



Republic of Mozambique

Ministry of Health



TB Infections Control and Waste Management Plan

For Mozambique

March 2016

TABLE OF CONTENTS

TABLE OF CONTENTS.....	i
LIST OF FIGURES.....	ii
LIST OF TEXT TABLES.....	3
ABBREVIATIONS AND ACRONYMS.....	4
EXECUTIVE SUMMARY.....	6
1. INTRODUCTION AND PROJECT OBJECTIVES.....	9
1.1 PROJECT DESIGN CONSIDERATIONS.....	9
1.2 PROJECT STRUCTURE.....	10
1.2.1 Component 1:.....	10
1.2.2 Component 2:.....	10
1.2.3 Component 3:.....	11
2. BASELINE INFORMATION.....	12
2.1 GLOBAL AND REGIONAL STATUS OF TB.....	12
2.2 STATUS OF TUBERCULOSIS IN MOZAMBIQUE.....	12
3. CONTEXT OF THE HCWM PLAN.....	14
3.1 INTRODUCTION.....	14
3.2 THE CONSTITUTION.....	14
3.3 LEGAL FRAMEWORK.....	14
3.3.1 The Environmental Law No. 20/97, of October 1:.....	14
3.3.2 Law on the protection of employees with HIV/AIDS.....	14
3.4 REGULATIONS.....	14
3.4.1 Environmental Impact Assessment Regulation.....	14
3.4.2 Further environmental regulations and standards.....	14
3.4.3 Regulations on hospital waste.....	15
3.5 POLICIES.....	15
3.5.1 National TB Infection Control Policy and Plan.....	15
3.6 PROGRAMS.....	16
3.6.1 National TB Control Program.....	16
3.6.2 Infections Control Program (PCI).....	16
3.7 GUIDELINES.....	16
3.7.1 TB skin smear test manual (2012).....	16
3.7.2 Resistant and Multi-Drug Resistant TB Diagnosis and Treatment Manual (2009).....	17
3.7.3 Guidelines on Health and Safety at Work Places.....	17
3.8 INFECTION CONTROL PROGRAM (ICP).....	17
3.9 INSTITUTIONAL FRAMEWORK.....	17
3.9.1 Responsibilities and authorities at the national level.....	17
4. THE INFECTION CONTROL AND WASTE MANAGEMENT PLAN (ICWMP).....	19
4.1 MAJOR OBJECTIVES OF THE ICWMP.....	19
4.2 THE ICWMP ACTION PLAN.....	26
4.3 SUMMARY OF COSTS.....	35
5. BUDGET FOR THE ICWMP.....	36



5.1	INTRODUCTION	36
5.2	ESTIMATED COST OF IMPLEMENTING THE ICWMP	36
5.3	MoH CONTRIBUTION TO THE IMPLEMENTATION OF THE ICWMP	Error!
	Bookmark not defined.	
5.4	CONTRIBUTION FROM World Bank PROJECT.....	Error! Bookmark not defined.
5.5	CONTRIBUTIONS FROM OTHER SOURCES/PARTNERS	Error! Bookmark not defined.
5.6	PROJECT FUNDING SUMMARY.....	37
6.	ICWMP IMPLEMENTATION MODALITIES.....	39
6.1	INSTITUTIONAL FRAMEWORK	39
6.2	RESPONSIBILITIES	39
6.3	INSTITUTIONAL ARRANGEMENTS FOR ICWM IMPLEMENTATION	40
6.4	IMPLEMENTATION TIMEFRAME.....	44
6.5	POTENTIAL PARTNERS AND FIELD OF INTERVENTION	44
6.6	INVOLVEMENT OF PRIVATE COMPANIES IN ICWM	45
7.	HANDLING HEALTH CARE WASTE STREAMS.....	46
7.1	RECOMMENDED SYSTEM FOR HANDLING WASTE	46
7.2	SUMMARY OF THE WASTE HANDLING SYSTEM.....	50
8.	TREATMENT OPTIONS FOR EACH TYPE (LEVEL) OF HEALTH UNIT	53
8.1	INTRODUCTION	53
8.2	PRIMARY LEVEL	53
8.3	SECONDARY LEVEL	54
8.4	TERTIARY LEVEL.....	54
8.5	QUARTEINARY LEVEL.....	55
9.	THE MONITORING PLAN	56
9.1	PRINCIPLE AND OBJECTIVE.....	56
9.2	METHODOLOGY.....	56
9.3	MEASURABLE INDICATORS.....	57
	REFERENCES	58
	ANNEXES	59
	Annex 1 National Response to Tuberculosis	59
	Annex 2 Prevention and control best practices	60
	Annex 3 Hospital Waste Management in Mozambique	68
	Annex 4 Tuberculosis treatment laboratory waste.....	81
	Annex 5 MODEL OF “WHO” INCINERATOR MADE WITH LOCAL MATERIALS	83
	Annex 6 CONCRETE LINED PIT - HOME BASED CARE WASTE DISPOSAL	84
	Annex 7 CONCRETE LINED PIT - SHARPS AND INFECTIOUS DISPOSAL.....	85

LIST OF FIGURES

Figure 7-1	Temporary storage for waste	48
Figure 7-2	Example of a centralized storage.....	49
Figure 7-3	Example of a hazardous waste transportation vehicle.	49

LIST OF TEXT TABLES

Table 3-1	Responsibilities of the national and provincial levels as for TB IC	18
Table 3-2	Responsibilities of Health Units.....	18
Table 4-1	ICWMP ACTION PLAN - LEGAL	26
Table 4-2	ICWMP ACTION PLAN - INSTITUTIONAL ARRANGEMENTS.....	27
Table 4-3	ICWMP ACTION PLAN - SITUATION ANALYSIS AND IMPROVEMENT.....	29
Table 4-4	ICWMP ACTION PLAN - TRAINING AND GENERAL PUBLIC AWARENESS.	31
Table 4-5	ICWMP ACTION PLAN - PRIVATE SECTOR PARTICIPATION	33
Table 4-6	ICWMP ACTION PLAN - FINANCIAL AND OPERATIONAL ISSUES.....	34
Table 4-7	Summary of costs.....	35
Table 5-1	Implementation costs of the ICWMP.....	36
Table 5-2	Annual costs of the ICWMP implementation	37
Table 5-3	MHSW Contribution to the Implementation of the ICWMP Error! Bookmark not defined.	
Table 5-4	Contribution From World Bank Project	Error! Bookmark not defined.
Table 5-5	Contributions from Other Sources/Partners	Error! Bookmark not defined.
Table 5-6	Project funding summary	37
Table 6-1	Implementation Responsibilities by Component.....	42
Table 6-2	Implementation Timetable	44
Table 6-3	Potential field of intervention.....	45
Table 7-1	Categories, Labelling And Containers For Health Care Waste.....	47
Table 7-2	Treatment And Disposal Methods	50
Table 7-3	Summary on how to improve HCW handling	52
Table 8-1	Primary level.....	53
Table 8-2	Secondary Level.....	54
Table 8-3	Tertiary level.....	54
Table 8-4	Quaternary level.....	55
Table 9-1	Implementation Plan for M&E.....	56

ABBREVIATIONS AND ACRONYMS

3R's	Reduce, Reuse and Recycle
AFB	Acid-Fast Bacillus
AIDS	Acquired Immuno-Deficiency Syndrome
BK	Bacillus of Koch, it refers to the <i>Mycobacterium tuberculosis</i> , or to the skin smear test for its detection
CBO	Community Based Organization
CDC	Centres for Disease Control and Prevention
CI TB	TB Infection Control
DDSs	District Directorates of Health
DNAM	National Department of Medical Assistance to the MoH
DPSs	Provincial Directorate of Health
EHD	Environmental Health Department
EHS	Environmental Health Services
EmONC	Emergency Obstetric and Neonatal Care
GAVI	Global Alliance for Vaccine Initiatives
GDP	Gross Domestic Product
HCF	Health Care Facility
HCGW	Health Care General Waste
HCRW	healthcare Risk Waste
HCW	Health Care Waste
HCWM	Health Care Waste Management
HCWMP	Health Care Waste Management Plan
HDI	Human Development Index.
HepB	Hepatitis B
HepC	Hepatitis C
HIV	Human Immunodeficiency Virus
HSSP	Health Sector Strategic Plan
HU (s)	Health Unit
HW	Health Worker
ICWM	Infection Control and Waste Management
ICWMP	Infection Control and Waste Management Plan
IMR	Infant Mortality Rate
IPT	Isoniazid Preventive Therapy
IUATLD	International Union Against Tuberculosis and Lung Diseases.
JPhiego	John Hopkins
LG	Local Government
M&E	Monitoring and Evaluation
MDG	Millennium Development Goals
MDR-TB	Multi-Drug Resistant TB
MITADER	Ministry of Land, Environment and Rural Development (Ministério da Terra, Ambiente e Desenvolvimento Rural)
MMR	Maternal Mortality Rate
MoH	Ministry of Health (Ministério da Saúde)
NCDs	Non-Communicable Diseases
NGO	Non-Governmental Organization
NTCP	National TB Control Program

PCI	National Infections Control Program (DNAM/MoH)
PIU	Project Implementation Unit
PLHS	People Living with HIV/AIDS
PNC ITS/ HIV/SIDA	National STI/HIV/AIDS Control Program
POA	Plan of Action
SOPs	Standard Operating Procedures
STC	Short Term Consultant
STI	Sexually Transmitted Infections
TB	Tuberculosis
WHO	World Health Organisation
XDR-TB	Extremely Drug Resistant TB

EXECUTIVE SUMMARY

The Southern Africa sub-region has one of the highest rates of tuberculosis (TB) in the continent, and it has been the epicenter of the global HIV/AIDS epidemic, with high rates of TB/HIV co-infections. The sub-region informal cross-border trade represents a key source of livelihood for the populations in this area, and it has been contributing to the spread of infectious diseases (e.g., cholera, hemorrhagic fevers).

While the historic labour migrations to the sub-regional mines in South Africa have been generating economic opportunities, they have also aggravated the efforts to control communicable diseases, particularly TB and HIV/AIDS. The high rates of TB in South Africa's mines (3,000-7,000 per 100,000) place the mine workers among the region's most vulnerable groups to TB infection. The unprecedented growth of TB cases in Southern Africa was largely triggered by the HIV epidemic. Historically, mining has been associated with some of the higher rates of TB incidence.

The Southern Africa Development Community (SADC), aware of the importance of the mining industry in the region, launched the Mining Protocol in September 1997. The Protocol aims at developing the region's mineral resources through international collaboration with a view to improve living standards of those working in the industry. SADC Health Policy promotes the regional collaboration in drugs and control of communicable diseases.

In order to support the African Union's New Partnership for Africa's Development (NEPAD), SADC and other international and regional organisations' programs on the TB epidemic, the World Bank has undertaken to support the Southern Africa Health Systems and TB Project which will, in the first phase, cover four countries, namely Mozambique, Zambia, Malawi and Lesotho. The Project overarching objective is to: (i) augment the use of key methods of TB and other occupational lung diseases control, and (ii) strengthen the sub-region capacity to address such conditions.

The advent of the Tuberculosis and Health Systems Support Project has necessitated the review of the current instruments and the development of the Infection Control and Waste Management Plan (ICWMP) for Mozambique. The plan brings in the holistic approach to Health Care Waste Management (HCWM) to embrace the legal and institutional aspects and to involve all the appropriate stakeholders in the sector.

This report elaborates the current status of HCWM in Mozambique, assesses the gaps in technology and information and explores options for solutions. The resultant ICWMP sets out the requisite playing field for an effective HCWM programme, starting with a clear legal and institutional framework, appropriate technology, empowered workforce and an enlightened public.

The ICWMP has been crafted in such a way as to initiate a process and support the national response to the shortcomings in HCWM in the country. It focuses on preventive measures, and mainly the initiatives to be taken in order to reduce the health and environmental risks associated with mismanaged waste. It also focuses on the positive pro-active actions, which, in the long term, will foster a change of behaviour, sustainable Infection Control and Waste Management (ICWM), and protection of actors against risks of infection.

The objectives around which the ICWMP is organized are: (i) to reinforce the national legal framework for ICWM, (ii) to improve the institutional framework for ICWM, (iii) to assess the ICWM situation, propose options for health care facilities and improve the ICWM in health care facilities, (iv) to conduct awareness campaigns for the communities and provide training for all actors involved in ICWM, (v) to support private initiatives and partnership in ICWM, and (vi) to develop and operationalize specific financial resources to cover the costs of the management of healthcare wastes.

These actions should be accompanied by complementary measures, mainly initiated by governmental programs, in terms of **ICWM** upgrading in health facilities. **The estimated cost of implementing the ICWMP and enhancing this process of proper handling, disposal and management of medical waste is US\$ 654,000.** The Ministry of Health (MoH), the World Bank project and other development partners will cover the estimated costs of implementation for the ICWMP. The project will cover the cost of training and general public awareness (US\$300,000), Thus MoH will require external support from other developing partners to be able to implement the ICWMP effectively.

The cornerstone of the management of waste is that it must be **consistent** from the point of generation “cradle” to the point of final disposal “grave”, following a defined waste stream that is standard and acceptable. The relative risk approach was used in determining the treatment systems and technologies to be used at each Health Care Facility (HCF). The criteria for deciding on the system are that it protects in the best way possible, healthcare workers and the community as well as minimize adverse impacts on the environment. The use of a burial pit or a small-scale incinerator, although clearly not the best solution, is much better than uncontrolled dumping. The following recommendations were drawn:

- Modern pyrolytic incinerators at Referral Hospitals, District Hospitals, other Hospitals, and the Local Authorities, because of its fairly low cost and operating skills requirements;
- Local incinerators (built with local material) in Health Centres, Private Health Centres and other Public Health Units because of its very low cost and small quantities of Health Care Waste (HCW) produced in these facilities;
- Stabilized concrete lined pits in Health Centres, other Public Health Units and for home based care, because of very low HCW production.

The handling of the final incineration residues is also very important and it was recommended that in big cities incineration residues be disposed of at the public municipal landfills. At District and local level, the remaining wastes can be buried within the premises or in lined pits, away from patient treatment areas.

The implementation schedule of the ICWMP is over a five year period and the lead agent, the Environmental Health Department of the MoH will coordinate the implementation and apply a multi-stakeholder approach to embrace all the relevant players that include the Ministry of Land, Environment and Rural Development (MITADER), Local Authorities, the Veterinary Department, NGOs, and other private players.

Above all, the ICWMP emphasizes on monitoring and evaluation of the system. The monitoring of ICWM is part of the overall quality management system. To measure the efficiency of the ICWMP, as far as the reduction of infections is concerned; activities should be monitored and evaluated, in collaboration with concerned institutions: MoH, MITADER,

Local Authorities, NGOs, etc. This can only be possible if it becomes mandatory to keep records of ICWM at all institutions and then maintain a reporting system of the same.

1. INTRODUCTION AND PROJECT OBJECTIVES

In March 2014, four countries in SADC, Lesotho, Mozambique, South Africa and Swaziland, were the first to adopt a regional framework for a harmonised management of tuberculosis (TB) in the mining sector within the scope of the Mining Protocol of September 1997. The framework seeks to introduce common clinical standards and processes. In order to support the framework, the SADC Ministers of Health approved a TB Code of Conduct in October 2014.

The proposed project is an investment that is necessary to strengthen the implementation of the End TB Strategy, a strategy that emphasises the controlling measures and targets to directly address the social protection and TB epidemic.

The Government is cognisant of the effects of the environment on the socioeconomic growth and development including health. Environmental health and safety is an important determinant of health outcomes and still remains a major challenge for the Ministry of Health (MoH) and partners. Hence one of MoH's policy drives is to reduce the frequency of environmental health and safety related diseases/conditions. This will be achieved through enforcement of environmental health related Acts, and instituting proper management of solid, liquid and gaseous wastes.

As part of this main component, the proper management of all health care waste is of prime importance, thus the development of this Infection Control and Management Plan (ICWMP) for Mozambique.

The ICWMP then brings in the holistic approach to Health Care Waste Management (HCWM) to embrace the legal and institutional aspects and to involve all the appropriate stakeholders in the sector. Such a plan is necessary in order to prevent and mitigate the environmental and health impacts of health care waste on health care staff and the general public.

The objective of this report is to elaborate procedures for Infection Control and Management (ICWM) to be appropriately assessed, with clear institutional arrangements for proper implementation.

1.1 PROJECT DESIGN CONSIDERATIONS

The broad design considerations for the project includes three mutually reinforcing components which will assist Mozambique on its part, to mount an effective response to the burden of TB, with emphasis on TB in the mining sector. The project will apply the following approaches:

- (i) Using a phased project implementation approach to enable the roll-out of the interventions gradually before going to full scale;
- (ii) Targeting the poor and vulnerable with evidence-based interventions via innovative service delivery strategies. The project will provide targeted interventions to underserved populations with a high burden of TB, using innovative delivery strategies;
- (iii) Strengthening TB and occupational health services as well as broader health systems. These include strengthening laboratory systems, skilled human resources and disease surveillance capacity, whose benefits cut-across health systems.

Implementation and coordination arrangements would be as simple as possible; performance-based with clear responsibilities and accountability; and strategies to encourage innovations and scaling up of successful interventions would be incorporated.

1.2 PROJECT STRUCTURE

The World Bank is financing the Southern Africa Tuberculosis and Health Systems Support Project (P155658). The project has a regional scope, involving four countries; Lesotho, Malawi, Mozambique, and Zambia. Mozambique will be supported by an amount of US\$ 45 million equivalent.

The project objectives will be achieved through the implementation of two technical components and one component dedicated to management, coordination and monitoring. It should be noted that **the first two technical components raise the principal safeguards issues associated with the project.** The three components of the project are outlined below:

1.2.1 Component 1:

INNOVATIVE PREVENTION, DETECTION AND TREATMENT OF TB SERVICES

The proposed activities will be derived from the National TB and Leprosy Programme strategic plan, with a vision of making Mozambique free of TB through the provision of quality TB prevention, diagnosis, treatment and care services with due attention to universal access, equity, affordability and gender mainstreaming. The overall goal is to reduce TB prevalence and mortality rates by 25% and 50% respectively relative to the 2012 rates. This component has the following sub-components:

Subcomponent 1.1: Harmonized Package of TB services

- 1.1.1 Points of Care/One Stop Shop services
- 1.1.2 Patient Referral System
- 1.1.3 TB control in correctional services
- 1.1.4 Decentralization of occupational health services
- 1.1.5 Provision of Nutritional support

1.2.2 Component 2:

STRENGTHEN REGIONAL CAPACITY FOR DISEASE SURVEILLANCE, DIAGNOSTICS AND MANAGEMENT OF TB AND OCCUPATIONAL LUNG DISEASES

This component will cover retaining experts and skills in Mozambique by improving the health care infrastructure and equipment and their general working conditions. It has the following sub-components:

Subcomponent 2.1: Human Resources for Health

- 2.1.1 Retain specialized expertise and skills to support MoH
- 2.1.2 Capacity building for surveillance and other public health events through short and long term training, mentoring, training institution capacitation
- 2.1.3 Capacity building on mine health and safety

Subcomponent 2.2: Disease Surveillance

- 2.2.1 Support the TB prevalence survey
- 2.2.2 Purchase information and communications technologies, and software programmes for use to strengthen cross border disease surveillance

Subcomponent 2.3: Strengthen Diagnostic Capacity

- 2.3.1 Strengthen laboratory information systems and networking
- 2.3.2 Procure diagnostic technology for TB and TB/HIV
- 2.3.3 Upgrade laboratories (physical)
- 2.3.4 Laboratory supplies
- 2.3.5 Biomedical waste management

Subcomponent 2.4: Strengthen Regulatory Capacity

- 2.4.1 Mapping of the local mining landscape using geomapping tools
- 2.4.2 Develop guidelines for mine health inspection, occupational health and compensation systems
- 2.4.3 Procurement of dust monitoring equipment

1.2.3 Component 3:

STRENGTHEN LEARNING, KNOWLEDGE AND INNOVATION

This component would establish effective programme management and administrative systems, ensuring coordination between the programme and other initiatives and national institutions in the sector. The proposed structure would include the following sub-components:

Subcomponent 3.1: Project Management and implementation, monitoring and evaluation

- 3.1.1 Staff salaries for running the Project Implementation Unit (PIU) (project coordinator, financial management specialist, procurement specialist and Monitoring and Evaluation (M&E) specialist)
- 3.1.2 Support for operations of the PIU
- 3.1.3 Training on financial management, procurement and risk based auditing
- 3.1.4 Attendance at regional meetings
- 3.1.5 Support the M&E systems (project M&E and NTP M&E)
- 3.1.6 Annual level joint review – National
- 3.1.7 National steering committee – training and meetings

Subcomponent 3.2: Support evidence based policy analysis and health financing innovations

- 3.2.1 Operations research
- 3.2.2 Monitoring and evaluation
- 3.2.3 Policy analysis and advocacy (Chiefs, research organizations, CSOs, NGOs, FBOs, traditional healers, private sector, social partners)

Subcomponent 3.3: Innovation – Centres of Excellence

- 3.3.1 Operation screening of all members of households for TB

2. BASELINE INFORMATION

2.1 GLOBAL AND REGIONAL STATUS OF TB

According to the WHO global report 2014 the TB and Multidrug Resistant TB (MDR-TB) are still the most fatal contagious diseases in the world. 6.1 million of TB cases were notified to WHO, and out of this figure, 5.7 million were recently diagnosed, and 0.4 million represents those who were under treatment. The countries with the highest number of cases are India, China, Russian Federation, the Republic of South Africa and Bangladesh.

In the Southern African Region has one of the highest rates of TB in the continent and it has been the epicenter of the HIV/AIDS global epidemic, with higher TB/HIV co-infection rates. Approximately 1/3 of the 22 countries with high TB rate are in the Southern Africa region, and the majority of the sub-region countries are above the WHO threshold for a TB emergency (250 cases per 100,000). Eight out of 14 countries in the world with higher TB incidence (at least 400 cases per 100,000) are found in Southern Africa.

The unprecedented increase of TB cases in the region is largely linked to the HIV epidemic and historically the mining sector has been associated with some of the highest rates of TB incidence. In the region's countries where mining is key (South Africa, Zambia), the TB incidence is 3-7 times higher among mine workers and ex-mine workers than the population in general. In the sub-Saharan region, 33% of the new TB cases are attributed to mining. Other areas that either contribute or are highly affected are: the regional transport corridors, the mining and peri-mining areas, cross-border areas and the mining labour sending communities.

2.2 STATUS OF TUBERCULOSIS IN MOZAMBIQUE

In 2013, Mozambique attained gains in the fight against tuberculosis that resulted in the improvement of the detection and notification of new cases, as well as improvement of treatment results, whose success rate was above 85 per cent of that recommended by the World Health Organisation (WHO) for 2015. In the same spectrum, it was possible to improve the quality of life of the TB/HIV co-infected patients through a coverage of more than 70 per cent in anti-retroviral treatment (ARVT).

However, the complexity of challenges still has an impact on the national response TB, with major emphasis on the interaction of TB and HIV, and the emergence of strains that are resistant to the anti-TB drugs as the most important. In the country, the rate of incidence of TB (2014) was estimated at 552 cases in every 100,000 inhabitants and the prevalence is estimated at 553 in every 100,000 inhabitants.

TB and HIV co-infection in Mozambique is estimated at 60 percent of all TB cases; in the pediatric group co-infection is estimated at 15 percent. Drug resistant cases are 11 percent of all TB infections.

Mozambique did not achieve the Millennium Development Goals (MDGs) that envisage that, by 2015, the TB prevalence would decrease from 298 cases to 149 cases per every 100,000 inhabitants, and mortality would decrease from 36 people to 18 per 100,000.

The reality poses the need to identify (detect and notify) lost cases, expedite the response to TB/HIV, strengthen the response to resistant tuberculosis, increase the domestic and donor funding, among other priority actions.

In the first semester of 2014, the Health Authorities recorded 23,000 new infections, but there was a slight reduction compared to the same period in the previous year. The Provinces of Maputo (including Maputo City), Gaza and Sofala are registering the majority of patients. Every year, at least seven percent of the people with TB infection die due to seeking treatment at the health unit at the later stages of illness.

TB is known as a disease whose control depends on social, economic and environmental interventions. A problem that concerns the authorities is related to the fact that about four percent out of 53,000 thousand patients registered annually (including those who suffer from AIDS) quit the therapy due to its side-effects, the relatively long period that it takes, the long distances to a health facilities and to lack of knowledge as regards the symptoms of the disease by the majority of the population.

With the project implementation, there will be the need to deal with the activities in a way to avoid or mitigate possible risks, since the expectation is to increase the cases. Therefore, there is a need to develop an Environmental and Social Management Plan as well as the Infection Control and Waste Management Plan. The Infections Control and Solid Waste Management Plan is to strengthen and consolidate the National Policy and Plan for TB Infectious Control in Health Units and in conglomerate environments in Mozambique.

This will facilitate the implementation of adequate practices of infections control and waste management, which include the appropriate use of individual protection equipment as well as collection of waste, storing, treatment and disposal, to avoid environmental infection and pollution. Specifically, this plan aims to 1) develop Standard Operating Procedures and Waste Management Plans for laboratories based on a rapid situational assessment and 2) review and update the documentation relative to the waste management plans at the health units under the health projects funded by the World Bank.

The TB transmission risk magnitude differs from one institution to another and, in the same institution, from one environment to another. Protecting the health facilities and patients from infecting themselves with *Mycobacterium tuberculosis* in health care environments must be an activity that is part of the health facility infections control.

Some critical challenges for the control of TB in Mozambique include increasing the cases detection rate, strengthening of collaboration among the TB and the HIV/AIDS Programs, improvement of diagnosis and handling of TB cases/MDR/Extremely Drug Resistant (XDR) and the improvement of the Pediatric TB approach.

3. CONTEXT OF THE HCWM PLAN

3.1 INTRODUCTION

Various policies and strategies relevant to ICWM have been used to inform this ICWMP report. The following is a summary of some of the relevant policies and strategies.

3.2 THE CONSTITUTION

The Mozambican Constitution states that the Government shall promote initiatives to ensure the ecologic balance, the conservation and preservation of environment in order to guarantee a better quality of life for all citizens.

3.3 LEGAL FRAMEWORK

3.3.1 The Environmental Law No. 20/97, of October 1:

The Environmental Law was passed by Parliament on October 1, 1997. The Law establishes legal basis for the utilization and feasible management of the environment and its components with a view of establishing a sustainable development system in Mozambique. This law bans the storage or disposal of polluting toxic products in the soil, subsoil, waters and atmosphere.

3.3.2 Law on the protection of employees with HIV/AIDS, Decree No 19/2014 of August 27

This Law aims to set the rights and duties of people living with HIV/AIDS and ensures the measures necessary for their protection and treatment. It also sets the rights and responsibilities of the worker or a job candidate living with HIV/AIDS.

3.4 REGULATIONS

3.4.1 Environmental Impact Assessment Regulation

The Decree 54/2015 of December 31 revokes the Decree 45/2004 of September 29 on EIA process: This Decree focuses on the following issues: projects and sub-projects categorisation (A+, A, B, C); Competencies within the EIA; EIA Process; Initial Assessment; Assessment Criteria; Technical Assessment Committee (Members, operation, etc.). The main entity in this process is the National Directorate for Environment. MITADER oversees the compliance of the EIA during the project construction and implementation, as appropriate. However, it is still the project proponent's responsibility to ensure the compliance of the identified mitigation norms and measures. In this case and context of this project, the MoH is the main proponent who shall comply with the norms stated by the EIA.

3.4.2 Further environmental regulations and standards

Since one of the options for the treatment of biomedical waste is the use of incinerators, there's a responsibility to operate them below the values provided for in the legislation.

The following general norms on public works planning, construction and operation are also applicable to construction/rehabilitation or extension of the units comprised by project:

1. *Guidelines for drafting the District Land Use Plans resulting from the land use planning policy (Resolution No 18/2007).*
2. *General regulation on urban buildings (1961) - Ministry of Public Works and Housing.*
3. *Regulation on the environmental quality and waste disposal standards (Decree No 18/2004).*

3.4.3 Regulations on hospital waste

In 2002, Programa de Prestação de Serviços de Saúde. adopted the HCWM that was developed by the previous World Bank project for the support to the HIV/AIDS program, which specifies the steps that need to be taken in order to strengthen the national system for hospital waste management. However, new policy documents have been drafted since 2002 (and in line with the HCWM):

- *Regulation on biomedical waste management (2003) defines basic responsibilities (including the need for every health institution to draft a simple plan for hospital waste management), principles of waste selection, acceptable transport and disposal requirements as well as fines for breaches.*
- *Biomedical waste management standards and procedures in health facilities (2010), specific on further details to the norms on handling and treatment of contaminated waste, including the EPI that shall be available, and the minimum standards of waste storage areas. The document indicates that the health centres shall ideally include a simple incinerator that meets the specifications for the treatment of biomedical waste, as well as having, amongst others, two combustion chambers and achieve the temperatures appropriate to disinfect waste. It also allows for the installation in the rural areas of dully constructed and operated pits for disposal of modest quantities of hospital waste.*
- *National biomedical waste management plan (2010), it reviews the current weaknesses of the hospital waste management system based on the survey conducted in 2007, and it specifies a number of actions to be improved in general, while focusing on the provision of equipment and training, as well as monitory system strengthening.*

The environmental health department has the overall responsibility to coordinate the policies on hospital and biomedical waste management related issues in the MoH.

3.5 POLICIES

3.5.1 National TB Infection Control Policy and Plan for Health Units and Conglomerate Environments in Mozambique

The Plan plays a key role as it provides guidelines on the measures and activities to be implemented from the central to the lowest level, in order to reduce the risk of transmission of TB in the health units and conglomerate environments, and it was developed under the acknowledgement of the decision-makers that there is a need to address the control of TB infections as a priority, the need to use appropriate, simple and cheap controlling measures, as well as to strengthen their ongoing implementation, and that through that it is possible to

reduce the risk that both patients and health professions are faced with to acquire TB in the health services.

The plan is comprised of four major objectives:

- To establish the TB Infection Control in health units and in conglomerate environments as an issue of national emergency for Mozambique;
- To develop and improve the TB prevention and control measures that are in place at the Health Units of the National Health System in Mozambique;
- To control the transmission of the MDR-TB;
- To ensure that the Mozambican Health Units are safe and healthy environments, be it for the health workers, users, relatives or the population in general.

3.6 PROGRAMS

3.6.1 National TB Control Program

The National TB Control Program was developed shortly after independence. However, the partnerships began in the 1980s with the Norwegian financial support and with the technical assistance of the International Union Against Tuberculosis and Lung Diseases (IUATLD). Thus, Mozambique became one of the various countries to develop a modern international approach of TB control, the Directly Observed Treatment Strategy, and setting a regional and international benchmark in the TB services. Since the end of the 1970s, the country has recorded significant strides, for instance the declaration of TB as a National Emergency in 2006.

Due to the importance of TB control and the maintenance of safe environments in hospitals, the WHO (2009) recommended that every country should have a TB Infections Control Plan. This plan is established and coordinated by the NTCP (National TB Control Program) that will aggregate and strengthen the work conducted by the general plan for the control of infections in the area of TB.

3.6.2 Infections Control Program (PCI)

In Mozambique, the National Infections Control Program has been in place since 2004. The Program has led to intense work on capacity-building, technical assistance and evaluation of health units for the compliance of the basic norms of infections control followed. This program is the continuation of the bio-safety related activities in the Ministry. In the first phase, the program objective focused on infections prevention. In 2009, through a Ministerial Decree, it became a national program.

3.7 GUIDELINES

3.7.1 TB skin smear test manual (2012)

The manual was developed by the National TB Control Program – National Health Institute. It was drafted specifically with focus on the personnel working on laboratories, and specifically to the laboratories that conduct skin smear tests, in addition to addressing all samples management issues (collection, transport, preparation); technical skin smear test procedures, ways of TB transmission, biosafety issues (collection of samples, transport of

samples, and measures in the event of spills). However, it does not address issues on how to report issues resulting from the entire process, which is in the procedures.

3.7.2 Resistant and Multi-Drug Resistant TB Diagnosis and Treatment Manual (2009)

The manual was developed by the National TB Control Program at MoH. This manual underscores issues from diagnosis and handing of cases to measures to be takes so as to reduce the transmission of TB in the communities. Its main objective is to guide the physicians and other health professionals in the management of cases of resistant TB, from the lower to the central levels.

3.7.3 Guidelines on Health and Safety at Work Places

The Guidelines were developed by the national directorate of medical assistance, with technical assistance of Jhpiego and funded by the USAID. They aim at improving labour conditions, workers' conditions of health and safety, and serve as benchmark in the organisation of safety and health occupational activities as a priority function of health units, as well as facilitate dialogue and collaboration on health and safety at work places between the managers and health practitioners.

The guidelines follow the principles of risk management approaches to address occupational health and health risks. They address the rights and responsibilities of workers, and highlight the right to safe labour conditions, the right to non-discrimination, gender equality, as well as the obligation to follow safe practices, use of EPI, report dangers, accidents, etc.

The guidelines pays particular attention to: I) consider everyone (patients and personnel) as potentially infected and vulnerable to infections, II) wash your hands, III) use gloves, IV) use physical barriers, V) use anti-septic agents, VI) follow safe labour practices, VII) dispose infected and cutting material with safety, and VIII) process instruments, gloves and other materials after use.

3.8 INFECTION CONTROL PROGRAM (ICP)

Since 2004 MoH has been implementing activities to prevent and control infections in health facilities of different levels of national health care services, through the infections control program.

3.9 INSTITUTIONAL FRAMEWORK

3.9.1 Responsibilities and authorities at the national level in tuberculosis area

Health units (HU) of the National Health Service (NHS) are divided into Health Posts (HP) and Health Centres (HC), General Hospital (GH) and Rural (RH), Provincial Hospitals (PH), Central Hospitals (CH) and Specialised Hospitals. HP and HC are the primary network contact, and the GH and RH are the urban and rural secondary network, PH are the third

reference line, and the CH and specialised hospitals are the last line of the regional and national reference.

For the country health facilities to implement control measures properly, it is crucial that the national and provincial/district levels, namely the MoH, PDH and DDH ensure technical and management support needed.

In the tables below the group of actions, activities and measures of each level and the responsibilities and authority of the same are presented as follows.

Table 3-1 Responsibilities of the national and provincial levels as for TB Infection Control

1	Awareness, collaboration and coordination of stakeholders for TB IC
2	Development and dissemination of policies and National Technical Guidelines for TB IC
3	Planning, budgeting, allocation and Strategic Funds
4	Development of a national training strategy for TB IC
5	Performing an analysis of the National TB IC Situation
6	Including TB IC as part of health and safety initiative at the workplace
7	Involving Patients and the Community in the Dissemination and Awareness Campaign for TB IC.
8	Expanding TB IC for other conglomerate environments
9	Organising M&E strategy for TB IC

Table 3-2 Responsibilities of Health Units

1	Implementing TB IC practices in health facilities <ul style="list-style-type: none"> <input type="checkbox"/> Management Measures <input type="checkbox"/> Administrative Measures <input type="checkbox"/> Environmental measures including rehabilitation of facilities <input type="checkbox"/> Personal Respiratory Protective Measures
2	Accelerating TB laboratory diagnosis and treatment

4. THE INFECTION CONTROL AND WASTE MANAGEMENT PLAN (ICWMP)

4.1 OBJECTIVE OF THE ICWMP

The objective of this ICWMP is to develop standard operating procedures and Waste Management Plans. The ICWMP provides detailed steps that will ensure that Health Care Waste generated by the project is handled in an appropriate and safe manner, consistent with international good practices. The ICWMP is to be used by relevant stakeholders including health care facilities, or partner ministries. The recommendations have been developed using the best available sources of information, including the WHO and national guidelines or policies.

Implementation of the proposed project will result in increased laboratory waste generation (e.g. from sputum cups after service delivery), which will contribute to the strain on the already deficient laboratory waste management capacities. To mitigate this impact, one of the objectives of the ICWMP is to facilitate implementation of appropriate laboratory waste management practices (which include collection, storage, treatment and disposal practices) to avoid the spreading of infection and environmental pollution.

It is acknowledged that the current management of health care waste faces some key challenges, including:

- i. Inefficient waste treatment and disposal;
- ii. Insufficient financial resource allocation towards HCWM;
- iii. Inexistence of private agencies that deal with health-care waste collection and treatment;
- iv. Lack of internal regulations in health care facilities leading to poor practices of health-care workers and waste-handlers;
- v. Non-performing organizational structure and equipment within the health care system.

OBJECTIVE 1: REINFORCE THE NATIONAL LEGAL FRAMEWORK FOR ICWM

The legal framework needs to be improved. In particular, it is necessary to set up a legal regime that spells out the illegality of mismanaging HCW, legal requirements for all persons in the HCW field, including codes of practices and methods of enforcement of the requirements.

Strategy:

a) Creating, consolidating, reviewing and updating laws, bylaws and regulations related to ICWM

ICWM is currently weakly dealt with in various pieces of legislation and a thorough reviewing and consolidation is necessary to bring the whole legal basis for ICWM up to speed with the current developments in the country. The legal update should result in a law that includes the following: a clear definition of roles and responsibilities of such institutions as the MTEC, and MoH and the Municipalities, a clear and properly categorized definition of hazardous waste; detailed legal requirements for all persons who are producers, carriers, or who are engaged in the treatment and disposal of hazardous HCW so as to prevent

harm to human health or pollution of the environment; the methodologies for record keeping and reporting; a regulatory system for enforcing the law; the penalties applicable to offenders; and the designation of the law courts where cases will be tried.

The legal system must be laid out in such a way that at each Health Care Facility, the ICWM will be regulated as follows:

- The roles and responsibilities for ICWM will be defined;
- An internal HCW management plan is established and implemented;
- An office responsible for monitoring the ICWM plan is designated;
- The treatment system for the Facility is defined and known;
- Financial provision for ICWM in the health centers budget is scheduled and assured;
- Procedures of positive and negative sanctions for staff, according to their involvement in HCW management are adopted and implemented.

b) Development of technical guidelines for HCWM

The MoH must undertake to develop Health Care Waste Management Guidelines. This should be possible using the information gathered from the rapid assessment programme. The technical guidelines should be practical and directly applicable, and include the following specifications, with a sufficient degree of detail such as:

- i. Legal framework covering safe health-care waste management; hospital hygiene and occupational safety and health;
- ii. Limits on emissions of atmospheric, land and water resources pollutants and releases into water resources;
- iii. Responsibilities of health-care facilities, health-care waste producers, and public waste disposal agencies;
- iv. Safe practices for waste minimization;
- v. Segregation, handling, storage and transport practices of health-care waste; recommended treatment and disposal methods for each health-care waste category.

c) Establishing control procedures for HCW management within all institutions generating and handling HCW

Information about any activities at the Health Care Facilities is hard to come by due to lack of standard operating procedures (SOPs). This makes planning a very difficult process as no baseline data can be availed. The following can assist to bring about control and maintenance of records:

- Elaborate specific EIA guidelines for waste management, including HCW;
- Implement clear directives for health control agents;
- Set up a waste generation register for HCW quantities produced by health centers;
- Define the mechanisms of control in needles and sharps collection and disposal process;
- Organize regular monitoring by technical staff in District Health Offices.

OBJECTIVE 2: IMPROVE THE INSTITUTIONAL FRAMEWORK FOR ICWM

The institutional framework needs to be carefully worked on and improved. It is necessary to set up a structure to coordinate and to follow up the Plan of Action (POA) and to develop specific technical guidelines for the health centers in terms of definition of responsibilities and setting standards and norms for good ICWM practices (e.g., reduction, selection and separation at source), and procedures for storage, handling, transformation, treatment and disposal.

Strategy:

d) Defining and harmonizing the duties and responsibilities of each actor involved in ICWM process at all levels.

The various actors in ICWM are not sure of their parameters and limits to the extent that functions tend to overlap, causing confusion to the clients and at times leaving gaps as people will be unsure whose responsibility it would be. A roundtable of all the players is thus needed firstly to **sensitize them on the Rapid Assessment findings** and then agree on the roles and responsibilities of each player.

e) Establishing of taskforces/working Groups (coordination structures) on health care waste management at national level

This structure would include all the actors involved in ICWM (MoH, MTEC, NGOs, Local Authorities, Health facilities, etc.)

f) Facilitating the establishment of inter-sectoral taskforces/working groups and focal points at all operational levels

A similar structure to the national level structure must also be established at operational levels, i.e. a structure which includes all the actors involved in ICWM (MoH, MTEC, NGOs, Local Authorities, Health facilities, etc.)

g) Creating awareness and lobbying for support for the ICWM program

Generally HCW is treated as general waste and the risks associated with it are not taken into consideration. It is thus imperative that awareness levels be raised to acceptable levels and that support be garnered at all possible levels for this program to the extent of being included in national budgets

h) Conducting operational research and development related to ICWM

There are a lot of grey areas in the field of ICWM especially in the area of disposal. It would be worthwhile to at least support one operational research every year. This would go a long way in opening up a once dark and stigmatized field.

i) Developing of Monitoring and Evaluation plan

Implementation of ICWM plans needs to be monitored and evaluated in order to assess success of the program. **Monitoring and Evaluation** tools need to be developed and surveillance be undertaken.

OBJECTIVE 3:ASSESS THE ICWM SITUATION, IDENTIFY OPTIONS FOR HEALTH CARE FACILITIES AND IMPROVE THE ICWM IN HEALTH CARE FACILITIES

The Infection Control and waste management system implementation in the country is generally deteriorating, but the extent of deterioration **needs to be more thoroughly assessed (beyond what the rapid assessment did)** using a well stratified sample of all

the Health Care facilities in the country and then derive the best technical options for HCW segregation, collection, containment, storage, transportation, and disposal according to type of HCW and size and location of Health Care Facility.

The provision of infrastructure and equipment must be attached to strict directives and guidelines that must be adhered to in implementing the programme. A centralized approach in which major equipment is centralized at Municipalities or District Health Teams (DHTs), will help reduce the equipment requirements as the surrounding facilities can all use one set of treatment facility.

Strategy:

j) Carry out a National Inventory of Health Care Facilities to help establish the ICWM situation in the country.

A well-stratified sample of all the health care facilities in the country must be taken and assessed to ascertain the true picture of current status of ICWM.

k) Choosing the best technical options for HCW segregation, collection, containment, storage, transportation and disposal according to (a) type of HCW (b) the size and location of the HCF.

l) Implementing pilot projects.

Before full-scale implementation of the ICWMP is developed, it is advisable to carry out pilot programmes to test the feasibility of the proposed plans of action.

m) Providing infrastructure, materials and equipment to HCFs based on conditions on site.

Each Health care Facility requires a different approach to handling HCW. This must be assessed correctly and the best practicable option determined. This will be cost effective and will provide each institution with exactly what it needs:

- Supply the health facilities with collection and storage materials;
- Implement an efficient HCW treatment system (for example modern incinerators for Municipalities, DHTs, Central and Regional Hospitals; local incinerators in minor and major health centres);
- Install liquid waste treatment systems in health facilities (septic pits/tanks with a chemical disinfection system for the District hospitals, health centres; as for central and general hospitals, a physical and chemical treatment is recommended);
- Operate systematic HCW segregation procedures.

Note: The health centres should be supplied with specific containers for needles and other sharp objects. Already used empty bottles (flacons, mineral water bottles, etc.) could replace these boxes. Plastic containers for temporary storage should be supplied to health care rooms.

n) Ensure appropriate protection equipment to health staff

HCW handling is risky business and those involved in it must be properly protected. All necessary protective gears must be availed to them to protect them as they carry out their duties.

OBJECTIVE 4: TO CONDUCT AWARENESS CAMPAIGNS FOR THE COMMUNITIES AND PROVIDE TRAINING FOR ALL ACTORS INVOLVED IN ICWM

The general public is unaware of the risks associated with HCW and worse still when it is mixed with general waste which they target for scavenging. A serious awareness drive must be targeted at the general public to raise their awareness as they are in danger of handling infectious and toxic wastes unawares.

Awareness programs for the general public should mainly be aimed at scavengers, children playing on the landfills, population performing or receiving home health care, those using recycled objects, and people living near the landfills. NGOs and Community Based Organizations (CBOs) enjoying a large experience in community communication and health activities would be best suited to conduct them.

The staff members of Health Care Institutions also require training so that they can handle HCW appropriately in order not to expose themselves and the general public to infections.

Strategy:

o) Inform population of dangers linked with bad HCW management practices

- Messages on television (about dangers related to the handling of HCW);
- Radio messages (mainly in local languages);
- National awareness raising campaign (posters in health facilities, billboards, monthly public animation sessions in the Districts).

p) Inform population of dangers linked to scavenged HCW materials

- Messages on television (about dangers related to the handling of HCW);
- Radio messages (mainly in local languages);
- National awareness raising campaign (posters in health facilities, billboards, and fliers)

q) Inform home-based care givers / traditional healers of risks linked to improper HCW handling

For more detailed information on the target groups and content of the proposed public awareness programs.

r) Conducting awareness campaigns on proper handling of HCW

Properly structured and planned, targeted awareness campaigns need to be carried out to raise the level of awareness about risks associated with HCW, of all sections of the society to acceptable levels

s) Elaborate training programs and Train trainers

- Identify the training needs and the groups to be trained in the health facilities;
- Train trainers.

- Organising training programmes for all stakeholders involved in ICWM with special emphasis on medical and non medical staff

- a. Train health staff in health facilities, Municipal Technical Services providers and other stakeholders;
- b. Train waste handlers in health facilities (ward attendants, ground workers, cleaners, etc.).

c. It is recommended to update pedagogical references of training institutions in medicine, midwives, nurses and other health care training institutions by integrating ICWM issues in their pre-service training programs.

t) Evaluate training program implementation

HCW monitoring in health facilities should be carried out regularly, in order to improve waste management and to ensure that good practices are performed after training. Measures should be adopted to ensure that problems and risks involved are identified to enhance safety and preventing the development of future problems. Supervision should be in the following areas:

- i. Segregation,
- ii. Collection routines and labelling,
- iii. Internal treatment system,
- iv. Internal storage of HCW,
- v. Transportation,
- vi. Worker safety measures,
- vii. Disposal at sanitary landfill,

OBJECTIVE 5: SUPPORT PRIVATE INITIATIVES AND PARTNERSHIP IN ICWM

The private sector and other private individuals are currently not involved either in solid waste management or ICWM. Supporting the private sector to participate will be beneficial to the system as this will ensure injection of private sector funds into the system and introduce some business sense in the HCW arena.

Strategy:

u) Inform private companies of the business opportunities in solid waste management

Business is not aware of the potential that awaits it in this sector, which is currently clouded by none funding of the programmes. Once funding start flowing in that direction, private players will be attracted. Government must support and promote this side of things.

v) Develop sustainable financing mechanism for ICWM activities

Innovative means of developing sustainable financing mechanism for the sector must be sought, including attracting the banking sector and NGOs.

w) Set up framework and partnership between public sector and private sector in ICWM

Such a partnership will be beneficial to the sector as financing will become more available and the private sector will have the assurance of the support of the public sector in its endeavours.

OBJECTIVE 6: DEVELOP AND OPERATIONALISE SPECIFIC FINANCIAL RESOURCES TO COVER THE COSTS OF THE MANAGEMENT OF HEALTH-CARE WASTES

It is absolutely necessary to develop and operationalize specific financial resources to cover the cost of ICWM for the purposes of sustainability. This means having specific budget lines for health care waste management issues from national to local level as a mandatory requirement.

The execution of the plan then needs regular and sustained monitoring and evaluation. This will be done by establishing a reporting structure that has to be adhered to.

Strategy:

- 1. Developing specific budget lines for ICWM at all levels of the accountancy (from national to local).**
- 2. Lobby for prioritization and mandatory budgeting for ICWM.**
- 3. Mobilising financial resources for ICWM capital and running costs.**
Resources can be mobilized nationally by using such instruments as the polluter pays and the user pays principles
- 4. Identifying the appropriate institutions through which the recovery mechanism can be implemented.**
If business sense is brought into the field of ICWM and acceptable segregation practices are adhered to, appropriate institutions can be attracted to engage in recovery programmes.
- 5. Monthly operational control reports**
Regular reporting has to be institutionalized and formalized in all Health Care Institutions. This will assist in the regular monitoring and evaluation of the execution of the programme.
- 6. Mid-term evaluation (end of year 2)**
Regular evaluation will assist in the regular monitoring and assessment of the execution of the programme.
- 7. Final Evaluation (end year 5)**
There will be a final evaluation at the end of the five years.

4.2 THE ICWMP ACTION PLAN

Table 4-1 ICWMP ACTION PLAN - LEGAL

OBJECTIVE 1 : TO REINFORCE THE NATIONAL LEGAL FRAMEWORK FOR ICWM.											
Result 1: Enabling legal environment for ICWM available.											
Strategies	<ul style="list-style-type: none"> Developing a national policy for ICWM 										
	<ul style="list-style-type: none"> Creating, consolidating, reviewing and updating laws, bylaws and regulations related to ICWM 										
	<ul style="list-style-type: none"> Development of technical guidelines for ICWM 										
	<ul style="list-style-type: none"> Establishing control procedures for HCW management within all institutions generating and handling HCW 										Procedures in place
Activities	Indicators	Responsible Person	Time frame					Cost \$US			
			2014	2015	2016	2017	2018	UNIT	QNTY	UNIT COST USD	TOTAL COST USD
Analyse all existing laws, bylaws and regulations	-Number of review meetings held. -Number of HCW legal documents analysed.	Working Group	X	X	X	X					40,000
Develop regulations and bylaws clearly highlighting the different responsibilities at all levels relating to ICWM	-Availability of gazetted regulations and bylaws	Director Environmental Health	X	X	X						20,000
Establishing procedures and roles for controlling the flow/s of HCW and increasing the responsibilities of all stakeholders	-Standard Operating Procedures which define roles and responsibilities in place	Director Environmental Health	X	X	X						30,000
Develop the National Healthcare waste Management guidelines.	Final draft for the National guidelines.	Working Group	X	X							10,000
SUB - TOTAL											100,000

Table 4-2 ICWMP ACTION PLAN - INSTITUTIONAL ARRANGEMENTS

OBJECTIVE 2: TO IMPROVE THE INSTITUTIONAL FRAMEWORK FOR ICWM											
Result 2: Responsibilities, standards, and sanctions are clearly defined											
Strategies	<ul style="list-style-type: none"> Defining and harmonising the duties and responsibilities of each actor involved in ICWM process at all levels 										
	<ul style="list-style-type: none"> Establishing of Taskforces/Working Groups (coordination structures) on health care waste management at National level 										
	<ul style="list-style-type: none"> Facilitating the establishment of inter-sectoral taskforces/working groups and focal points at all operational levels 										
	<ul style="list-style-type: none"> Creating awareness and lobbying for support for the ICWM program 										
	<ul style="list-style-type: none"> Conducting operational research and development related to ICWM 										
	<ul style="list-style-type: none"> Developing of Monitoring and Evaluation plan 										
Activities	Indicators	Responsible Person	Time frame					Cost \$US			
			2014	2015	2016	2017	2018	UNIT	QNTY	UNIT COST USD	TOTAL COST USD
Organise a national workshop and give feedback on findings of the Rapid Assessment Survey and expected roles and responsibilities of different players	-National workshop held - Workshop report produced	Director Environmental Health	X								3,000
Cascade sensitization and formation of taskforces at operational levels	-Number workshops held -Number of taskforce committees formed	Director Environmental Health	X	X							2,000
Facilitating conduction of at least one operational research per year on ICWM	-Number of research proposals submitted and funded	All Focal Persons	X	X	X	X	X				10,000

	-Number of researches conducted										
Development of Monitoring and Evaluation tools for ICWM including establishment of a surveillance programme on accidents related to ICWM	-Availability of a surveillance system and baseline database on ICWM -Availability of M&E checklists	Working groups	X	X	X						5,000
Ensure ongoing and final evaluation and updating of the ICWMP as necessary.	-Updated ICWMP - M & E biannual reports	Director Environmental Health	X	X	X	X	X				5,000
SUB-TOTAL											25,000

Table 4-3 ICWMP ACTION PLAN - SITUATION ANALYSIS AND IMPROVEMENT

OBJECTIVE 3: TO ASSESS THE ICWM SITUATION, PROPOSE OPTIONS AND IMPROVE THE ICWM IN HEALTH CARE FACILITIES.											
Result 3: Appropriate options available for the different categories of Health care facilities and HCW collected and treated in a safe and secure way											
Strategies	<ul style="list-style-type: none"> Carrying out a National Inventory of Health Care Facilities {HCFs} to help establish the ICWM situation in the country. 										
	<ul style="list-style-type: none"> Choosing the best technical options for HCW segregation, collection, containment, storage, transportation and disposal according to (a) type of HCW (b) the size and location of the HCF. 										
	<ul style="list-style-type: none"> Implementing pilot projects before setting up the ICWMP. 										
	<ul style="list-style-type: none"> Providing infrastructure, materials and equipment to HCFs based on conditions on site. 										Number of equipment
	<ul style="list-style-type: none"> Ensure appropriate protection equipment to health staff 										Number of equipment
Activities	Indicators	Responsible Person	Time frame					Cost \$US			
			2014	2015	2016	2017	2018	UNIT	QNTY	UNIT COST USD	TOTAL COST USD
Conduct a National Inventory of ICWM in Health Care Facilities (HCFs.)	Inventory document	Director DEH	X								40,000
Analyze the inventory data and develop options	Report	Working group	X								5,000
provision of adequate collection equipment, sanitation and proper disposal of wastewater.	National standard procedures in place.	Working group	X	X							40,000
Carry out requisite Maintenance works at the different treatment facilities.	Treatment facilities selected	Working group	X	X	X	X					110,000

Build stabilized concrete lined pits in rural health centers, Clinics, and for home based care.	Infrastructure and equipment availed	Steering committee	X	X	X	X	X				105,000
SUB-TOTAL											300,000

Table 4-4 ICWMP ACTION PLAN - TRAINING AND GENERAL PUBLIC AWARENESS.

OBJECTIVE 4: TO CONDUCT AWARENESS CAMPAIGNS FOR THE COMMUNITIES AND PROVIDE TRAINING FOR ALL ACTORS INVOLVED IN ICWM											
Result 4: All ICWM actors are conscious of risks and demonstrate good ICWM practices											
Strategies	<ul style="list-style-type: none"> Inform population of dangers linked with bad HCW management practices 							Posters, radio and televised messages, public animations sessions, etc.			
	<ul style="list-style-type: none"> Inform population of dangers linked to scavenged HCW materials 										
	<ul style="list-style-type: none"> Inform home-based care givers / traditional healers of risks linked to improper HCW handling 										
	<ul style="list-style-type: none"> Conducting awareness campaigns on proper handling of HCW 										
	<ul style="list-style-type: none"> Elaborate training programs and Train trainers 							Programs elaborated and Number of trained trainers			
	<ul style="list-style-type: none"> Organising training programmes for all actors involved in ICWM with special emphasis on medical and non medical staff 							% of trained staff			
	<ul style="list-style-type: none"> Evaluate training program implementation 							Appraisal reports			
Activities	Indicators	Responsible Person	Time frame					Cost \$US			
			2014	2015	2016	2017	2018	UNIT	QNTY	UNIT COST USD	TOTAL COST USD
Develop specific ICWM Information Education and Communication (IEC) materials	-Availability of specific IEC materials	Working Group/ Health Promotion Directorate	X	X	X	X	X				25,000
Initiate a national awareness campaign through various media e.g. posters, print media, electronic media, and group discussions.	-Number of awareness campaigns held	Working Group/ Health Promotion Directorate	X	X	X	X	X				25,000
Conduct a training needs analysis for actors involved in ICWM.	-Number of training needs	Working Group/	X	X	X	X	X				10,000

	identified -Training program developed	Health Promotion Directorate									
Lobby to include ICWM in the training curricula for health personnel	-Number of meetings held -Availability of reports	Head of Environmental Health	X	X	X	X	X				8,000
Conduct on the job training of trainers (TOT) on ICWM and cascade training to operational levels	-Number of TOT sessions held -Number of trainers trained -Number of trainings cascaded	Working group	X	X	X	X	X				32,000
SUB-TOTAL											100,000

Table 4-5 ICWMP ACTION PLAN - PRIVATE SECTOR PARTICIPATION

OBJECTIVE 5: TO SUPPORT PRIVATE INITIATIVES AND PARTNERSHIP IN ICWM											
Result 5: Private players involved in ICWM											
Strategies	Inform private companies of the business opportunities in solid waste management							Awareness programs			
	Develop sustainable financing mechanism for ICWM activities							Annual financial Flows			
	Set up partnership framework between public sector and private sector in ICWM							Number of Partnership Agreements			
Activities	Indicators	Responsible Person	Time frame					Cost \$US			
			2014	2015	2016	2017	2018	UNIT	QNTY	UNIT COST USD	TOTAL COST USD
Organise a workshop for potential Private players and appraise them on the potential role they can play	-National workshop held - Workshop report produced	Director Environmental Health	X								10,000
Establish Private – Public sector partnership forum.	-Number consultations made. -Number of taskforce committees formed	Director Environmental Health	X	X	X	X					5,000
Establish financing mechanisms to attract business community to participate in ICWM.	-Banking sector involvement secured -Donor community sensitized. -Waste generators budgeting for its management.	Director Environmental Health	X	X	X	X					5,000
SUB-TOTAL											20,000

Table 4-6 ICWMP ACTION PLAN - FINANCIAL AND OPERATIONAL ISSUES

OBJECTIVE 6: TO DEVELOP AND OPERATIONALISE SPECIFIC FINANCIAL RESOURCES TO COVER THE COSTS OF THE MANAGEMENT OF HEALTH-CARE WASTES.											
Result 6: ICWM activities are budgeted for, monitored, evaluated and documented											
Strategies		<ul style="list-style-type: none"> Developing specific budget lines for ICWM at all levels of the accountancy (from national to local). Mobilising financial resources for ICWM capital and running costs. Identifying the appropriate institutions through which the recovery mechanism can be implemented. 									
		<ul style="list-style-type: none"> Monthly operational control reports 					Monthly reports				
		<ul style="list-style-type: none"> Mid-term evaluation (end yr 2) 					Evaluation report				
		<ul style="list-style-type: none"> Final Evaluation (end yr 5) 					Evaluation report				
Activities	Indicators	Responsible Person	Time frame					Cost \$US			
			2014	2015	2016	2017	2018				
Lobby for the establishment of a specific budget line for ICWM	ICWM budget line item established	Steering Committee		X							6,000
Mobilize resources utilizing instruments such as the 'Polluter Pays Principle'	Resources mobilised	Steering Committee	X	X	X	X	X				12,000
Raising financial resources through User Fees charges for private HCW generators	Funds raised	Working group	X	X	X	X	X				12,000
SUB-TOTAL											30,000

4.3 SUMMARY OF COSTS

Table 4-7 Summary of costs

OBJECTIVE	TOTAL COST \$US
1. TO REINFORCE THE NATIONAL LEGAL FRAMEWORK FOR ICWM.	70,000
2. TO IMPROVE THE INSTITUTIONAL FRAMEWORK FOR ICWM.	40,000
3. TO ASSESS THE ICWM SITUATION, PROPOSE OPTIONS FOR HEALTH CARE FACILITIES AND IMPROVE THE ICWM IN HEALTH CARE FACILITIES.	290,000
4. TO CONDUCT AWARENESS CAMPAIGNS FOR THE COMMUNITIES AND PROVIDE TRAINING FOR ALL ACTORS INVOLVED IN ICWM.	189,000
5. TO SUPPORT PRIVATE INITIATIVES AND PARTNERSHIP IN ICWM	15,000
6. TO DEVELOP AND OPERATIONALISE SPECIFIC FINANCIAL RESOURCES TO COVER THE COSTS OF THE MANAGEMENT OF HEALTH-CARE WASTES.	50,000
GRAND TOTAL	654,000

Due dates and source of financing are indicated in table 7-6.

5. BUDGET FOR THE ICWMP

5.1 INTRODUCTION

The estimated cost of implementing the ICWMP and enhancing this process of proper handling, disposal and management of medical waste is **US \$ 654,000**. **The estimated costs of implementation for the ICWMP will be covered by the MoH, the World Bank project and other development partners as detailed below:**

5.2 ESTIMATED COST OF IMPLEMENTING THE ICWMP

Table 8-1 below provides details of the implementation costs per component of the ICWMP, and Table 8-2 provides estimated yearly costs of the ICWMP implementation.

Table 5-1 Implementation costs of the ICWMP

OBJECTIVES	STRATEGIES	UNIT	QUANTITY	UNIT COST USD	TOTAL USD
Reinforce the National legal framework for ICWM.	Development of HCW Policy, Regulations, technical guidelines and standard operational procedures	Man/day	348	400	50,000
	Printing the documents for circulation	U	1429	14	20,000
	Sub-total				70,000
Improvement of institutional Arrangements	Workshops				10,000
	Taskforce business				7,000
	Awareness and lobbying				10,000
	Operational research				13,000
	Sub-total				40,000
Improvement of ICWM in the health facilities	Piloting some technologies in the various categories.				50,000
	Supply the health services with adequate HCW collection equipment				50,000
	Build low cost, local material incinerators in health centers, clinics and Public Health Units.	U	4	25 000	100,000
	Build stabilized concrete lined pits in rural health centers, Clinics, and for home based care	U	164	550	90,000
	Sub-total				290,000
Training programs and Public awareness	formulation of comprehensive training manuals relevant to the target groups	Man/day	25	400	10,000
	Printing the documents for circulation	U	1143	14	16,000
	Training of trainers	Man/day	150	120	18,000
	Training of medical staff	Man/day	417	120	50,000
	Training of supplies staff	Man/day	400	100	40,000

OBJECTIVES	STRATEGIES	UNIT	QUANTITY	UNIT COST USD	TOTAL USD
	Televised messages	U	19	900	17,000
	Radio messages	U	45	400	18,000
	Posters in Health centers	U	1667	6	10,000
	Public animation sessions	U	25	400	10,000
	Sub-total				189,000
Supporting Private Initiatives	Advocacy and lobbying at different fora	Man/day	100	100	10,000
	Public-Private partnership Forum business				5,000
	Sub-total				15,000
Support for the execution of ICWM Plan (Management Of Health-Care Wastes)	Plan starting activities and institutionalizing ICWM	Man/day	50	100	5,000
	Establishing the User Pays and the Polluter Pays Systems	Man/day	50	100	5,000
	Monitoring at national and local level	Man/day	42.5	200	8,500
	Halfway evaluation	Man/day	30	450	13,500
	Final evaluation	Man/day	40	450	18,000
	Sub-total				50,000
TOTAL					654,000

Table 5-2 Annual costs of the ICWMP implementation

ICWM Plan Activities	YR 1	YR 2	YR 3	YR 4	YR 5	TOTAL
Reinforce the National legal framework for ICWM.	70,000	-----	-----	-----	-----	70,000
Improvement of institutional Arrangements	40,000	-----	-----	-----	-----	40,000
Improvement of ICWM in health facilities	150,000	75,000	50,000	10,000	5,000	290,000
Training for health staff and others actors active in ICWM and Public awareness (general public)	75,000	50,000	25,000	20,000	19,000	189,000
Supporting Private Initiatives	10,000	3,000	2,000	-----	-----	15,000
Support for the execution of ICWM Plan (Management Of Health-Care Wastes)	25,000	10,000	10,000	3,000	2,000	50,000
TOTAL	370,000	138,000	87,000	33,000	26,000	654,000

5.6 PROJECT FUNDING SUMMARY

Table 5-3 Project funding summary

FUNDING SOURCE	DUE DATE	YR 1	YR 2	YR 3	YR 4	YR 5	TOTAL US\$
Contribution from World Bank project							300,000
MoH contribution							90,000
<i>Contributions from WHO, USAID</i>							49,000
<i>Contributions from Other Development Partners</i>							215,000
TOTAL PROJECT COST							654,000

The World Bank project will cover some of the training and general public awareness costs as outlined in tables 7-4, 8-4 and 8-6. The MoH will thus require a further US\$ 654,600 external support from other developing partners to be able to implement the ICWMP effectively.

6. ICWMP IMPLEMENTATION MODALITIES

6.1 INSTITUTIONAL FRAMEWORK

The ICWMP falls directly under the responsibility of the Environmental Health Department (EHD) of MoH. The Department will coordinate the implementation and apply a multi-stakeholder approach to embrace all the relevant players to include MTEC, Local Authorities, NGOs, and other private players.

6.2 RESPONSIBILITIES

Part of improving ICWM involves clarifying who is responsible for what functions and identifying the fields of competencies of each institutional actor involved in this process. The following roles and responsibilities are suggested:

At the central level:

The MoH is responsible for the national health policy and ensures the guardianship of the health facilities. The Environmental Health Department (EHD) will take the lead in coordinating the implementation of the ICWMP because:

- i. it is part of its mission,
- ii. it has competent staff in this field,
- iii. it has decentralized services down to District level and
- iv. it has capacity to offer Health Education Service, public information and awareness raising.

The Environmental Health Department will be heavily involved in overseeing the following ICWM activities:

- a) Procurement of consumables (sharp containers, colour coded bin liners)
- b) Procurement of re-usable waste receptacles
- c) Running maintenance of existing incinerators
- d) Ensuring availability of land for new sites for installation of new waste treatment and disposal facilities
- e) Organising /facilitating capacity building on ICWM amongst Health Care Workers
- f) Providing human resources (waste handlers, incinerator attendants etc.)

MoH has no direct budget for Healthcare waste management activities but to implement such a programme MoH has been spending around US\$ 174,750 annually

The Environmental Health Department (EHD) is the lead agent for this programme and its work plan is as outlined in table 9-2 where it will be guiding the whole process.

The Environment Department of MTEC will be responsible for monitoring of the implementation of the ICWMP. It has the overall responsibility of protecting the environment and thus ultimately the activities of the Environmental Health Department of MoH must conform to the requirements of the Environmental Management Act. It will watch over the whole chain of HCW from generation to final disposal.

The Environment Department is also responsible for developing norms and standards for soil, water and air protection, mainly as they relate to the use of landfill sites for HCW disposal. This function is very important as this assures an independent control and monitoring mechanism for the system to bring about safe handling of HCW throughout the system.

At the District / Local Authority level:

The **Districts and Local Authorities** will need to put in place arrangements to make sure that HCW are not mixed with general wastes in their public landfills. This is becoming a challenge, with the advent of home based care in urban areas and innovative ways of convincing the public to separate at source have to be found.

The **Districts and Local Authorities** must ensure, either by themselves or through partnerships, that facilities capable of handling all the HCW generated in their areas of jurisdiction are in place. They should be responsible for a centralized ICWM regime within their areas of jurisdiction. They should also give their opinion about the ICWMP activities proposed for health facilities in their jurisdiction, in case some may have negative impacts on the local population's health. Coordination of the ICWM activities will be exercised by their respective Environmental Health Departments.

The **Districts and Local Authorities** should design their landfills according to the norms and standards defined by the Environment Department (MTEC), in order to avoid soil, water and air pollution in case of reception of HCW. To accomplish safe disposal of HCW, **especially the ash from incinerators**, specific areas should be reserved for that purpose. In addition, local governments should enact regulations to: (i) refuse to receive mixed HCW with non infectious wastes at local landfills; (ii) forbid uncontrolled HCW disposal; and (iii) set up strong waste management controls in their landfills (materials for covering, restriction for non authorized public access, equipment protection, etc.).

At the health care facility level:

The manager of each health care facility shall be responsible for ICWM in his/her establishment. The manager must ensure that a ICWM plan is prepared and then institute all the requirements of the national policy, regulations and standard operating procedures. S/he must designate the officers/teams charged with HCW segregation, collection, transportation and treatment and be overally responsible.

6.3 INSTITUTIONAL ARRANGEMENTS FOR ICWM IMPLEMENTATION

Effective implementation of the ICWMP components requires that institutional arrangements and responsibilities be clearly defined. The following institutional arrangements are proposed:

i) Improvement of institutional and legal framework

The co-ordination structure should be set up by the Environmental Health Department (EHD). This Unit should take the lead in developing the HCW regulations and technical guidelines.

ii) ICWM improvement at health facilities

The improvement of ICWM at health care facilities should be managed by the Environmental Health Department (EHD) and Health facility managers working

together. For example, EHD should regulate the ICWM in health facilities, in line with their own regulations and MTEC requirements. MoH should supply the health facility managers with ICWM equipment and materials, but actual execution of ICWM improvement programs should be conducted by health care facility managers and their staff. Health care facility managers should promote use of recyclable materials and set up control procedures in HCW management, under the supervision of EHD.

iii) Training

Training activities should be led by the EHD of the MoH. This structure has competence in ICWM and could be supported by training and higher learning institutions like the University, the Polytechnic, and other institutions.

At District level, management of training activities should be assigned to the District Health Teams (DHT). The specific training activities will be done in the first two years of the programme. National Consultants will train key staff as trainers in health facilities and other institutions like the Municipalities. The trained key staff should then train the other employees.

The EHD may not have the human resources to prepare and diffuse the training courses about ICWM. The EHD could prepare the TORs, and do the control and supervision at national level while District Health Teams (DHT) would assume the monitoring at local level. In other words:

- i. The EHD prepares the Terms of Reference for developing the training programs, and does the control and supervision at national level ;
- ii. Health Training Institutes or National Consultants having acquired a large experience in ICWM will prepare the training courses;
- iii. In each District, a training of trainers workshop will be held and will be conducted by Training institutions or national consultants, under the supervision of the DHTs. The latter must prepare periodic reports to be sent to the central level (EHD/MoH);
- iv. In each health care facility, the supervising staff trained in the District workshops will ensure the training of all medical staff, orderlies, cleaners, etc., under their supervision. The heads of the health establishments must supervise this work and prepare periodic evaluation reports.

iv) Public Awareness

The Health Education/Environmental Health Department of the MoH will lead the activities intended to increase the awareness of the general public about the risks associated with HCW. At local level, DHTs will do the supervision. These activities will cover the 5 years of the program, through Public animations, radio and television messages, posters, etc., and will be done as follows:

- The Health Education/Environmental Health Department of the MoH will elaborate the content of these messages, of posters and public animation;
- The televised messages will be diffused by the National Station;
- The radio messages will be diffused by the local radio stations, in English and local languages, under the supervision of District Health Teams
- Private companies (printing enterprises) will make posters to be used in the health centers;

- Public animation sessions will be led by NGOs acting in the health and the environmental field, under the supervision of District Management Teams.

v) Strategy for private sector involvement and partnership

The elaboration of measures to involve private companies more directly in ICWM will be coordinated by the MoH, in collaboration with other stakeholders.

vi) Baseline Survey and Activity Planning

National Consultants, supervised by DHTs and EHD, will carry out a baseline survey at the beginning of the investment phase. During this task, the consultants will indicate the situation prevailing presently in the health facilities, elaborate evaluation criteria, and prepare the execution plan.

vii) Monitoring of the ICWMP

At the local level, it is recommended that the DHTs ensure regular program oversight and provide monthly monitoring reports, while the six-monthly follow up will be realized by EHD.

viii) Evaluation of the ICWM Plan

It is recommended to assign this evaluation to international consultants (under the supervision of EHD), to ensure its neutrality. This evaluation must be done halfway through (at the end of the 2nd year) and at the end of the first phase of the program (year 4).

The following table shows the implementation responsibilities for the ICWMP.

Table 6-1 Implementation Responsibilities by Component

COMPONENTS AND ACTIVITIES		EXECUTION	CONTROL AND SUPERVISION
Improve ICWM in health facilities	Regulate the HCW management in health facilities.	EHD	EHD/ MoH and MTEC
	Supply HF with ICWM equipments and materials.	Health facilities	EHD/ MoH
	Ensure appropriate protection equipment for health staff.	Health facilities	EHD/ MoH
	Promote use of recyclable materials.	Health facilities	EHD/ MoH
	Set up procedures of control in HCW management.	Health facilities	EHD/ MoH
Training	Elaborate training programs and train trainers.	Consultants/training Institutes.	EHD/ MoH
	Train all health staff active in ICWM	Supervising staff/ Training Institutes.	EHD/ MoH
	Evaluate the training program implementation	Heads of Health centres Health Districts	EHD/ MoH
Public awareness	Televised messages	National Television	Health Education /EHD
	Messages radio	local Radios	Health Education /EHD
	Posters in health facilities	Printers societies	Health Education /EHD
	Public animation sessions	NGO and CBO	Health Education /EHD
Support the private initiatives	Diffuse information about business opportunities in solid	EHD	MoH

COMPONENTS AND ACTIVITIES		EXECUTION	CONTROL AND SUPERVISION
and partnership in ICWM	waste management		
	Develop partnership arrangements between public sector and private sector for ICWM	EHD /Health Facilities Region and Local Authorities	MoH / Ministry of Local Government
Support the execution of ICWM Plan	Plan ICWM activities	National Consultants	EHD/ MoH
	Monitor the execution (national and local level)	Health District	EHD/ MoH
	Evaluation of the ICWM POA (halfway and final)	International Consultants	EHD/ MoH, /ME and Local Authorities

6.4 IMPLEMENTATION TIMEFRAME

The following timetable shows the proposed implementation schedule of the ICWM Plan over a five-year period.

Table 6-2 Implementation Timetable

ICWM Plan Activities	YR 1	YR 2	YR 3	YR 4
Development of ICWM policy				
Regulation of HCW management				
Development of technical guidelines and standard operation procedures for ICWM				
Institutional arrangements - Set up a structure for coordination and follow up of the POA				
Improvement of ICWM in health facilities				
Elaboration of training programs and training of trainers				
Training for health staff active in ICWM				
Public awareness (general public)				
Supporting private initiatives and partnership in ICWM				
Monitoring and evaluation of the ICWM plan				

Before such an elaborate plan is implemented, certain activities can be started immediately, and others may be realized over the medium/long term.

The following actions could be realized immediately:

- b) set up a structure for coordination and follow up of the Plan of Action (POA)
- c) elaboration and dissemination of Policy, regulations, technical basic guidelines and standard operational procedures in ICWM
- d) elaboration of ICWM training program
- e) elaboration of public awareness training modules and supports
- f) set up ICWM procedures in health facilities, including health staff responsibilities

In the short term:

- g) training of trainers
- h) training all the stakeholders involved in the ICWM
- i) dissemination of public awareness programmes
- j) assessment of training program implementation
- k) halfway appraisal

In the medium/longer term:

- l) improvement of the ICWM in the health facilities
- m) Supporting of the private initiatives and partnership in ICWM
- n) Monitoring and evaluation of the ICWM plan

6.5 POTENTIAL PARTNERS AND FIELD OF INTERVENTION

Delivery of essential health services relies on the involvement of a wide range of actors -- public and private sectors, NGOs, and civil society. So it is necessary to establish a partnership framework to identify the roles and responsibilities of each category of actor.

Table 6-3 Potential field of intervention

ACTORS	POTENTIAL FIELD OF INTERVENTION
Technical services of the State (MoH / MTEC)	<ul style="list-style-type: none"> - inform the local and national authorities - facilitate co-ordination of ICWM plan activities - supply technical expertise - execute control and monitoring activities - train the health staff - supervise the training process, monitoring and evaluation
Local Authorities / Districts	<ul style="list-style-type: none"> - participate in the mobilization of populations - ensure HCW are properly disposed in their landfill - participate in training, monitoring and evaluation
Public health facilities / Private health facilities	<ul style="list-style-type: none"> - participate in training activities - supply staff with security equipment - elaborate internal plans and guidelines about ICWM - allocate financial resources for ICWM - ensure HCW management plan is implemented
Private operators	<ul style="list-style-type: none"> - invest in ICWM (e.g., treatment, transport, disposal) - operate as sub-contractors (Local Authorities / Districts / Health Facilities)
NGOs and CBOs	<ul style="list-style-type: none"> - inform, educate and make population aware - participate in / offer training activities
Training Institution	<ul style="list-style-type: none"> - provide health staff training

6.6 INVOLVEMENT OF PRIVATE COMPANIES IN ICWM

HCW collection is a major concern for public and private health facilities. According to environmental regulations, health facilities must ensure sustainable management of their wastes. However, in practice health care facilities have very limited financial resources, and no public health establishment has funds to pay for collection or disposal services for wastes. For health care facilities having incinerators, waste collection is less of a concern. For private facilities, the major constraints are the absence of alternative solutions to their present practices; HCW co-mingled with general wastes and crude disposal. Most of them can't afford appropriate equipment for treatment.

Both public and private facility managers and staff express a willingness to participate in an institutional arrangement whereby costs of treating their HCW could be shared under a common agreement. Such a public-private partnership arrangement could be put in place on the basis of the following principles:

- Selected public health care facilities would be equipped with incinerators to serve a defined geographic radius;
- Health centres equipped with incinerators would agree to accept and treat HCW from private facilities and smaller health centres within their service area;
- Private health facilities receiving such HCW treatment services would agree to pay a collection / treatment fee as per the terms of the cost sharing agreement.

Long-term private sector involvement in the ICWM business will depend on whether national, local, and municipal authorities are able to put in place self-sustaining sources of financing to cover investment and operating costs for this critical environmental and public health service. If the financial equation is solved, then private sector operators can be expected to identify their individual comparative advantage and explore contractual arrangements to provide a range of services for health care facilities and landfill sites (e.g., transport, treatment, and disposal).

7. HANDLING HEALTH CARE WASTE STREAMS

7.1 RECOMMENDED SYSTEM FOR HANDLING WASTE

The management of waste must be **consistent** from the point of generation (“cradle”) to the point of final disposal (“grave”). The path between these two points can be segmented schematically into eight steps. The following is an outline of the recommended system for handling waste streams in Mozambique:

Step 1: Waste minimization

This first step comes prior to the production of waste and aims at reducing as much as possible the amount of HCW that will be produced by setting up an efficient purchasing policy and having a good stock management, for example.

Step 2: HCW generation

This is the point at which waste is produced.







Step 3: Segregation and containerization

The correct segregation of waste at the point of generation relies on a clear identification of the different categories of waste and the separate disposal of the waste in accordance with the categorization chosen. Health care waste can generally be classified into four fractions; (i) sharps, (ii) infectious or contaminated non-sharps (healthcare risk waste – (HCRW)), (iii) non-infectious or healthcare general waste (HCGW) and (iv) medical devices and radioactive materials.

Segregation must be done at the point of generation of the waste. To encourage segregation at source, (reusable) containers or baskets with liners of the correct size and thickness are placed as close to the point of generation as possible. They should be properly **colour-coded** (red for infectious waste and Black for general waste) and have the international infectious waste symbol clearly marked.

When they are 3/4 full, the liners are closed and sealed with plastic cable ties or string and placed into larger containers or liners of the same colour coding at the intermediate storage areas. Suitable latex gloves must always be used when handling infectious waste.

Table 7-1 Categories, Labelling And Containers For Health Care Waste

No.,	Waste Category	Labelling	Type of Container	Colour code			
1.	Sharps	Needles, infusion sets, scalpels, knives, blades, lancets and broken glass.	Sharps	Purpose – made puncture proof container	Yellow		
2.	infectious or contaminated non-sharps (healthcare risk waste – (HCRW))	Contaminated non-sharps e.g. Gauze, Cotton wool, dressings, blood, swabs, sample vials.	Infectious	Strong, leak proof plastic bag or container	Red		
		Pathological waste	Pathological	Leak proof plastic bag or container lined with leak proof material			
		Pharmaceutical waste	Pharmaceutical waste	Plastic bag or plastic lined container			
		Genotoxic waste	Genotoxic	Plastic bag or plastic lined container			
		Chemical waste	Chemical	Plastic lined container that is leak proof			
3.	non-infectious or healthcare general waste (HCGW)	Paper, packaging materials, office supplies, drink containers, hand towels, cartons, unbroken glass, plastic bottles and food remains.	General Waste	Black Plastic Bag or black plastic lined container	black		
4.	Radioactive waste		Radioactive	Lead box labelled with radioactive symbol			
5.	Pressurized containers		Pressurized containers	Plastic bag (if small)			
6.	Medical devices		e- waste				

NB: Liquid pharmaceutical waste shall be put in plastic lined containers in their original bottles.

Step 4: intermediate storage (in the HCF)

In order to avoid both the accumulation and decomposition of the waste, it must be collected on a **regular** daily basis.

This area, where the larger containers are kept before removal to the central storage area, should both be close to the wards and not accessible to unauthorized people such as patients and visitors (Figure 10-1).



Figure 7-1 Temporary storage for waste

Step 5: internal transport (in the HCF)

Transport to the central storage area is usually performed using a wheelie bin or trolley. Wheelie bins or trolley should be easy to load and unload, have no sharp edges that could damage waste bags or containers and be easy to clean. Ideally, they should be marked with the corresponding coding colour.

The transport of general waste must be carried out separately from the collection of healthcare risk waste (HCRW) to avoid potential cross contamination or mixing of these two main categories of waste. The collection should follow specific routes through the HCF to reduce the passage of loaded carts through wards and other clean areas.

Step 6: centralized storage (in the HCF)

The central storage area should be sized according to the volume of waste generated as well as the frequency of collection. The facility should not be situated near to food stores or food preparation areas and its access should always be limited to authorized personnel. It should also be easy to clean, have good lighting and ventilation, and be designed to prevent rodents, insects or birds from entering. It should also be clearly separated from the central storage area used for Health Care General Waste (HCGW) in order to avoid cross-contamination. Storage time should not exceed 24-48 hours especially in countries that have a warm and humid climate.



Figure 7-2 Example of a centralized storage.

Step 7: external transport

External transport should be done using dedicated vehicles. They shall be free of sharp edges, easy to load and unload by hand, easy to clean/disinfect, and fully enclosed to prevent any spillage in the hospital premises or on the road during transportation.

The transportation should always be properly documented and all vehicles should carry a consignment note from the point of collection to the treatment facility.



Figure 7-3 Example of a hazardous waste transportation vehicle.

Step 8: treatment and final disposal

There are a number of different treatment options to deal with infectious waste. These are listed in table 10-2 below and then detailed under the “Determination of Treatment Systems and Technologies” chapter.

Table 7-2 Treatment And Disposal Methods
Suitable For Different Categories Of Health Care Waste

Waste Category	Treatment	Disposal Method
a) Sharps	- Incineration	- Safe burial - Land filling
b) Infectious waste	- Incineration - Chemical disinfection - Autoclaving - Biological	- Land filling - Safe burial - Sewage - Ottway pit
c) Pathological waste	- Incineration - Biological	- Safe burial - Land filling - Ottway pit *
d) Pharmaceutical waste	- Incineration - Encapsulation - Dilution - Inertization - Dissolution	- Land filling (small quantities) - Safe burial (small quantities) - Discharge to a sewer
e) Genotoxic waste	- Rotary kiln incineration - Inertization - Encapsulation (small quantities) - Neutralization	- Return to supplier
f) Chemical waste	- Rotary kiln incineration - Treatment lagoons - Pyrolytic incineration - Neutralization - Encapsulation - Dilution	- Safe burial (small quantities) - Return to supplier
g) Radioactive waste	- Decay by storage	- Storage
h) Pressurized containers	- Crushing (damaged containers)	- Recycling - Reuse - Return to supplier - Land filling - Controlled explosion (usually done by military specialized units)

- Sewage disposal needs approval from the local authority.

7.2 SUMMARY OF THE WASTE HANDLING SYSTEM

The Mozambique Health Care Waste handling model is based on having centrally located Modern pyrolytic incinerators at Referral, District hospitals, or other Hospitals. All other health centres have smaller treatment facilities.

It is imperative that the government seriously considers erecting Local incinerators (built with local material) in Health Centres, Private Health Centres and other Public Health Units because of their very low cost and small quantities of HCW produced in these facilities. Also stabilized concrete lined pits should be erected in Health Centres, Public Health Units and for home based care, because of very low HCW production.

For effective ICWM segregation, handling and disposal/transportation the following practices should be followed:

- The medical waste should continue to be segregated by (i) sharp waste; (ii) infectious or contaminated non sharps; (iii) non infectious or healthcare General waste; and (iv) medical or radioactive devices and hazardous materials.
- Segregation should 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);
- HCW receptacles shall be readily available at the point of generation, located away from patient areas to avoid cross infections; should be safe; utilization of the receptacles should be well understood by the medical and other health staff dealing with medical waste; and should be monitored regularly to ensure that the procedures are respected;
- Receptacles of appropriate color, size and number should be used, to accommodate and label the different waste types being generated. Labels have to be firmly attached to containers so that they do not become detached during transportation and handling. **If general and hazardous waste are accidentally mixed, the mixture should be treated as hazardous HCW.** The bags or containers should 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;
- Staff involved in HCW management must ensure that the waste bags are properly labeled and sealed to prevent spilling during handling and transportation, and properly removed and should also ensure that for storage purposes, the waste is kept separate, and that the central storage receptacles for each color coded bags be placed in similarly color coded receptacles;
- All loading and unloading of waste shall take place within the designated collection area around the storage point;
- There should be separate schedules and separate collection times for different color coded containers. **Separate vehicles should be used for different types of waste.** This is to avoid increased possibilities of wastes becoming mixed and being transported to the wrong disposal routes and sites;
- Transportation must be done only by **accredited Waste Management Contractors** and certified by the local authority, ENA and other relevant departments;
- HCW must be transported directly to the disposal or treatment site within the shortest possible time; treatment and disposal of HCW should focus in minimizing negative impacts on health and on the environment;
- Capacity building of health facilities workers in all the areas related to health-care waste management should be performed at all levels;
- Segregation system should be uniformly applied throughout the country and should be maintained throughout the entire waste cycle up to disposal.
- Domestic waste should be dealt separately from health care waste.

Table 7-3 Summary on how to improve HCW handling

STEP No.	TITLE	POSSIBLE IMPROVEMENTS
1.0	waste minimization	<ul style="list-style-type: none"> • Take measures that will reduce as much as possible the amount of HCW that will be produced in future. • set up an efficient purchasing policy • set up a good stock management system
2.0	HCW generation	<ul style="list-style-type: none"> • Avoid generating waste as much as is possible
3.0	segregation and containerization	<ul style="list-style-type: none"> • Identify your waste categories • Segregate the waste into these categories at point of generation • Place bins with colour coded liners as close to the point of generation as possible • Observe the procedure of sealing the bags when full and keep them sealed throughout transportation. • Keep the different waste streams separate throughout the process • Have waste segregation policy statements clearly posted in the working areas. • Enforce PPE use at all times when handling waste
4.0	intermediate storage (in the HCF)	<ul style="list-style-type: none"> • Collect waste from working areas regularly and transport it to an intermediate storage area. • Place sealed liners into large containers of similar colour coding • Temporary storage area should both be close to the wards and not accessible to unauthorized people such as patients and visitors. • Infectious waste should be secured away at all times.
5.0	internal transport (in the HCF)	<ul style="list-style-type: none"> • use a wheelie bin or trolley to transport the waste to the central storage area. • Transport the different waste streams separately to avoid cross contamination or mixing. • follow specific routes through the HCF • avoid passing through wards or other clean areas
6.0	centralized storage (in the HCF)	<ul style="list-style-type: none"> • size of central storage area must be according to volume of waste generated. • central storage area must be situated away from food areas. • central storage area must be secure and not accessible to everybody. • It should be easy to clean, have good lighting and ventilation, • It should be designed to prevent rodents, insects or birds from entering. • General waste and Infectious waste should be stored in separate areas. • Storage time should not exceed 24-48 hours
7.0	external transport	<ul style="list-style-type: none"> • Should be done using dedicated vehicles • Vehicles should be free of sharp edges, easy to load and unload, easy to clean/disinfect. • Vehicles should be enclosed. • Transportation should always be properly documented. • Vehicles should carry a consignment note from the point of collection to the treatment facility.
8.0	treatment	<ul style="list-style-type: none"> • Appropriate treatment options should be used (table 10-2 and Chapter 11). • Each HCF must have an alternative treatment option in case of failure.
9.0	final disposal	<ul style="list-style-type: none"> • Appropriate final disposal should be used (table 10-2 and Chapter 12).

8. TREATMENT OPTIONS FOR EACH TYPE (LEVEL) OF HEALTH UNIT

8.1 INTRODUCTION

The relative risk approach will be used in determining the treatment system and technology to be used at each HCF. The criteria for deciding on the system is that it protects in the best way possible, healthcare workers and the community as well as minimize adverse impacts on the environment.

Environmentally-friendly and safe options used in high income countries may not always be affordable or possible to implement e.g. due to lack of electrical supply, etc. Health risks from environmental exposures should be weighed against the risks posed by accidental infection from poorly managed infectious waste (sharps in particular). The use of a burial pit or a small-scale incinerator, although clearly not the best solution, is much better than uncontrolled dumping.

The main criteria for the selection of a technical option should be that their implementation will offer a level of health protection which eliminates as many risks as possible. The ICWM systems can subsequently be upgraded to reach higher safety standards.

8.2 PRIMARY LEVEL

Table 8-1 Primary level

Type	Ideal	Alternative
Cutting and/or perforating	Incineration	Lined well
Infectious (treatment)	Oven burning	Landfill with control
Anatomical	Oven burning	<input type="checkbox"/> Landfill with control and daily coverage <input type="checkbox"/> Delivery to family for burial
Photochemical (Rx)	Return to supplier	<input type="checkbox"/> Controlled Landfill (small amounts at a time)
Pharmaceutical	Oven burning (small amounts) Eviction for drainage (those identified)	<input type="checkbox"/> Controlled landfill

8.3 SECONDARY LEVEL

Table 8-2 Secondary Level

Type	Ideal	Alternative
Cutting and/or perforating	Incineration	Lined well
Infectious (treatment)	Incineration	Oven burning
Anatomical	Incineration	Oven burning Landfill with control and daily coverage Delivery to family (if applicable)
Photochemical (Rx)	Return to supplier	Controlled landfill
Pharmaceutical	Return to supplier	Oven burning (small amounts) Eviction for drainage (those identified)

8.4 TERTIARY LEVEL

Table 8-3 Tertiary level

Type	Ideal	Alternative
Cutting and/or perforating	Autoclaves with grinding	Pyrolytic incinerator (excluding plastics)
Infectious (treatment)	Autoclaves with grinding	Pyrolytic incinerator
Anatomical	Incineration	Landfill with control and daily coverage (if there is space)
Photochemical (Rx)	Return to supplier	Pyrolytic incinerator
Pharmaceutical	Return to supplier	Pyrolytic incinerator Eviction for drainage (those identified)
Laboratorial	Autoclaving	Pyrolytic incinerator
Chemical	Return to supplier	Pyrolytic incineration (small amounts)

The incinerator facility at the tertiary level will depend on its location relative populations in the situation to find the distances below 500 meters this option should be considered.

8.5 QUARternary LEVEL

Table 8-4 Quaternary level

Type	Ideal	Alternative
Cutting and/or perforating	Autoclaves with grinding	* due to its location the incinerator option is not viable
Infectious (treatment)	Autoclaves with grinding	Shipping abroad for pyrolytic incineration
Anatomical	Tissue digester	Burials in municipal cemeteries (mass graves)
Photochemical (Rx)	Return to supplier	
Pharmaceutical	Return to supplier	Eviction of small amounts
Laboratorial	Autoclaves	Shipping abroad for pyrolytic incineration
Chemical	Return to supplier	Recycling or neutralisation
Radioactive	Return to supplier	Liquids with low radioactivity can be poured into the drain. Safe storage
Cytotoxic	Inertising	Encapsulation (specific programs) Shipping abroad for pyrolytic incineration

9. THE MONITORING PLAN

9.1 PRINCIPLE AND OBJECTIVE

Waste management is a continual task demanding a permanent effort from each and every person at the health care facility. During the upgrading phase, the process of ICWM must be investigated and recorded. Once the required level is reached, regular monitoring should ensure that the desired standard is maintained. The monitoring of ICWM is part of the overall quality management system. To measure the efficiency of the ICWMP, as far as the reduction of infections is concerned; activities should be monitored and evaluated, in collaboration with concerned institutions: MoH, MTEC, Local Authority, NGOs, etc.

9.2 METHODOLOGY

The ICWMP will be executed over five years and implementation monitoring will be carried out as follows:

Table 9-1 Implementation Plan for M&E

OBJECTIVE	TIMING/PERIOD	RESPONSIBLE PARTY
Development of ICWM policy		
Legal framework: <ul style="list-style-type: none"> • Development of ICWM policy • Regulation of HCW management • Development of technical guidelines • Development of standard operational procedures 	At the beginning of the program (first year)	EHD/ MoH
Institutional arrangements <ul style="list-style-type: none"> • Setting up a structure for coordination and follow up of the POA • Supporting private initiatives and partnership in ICWM 	At the beginning of the program (first year)	EHD/ MoH
Planning activities	At the beginning of the program	EHD/ MoH
Implementation of health facility ICWM Plan	Yearly, according to the time-table established	EHD/ MoH
Control and follow up of the execution of ICWM Plan activities	Daily	Health facilities
	Monthly	Health Department in the Districts (MoH)
	Yearly	EHD/ MoH
Training : <ul style="list-style-type: none"> • Elaboration of training programs and training of trainers • Training for health staff active in ICWM 	- two first years	- EHD/ MoH, National Consultants, Training Institutes
Awareness	- yearly	- EHD/ MoH and NGOs, CBOs

OBJECTIVE	TIMING/PERIOD	RESPONSIBLE PARTY
<ul style="list-style-type: none"> Public awareness (general public) 		
ICWM Plan Evaluation	Half-way (at the end of the 2nd year)	EHD/ MoH, with the support of international consultant
	At the end of the 5th year	EHD/ MoH, with the support of international consultant
Supervision	Six-monthly	EHD/ MoH; MTEC; Local Authority

9.3 MEASURABLE INDICATORS

Program level indicators are presented in Tables 7-1 to 7-6 of the ACTION PLAN for the ICWMP. At the facility level, the following framework and measurable indicators could be developed into a standard format to facilitate comparability and usefulness of the data:

- HCW management structure:**
 Reduction of waste, increase in efficiency; standard of hygiene; awareness of staff and patients; statistical data on waste generation; financial resources; functioning of responsibilities; training and awareness creation activities; monitoring and recording activities;
- HCW collection:**
 Sufficient and appropriate collection containers; efficiency of waste segregation; frequency of waste removal; environmentally friendly handling of waste; responsibilities;
- HCW transportation and storage:**
 cleanliness and functioning of transport equipment; execution of recommended transport procedures; status of storage facilities; cleanliness; separate storage of hazardous items; emergency equipment; lock and safety measures; responsibilities;
- HCW treatment:**
 Incinerator for infectious waste; proper functioning of incinerator; maintenance procedure; safety regulation for operation; safe disposal of ash; responsibilities; sewage system; functioning of septic tanks; maintenance procedure; wastewater treatment;
- HCW disposal:**
 Proper operation of landfill site; proper operation of waste pit for infectious waste; transport of chemical and radioactive waste; responsibilities;
- General cleanliness:**
 containers not overfull; no used sharps outside or protruding from sharps containers; no foul-smelling waste in facility or on premises; no litter in facility or on premises; no faeces on premises; waste pits not overfull.

REFERENCES

- 1) National Policy and Plan of infection control for TB in health facilities and conglomerate environments of Mozambique - NTCP / MoH (2009)
- 2) Diagnostic and Treatment of Resistant and Multi-Drug Resistant TB Manual- NTCP / MoH (2009)
- 3) Skin Smear Test Manual – NTCP/INS (2012)
- 4) Biomedical Waste Management Regulation - Decree 3/2008.
- 5) Hospital Waste management National Policy - DNAM / MoH
- 6) TUBERCULOSIS INFECTION CONTROL IN THE ERA OF EXPANDING HIV CARE AND TREATMENT-Addendum to WHO *Guidelines for the Prevention of Tuberculosis in Health Care Facilities in Resource-Limited Settings, 1999*
- 7) National strategic plan for TB control 2008-2012 - DNPSCD / MoH (2007)
- 8) BIOSAFETY MANUAL FOR TUBERCULOSIS LABORATORIES - **WHO (2013)**

ANNEXES

Annex 1 National Response to Tuberculosis

1.1 Structure

The provision of TB services is made within the framework of health services and primary health care. In each of the 128 administrative districts of the country, there is a facility that is called Basic Management Unit.

1.2 Policy

Policies are developed within the health services, namely: government responsibility in the free service provision within the health services, diagnosis and follow-up treatment by sputum bacteriological examination, regular distribution of medicines and diagnostic materials at the level of the basic management unit, standardised management of cases with a different standard regime for new or retreatment of cases, treatment under direct observation in the intensive initial phase and maintenance and reporting of program activities following the standardised model for Cohort analysis.

TB patients' diagnosis with negative skin smear test is confirmed by a doctor (physician or technician of Medicine). For patients who live at a distance of 10 km from the HU and those severely debilitated, they must be admitted to hospital to do the treatment throughout the intensive treatment phase, which is of two months.

After discharge, patients are transferred to a facility that is near their home, where they are registered and continue with treatment.

1.3 Health System Information

NTCP information system in Mozambique is structured and based on data collection, at the health centre level where TB basic management units register, treat and do the follow-up to patients. Information is initially recorded in the Tuberculosis Patient Registration Book, an updated version of records that include aspects such as HIV co-infection and the book was prepared by the NTCP and is being introduced gradually (including results of HIV tests, Cotrimoxazole Preventive Therapy, reference to HIV services and ART start date). IPT Record Book was proposed for Isoniazid Preventive Therapy. Each piece of quarterly information from districts with TB services is compiled at the provincial level and sent to the central level, NTCP / MoH using the Quarterly Tuberculosis Provincial Notification form.

1.4 Diagnostic Services

The National Reference Laboratory (NRL) — is responsible for External Quality Control of sputum microscopy tests at the provincial level. This is done through regular external quality control and supervision visits. The feedback is done in appropriate forms with identification of remedial measures.

Since 2003 NRL is connected to a supranational Reference Laboratory (SRL) based on Milan in Italy.

The NRL staff oversees the seven laboratories of provincial hospitals and 3 laboratories of central hospitals and conducts external quality control in these laboratories for checking at least 2 times a year, a certain number of microscope slides randomly selected, including all discordant slides from the districts.

Annex 2 Prevention and control best practices

Prevention of infections and TB control measures

Infection control refers to specific working steps and methods which reduce the probability of transmission of pathogenic agents (in this case, Mtb) from one individual to another. It is essential that infection control measures are included in all activities of the business plan.

TB transmission depends on:

- The concentration of bacilli in the air, i.e., produced infectious particles or eliminated;
- Bacillus patient;
- Time of exposure;
- Proximity or socialising indoors;
- Immunological factors.

TB transmission control in health care follows the rules of Infection Control and Prevention (ICP).

According to the WHO, the top three recommended methods for the control of tuberculosis in effective environments (e.g., mines), health services or households include: 1) work practice and administrative control; 2) Environmental Control or engineering; and 3) individual respiratory protection. These measures must be implemented together, since they are complementary. Administrative control measures are the most important ones following environmental control measures.

In Mozambique besides the three measures described above, there is the management measure above them, which is the measure that determine the responsibilities and authority at each management level (national, provincial, district and within the Health Unit), which will ensure the effective implementation of the remaining measures.

3 levels for infection control:

- 1st Priority Administrative Control;**
- 2nd Priority Environmental Control;**
- 3rd Priority Personal Respiratory Protection**

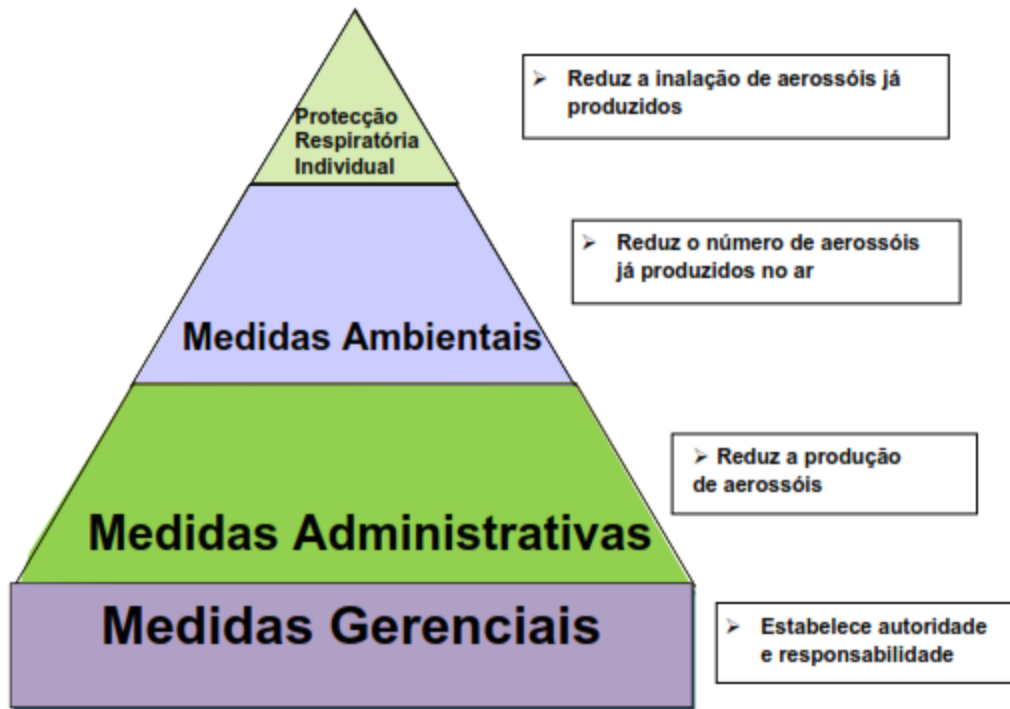


Figure A2.1 - Hierarchy of control measures for TB and its functions

Administrative control and work practices

Managers of health facilities at all levels must prioritise and ensure the applicability of administrative measures, because of its efficiency and cost, as these have a great impact because they reduce and prevent TB transmission within the HU, thus reducing the formation of sputum aerosol droplets and the exposure of health workers, patients, family and friends to *Mycobacterium Tuberculosis*.

The NTCP should include in its activities the provision of support to primary and secondary level health units in the preparation of administrative measures. Note that this is due to the weak capacity of these in this sense.

Administrative measures to be imposed are:

- Infection Control Plans
- Early diagnosis and treatment of infectious TB cases;
- Education of patients (Cough Etiquette);
- Prioritising patients with cough;
- Evaluation of suspected cases in clinic;
- Reducing exposure in the laboratory;
- Infection Control Plan including training of health workers.

Examples of administrative measures

- **Patient management:** Defining procedure and patient management plans (including screening and recognition of suspected TB patients) including:

- Abolishment of the normal line of service;
 - Instruction on how to cough and provision whenever available of napkins or paper towels for this purpose;
 - Separation from the rest of patients, leading to well-ventilated areas or outdoors if the weather permits.
- Implementing a simple standard system, prioritising and separating potential infectious TB patients, according to each context.
 - Providing annual screening for TB and HIV to health workers in health facilities, offering and / or referring for treatment and care when needed.
 - Producing an annual confidential registration of TB cases in TSs in the health unit.
 - Offering isoniazid preventive treatment (IPT) to TSs with HIV + without active TB (according to the IPT standards, MoH).
 - Ensuring that health workers living with HIV do not run the risk of being infected by TB in the workplace and reallocating them where possible and necessary.
 - Ensuring that infectious TB patients (skin smear test +) and suspects wear a surgical mask when leaving their isolation rooms for essential medical procedures and, when they are in poorly ventilated areas at the clinic, especially MDR-TB patients.
 - Ensuring the safety of users and health professionals by signalling the halls / wards / rooms with TB transmission risk.
 - Ensuring the safe collection of sputum for skin smear test, preferably outdoors, away from other people or in a well ventilated area of the facility.
 - Restricting access to the laboratory where it carries out the skin smear test to essential TS
 - Restricting visits for TB patients-M (X) DR TB and BK + or if it occurs, it should be done outdoors.
 - Radiology services should prioritise TB patients (e.g., mark such patients for the low movement time, provide them with surgical masks when necessary).

An important issue in administrative measures to take into account is the length of stay at the clinic, since the longer the time the risk of nosocomial transmission between patients and those with TS increases.

Environmental control

Environmental control is the second line of defense for the prevention of nosocomial transmission. In the face of inadequate administrative controls, environmental measures **will not eliminate the risk**. Although some environmental controls do not require an expenditure of resources, others are expensive and technically complex. These measures aim primarily to reduce the concentration of droplets of contaminated aerosols in the air.

Health units must implement and ensure:

- Ventilation (natural, mechanical or combination) controlling the direction of air flow;
- Ultraviolet radiation; and
- Particle Filtering in high efficiency air.

The simplest measure and less expensive one is to use good ventilation in areas with patients suffering from TB maximising natural ventilation through windows (and doors) open.

One must ensure ventilation pattern precaution in rooms which must be at least 12 ACH (Air Changes per hour) — (air per minute change, or the rate of air exchange, abbreviated as either AC / h, is a measure of the volume of air added to or removed from a space (typically a room or home) divided by the volume of the space).

Personal Respiratory Protection

Personal respiratory protection is the last line of defence against nosocomial infection by *Mycobacterium tuberculosis* and should always be used in combination with administrative and environmental controls. Respirators are a valuable complement to administrative and environmental measures for infection control.

The masks for TB prevention are known as “breathing particulate” and have the features of protecting the user from fine particles (1 to 5 microns) which include contaminated droplets, and the so called N95 as the most common ones.

The use of respirators in the following situations is **mandatory**:

- Isolation rooms for patients with TB or TBM (X) DR;
- During the induction of sputum or other procedures which produce coughing;
- Bronchoscopy rooms;
- Autopsies Areas;
- Spirometry Areas;
- During emergency surgery on potential patients or confirmed TB.

In the above situations or high-risk areas particle respirator (N-95 and FFP-2) should be available at all times.

It should be part of in-service staff training for proper use of particle respirator (N-95 and FFP-2) by TSs;

The NTCP in coordination with the ICP must ensure the existence of PPE in the health units of small dimensions, prioritising the above areas.

In addition to general recommendations, here are important measures to control nosocomial transmission of MDR-TB:

Isolation of MDR-TB patients:

- MDR-TB patients when hospitalised or receiving care in the HU should be cut off in bedroom / closed rooms. They should not be in the same place as the other patients to the conversion of skin smear tests.
- It is extremely important that MDR-TB patients are isolated from HIV-positive patients or with other types of immunosuppression.
- HIV positive health workers (or with immunosuppression from another cause) **should not work** with MDR-TB patients or in the area where they are hospitalised or being treated.
- Health workers **should instruct** MDR-TB patients to cough with etiquette. It is important to supervise this practice so that these patients maintain this habit.
- MDR-TB patients **should not receive** treatment in places where HIV patients are treated, or at least not in the same physical area or at the same time.
- It should be avoided that MDR-TB patients leave the designated area of the facility for treatment. However, if they need to leave this area and their rooms they should **always** wear a surgical mask in order to reduce the spread from MDR-TB bacillus when coughing.

- MDR-TB treatment unit should really be **located in a separate building** from the hospital, or, if not possible, in a separate area of the same building with dedicated nursing staff.
- If the facility is not able to maintain the isolation of TB-MDR patients, these should be referred to a facility that is able to do so.
- If present, the Hospital Infection Control and Prevention group (ICP) must be notified of the admission of MDR-TB patients in order to maintain surveillance, guide control measures, monitor and guide health workers working in the area. ICP group should also advise to discontinue isolation of such patients.

In general, it is recommended to evaluate the need to maintain the isolation of TB patients as often as possible. In case of patients with TB sensitive to isolation can be suspended after at least two weeks of DOT treatment and clinical improvement. In the case of MDR-TB the criteria should be stricter if the insulation can be suspended after two skin smear tests and negative cultures.

Avoidance or reduction of risk procedures:

Procedures that induce coughing (including inhalation), bronchoscopy, and autopsies should normally be avoided in MDR-TB patients.

The spittoons used by MDR-TB patients must have a cover and be suitable for incineration.

When necessary a health care professional during cough-inducing procedure should be present, this is in addition to using the N-95 respirator, to **remain behind the patient and not in front.**

Promotion of ventilation and air irradiation:

Visits from family and friends to MDR-TB patients should be restricted and when they occur, they should be held preferably outdoors.

The rooms of the MDR-TB treatment unit should have large windows to allow sunlight to enter, and must be open to allow natural ventilation.

The doors should be between bedroom and hallway closed, preventing the entry of aerosols within the corridor.

Monitoring and Evaluation

The NTP should start with a discussion process on how the various departments of the Ministry responsible for several areas can coordinate with the ICP so that the monitoring process is carried out in the HU, and can include issues identified by these units in the infection control as a continuous process and requiring continuous updates.

The ICP should initiate an inclusion process in the Monitoring and Evaluation regarding the verification of the implementation of administrative, environmental and personal protection measures of tuberculosis control, as well as the implementation of solid waste management measures with respect to individual plan of the health facilities.

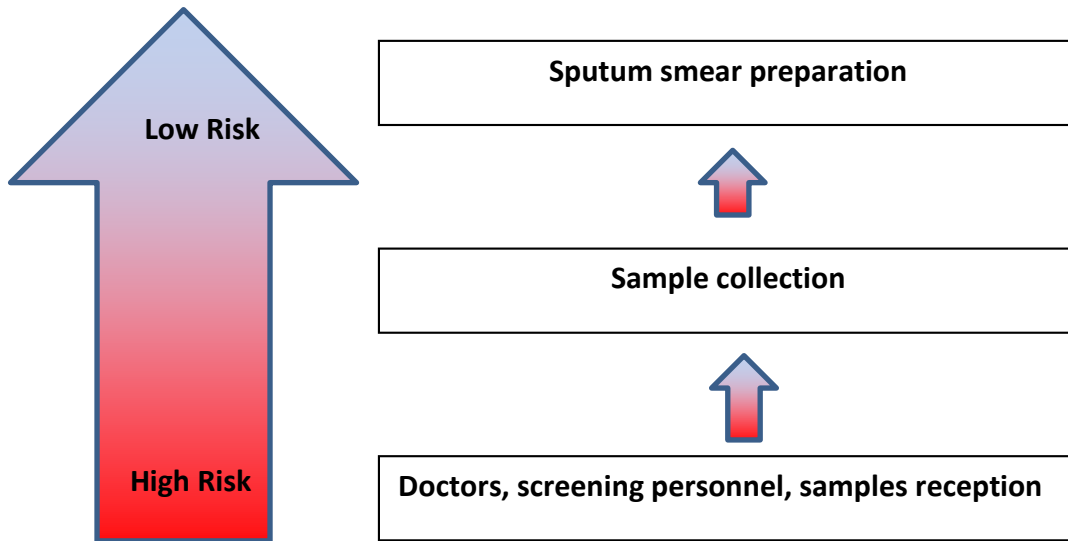
The NTCP should begin in coordination with the ICP an outreach program of the existing normative documents, in order to harmonize procedures relating to TB, aiming at adopting measures to ensure that the contents of the manuals and other documents to be converted into brochures, POP's that are simple, concise and targeted to each sector, due to the fact that technicians do not read "voluminous" documents.

The NTCP in coordination with the reference laboratories and others in the process of the update procedures of manuals in the laboratories must include the production of waste streams identification process, as well as the clear identification of waste and how to proceed with their management.

Relative risk of exposure to a tuberculosis infectious case

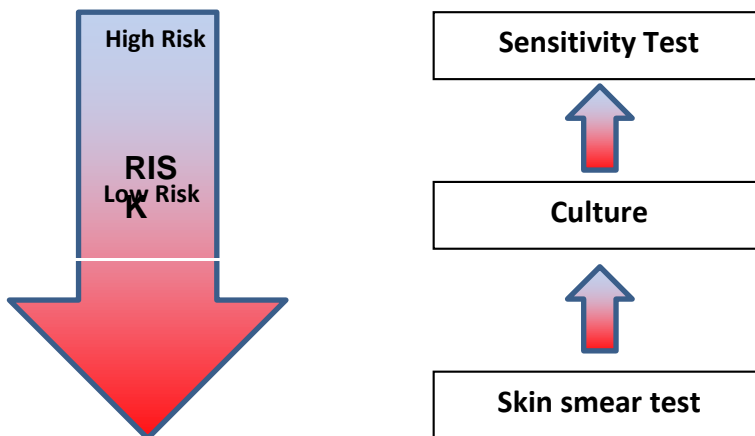
The figure below shows the relative risk for exposure to the bacillus according to the level of patient care:

The risk decreases upward.



Risk Degree in Laboratory

In the laboratory the degree of risk is proportional to the complexity of the procedure, and this is due to the fact that there is a need for a higher concentration of bacilli in the more complex procedures.



Due to the increased risks presented in the previous schemes whenever these infectious samples are manipulated, they must occur within a biological safety cabinet.

Due to the fact that direct sputum skin smear tests offer a low risk of aerosol generation, they may occur in open bench where there is a guarantee of adequate ventilation, and compliance with good microbiological techniques.

Risk level of a TB laboratory	Laboratory activities	Risk assessment
Low risk	Direct skin smear test; preparing samples for use in an automated test cartridge with nucleic acid amplification (such as Xpert MTB / RIF)	Low risk of generation of infectious aerosols from the sample; low concentration of infectious particles
Moderate risk	Processing and concentration of samples for inoculation in primary culture medium; direct susceptibility testing (e.g. genetic probe test processed sputum)	Moderate risk of generation of infectious aerosols from the sample; low concentration of infectious particles
High risk (TB containment laboratory)	Culture manipulation for identification; Sensitivity testing or genetic probe tests in isolated culture	High risk of generation of infectious aerosols from the sample; High concentration of infectious particles

Table 3 - Precautionary levels against risks, associated laboratory activities and risk assessment

The level of risk refers to the probability of someone in the laboratory to be infected with TB as a result of the procedures performed in the laboratory.

Essential biosecurity measures in TB laboratories

All TB laboratories, regardless of the procedures performed, should establish a set of core biosecurity measures to minimize the risks.

The measures to be defined and implemented are as follows:

1. Code of Practice
2. Equipment
3. Design and laboratory facilities
4. Health surveillance
5. Training
6. Waste treatment

Code of Practice

The code of practice describes the practices and essential laboratory procedures for the application of good (i.e., safe) microbiological techniques.

Specialised laboratory equipment should always be accompanied by proper procedures and good microbiological techniques, but can never replace them.

Equipment

Equipment should be selected, taking into account some general principles, that is, they should be:

- Designed to prevent and limit contact between the operator and the infectious material;
- Made of impermeable material to liquids and corrosion-resistant materials;
- Made to be smooth, with no sharp edges or unprotected moving parts;
- Designed, constructed and installed to facilitate their operation and provide easy maintenance, cleaning, decontamination and certification testing;
- The glass and other breakable materials should be avoided whenever possible.

Design and facilities

Proper design of the laboratory, as well as the actual construction of its facilities, should contribute to the protection of their employees and provide a barrier that protects people from the community against TB aerosols that may have been generated in the laboratory.

Training

Human error and poor technique can compromise the best security measures put in place to protect laboratory personnel. Well-trained staff, informed and aware of safety is essential to prevent infections acquired in the laboratory, as well as incidents and accidents.

Waste treatment

Waste management procedures must meet all the requirements and local or national regulations. The fundamental principle to minimize risks from waste is that all infectious materials should be disinfected, autoclaved, incinerated and prepared for burial.

Annex 3 Hospital Waste Management in Mozambique

The waste produced in health units fall into two major groups: general waste (equivalent to municipal solid waste) and biomedical waste.

Biomedical waste according to Decree 8/2003 of 18 February defines it as “waste resulting from treatment, diagnosis and human research and veterinary medicine activities”, and include among other cutting / piercing, blood, body parts, chemicals, pharmaceuticals, medical devices and radioactive materials, all of them have a high potential to cause infection and injury than any other form of waste due to its state of contamination and this requires a proper handling and management.

The management of all health facilities within the biomedical waste management has the responsibility to nominate or appoint an administrative management team which comprises the Director or her/his representative, head of epidemiology service, head of ward, HU manager, inventory manager and head of pharmacy and medicine with the following functions:



Waste category of the National Health System

In general there are four main groups of biomedical waste: general, infectious, anatomical and chemical / dangerous waste.

Table 5 - Categorisation of hospital waste

Category	Description	Examples/composition
General waste	This type of waste is similar to the waste produced in households, there is direct danger, however in order to be produced at the facility requires special attention, including sweeping corridors, gardens, warehouses, etc.	Paper, cardboard, plastic, etc.
Infectious waste	Waste produced in situations with or without hospitalisation, where there is knowledge or suspicious of pathogenic microorganisms. It includes materials which may be hazardous or infectious for both drive workers, patients, or public, requiring special attention in and out of the unit until its final deposition and it can be classified in the following subcategories	Laboratory waste, microbiological research, human tissue or infected animals, etc.
	<input type="checkbox"/> Cutting and / or perforating - objects or devices having ends, edges, spikes, rigid or sharp protuberances and stained or contaminated with blood or other body fluid, from the wards, surgeries , etc.	Needles, syringes, lancets. Intravenous spikes, blades, scalpel, pipettes, etc.
	<input type="checkbox"/> Infectious (treatment) — other than sharp waste that have come into contact with human tissue, blood or human fluids or animals.	Cushions contaminated with blood or other fluid, diapers, blood bags, used cotton gloves, blood transfusion bags, etc.
	<input type="checkbox"/> Cultures / samples in this group have samples and laboratory cultures, human tissues	Culture (tissue culture, urine, exudates, animal experimental samples, etc.
Anatomical	Such waste include, among others, amputations and other tissues from surgical operations, autopsies, gestation	Human tissue, placenta, foetus, teeth, large quantities of fluids, organs or parts of organs, etc.

Hazardous Chemicals /	This type of waste has physical or chemical characteristics similar to hazardous industrial waste and require special treatment and handling and they can be classified into the following categories.	It includes pharmaceuticals, organic chemicals, heavy metals and other
	<input type="checkbox"/> Pharmaceutical waste	Drugs with expired validity, medication remains that can be cytotoxic, genotoxic, mutagenic or carcinogenic / cancerous.
	<input type="checkbox"/> Photochemical waste — mainly waste from radiology departments	Photo developer, fixer and X-ray films.
	<input type="checkbox"/> Radioactive waste — any solid waste, liquid or anatomical contaminated with isotopes of any kind	Paper, gloves, cotton balls, syringe, liquid excreta of patients, radiation sources used, <i>radium needles</i>
	<input type="checkbox"/> Laboratory Waste - basically formed by chemical out of time or have used research and laboratory analysis	Different types of acids (hydrochloric acid), alkalis, organic substances (phenol), solvents (ethanol, methanol, chloroform), heavy metals (mercury)

Biomedical waste management should be organised and should always differentiate: production, segregation / separation, collection, transport, treatment and disposal.

The figure below summarises the minimum procedures to be followed to ensure waste effective management from the generation until the deposition.

Step	Location	Flow of biomedical waste	Main points
0		Minimising waste	Purchasing policies / stock management, recycling of certain types of waste
1			

2	Hospital Ward		One of the most important steps to reduce the risk and amount of hazardous waste
3	In Health Unit		Protective equipment, sealed containers, and carts easy to wash
4			Lockable site, easy to wash, limited storage time 24-48 hours
5			Suitable option and minimised impacts
6	Outside the HU		Appropriate vehicle and note / manifesto of the conveyed material
7			Licensed site and proper treatment

Table 6 - Summary of biomedical waste management flow (Basel Convention / WHO)

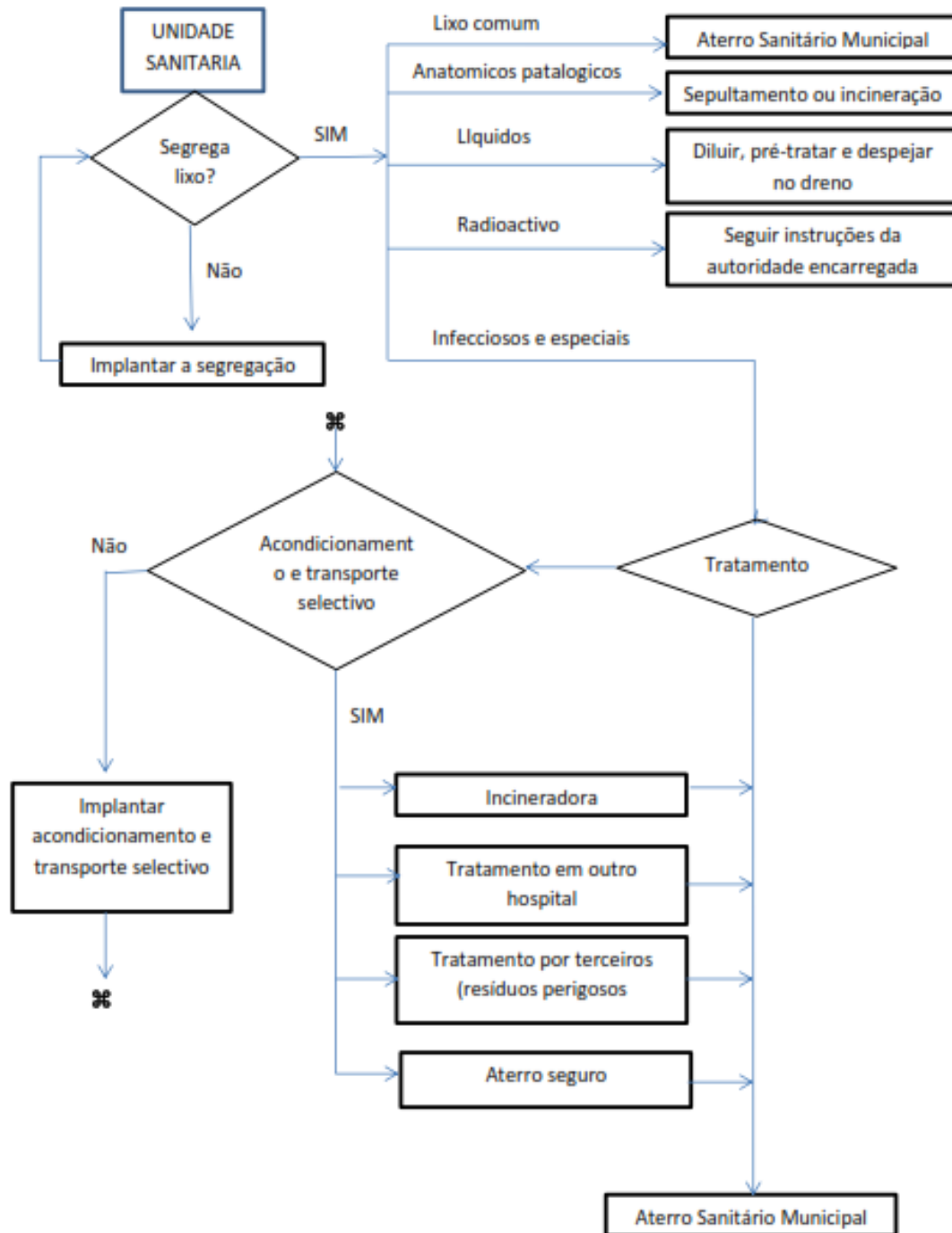


Figure 5-Diagram flow - Waste management in HU

Segregation and Reduction of Medical Waste

Segregation of waste in health facilities is the most important and fundamental part in waste management in general, but also very important in biomedical waste management, because a good segregation will depend on the following:

Cost reduction in the treatment of infectious waste since according to the national and international data, the percentage of waste requiring special treatment produced in health units ranges from 15 to 20% of total production, thus an appropriate segregation allowing for the treatment of the relevant matter would allow for cost reduction, therefore giving rise to financial savings by the unit.

Identification and segregation of waste is the key to minimize and for efficient management of biomedical waste.

Segregation should be made from the point of production / generation (wards, laboratories, operating rooms, etc.). The responsibility for segregation should always be of the person who produces, including doctors, technicians, nurses, etc. The place should be as close as possible to the point of production.

Another important premise is that people should be trained on the importance of segregation, showing not only the health and environment protection issues, but also the financial, aesthetic issues, decoding of colours and types of waste among others, at all levels (hospital managers, doctors, technicians, interns, etc.).

According to Mozambican regulations each health unit or the company handling biomedical waste must have a minimum of conditions for packaging waste of 5 categories.

1. Infectious waste,
2. Cutting and / or perforating waste
3. Anatomical waste
4. Common Waste
5. Another type of waste

Health facilities must not only ensure the segregation of waste within the wards or units but also clearly define and ensure a withdrawal process for the same waste separately in order to avoid cross contamination of infectious and non-infectious waste, so as to ensure not only the ease and correct treatment but also to reduce costs, making it often difficult or impossible to conduct a proper treatment. Note that the dangerous fraction of the waste produced is less than 25% of the total.

Of the various issues identified in the waste management, the management of health facilities should:

1. Guarantee a waste segregation system, in each of the wards or areas with potential to produce hazardous waste, two containers / pails properly identified, either by colour or information within the possible containers and bags. For infectious waste, it should be yellow in colour and non-hazardous waste of any other colour cannot be confused with the yellow colour. Must be containers that are easy to wash, with smooth walls to avoid the possibility of retaining liquid and waste and wherever possible these should always be covered with plastic bags, which will be removed and replaced in accordance with the waste removal plan.

2. Containers / buckets should have sufficient capacity to accommodate the average volume produced in each ward and an increase of 20% capacity. There should be a cap, as far as possible with a mechanical opening mechanism “pedal” to avoid contact of personnel with the lid and possibly with the waste.
3. Analyse the implementation of 3R's waste principle for some types of waste (Reduce, Reuse and Recycle) however taking into account first health protection.

Medical units must prepare a waste management plan applying the hierarchy. Among the most common diseases resulting from poor or non-existent biomedical waste management, there are the following:

- Hepatitis B
- AIDS
- Tuberculosis
- Disorders caused by chemicals
- Other infectious diseases

These diseases and disorders can be transmitted or produced by any of these two ways: by accident or nosocomial infection.

Avoiding generation of biomedical waste (REDUCE)

In relation to this aspect of the management of a HU, the need to reduce waste production should be highlighted as follows:

- Whenever possible the greatest amount of material should be used
- Accumulation or storage of materials should be avoided preventing their degradation before use, by ensuring proper inventory management system and the principle of “first in — first out”
- Analysis of product replacement, in view of less harmful or less toxic material should be carried out.

Reuse and recycling

It is always possible in the large amount of waste produced in health units to start the segregation process. Each health facility should take stock of its waste and separately identify not only between hazardous and non-hazardous materials, but also fraction of recyclable materials.

The judicious purchasing or requesting process should be set in order to avoid stock-outs, exceeding expiry dates. The other issue is to give preference to products with less packaging, return possibility of unused chemicals or waste thereof, refill of gas cylinders, return to the producer of radioactive waste.

Medical Waste Collection

Each of the wards or areas with potential to produce hazardous waste must have:




- Two containers / pails properly identified, either by colour or indications for infectious and general waste
- Incinerators boxes for cutting / piercing or cutting equipment or burning needles.
- The collection system depending on the size of the health unit should be done in time when there is the slightest movement of users / visitors, and the collection of

ordinary waste and hazardous materials must always be made at different times or by two different workers and if possible in different script, e.g., north-south entrance, south-north entrance, declining numbers, increasing numbers, etc.

- Workers involved in waste collection must compulsorily wear rubber gloves, even if the unit uses plastic bags for segregation, both for the collection of common non-hazardous and hazardous waste, and should have waterproof aprons and resistant material to protect the possible contacts with their uniforms / tap , etc.
- In case of existence of waste storage areas and waiting times for treatment, there should be an amount of the same colour containers in the warehouses, so that the workers do not have the need to transfer material manually from one container to another or to some other containers, thus ensuring that the waste containers are removed to the final treatment, either in incinerators, landfill or other.

Identification and storage of hospital waste

The coding of containers, plastic containers and bags colour is one of the most efficient ways of obtaining or achieving the necessary separation, which allows the possibility of recycling items such as paper, glass, plastic and other non-contaminated recyclable materials.

Type of Waste	Colour of the receptacle / container	Label	Other indications
Infectious	Yellow containers Yellow plastic bags	another colour bag with yellow label "infectious waste"	 infectious waste
Cutting and / or perforating	Yellow containers or painted yellow with rigid walls.	cutting and / or perforating waste	 cutting and / or perforating waste
Anatomical	Small amounts in infectious yellows bags, Large amounts in rigid walls of containers and waterproof.	infectious waste	 infectious waste
Pharmaceutical (medicines)	letterhead container	drug waste	
Radioactive	specific and appropriate containers		Completely isolated area and restricted access.
Cytotoxic	specific and appropriate containers		safe area and restricted access

Common	transparent plastic bags		One can use any however, conditions must be created to monitor the content without requiring physical handling.
--------	--------------------------	--	---

Transport outside the HU

Important and compulsory questions when transferring waste from one unit to another for final treatment.

1. Waste transfer of a superior unit to another lower level should not be allowed,
2. Only the transfer of waste between the same level units will be allowed, or to a higher level that presents the best treatment system.
3. Private clinics if they cannot make their treatment within their premises could only transfer to general and central provincial level hospitals, which have in their system capacity and organisation to receive, not being allowed to transfer to lower-level units.
4. No transfer shall be allowed in any case of sharp waste, and for this type of waste internal conditions should be created. It could be an exceptional case when the unit is of top level and it has installed one pyrolytic incinerator with gas treatment system.

The shipment of waste from one unit to another should always be carried out in closed box cars, whose share of the load is physically separated from the driver's cab. (e.g., vans with Canopy can be an acceptable option).

Waste must be packaged in bags in containers with rigid walls and lid system with a certain security to prevent evictions in case of sudden braking or holes.

Shipments of waste must always be accompanied by a manifest data with the quantities and types of waste, signed by the area.

Hospital Waste Treatment

The choice of treatment method must be based on the following factors:

Disinfection efficiency, environmental and health considerations, reduced mass and volume, health and biosecurity considerations, system capacity depends on the quantities produced, types of waste to be treated, maintenance and operation, availability of operators, space, public acceptance, risk of emission of toxic / hazardous materials and legal issues.

Among the most appropriate techniques for biomedical waste treatment, the following should be stressed:

- Ovens montfort
- Incinerator pyrolytic
- Municipal Incinerator or single chamber
- Autoclave, moist treatment
- Encapsulation for quantities and specific situations
- Burying within the hospital limits

- Discharge into the sewage system
- Inerting
- Tissue digesters

For each level of health facility possible methods of use will be identified taking into account the type of waste it generates, its location in relation to the surrounding population, the availability of funds, availability of space within the fence of the facility.

Hierarchically the disposal of biomedical waste follows the following sequence, the least desirable, with greater environmental impact, the most desirable and with less environmental impact. Note that the choice of method must be defined in each health unit management plan signed by the head of the unit.

1. Burying process (landfills)
2. Open burning in pits
3. Burning in barrels or incinerators and cement block
4. Burning in single chamber incinerators
5. Burning in pyrolytic incinerators
6. Disinfection and grinding
7. Recycling

The management of the MoH in coordination with the Department of infrastructure and the ICP should initiate a plan for investment in the construction and installation of equipment and infrastructure for waste treatment and clearly prohibit landfills and open burning of hazardous waste.

The management of each facility should ensure that waste containing heavy metals in particular mercury, as well as pre-treated wastes by chemical disinfection (hypochlorite, hydrogen peroxide) are forbidden from ash.

Infectious waste treatment by incineration

It addresses infectious waste treatment by incineration due to its flexibility to deal with many types of waste however there is every need to comply with some key issues in order to avoid impacts on health and environment.

It is a method used under controlled conditions to oxidise carbon and the existing hydrogen in the waste, and given that non-burnable materials remain in the ash waste incinerators must have two combustion chambers, and the first to should reach temperatures between 600 and 850 °C, and the second should reach 1200°C as well as having fume treatment systems.

Among the advantages there is the possibility of treating many types of waste and reduction in volume, but it has the disadvantage of gaseous emissions, price and maintenance procedures and specialised operation.

The units with their own incinerators must keep a log book with the following data: type of waste; origin; date of incineration and operating conditions.

All units of type I and II must include in their construction design the installation of an incinerator of Montfort type (version 8a or higher), whose chimney would never be less than 4 meters.

Some technical aspects will be listed for compliance in order to extend the life of incinerators as well as reducing emissions given that incinerators greatly depend on specific procedures of good programming for proper operation and reduction of pollution.

The burnout cycle consisting of three phases should be respected including:

1. Preheating - starting the burning of non-infectious material such as wood, coconut shell, etc., for at least 20 to 30 minutes to reach temperatures of approximately 6000 C, if necessary with the addition of diesel or oil.
2. Starting the burning of biomedical waste incinerators boxes with syringe at a constant rate so as to maintain the burning at a constant grid, however
3. 8 to 10 minutes after all the contaminants are loaded, add 1 to 2 kilos of non-hazardous waste to ensure complete burning.

Burning between 600 - 9000C should be ensured since values over 9000C increase the speed and burning in the chimney resulting in the reduction of the gas residence time, and induce the production of black smoke despite reducing the emission of toxic gases and burning below 6000C results in increased emissions of dioxins and furans.

Careful balance between loading speed (introduction of waste in the incinerator) and temperature will minimize the generation of black smoke and the emission of toxic gases.

The management of the health units which have installed type Montfort incinerators should ensure that the following are not used for burning:

1. Waste containing broken thermometers
2. IV fluid bags
3. PVC plastic bags.
4. Ampoules and closed vials
5. Wet common waste

Since the production of dioxins and furans is connected partly with the burning of PVC and other plastics, whenever possible the burning of such material should be banned or reduced to the maximum.

Moist heat autoclaving

The calorific power causes destruction of pathogenic organisms located in the infectious waste. Note that this method is effective for the treatment of perforating and cutting biomedical waste. It is not feasible for anatomical and animal waste and blood treatment.

There must be vapour pressure, temperature and residence time to ensure that all pathogens are eliminated. Attention should be paid to the amount in order to ensure that it has a homogeneous temperature of the entire waste load. The materials must be in open plastic bags so as to allow water vapour to circulate freely and that air is easily removed, the temperature of the water vapour must be between 121 to 132° C, water vapour pressure should be 1.03 bar.

The materials that can be treated are as follows:

Needles, scalpels, syringes, gases, applicators, cotton, drains, gloves, test tubes, petri dishes, culture media , etc.

Deactivation with the use of dry heat

Deactivating by dry heat is carried out by submitting the materials to 180° C heating temperatures for twice. It is not feasible for products that may contain alkaline substances or fats because they can burn.

Radiation

This approach involves the exposure of the waste to ultraviolet light that can be used for low-density and fragile waste. It can also be used to gamma radiation, and the residence time should be approximately 12 hours.

Microwaves

Microwaves destroy the microorganisms by increasing the temperature within the waste mass. It is important to note that not all commercially available devices can be used to treat all types of infectious waste, but only those with such specifications.

It is not feasible for cutting and/or perforating, anatomical and animal waste.

Before the process, the waste must be crushed in order to ensure homogeneity which ensures a uniform absorption of microwave material to be treated. Note that it is expensive and difficult to implement.

Chemical Disinfection

It is used for the pre-treatment of chemical disinfectants which act as germicides, especially contaminated liquids, solids and surfaces may pose biological hazards (e.g., sodium hypochlorite, phenolic, formaldehyde and hydrogen peroxide).

Freezing

This pre-treatment technique is used for biological materials which are subsequently burned. In the case of anatomical waste, the normal temperature for the procedure should not be higher than 4° C.

Table 7 - Comparative table of some processing systems

Factor	Treatment System		
	Steam Sterilisation	Incineration	Microwaves
Application	Most infectious waste	Almost all infectious wastes	Almost all infectious wastes
Operation	Easy	Complex	Moderately complex
Staffing requirements	Enabled	Enabled	Enabled
Volume reduction	30% (without subsequent compaction)	85 to 95%	60% (with grinder)
Occupational hazards	Low	Moderate	Low
Liquid effluents	Low risk	Moderate risk (gas scrubber)	Low risk
Emissions to air	Low risk	High risk	Low risk

Adapted from: Reinhardt, P.; Gordon, J. Infectious and medical waste management. Michigan, 1991.

Sharp Waste Treatment

Given the fact that within the program implementation this type of waste will be produced, it will be discussed herein due to its importance.

For this type of waste, the transfer between health units should be prohibited. It is the responsibility of each HU to create conditions for the implementation of one of the options detailed below.

The options for cutting and/or perforating waste are as follows:

1. Coated pit
2. Incineration
3. Syringe cutters
4. Melting system
5. Autoclaving and grinding

As it can be seen there are methods for all levels of health facilities, so its transfer is not justifiable because besides being costly, its handling is a very dangerous process.

Annex 4 Tuberculosis treatment laboratory waste

In the treatment of tuberculosis the following wastes are produced:

- Spittoons
- Spatulas
- Blades
- Biological and pathogenic agents
- Cultures
- Agents / chemicals

The laboratory management shall evaluate the waste produced and define its management. It is important to lay out the waste production process in the laboratory, and the following assessment steps should be followed:

- Identify the volume and nature of products for laboratory use purchased and used by each department and laboratory area;
- Identify and map all sources and origins of waste resulting from laboratory services;
- Identify, characterise and quantify the waste streams of each department and laboratory area;
- Design a system and waste flow pattern to facilitate separation at the point of production, collection, transfer, internal storage of waste, separate and analyse the options for applying 3R's.
- Identify and evaluate options for the collection, internal transfer, methods and disposal sites; and
- Establish a control, weighing, regular measurement, registration standards and location; including staff to carry out this task.

Standard procedures for tuberculosis treatment systems waste

The spittoons used for collecting material will contain sputum which is potentially infectious and must be deposited as follows:

- a) After the skin smear test, all containers with sputum and used spatulas are kept in a bucket containing 5% of phenol or 5% of cooked hypochlorite. The bucket should be a foot control. The spittoons caps, cups and the paddles must be completely immersed in the solution for at least 12-18 hours. After this, they can be discarded along with other waste depending on the method used in the HU, either by incineration or disposal in a landfill.
- b) Autoclaving, if available or pressure cookers with a capacity of 7 litres, with the guarantee that the material is fully immersed and boiled for at least 20 minutes. This process is done at the end of each day of laboratory work once cooled content is crushed and disposed of with the rest of the general waste according to the approved methods.
- c) A solution is drained in the drainage system of a HU.

The other waste produced by the TB program is discarded as follows:

- Empty drug packaging (blister packs) is disposed of with the general waste.
- Medicines out of date or out of use must be crushed and placed in the cistern.
- Glass slides for examination with positive results are discarded in the landfills after treatment with 5% of phenol or hypochlorite solution 5% readily prepared or 10% of Javel, blades tested negative can be reused for malaria diagnosis, otherwise discarded as those tested positive.

Plastics burning must be avoided at all costs, especially those containing chlorine or have been treated with products based on chlorine.

Safe disposal of waste must be ensured. Empty bottles of streptomycin can be reused once washed with water or disposed of with the general waste from the hospital.

The use of spittoons made of polypropylene / polyethylene biodegradable should be encouraged.

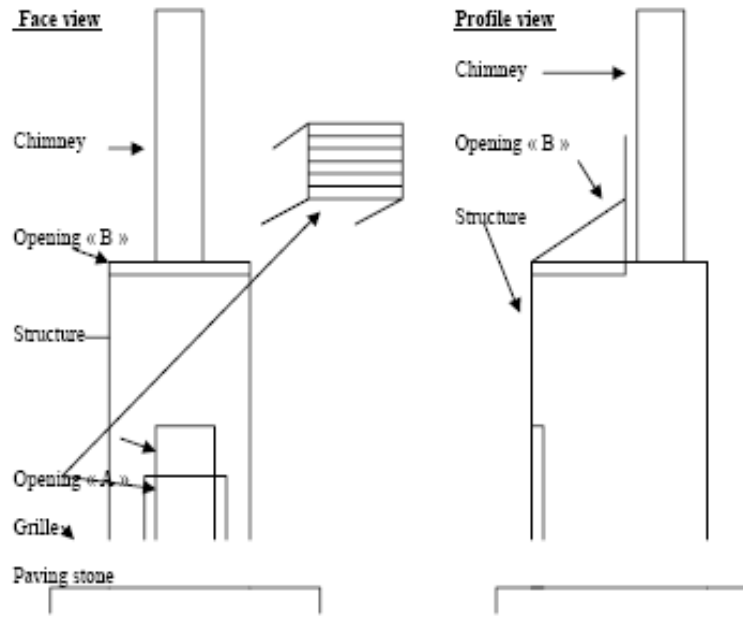
Annex 5 MODEL OF “WHO” INCINERATOR MADE WITH LOCAL MATERIALS

Some technical characteristics:

- Materials : red sand (laterite), clay, white cement
- Bricks of cooked sand
- Galvanized metal sheet Chimney

Structure :

- 0.6m x 1m x 1.5m
- Height of chimney : 5 to 6m
- Opening « A » for lighting and ashes recuperation : 40cmx30cm
- metallic gate (Galvanized metal sheet galvanized) for opening « A »
- metallic grate for burning the waste
- opening « B » for the introduction of waste: 40 cm x30cm
- mobile lid for shutting opening « B »
- Concrete paving stone (2m x 2m)

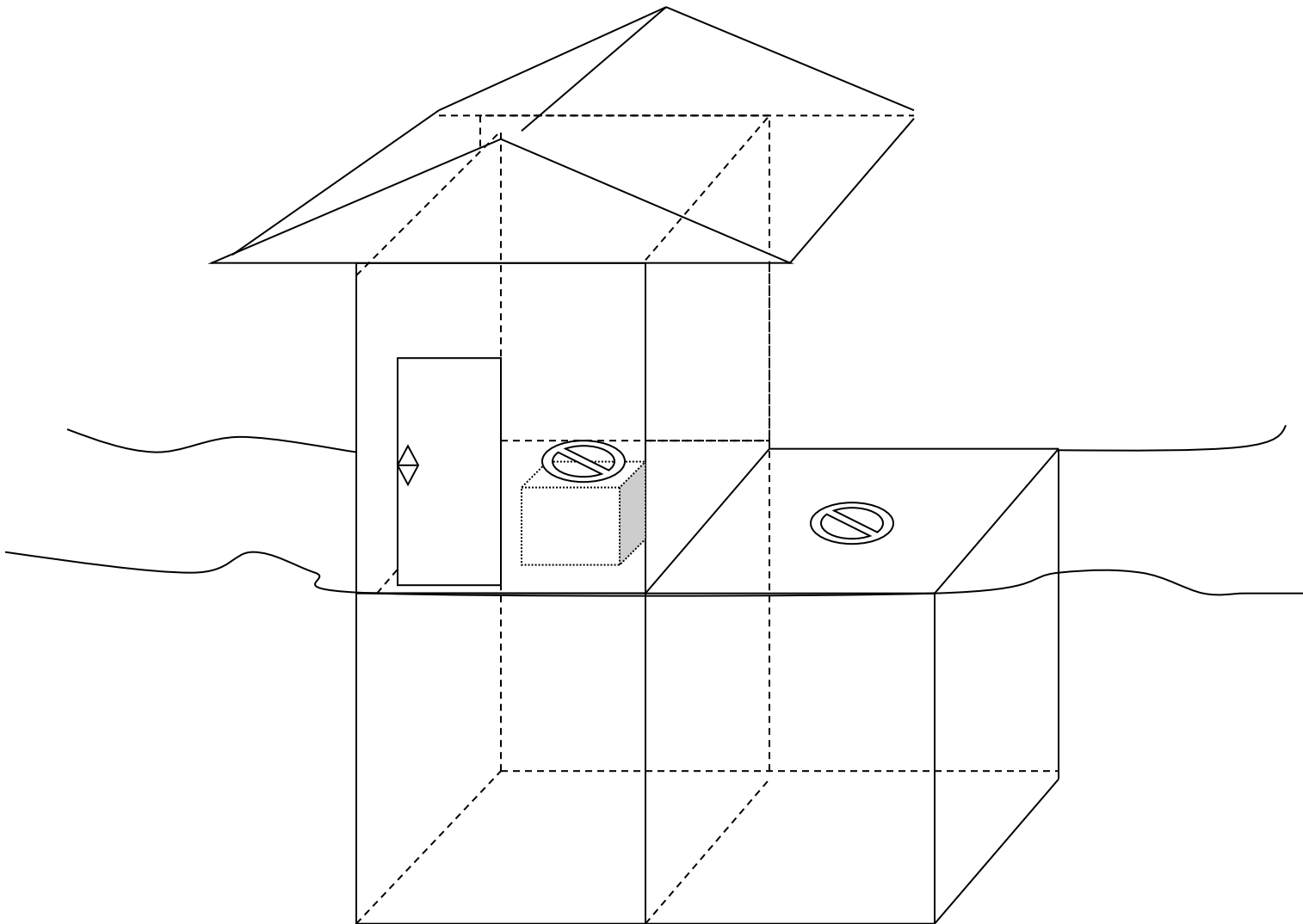


Annex 6 CONCRETE LINED PIT - HOME BASED CARE WASTE DISPOSAL



Pit with Pit Latrine for home based care

Design:



Annex 7 CONCRETE LINED PIT - SHARPS AND INFECTIOUS DISPOSAL

