Education on safe disposal practices and methods to all. The public has a right and responsibility to know how to handle home based health care medical waste.
- Pre and post-test for all participants

### **2.2.17. Occupational Health and Safety**

During handling of wastes, the medical and ancillary staff as well as the sanitary labourers can be injured if the waste has not been packaged safely. Many injuries occur because syringe needles or other sharps have not been collected in safety boxes or because these have been overfilled. On dumpsites, scavengers during their recycling activities may also come in contact with infectious waste if it has not been properly treated or disposed of.

The general public can be infected by health care waste either directly or indirectly through several routes of contamination. Dumping health care waste in open areas is a practice that can have major adverse effects on the population. The recycling practices that have been reported, particularly, the reuse of syringes is certainly the most serious problem in some of the developing countries.

#### **a) Indirect risks via the environment**

The dumping of health care waste in uncontrolled areas can have a direct environmental effect by contaminating soils and underground waters. During incineration, if no proper filtering is done, air can also be polluted causing illnesses to the nearby populations. This has to be taken into consideration when choosing a treatment or a disposal method by carrying out a rapid environmental impact assessment.

### **2.2.18 Cost of HCWM**

It must be stated that the cost of health-care waste management will vary from one facility to another. This is mainly because of varied problems and constraints in their institutional management practices such as lack of policy and technical guidelines on how to plan and manage health-care waste. Other problems are high costs of transportation, long distances of travel to designated disposal sites, limited number of operating incinerators, limited technical capacity and inadequate health-care waste data bases.

## CHAPTER THREE: RECOMMENDATIONS

### 3.1 Strengthening the institutional capacities for HCWM

In order to build capacity for HCWM, there is need to develop structures at all levels of health care starting with the national level. The following is the recommended organogram for HCWM.

#### Organogram for HCWM

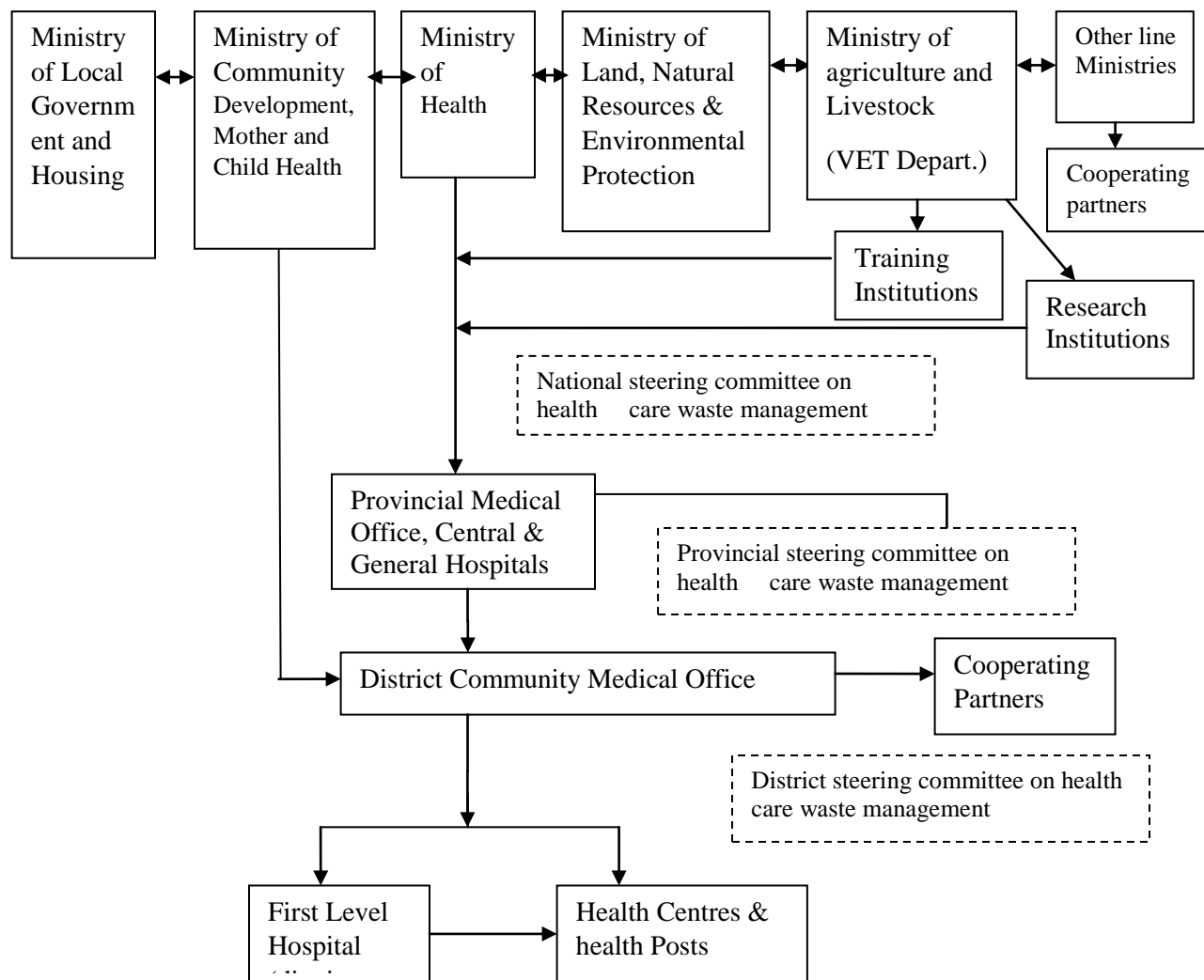


Figure 8: Organogram for HCWM

There is a need for the formation of a national steering committee to supervise and manage health care waste management in the country under the directorate of disease surveillance, control and research.

### 3.1 National Steering Committee

#### 3.1.1 Composition

Permanent Secretary- MoH	Chairperson
Permanent Secretary- MCDMCH	-Co-Chairperson
Director Disease Surveillance Control & Research (MoH)	-Secretary
Deputy Director Epidemiology and Surveillance (MCDMCH)	-Co-Secretary
DD- EH (MoH)	-Deputy Secretary
P S – MALF	-Member
P S – MLGH	-Member
P S – MLNREP	-Member
P S- MOE	-Member
Key stakeholders	-Member
Provincial Medical Officers	Member

##### 3.1.1.1 Terms of Reference (Tasks)

The tasks of the National Steering Committee will be as follows:

- Mobilise resources
- Establish the criteria for the evaluation of the HCWM plan during its implementation.
- Designate the administrative authorities in charge of the implementation of the HCWM Plan at all levels
- Set-up intermediary and final evaluations of the implementation of the HCWM plan.
- Advocacy for HCWM and environmental sustainability

### 3.2 NATIONAL HEALTH CARE WASTE MANAGEMENT COMMITTEE

Permanent Secretary- MoH	-Chairperson
Permanent Secretary- MCDMCH	-Co-Chairperson
Director Disease Surveillance Control & Research (MoH)	-Secretary
Deputy Director ZEMA	-Co-Secretary
DD - EH (MoH)	-Deputy Secretary
Focal person – MALF	-Member
Focal person – MLGH	-Member
Focal person – MLNREP	-Member
Focal person - MOE	-Member
Key stakeholders	-Member
Provincial Medical Officers	- Member

#### 3.2.1 Terms of References

- Capacity building (trainings and workshops) research and training Institutions
- Guide the administrative authorities in-charge of the implementation of HCWM
- Set up intermediary and final evaluation of the implementation of the HCWM plan
- Strengthen adherence to ZEMA regulations and guidelines
- Ensure HCWM and environmental sustainability
- Interpretation of the

### 3.3. Provincial Health Office

The Provincial Medical Officer (PMO) will appoint the Chief Environmental Health Officer (CEHO) as a focal point person for HCWM in the Province. The focal point unit shall drive the HCWM issues in the province and shall be constituted from the District Health Offices line ministries and Cooperating partners (CPs.). Duties are outlined in box 3 below.

**Box 3:** The duties among others shall include: CEHO - PMO

- To coordinate and support activities of HCWM in the Province.
- To convene meetings in liaison with PMO for partners, donors and other stakeholders, including the private sector.
- To facilitate preparation of the HCWM plans in health facilities and districts.
- To liaise with the MCDMC on issues of HCWM implementation
- To disseminate HCWM guidelines (including written emergency procedures) to all stakeholders
- To support implementation of HCWM through the stakeholders.
- To offer technical support and conduct monitoring visits for HCWM implementation.
- To identify areas for operational research in waste management practices and treatment technologies.
- To advise on the installation and maintenance of waste treatment and storage facilities and handling equipment to comply with the specifications in the ZEMA standards
- Organize and train staff in HCWM.
- To perform any other duties as assigned by the PHO
- Enforce penalty in cases of non-compliance to HCWM regulations as mandated by the Public Health Act CAP303 Section 108

### 3.3.3. Central and General Hospitals

The Senior Medical Superintendent (SMS)/Medical Superintendent will appoint the Principal Environmental Health Officer (PEHO) as a focal point person for the HCWM in the institution. The PEHO will in turn recommend HCWM officers for the institution. There shall be a Hospital HCWM committee administered by the focal point unit. The focal point unit shall drive the health care waste management issues in the facility and shall be constituted from heads of departments and units. The box below shows the duties in detail.

**Box 4:** The duties among others shall include:



- To coordinate and support efforts of HCWM in the facility.
- To coordinate in liaison with SMS/MS the activities of the HCWM Committee.
- To convene meetings in liaison with SMS/MS for Departments and unit heads.
- To facilitate preparation of the HCWM plans for the facility
- To liaise with all the departments that generates HCW
- To disseminate HCWM guidelines to the facility
- To support implementation of HCWM through unit heads.
- To offer technical support and conducting monitoring visits within the facility.
- To identify areas for operational research in waste management practices and treatment technologies.
- To be responsible for advising on installation and maintenance of waste treatment and storage facilities and handling equipment to comply with the specifications in the ZEMA standards.
- Organize and train staff in HCWM
- To perform any other duties as assigned by the SMS

### 3.4 District Health Office

The District Medical Officer (DMO) will appoint the Principal Environmental Health Officer/Senior Environmental Health Officer/ Environmental Health Technologist as a focal point person for HCWM Officer for the District. The PEHO will in turn recommend HCWM officers for the district. The focal point unit shall drive the health care waste management issues in the district and shall be constituted from the District Development Coordinating Committee (DDCC). Refer to box 5 for duties.

**Box 5:** The duties among others shall include:

- To coordinate and support efforts of HCWM in the District.
- To coordinate in liaison with District Medical Officer the activities of the District Steering Committee on Health Care Waste management.
- To convene meetings in liaison with District Commissioner (DC) for partners, donors and other stakeholders, including the private sector.
- To facilitate preparation of the HCWM plans in health facilities and districts.
- To liaise with the Council Secretary or Town Clerks on issues of HCWM implementation in the district
- To disseminate HCWM guidelines (including written emergency procedures) to all stakeholders and conduct assessments
- To support implementation of HCWM through the stakeholders.
- To offer technical support and conduct monitoring visits for HCWM implementation at 1st Level hospitals, Health Centres and health posts, including community.
- To monitor management of waste disposal sites in collaboration with Community leaders and Local Councils.

- To identify areas for operational research in waste management practices and treatment technologies.
- To create awareness on dangers/risks of HCWM of improper HCWM practices
- To be responsible for advising on installation and maintenance of waste treatment and storage facilities and handling equipment to comply with the specifications in the ZEMA standards.
- Organize and train staff in HCWM.
- To perform any other duties as assigned by the DMO.

### 3.5. First Level/District Hospitals

The Medical Officer in Charge will appoint the Principal/Senior Environmental Health Officer (PEHO/SEHO) as a focal point person for HCWM Officer in the hospital. The PEHO/SEHO will in turn recommend HCWM officers for the hospital. There shall be a Hospital HCWM committee administered by the focal point unit. The focal point unit shall drive the health care waste management issues in the facility and shall be constituted from heads of departments and units. The duties are outlined in box 6.

**Box 6:** The duties among others shall include:

- To coordinate and support activities of HCWM in the facility.
- To coordinate in liaison with MS the activities of the HCWM Committee.
- To convene meetings through the office of the DCMO for Departments and unit heads.
- To facilitate preparation of the HCWM plans for the facility
- To liaise with all the departments that generate HCW
- To disseminate HCWM guidelines (including written emergency procedures) to the facility
- To support implementation of HCWM through unit heads.
- To offer technical support and conduct monitoring visits within the facility.
- To identify areas for operational research in waste management practices and treatment technologies.
- To be responsible for advising on installation and maintenance of waste treatment and storage facilities and handling equipment to comply with the specifications in the ZEMA standards.
- Organise and train staff in HCWM
- To perform any other duties as assigned by the Medical Superintendent

### 3.6 Health Centres (Urban and Rural)

The District Community Medical Officer (DCMO) will appoint the Senior Environmental Health Technologist /Environmental Health Technologist as a focal point person for HCWM Officer for the facility. There shall be a Health Centre HCWM committee administered by the focal point unit. The focal point unit shall drive the health care waste management issues in the facility and shall be constituted from all departments and Health Centre Committee. Box 7 has the outlined duties in detail.

**Box 7:** The duties among others shall include:

- To coordinate and support activities of HCWM in the facility.
- To coordinate through the office of the officer In-charge for the activities of the HCWM Committee.
- To convene meetings in liaison with all Departments.
- To coordinate the preparation of the HCWM plans for the facility
- To liaise with all the departments that generates HCW
- To disseminate HCWM guidelines (including written emergency procedures) to the facility and the community
- To facilitate implementation of HCWM activities through unit heads.
- To offer technical support and conducting monitoring visits to the community.
- To identify areas for improvement of waste management practices and treatment technologies.
- To be responsible for advising on installation and maintenance of waste treatment and storage facilities and handling equipment to comply with the specifications in the Zambia Environmental Management Act standards.
- Organise and train staff in HCWM
- To perform any other duties as assigned by the DCMO.

### **3.7 Continuous capacity building and information on health and safety**

For staff training and information, the focal point unit in the health facility should ensure that there is continuous capacity building to ensure that all staff performs their duties. The main duties are as follows:

#### **3.7.1. Hospital Administrator**

The Hospital Administrator should ensure that all members of staff are aware of their own responsibilities for HCWM

#### **3.7.2. Departmental Heads**

The Departmental Heads are responsible for the supervision of the segregation, storage, and removal of waste generated in their departments and stores the waste in an internal receptacle before being transported to an outside storage capacity. They should ensure that all doctors, nurses, clinical, paramedical and non-clinical professional staff in their departments are aware of the segregation and storage procedures so that they comply with the established standards. Departmental heads should also work on the following.

- Continuously liaise with the Focal Point Person to monitor working practices for failures or mistakes;
- Ensure that key staff members in their departments are given training in waste segregation and disposal procedures;
- Encourage medical and nursing staff to be vigilant and ensure that supportive staff follow correct procedures at all times.

### 3.7.3 Pharmacist in-Charge

The Pharmacist in-Charge is responsible for the sound management of stores and pharmaceutical waste minimization.

The duties are to:

- Liaise with Departmental Heads, the Focal Point Person, the Matron, and the Hospital Administrator, giving advice, in accordance with the national policy and guidelines, on the appropriate procedures for pharmaceutical waste disposal;
- Coordinate continuous monitoring of procedures for the disposal of pharmaceutical waste;
- Ensure that personnel involved in pharmaceutical waste handling and disposal receive adequate training.
- Ensuring safe management of genotoxic waste.

### 3.7.4 Radiation Safety Officer or Protection Officer

The duties and responsibilities of the Radiation Safety Officer, Protection officer or radiographer are the same as those of the Pharmaceutical Officer but seemingly relate to radioactive waste guided by the relevant legislation in force.

### 3.7.5 Procurement Officer/Department

The Procurement Officer or department should liaise with the Focal point Person to ensure a continuous supply of the items required for waste management (plastic bin liners in approved colours and containers of the right quality, spare parts for on-site health-care waste treatment equipment, purchase of waste transport tricycles, bin trolleys, hand-held thermometers, PPEs, etc.). These items should be procured and ordered in good time to ensure that they are always available to support sustainable mechanisms of managing waste. Further, a PPE matrix will should be developed to promote effectiveness and efficiency of issuance of PPEs. The Supply Officer should also investigate the possibility of purchasing environmental friendly products through liaison with technical officers in the Waste management Unit.

### 3.7.6 Infection Prevention and Control Focal Point Unit (IPCFPU)

The focal point unit for infection prevention and control should liaise with the focal point unit dealing with HCWM on a continuous basis in order to provide advice concerning the control of infection and the standards for waste disposal system.

Refer to box no. 8 duties.

**Box 8:** The duties of the incumbent officer are to:

- Identify training requirements according to staff grade and duties.
- Organize and supervise staff training courses on safe waste management infection prevention.
- Liaise with the Departmental Heads on infection prevention.
- Report and keep records of all incidences.
- Ensure that Personal Protective Equipment is available

- Ensure that there is an effective occupational health Programme for immunization, post-exposure prophylaxis treatment, and medical surveillance established.

### 3.8 .Standardizing health care delivery and HCWM practices

#### 3.8.1 Internal storage

##### **Box 9: Recommendations for storage facilities for Health-care waste**

- The storage area should have an impermeable, hard-standing floor with good drainage; it should be easy to clean and disinfect.
- There should be water supply for cleaning purposes (running water).
- The storage area should afford easy access for staff in charge of handling the waste.
- The storage area should be lockable to prevent unauthorised persons entering. Easy access for waste-collection vehicles is essential.
- There should be protection from the sun.
- The storage area should be inaccessible for animals, insects, and birds.
- There should be good lighting and at least passive ventilation.
- The storage area should not be situated in the proximity of fresh food stores or food preparation areas.
- A supply of cleaning equipment, protective clothing, and waste bags or containers should be located conveniently close to the storage area.

Health care waste should be transported within the hospital or other facility by means of wheeled trolleys, tricycle, containers, or carts that are not used for any other purpose and meet the following specifications:

- Easy to load and offload;
- No sharp edges that could damage waste bags or containers during loading and off loading
- Easy to clean.
- Vehicles should be cleaned and disinfected daily with an appropriate disinfectant.

#### 3.8.2 External Transport

- a) No person shall transport hazardous waste without a license from the competent authority.
- b) Transportation of hazardous waste shall be allowed in:
  - Approved routes
  - Approved vehicles
  - Approved labelling
- c) Transportation of hazardous waste shall:
  - Provide for security and an emergency procedure or plan.
  - Specify the final destination of the transportation.
  - Be undertaken according to approved times

- d) The generator of waste shall notify the competent authority about the proposed transportation stating the licensed transporter or final licensed disposal facility/site.

### **3.8.3. Follow up and Refresher Courses**

Conduct follow-up/ refresher courses where necessary.

## **3.9. Technologies for treatment and disposal of HCW**

The following Factors should be used in the Selection of Treatment Methods

- Types and quantities of waste for treatment and disposal
- Capability of the healthcare facility to handle the waste quantity
- Technological capabilities and requirements
- Availability of treatment options and technologies
- Capacity of systems.
- Treatment efficiency (microbial inactivation efficacy)
- Occupational health and safety factors
- Environmental releases
- Volume and/or mass reduction
- Installation requirements
- Space available for equipment
- Operation and maintenance requirements
- Infrastructure requirements
- Skills needed for operating the technology
- Location and surroundings of the treatment and disposal sites
- Options available for final disposal
- Public acceptability
- Regulatory requirements
- Capital cost of the equipment
- Operating and maintenance costs of the equipment
- Other costs including costs of shipping, customs duties, installation, commissioning /decommissioning, transport and disposal of residues.

### **3.9.1 Assessment of waste parameters for incineration**

Specific waste parameters should be assessed at the planning stage to determine the most suitable type and size of incinerator:

- Current extent of waste production and type of health care waste;
- Volume of waste;
- Estimated future waste production;
- All the physical parameters that determine the suitability of waste for incineration, such as low heating values and low moisture content.

## Categories of HCW

**Table 6: Refers to Categories of HCWM**

Type of health institution	Recommended technology at various levels
Private health care facilities	<ul style="list-style-type: none"> <li>This will depend on the level and location of the institution i.e. clinic, health centre/ hospital and rural/urban setting</li> </ul>
Health Post	<ul style="list-style-type: none"> <li>Land disposal with safe burying with provision and use of liners to prevent ground water contamination</li> </ul>
Health Centre (Rural)	<ul style="list-style-type: none"> <li>Land disposal with safe burying with provision and use of liners to prevent ground water contamination</li> <li>Brick incinerator</li> <li>Where there is electricity, free-burn incinerators are recommended.</li> </ul>
Health Centre (Urban)	<ul style="list-style-type: none"> <li>Land disposal with safe burying with provision and use of liners to prevent ground water contamination</li> <li>Chemical disinfection</li> <li>Rotary kiln incinerator</li> <li>Where there is electricity, free-burn incinerators are recommended.</li> </ul>
First Level (District Hospital)	<ul style="list-style-type: none"> <li>As for Urban Health Centre</li> </ul>
Second Level (General Hospital)	<ul style="list-style-type: none"> <li>Land disposal with safe burying with provision and use of liners to prevent ground water contamination</li> <li>Pyrolytic incinerator</li> <li>Chemical disinfection</li> <li>Wet thermal or steam treatment</li> <li>Free-burn Incineration</li> </ul>
Third Level: (Central Hospital)	<ul style="list-style-type: none"> <li>Land disposal with safe burying with provision of liners to prevent ground water contamination</li> <li>Pyrolytic incinerator</li> <li>Chemical disinfection</li> <li>Wet thermal or steam treatment disinfector</li> <li>Microwave irradiation for teaching hospital</li> <li>One waste collection vehicle per institution</li> </ul>
<b>National Reference:</b> (University Teaching Hospital), <b>Regional:</b> (centralized) waste disposal sites (Lusaka and Copperbelt provinces)	<ul style="list-style-type: none"> <li>As for third level, except the number of units will be twice those at level three</li> <li>Two waste collection vehicles</li> <li>Free-burn Incineration</li> <li>Three at each station of either Pyrolytic incinerator or incinerator 350 to 1000 LA wood / coal fired.</li> <li>Four waste collection and two utility vehicles per station</li> <li>Free-burn Incineration</li> </ul>

### 3.9.2. Non Incineration Treatment Options

The following basic processes are used for the non- incineration treatment of hazardous healthcare wastes, particularly sharps, infectious and pathological waste:



### **i) Low heat Thermal**

Low-heat thermal processes use thermal energy at elevated temperatures (100°C and 180°C) high enough to destroy pathogens, but not sufficient to cause combustion or pyrolysis of waste. The treatment processes take place in two environments – moist or dry environment. In the former, steam is used to disinfect waste, commonly performed in an autoclave or other steam-based system; also referred to as a wet thermal process whilst in the later heat is used without the addition of water or steam.

### **ii) Chemical**

Chemical Treatment Processes use chemical disinfectants such as dissolved chlorine dioxide, bleach (sodium hypochlorite), peracetic acid, lime solution, ozone gas, or dry inorganic chemicals. This process often involves shredding, grinding, or mixing to increase exposure of waste to the chemical agent and the treatment usually results in disinfection rather than sterilization. For liquid systems, wastes may go through a dewatering stage to remove and recycle the disinfectant.

### **iii) Irradiation**

This is a process by which an object is exposed to radiation. The waste is treated using irradiation from electron beams, Cobalt-60, or ultraviolet sources to destroy pathogens. The effectiveness of pathogen destruction depends on absorbed dose by mass of waste. The operator is required to be shielded to prevent occupational exposure. This method is not commonly used for treating HCW because of the high investment cost.

### **iv) Biological**

Specifically refers to the degradation of organic matter through processes occurring in nature. Examples include composting, vermiculture (digestion of organic wastes through the actions of worms), bio digestion, and natural decomposition through burial of cadavers, tissues and anatomical parts. In some cases, enzymes may be added to speed up decomposition of organic waste. Composting and vermiculture methods have been successfully used for placenta and hospital kitchen waste.

### **v) Mechanical**

This method generally supplements other treatment methods and includes shredding, grinding, mixing, and compaction which reduce waste volume. This method is unable to destroy pathogens. The advantage of this method is that the rate of heat transfer is improved and the waste has more surface area for treatment

### **vi) Inertisation (Stabilisation)**

This process involves mixing waste with a mixture containing lime, cement and water in order to minimize the risk of toxic substances contained in the waste migrating into

surface water or underground water. The mixture can be transported in liquid state to landfill. It is a suitable technology for disposing of pharmaceuticals and incineration ashes with a high metal content.

#### **vii) Shredding**

Shredders cut sharps into small pieces. This technology requires a worker skilled in the operation and maintenance of heavy-duty, rotating equipment. Simple shredders can be made from a manually operated grain mill. Due to the presence of workers during operation, only disinfected needles and syringes should be processed.

#### **viii) Non Incineration**

Non-incineration technologies 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. The current plan proposes to introduce the non-incineration of HCW under the UNDP project title “Reducing UPOP and Mercury from Releases from Health Sector in Africa”. The technology will be piloted in two level one health facilities in order to assess social and ethical acceptability. Results from pilot will provide policy direction and further guidelines.

## On site incineration technologies and related type of waste

Table 7: Refers to incineration technologies and related type of waste

Non incineration process	Example of treatment technology	Type of waste to be treated and waste not to be treated	Capacities	Installation requirements
<b>Low-Heat Thermal</b>	Autoclaves	<ul style="list-style-type: none"> <li>▪ Autoclaves are capable of treating a wide range of HCWs including cultures and stocks, sharps, materials contaminated with blood and body fluids, isolation and surgery waste, laboratory waste (excluding chemical waste) and ‘soft’ waste (including gauze, bandages, drapes, gowns and bedding) from patient care. With sufficient time and temperature, it is technically possible to treat small quantities of human tissue.</li> <li>▪ Autoclaves are generally not used for large anatomical remains (body parts) since it is difficult to determine beforehand the time and temperature parameters needed.</li> <li>▪ Volatile and semi-volatile organic compounds, cytotoxic waste, mercury, other hazardous chemical waste, and radioactive waste should not be treated in an autoclave</li> <li>▪ Waste containing hazardous chemicals should not be treated by autoclave as low levels of alcohols, phenols, formaldehyde, and other organic compounds may be emitted in the air and pose health risks to the autoclave operators and waste workers</li> <li>▪ Hybrid steam treatment systems with internal shredding can be used for anatomical waste or body parts.</li> <li>▪ Wastes commonly treated in microwave systems are the same as those treated in autoclaves, such as sharps waste, materials</li> </ul>	<ul style="list-style-type: none"> <li>▪ Waste treatment autoclave can range in size from about 20 liters to over 20,000 liters per cycle.</li> <li>▪ They operate in a batch mode.</li> <li>▪ Manufacturers ‘rated capacities range from 1 kg/hour to 2,700 kg/hour including the time needed for putting in the waste, steam exposure, and waste removal.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Enclosure and foundation</li> <li>▪ Electrical connections</li> <li>▪ Water supply</li> <li>▪ Drains</li> <li>▪ Ventilation</li> <li>▪ Steam supply if the autoclave system does not include its own boiler or steam generator</li> <li>▪ Water softening system if needed.</li> </ul>

		<p>contaminated with blood and body fluids, sharps, and laboratory wastes.</p> <ul style="list-style-type: none"> <li>Some microwave units are able to treat anatomical waste or body parts</li> </ul>		
	Hybrid Steam Systems (Rotating autoclaves or rotoclaves, Autoclaves with internal shredders, Autoclaves with internal mixing arms)	<ul style="list-style-type: none"> <li>Hybrid autoclaves are capable of treating cultures and stocks, sharps, materials contaminated with blood and body fluids, isolation and surgery waste, laboratory waste (excluding chemical waste) and ‘soft’ waste (including gauze, bandages, drapes, gowns and bedding) from patient care. Large and bulky bedding material and sealed heat-resistant containers are easily treated in these hybrid autoclaves.</li> <li>Rotating autoclaves can treat animal waste and pathological waste including anatomical parts.</li> </ul>	<ul style="list-style-type: none"> <li>The sizes of hybrid autoclaves range from 38 liters to 21,800 liters.</li> <li>They operate in a batch mode.</li> <li>Manufacturer’s rated capacities range from 18 kg/hour to 3,300 kg/hour.</li> </ul>	<ul style="list-style-type: none"> <li>Enclosure and foundation</li> <li>Electrical connections</li> <li>Water supply</li> <li>Drains</li> <li>Ventilation</li> <li>Steam supply if the hybrid autoclave does not include its own boiler or steam generator</li> <li>Water softening system if needed.</li> </ul>
	Continuous steam treatment systems	<ul style="list-style-type: none"> <li>Capable of treating cultures and stocks, sharps, materials contaminated with blood and body fluids, isolation and surgery waste, laboratory waste (excluding chemical waste) and ‘soft’ waste (including gauze, bandages, drapes, gowns and bedding) from patient care. Large and bulky bedding material and sealed heat-resistant containers are easily treated in continuous steam treatment systems.</li> <li>It is theoretically possible to treat pathological waste including anatomical parts in continuous steam treatment systems with internal shredders.</li> <li>Volatile and semi-volatile organic compounds, chemotherapeutic waste, mercury, other hazardous chemical waste, and radiological waste should not be treated in steam treatment systems.</li> </ul>	100 to over 1,000 kg/hour.	<ul style="list-style-type: none"> <li>Enclosure and foundation</li> <li>Electrical connections</li> <li>Water supply</li> <li>Drains</li> <li>Ventilation</li> <li>ISDN line with modem for remote computer service</li> <li>Water softening system if needed.</li> </ul>
	Batch microwave	<ul style="list-style-type: none"> <li>Cultures and stocks, sharps, materials</li> </ul>	Manufacturers ‘rated	Electrical connection and water supply.

	systems	<p>contaminated with blood and body fluids, isolation and surgery waste, laboratory waste (excluding chemical waste) and soft waste (e.g. gauze, bandages, drapes, gowns and bedding) from patient care.</p> <ul style="list-style-type: none"> <li>▪ Some microwave technologies are not recommended for tightly sealed glass bottles that contain fluid since the pressure inside could cause the bottles to burst. The problem is avoided by leaving glass bottles partially opened.</li> <li>▪ Needles and other sharp metal objects should be in puncture-safe needle containers. Sharps containers should not be hermetically sealed to allow steam penetration.</li> <li>▪ Volatile and semi-volatile organic compounds, bulk chemotherapeutic wastes, mercury, other hazardous chemical wastes, and radiological wastes should not be treated in a microwave.</li> </ul>	capacities range from 30 to 210 kg/hour.	
	Continuous Microwave System	<ul style="list-style-type: none"> <li>▪ Cultures and stocks, sharps, materials contaminated with blood and body fluids, isolation and surgery waste, laboratory waste (excluding chemical waste) and soft waste (e.g. gauze, bandages, drapes, gowns and bedding) from patient care.</li> <li>▪ Because of the internal shredder and moist heat environment, tightly sealed glass vials and bottles containing fluids, as well as metal objects such as sharps, needles, blades, lancets, etc. can be treated without any difficulty by the continuous microwave technology.</li> <li>▪ Microwave units with internal shredders, can theoretically be used for pathological waste, just like hybrid autoclaves and continuous steam treatment systems with internal</li> </ul>	100 to 250 kg/hour	<ul style="list-style-type: none"> <li>▪ Foundation</li> <li>▪ Electrical connections</li> <li>▪ Water supply</li> <li>▪ Steam supply unless an optional steam generator is included.</li> </ul>

		<p>shredders.</p> <ul style="list-style-type: none"> <li>▪ Volatile and semi-volatile organic compounds, bulk chemotherapeutic wastes, mercury, other hazardous chemical wastes, and radiological wastes should not be treated in a microwave.</li> </ul>		
	Frictional Heat Treatment	Infectious waste that can include cellulose (e.g., gauze and bandages), glass, plastics, metals (needles, lancets and other sharps waste), liquids, and pathological waste (including anatomical parts).	10 to 500 kg per hour	<ul style="list-style-type: none"> <li>▪ Foundation</li> <li>▪ Electrical connections</li> <li>▪ Water supply</li> <li>▪ Drain for wastewater discharge</li> <li>▪ Exhaust vent for vapor discharge</li> </ul>
	Dry Heat Treatment Systems	Intended to treat sharps waste and small amounts of infectious waste as one might find in a clinic, medical or dental office, or in a department of a hospital	0.2-0.3 kg/hour	A small space and electric power supply.
	Alkaline Hydrolysis	<ul style="list-style-type: none"> <li>▪ Pathological waste, organs, tissues, cadavers, anatomical parts and contaminated animal carcasses.</li> <li>▪ Can also treat biological stocks, cultures, liquid blood, body fluids, and other types of infectious waste.</li> <li>▪ Process can degrade aldehydes, such as formaldehyde and glutaraldehyde waste which are commonly used in healthcare and research settings and may be found in pathological and animal wastes.</li> <li>▪ Many chemotherapeutic agents, such as Cyclophosphamide, Chlorambucil, Melphalan, Uracil Mustard, Daunomycin, etc., are also destroyed by alkaline hydrolysis.</li> <li>▪ The treatment system should not be used for wastes containing aluminum, tin, zinc, magnesium, copper, or galvanized iron (as these metals could react to form hydrogen gas), as well as concentrated acids, flammable liquids and organohalogen</li> </ul>	15 to 4500 kg per load, with treatment cycles ranging from 3 to 8 hours depending on temperature, pressure, alkali concentration, and mixing efficiency	<ul style="list-style-type: none"> <li>▪ Enclosure and foundation</li> <li>▪ Sewer</li> <li>▪ Water supply</li> <li>▪ Steam (unless an electric or gas-fired steam generator is used)</li> <li>▪ Electrical connections</li> <li>▪ Air</li> </ul>

		compounds (especially trichloroethylene), and nitromethane and other similar nitro compounds		
<b>Chemical</b>	Dissolved chlorine dioxide, bleach, peracetic acid, lime solution, ozone gas, or dry inorganic chemicals	<ul style="list-style-type: none"> <li>▪ Liquid waste such as blood, urine, stools or hospital sewage.</li> <li>▪ Infectious HCWs, including microbiological cultures and sharps, have also been disinfected chemically but using the proper concentration and ensuring contact of the disinfectant with contaminated surfaces are important.</li> </ul>	Capacities ranging from 40 kg/hour to 700 kg/hour.	<ul style="list-style-type: none"> <li>▪ Adequate floor space and foundation</li> <li>▪ Electrical connections</li> <li>▪ Water supply</li> <li>▪ Drain to the sanitary sewer</li> <li>▪ Ventilation possibly including local exhaust ventilation</li> <li>▪ Separate well-ventilated area for chemical storage</li> <li>▪ Eyewash station, sink, and safety shower as needed; storage area for personal protection equipment.</li> </ul>
<b>Biological</b>	Composting, vermiculture, bio-digestion, natural decomposition through burial	Cadavers, tissues and anatomical parts, placentas, kitchen waste		
<b>Mechanical</b>	Shredding, grinding, mixing, and compaction			
<b>Inertisation</b>	Mixing waste with a mixture containing lime, cement and water in order to minimize the risk of toxic substances	It is a suitable technology for disposing of pharmaceuticals and incineration ashes with a high metal content.		



**Table 8: HCWM monitoring and evaluation framework**

**National Health Care Waste Management Objectives**

National Health Care Waste Management Statement

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These results are at **Project Level**

**8.1 National Health Care Waste Management Objective Indicators**

Indicator Name	Core	Unit of Measure	Baseline	Cumulative Target Values					Frequency	Data Source/ Methodology	Responsibility for Data Collection
				YR1	YR2	YR3	YR4	End Target			
<b>Review and harmonize legal, regulatory, policy and administrative frame work of health care waste</b>											
Review HCW Guidelines		# reviewed	0	1	-	-	-	-	Once	MoH Establishment	MOH
Advocating and creation of HCWM database in HMIS		Database created	0	1	-	-	-	-	Once	MoH Establishment	MOH
<b>To create community awareness on acceptable health care waste management</b>											
Advocacy on HCWM to parliamentarians		# of meetings held		160	-	-	-	160	Once	Reports	MOH

Conducting quarterly collaborative meetings with line ministries and Stakeholders		# of meetings held	0	4	8	12	16	20	Quarterly	Reports	MOH
Designing, Printing and distribution of IEC Materials in HCWM		%	0	50	75	100	-	100	Yearly	Reports	MoH
Training 9775 health workers in HCWM country wide		# trained	0	2000	4000	6000	8000	10000	Yearly	Reports	MoH
Training of 6370 general workers in health facilities involved in waste handling		# trained	0	1200	2400	3600	4800	6000	Yearly	Reports	MoH
Training of 120 medical equipment officers in maintenance and servicing new HCWM equipment		# trained	-	60	60	-	-	120	Yearly	Reports	MoH
Orientating 120 Medical Equipment Technicians in new HCWM equipment		# trained	0	60	60	-	-	120	Yearly	Reports	MoH
Conducting National Health		# of HRA conducted	0	1	2	3	4	5	Yearly	Reports	MoH

Care Waste Risk Assessment annually											
Report writing for risk assessment and publication		# of reports	0	1	2	3	4	5	Yearly	Reports	MoH
Holding Provincial quarterly HCWM Performance review meetings		# of meetings held	0	40	80	120	160	200	Quarterly	Reports	MoH
Conducting short training course of 6 officers in Radiation Protection and Radioactive Waste Management- Cancer Hospital		# trained	0	6	-	-	-	6	Once	Reports	MoH
<b>Procure and introduce alternative appropriate equipment and technologies for treatment of HCW</b>											
Indicator Name	Core	Unit of Measure	Baseline	Cumulative Target Values					Frequency	Data Source/ Methodology	Responsibility for Data Collection
				YR1	YR2	YR3	YR4	target			
Procuring and installation of 106 incinerators with adequate capacity to handle Health Care Waste		# procured	0	18	25	30	33	106	Annually	reports	Procurement unity MoH
Procure Non Incineration Treatment Options		# procured	0	1	-	-	-	1	Once	Procurement records	Procurement unity MoH

at pilot sites Levy Hospital (Central location)											
Level 3: Ndola Central Hospital	#tendered	0	1	-	-	-	1	Once	Procurement records	Procurement unity MoH	
Level 2: Kabwe General Hospital	#tendered	0	1	-	-	-	1	Once	Procurement records	Procurement unity MoH	
Level 1: Kapiri Mposhi and Kamchanga District Hospitals	#tendered	0	1	-	-	-	1	Once	Procurement records	Procurement unity MoH	
Mukonchi Rural Health Center	#tendered	0	1	-	-	-	1	Once	Procurement records	Procurement unity MoH	
Adverts, Evaluation and tendering the procurement of none incineration technologies	# tendered	0	1	-	-	-	1	Once	Procurement report	Procurement unity MoH	
Procure on site needle stick crushers	# of needle sticks crushers procured	0	140	250	340	415	415	Quarterly	Stock Control Cards	Procurement unity MoH	
Orient incinerator operators in maintenance and servicing	# Oriented	0	106	-	-	-	106	Once	Training report	MoH	

### 8.2 To provide adequate equipment, tools and infrastructure for HCWM

				Cumulative Target Values	Frequency	Data Source/	Responsibility for
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Indicator Name	Core	Unit of Measure	Baseline	YR1	YR2	YR3	YR4	End Target		Methodology	Data Collection
Procure approved equipment and tools such as trollies, wheel bins, waste bins, weighing scales, bin liners, air monitoring equipment, PPEs, tricycles and Hand tools.		# of units procured	0	800	1600	2000	-	2000	Annually	Procurement report	MoH
Constructing approved storage facilities for HCW		# constructed	0	30	60	80	106	106	Yearly	Construction report	MoH
Construction of 838 brick lined incinerators in health facilities where they are none existing.		# constructed	0	300	600	700	800	838	annually	report	MoH/MCDMCH
Procurement of 50 generators for 3 <sup>rd</sup> , 2 <sup>nd</sup> and 1 <sup>st</sup> level hospitals including some big HCs		# procured	25	25	-	-	-	50	annually	Procurement report	MoH/MCDMCH
Construct housing for incinerators		# constructed	-	50%	100%	-	-	100%	annually		MoH/MCDMCH
Repair of		# repaired	0	100	200	200	100	600	annually	Maintenance	MoH/MCDMCH

incinerators										report	
Repair and servicing generators		# repaired	0	-	-	20	10	20	annually	Maintenance report	MoH/MCDMCH
Procure 40 bins for radiation isotope wastes		# procured	0	20	20	-	-	40	Twice	Procurement report	MoH/MCDMCH
Procurement of cytotoxic spill kits		# procured	0	100	200	300	-400	400	Annually	Procurement report	MoH
Procurement of 2 Radiation survey meters(Radiation probe)		#procured	0	-	2	-	-	2	Once	Procurement report	MoH
Construction of Radioactive Waste Storage Facility - Cancer Disease Hospital		#constructed	0	-	1	-	-	1	Once	Construction report	MoH
Procuring 1,500 Biohazard Bags for the Laboratory - Cancer Diseases Hospital		#procured	200	400	800	1200	1500	1500	Annual	Procurement report	MoH
Procuring 15 Digital X- ray units		# procured	0	8	7	--	-	15	Twice	Procurement report	MOH
Procuring 200 Hand held Thermo Scanners (Thermometers) Procuring 20 Lead		# procured	0	100	100	-	-	200	Twice	Procurement report	MOH

aprons (Jackets) for Cancer Diseases											
Procuring 20 Lead aprons (jackets) for Cancer Diseases Hospital		# procured	0	20	-	-	-	20	Once	Procurement report	MOH
<b>8.2 Pre-treatment, collection, storage, transportation and final disposal of HCW</b>											
Indicator Name	Core	Unit of Measure	Baseline	Cumulative Target Values					Frequency	Data Source/ Methodology	Responsibility for Data Collection
				YR1	YR2	YR3	YR4	End Target			
Sensitization of contractors in waste management collection		# of sensitization	0	200	200	200	200	800	quarterly	Reports	Health promotion officers
Conduct technical support to health facilities in HCWM		Technical support done	0	40	80	120	160	200	quarterly	Reports	Health promotion officers
<b>8.3 Maintenance of HCWM equipment and tools</b>											
Indicator Name	Core	Unit of Measure	Baseline	Cumulative Target Values					Frequency	Data Source/ Methodology /	Responsibility for Data Collection
				YR1	YR2	YR3	YR4	End Target			
Operation and maintenance of HCWM treatment, equipment, bins, steel rods, brooms, waste ash bins.		Proportion maintained	0	all	all	All	all	all	Monthly	Maintenance records	MCDMCH/MoH



Maintenance of surroundings and fences of disposal sites		Percentage of surroundings maintained	0	100%	100%	100%	100%	100%	Daily	Maintenance records	MCDMCH/MoH
Repair and maintenance of 515 existing incinerators and 60 micro burns		# of incinerators and micro burns maintained		all	all	All	all	100%	monthly	Maintenance records	MCDMCH/MoH
<b>8.4 Provision of code of conduct, standard operating procedures and technical guide lines for safety measures in HCWM</b>											
Indicator Name	Core	Unit of Measure	Baseline	Cumulative Target Values					Frequency	Data Source/ Methodology /	Responsibility for Data Collection
				YR1	YR2	YR3	YR4	End Target			
Developing of standard operating procedures guide lines for health facilities		# of SOPs developed	0	3000	1000	-	-	4,000	Quarterly	Reports	Health promotion
Production and printing of 2000 copies of SOPs		# SOPs produced & printed	0	2000	-	-	-	2,000	once	Production reports	Health promotion
Distribution of SOPs in health facilities		# of SOPs distributed	0	2000	-	-	-	2,000	Quarterly	Reports	Health promotion
<b>8.5 Capacity building</b>											
Developing of standard operating procedures guide		%	0	100%	-	-	-	100%		documents	MoH

lines for health facilities											
Production and printing of 2000 copies of SOPs			0	900	-	500	600	2000	quarterly	Documents	MOH
Distribution of SOPs in health facilities		percentage	0	100%	-	-	-	100%		Record of distribution	MoH/MCDMCH

### 8.6 Provision of code of conduct, standard operating procedures and technical guide lines for safety measures in HCWM

Indicator Name	Core	Unit of Measure	Baseline	Cumulative Target Values					Frequency	Data Source/ Methodology /	Responsibility for Data Collection
				YR1	YR2	YR3	YR4	End Target			
Developing of standard operating procedures guide lines for health facilities		percentage	0	100%	-	-	-	100%		documents	MoH
Production and printing of 2000 copies of SOPs			0	900	-	500	600	2000	quarterly	Documents	MOH
Distribution of SOPs in health facilities		percentage	0	100%	-	-	-	100%		Record of distribution	MoH/MCDMCH

### 8.7 Creation of regional centralized disposal facilities to handle large quantities of HCW

Indicator Name	Core	Unit of	Baseline	Cumulative Target Values					Frequency	Data Source/	Responsibility for
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		Measure		YR1	YR2	YR3	YR4	End Target		Methodology /	Data Collection
Engagement of Private Partnership to collect waste from health facilities.		# of PP engaged in waste management. vehicles procured	0							Procurement records	MoH
Procurement of 12 suitable vehicles for supervision and monitoring of HCWM		# of vehicles procured	0	12	-	-	-	12	Once	Procurement records	Procurement office
Procurement of 116 Motorbikes for use in supervision by HCW managers		# of motor bikes procured	0	116	-	-	-	116	once	Procurement records	Procurement office
Running and maintenance cost of 116 motor bikes and 12 vehicles .		# of vehicles maintained	0	122	122	122	122	-	monthly	Maintenance schedule records	Procurement office
Environmental licensing for health facilities		Percentage of facilities licensed	0	100%	100%	100%	100%	100%	annually	records	MoH
Monitoring and supervision		Level of monitoring/supervision	0	100%	100%	100%	100%	100%	quarterly	records	MoH

### 8.8 To Create Community awareness on acceptable Health care Waste Management

A. Conduct steering committee meetings with stakeholders at national level	# meetings conducted	0	4	8	12	16	20	quarterly	minutes	MoH
B. Conduct steering committee meetings with stakeholders at provincial level	# meetings conducted	0	4	8	12	16	20	quarterly	minutes	PMO
C. Conduct steering committee meetings with stakeholders at district level	# meetings conducted	0	4	8	12	16	20	quarterly	minutes	DMO

**Table 9: Monitoring and Evaluation: Monitoring and evaluation**

Number	Action	Coordination	Supervision	Indicators of Achievement
<b>4.2.1</b>	<b>Review and Harmonise legal, regulatory, policy and administrative framework of health-care waste</b>			
a)	Advocacy for inclusion of HCWM data in HIMS	DD – EOH	MOH	Advocacy of HCWM data in HMIS done.
<b>9.1</b>	<b>To Create Community awareness on acceptable Health care Waste Management</b>			
a)	Conduct meetings with stakeholders	DD – EOH	MOH/MCDMCH	Number of meetings conducted
b)	Support on- site training for all relevant staff in HCWM	DD – EOH	MOH/MCDMCHX	Number of on-site support conducted
<b>9.2</b>	<b>Procure and introduce alternative appropriate equipment and technologies for treatment of HCW</b>			
a)	Procure 106 incinerators which are environmentally friendly and with adequate capacity to handle waste	CMEO	MOH	Approved incinerators with adequate capacity
b)	Procure Non incineration treatment options	CMEO/CEHO General	MOH/MCDMCH	Number of none incineration options procured
c)	Procure Onsite needle stick crushers	CMEO/CEHO	MOH	Number of onsite needle stick crushers procured
d)	Advocate for capacity building for the incinerator operators in maintenance and servicing	DD – EOH	MOH	Number of advocacy meeting conducted

9.3	Inadequate equipment, tools and infrastructure for HCWM			
a)	procure approved equipment and tools such as trolleys, wheel bins, tricycles, waste bins, bin liners, weighing scales, Air monitoring equipment ,personal protective equipment and hand tools	CMEO/CEHO General	MOH/MCDMCH	Procurement of tools and equipment done
b)	Construct approved storage facilities for health care waste.	Policy and Planning/DD – EOH (EOH)	MOH/MCDMCH	Appropriate and approved infrastructure constructed
9.4	Pre-treatment, collection, storage, transportation and final disposal of HCWM			
a)	Capacity building of health care waste managers and operators.	DD – EOH	MOH	Number of Managers and operators capacity built
Short-term				
b)	sensitisation of contractors in waste management collection	DD – EOH	MOH	Number of Contractors sensitised.
Long-term				
c)	Designing and printing and distribution of IEC material in HCWM	DD – EOH	MOH/MCDMCH	Number of IEC designed, printed and distributed
9.5	<b>Maintenance of HCWM Equipment and tools</b>			
	Action	Coordination	Supervision	Indicators of Achievement
a)	Operation and Maintenance of HCWM treatment equipment , trolleys ,trolley bins, steel rods, brooms and waste ash buckets	CMEO/DDDSC &R	MOH/MCDMCH	All equipment repaired, replaced and working
b)	Maintenance of surroundings and fences of disposal sites.	PMO/DMO	MOH/MDCMCH	Surroundings and fences maintained.
9.6	Provision of code of conduct, standard operating procedures and technical guidelines for safety measures HCWM.			
	<b>Action</b>	<b>Coordination</b>	<b>Supervision</b>	<b>Indicators of Achievement</b>

a)	Developing of standard operating procedure guidelines in health facilities	DD – EOH	MOH/MCDMCH	SOPs and guidelines developed
b)	Distribution of SOPs to all health facilities	DD – EOH	MOH/MCDMCH	SOPs and guidelines distributed
<b>9.7 Creation of regional centralized disposal facilities to handle large quantities of HCW</b>				
a)	Procure suitable vehicles for transportation of health care waste	DD – EOH	MOH	Number of vehicles procured.
b)	Procure suitable vehicles for supervision of Health care waste	DD – EOH	MoH/MCDMCH	Vehicles for supervision procured
c)	Running and maintenance costs for operational vehicles	DD – EOH	MOH/MCDMCH	Plan for running and maintenance cost adhered to.
d)	Environmental Licensing for the Health Facilities	DD – EOH	MOH/MCDMCH	All health facilities licenced.
e)	Monitoring standard operating procedures on; <ul style="list-style-type: none"> <li>• Health care waste management system</li> <li>• Personal Protective Equipment</li> </ul>	DD- EOH	MOH/MCDMCH	Number of monitoring and supervision visits recorded and reports available.
f)	Monitoring and Supervision	DD – EOH	MOH/MCDMCH	Number of monitoring and supervision visits recorded and reports available.
g)	End of 2 <sup>nd</sup> year (midterm) evaluation of the project r)	Consultant	MOH	Project evaluated

**Table 10: Risks/assumptions Analysis and Risk Mitigation Measures for HCWM**

<b>Risks/ Assumptions</b>	<b>Level</b>	<b>Mitigation measures</b>
1. Lack of coordination among key ministries and stakeholders	Medium	Strengthening collaboration meeting among line ministries and key stake holders.
2. The Ministry of Health / Government might not fund the implementation of HWCM due to inadequate resources.	Low	To lobby and corroborate with cooperating partners for possible funding

Risks/ Assumptions	Level	Mitigation measures
3. 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 the country.	Medium	To lobby and corroborate with stakeholders and cooperating partners for the support in the implementation of NHCWM.
4. Slow Review and harmonisation of the legal and regulatory framework.	High	The MoH and all Committees to outline responsibilities and timelines. The evaluation project component will identify problems and recommend improvements. The evaluation and technology allocation formula will also incentivize healthcare facilities to implement project activities successfully and efficiently.
5. Technology procurement beset by delays, inadequate equipment, wrong specifications, lack of transparency, or non-compliance with ZPPA bidding requirements and procedures.	Low	The competitive bidding process for the non-incineration technologies will be centralized for whole country and will be transparent and adhere strictly to ZPPA requirements and procedures.
6. Health care Facilities discontinue the use of none incineration technologies after the project comes to an end, and discontinue the maintenance resulting in their ultimate breakdown and return to open burning and incineration.	High	<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 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</p>



Risks/ Assumptions	Level	Mitigation measures
		<p>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 national project will establish a certification program under which accredited parties can certify the quality of non-incineration technologies.</p> <p>The teams of national experts will be encouraged to form a network for the purpose of information exchange, and professional development.</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>
6. Insufficient number of technology suppliers involved in the bidding and/or high purchase costs.	Medium	Ensuring sufficient outreach to vendors, conducted within the scope of HCWM projects, will ensure sufficient vendors. Centralized high-volume procurement will help lower prices. Procurement facilitated by ZPPA will ensure that long-term agreements with various international suppliers can be relied upon.
7. Little confidence of healthcare	Low	"Recipients facilities" that are successfully using non-incineration technologies will

Risks/ Assumptions	Level	Mitigation measures
facilities and providers in non-incineration technologies, resulting in continued use of inadequate incinerators.		provide decision-makers at HCFs, Districts, provincial and National level with information on their experiences with non-incineration technologies.
8. Health workers not trained in non-Incineration technologies in HCWM there by abandoning the technologies after project.	High	Consider training of health care workers in Non-incineration technologies in HCWM.

### 3.10 POTENTIAL RISKS AND MITIGATION MEASURES

This document has highlighted the potential risks which could be encountered during the implementation of the project activities. It has also outlined the mitigation measures for the risks identified so that the risks are eliminated or minimized while benefits are enhanced.

**Table 11: Potential risk and mitigation measures**

Potential risks	Mitigation measure	Responsible organization
Health workers at risk of disease transmission from HCW	<ul style="list-style-type: none"> <li>▪ Training of health workers in HCWM</li> <li>▪ Procurement of appropriate PPEs.</li> <li>▪ Ensure that workers put on personal protective equipment.</li> <li>▪ Prevention messages on exposure through IEC materials Posters</li> </ul>	MoH
Risk of disease transmission to scavengers	<ul style="list-style-type: none"> <li>▪ Construct housing for incinerator.</li> <li>▪ Restrict accessibility to the incineration area by fencing.</li> <li>▪ Collection of ash</li> </ul>	MoH/MCDMCH  MLGH
Air Pollution from Incineration	<ul style="list-style-type: none"> <li>▪ Training of Incinerator Operators.</li> <li>▪ Regular servicing of Incinerators.</li> <li>▪ Post installation maintenance.</li> <li>▪ Monitoring of the performance of Incinerators in Health facilities.</li> <li>▪ Management of individual incinerators against overload</li> </ul>	MoH  MoH /ZEMA  Respective managements at health facilities and Hospitals

### 3.11 Summary Recommendations

In summary the MoH collaboration with other stakeholders should ensure that the following issues are addressed in order to effectively manage HCW

<ul style="list-style-type: none"><li>• <b>Box 10: Summary</b></li><li>•</li><li>• Ensure that the guidelines for the sound management of HCW are reviewed to incorporate Non incineration treatment and disposal options. Review and suggest amendment of the Public Health Act to include a component on HCWM</li><li>• Collaborate with local authority agencies to develop Bye-laws that will deal more strictly with health-care waste.</li><li>• Develop health-care waste management plans, which are designed to salvage the capacity of HCFs and bring them to acceptable levels of sustainability.</li></ul>
<ul style="list-style-type: none"><li>• Establish health management information systems on waste generation at all health care facilities.</li><li>• Establish HCW inventories for each facility using the same classification by type of waste.</li><li>• Facilitate development of integrated waste management plans for all levels of health care facilities.</li><li>• Institute best operating practices, to facilitate waste management procedures.</li><li>• Facilitate research in HCW characterization related to waste quantities and composition.</li><li>• Develop a culture in all health care facilities that will inculcate appropriate behavioural change among stakeholders to enhance success.</li><li>• Create HCW awareness raising campaigns through the use of electronic and print media (television, radio, pamphlets, posters, leaflets and brochures) to enhance capacity to deal with risks associated with health-care waste.</li></ul>
<ul style="list-style-type: none"><li>• Ensure that all health care facilities have in place proper facilities for waste collection, storage, transport, pre-treatment, treatment and final disposal site.</li><li>• Choose appropriate, reliable and sustainable technologies for hazardous health-care waste treatment and final disposal in close consultation with stakeholders.</li><li>• Ensure that HCW is segregated according to colour of the container</li><li>• Ensure all supplies and equipment are available.</li><li>• Appoint a responsible officer to coordinate HCWM</li><li>• Advocate for Public Private Partnership (PPPs) at levels of operation in HCWM</li><li>• Ensure that incinerators procured meet the requirement per facility</li><li>• Harmonise and develop Standard Operating Procedures (SOPs) for HCWM</li><li>• Incorporate HCWM in learning institution curricula</li></ul>

**Table 12: Summary of types of treatment and disposal methods for HCW**

Method	Advantages	Disadvantages
Double chamber/rotary kiln incineration	<ul style="list-style-type: none"> <li>Elimination of health risks due to the complete destruction of the waste</li> <li>Fully destroys microorganisms and sharps</li> <li>Reduces volume and weight of waste</li> <li>Destroys all types of organic waste (liquids, pharmaceuticals, and other solids)</li> </ul>	<ul style="list-style-type: none"> <li>High investment and operation costs</li> <li>Requires skilled staff to operate</li> <li>Emit toxic flue gases</li> <li>Generates residues that need safe land-filling</li> </ul>
Single chamber or drum/brick incineration	<ul style="list-style-type: none"> <li>Good disinfection efficiency</li> <li>Reduces volume and weight of waste</li> <li>No need for highly trained operators</li> </ul>	<ul style="list-style-type: none"> <li>Emission of atmospheric pollutants</li> <li>Need for periodic removal of slag and soot</li> <li>Inefficient in destroying thermally resistant chemicals and drugs</li> </ul> <p>No destruction of sharps</p>
Autoclaving	<ul style="list-style-type: none"> <li>Relatively simple to operate</li> </ul>	<ul style="list-style-type: none"> <li>Relatively expensive to install and operate</li> <li>Requires boiler and stack emissions controls</li> <li>Relatively high maintenance costs</li> <li>Generates contaminated wastewater that needs treatment</li> </ul>
Microwave irradiation	<ul style="list-style-type: none"> <li>The shredding process reduces the volume of the waste</li> <li>Once treated, waste can be land filled with other municipal waste</li> <li>No air pollution</li> </ul>	<ul style="list-style-type: none"> <li>Highly sophisticated and complex</li> <li>High investment and running costs</li> <li>Only solids can be treated and only when shredded</li> <li>Cannot be used to treat pharmaceutical and cytotoxic waste</li> <li>Highly skilled operators required</li> <li>No reduction of the weight of the waste treated</li> </ul>
Chemical disinfection	<ul style="list-style-type: none"> <li>The shredding process reduces the volume of the waste</li> </ul>	<ul style="list-style-type: none"> <li>Cannot be used to treat pharmaceutical and cytotoxic waste</li> <li>Skilled operators required</li> <li>Chemicals used are themselves hazardous and require special precautions when used</li> </ul>
Encapsulation	<ul style="list-style-type: none"> <li>Simple, low cost and safe</li> <li>May be used for sharps</li> <li>Reduces the risk of scavengers gaining access to the waste</li> </ul>	<ul style="list-style-type: none"> <li>Generates hazardous waste water that needs treatment</li> </ul>
Inertisation	<ul style="list-style-type: none"> <li>Simple, low cost and safe</li> <li>May be used for pharmaceutical waste</li> </ul>	<ul style="list-style-type: none"> <li>Not applicable to infectious waste</li> </ul>
Refuse pit	<ul style="list-style-type: none"> <li>Simple to operate</li> </ul>	<ul style="list-style-type: none"> <li>Practically for limited periods of time and amount of waste</li> <li>Possibility of groundwater pollution</li> <li>Risky HCW is not treated and remains hazardous</li> </ul>

### 3.11 Training strategy for health care personnel

A policy for the management of health care waste cannot be effective unless it is applied carefully, consistently and universally. It is through training that standardization of waste handling practices and its management can be achieved.

### **3.11.1. Employees to be trained**

Training activities should be targeted to the following main categories of health care personnel both from the public sector and the private sector.

- Health facility managers and administrative staff responsible for the implementation of health care waste management plans and regulations.
- Medical doctors
- Environmental health Staff.
- Nurses, Clinical Officers, Biomedical Scientists, Radiographers, Physiotherapists, Pharmacists, Orthopaedic staff, Dental staff, Dietician, Cooks and any other staff.
- Cleaners, porters, auxiliary staff, incinerator operators and waste handlers.
- Pre-service students from Health training institutions.

### **3.11.2. Training Package for HCWM**

The content of staff education on infection prevention and health care waste management programme should contain the following:

- Justification for all aspects of health care waste policy;
- Explanation of the role and responsibilities of each health facility staff member in implementing the policy.

Technical instructions relevant for the target group under some or all of the following headings;

- Definition of health care waste
- Importance of proper waste disposal
- Classification of health care waste
- Handling health care waste
- Segregation of health care waste
- Safety measures when handling health care waste
- Recording and reporting accidents
- Health care waste disposal methods
- Laws relating to waste management.
- Personal Protective Equipment (PPEs)
- Occupational Health and Safety
- Education of health risks associated with bio-medical waste to health workers and members of the public through Information Education and Communication (IEC) materials in all media.
- Education on safe disposal practices and methods to all. The public has a right and responsibility to know how to handle home based health care medical waste.
- Pre and post-test for all participants

### 3.12. INSTITUTIONAL FRAMEWORK ON TRAINING AND CAPACITY BUILDING

The plan will be implemented through the existing health sector institutional framework. MOH will take the overall responsibility for coordinating trainings and capacity building to ensure success. However, several other key sector partners will also be involved in its implementation.

1. This will be coordinated through the existing health sector organisational and management structures.
2. Ministry of health will spearhead mobilisation of resources for sponsorship of the trainings to be conducted in HCWM in order to have fully qualified personnel to handle the program.
3. Provincial Health Office (PHO) under the Ministry of Health will be the focal point in capacity building and trainings in all the 10 provinces of Zambia.
  - Provincial Health Offices: PHOs will serve as intermediaries for trainings and capacity building in the implementation of HCWM plan within their respective provinces.
4. Under Ministry of Community Development Mother and Child Health:
  - The District Health Offices will be the ones to have more capacity building at both district and Health Centre Level and cascade it to the community health workers and all their support staffs.
  - Health service delivery facilities: Health Centres, Hospitals, Health Posts, and community level, capacity building will be done by the district health office.
5. Other line Ministries like Ministry of Local Government and Housing, Ministry of Community Development Mother and Child Health and Ministry of Agriculture and Livestock will be involved in the capacity building of the staffs who will be handling health care waste.

#### Key Sector Partners

All the key sector partners will play their respective roles in the capacity building of the personnel who will be involved in the implementation of this HCWM plan.

In order to ensure efficient and effective coordination of the partnerships with all these players, MOH will strengthen inter-sector collaboration and coordination mechanisms at all levels.

The following are the key partners:

- The Faith-based Health Sector/CHAZ: The CHAZ group is the largest partner to Government in the health sector and is currently the second largest provider of health services to the general public, after MOH. CHAZ will, therefore, play an important role in the training and capacity

building and implementation of the HCWM plan, through their network of health facilities, which include hospitals, health centres and health posts, distributed throughout the country.

- **Civil Society:** The civil society, both local and international, will play an important role in the implementation of the plan. Some civil societies are involved in the health promotion, provision of health services, training and capacity building, while others are involved in advocacy for health. MOH will work towards promoting stronger coordination and participation of the civil society in the health sector, through the Sector-wide Approach.

Other stakeholders include:

- Training Institutions like University of Zambia, Copperbelt Medical University, Health Science Colleges (Nursing schools and Paramedic colleges)
- Private Medical Universities

The Government will work towards strengthening partnerships with the CPs, and harmonisation of their support efforts, for high impacts.



## CHAPTER FOUR: NATIONAL PLAN OF ACTION

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### 4.1. Introduction

This plan is based on the results of the situation analysis presented in chapter two (2) and subsequent recommendations arrived at in chapter three (3). In this plan it is advocated for individual institutions to adopt / develop their own waste management plans that are realistic and affordable for implementation. The development of such plans should provide for possible donor / agency support while taking into account existing conditions, needs and available possibilities for waste management arrangements. An appropriate, safe and cost-effective health-care waste management plan should concentrate on generation, collection, treatment, recycling, transportation and options for final disposal.

This chapter gives the detailed short and long term actions, coordination and supervision structures, diversification of technology and equipment, indicators for achievement and the cost implications. It is the ambition of the Ministry of Health in collaboration with the Ministry of Community Development Mother and Child Health, Ministry of Land, Natural Resources and Environmental Protection, Local Government and Housing, and Ministry of Agriculture and Livestock and its development partners that through the setting up of institutional structures, the implementation of this action plan will result in improved HCWM in Zambia.

### 4.2. Strategy for the implementation of the plan

In this strategic plan, all health care facilities in Zambia that generate HCW should set up customized waste management systems based on the most appropriate means of achieving the environmentally safe management of health care waste at a reasonable cost dependent on the level of operation. The implementation of this plan is proposed to run for 5 years beginning from 2015 to 2019. The resources needed for successful implementation of this plan of action are both human and financial. The starting point of a successful program is building capacity for advocacy among the operators and their partners by encouraging them to carry out a situation analysis and coming up with a plan of action.

This plan therefore endeavours to tackle the HCWM challenges in Zambia that comprise the following components as addressed in the recommendations stated below:

- a) Legal and Regulatory (Including institutional) framework
- b) Standardize / customised HCWM practices.
- c) Funding for HCWM activities.
- d) None availability of technology and equipment for management of HCWM.
- e) Capacity-building, training, and awareness-building measures.

- f) Monitoring and evaluation.
- g) Reduction of the pollution associated with HCWM.

### 4.3. Setting up HCWM systems

Financial and human resources are cardinal in setting up and strengthening HCWM systems. In the WHO core principles for achieving safe and sustainable management of HCW, it is recommended that countries should identify, mobilise and progressively allocate sufficient funds to the management of HCW. Currently issues of solid waste management in the country are supported with funds from MLGH to Local Authorities and the same practice is being encouraged for funding to be allocated to Ministries responsible for health (polluter pays principles). This is in view of the fact that funding of HCWM shall translate into measurable outcomes, such as reductions in needle stick injuries, lower disease burdens, reduced environmental pollution, economic savings, etc. Furthermore, internationally we are urged to view waste management expenses as a new category of overhead costs built into programmes, just as administrative costs are seen as normal costs of doing business.

Currently the Ministry of Health funds maintenance and servicing of incinerators through medical equipment budget line, whilst other HCW necessary supplies are supported by individual health facilities because there is no specific budget line to support such activities. The financial resources are allocated as a block fund together with other activities hence it is difficult to quantify exactly how much goes specifically to waste management.

In order to implement this plan therefore, it is necessary to formulate policies to address the need for financial allocation for the management of HCW based on plans which have been developed and costed. The implementation of HCW management plan will be within the legal framework provided for under the ZEMA Act. The HCWM system should link to the HMIS

The critical issues identified for financing are based on data analysis generated during field assessments and the review of the 2008 – 2010 National HCWM plan as stated below:

- Limited capacity for enforcement of the provision of the ZEMA Act regarding HCW
- Inadequate appropriate technologies to deal with HCWM
- Inadequate equipment and tools for HCWM.
- Poor health-care waste management practices in health care facilities and local authority disposal sites with regard to handling inclusive of waste pre-treatment, collection, storage, transportation and final disposal.
- Inadequacies in documentation in health-care waste characterization of related waste quantities and composition (Registers and Standard Operating Procedures).
- Lack of research in health-care waste characterization related waste quantities and composition.
- None existence of advocacy in lobbying for public, private partnerships in HCWM.
- None existence of alternative technology for HCWM.

- None existence of a zoned sites for health care facilities taking into consideration issues of pollution arising from Health Care Services.
- Inadequate knowledge and practical skills among those involved in health-care waste management.
- Lack of regional / centralized disposal facilities to handle large quantities of health-care waste
- No budgetary allocation of health-care waste activities in District Health action Plans
- Inadequate awareness on health-care waste hazards among health workers and the general public
- Lack of collaboration with other stakeholders towards the achievement of harmonized national standards
- Unavailability of standard operating procedures and technical guidelines for safety measures.

#### **4.4 HCWM Financing**

The strategic plan is expected to be implemented with financial support from the Government Republic of Zambia (GRZ). Government funding will be supplemented by the World Bank, Zambia Water Supply, Sanitation and Healthcare Waste (ZWSSHW) Project for Public Health Facilities, UNDP, and European Union, Zambia Health Services Improvement Project (ZHSIP), GEF, UNICEF and the World Health Organization (WHO). It is envisaged that in order to ensure sustainability of the HCWM system, institutions will be required to include HCWM financing in their annual actions plans. Additionally, the government is in the process of decentralizing funds to districts pertaining to the current Fiscal financial discipline. Money will be sent direct from Ministry of Finance to districts. This will enhance efficiency and effectiveness of service delivery in all aspects

**Table 13:** Action Plan showing activities, responsible unit, time frame and cost

**13.1 To Review and Harmonize Legal, Regulatory, Policy and Administrative Framework for Health Care Waste**

Activity/Action	Level of Coordination	Supervision	Indicators of Achievement	Time Frame					Cost ZMK	Amount in \$	Source of funding
				1	2	3	4	5	Initial	Rate: US\$1=K6.30	
Reviewing Health Care Waste Guidelines	DDDSC & R (EOH)	MoH	Availability of a copy of the reviewed Health Care Waste Management Guidelines						600,000	95,238	GRZ
Advocating and creation of HCWM data base in HMIS	DDDSC & R (EOH)	MoH	HCWM data included in HMIS						274,000	43,492	GRZ
<b>Sub total</b>									<b>874,000</b>	<b>138,730</b>	

**13.2 To Create Community Awareness on acceptable Health Waste Management Practices**

Activity/Action	Level of Coordination	Supervision	Indicators of Achievement	Time Frame					Cost ZMK	Amount in \$	Source of funding
				1	2	3	4	5	Initial		
Advocacy on HCWM to Parliamentarians	MoH/MCDMCH	MoH/MC DMCH	number of MPs sensitised						206,000.00	32,698.50	GRZ
Conducting quarterly collaborative meetings with line ministries and Stakeholders	DDDSC & R/PHO/DHO	MoH/MC DMCH	Number of meetings held with line ministries and Stakeholders with minutes and action sheets						800,000	126,984.13	GRZ
Designing, Printing and distribution of IEC Materials in HCWM	DDDSC & R (EOH)	MoH/MC DMCH	IEC Designed, printed and distributed						800,000	126,984.13	GRZ
Training 9775 health workers in HCWM country wide	DDDSC & R (EOH)	MoH/MC DMCH	No. of health workers trained						30,000,000	4,761,904.76	GRZ

Training of 6370 general workers in health facilities involved in waste handling	PMO, DMO	MoH/MC DMCH	No. of general workers trained						18,000,000	2,857,142.86	GRZ
Training of 120 medical equipment officers in maintenance and servicing new HCWM equipment	DD – EOH	MoH/MC DMCH	No of officers trained in maintenance and servicing						3,240,000.00	514,285.71	GRZ
Orientating 120 Medical Equipment Technicians in new HCWM equipment	DD – EOH	MoH/MC DMCH	Number of Medical Equipment Technicians oriented in new HCWM						3,600,000	571,428.57	GRZ
Conducting Health Care Waste Risk Assessment annually	DD – EOH	MoH/MC DMCH	Report, Findings and Recommendations on Health Care Waste Risk Assessment available						1,250,000	198,412.70	GRZ
Report writing for the assessment and publication	DD-EOH	MoH/MC DMCH	report written and published						330,000	52,380.95	GRZ
Holding Provincial Quarterly HCWM Performance review meetings	DDDSC & R/PHO/DHO	MoH/MC DMCH	Number of HCWM Review meetings held with minutes and action sheets						1,700,000	269,841.27	GRZ
Conducting short training course of 6 officers in Radiation Protection and Radioactive Waste Management- Cancer Hospital and other	DDDSC & R	MOH	Number of Officers trained in Radiation Protection						300,000	47,619.05	GRZ
<b>Sub total</b>									<b>60,020,000</b>	<b>9,559,682.63</b>	

### 13.3 To Procure and introduce alternative equipment and technologies for treatment of Health-Care Waste

Activity/Action	Level of Coordination	Supervision	Indicators of Achievement	Time Frame					Cost ZMK	Amount in \$	Source of funding
				1	2	3	4	5			
									Initial		
Procuring and installation of 106 incinerators with adequate capacity to handle Health Care Waste	CMEO	MOH	Number of approved incinerators with adequate capacity						31,800,000.00	5,047,619.05	GRZ
<b>Procure Non Incineration Treatment Options at pilot sites</b> (Central location) - Levy hospital	CMEO/CEHO - G	MoH/MC DMCH	Non Incineration Treatment Options procured							0.00	
Level 3: Ndola Central Hospital									7,765,481	1,232,616.00	GRZ
Level 2: Kabwe General Hospital									7,765,481	1,232,616.00	GRZ
Level 1: Kapiiri Mposhi and Kamchanga District Hospitals									7,765,481	1,232,616.00	GRZ
Mukonchi Rural Health Center									1,164,822	184,892.40	GRZ
Adverts, Evaluation and tendering the procurement of non incineration technologies				CMEO/CEHO - G	MOH	Non incineration technologies evaluated and tendered					
Procuring onsite needle stick crushers	CMEO/CEHO - G	MOH	Availability of Onsite needle stick crushers						80,000	12,698.41	GRZ
Capacity building for incinerator operators in maintenance and servicing	DDDSC & R (EOH)	MOH	Incinerator Operators capacity built						3,472,000	551,111.11	GRZ
<b>Sub total</b>									<b>67,938,745</b>	<b>10,783,927.83</b>	

### 13.4 To provide adequate Equipment, Tools and Infrastructure for HCWM

Activity/Action	Level of Coordination	Supervision	Indicators of Achievement	Time Frame					Cost ZMK Initial	Amount in \$	Source of funding
				1	2	3	4	5			
Procuring approved equipment and Tools such as Trolleys, Wheel bins, Waste bins, Bin liners, Weighing Scales, Air monitoring equipment, Personal Protective Equipment and Hand tools	CMEO/CEHO - G	MoH/MC DMCH	Availability of HCWM Equipment and Tools						29,935,715	4,751,701	GRZ
Constructing approved storage facilities for HCW	Policy and Planning/DDDS & R	MoH/MC DMCH	Availability of approved HCW Storage facilities						580,500	92,143	GRZ
Construction of 838 incinerators in health facilities where they are non existing. *	Policy and Planning/DDDS & R	MoH/MC DMCH	No. of incinerators constructed						25,140,000.00	3,990,476.19	GRZ
Procurement and installation of 50 generators for 3 <sup>rd</sup> , 2 <sup>nd</sup> and 1 <sup>st</sup> level hospitals including big HCs	Policy and Planning/DDDS & R	MoH/MC DMCH	No. of Generators procured						12,500,000.00	1,984,127	
Construction of 50 Generator shelters	Policy and Planning/DDDS & R	MoH/MC DMCH	No. of Generators installed						500,000.00	79,365	
Repair and servicing of generators	DDDS & R	MoH/MC DMCH	No. of Generators repaired and serviced						300,000.00	47,619	
Procuring 40 Bins for radiation isotope wastes	CMEO/CEHO - G	MoH/MC DMCH	Number of Radioactive storage bins in wards at Cancer Disease Hospital						1,600,000	253,968	GRZ

Procurement of cytotoxic spill kits	CMEO/CEHO - G	MoH/MC DMCH	Availability of cytotoxic spill kits						800,000	126,984	GRZ
Procurement of 2 Radiation survey meters(Radiation probe)	CMEO/CEHO - G	MoH/MC DMCH	Availability of Radiation Survey meters						400,000	63,492	GRZ
Construction of Radioactive Waste Storage Facility - Cancer Disease Hospital	CMEO/CEHO - G	MoH/MC DMCH	Availability of approved Radioactive Storage facilities at Cancer Diseases Hospital						10,000,000	1,587,302	GRZ
Procuring 1,500 Biohazard Bags for the Laboratory - Cancer Diseases Hospital	CMEO/CEHO - G	MoH/MC DMCH	Availability of Biohazard Bags in the Laboratory at Cancer Diseases Hospital						150,000	23,810	GRZ
Procuring 15 Digital X- ray units	CMEO/CEHO - G	MoH/MC DMCH	Availability of Digital X- Ray Units at Cancer Diseases Hospital						3,000,000	476,190	GRZ
Procuring 200 Hand held Thermo Scanners (Thermometers)	CMEO/CEHO - G	MoH/MC DMCH	Hand held scanners available						1,260,000	200,000	
Procuring 20 Lead aprons (Jackets) for Cancer Diseases Hospital	CMEO/CEHO - G	MoH/MC DMCH	Availability of Lead Aprons (Jackets) at Cancer Diseases Hospital						3,000,000	476,190	GRZ
<b>Sub total</b>									<b>72,635,715.00</b>	<b>11,529,478.57</b>	

**13.5 To provide for the Pre-treatment, collection, storage, transportation and final disposal of HCW**

Activity/Action	Level of Coordination	Supervision	Indicators of Achievement	Time Frame					Cost ZMK	Amount in \$	Source of funding
				1	2	3	4	5			
									Initial		
Sensitizing of Contractors in Health Care Waste Collection	DDDSC & R (EOH)	MOH	Availability of Contractors sensitized in Health Care Waste Collection						140,000	22,222.22	GRZ
Conduct technical support to health facilities in HCWM	DDDSC & R (EOH)	MOH	Technical support conducted						800,000.00	126,984.13	GRZ
<b>Sub total</b>									<b>940,000</b>	<b>149,206.35</b>	



### 13.6 Maintenance of HCWM Equipment and Tools

Activity/Action	Level of Coordination	Supervision	Indicators of Achievement	Time Frame					Cost ZMK		
				1	2	3	4	5	Initial	Amount in \$	Source of funding
				Operation and Maintenance of HCWM treatment equipment , trolleys ,trolley bins, steel rods, brooms and waste ash buckets	CMEO/DDDSC &R	MoH/MCDMCH	All equipment repaired, replaced and working				
Maintenance of surroundings and fences of disposal sites.	PMO/DMO	MOH/MDCMCH	Surroundings and fences maintained.						1,000,000	158,730.16	GRZ
Repair and maintenance of 515 existing ordinary incinerators and 60 micro burns.	PMO/DMO	MOH/MDCMCH	No of incinerators repaired and maintained						7,337,500.00	1,164,682.54	GRZ
<b>Sub total</b>									<b>11,337,500</b>	<b>1,799,603.17</b>	

\*Annex 12: Refer to minimum specifications for health incinerators

### 13.7 Provision of Code of Conduct, Standard Operating Procedures and Technical Guidelines for Safety measures

Activity/Action	Level of Coordination	Supervision	Indicators of Achievement	Time Frame					Cost ZMK	Amount in \$	Source of funding
				1	2	3	4	5			
Developing of standard operating procedure guidelines for health facilities	DDSC & R	MoH/MCDMCH	Sops and Guidelines developed	x					170,000	26,984.13	GRZ
Production and printing of 2000 copies of SOPs	DDSC & R	MoH/MCDMCH	SOPs printed and produced	x					100,000.00	15,873.02	
Distribution of SOPs to all Health Facilities	DDDSC&R	MOH/MCDMCH	SOPs and Guidelines distributed	x					45,000	7,142.86	GRZ
<b>Sub total</b>									<b>315,000</b>	<b>50,000.00</b>	

### 13.8 Creation of regional centralized disposal facilities to handle large quantities of health-care waste

Activity/Action	Level of Coordination	Supervision	Indicators of achievement	Time Frame					Cost ZMK	Amount in \$	Source of funding
									Initial		
Engagement of PP to collect waste from health facilities	DDDSC& R	MOH	Availability of suitable vehicles for HCW Transportation						20,000,000	3,174,603.17	GRZ
Procuring of 12 suitable vehicles for supervision and monitoring of HCWM	DDDSC& R	MOH/MCDMCH	Availability of suitable vehicles for monitoring and supervision of HCW						6,192,000	982,857.14	GRZ
Procuring 116 Motor bikes for use by HCW Managers in Health facilities	DDDSC& R	MOH/MCDMCH	Availability of Motor bikes for HCW programmes						4,060,000	644,444.44	GRZ
Running and maintenance costs for 116 motors and 12 vehicles	DDDSC& R	MOH/MCDMCH	All vehicles maintained and running						1,220,000.00	193,650.79	GRZ
Environmental Licensing of Health Facilitie	DDDSC& R	MOH/MCDMCH	All Health Facilities licensed						4,000,000	634,920.63	GRZ
Supervision and monitoring	DDDSC& R	MOH/MCDMCH	HCWM Activities supervised and monitored One midterm evaluation conducted						5,000,000	793,650.79	GRZ
<b>Sub total</b>									<b>40,472,000</b>	<b>6,424,126.98</b>	
<b>Grand Total</b>									<b>219,622,215.00</b>	<b>34,860,669.05</b>	

## References

1. CBoH (2000). National Health Strategic Plan, 2001-2005. Lusaka, Zambia.
2. Chih-Shan & Fu-tien, J. (1993). Physical and chemical composition of hospital waste in infection control and hospital epidemiology, 14(3): 145-150
3. CSO (1990). Census of population and housing. Lusaka, Zambia
4. ECZ/LCC (1997). Solid waste management master plan for the city of Lusaka.
5. Elliot, C. (2001). Pharma buys conscience. Vol. 12, Issue 17. TAP on IRAQ. The American Prospect.
6. CSO (2000). Census of population and housing. Lusaka, Zambia.
7. ECZ (2000). National waste management strategy. Lusaka, Zambia.
8. ECZ (2000). National working group on hazardous waste. Lusaka, Zambia
9. GRZ (1995). Local government Act. Cap.281. Lusaka, Zambia
10. GRZ (1995). National Health Service Act. Cap 315. Lusaka, Zambia
11. GRZ (1995). Radiation protection Act. Cap. 311. Lusaka, Zambia.
12. GRZ (1995). Environmental protection and pollution control Act. Cap 204. Lusaka, Zambia
13. ISWA (1996/7). International solid waste association year book
14. ISWA (1997/8). International solid waste association year book
15. Johannessen, L. M .et al (2000). Health care guidance note. World Bank.
16. Johannessen, L. M. (1997). Management of health-care waste. In proceedings in environment'97 conference, Egyptian Environmental Affairs Agency, Dokki-Giza, Cairo. Egyptian
17. Ministry of Health. The National Health Care Waste Management Plan 2008-2012. Kenya
18. MoH (2008). National health care waste management plan
19. MoH/CBoH (1999). HIV/AIDS in Zambia: Background projections, impact and interventions. Lusaka, Zambia.
20. MoH/CBoH (2000). National health strategic plan/ 2002-2005. Lusaka, Zambia.
21. MoH/CBoH (2001) National environmental health policy, (Draft). Lusaka, Zambia.
22. MoH/CBoH (2001). Data base on 2001 health care facility statistics. Lusaka, Zambia
23. Mwansa, K. et al (2001). Reproductive health strategic plan. Northern province health office. Lusaka
24. NAC (2000). Strategic framework, 2001-2003". Lusaka, Zambia.
25. NCSA (1996). Study on the management of medical waste. National Conservation Strategy (coordinating) agency. Report No. NCS/GTZ 7. Gaborone Botswana
26. RSA (1998). Minimum Requirements for Waste Disposal by Landfill. Department of Water Affairs and Forestry.
27. Sakala, J. (1998). Personal Communication. Lusaka, Zambia.
28. UNAIDS (2000). Report on global HIV/AIDS epidemic.
29. UNCED (1992). Agenda 21, Rio
30. UNEP (1992). Basel convention on the trans-boundary movement of hazardous waste and their disposal.
31. WHO (1999). Safe management of waste from health-care activities. Editors Pruss, A. et al. Geneva, Switzerland.
32. WHO (2000). Zambia newsletter, Vol. No.20. Geneva, Switzerland
33. EIB (2012). ToR for Zambia, Water Supply, Sanitation and Healthcare Waste (WSSHW) Project for Public Health Facilities

34. United Nations Development Programme Countries (2014): Ghana, Madagascar, Tanzania and Zambia. PROJECT DOCUMENT: Reducing UPOPs and Mercury Releases from the Health Sector in Africa

35. United Nations Development Programme Countries: Ghana, Madagascar, Tanzania and Zambia. PROJECT DOCUMENT: Reducing UPOPs and Mercury Releases from the Health Sector in Africa

# *Annex*

### Annex 1: Estimate of daily health-care waste generation in institutions visited

Name of site visited	Level of the institution	Number of beds	Total waste generated in kg / patient day		
			Health care waste	General communal waste	Total waste
Kitwe Central Hospital	Level III	306	61	612	673
Ndola Central Hospital	Level III	508	102	116	218
Solwezi General Hospital	Level II	240	48	480	528
Livingstone General Hospital	Level II	274	55	548	603
Choma General Hospital	Level I	204	41	804	845
Mazabuka District Hospital	Level I	70	14	140	154
Monze Mission Hospital	Level I	246	49	492	541
Solwezi Health Centre	N/A	N/A			
Kalomo District Hospital	Level I	N/A			
Kasama General Hospital	Level II	328	66	656	722
Kasama Urban Health Centre	UHC	N/A			
Mpika District Hospital	Level I	78	16	156	172
Chilonga Mission Hospital	Level II	230	46	460	506
Mpango Health Centre	RHC	23	5	46	51
Kampekete Health Centre	RHC	14	3	28	31
<b>Total</b>			<b>1009</b>	<b>4035</b>	<b>5044</b>

**Note:** The following formula has been used in the calculation of waste with 100% occupancy rate: Big and specialized hospitals 0.5 kg/patient day, small or medium size clinics 0.2 kg/patient day and general / communal waste 2 kg/patient day.

## Annex 2. Capacity and characteristics for technologies recommended at each level

Level of institution	Capacity	Technology	Characteristic and maintenance
Health Centre (Rural and Urban)	2 m. deep & filled to a depth of 1-1.5m.	<ul style="list-style-type: none"> <li>Land disposal with safe burying</li> </ul>	<p>Burial site lined with low permeability</p> <p>Suitable for hazardous and quantities of chemical waste</p>
	<p>One bag at a time.</p> <p>100-200 kg/day at 300-400°C</p>	<ul style="list-style-type: none"> <li>Brick incinerator</li> </ul>	<p>Appropriate for infectious and general health-care waste</p> <p>Not suitable for chemical residues, pharmaceutical, genotoxic, radioactive, inorganic compounds, thermal resistant waste, pressurized containers, halogenated plastics and heavy metals</p> <p>Easy to operate but not suitable where air pollution is a problem</p>
First Level (District Hospital)	As above	Land disposal with safe burying	As for health centre
	80°C for 45 minutes. 7-73% concentration	<ul style="list-style-type: none"> <li>Chemical disinfection</li> <li>Formaldehyde (HCHO)</li> </ul>	<p>Inactivate microorganisms, used on dry and solid waste with steam</p> <p>Corrosive to metals with exception of stainless steel and aluminum</p> <p>Suitable where safety is guaranteed</p>
	37-55% at 60-80% humidity for 4 – 12 hrs.	<ul style="list-style-type: none"> <li>Ethylene oxide (CH<sub>2</sub>OCH<sub>2</sub>)</li> </ul>	<p>As for formaldehyde except it is corrosive to rubber and plastics</p> <p>Not recommended because it irritates the skin, eyes and it is carcinogenic (health hazards)</p>
	2% for 5min. & 10hrs. on spores	<ul style="list-style-type: none"> <li>Glutaraldehyde (CHO-(CH<sub>2</sub>)<sub>3</sub>CHO)</li> </ul>	<p>As for formaldehyde</p> <p>Not to discharge into sewers</p>
	2 – 12% active chlorine	<ul style="list-style-type: none"> <li>Sodium hypochlorite (NaOCl)</li> </ul>	<p>Active on bacteria, viruses, &amp; spores but ineffective on blood and stool</p> <p>Corrosive to metal &amp; safe to plastic</p> <p>Mild health hazards</p>
	0.5 to 3 tones/hr. at 1200 – 1600 °C	<ul style="list-style-type: none"> <li>Rotary kiln incinerator</li> </ul>	<p>Appropriate for infectious, chemical and pharmaceutical waste</p> <p>Not suitable for non-risk, radioactive, pressurized containers and heavy metals</p>

			Require trained personnel
<b>Second Level</b> (General Hospital)	25 (50LA)	<ul style="list-style-type: none"> <li>Land disposal with safe burying</li> </ul>	As for health centre
	200 kg to 10 tons / day at 800 – 900 °C	<ul style="list-style-type: none"> <li>Pyrolytic incinerator</li> </ul>	Appropriate for infectious, pathological, pharmaceutical and chemical residue waste Not suitable for non-risk, genotoxic, radioactive, pressurized containers and heavy metals Expensive and requires trained personnel to operate and maintain Suitable for larger facilities
	As above	<ul style="list-style-type: none"> <li>Chemical disinfection</li> </ul>	As for First Level
	5 – 8kg requires 60 minutes. At 121°C	<ul style="list-style-type: none"> <li>Wet thermal or steam treatment (autoclaving)</li> </ul>	Inactivate microorganisms. Sterilize reusable medical equipment Suitable for infectious waste & sharps & not pathological, cytotoxic or radioactive wastes
<b>Third Level</b> (Central Hospital) including  <b>National Reference</b> (University Teaching Hospital, Chainama, Liteta,)	As above	<ul style="list-style-type: none"> <li>Land disposal with safe burying</li> </ul>	As for health centre
	As above	<ul style="list-style-type: none"> <li>Pyrolytic incinerator</li> </ul>	As for general hospital
	As above	<ul style="list-style-type: none"> <li>Chemical disinfection</li> </ul>	As for district hospital
	As above	<ul style="list-style-type: none"> <li>Wet thermal or steam treatment</li> </ul>	As for general hospital
	250kg/hr	<ul style="list-style-type: none"> <li>Microwave irradiation disinfector (teaching hospital)</li> </ul>	Potential operation and maintenance problems
<b>Regional waste disposal site</b>  (Two centralized incinerators stationed in Lusaka and	As above	<ul style="list-style-type: none"> <li>Land disposal with safe burying</li> </ul>	As for health centre
	As above	<ul style="list-style-type: none"> <li>Chemical disinfection</li> </ul>	As for district hospital
	As above	<ul style="list-style-type: none"> <li>Pyrolytic incinerator</li> </ul>	As for general hospital
	160kg/hr or one for 500kg/hr	<ul style="list-style-type: none"> <li>Incinerator 350</li> </ul>	Multiple chamber design with automatic temperature control



Copperbelt provinces)	4 - 7hrs / day	LA or one for 1000 LA wood/coal fired	Hygienically destroy putrescible waste (hospital, abattoir, sewage works, industry, municipalities, etc.) Spare parts readily available in South Africa and requires trained personnel
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**Note:**

1. The final choice of treatment and disposal should be made carefully after taking into consideration advantages, disadvantages and other factors at play.
2. Use deep pits in rural areas.
3. No disposal of health-care waste for landfill on municipal dumpsites.

### Annex 3: Biohazard symbols



#### Annex 4: Technical Working Group for the review of the HCWM Plan

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### Annex 5: List of names consulted during MoH HCWM assessment in June 2013

No	Name	Title	Institution	Contact No
1	Polson Kabanze	HRM Officer	Mazabuka DMO	0977-892896
2	Fortune Bweenje	EHT	Mazabuka DMO	0977-464683
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6	Tuedess Sikagoyo	Med Lab Technologist	Mazabuka DMO	0950-602477
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13	Janet Ndhlovu	Hospital Administrator	Mazabuka District Hospital	0979-301625
14	James Mutesamwa	Ag DMO	Monze DMO	0977-380975
15	Gift Hazyondo	Senior EHO	Monze DMO	0977-704198
16	Emmanuel Meleki	EHT	Monze DMO	0979-419198
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23	Kennedy Phiri	Ag Ass Accountant	Monze General Hospital	0977-416497
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25	Ricky Siasendeka	Radiographer/Ag CCO	Monze General Hospital	0979-049853
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29	Rita Hatontola	Nursing Officer	Choma District Hospital	0977-312242
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43	Ms.Phiri	EM	Chilonga Mission Hospital	
44	Cheleka Mulenga	CEHO	Northern PHO	
45	Rosemary Moya	SEHT	Mungwi DMO	
46	James Mwansa	HIO	Mungwi DMO	
47	Kaonga	EHT	Mpika DMO	
48	Stephen Banda	Hospital Administrator	Mpika District Hospital	
49	Mwango	Med Lab Technologist	Mpika District Hospital	

## Annex 6: Attendance List

Table: Attendance list for the validation of the health care waste management review meeting held from 27<sup>th</sup> to 30<sup>th</sup> April 2014, Ndozo lodge, Chilanga

No	Name	Institution	Position	Phone	Email
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23	Florence Ngala	MoH	CEHO-FS		
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**Annex 6 b : attendance list** the front line workers on the consultative meeting for health care waste management- 28<sup>th</sup> July- 1<sup>st</sup> August, 2014-mck lodge chilanga

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41	Felix Chilemya	Driver	Mansa	0977506660	-
42	Ignatius Chenda	Driver	PMO-Solwezi	0977166852	-

### Annex 7: Health Care Waste Management Training Plan

S/N	ACTIVITY	CATEGORY/TARGET	PERIOD/DURATION	KEY AREA	Total cost (ZMW)	USD(\$)
<b>National level</b>						
1.	Development of Health Care Waste Management training materials	Health workers and General workers	1 year	Healthcare waste management manual & training material.	120 000	17 143
2.	Orienting staff in new HCWM equipment	Medical equipment technicians 12 participants from each of the 10 provinces	3 years	Installation, maintenance and servicing of equipment	3,600,000	571,428.57
3.	Training of staff in new HCWM equipment	Medical equipment Officers 12 participants from each of the 10 provinces	3 years	Installation, maintenance and servicing of equipment	3,240,000	514,285.71
4.	Advocacy	Parliamentarians  (160) 150 from constituencies & 10 nominated by the president.	1 day	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Risks of HCWM</li> <li>• Infection Prevention</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• Auditor General's report</li> <li>• HCWM plan</li> </ul>	206,000.00	32,698

				<ul style="list-style-type: none"> <li>• Abel investment</li> </ul>		
<b>PROVINCIAL LEVEL</b>						
1.	Conduct trainings on HCWM	MoH – Provincial program officers (150) ( 15 participants from each of the 10 provinces )	5 days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Risks of HCWM</li> <li>• Infection Prevention</li> <li>• Auditor General's report</li> <li>• HCWM plan</li> <li>• Role of H/Ws in HCWM</li> <li>• Practical</li> <li>• WHO guidelines on PEP</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• UPOP</li> <li>• Abel investment</li> <li>• ZEMA</li> </ul>	811,175	128757.9

Conduct trainings on HCWM	Provincial program (60) officers – Training of Trainers  ( 6 participants from each of the 10 provinces )	5 days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Risks of HCWM</li> <li>• Infection Prevention</li> <li>• Auditor General ‘s report</li> <li>• HCWM plan</li> <li>• Role of H/Ws in HCWM</li> <li>• Practical</li> <li>• WHO guidelines on PEP</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• UPOP</li> <li>• Abel investment</li> <li>• ZEMA</li> </ul>	526,175	83,519.8
<b>District level</b>					
Conducting trainings on HCWM	Management teams (DCMO) 1060  (10 participants from each of the 106 districts within the 10 provinces across the country )	5 days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Risks of HCWM</li> <li>• Infection Prevention</li> <li>• Auditor General’s report</li> <li>• HCWM plan</li> </ul>	3,466,175	550,186.5

				<ul style="list-style-type: none"> <li>• Role of H/Ws in HCWM</li> <li>• Practical</li> <li>• WHO guidelines on PEP</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• UPOP</li> <li>• Abel investment</li> <li>• ZEMA</li> </ul>		
Conducting trainings on HCWM	Health workers 1590 ( 15 participants from each of the 106 districts in 10 provinces across the country )	5days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Risks of HCWM</li> <li>• Infection Prevention</li> <li>• Auditor General's report</li> <li>• HCWM plan</li> <li>• Role of H/Ws in HCWM</li> <li>• Practical</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• WHO guidelines on PEP</li> <li>• UPOP</li> </ul>	5,056,175	802,567.4	

				<ul style="list-style-type: none"> <li>• Abel investment</li> <li>• ZEMA</li> </ul>		
		<p>General workers 2120 ( 20 participants from each of the 106 district in 10 provinces across the country )</p>	7 days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Types of HCWM</li> <li>• Risks of HCW</li> <li>• Infection Prevention</li> <li>• Role of all staff in HCWM</li> <li>• HCW and Climate Change</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• Practicals</li> <li>• PPEs</li> <li>• WHO guidelines on PEP</li> <li>• Advocacy for HCWM inclusion in the curriculum</li> <li>• ZEMA</li> </ul>	824,080	130,806.35
				<ul style="list-style-type: none"> <li>•</li> </ul>		
		<b>Hospitals 3<sup>rd</sup> level</b>				
	Conducting trainings on HCWM	<p>Management teams ( 240)</p>	5 days	<ul style="list-style-type: none"> <li>• HCWM information system</li> </ul>	1,126,175	178,757.9

		40 participants from each of the 6, 3 <sup>rd</sup> level institutions across the country.		<ul style="list-style-type: none"> <li>• Types of HCWM</li> <li>• Risks of HCW</li> <li>• Role of all staff in HCWM</li> <li>• HCW and Climate Change</li> <li>• Infection Prevention</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• Practicals</li> <li>• PPEs</li> <li>• WHO guidelines on PEP</li> <li>• Advocacy for HCWM inclusion in the curriculum</li> <li>• ZEMA</li> </ul>		
	Conducting trainings on HCWM	Health workers ( 600) 100 participants from each of the 6, 3 <sup>rd</sup> level hospitals around the country	5days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Types of HCWM</li> <li>• Risks of HCW</li> <li>• Role of all staff in HCWM</li> <li>• HCW and Climate Change</li> <li>• Infection</li> </ul>	2,086,175	331,138.9

				<ul style="list-style-type: none"> <li>Prevention</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• Practicals</li> <li>• PPEs</li> <li>• WHO guidelines on PEP</li> <li>• Advocacy for HCWM inclusion in the curriculum</li> <li>• ZEMA</li> </ul>		
		<p>General workers ( 150 ) 25 participants from each of the 6, 3<sup>rd</sup> level hospitals around the country</p>	7 days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Types of HCWM</li> <li>• Risks of HCW</li> <li>• Role of all staff in HCWM</li> <li>• HCW and Climate Change</li> <li>• Infection Prevention</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• Practicals</li> <li>• PPEs</li> </ul>	65,630	10,417.46



				<ul style="list-style-type: none"> <li>• WHO guidelines on PEP</li> <li>• Advocacy for HCWM inclusion in the curriculum</li> <li>• ZEMA Abel investment</li> </ul>		
		<b>Hospitals 2<sup>nd</sup> level</b>				
	Conducting trainings on HCWM	<p>Management teams ( 200 ) 10 participants from each of the 20 2<sup>nd</sup> level hospitals across the country.</p>	5 days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Types of HCWM</li> <li>• Risks of HCW</li> <li>• Role of all staff in HCWM</li> <li>• HCW and Climate Change</li> <li>• Infection Prevention</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• Practicals</li> <li>• PPEs</li> <li>• WHO guidelines on PEP</li> <li>• Advocacy for HCWM</li> </ul>	946,175	150,186.5

				inclusion in the curriculum <ul style="list-style-type: none"> <li>• ZEMA</li> </ul>		
		Health workers ( 1000 ) 50 participants from each of the 20 2 <sup>nd</sup> level hospitals across the country.	5 days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Types of HCWM</li> <li>• Risks of HCW</li> <li>• Role of all staff in HCWM</li> <li>• HCW and Climate Change</li> <li>• Infection Prevention</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• Practicals</li> <li>• PPEs</li> <li>• WHO guidelines on PEP</li> <li>• Advocacy for HCWM inclusion in the curriculum</li> <li>• ZEMA</li> </ul>	3,286,175	521,615.1
		General workers ( 400 ) 20 participants from	7 days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Types of HCWM</li> </ul>	161,880	2,5695.24

		each of the 20 2 <sup>nd</sup> level hospitals across the country)		<ul style="list-style-type: none"> <li>• Risks of HCW</li> <li>• Role of all staff in HCWM</li> <li>• HCW and Climate Change</li> <li>• Infection Prevention</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• Practicals</li> <li>• PPEs</li> <li>• WHO guidelines on PEP</li> <li>• Advocacy for HCWM inclusion in the curriculum</li> <li>• ZEMA meetings</li> <li>• Abel investment</li> </ul>		
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**Hospital 1<sup>st</sup> level**

Conducting trainings on HCWM	Management teams (820)  10 participants from each 82 1st level hospital across the country	5 days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Types of HCWM</li> <li>• Risks of HCW</li> <li>• Role of all staff in HCWM</li> <li>• HCW and Climate Change</li> <li>• Infection Prevention</li> </ul>	2,992,175	474,948.4
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				<ul style="list-style-type: none"> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• Practicals</li> <li>• PPEs</li> <li>• WHO guidelines on PEP</li> <li>• Advocacy for HCWM inclusion in the curriculum</li> <li>• ZEMA</li> </ul>		
	Conducting trainings on HCWM	<p>Health workers ( 2460 )</p> <p>30 participants from each of the 82 1st level hospitals across the country</p>	5days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Types of HCWM</li> <li>• Risks of HCW</li> <li>• Role of all staff in HCWM</li> <li>• HCW and Climate Change</li> <li>• Infection Prevention</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• Practicals</li> <li>• PPEs</li> <li>• WHO guidelines on PEP</li> <li>• Advocacy for HCWM inclusion in the curriculum</li> <li>• ZEMA</li> </ul>	8,402,175	1,333,678.6

Conducting trainings on HCWM	General workers ( 1640 )  20 participants from each of the 82 1st level hospitals across the country	7 days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Types of HCWM</li> <li>• Risks of HCW</li> <li>• Role of all staff in HCWM</li> <li>• HCW and Climate Change</li> <li>• Infection Prevention</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• Practicals</li> <li>• PPEs</li> <li>• WHO guidelines on PEP</li> <li>• Advocacy for HCWM inclusion in the curriculum</li> <li>• ZEMA</li> </ul>	5,805,280	921473.02
<b>Health centers</b>					
Conducting trainings on HCWM	Management teams (1575)  1 participant from each 1575 Health centers across the country	5 days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Types of HCWM</li> <li>• Risks of HCW</li> <li>• Role of all staff in HCWM</li> <li>• HCW and Climate Change</li> <li>• Infection Prevention</li> <li>• Legislation and policy</li> </ul>	679,925	107,924.6

				<ul style="list-style-type: none"> <li>• Non incineration methods</li> <li>• Practicals</li> <li>• PPEs</li> <li>• WHO guidelines on PEP</li> <li>• Advocacy for HCWM inclusion in the curriculum</li> <li>• ZEMA</li> </ul>		
Conducting trainings on HCWM	<p>Health workers ( 3150 )</p> <p>2 participants from each of the 1575 health centers across the country</p>	5 days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Types of HCWM</li> <li>• Risks of HCW</li> <li>• Role of all staff in HCWM</li> <li>• HCW and Climate Change</li> <li>• Infection Prevention</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• Practicals</li> <li>• PPEs</li> <li>• WHO guidelines on PEP</li> <li>• Advocacy for HCWM inclusion in the curriculum</li> <li>• ZEMA</li> </ul>	1,073,675	170,424.6	

	Conducting trainings on HCWM	General workers ( 3150 )  2 participants from each of the 1575 health centers across the country	7 days	<ul style="list-style-type: none"> <li>• HCWM information system</li> <li>• Types of HCWM</li> <li>• Risks of HCW</li> <li>• Role of all staff in HCWM</li> <li>• HCW and Climate Change</li> <li>• Infection Prevention</li> <li>• Legislation and policy</li> <li>• Non incineration methods</li> <li>• Practicals</li> <li>• PPEs</li> <li>• WHO guidelines on PEP</li> <li>• Advocacy for HCWM inclusion in the curriculum</li> <li>• ZEMA</li> </ul>	11,143,130	1,768,750.79
<b>6</b>	<b>GRAND TOTAL</b>					

**Annex 8: Pictures of health care waste equipment**



**Yellow 140ltr  
Wheeler bin (Sale  
Bins)**

Sale Price £35.40 - Normally  
£44.64 (inc VAT and Delivery)  
**£29.50 (Ex. VAT)** £35.40  
(Incl. VAT)  
Including Delivery\*

1 Buy



**RED 140 ltr Wheelie  
Bin (Sale bins)**

Sale Price £35.40 - Normally £44.64  
(inc VAT and Delivery)  
**£29.50 (Ex. VAT)** £35.40 (Incl.  
VAT)  
Including Delivery\*

1 Buy

usD\$1,600 **Gabbage  
Tricycles**



sD \$1,800 **Gabbage Triicycle**



usD \$300 **Waste Trolley Bin**

USDS \$2,000 **Gabbage Triicycle**





## Annex 9: Breakdown of funding for National level

### 9.1 To Review and Harmonize Legal, Regulatory, Policy and Administrative Framework for Health Care Waste

Activity/Action	Cost ZMK	Amount in \$	Source of funding
	Initial	Rate: US\$1=K6.30	
Reviewing Health Care Waste Guidelines	600,000.00	95,238.10	GRZ
Advocating and creation of HCWM data base in HMIS	274,000.00	43,492.06	GRZ
<b>Sub total</b>	<b>874,000.00</b>	<b>138,730.16</b>	

### 9.2 To Create Community Awareness on acceptable Health Waste Management Practices

Activity/Action	Cost ZMK	Amount in \$	Source of funding
	Initial		
Advocacy on HCWM to Paliamentarians	206,000.00	32,698.50	GRZ
Designing, Printing and distribution of IEC Materials in HCWM	800,000.00	126,984.13	GRZ
Conducting short training course of 6 officers in Radiation Protection and Radioactive Waste Management- Cancer Hospital and other	300,000.00	47,619.05	GRZ
<b>Sub total</b>	<b>1,306,000.00</b>	<b>207,301.67</b>	

### 9.3 To Procure and introduce alternative equipment and technologies for treatment of Health-Care Waste

Activity/Action	Cost ZMK	Amount in \$	Source of funding
	Initial		
<b>Procure Non Incineration Treatment Options at pilot sites</b>		0.00	
(Central location) - Levy hospital	7,765,480.80	1,232,616.00	GRZ
Level 3: Ndola Central Hospital	7,765,480.80	1,232,616.00	GRZ
Level 2: Kabwe General Hospital	7,765,480.80	1,232,616.00	GRZ
Level 1: Kapiri Mposhi and Kamchanga District Hospitals	7,765,480.80	1,232,616.00	GRZ

Mukonchi Rural Health Center	1,164,822.12	184,892.40	GRZ
Adverts, Evaluation and tendering the procurement of non 4.3.1 To Create Community Awareness on acceptable Health Waste generation technologies Management Practices	360,000.00	57,142.86	GRZ
Procuring 40 bins for the stick crushers	80,000.00	12,698.41	GRZ
<b>Sub total</b>	<b>32,666,745.32</b>	<b>5,185,197.67</b>	

#### 9.4 To provide adequate Equipment, Tools and Infrastructure for HCWM

Activity/Action	Cost ZMK Initial	Amount in \$	Source of funding
Constructing approved storage facilities for HCW	580,500.00	92,142.86	GRZ
Procuring 40 Bins for radiation isotope wastes	1,600,000.00	253,968.25	GRZ
Procurement of cytotoxic spill kits	800,000.00	126,984.13	GRZ
Procurement of 2 Radiation survey meters(Radiation probe)	400,000.00	63,492.06	GRZ
Construction of Radioactive Waste Storage Facility - Cancer Disease Hospital	10,000,000.00	1,587,301.59	GRZ
Procuring 1,500 Biohazard Bags for the Laboratory - Cancer Diseases Hospital	150,000.00	23,809.52	GRZ
Procuring 20 Lead aprons (Jackets) for Cancer Diseases Hospital	3,000,000.00	476,190.48	GRZ
<b>Sub total</b>	<b>16,530,500.00</b>	<b>2,623,888.89</b>	

#### 9.5 Provision of Code of Conduct, Standard Operating Procedures and Technical Guidelines for Safety measures

Activity/Action	Cost ZMK	Amount in \$	Source of funding
Developing of standard operating procedure guidelines for health facilities	170,000.00	26,984.13	GRZ
Production and printing of 2000 copies of SOPs	100,000.00	15,873.02	
<b>Sub total</b>	<b>270,000.00</b>	<b>42,857.14</b>	

Lusaka, Copperbelt, Northern and Luapula Provinces

Activity/Action	Cost ZMK	Amount in \$	Source of funding	Lusaka		Copperbelt		Northern		Luapula	
				ZMW	US\$	ZMW	US\$	ZMW	US\$	ZMW	US\$
				Initial							
Conducting quarterly collaborative meetings with line ministries and Stakeholders	800,000.00	126,984.13	GRZ	136,000.00	21,587.30	120,000.00	19,047.62	72,000.00	11,428.57	56,000.00	8,888.89
Training 10,000 health workers in HCWM country wide	30,000,000.00	4,761,904.76	GRZ	5,100,000.00	809,523.81	4,500,000.00	714,285.71	2,700,000.00	428,571.43	2,100,000.00	333,333.33
Training of 6000 general workers in health facilities involved in waste handling	18,000,000.00	2,857,142.86	GRZ	3,060,000.00	485,714.29	2,700,000.00	428,571.43	1,620,000.00	257,142.86	1,260,000.00	200,000.00
Training of 120 medical equipment officers in maintenance and servicing new HCWM equipment	3,240,000.00	514,285.71	GRZ	550,800.00	87,428.57	486,000.00	77,142.86	291,600.00	46,285.71	226,800.00	36,000.00
Orientating 120 Medical Equipment Technicians in new HCWM equipment	3,600,000.00	571,428.57	GRZ	612,000.00	97,142.86	540,000.00	85,714.29	324,000.00	51,428.57	252,000.00	40,000.00
Conducting Health Care Waste Risk Assessment annually	1,250,000.00	198,412.70	GRZ	212,500.00	33,730.16	187,500.00	29,761.90	112,500.00	17,857.14	87,500.00	13,888.89
Report writing for the assessment and publication	330,000.00	52,380.95	GRZ	56,100.00	8,904.76	49,500.00	7,857.14	29,700.00	4,714.29	23,100.00	3,666.67
Holding Provincial Quarterly HCWM Performance review meetings	1,700,000.00	269,841.27	GRZ	289,000.00	45,873.02	255,000.00	40,476.19	153,000.00	24,285.71	119,000.00	18,888.89
<b>Sub total</b>	<b>58,920,000.00</b>	<b>9,352,380.95</b>			10,016,400.00	1,589,904.76	8,838,000.00	1,402,857.14	5,302,800.00	841,714.29	4,124,400.00
Procuring and installation of 106 incinerators with adequate capacity to handle Health Care Waste	31,800,000.00	5,047,619.05	GRZ	5,406,000.00	858,095.24	4,770,000.00	757,142.86	2,862,000.00	454,285.71	2,226,000.00	353,333.33
Capacity building for incinerator operators in maintenance and servicing	3,472,000.00	551,111.11	GRZ	590,240.00	93,688.89	520,800.00	82,666.67	312,480.00	49,600.00	243,040.00	38,577.78
<b>Sub total</b>	<b>35,272,000.00</b>	<b>5,598,730.16</b>		5,996,240.00	951,784.13	5,290,800.00	839,809.52	3,174,480.00	503,885.71	2,469,040.00	391,911.11

Procuring approved equipment and Tools such as Trolleys, Wheel bins, Waste bins, Bin liners, Weighing Scales,	29,935,715.00	4,751,700.79	GRZ	5,089,071.55	807,789.13	4,490,357.25	712,755.12	2,694,214.35	427,653.07	2,095,500.05	332,619.06
Air monitoring equipment, Personal Protective Equipment and Hand tools				-	-	-	-	-	-	-	-
Construction of 838 incinerators in health facilities where they are non existing.	25,140,000.00	3,990,476.19	GRZ	4,273,800.00	678,380.95	3,771,000.00	598,571.43	2,262,600.00	359,142.86	1,759,800.00	279,333.33
Procurement and installation of 50 generators for 3rd, 2nd and 1st level hospitals including big HCs	12,500,000.00	1,984,126.98		2,125,000.00	337,301.59	1,875,000.00	297,619.05	1,125,000.00	178,571.43	875,000.00	138,888.89
Construction of 50 Generator shelters	500,000.00	79,365.08		85,000.00	13,492.06	75,000.00	11,904.76	45,000.00	7,142.86	35,000.00	5,555.56
Repair and servicing of generators	300,000.00	47,619.05		51,000.00	8,095.24	45,000.00	7,142.86	27,000.00	4,285.71	21,000.00	3,333.33
Procuring 15 Digital X- ray units	3,000,000.00	476,190.48	GRZ	510,000.00	80,952.38	450,000.00	71,428.57	270,000.00	42,857.14	210,000.00	33,333.33
Procuring 200 Hand held Thermo Scanners (Thermometers)	1,260,000.00	200,000.00		214,200.00	34,000.00	189,000.00	30,000.00	113,400.00	18,000.00	88,200.00	14,000.00
<b>Sub total</b>	<b>72,635,715.00</b>	<b>11,529,478.57</b>		12,348,071.55	1,960,011.36	10,895,357.25	1,729,421.79	6,537,214.35	1,037,653.07	5,084,500.05	807,063.50
Sensitizing of Contractors in Health Care Waste Collection	140,000.00	22,222.22	GRZ	23,800.00	3,777.78	21,000.00	3,333.33	12,600.00	2,000.00	9,800.00	1,555.56
Conduct technical support to health facilities in HCWM	800,000.00	126,984.13	GRZ	136,000.00	21,587.30	120,000.00	19,047.62	72,000.00	11,428.57	56,000.00	8,888.89
<b>Sub total</b>	<b>940,000.00</b>	<b>149,206.35</b>		159,800.00	25,365.08	141,000.00	22,380.95	84,600.00	13,428.57	65,800.00	10,444.44
Operation and Maintenance of HCWM treatment equipment , trolleys, trolley bins, steel rods, brooms and waste ash buckets	3,000,000.00	476,190.48	GRZ	510,000.00	80,952.38	450,000.00	71,428.57	270,000.00	42,857.14	210,000.00	33,333.33
Maintenance of surroundings and fences of disposal sites.	1,000,000.00	158,730.16	GRZ	170,000.00	26,984.13	150,000.00	23,809.52	90,000.00	14,285.71	70,000.00	11,111.11
Repair and maintenance of 515 existing ordinary incinerators and 60 micro burns.	7,337,500.00	1,164,682.54	GRZ	1,247,375.00	197,996.03	1,100,625.00	174,702.38	660,375.00	104,821.43	513,625.00	81,527.78

<b>Sub total</b>	<b>11,337,500.00</b>	<b>1,799,603.17</b>		1,927,375.00	305,932.54	1,700,625.00	269,940.48	1,020,375.00	161,964.29	793,625.00	125,972.22
<b>Activity/Action</b>	<b>Cost ZMK</b>	<b>Amount in \$</b>	<b>Source of funding</b>								
Distribution of SOPs to all Health Facilities	45,000.00	7,142.86	GRZ	7,650.00	1,214.29	6,750.00	1,071.43	4,050.00	642.86	3,150.00	500.00
<b>Sub total</b>	<b>45,000.00</b>	<b>7,142.86</b>		7,650.00	1,214.29	6,750.00	1,071.43	4,050.00	642.86	3,150.00	500.00
Engagement of PP to collect waste from health facilities	20,000,000.00	3,174,603.17	GRZ	3,400,000.00	539,682.54	3,000,000.00	476,190.48	1,800,000.00	285,714.29	1,400,000.00	222,222.22
Procuring of 12 suitable vehicles for supervision and monitoring of HCWM	6,192,000.00	982,857.14	GRZ	1,052,640.00	167,085.71	928,800.00	147,428.57	557,280.00	88,457.14	433,440.00	68,800.00
Procuring 116 Motor bikes for use by HCW Managers in Health facilities	4,060,000.00	644,444.44	GRZ	690,200.00	109,555.56	609,000.00	96,666.67	365,400.00	58,000.00	284,200.00	45,111.11
Running and maintenance costs for 116 motors and 12 vehicles	1,220,000.00	193,650.79	GRZ	207,400.00	32,920.63	183,000.00	29,047.62	109,800.00	17,428.57	85,400.00	13,555.56
Environmental Licensing of Health Facilities	4,000,000.00	634,920.63	GRZ	680,000.00	107,936.51	600,000.00	95,238.10	360,000.00	57,142.86	280,000.00	44,444.44
Monitoring and Supervision	5,000,000.00	793,650.79	GRZ	850,000.00	134,920.63	750,000.00	119,047.62	450,000.00	71,428.57	350,000.00	55,555.56
<b>Sub total</b>	<b>40,472,000.00</b>	<b>6,424,126.98</b>		6,880,240.00	1,092,101.59	6,070,800.00	963,619.05	3,642,480.00	578,171.43	2,833,040.00	449,688.89
<b>Grand Total</b>	<b>219,622,215.00</b>	<b>34,860,669.05</b>		37,335,776.55	5,926,313.74	32,943,332.25	5,229,100.36	19,765,999.35	3,137,460.21	15,373,555.05	2,440,246.83

Central, North Western, Western and Eastern Provinces

**9.6 .To Create Community Awareness on acceptable Health Waste Management Practices**

Activity/Action	Cost ZMK	Amount in \$	Source of funding	central		North western		Western		Eastern	
				ZMW	US\$	ZMW	US\$	ZMW	US\$	ZMW	US\$
Conducting quarterly collaborative meetings with line ministries and Stakeholders	800,000.00	126,984.13	GRZ	80,000.00	12,698.41	40,000.00	6,349.21	56,000.00	8,888.89	104,000.00	16,507.94
Training 10,000 health workers in HCWM country wide	30,000,000.00	4,761,904.76	GRZ	3,000,000.00	476,190.48	1,500,000.00	238,095.24	2,100,000.00	333,333.33	3,900,000.00	619,047.62
Training of 6000 general workers in health facilities involved in waste handling	18,000,000.00	2,857,142.86	GRZ	1,800,000.00	285,714.29	900,000.00	142,857.14	1,260,000.00	200,000.00	2,340,000.00	371,428.57
Training of 120 medical equipment officers in maintenance and servicing new HCWM equipment	3,240,000.00	514,285.71	GRZ	324,000.00	51,428.57	162,000.00	25,714.29	226,800.00	36,000.00	421,200.00	66,857.14
Orientating 120 Medical Equipment Technicians in new HCWM equipment	3,600,000.00	571,428.57	GRZ	360,000.00	57,142.86	180,000.00	28,571.43	252,000.00	40,000.00	468,000.00	74,285.71
Conducting Health Care Waste Risk Assessment annually	1,250,000.00	198,412.70	GRZ	125,000.00	19,841.27	62,500.00	9,920.63	87,500.00	13,888.89	162,500.00	25,793.65
Report writing for the assessment and publication	330,000.00	52,380.95	GRZ	33,000.00	5,238.10	16,500.00	2,619.05	23,100.00	3,666.67	42,900.00	6,809.52
Holding Provincial Quarterly HCWM Performance review meetings	1,700,000.00	269,841.27	GRZ	170,000.00	26,984.13	85,000.00	13,492.06	119,000.00	18,888.89	221,000.00	35,079.37
<b>Sub total</b>	<b>58,920,000.00</b>	<b>9,352,380.95</b>		<b>5,892,000.00</b>	<b>935,238.10</b>	<b>2,946,000.00</b>	<b>467,619.05</b>	<b>4,124,400.00</b>	<b>654,666.67</b>	<b>7,659,600.00</b>	<b>1,215,809.52</b>

**9.7 To Procure and introduce alternative equipment and technologies for treatment of Health-Care Waste**

Procuring and installation of 106 incinerators with adequate capacity to handle Health Care Waste	31,800,000.00	5,047,619.05	GRZ	3,180,000.00	504,761.90	1,590,000.00	252,380.95	2,226,000.00	353,333.33	4,134,000.00	656,190.48
Capacity building for incinerator operators in maintenance and servicing	3,472,000.00	551,111.11	GRZ	347,200.00	55,111.11	173,600.00	27,555.56	243,040.00	38,577.78	451,360.00	71,644.44
<b>Sub total</b>	<b>35,272,000.00</b>	<b>5,598,730.16</b>		3,527,200.00	559,873.02	1,763,600.00	279,936.51	2,469,040.00	391,911.11	4,585,360.00	727,834.92

**9.8 To provide adequate Equipment, Tools and Infrastructure for HCWM**

Procuring approved equipment and Tools such as Trolleys, Wheel bins, Waste bins, Bin liners, Weighing Scales,	29,935,715.00	4,751,700.79	GRZ	2,993,571.50	475,170.08	1,496,785.75	237,585.04	2,095,500.05	332,619.06	3,891,642.95	617,721.10
Air monitoring equipment, Personal Protective Equipment and Hand tools				-	-	-	-	-	-	-	-
Construction of 838 incinerators in health facilities	25,140,000.00	3,990,476.19	GRZ	2,514,000.00	399,047.62	1,257,000.00	199,523.81	1,759,800.00	279,333.33	3,268,200.00	518,761.90



where they are non existing.											
Procurement and installation of 50 generators for 3rd, 2nd and 1st level hospitals including big HCs	12,500,000.00	1,984,126.98		1,250,000.00	198,412.70	625,000.00	99,206.35	875,000.00	138,888.89	1,625,000.00	257,936.51
Construction of 50 Generator shelters	500,000.00	79,365.08		50,000.00	7,936.51	25,000.00	3,968.25	35,000.00	5,555.56	65,000.00	10,317.46
Repair and servicing of generators	300,000.00	47,619.05		30,000.00	4,761.90	15,000.00	2,380.95	21,000.00	3,333.33	39,000.00	6,190.48
Procuring 15 Digital X- ray units	3,000,000.00	476,190.48	GRZ	300,000.00	47,619.05	150,000.00	23,809.52	210,000.00	33,333.33	390,000.00	61,904.76
Procuring 200 Hand held Thermo Scanners (Thermometers)	1,260,000.00	200,000.00		126,000.00	20,000.00	63,000.00	10,000.00	88,200.00	14,000.00	163,800.00	26,000.00
<b>Sub total</b>	<b>72,635,715.00</b>	<b>11,529,478.57</b>		7,263,571.50	1,152,947.86	3,631,785.75	576,473.93	5,084,500.05	807,063.50	9,442,642.95	1,498,832.21

**9.9 To provide for the Pretreatment, collection, storage, transportation and final disposal of HCW**

Sensitizing of Contractors in Health Care Waste Collection	140,000.00	22,222.22	GRZ	14,000.00	2,222.22	7,000.00	1,111.11	9,800.00	1,555.56	18,200.00	2,888.89
Conduct technical support to health facilities in HCWM	800,000.00	126,984.13	GRZ	80,000.00	12,698.41	40,000.00	6,349.21	56,000.00	8,888.89	104,000.00	16,507.94
<b>Sub total</b>	<b>940,000.00</b>	<b>149,206.35</b>		94,000.00	14,920.63	47,000.00	7,460.32	65,800.00	10,444.44	122,200.00	19,396.83

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Southern and Muchinga Provinces

**9.10 To Create Community Awareness on acceptable Health Waste Management Practices**

Activity/Action	Cost ZMK Initial	Amount in \$	Source of funding	southern		Muchinga	
				ZMW	US\$	ZMW	US\$
Conducting quarterly collaborative meetings with line ministries and Stakeholders	800,000.00	126,984.13	GRZ	96,000.00	15,238.10	40,000.00	6,349.21
Training 10,000 health workers in HCWM country wide	30,000,000.00	4,761,904.76	GRZ	3,600,000.00	571,428.57	1,500,000.00	238,095.24
Training of 6000 general workers in health facilities involved in waste handling	18,000,000.00	2,857,142.86	GRZ	2,160,000.00	342,857.14	900,000.00	142,857.14
Training of 120 medical equipment officers in maintenance and servicing new HCWM equipment	3,240,000.00	514,285.71	GRZ	388,800.00	61,714.29	162,000.00	25,714.29
Orientating 120 Medical Equipment Technicians in new	3,600,000.00	571,428.57	GRZ	432,000.00	68,571.43	180,000.00	28,571.43

HCWM equipment							
Conducting Health Care Waste Risk Assessment annually	1,250,000.00	198,412.70	GRZ	150,000.00	23,809.52	62,500.00	9,920.63
Report writing for the assessment and publication	330,000.00	52,380.95	GRZ	39,600.00	6,285.71	16,500.00	2,619.05
Holding Provincial Quarterly HCWM Performance review meetings	1,700,000.00	269,841.27	GRZ	204,000.00	32,380.95	85,000.00	13,492.06
<b>Sub total</b>	<b>58,920,000.00</b>	<b>9,352,380.95</b>		7,070,400.00	1,122,285.71	2,946,000.00	467,619.05

9.11 To Procure and introduce alternative equipment and technologies for treatment of Health-Care Waste

Activity/Action	Cost ZMK	Amount in \$	Source of funding				
	Initial						
Procuring and installation of 106 incinerators with adequate capacity to handle Health Care Waste	31,800,000.00	5,047,619.05	GRZ	3,816,000.00	605,714.29	1,590,000.00	252,380.95
Capacity building for incinerator operators in maintenance and servicing	3,472,000.00	551,111.11	GRZ	416,640.00	66,133.33	173,600.00	27,555.56
<b>Sub total</b>	<b>35,272,000.00</b>	<b>5,598,730.16</b>		4,232,640.00	671,847.62	1,763,600.00	279,936.51

**9.13 To provide adequate Equipment, Tools and Infrastructure for HCWM**

Procuring approved equipment and Tools such as Trolleys, Wheel bins, Waste bins, Bin liners, Weighing Scales,	29,935,715.00	4,751,700.79	GRZ	3,592,285.80	570,204.10	1,496,785.75	237,585.04
Air monitoring equipment, Personal Protective Equipment and Hand tools				-	-	-	-
Construction of 838 incinerators in health facilities where they are non existing.	33,540,000.00	5,323,809.52	GRZ	4,024,800.00	638,857.14	1,677,000.00	266,190.48
Procurement and installation of 50 generators for 3rd, 2nd and 1st level hospitals including big HCs	12,500,000.00	1,984,126.98		1,500,000.00	238,095.24	625,000.00	99,206.35
Construction of 50 Generator shelters	500,000.00	79,365.08		60,000.00	9,523.81	25,000.00	3,968.25
Repair and servicing of generators	300,000.00	47,619.05		36,000.00	5,714.29	15,000.00	2,380.95
Procuring 15 Digital X-ray units	3,000,000.00	476,190.48	GRZ	360,000.00	57,142.86	150,000.00	23,809.52
Procuring 200 Hand held Thermo Scanners (Thermometers)	1,260,000.00	200,000.00		151,200.00	24,000.00	63,000.00	10,000.00
<b>Sub total</b>	<b>72,635,715.00</b>	<b>11,529,478.57</b>		<b>8,716,285.80</b>	<b>1,383,537.43</b>	<b>3,631,785.75</b>	<b>576,473.93</b>

**9.14 To provide for the Pretreatment, collection, storage, transportation and final disposal of HCW**

Sensitizing of Contractors in Health Care Waste Collection	140,000.00	22,222.22	GRZ	16,800.00	2,666.67	7,000.00	1,111.11
Conduct technical support to health facilities in HCWM	800,000.00	126,984.13	GRZ	96,000.00	15,238.10	40,000.00	6,349.21
<b>Sub total</b>	<b>940,000.00</b>	<b>149,206.35</b>		<b>112,800.00</b>	<b>17,904.76</b>	<b>47,000.00</b>	<b>7,460.32</b>

## Annex 11: Color coding guide

Waste type	Types of waste	Colour code	Type of receptacles
A	General waste	Black	Plastic bag of appropriate size
B	<b>Infectious Waste</b>		
B1	Sharps	yellow	Puncture-resistant containers plastics bags
B2	Patient waste	yellow	Plastic bags and containers
B3	Culture /specimen	Yellow	Plastic bags and containers
C	Pathological /organic Human Tissues	Yellow	Plastic bags
D1	Pharmaceutical waste	Brown	Plastic bags and containers
D2	Photographic Chemical waste <ul style="list-style-type: none"> <li>• Photographic developer</li> <li>• Fixer solution</li> <li>• X-ray photographic film</li> </ul>	Brown	<ul style="list-style-type: none"> <li>➤ Plastics containers</li> <li>➤ To be recycled /reused</li> <li>➤ To be neutralized</li> </ul>
D3	Radioactive waste	Yellow	<ul style="list-style-type: none"> <li>➤ Containers with radio- active symbol</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Solid – combustible /compact able</li> </ul>		<ul style="list-style-type: none"> <li>➤ Durable plastic bags which can be sealed</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Noncombustible /non- compactable</li> </ul>		<ul style="list-style-type: none"> <li>➤ Puncture-resistant containers (metal)</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Liquid –aqueous</li> </ul>		<ul style="list-style-type: none"> <li>➤ Thick walled polythene bottles or organic-glass containers but should have secondary containers to prevent them from breaking</li> </ul>
	<ul style="list-style-type: none"> <li>➤ Spent sealed sources</li> </ul>		<ul style="list-style-type: none"> <li>➤ Container in which the sources was originally received.</li> </ul>
D4	<b>Laboratory waste</b>	Brown	<ul style="list-style-type: none"> <li>➤ Containers with appropriate labels</li> </ul>
D4.1	<ul style="list-style-type: none"> <li>➤ Acids</li> </ul>		<ul style="list-style-type: none"> <li>➤ Acid label</li> </ul>
D4.2	<ul style="list-style-type: none"> <li>➤ Alkalis</li> </ul>		<ul style="list-style-type: none"> <li>➤ Acid label</li> </ul>

D4.3	➤ Solvents		➤ Solvent label
D4.4	➤ Organic substances		➤ Organic substances label
D4.5	➤ Heavy metal (e.g. mercury )		➤ Heavy metal label
E	➤ Incinerator Ash/Sludge	Yellow	➤ Metal containers labeled “sludge” “ash”

## Annex 12: Minimum specifications for HCW incinerators

Item	Specifications
Location of incinerator.	At least 30-60m from nearest infrastructure
Manufacturers rated capacity of incinerator (kg/hr)	As specified by manufacturer
Model of incinerator.	As specified by ZEMA
Height of incinerator stack.	As specified by ZEMA
Temperatures.	As appropriate to the model
Waste destruction efficiency	As specified by ZEMA
Restriction of accessibility to the area.	As appropriate to the model and operating instruction
Personal Protective Equipment for workers.	As specified by ZEMA
Planned Preventive Maintenance schedule.	As specified by manufacturer
Availability of trained incinerator operator	As specified by manufacturer

### Annex 13: National HCWM policy schedule of development

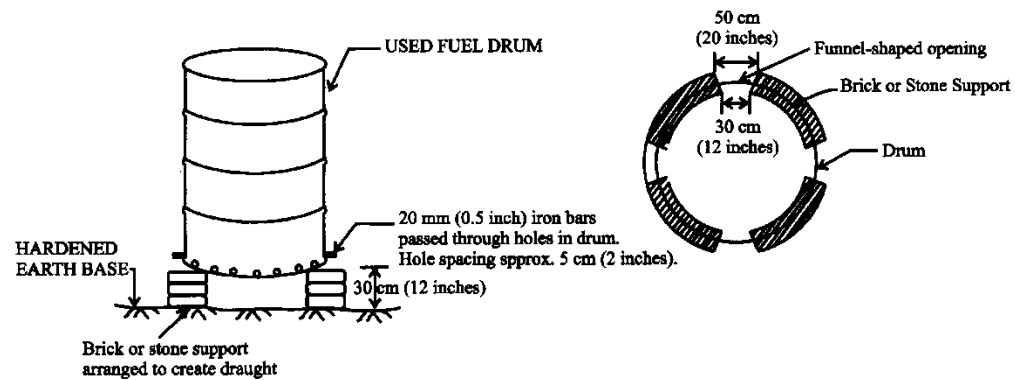
No	ACTIVITY	PURPOSE	RESPONSIBLE ORGANISATION	Time frame
1	Hold a consultative meeting with all stakeholders involved in HCWM	Formulate the thematic areas for the Policy and provide the course of action	MoH/ MCDMCH	2 <sup>th</sup> quarter 2015
2	Hold a meeting with health professionals and HCWM stake holders	To make a draft plan of the policy with the earlier thematic areas suggested	MoH/MCDMCH	2 <sup>nd</sup> quarter 2015
3	Submission of the draft document to legal competent persons	In put the legal components that should allow for the draft policy be ready for presentation to approving authorities	Ministry of Justice	3 <sup>rd</sup> quarter 2015
4	Presentation of the draft policy to the stakeholders	Review the content documents and comments	MoH	3 <sup>rd</sup> quarter 2015
5	Submission of policy to Permanent secretaries responsible and onward submission to the approving body	Study the document for onward submission to approving Authorities	MoH/ MCDMCH, MoJ, Min of Agric and live stock, Min of Energy, Environ & natural resources	3 <sup>rd</sup> quarter 2015
6	After approval, derive guidelines for its implementation and operationalize it	National Provincial District/ Facility level trainings	MoH	4 <sup>rd</sup> quarter 2015



Annex 14: Technologies options

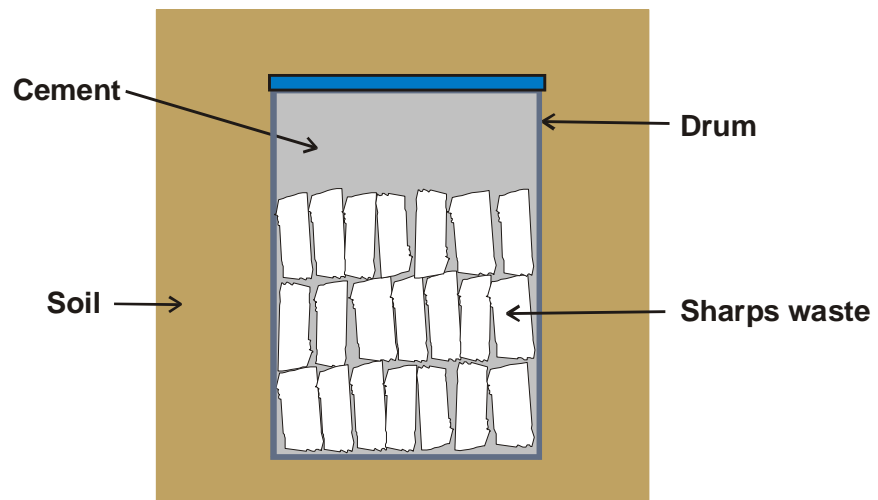


Brick incinerator (Source: ECZ, 2005)



Source: SEARO/WHO 1988.

## Design of simple used fuel drum incinerator



**Encapsulation with immobilizing material (ECZ 2005)**