

# Swaziland Environmental Authority

Health Care Waste Pilot Project  
Main Report  
Sustainable HCW Management in Mbabane Hospital

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# 1. BACKGROUND

The Swaziland Environmental Authority (SEA) is currently, with the support of the Danish Government, developing a National Solid Waste Management Strategy (NSWMS). The NSWMS is a strategy subsidiary to the National Environmental Policy and Draft Environmental Management Bill and serves as an enabling mechanism for the implementation and enforcement of the Waste Regulations 2000. The strategy therefore subscribes to the vision, principles, goals and regulatory approaches as set out in the above documents. The strategy applies to all government institutions, society at large and to all activities that impact on waste management. The fundamental approach to this strategy is to prevent and minimise waste and to control and remediate impacts. Through the strategy the management of waste will be done in a holistic, planned and integrated way and will extend over the entire waste cycle including generation, prevention, recycling, collection, transportation, treatment and disposal. DANCED provided financial support and technical expertise through a team of consultants.

The National Solid Waste Management Strategy (NSWMS) sets out the following vision for Swaziland:

“to develop, implement and maintain an integrated waste management system that will reduce the adverse impact of all forms of solid waste, so that social and economic development in Swaziland, the health of its people and the quality of its environment and its resources benefit”  
*(Refer: National Solid Waste Management Strategy for Swaziland Fifth Draft Volume I & II)*

The Pilot Projects are to test the relevance and importance of the NSWMS and, through practical application, to inform the NSWMS and to give recommendations for improvements.

This strategy also covers Health Care Risk Waste. The SEA has negotiated the testing of this strategic action in Mbabane Hospital by means of a pilot project. The pilot project will assist the SEA in developing approaches for the installation of waste management systems in areas that are not currently serviced. The purpose of the pilot project is to:

- § Clarify institutional issues and arrangements for waste management in health care facilities in urban and rural areas.
- § Evaluate and facilitate institutional cooperation between the various levels of government and health care institutions so as to improve the health care waste management services in the country as a whole.
- § Test different technical and organisational aspects.

§ Improve segregation of health care risk waste and general waste in health care institutions and improve the treatment of health care risk waste so as to improve the quality of the environment in the surrounding environment.

§ Build the capacity of institutions to improve their waste management skills and services.

## 2. INTRODUCTION

The Pilot Project was initially planned to begin in July 2001. The SEA together with the hospital management agreed to run the health care pilot test. After some delays, a final decision was taken in October to appoint a Sub-consultant to assist the hospital management.

In November 2001 the Sub Consultant was contracted to cover a broad spectrum of responsibilities that included the designing and implementation of a waste management system, from the cradle to the grave, into the Mbabane Hospital. The responsibilities included the setting up of institutional arrangements and the development of capacity to ensure sustainability of the system.

The time allocation did not allow for inclusion of the Siphofaneni rural clinic as initially intended. It was agreed with the CTA, MHSW, SEA and the Sub Consultant that the clinic would therefore not form part of the contract. This report only relates to the activities carried out at Mbabane Hospital

The Sub-Consultant was assisted in the capacity building planning by the Danish Capacity Building Consultant.

A status quo assessment of health care waste management in Swaziland was completed in August 2000. The existing management of health care waste has severe impact on the health of the people of Swaziland and on the environment in general. The current health care waste management is as such the most urgent issue within the waste management system to address. During the assessment the following problems have been identified.

There is a lack in the following implementing instruments:

- Legislation (including clarification of responsibilities and duties) guidelines and health and environmental standards etc. Re-visit legislation to get clarity on responsibilities and duties for all stakeholders within health care waste management.
- Institutional and capacity development. For example there is a lack of supervision, accountability, auditing and control of hospitals, health centres, clinics, health care facilities and suppliers.
- Financial management and support.

- Continued training at all levels must be applied. Staff is inadequately trained to handle and manage health care waste. Training programmes must be developed to ensure proper health care waste management practices. Provision must be made for adequate security within the health care waste management system during generation, storage, collection, transport and disposal.
- Awareness amongst all parties involved must be raised, and
- Creation of partnerships between institutions and organisations, regulators, and implementers is a necessity in order to sustain a sound health care waste management system in Swaziland.

The following technical and environmental problems were identified in the status quo report:

- Lack of separation of health care waste at source
- Lack of standardised reception equipment
- Lack of the "no touch from source to final disposal" principle which is a must to avoid infection.
- Lack of adequate operation and treatment of health care waste in Swaziland as a whole. The operation and maintenance of existing equipment are inadequate. Secondary waste fractions must be catered for in the waste management system devised for health care waste.
- Lack of sufficient enforcement, monitoring and control routines
- Insufficient educated and trained staff to carry out duties and responsibilities at all levels.
- Low public awareness on health risks
- No Guidelines for management of health care waste.
- Improvement of co-ordination between cities and Ministry of Health & Social Welfare. Mbabane City Council is not reporting to the Ministry of Health & Social Welfare because no-one asks for information.
- Lack of clarification of roles and responsibilities is needed between local authorities and the Ministry of Health & Social Welfare.
- No Guidelines for collection and (pre) treatment of health care waste.
- No Guidelines for management of waste in rural areas.
- SEA must be able to enforce regulations and monitor the activities carried out by the Ministry of Health & Social Welfare.

Based on the above the following needs were identified:

- There is an urgent need to agree upon the main principals for health care waste handling, storage, collection, transport and treatment.
- Source separation of health care waste should be compulsory in order to separate health care waste from ordinary waste.
- Introduce sound Waste Management Planning including Data Management

### 3. PILOT PROJECT PROPOSAL

A pilot project proposal was drafted based on the above problems and needs identified. The full project proposal is appended as Annexure 1 for reference. The objective and outputs for the project was agreed on with the MHSW, SEA and Mbabane hospital to be the following:

*(Ref: Annexure 1: Project Proposal)*

#### 3.1 Objective:

To plan, develop and implement a technical and financial feasible Health Care Risk Waste Management System into the Mbabane Hospital and the Siphofaneni rural clinic that will be in line with requirements for developing countries set by the World Health Organisation taking cognisance of the geographical, institutional and financial context in the country.

*(Ref. Annexure 2 “Pilot Project Plan” and Annexure 3 “TOR’s for the Sub-Consultancy”)*

#### 3.2 The Outputs:

- A waste management plan for Mbabane Hospital and the Siphofaneni rural clinic.
- An implemented waste management system at both institutions covering all aspects of Health Care Waste Management
- Capacitated and trained staff in the selected institutions to implement the systems
- An Awareness campaign on Health Care Risk Waste

*(NOTE: In the final analysis, the Siphofaneni Clinic was not included due to time constraints)*

### 4. PROCESS FOLLOWED TO IMPLEMENT THE PILOT PROJECT

#### 4.1 Project Planning:

The LFA framework was used for the project planning. Four project outputs were identified:

1. A 2 Year Waste Management Plan for Mbabane Hospital

2. An implemented waste management system covering all critical aspects of health care waste management
3. Capacitated and trained staff to instil and implement the system
4. Awareness campaign on health care risk waste

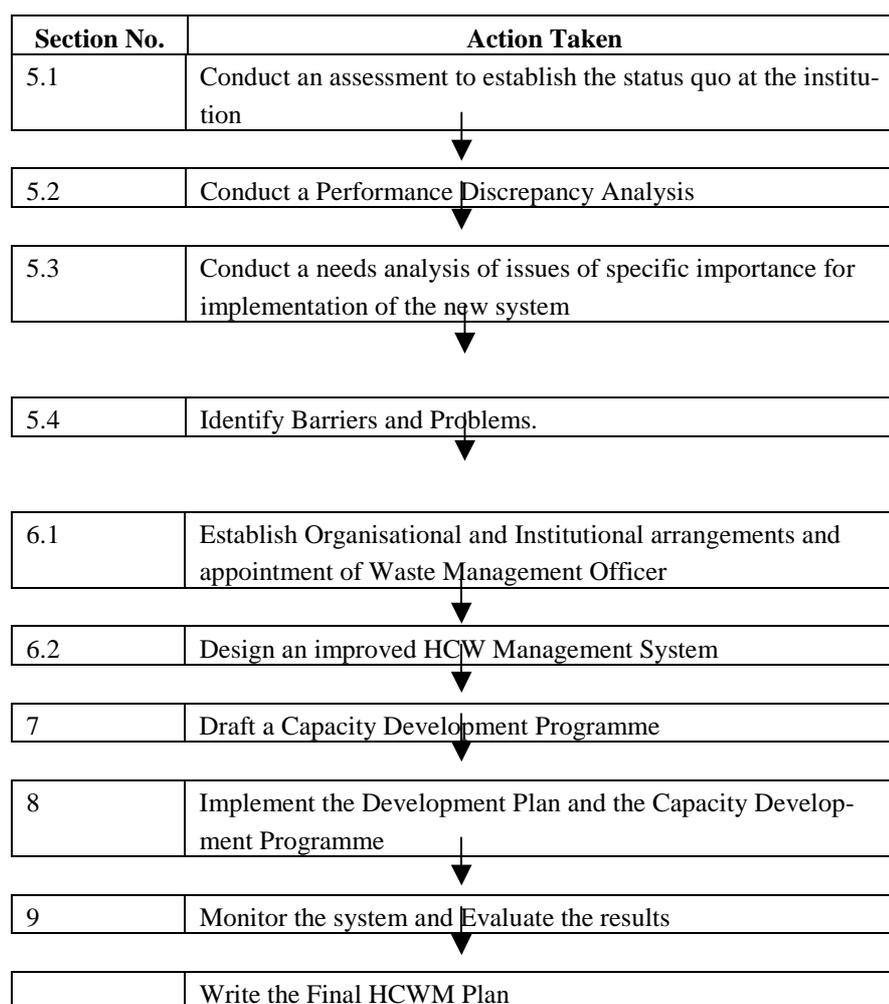
(Ref: Annexure 2 "Pilot Project Plan" – Mbabane Hospital)

A participative approach was a key aspect to the success of this pilot project. This involved many meetings, workshops and consultations with all the key stakeholders throughout the process.

The World Health Organisation Guidelines for Developing Countries was used as a reference. (Other source documents are included in the Reference section.)

#### 4.2 Participation process:

The flow chart shows the process that was followed. The relevant section numbers of this report are indicated in the left hand column

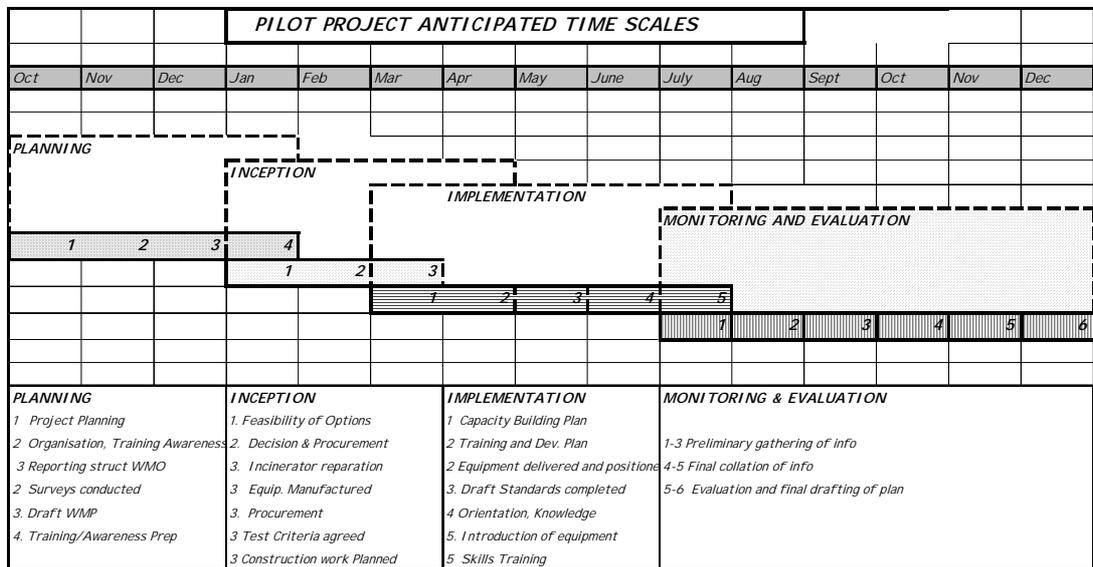


4.3 Pilot Project Time Scales:

The initial time scales for the pilot project was from October 2001 to August 2002. However an application for the extension of the project to end in March 2003 was approved by DANCED.

The following two charts show: (A) The Initial Time Scales and (B) the Extended Time scales after the extension was granted.

(A) Initial time scales for the pilot project



**(B) Extended time scales for the pilot project granted in**

PILOT PROJECT NEW ANTICIPATED TIME SCALES																													
Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar												
PLANNING				INCEPTION				IMPLEMENTATION				MONITORING				EVALUATION													
1 2 3 4				1 2 3 4				1 2 3 4 5 6 7				1 2 3 4 5				1 2 3 4 5													
= available time																													
<b>PLANNING</b>						<b>INCEPTION</b>						<b>IMPLEMENTATION</b>						<b>MONITORING</b>						<b>EVALUATION</b>					
1 Project Planning						1. Feasibility of Options						1-2 Intro of system into test area						Monitoring system estb.						1 Evaluation of system					
2 Organisation, Training Awareness						2. Decision & Procurement						1-2 Training & Awareness						Ongoing monitor of system						1-2 Preliminary gathering of info					
3 Monitoring and Reporting struct						3. Draft Development Plan						3-4 Assess system & changes made												3-5 Inclusion into SWM strategy					
2 Surveys conducted						3-4 Equip. Manufactured						3-7 Continuation of training																	
3. Draft WMP						3-4 Procurement						5 Plans made for the roll out																	
4. Training/Awareness Prep						3-4 Construction wk planned						6-7 WM Team implementation further																	
												6-7 Completion of WM Plan																	

**5. STATUS QUO IN THE MBABANE HOSPITAL**

**5.1 Assessment to establish the status quo.**

An assessment of the Mbabane Hospital was conducted early in November 2002.

The objectives of the assessment were to

- Assess the types and quantities of waste generated by each section.
- Establish the present level of segregation carried out.
- Draw a layout of each unit to determine the location of intermediate storage areas and the best route for transportation of the waste to the central holding area.
- Assess the technical and managerial needs.
- Build relationships with the section heads and the staff
- Sensitise the hospital staff on the objectives of the waste management project and the general segregation methods.

The Consultant together with the Waste Management Officer conducted the assessment using the “Waste Assessment Questionnaire”. Visits were conducted to every section of the hospital over a two-three week period and the necessary information was gathered through discussions with senior and line management, interviews with individual staff members and physical observations.

*(Refer Annexure 4 “Waste Assessment Questionnaire”)*

A site plan of the hospital was obtained from the Public Works Department and the layout of each individual unit was roughly drawn out on graph paper. Each unit's requirements in terms of number of bins, positions and quantities of waste were assessed.

### 5.1.1 Types of Waste Generated

The types of waste identified were classified in accordance with the World Health Organisation guidelines as follows:

Health Care Waste (HCW) is divided into two main categories viz. Health Care General Waste (HCGW) and Health Care Risk Waste (Special Waste – Regulation 2000) (HCRW)

Health Care Risk Waste (HCRW) is considered to be the hazardous component of Health Care Waste (HCW) generated within the hospital. HCRW has the potential for creating a number of environmental, health and safety risks, depending on the particular type of HCRW that is handled as well as the way in which exposure takes place.

Examples of HCRW include:

**Infectious Waste:** All kinds of waste that is likely to contain pathogenic Micro organisms.

**Pathological Waste: (Anatomical)** Parts that are sectioned from the body

**Sharps:** Includes sharp and pricking objects that may cause injury

**Chemical Waste:** Includes all kinds of discarded chemicals, including pharmaceuticals that pose a special risk to human health and environment

**Radioactive Waste:** Includes solid, liquid and gaseous waste contaminated with radio nuclides

#### Health Care General Waste (HCGW):

Health Care General Waste (HCGW) is the non-hazardous component of HCW from health care facilities that includes many of the same substances as domestic waste. HCGW is generated among others during the administrative and house-keeping functions of health care facilities as well as from patients and visitors. HCGW may include a number of recyclable materials

Examples of HCGW are:

- Packaging materials e.g. cardboard boxes, plastic bags, clean packaging from needles, syringes and IV lines
- Kitchen Waste: e.g. organic waste and packaging materials
- Office Waste: Paper, cans, food wrappings, glass bottles etc.
- Patient waste: similar to household waste
- Garden Waste: organic waste from garden activities
- Building and construction waste: from construction and demolition work

The types of waste generated in Mbabane Hospital per department are found in *Annexure 5 “Types of waste Generated per Department”*.

### 5.1.2 Quantities of Waste Generated

This was an important exercise that could have provided valuable information to factor into the planning.

Most of the sections have good patient scales. The exercise commenced on Monday 12th November and ran for a period of one week. A staff member in each section was requested to weigh their waste bins empty and record the weight. The full bins were weighed on a daily basis before removal to the central holding area. (Form were provided to record the quantities)

The exercise was not entirely successful and the information obtained was incomplete for the following reasons:

- § Mixing of waste made it difficult to get accurate quantities of risk and general waste.
- § Scale not available in some areas
- § Change in shift and information not communicated
- § Food waste is collected by unknown persons before they can be weighed so food quantities were not calculated
- § Filling in the form correctly, coaching and training

A summary of the calculations in weight and volume can be obtained in Annexure 6 “Assessment of Waste Quantities”.

Attempts were made to quantify the waste passing through the incinerator. This was again difficult due to:

- Illiteracy of the Incinerator Operators
- Lack of commitment to weigh regularly
- Mixing of the waste.

In summary the following total quantities were calculated for a total period of 7 days

Weight in Kgs.								
	Food	General (Mixed)	Other	Sharps	Human Tissue incl Placentas	Chemicals	Radio Active (x-ray)	Total
<b>Total kgs.</b>	<b>563</b>	<b>1904.89</b>	<b>0</b>	<b>145.22</b>	<b>185</b>	<b>0</b>	<b>0</b>	<b>2798.21</b>

Volume (converted to litres)								
	Food Approx 8 litres	General (Mixed) - 85 litre bins	Other	Sharps - 5 litre bins	Human Tissue incl Placentas	Chemicals	Radio Active (x-ray)	Total
<b>Total containers</b>	<b>36</b>	<b>189</b>	<b>0</b>	<b>36</b>	<b>7</b>	<b>0</b>	<b>0</b>	<b>268</b>
<b>Total litres</b>	<b>288</b>	<b>16065</b>	<b>0</b>	<b>180</b>	<b>70</b>	<b>0</b>	<b>0</b>	<b>1663</b>

NOTE: The chemical and radio active waste was difficult to weigh as the chemicals are thrown down the drain and although there is some silver recovery carried out, there are no statistics available to calculate the quantities. The x-ray department only takes x-rays and there are no isotopes to dispose of. No Cytotoxic drugs are administered by the hospital.

### 5.1.3 Current Situation in the hospital (as at November 2001)

Mbabane Hospital does not have an effective system in place to manage their waste. There are no documented standards for the management and control of waste and the equipment provided for containing the waste is inappropriate and in some places, non-existent.

The hospital staff frequently experience shortages of essential equipment such as liners and dustbins. The basic cause of these shortages has been identified as:

- Lack of understanding of the importance of safe and environmentally friendly disposal of waste.
  - Lack of adequate assessment of the requirements with no legislated specifications for the minimum requirements.
  - In- sufficient budget allocation for liners, equipment and protective equipment
- There is no standard for segregation and the only attempt at segregating is with sharps that are placed into cardboard boxes, old re-used sharps containers with no lids, plastic and glass bottles. Some of the donations of sharps containers are emptied out into cardboard boxes for incineration and the containers are reused. There is no colour coding and no differentiation is made between health care risk waste and health care general waste.

There is an uncoordinated attempt to recycle left over food from patients, visitors and the general public. Small 5-10 litre containers are kept in the wards for collection of the food. The food is not strictly controlled and segregation leaves something to be desired. During the frequent visits to the hospital, soiled gauzes and other items of hazardous waste were seen in the food bins. The removal of the food is haphazard and left for 'visitors' to remove. No one is sure where the food goes!

The Orderlies carry out the collection routines for waste from the areas in an undisciplined way. There are no documented routines and each individual ward or area will place the waste at the collection points at times that suit their workload rather than the most efficient collection times. This leads to problems such as the locked incinerator gates, waste left for long periods at the collection points and the indiscriminate dumping of waste.

There are two exposed places where waste can be stored awaiting collection by the Municipality, one at the entrance gate and one at the exit gate. Sharps, infectious and other hazardous waste such as fluorescent tubes, pressure cans etc. are found mixed with the paper, cardboard and other general household waste for collection by the municipality. This waste is not only unsightly, but is also extremely hazardous to workers, children, patients, visitors and the general public.

Both wastes are taken to the incinerators and those left for collection is mixed health care risk and general waste. On the days that the municipality does not collect, all the waste is taken up to the incinerator for burning.

The Incinerator is in a poor condition. Incomplete combustion takes place with only one burner fitted. The control panel is not commissioned. Safety devices have been removed and there is no temperature control. The operating standards are not according to the manufacturer's recommendations. (Refer to Report on the Incinerator at Mbabane Hospital, 15 June 2002)

Within the hospital, basic general hygiene is cause for concern. The areas in and around the waste containers are unhygienic and there are no documented routines for regular cleaning and sanitising of the area. The foam mattresses used and stored in the wards are uncovered and badly stained

There is no system for the disposal of chemicals and pharmaceuticals. Chemicals are generally thrown down the drain.

The Mbabane Hospital does not have radiotherapy or nuclear medicine so the exposure to radioactive waste is confined to the levels of radiation associated with the taking of x-rays.

#### 5.1.4 Community and Environmental Impacts

The community and environmental impacts of the indiscriminate disposal of waste are enormous.

##### **Needlestick Injuries**

Needlestick injuries carry a risk of exposure to blood borne pathogens such as HIV/Aids, Hepatitis B & C, and Septicaemia and Haemorrhagic fever. The Orderlies leave unprotected sharps, exposed contaminated dressings, gauzes etc. for collection by the Municipality and this leaves not only the Municipal workers, but also the general public, including children, patients and visitors to the hospital exposed to needlestick injuries.

This hazardous waste is then taken to landfill sites where pickers and other scavengers on the landfill sites are exposed to these infectious diseases.

##### **Infectious Diseases from Body Fluids**

Infectious Diseases can be contracted through exposure to the pathogens found in body fluids on soiled dressings, bandages, nappies etc. These include septicaemia, HIV (AIDS) Bacteraemia, Candidaemia, Viral Hepatitis A, B and C. Haemorrhagic fevers, Gastro enteric infections, respiratory infections (T.B), streptococcus pneumonia and skin infections.

The risk of infection to human health increases when infectious waste is sent to landfill and is inadequately covered.

##### **Water contamination**

The disposal of chemical residues and pharmaceuticals into the sewage system may have a toxic effect on the operation of biological sewage treatment plants or on the natural ecosystems of receiving waters. Samples for analysis will be able to determine the extent of the pollution

##### **Air Pollution**

There is no legislation to control the emissions from the incinerator. Incomplete combustion takes place that results in uncontrolled and unacceptable emissions into the atmosphere.

##### **Ground Pollution**

The indiscriminate dumping of hazardous waste and even the ash from the incinerator results in leachate into the ground.

#### 5.1.5 Existing Organisational and Institutional Arrangements

##### **Hospital Organisation**

The hospital falls within the Ministry of Health and Social Welfare and is managed by a Hospital Management Team consisting of the Chief Medical Officer, Matron I, (supported by 3 Matron II) and Hospital Administrator. There is no Infection Control or Occupational Health and Safety Committee established in the hospital.

The Hospital Management Team operates on a tripartite system made up of:

- Senior Medical Officer
- Administration - Hospital Manager (appointed in July) and
- Hospital Administrator

- Nursing - Matron 1, supported by three Matron II

The Line Management structure consists of Heads of Departments and Unit Supervisors who are responsible for the day to day running of the sections. Mbabane Government Hospital has a total of 500 beds with an occupancy rate of 110%. There is a total staff complement of 611 comprising mainly of:

163 Staff Nurses  
 132 Orderlies  
 66 Nursing Assistants  
 36 Nursing Sisters,  
 20 Medical Officers  
 16 Laundry Staff

The hospital has 18 wards that provide a basic service to the community of Medical, Surgical, ICU, High Care, Maternity, Gynaecology, Orthopaedic, Children's and Isolation ward. There is also a Theatre, Casualty, OPD, Laboratory, X-Ray, Kitchen, Dispensary, Laundry and Physiotherapy.

Staff from the Ministry of Public Works and Transport runs the Biomedical Engineering Department. This department is responsible for the general maintenance of the buildings and equipment, the incinerator and the medical equipment. They are based at Mbabane Hospital, and also have a responsibility for other government institutions in the region.

The kitchen is contracted out to an independent company.

The incinerator is situated some 400 metres on the hill on the south side of the hospital. The road gradient leading to the area is steep and the surface has only been tarred running on the south and east sides of the hospital. The last 200 metres up the hill are gravel and badly eroded by rain. The diesel incinerator is housed in a building towards the south end of the enclosed area. The Biomedical Engineering Department contracts out the servicing of the Incinerator on an annual basis to a local engineering company. The contract is for the whole region

#### *Other Institutions and organisations*

National agencies are expected to forge linkages between each other to ensure the broadest possible coverage and backstopping of the project.

The following bodies play an important part in the Health Care Waste Management System for Mbabane Hospital:

***The Swaziland Environmental Authority (SEA)*** is responsible for the National Waste Management Plan and the Waste Information System. The hospital must comply with the requirements of the National Solid Waste Management Strategy

***The Ministry of Health and Social Welfare (MHSW)*** is responsible for the preparation of a National Integrated Health Care Risk Waste Plan. The Ministry is therefore responsible for the successful implementation of a Health Care Waste Management System in Mbabane Government Hospital and requires the hospital to prepare an annual waste management plan. A budget for waste management must be requested by the hospital from the MHSW. The ministry can also assist with available training and awareness material.

***The Mbabane City Council (MBBCC)*** collects the Health Care General waste and ensures that it is safely disposed of to landfill. They are also responsible for the safe disposal of the ash from the incinerator.

***The Ministry of Public Works and Transport (MPWT)*** is responsible for the upkeep of the buildings, medical equipment and infrastructure. They supply the technical support for the Bio Medical department within the Hospital and are therefore responsible for the maintenance and upkeep of the incinerator. Responsibility rests with the hospital management to monitor that the requirements are met.

***General Public*** provides an important inter-action between the different levels in society and sound behavioural patterns can be spread through awareness of the hazards posed by Health Care risk waste. Mbabane Government Hospital has a close association with the local community and provides a service in a number of ways. There is accommodation for expectant mothers who cannot reach their home. The children's ward caters for a small number of orphans. Visitors wait for many hours in the corridors for visiting hours.

***Private Sector*** plays an important role in all areas of the hospital. Private Contractors run the Kitchen and other contractors are employed on a regular basis to service equipment. They play an important role as generators of waste and therefore have a 'duty to care' and must be included in the waste management plan.

#### 5.1.6 Occupational Health and Safety

***Protective Equipment:***

PPE is issued, but is generally inappropriate. Latex gloves are readily available and rubber gloves are issued to the incinerator operators. Paper masks are avail-

able. The protective clothing is often not used as there is no procedure in place for the issue and use and no regular discipline is applied.

**Manual Handling:**

No attention is given to the manual handling aspects of the tasks that are carried out.

**General Housekeeping:**

The hospital does not follow the principle of 'a place for everything and everything in its place'. Unsafe practices therefore exist throughout the hospital. There is general apathy towards trying to improve the situation or the workers are so used to the lack of standards that no attention is given to improving it.

**Stacking and Storage Practices:**

Theft is a problem and lockable storeroom space is limited. As much equipment as is possible is jammed into these rooms. Equipment is therefore piled high with no systematic storage of items.

**Hygiene standards:**

The hygiene standards in the hospital are a real cause for concern. The level of cleanliness appears to be directly related to the degree of supervision practised by the supervisor in the area. The equipment provided is totally inadequate with no colour coded cloth identification for floor, surfaces and toilets. Food splashes and other soiling on the walls are left sometimes for days before being cleaned. The areas around the bins and the bins themselves are dirty. The black rubberised bins are not easy to clean and attract the dirt.

**Occupational Health:**

There is no formal occupational health system in place. Hepatitis immunisation was carried out some years ago, but this was not recorded and there was no follow through from management

**Incident Reporting:**

There is no formal reporting of needle stick injuries and no statistics are kept. The culture of reporting and investigating of incidents does not exist.

**Infection Control:**

At the time of the survey, there was no Infection Control Committee or dedicated Infection Control Nurse. The standard precautions for infection control are not practised. The foam mattresses do not have plastic covers on them and they are badly stained. Several of the wards are overcrowded, with mattresses on the floor and patients lying under the beds. Lodgers (relatives of the patients) assist with the nursing of the patients that makes the control of standards extremely difficult. The eating of food and lack of adequate hand washing equipment was evident

#### 5.1.7 Equipment and Technical Aspects

There are no specifications for the purchasing of equipment for waste management. This results in the purchasing of inappropriate containers, plastic bags and trolleys. The budget constraints are the main factor for the lack of equipment. A limited number of thin 110 litre black liners are made available and these are used sparingly for both risk and general waste due to cost and availability.

A selection of plastic containers, black rubber dustbins and cardboard boxes are used to contain the waste. No differentiation is made for containers used for risk or general waste.

A variety of unsuitable trolleys such as wheelchairs, cylinder trolleys and two wheeled trolleys are used for the transportation of waste within the hospital, as there is no other means for transporting. Each unit is responsible for their waste and must provide the means for the Orderlies to get the waste to the collection and treatment areas.

The waste generated from the hospital is treated in two ways – incineration on site and transport to landfill.

There is an incinerator on the hospital premises that is operated five days in the week. The temperature control and timer do not work as the service provider has disconnected them. This was done as the sensitive temperature and timer controls kept malfunctioning due to operator incompetence. Consequently the incineration process is compromised, as the temperatures reached do not ensure adequate destruction of the waste. Two persons operate the incinerator in shifts and although protective clothing is issued, the operators do not use it as the equipment is not suited to the high temperatures and there is a lack of supervision and discipline. Ash is dumped outside the building, as there is no system in place for the regular collection of the ash. (Refer to “Report on the Incinerator at Mbabane Hospital” for more detail)

The transportation of waste off the site by the Municipality is carried out four times a week. The waste is collected and placed at two collection points alongside the entrance and exit gates for easy access by the municipal trucks. An assortment of black bins, plastic bags, boxes and other containers are left in the area for collection.

#### 5.1.8 Financial Aspects

There is no separate allocation in the budget for waste management. Limited resources are available for the purchasing of liners, protective equipment and bins. The buying of protective equipment, bins, and liners is done through the Stores Department. There are no tender specifications available for the procurement of suitable equipment for the containment of waste.

Frequent shortages of equipment is the norm due to budgetary constraints and the unit supervisors are forced to resort to making do with what they have got. This has led to the practise of emptying the sharps containers for reuse and the emptying of bins at the incinerator so that the bin can be returned to the unit.

#### 5.1.9 Existing Waste Management procedures and practices

There are no documented guidelines or protocols on waste management in the hospital. This results in a “liaise faire” type of management where the supervisors of the individual units determine the level of supervision and enforcement of the “norms”.

The routines for the daily collection and treatment of the waste are centred round the Municipal collection four times a week. The orderlies allocated to the areas

are left to manage the routines and if they are too late for the municipal collection, the waste is then taken to the incinerator or left at the collection point for the next day. On the days when the municipal collection is not done, the waste is taken up to the incinerator for burning. There is very little discipline exercised around the collection and disposal other than the insistence from the unit supervisors that the waste containers are returned to their units. This results in the waste being emptied directly into the incinerator, or onto the ground.

#### 5.1.10 Legislative aspects

Swaziland Legislative requirements with regard to the management of solid and liquid waste disposal are contained in:

1. The Waste Regulations, 2000
2. The Environmental Audit, Assessment and Review Regulations 2000

Both these regulations were promulgated in the Swaziland Government Gazette on Friday April 21<sup>st</sup> 2000 and therefore came into force on that day.

#### **Waste Regulations 2000**

The waste regulations 2000 regulates the ‘Duty to Care’ for all persons who collect, transport, sort, recover, treat, store, dispose of or otherwise manage waste to do so in a manner that is unlikely to result in any adverse effect

The scope of this regulation is broad and contains regulations on storage, collection and disposal of waste in both urban and rural areas. Aspects covered include Carriage of waste, Certification and licensing, Special waste, Recovery of waste, Littering and abandoned vehicles, Waste Management Plans, and Enforcement.

Mbabane hospital is both a generator and a disposer of Health Care Risk Waste and is therefore required to abide in particular with Part VII, Part VIII, Part IX and Part XIII of these regulations

#### **Definitions:**

Definitions contained in the Waste Regulations 2000 that are applicable to the healthcare environment are:

“clinical waste” to define the health care risk waste and includes microbial wastes, stocks of infectious waste, human blood and blood products, pathological waste, body parts and organs, isolation waste and all contaminated and uncontaminated sharps.

“disposal” .includes deposit to land and incineration

“hazardous waste” as listed in Part I of Schedule Three with a six digit waste code. This category includes organic and inorganic waste from all sources.

Section 18 of this schedule describes the waste from Human or Animal Care as follows:

- 1801 – Waste from Natal Care, Diagnosis, Treatment or prevention of disease in humans,
- 1802 - Waste from research, diagnosis, treatment or prevention of disease involving Animals.

Section 19 of this schedule describes the wastes from Waste Treatment Facilities as follows:

- 1901 – Wastes from incineration or pyrolysis of municipal and similar commercial, industrial and institutional wastes.

“household waste” includes waste from premises forming part of a hospital or nursing home, but excludes hazardous waste, effluent or garden waste

“special waste” means hazardous and clinical waste

**Comment:**

These definitions are a little confusing and difficult to work with as there is duplication and overlapping in the three terms used to describe the health care risk waste; clinical waste, hazardous waste and special waste. There is an exclusion of ‘hazardous waste’ from the definition of ‘household waste’ and no reference is made to clinical or special waste. The codes given in the schedule are in line with the international coding system. The term ‘health care risk waste’ as defined by the World Health Organisation is a simpler term and should be used in place of ‘clinical waste’

*Treatment and Disposal of Waste*

The relevant sections of this legislation for the treatment and disposal of waste are contained in Part VII Waste Disposal Facilities, Part VIII – Waste Management Licence.

A ‘*waste disposal facility*’ is defined as ‘a landfill site, **incinerator** or any other facility at which waste is permanently disposed of.

A ‘*waste authority*’ for an urban area means ‘the local authority responsible for that area.

**Part VII, section 16 (1)** requires a person operating a **waste disposal facility**, other than a local waste disposal site, to do so only under the terms and conditions of an **Environmental Compliance Certificate**.

Mbabane Government Hospital is situated within an urban area and does not fall within the exclusion as a “local waste disposal site”. (Section 12). Under this regulation the hospital is therefore required to apply for an ‘Environmental Compliance Certificate’ to operate the incinerator. The following information should be submitted to the Authority (Swaziland Environmental Authority):

- A description of the site
- The anticipated volume and categories of waste to be disposed of at the site annually

**Part VIII, Section 17** – prohibition on unlicensed operation of a waste disposal facility also applies. Section 17(1) stipulates that a person shall operate a *waste disposal facility* in accordance with a **waste management licence** issued by the Authority (SEA) under regulation 18. On application for this licence the following information is required:

- Applicant name and contact details
- The site, including relevant land use in the surrounding area
- The proposed management and operating methods
- The technical expertise and experience of the applicant and its staff in undertaking the waste management activities for which the licence is required
- The actual and/or anticipated environmental impacts of the operation of the facility unless such information has already been submitted to the Authority in compliance with the requirements of the Environmental Audit, Assessment and Review Regulations 2000.
- Subscription fee prescribed in Schedule four
- The anticipated categories and quantities of waste to be handled and disposed of at the facility
- Any other information which the Authority may reasonably require.

Section 18(2) also applies to Mbabane Hospital as they operate the **waste disposal facility** and they are required to submit a **facility operating plan** that shall include:

- A set of facility rules and standards relating to the operation of the facility
- A list of the types and volumes of waste which may be accepted at the facility
- The technical standards of the facility
- The staffing of the facility including security and monitoring measures
- The overall management of the facility

The Authority shall inspect the facility and evaluate the application and shall respond within 60 days of the application.

Further requirements for the operator with regard to the safe operation of the facility. (Section 18(9))

**Comment:**

Under these regulations, Mbabane Hospital as a waste disposal facility is required to apply for:

Environmental Compliance Certificate

A Waste Management License

A facility operating plan

Operating an incinerator carries a great responsibility for the hospital management team who are ill equipped to understand and manage the equipment. The above requirements appear too onerous for a small incinerator operated at a local level. Although regulation is required, the above requirements could be combined under a single application.

Generation of Special Waste

Section 21 (1) requires the occupier or owner of a premises producing special waste to ensure that the special waste is separated from other waste and is stored in separate containers, pending disposal.

Section 23 (1) requires the owner or occupier of a premises on which special waste is kept, treated or disposed of to apply for a ‘special waste management licence’ from the Authority. The application of this licence must be accompanied with details as listed under Sect. 23.3 (a) – (h)

Section 24 (1) refers to the owner or occupier of a premises on which ‘**clinical waste**’ is produced to ensure that it is immediately placed into heavy duty plastic bags or other containers that are colour coded in accordance with the following:

- Unsterilised clinical waste to be placed in heavy duty red plastic bags at point of generation
- Clinical waste sterilised through autoclaving, microwaving, chemical or other non-burning method to be placed into heavy duty yellow plastic bags
- All sharps, sterilised or not, to be placed into rigid, sealed, plastic containers clearly marked “clinical waste – Sharps” in red lettering

All clinical waste is required to be sterilised (no mention is made of incineration) prior to final disposal either on the premises or at an authorised waste disposal facility.

Other requirements include periodic training on proper clinical waste handling procedures for all employees who come into contact with the waste.

Part XIII deals with enforcement and stipulates that the Authority may give notice in writing for the revoking of any licences.

**Comment:**

In accordance with these sections, Mbabane hospital management must also apply for a ‘Special Waste Licence’ and the ‘special waste’ must be stored in separate containers. The provision of ‘heavy duty red plastic bags at the point of generation and the provision of rigid, sealed plastic containers with specific lettering is also legislated. No specifications for

the plastic bags, plastic containers are given, and the regulation does not stipulate the disposal of sharps other than it must be 'sterilised'.

### **Environmental Management Act**

This act deals with an integrated approach in considering the whole environment and the prevention of pollution. The 'precautionary principle', 'polluter pays' principle and the duty to care principle are applicable. The minimisation of waste is encouraged and waste must be reused, recycled, recovered and disposed of safely.

### **Occupational Health and Safety Act 2001**

This act came into being on 14<sup>th</sup> September 2001 by promulgation in the government gazette by the Ministry of Enterprise and Employment, Department of Labour. Although this act does not refer specifically to waste management, the long title provides for the 'safety and health of persons at work and at the workplace and for the protection of persons other than persons at the workplace against hazards to safety and health arising out of or in connection with the activities of persons in the workplace.'

The application of this Act applies to any workplace, including premises owned or occupied by the Government.

The act provides a useful framework for the management of hazards in the workplace with the Duties of Employers defined, the election and functions of Safety and Health Representatives, the setting up and functions of Safety and Health Committees, Notification and Investigation of Occupational accidents and diseases.

Section 8 (1) defines the duties of an employer and stipulates that the employer must ensure that the safety and health of all employees by securing safe and healthy conditions in the workplace.

Section 8(2) requires the employer to *as far as reasonably practicable* (no definition has been given for the phrase) ensure by effective supervision that work is performed in a safe manner and without risks to health or exposure to danger

Section 8(3) states that the employer must have an operative systematic way of identifying, evaluating and controlling hazards at the workplace.

Section 8(4) provides for adequate personal protective appliances, equipment and clothing to the employee who is performing activities or processes which expose them to, et al, poisonous, corrosive or injurious substances or material likely to affect the employee's safety and health.

All these sections apply to waste management.

Comment:

Part II, Part V, of this Act give wide ranging powers to the inspectorate.

Part VII: Procedure and Miscellaneous carries the presumption of guilt by

the employer in section 34(1) leaving the onus of proof on the employer or occupier.  
The Act is very basic, but as a first step gives Swaziland a framework within which the employers can operate.  
The Act is not well known and no attempts have been made to implement the requirements in the hospital

## 5.2 Performance Discrepancy Analysis

The Danced Capacity Building Consultant, Mr. Flemming Koch, carried out a performance discrepancy analysis in April 2002. Members of the training task team and the Health Education Unit assisted him. (Ref: Draft Capacity Development Plan, 04.04.2002).

The team who assisted in this analysis were:

Sr. Khanysele Simelane	In-service training Mbabane Government Hospital
Mr. Bongani Sgudla	Waste Management Officer MHSW
Mr. Duma Mamba,	Health Education Unit, University of Swaziland
Ms. Dellie Dlamini,	Senior Orderly, Mbabane Government Hospital
Mr. Peter,	Health Education Unit, University of Swaziland

There were some inevitable overlaps between this analysis and the assessment that was initially conducted on the status quo. However, the focus of this analysis did bring to the fore some important aspects related to capacity building and the short-falls presently existing in the hospital with regard to attitudes, behaviours, supervisory skills and monitoring skills, and confirmed the lack of enforcement and discipline that exists in the hospital.

The performance analysis was approached at two levels:

- Organisational (ward/unit) with an emphasis on behavioural issues
- Occupational (related to different staff categories) that was all-inclusive with a strong view to the new waste management system.

The performance discrepancy or gap analysis considered two scenarios:

- The existing waste management system, equipment and practices
- The proposed new waste management system, equipment and practices

The following framework was used.

<b>Performance Gap</b>	<b>Explanation</b>
Knowledge Gaps	Basic knowledge about HCWM, Hygiene, Occupational Health and Safety, technology etc.
Skills Gaps	Skill related to the existing and the proposed new system to be able to do the task required
Attitude/Behavioural Gaps	Identification of good and bad behaviour patterns
Worst Case Scenarios	Issues that could have a major adverse affect on the WM system. (Also identified under the heading barriers to the progress of the pilot project)
Technology Gaps	Assessment against the specifications and standards existing. (Greater detail was covered in the assessment on the status quo.)
Organisational, Management and Supervisory Gaps	Looking at organisational, roles, responsibilities and supervisory aspects. (This was also covered in the assessment on the status quo)
Awareness Issues	Also includes aspects related to the general public and patients.

The separate report “Draft Capacity Development Plan”, dated 04-04-2002 details the findings of this analysis. A summary of two critical issues identified are given below. *A summary of the Performance Discrepancy Analysis as detailed in this report can be found in Annexure 7.*

#### 5.2.1 Health Care Worker knowledge, attitude and practices

The findings of the performance analysis concluded that with most cadres of staff there was a lack of application of the basic principles of hygiene and occupational health and safety principles that could be attributed to ‘negligence’ rather than lack of knowledge. However the report highlighted the fact that the new system would be introducing new knowledge gaps that would need to be addressed.

#### 5.2.2 Current Capacity Status within the institution

The effects of the present organisational system within the hospital leaves the hospital staff unsure who is doing what and the decision making process is further frustrated by an apparent lack of a willingness to take disciplinary action. The inter-relations between the nursing staff, between the orderlies and between nurses and orderlies are at times strained and there is a need to clarify the waste management organisation and the roles and responsibilities at all levels. This, coupled with the identified lack of supervisory and monitoring skills, was identified as an aspect that could seriously hamper the pilot test and the proposed

roll out into the rest of the hospital. The behavioural and inter-relationship problems however, cannot be successfully resolved by conventional training sessions nor can this be done within the time frames and scope of this project.

5.3 Needs analysis to identify issues of specific importance in Mbabane hospital. Arising out of the status report and the performance analysis, a problem analysis was conducted. Critical issues and problem areas to be addressed with regard to both the equipment and the capacity aspects were identified. A needs analysis was compiled in two categories of equipment and practices.

#### 5.3.1 Equipment

The main aspect with regard to equipment is the provision of adequate number and suitable quality of equipment to international specifications for the containment of health care risk and general waste. The availability of suitable equipment locally was anticipated a cause for concern.

Other aspects that would need to be addressed with the new system were identified as:

- General cleanliness of equipment with regard to waste management
- Several of the Nursing trolleys require repair and thorough cleaning.
- The trolleys used to transport the waste are totally unsuited to the task. The long distance, the eroded gravel road way and steep terrain requires a rugged trolley design
- Storage facilities for consumable equipment
- Storage of waste at both unit level and centrally
- Provision of protective equipment
- The present condition of the incinerator is unacceptable with one burner, a disconnected control panel,
- A large ash pile has accumulated outside the incinerator that will need to be cleared away
- Reparation of the roadway to the incinerator

#### 5.3.2 Practices

##### **Segregation**

Segregation is a critical area that needed to be addressed. This can only be achieved if equipment is provided for both health care risk waste and health care general waste. Sufficient colour coded containers, correctly placed goes a long way to encourage segregation. Awareness training on the importance of segregation together with a monitoring and enforcement programme to ensure that the new concepts are correctly applied was also identified.

##### **'Do not' ... Behaviours**

Addressing some critical 'Do not' ... Behaviours such as:

- Emptying sharps containers to re-use
- Pushing down the waste
- Not using protective equipment
- Recapping of needles
- Passing of sharps or needles to another staff member
- Overfilling sharps and other containers
- Using equipment without liners

Other practices that needed to be addressed include:

- Documented routines for the transportation of the HCRW to the incinerator.
- Good basic general hygiene in and around the waste bins.
- The introduction of good infection control principles such as hand-washing techniques and personal hygiene when handling infectious and general waste.
- Re-evaluate the risk created by the practise of collection and possible redistribution of food from the wards by unauthorised persons.
- Introduction of codes of practise, protocols and procedures for waste management
- Introduction of Occupational Health and Safety aspects such as wearing of protective equipment, Manual handling techniques, general housekeeping and hygiene standards, reporting of incidents and emergency procedures.
- Introduction of monitoring systems and supervisory techniques

#### 5.4 Identified Barriers to the success of the Pilot Project

Some assumptions or barriers were identified that could have a major negative impact on the success of the project. The solutions to some of these assumptions lie outside of the scope of this project.

##### **Equipment**

- Delays in obtaining suitable equipment and having the transportation trolleys made.
- The theft of the new equipment is cause for concern and solutions are necessary to prevent loss.
- Availability of equipment locally

##### **Behaviours, practices and procedures**

- Non attendance at meetings, workshops and training sessions
- Lack of accountability for the outcomes as stipulated
- Responsibilities of the Senior Orderly and Orderlies are not clearly defined. There appears to be some confusion over the division of responsibility and authority over the routines carried out by the Orderlies.
- The capacity to provide training material and carry out the required training is severely limited.

- There is a lack of discipline and the culture of enforcement is required to ensure that the standards for waste management and the wearing of protective equipment is instilled
- The sustainability of the Waste Management System depends on the motivation and ability of the hospital staff to maintain the system. The hospital staff must be prepared to intensify supervision and ensure that the system is regularly monitored

#### **Administration and Budget**

- Sufficient funds made available for the replication of the system into the whole hospital and insufficient budget allocations made available for the sustainability of the system.
- Clarity is required on whether the hospital can sustain the expense of the disposable items such as sharps containers and liners.
- Assistance from Public Works for the upgrading of the road to the incinerator
- Assistance from Public Works for the removal of the old incinerator and the erection of a caged area for the collection of risk waste awaiting incineration
- The level of general cleanliness and hygiene standards throughout the hospital will impact significantly on the success of the project.
- The location and funding for the building of a central storage area for the general waste.

## 6. PILOT PROJECT DEVELOPMENT

### **Introduction**

A detailed development plan outlines the critical issues and problem areas that are to be addressed by the new waste management system. It also outlines in detail the new waste management system to be tested, the budget estimates, procurement of equipment and the specifications for the equipment. The Development Plan is available as a separate document.

#### 6.1 Organisational and Institutional Arrangements for the Pilot Project

For the sustainability of the pilot project and to ensure that the system was adequately integrated into the overall management of the hospital, internal appointments and committees were established with the management and staff of the hospital. The responsibilities of these individuals were defined to ensure that the pilot project was driven by the hospital management.

### 6.1.1 Institutional Structures

The Hospital Administrator fulfilled the role as the senior representative for the pilot project until June 2002 when a Hospital Manager was appointed to the hospital.

*(Refer to Annexure 8 - Hospital Organogram)*

#### **Waste Management Officer**

The MHSW appointed an Environmental Officer full time to work with the Senior Management and the Waste Management Steering Committee. The duties of the Waste Management Officer in summary are to assist with the initial assessment of the status quo, manage the implementation of the agreed new system, take part in the training sessions and oversee the day-to-day operation and monitoring of the system.

The WMO was required to report directly to the Regional Health Inspector on the progress made in the pilot project. This was done on a weekly basis at the departmental meetings.

A detailed terms of reference for the waste management officer was prepared for the Ministry of Health and Social Welfare so that a motivation could be prepared for the post of a Health Care Facility Environmental Health Officer who would fulfil the role of the Waste Management Officer as defined in the pilot project and extend the role to include occupational health and hygiene. The key outputs in this document were recorded as:

1. Develop and maintain HCWM and occupational health and hygiene in line with the Waste Regulations 2000, other relevant legislation, codes of practice, guidelines and infection control
2. Obtain commitment to improved standards for waste management and hygiene from all levels of management
3. Educate all role players (stakeholders) about improved waste management and hygiene
4. Monitor waste management and hygiene on a regular basis through an ongoing programme of performance monitoring, auditing and incident reporting.

*(Refer Annexure 9 “Motivation for the appointment of a health care facility Environmental Health Officer”.)*

#### **Waste Management Steering Committee**

A Waste Management Steering Committee was established to carry out the planning, make decisions and give authority to the project. The role of this body was to bring together the external organisational membership of the SEA, DANCED, MHSW, Regional Environmental Health Office, Local Municipality and the Bio-medical department with the internal institutional management structures.

Membership of this body together with their responsibilities and outcomes expected are described in *Annexure 10 “Waste Management Steering Committee Members.”*

Two smaller task teams were established to implement the new system. Membership of these teams was taken from Steering Committee Members, Supervisors and Staff members out of the test site areas as well as staff from engineering, stores and in-service training. The table below summarises their responsibilities. More detail of the individual responsibilities is to be found in a separate document called the ‘Development Plan for Implementation of the new Waste Management System in Mbabane’ Section 6.15.

The table below shows a summary of the task team responsibilities

<b>Test Task Team</b>		<b>Training Task Team</b>	
Membership	Responsibilities	Membership	Responsibilities
Members of the test sites, Matron II, In-Service Training, Engineering, Stores, Senior Orderly. Chair: Hospital Administrator	Making decisions on the equipment to be tested Implementation into the selected areas and accountable for the results.	In-Service training, Nursing representative, Senior Orderly, Health Education Officer Chair: In-Service Training	Determine the training req. Devise training modules Deliver the training Conduct awareness programme

**Comment:**

The Institutional structures described above were established to ensure maximum participation and involvement of the hospital staff and the outside bodies who played an important role. Meetings of the Steering Committee were to be held every Tuesday morning. During the periods of the Consultant's visits, regular meetings were held and minutes kept recording the progress made.

Full day workshops were arranged for the task teams at outside venues. The Test Task Team and Training Task Team held more regular meetings during the implementation phases. Minutes were kept recording the progress.

In general the attendance at all the meetings was sporadic and the meetings always started late. Continuity was affected as attendees at the steering committee meetings kept changing when staff members were sent to 'fill in' for the member.

The tripartite system of governance in the hospital complicates the reporting structures in the hospital and leaves the Heads of Departments and Unit Supervisors unsure whom to report what to. This problem is compounded by the lack of documented policies and procedures or job descriptions. The follow through of actions arising out of the meetings was slow (although this did improve as the project progressed) and with the frequent changes of membership or representation at the meetings, there was limited acceptance of accountability.

### 6.1.2 Test Area Selection

The Waste Management Steering Committee decided that it would be more beneficial to limit the implementation to six areas to maximise on the time frames and resources available.

The selected areas were to achieve two main objectives:

1. To address as many of the critical issues and risks as identified
2. To give a representative sampling for the hospital.

The limitations of a small test area were identified in the development plan as follows:

- Limited accumulation of data
- Inability to test the sustainability of the system beyond the test period time scales

- Inability to test the system throughout the hospital which could lead to serious unforeseen problems
- Insufficient training of all hospital staff
- Budgetary and capacity constraints preventing the replication of the system into the whole hospital.

The six test site areas selected gave a balance between high and medium risk and included specialities such as platelets and blood vials from Laboratory, high risk areas such as theatre, casualty and ICU, busy ward areas such as medical ward 18 and the distinct different layout and function that are experienced in GOPD. The areas selected were therefore:

Theatre; ICU; Ward 18; Maternity; Laboratory; General Outpatient Department

### 6.1.3 Anticipated Problems with test selection.

The selection of the 6 areas in the hospital limited the involvement of all the staff of the Mbabane Hospital and resulted in only a section of the hospital being trained during the first four months.

The implementation was initiated without the construction of the storage areas and the reparation of the roadway to the incinerator to prevent any further delays.

Problems with sections of the hospital operating two different systems were identified as follows:

- Logistical problems with the use of areas and routes prior to proper construction
- Transportation problems with the departments using different systems
- De-motivation of staff in the areas not included
- Confusion with the collection of waste that has not been properly segregated and colour coded
- Lack of awareness of the whole hospital of the changes
- Perceptions of being singled out and having additional work in test site areas

- Objectives of the New Waste Management System

The main objective was to develop and test a new waste management system for the hospital. This was achieved by:

- Providing better equipment and facilities and test its suitability for the Swazi-land circumstances
- Introducing improved practices and routines used for the disposal of waste
- Improving the treatment of waste through better incineration practices

- Capacitating and training the staff to manage the system so that it can be sustained and replicated into the rest of the hospital

As there was no effective waste management system in place at the hospital, the project team were of the opinion that to introduce a system that included the full spectrum of wastes generated at the outset would not be sustainable and it was decided therefore to limit the introduction of new processes to the critical issues around the infected waste and to encourage better segregation practices. The new waste management system was designed to include both the health care risk waste and the general waste, but does not include the disposal of chemicals, heavy metals, expired medication or the recycling of food. Other recycling opportunities were also not addressed. The project team recommend that a process of continuous improvement be embarked upon that will include these aspects at a later stage.

## 6.2 Design of the improved HC Waste Management System

### 6.2.1 Overview

A decision was taken by the waste management team to keep the system as basic as possible as it must be easy to manage to provide the hospital with a workable and sustainable solution that can be replicated into the whole hospital. Once a sound basis is established and the basic equipment is in place, continuous improvements can be made as additional resources become available.

Two colours are used:

- Red Health Care Risk waste (HCRW)
- Black Health Care General waste (HCGW)

A liner-based system is economical and easy to manage. Liners of different sizes, microns and two colours are used in a selection of standardised containers and stands. In order to provide sufficient strength, the microns are increased according to the size and type of waste to be contained.

Either environmentally friendly disposable or standardised re-usable containers of various sizes and types are used. The number of containers provided was reduced and where possible, stands were fixed to the walls to eliminate the threat of theft. Segregation at generation is critical to the success of this system. The HCR waste is segregated according to the categories of sharps, infectious waste and anatomical. Disposable containers are used for sharps and standardised re-usable containers of varying sizes are placed at strategic positions to ensure that the waste is contained as soon as possible.

Intermediate storage areas were identified and equipped with large liners supported by custom-built holders mounted on the walls for the disposal of dry infec-

tious waste. The smaller liners, when full, are securely closed and placed inside the larger containers. These in turn are closed when  $\frac{3}{4}$  full and transported by trolley to the central storage areas.

A new Central Storage Area for the collection of general waste was planned to be constructed on the west side of the hospital's main entrance. This area was planned to be equipped with running water and shelving to ensure that the waste is kept in a hygienic manner. The infectious waste is transported to the Incineration Area and stored there on shelves or bins for incineration.

Two trolleys are supplied for the collection of general waste from the ward areas for transportation to the central storage area. One larger trolley is supplied for the collection of the infectious waste and sharps to be transported to the incinerator.

The Incinerator was upgraded to ensure that the risk waste is incinerated at sufficiently high temperatures to ensure complete destruction of the pathogens. The Ash is deposited into black plastic bags of sufficient micron to ensure that the ash is safely contained for transportation to landfill.

#### 6.2.2 The Principles used in the decision of the new system

Three key principles applied are:

- The legal framework presently existing in Swaziland e.g. National Waste Management Strategy, the Environmental Management Bill, the Environmental Authority Act, the Public Health Act and the Waste Regulation 2000. This strategy requires all generators of waste to have a duty of care and be responsible for the hazardous waste generated within their areas. The concept cradle to grave is also entrenched into the legislation and includes collection at source, transportation, storage, destruction and final disposal.
- A multi disciplinary approach with interaction at all levels within the hospital. This framework used includes responsibilities, the quality and quantity of staff, the existing skills and the equipment.
- Segregation at source is a key requirement in this process. The provision of sufficient colour coded and labelled equipment will ensure that this is carried out as efficiently as possible. The minimum handling of waste will reduce the exposure of workers to infection and injury.

A participative process was followed for the development of the new waste management system. A presentation on the proposals was given on 7th December 2001 by the consultant and the three task teams were assigned to look at the aspects of the system.

(Refer: Document “Development Plan for Implementation of the new waste management system – March 2002”, section 6.3)

### 6.2.3 Segregation

Segregation is central to the new waste management system. Not only does it reduce the risk of exposure, but also it is also more cost effective. Incineration of waste is costly so the indiscriminate burning of all waste increases the load on the incinerator and the cost. The general waste can be disposed of more cheaply by transporting it to landfill. It is critical that a good culture is developed in the health care institution of waste segregation at source.

The new system was designed to make containers and liners available as close as possible to the source of generation so that segregation can be encouraged.

### 6.2.4 Minimisation and Recycling

The minimisation and recycling of waste is a key concept that will reduce the volume and consequently the cost of treating the waste. The development plan for the pilot project has not factored these aspects into the plan as it was more important in the initial stages to concentrate on the concepts of segregation at source and cradle to grave. This should form part of the continuous improvement cycle after the roll out into the whole hospital has taken place.

### 6.2.5 Equipment Design and Specifications

The equipment is a critical aspect of a good waste management system. When designing the system, the following aspects were of key importance:

- For the system to be sustainable, the consumable items must be readily available to the hospital. Importation is both inconvenient and expensive so availability locally is important factor
- The specifications for the equipment must be in line with international standards for safety
- Affordability without compromising the minimum specifications
- Fixtures are preferable to free standing containers
- Equipment must be robust to withstand rough handling

The liner based system was preferred as this was affordable and manufactured locally. Incineration of the health care risk waste is carried out on site so the liners do not need to be transported off site and handling is reduced to a minimum.

#### **Types of Equipment**

The different types of equipment specified were kept to a minimum, but at the same time providing containers customised to the individual needs of the units. This was achieved by standardising on sizes and adapting the stands or containers with different attachments or brackets to ensure that they were placed as close as possible to the source of generation. The liners specified were limited to three

sizes and each size had multiple applications. The various types of equipment supplied are listed in the table below:

<b>Types of Equipment and Specifications</b>		
<b>Equipment</b>	<b>Type of Waste</b>	<b>Specifications</b>
8 litre sharps container	Sharps	Impenetrable, rigid and leak proof, disposable rectangular polyethylene plastic container with horizontal loading facility and securely fitted lid
10 litre tall sharps	Tro-catheters and other long sharp instruments	Impenetrable, rigid and leak proof long polyethylene plastic container with securely fitted lid
10 litre speci-can	Human Tissue, Blood vials, cultures, stools	Impenetrable, rigid and leak proof, disposable polyethylene plastic container with securely fitting lid.
30 litre Nursing Trolley Bag Holder	Infectious Waste,	470 x 190 stands with 5mm wire hook that clips onto the nursing trolley. The stand is made of 6 mm hard-drawn wire with a lipped opening of 45 degrees. Details of the stand can be obtained from the engineering drawings kept with the engineering company
30 litre wall mounted stand	With black liner for general waste With red liner for infectious waste	The same as above without the lid and it has support bars approximately 125 mm from the edges. Details of the stand can be obtained from the engineering drawings kept with the engineering company
85 litre wall mounted stand	With black liner for general waste With red liner for infectious waste	470 x 660 x 340 wide stand with mounting brackets fitted to the back. Details of the stand can be obtained from the engineering drawings kept with the engineering company.
12 and 20 litre pedal bins	With black liner for general waste With red liner for infectious waste	Robust metal bin, enamel coated with foot operated lid-lifting device. A handle and chain to be fixed to the wall
Kick-about trolleys	With red liner for infectious waste in Maternity, ICU and Theatre and Casualty	Stainless steel bowl on a tripod with wheels.
Transportation Trolleys	For internal use	915 x 610 with 0,7 metre high mesh with four swivel wheels and low handle for pushing. All the metal

<b>Types of Equipment and Specifications</b>		
<b>Equipment</b>	<b>Type of Waste</b>	<b>Specifications</b>
		components are hot dip galvanised.
Transportation Trolley	For external use with risk waste to the incinerator	Rugged design of 1370 x 760 with 1 metre high wire mesh and a hinged door at the back. Four wheelbarrow size wheels with a front rotating mechanism and a long handle. A log handle provided at the back for ease to push
85 litre black bins	With black liner for general waste	Smooth, reusable plastic round dust bin
85 litre white bins	With a red liner for infectious waste	Smooth, reusable plastic round dust bin
43 x 46 red liner Small	Kick-about trolley, 12 litre pedal bin, 10 litre speci-can and 8 litre speci-can	Linear low, virgin plastic with a minimum tensile strength of 20 kgs. Welded leak proof seams Micron thickness: 60
56 x 66 red liner Medium	Nursing trolley stand and small wall stand 20 litre pedal bin	Linear low, virgin plastic with a minimum tensile strength of 20 kgs. Welded leak proof seams Micron thickness: 75
75 x 90 red liner Large	Large wall stands and 85 litre bins	Linear low, virgin plastic with a minimum tensile strength of 20 kgs. Welded leak proof seams Micron thickness: 90
75 x 90 black liner Large	Large wall stands and 85 litre bins	Linear low, virgin plastic with a minimum tensile strength of 20 kgs. Welded leak proof seams Micron thickness: 60
56 x 66 black liner Medium	Small wall stand and 20 litre pedal bin	Linear low, virgin plastic with a minimum tensile strength of 20 kgs. Welded leak proof seams Micron thickness: 30

### **Quantities of Equipment**

The quantities for the test site were calculated using the information obtained during the assessment of the status quo. The estimates calculated during the weighing exercise were inaccurate, but nevertheless gave some idea of the quantities when estimating the types and sizes of containers that would be required.

The chart below gives the total quantities as calculated:

Area	5 lt sharps	10 lt sharps/ HT	5 lt 70 cm tall sharps	Kick about trolley	12 lt black pedal	12 lt red pedal bins	20 lt red pedal bin	20 lt black pedal bin	8 l Wall Mount Red Bins	Small Black Hang	Small Red Hang	85 lt Black GW Bin	85 lt Red Bin	Large Black Hang	Large Red Hang	Nursing T. Bag Holder	Green Food Bin	46 x 43 Red Pedal & Trolley	56 x 66 Black Hang	56 x 66 Red (N.T. & Linen)	75 x 90 Black (Bin & Hang)	75 x 90 Red (Bin & Hang)
Total	33	7	5	10	3	12	5	4	10	18	3	14	6	3	11	17	0	126	29	45	17	17

27 black and 11 white 85 Litre bins were calculated in total.

The amounts were estimated on the following daily requirements

Sharps	50% replacement
Placentas	10
Nursing Trolley Liners	2/day
Kick about trolley liners	10/day
8 litre red handing and pedal bin liners	2/day
Large black and red hanging liners	1/day

NOTE: full details of the quantities per unit are contained in the separate report “Development Plan for the Implementation of the new WM System into the Six Test Site Areas” dated March 2002

#### 6.2.6 Storage Requirements

The storage of the waste posed a particularly challenge as there were no existing storage facilities. Negotiations were embarked upon early in the planning phase for the construction of new storage areas. The budget requirements for these areas were estimated and communication to the SEA. Three main storage areas are required for the safe and environmentally friendly and safe storage of waste; viz. Intermediate storage areas, central storage areas and an equipment storage.

##### ***Intermediate Storage Area***

Various options are available for intermediate storage areas. A dedicated storage area is recommended, but if the sluice room has sufficient space, this can be used. The recommended minimum size for an intermediate storage area is 2 x 3 metres. It should be large enough to allow for full and empty containers and be able to cater for a sudden increase in volume, the volume likely to be generated over a weekend or a temporary breakdown in the collection and transportation routines. These areas must be well ventilated, have sufficient illumination (minimum 150 lux) and easy to clean, e.g. tiles or gloss paint. Access to these areas must be such that it is easy for the transportation vehicle to access the area and should be secured from unauthorised entry.

The intermediate storage areas were identified in each of the areas. Ward 18 required some construction to take place in the outside courtyard as the sluice room area was too small. General OPD identified an external room and a lock and key

was supplied

### **The Central Storage Area**

A central storage area is a place where HCGW can be safely accumulated outside the institution, but within the perimeter of the building for future removal by the municipality or contracted persons. The size of the central storage is determined by the volume of waste accumulated. Easy access to the area for large municipal trucks is essential and the area must be secured.

A well-ventilated, easy to clean building with a hard standing and impermeable floor, supplied with running water, good drainage and shelving to stack the bags and sharps containers is required.

The Public Works department has constructed plans for this area and it is situated to the side of the main entrance with access to the main road running through the hospital. The Plan is available at the Public Works Department.

The construction of the Central storage area was delayed due to lack of funds being provided by the Ministry of Finance and the SEA Office. Nevertheless, the drawings for the area have been done and construction will take place as soon as the funds are released.

### **Equipment Storage Area**

With the threat of theft identified, a secure storage area for the equipment on arrival at the site and for the ongoing consumable items was essential. Strong shelving was necessary to store the heavy plastic liners and there must be sufficient space for the more bulky sharps containers.

### **Transportation**

Transporters are very vulnerable to exposure of the waste during the collection and transportation of the bags. Miss-segregation, overfilled bags and containers, open bags etc. can result in needlestick injuries and exposure to blood borne pathogens. In addition the lifting, pushing and pulling of heavy loads can lead to long-term back and other skeletal injuries.

The transportation trolleys must be designed to reduce the impact of these hazards and must be designed to meet the requirements of the volume and the terrain to be traversed.

Three trolleys are supplied, two internal trolleys for collection from the units and one larger trolley for the infectious waste. The smaller trolleys are fitted with roller casters and are to be operated by one person. The larger trolley has four robust large wheels for negotiating the rough terrain. This trolley must be operated by two persons to prevent back injury.

## 6.2.7 Treatment

The treatment method for the HCRW during the pilot project is incineration. The risks associated with incineration are many and varied from threat of explosion, fire, exposure to needlestick injury, heat exhaustion, burns, back injury and is

definitely a high risk area. There is also a risk of environmental pollution if the burning process is not carried out at the correct temperature and in the correct manner. The existing equipment was not functioning in an environmentally friendly manner. The costs of upgrading the incinerator were weighed up against the long term objective of the National Waste Management Strategy to conduct a feasibility study into the provision of a central treatment plant for Swaziland. As this decision would not be taken in the near future, it was decided to upgrade the Mbabane incinerator to meet the hospitals more pressing immediate needs. (Refer to separate Report on the Incinerator at Mbabane Government Hospital dated 15th June 2002)

#### 6.2.8 Disposal Options

The final disposal of the waste was to landfill. With the present mixing of the waste, there is risk of exposure to the local authority workers as well as the general public and those who frequent the landfill sites.

The removal of health care general waste takes place four times a week on Mondays, Tuesdays, Wednesdays and Thursdays. The units were required to keep their waste for the long period from Friday to Monday. Arrangements were made with the Local Authority to collect the ash placed in black bags on a regular basis from the hospital

#### 6.2.9 Occupational Health and Safety Requirements

##### **Protective Clothing:**

There is a need to assess the protective clothing requirements of each unit. The equipment of a leather apron, visor and gloves for the incinerator operator was purchased by the project. The Orderlies require thicker gloves for the handling of bags. Nitrile gloves are recommended.

##### **Manual Handling**

The sizes of the containers and liners have been limited to ensure that they do not become too heavy to handle. Two persons are required to transport the risk waste to the incinerator.

##### **General Housekeeping and Hygiene**

Better housekeeping and hygiene standards were encouraged during the period of the pilot test. This overlaps with better infection control standards and falls outside of the ambit of the pilot test. Every effort was made to improve the standards.

##### **Stacking and Storage**

Good stacking and storage practises are to be encouraged where it relates to waste management.

**Reporting of Incidents**

A protocol for the reporting of incidents was required. Forms were introduced and a protocol for reporting drawn up. As there is no culture within the hospital at present for the reporting of incidents, it will take some time for the required change to take place.

6.2.10 Financial Aspects and Budgets

The pilot project is financed largely by DANCED. Agreements were made with SEA and MHSW for the construction, reparation of the road and the roll out into the whole hospital at the completion of the pilot test.

**Budget for the Pilot Test to December 2002**

A budget was prepared for the purchase of the equipment required for the pilot test to December 2002. A summary of the estimated costs are given below

<b>Estimated Fixed Costs</b>	<b>Estimated Total Cost</b>		
Re-usable Containers	10,195.00		
Equipment	16,832.96		
Incinerator Repair	37,324.00		
<b>TOTAL</b>	<b>64,351.96</b>		
<b>Estimated Recurring Costs</b>	<b>Estimated Weekly re- placement cost</b>	<b>Estimated Monthly Cost</b>	<b>Estimated Cost 16 weeks</b>
Disposable Containers	897.50	3,590.00	14,795.00
Liners	283.94	1,135.76	27,463.70
Protective Equipment			4,080.00
<b>TOTAL</b>	<b>1,181.44</b>	<b>4,725.76</b>	<b>42,258.70</b>
<b>TOTAL COST FIXED AND RECURRING</b>			<b>106,610.66</b>

(Ref: Annexure 11 “Budget for the Pilot Test to December 2002)

These costs did not include VAT (only applicable for imported items), depreciation, labour or transport. Other assumptions made during the development of this budget are given in *Annexure 12 – “Assumptions to the Budget”*

This budget was presented at a meeting held on Friday 8<sup>th</sup> February with Mr. M. Dlamini, of SEA; Mr. M. Mndzebele, Hospital Administrator and Mr. T. Joubert, CTA when the following costs were estimated and agreed.

- The total costs estimated for the whole hospital for a year is estimated at approximately E245 000
- Construction costs have been guessed in the region of E150 000.
- This gives a total overall amount of E350 000
- The division of costs were agreed by the parties could be as follows
  1. Hospital E100 000 of recurring costs
  2. SEA R150 000 (construction costs)
  3. DANCED E100 000 (re-usable and disposable containers)

A further amount of approximately E50 000 was applied for through a supplementary budget and may be available through the MHSW (Mr. Edmund Dlamini)

Additional costs for capacity building and training were estimated as follows:

Development of Training Manuals	6 600
Scanning in of Pictures	1 900
Development of Pamphlets	5 400
Development of 4 x black and red posters	
Printing Costs:	
1. Posters	
2. Pamphlets	
3. T-Shirts	
Workshops and training venues and catering	

### **Estimated costs for the extension of the Pilot Test to April 2003**

A budget was prepared in November and submitted to the SEA and Hospital Administration for the continuation of the pilot test sites to April 2003. These costs were estimated separately to ensure that the pilot test did not run out of consumable costs. In order to maximise the discounts offered for larger orders, the quantities for the sharps containers were increased to give sufficient sharps containers for the whole hospital for the year. This will reduce the costs for the roll out in the hospital. When prices are quoted from S.A., VAT has been included. Also included is an estimate for importation transportation from S.A. A summary of these costs are given below

<b>Estimated Fixed Costs</b>	<b>Estimated Total Cost</b>
Re-usable Containers	6,561.30
Equipment	5,112.90
Transportation and Import duties	2,000.00
<b>TOTAL</b>	<b>13,674.20</b>

Estimated Recurring Costs	Estimated Weekly re- placement cost	Estimated Monthly Cost	Estimated Cost 16 weeks
Disposable Containers	360.36	1,621.62	16,646.30
Liners	717.57	3,229.07	15,948.45
Protective Equipment			235.68
<b>TOTAL</b>	<b>1,077.93</b>	<b>4,850.69</b>	<b>32,594.75</b>

<b>TOTAL COST FIXED AND RECURRING</b>			<b>46,268.95</b>
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(Ref: Annexure 11 “Estimated costs for the extension of the Pilot Test to April 2003”)

***Estimated costs for the roll out into the rest of the hospital***

The quantities and estimated costs of equipment and training have been detailed in the document “Waste Management Plan for the replication of the pilot project into the rest of the Mbabane Government Hospital” dated 27<sup>th</sup> November. This is a more comprehensive estimate that includes capacity building/training, VAT where applicable, labour for fitting. A summary of these estimates are given below:

Estimated Fixed Costs	Estimated Total Cost		
Re-usable Containers	2,760.00		
Equipment	30,801.00		
Engineering (fitting)	5,000.00		
Transportation and Import duties	2,000.00		
Capacity Building/Training	38,708.00		
<b>TOTAL</b>	<b>79,269.00</b>		
Estimated Recurring Costs	Estimated Weekly re- placement cost	Estimated Monthly Cost	Estimated Cost 16 weeks
Disposable Containers	222.77	1,002.47	2,650.50
Liners	890.21	4,005.94	26,670.29
Protective Equipment			372.00
<b>TOTAL</b>	<b>1,112.98</b>	<b>5,008.41</b>	<b>29,320.79</b>
<b>TOTAL COST FIXED AND RECURRING</b>			<b>108,589.79</b>

(Ref: Annexure 11 – Estimated costs for the roll out into the rest of the hospital”)

### **Releasing of Funds**

There has been a protracted delay in the release of funds for the construction and reparation of the roadway so the pilot project commenced without this working being done. The funds were finally approved in September, The following extracts have been taken from the minutes of a meeting held on 27<sup>th</sup> September with the hospital management, SEA and MHSW.

*“Mr. Mboni Dlamini confirmed that the Ministry of Finance had made an amount of E120000 available to the SEA for the construction of a central storage area and the intermediate holding areas for the test site. He indicated that there were two ways in which this work can be undertaken.*

- a) The SEA could request a contractor to do the work or*
- b) the money could be transferred to Public Works Department.*

*An amount of E30000 had also been released for paving the road to the incinerator*

*An amount of E50000 had also been budgeted for sustaining the test area for the period Nov 02 – April 03. Mboni indicated that an internal transferral of this amount from the SEA office to the Hospital would need to take place. Quotes are*

*required on the actual amount of consumables required before this can be released. The plastic liners can be manufactured in Swaziland, but the sharps containers can only be obtained from one source. A justification for the use of one supplier will be required with the specifications of the equipment required. There was extreme urgency for the process to be started to prevent the test area running out of equipment.”*

*“Mboni Dlamini said that an amount of E120000 had been budgeted by the Ministry of Finance for this for a period Nov. 02 – April 03. The Hospital Administrator queried whether this amount would be enough. The amount of time needed to plan the implementation in the rest of the hospital would take the management to the middle of December. With the December/January holiday season, the implementation could only realistically be planned for end of January. Also the larger units such as Theatre, Maternity and Ward 18 had been included in the test site budget. The majority of the money would be used for the reusable equipment and stands and consumables would be purchased for a period of 3 months at which time the hospital budget would be available.”*

## 7. CAPACITY DEVELOPMENT PROGRAMME

### 7.1 The Process Followed

The performance discrepancy analysis was conducted in April 2002 (Ref paragraph 5.3) by The Capacity Building Consultant together with members of the Training Task Team, Waste Management Officer and Representatives from the Health Education Unit of the University of Swaziland.

The report “Draft Capacity Development Plan, dated 04-04-2002” recorded the results and gave recommendations to address the performance gaps identified under the following categories:

- knowledge
- skills
- changing attitudes and behaviour
- inter-relations
- technology gaps

The pilot project could not be responsible for initiating the paradigm shift required in the management of the hospital as there is too little time available for instruction and application of basic supervisory and coaching skills. The extent of the capacity building programme during the pilot test could not totally address the complicated inter-relations or change attitudes and behaviours other than those directly related to the disposal of waste.

The scope of the capacity development programme adopted during the pilot test was therefore limited to the performance gaps identified under the categories of knowledge, skills, technology and equipment of the different cadres of staff within the pilot test areas. An awareness campaign was introduced that did, however, involve the whole hospital.

### 7.2 Performance Gaps Identified

Performance gaps for the six cadres of staff were identified under the categories of knowledge and skills. The documents required and the delivery methodologies were identified for each section. The details of these are to be found in *Annexure 13 “Summary of Performance Gaps”*. This summary was used as a basis for the development of awareness material, pamphlets, and training material by the Training Task Team

### 7.3 The Role of the Training Task Team

A Training Task Team was established consisting of members of the hospital in-service training department, nursing representative, Senior Orderly, and a Health Education Officer. The Waste Management Officer was also actively involved in this task team.

The resources for devising the training material and facilitating the sessions were severely limited and assistance was obtained for the development and layout of the training modules and awareness material.

The responsibilities of the Training Task Team included:

- Identification of training requirements using the performance discrepancy analysis
- Assist with the development of the training modules
- Assist with the facilitation of the training sessions
- Carry out awareness activities

The Chairperson of this committee was Sr. Khanyisele Simelane of the in-service training department.

## 7.4 Devising Job Descriptions and Responsibilities

### **Job Descriptions**

As identified during the status quo assessment and the discrepancy analysis, there are no documented job descriptions other than very generic descriptions issued by the Ministry of Health and Social Welfare for the various cadres of staff. The lack of defined job descriptions is particularly evident within the Orderly ranks where the individual tasks and the levels of supervision are left largely to the competence of the supervisors. It therefore became necessary to more clearly define the tasks that the male, female and senior orderlies perform with regard to waste management as the tasks of disposal, collecting, transporting and incineration are largely carried out by this cadre of staff.

Job descriptions with regard to waste management were compiled for:

- Male Orderly
- Female Orderly
- Senior Orderly
- Incinerator Operator
- Waste Management Officer

The job descriptions for the Orderlies were compiled with the assistance of the Unit Supervisors for the tasks as performed by the orderlies. These were then summarised to reflect only those aspects that were directly related to waste management. (*Ref: Annexure 14 – Summary of Orderly Waste Management Duties*)

There is no official post for the position of an Incinerator Operator at the Hospital. Individuals are taken from the Male Orderly ranks to perform this task. Historically the position has been managed largely by one illiterate individual who is nearing retirement. Two younger orderlies have now been allocated to the task. The level of education of the orderlies varies from a grade 5 to grade 9. A motivation for the position of an Incinerator Operator was compiled and a copy given to the MHSW. (*Ref: Annexure 15 – Motivation for post of Incinerator Operator*)

The description of the post for a Waste Management Officer has been discussed in section 6.1.1 – Institutional Structures - and the motivation for the appointment of a

Health Care Facility Environmental Health Officer was devised at the request of the MHSW. (Ref: Annexure 9 - “Motivation for the appointment of a Health Care Facility Environmental Health Officer”.)

#### **Responsibilities for Cadres of Staff**

The responsibilities for other cadres of staff have been discussed and agreed with the Steering Committee members. (Ref: Annexure 16 “Responsibilities for Cadres of Staff”)

### 7.5 Development of Training Material

Four training modules were prepared as follows:

- Knowledge Training – Orderlies
- Knowledge Training - Nursing
- Skills Training – Orderlies
- Skills Training – Nursing

All the training sessions were designed to be interactive, visual using pictures, and participative.

#### **Knowledge Training Manuals**

The knowledge training sessions were designed as formal facilitated workshops over a 5 hour period and covering the following topics:

- HCWM – Cradle to Grave
- Categories of HCW
- Concept of Risk
- Colour Coding and Segregation
- The old system vs the new system
- Infection Control
- Good and Bad Practices

A detailed facilitator’s guide was included for both courses

#### **Skills Training Manuals**

The skills training two hourly sessions were designed to be held in the work area and consisted of a practical demonstration of how to use the equipment. The roles and responsibilities of the various cadres of staff with regard to waste management were detailed, discussed and practised.

### 7.6 Development of Awareness Material

The services of a graphic artist were obtained from Health Education and excellent outline drawings of the various types of equipment were drawn up. Copies of these drawings were given to a computer graphic artist to place on disc and apply the colours. These pictures formed the basis for the following awareness material:

- Pamphlets for Doctors, Nurses and Orderlies
- 4 posters in red and black
- T-shirts

## 7.7 Programme for Training and Awareness

A training and awareness programme was drawn up by the training task team and was based on the recommendations given in the draft capacity development report. The programme was divided into Orientation, Knowledge, Skills, Incinerator Operator Training and Senior Management Workshops. An Awareness programme was also arranged with an official launch of the project by the Ministers followed by the distribution of posters, T-shirts and pamphlets.

### **Orientation Phase One – 2 Hour**

To inform decision makers and stake holders of the elements of the waste management system

To highlight the importance of codes of practice and the monitoring against the codes

The Orientation Phase One is the first stage in the training programme and was to be completed first

### **Orientation Phase Two – 2 Hour**

- To inform departmental heads and the staff of the test site areas of the elements of the waste management system
- To highlight the importance of codes of practice and the importance of good management control

The Orientation Phase Two is facilitated by Hospital Senior Management and thereby re-enforces their understanding and demonstrates their commitment to the process

### **Orientation Phase Three - Official Launch**

- To sensitise the whole hospital of the elements of a good waste management system
- Re-enforcing the knowledge and skills training conducted within the test site areas.

Orientation Phase Three should be completed after the knowledge and skills training have been conducted in the test site area. Demonstrations and/or theatre was planned to be carried out by members of staff from the test site areas and thereby re-enforce the training.

### **Knowledge Training – 5 Hours**

To inform all the staff directly involved in the test site areas on the principles of good waste management and general knowledge on the new waste management system

To inform all the staff directly involved in the test site areas on their roles and responsibilities with regard to good codes of practice in waste management

The knowledge training sessions should be conducted before the Skills training and can be facilitated by an experienced trainer that has a general understanding of the waste management system

### **Skills Training – 2 Hours**

- To equip the staff in the test site areas to use the system effectively

The skills training sessions were to be conducted after the knowledge training. It is an intensive individual practical tuition designed to capacitate the staff to use the equipment properly and should be facilitated by a person knowledgeable in the waste management system.

### **Senior Management Workshops**

The training task team identified the need to conduct Senior Management Workshops. These one day workshops were planned to be held monthly over a period of three months to discuss and agree on the protocols and procedures for waste management and the monitoring and evaluation programme for the pilot test. At the same time some of the principles of good management control with the emphasis on supervision and monitoring were discussed. (Ref: Annexure 17 - “Summary of Meetings held”)

### **Awareness Activities**

A competition was planned to find a design for the T-Shirts. Other awareness activities were to be incorporated into the official launch planned in Orientation Phase three.

## 7.8 Protocols, Procedures and Code of Practise

### **Protocols and Procedures**

There were no documented protocols, procedures or codes of practise for waste management. These are essential to ensure that the correct standard is applied throughout the hospital and that control is maintained. The documents would therefore have to be devised and customised to the specific circumstances of the hospital.

A list of protocols that covered the full spectrum of waste management was drawn up and divided into three categories – Nursing, Infection Control and Administration. Senior Management had to be involved in the writing of these to ensure that the correct authority was given and enforcement was assured.

The protocols must be numbered and written in a quality assurance format with development dates, review dates and approval signatures. Each protocol was standardised and written up under the following headings: objective, the scope, hazards of exposure, equipment, protective equipment requirements, the application, training, responsibilities and monitoring.

### **Code of Practise Booklet**

A user-friendly code of practise booklet is required based on the information contained in the protocols. This booklet covers the main aspects of the waste management system.

The objectives of this booklet are to:

- Guide management and staff members in the occupationally safe and hygienic handling of all waste streams generated within the premises of the hospital to reduce injuries and exposure to infectious agents
- To provide an integrated framework under which waste management practices and principles can be applied.

Although this booklet does cover some aspects of HCGW, the main focus is on the HCRW with an emphasis on good segregation.

## 8. IMPLEMENTATION PROCESS SYSTEM AND PROGRAMME

The process for the implementation of the waste management system and the capacity building programme system was complicated by a number of factors such as:

- limited resources in the project team and within the hospital for the development and facilitation of the training material
- Tight time constraints
- Slow response and sometimes lack of regard for project deadlines from the role players

The implementation process adopted included:

- An implementation plan with detailed time scales
- The role of the Waste Management Officer
- Steering Committee and Task Team Meetings
- Procurement of equipment
- Servicing of the incinerator, removal of ash and the reparation of the roadway
- Construction of the Storage areas
- Transportation methods and routines
- Introduction of the capacity building programme
- Codes of Practice, protocols and procedures

### 8.1 Implementation Plan and time scales

An implementation activity plan was devised for the 2, 3 and 4<sup>th</sup> outputs on the pilot project plan.

Progress reports were issued on 15<sup>th</sup> November 2001, 8<sup>th</sup> February, 24<sup>th</sup> May and 13<sup>th</sup> June 2002. In addition, throughout the implementation of the pilot project minutes of meetings, workshops, discussions and consultations were recorded.

#### Time Scales for Implementation

The overall time scales for the project are indicated in section 4.3. The time scales for the implementation phase of the project was originally planned for the week of 5<sup>th</sup> April. Extensive delays in the manufacture of the bag holders and the trolleys and the delivery of the liners delayed the implementation. Funds for the building of the central storage area, intermediate storage areas and the roadway had also not been received by the beginning of April 2002. A proposal was put to the Senior Management that the orientation phases and knowledge training be done in May before the distribution of the equipment. This was agreed at a presentation given to the group in April 2002.

The table below is a summary of the advantage and disadvantages of delaying the implementation as presented at that meeting.

<b>Time scales</b>	<b>Advantages</b>	<b>Disadvantages</b>
Existing Time Scales	<p>Expectations are presently high that the system will start</p> <p>Longer period of application of the system</p> <p>Longer period to monitor the system</p>	<p>Cramped time scales could result in less participation due to lack of time</p> <p>Less exposure and involvement of the whole hospital</p> <p>Less hospital staff will be capacitated and able to carry out their duties</p> <p>Will require additional resources to accomplish the activities particularly with regard to training</p> <p>Skills training will commence before the knowledge training</p>
New proposed time scales	<p>Longer time will have more success in capacitating staff</p> <p>More time to allow the management staff to attend coaching and supervisor skills training</p> <p>Possibility of management staff being better able to carry out their tasks of supervision and monitoring</p>	<p>Shorter period for the application of the system within the project time frames</p> <p>Shorter period for monitoring and evaluating the system within the time frames</p> <p>Monitoring and Evaluation will continue without DANCED input</p> <p>De-motivation due to high expectations that the system will start</p>

The time scales and detailed plan for the full implementation process from April to November are indicated in the tables below :

	APRIL				MAY				JUNE				JULY			
	8 - 12	15-19	22-26	29 - 3	6 - 10	13 - 17	20 - 24	27 - 31	3 - 7	10 14	17 - 21	24 - 28	05-Jan	8 - 12	15 - 19	22 - 26
Equipment	Equipment delivered	Trolleys and bag holders delivered	Signage on containers							Distribution of equipment to pilot	Signage on containers completed					
			Bag holders fixed to walls	Bag holders fixed to walls	Bag holders fixed to walls	Bag holders fixed to walls	Bag holders fixed to walls	Bag holders fixed to walls			Bag holder completed					Additional bag holders to be
Systems Development		New routines for collection	New routines for collection						New draft standards for the system completed	Draft standards approved by committee	Draft of Monit systems introduced into test sites		Draft WM Dev. Plan completed	Draft policies and procedures introduced	Draft monitoring standards approved by committee	Commence monitoring and weighing
Capacity Building		Capacity building planning & material development	Capacity building planning & material development				Roles and responsibilities agreed for categories of staff						Establish monitoring responsibilities	Establish forum for approval of protocols and procedures		
Training Material Development	First Drawings for visual aids	Orientation material developed			Knowledge Material Developed	Knowledge material developed	Knowledge material developed	Visual material completed	Skills material developed							Reproduction of awareness material
Training and Awareness			Phase one Orientation complete	Phase two Orientation in depts		Knowledge training in test sites	Knowledge training in test sites	Knowledge training in test sites	Skills training in test sites	Skills training in test sites	Skills training in test sites	Training to be cascaded down by Supervisors				
						Planning for demonstration day	Demonstration day converted into Launch									Planning for Launch
Construction			Budget approval for construction work					Detailed drawings for storage areas complete	Construction of storage areas commence		Construction of storage areas complete	Construction of roadway completed				

PILOT PROJECT PROPOSED NEW TIME SCALES																	
	August			September				October			November						
	5-9	12-16	19-23	26-30	2-6	9-13	16-20	23-27	30-4	7-11	14-11	21-25	28-1	4-8	11-15	18-22	25-29
Equipment				Additional equipment fixed to													
Systems Development			Protocols workshops and approved			Protocols final approval					Code of Practice written						
Capacity Building			Launch arrangements finalised			Project launch						Tour to S.A.					
Training Material Development				Posters completed and promotional material							Review training material						
Training and Awareness	Evaluation of training devised					Evaluation of training material					Focus group discussions held						
Construction	STILL AWAITING FUNDING																
Monitoring and Evaluation	Frame work finalised	Monitoring and monitoring commences		Evaluation of monitoring process							Evaluation of Monitoring process						
Report writing	Interim report draft		Outline of final report			Interim evaluation report	Interim Alternative Technology					Review of reports					Project evaluation

## 8.2

### The role of the Waste Management Officer

The Waste Management Officer played an important role on a full time basis throughout the process. Without the drive, dedication, persistence and enthusiasm exhibited by this individual, the pilot test would not have been successful. Regular communications were conducted between the CTA, WMO and the consultant and these are recorded in notes, e-mails and minutes of meetings.

### 8.3 Steering Committee and Task Team Meetings

Throughout the implementation process regular Steering Committee and Task Team Meetings were held. Participation at these meetings was at time sporadic. An attendance register was signed and minutes were kept. (*Ref: Annexure 17 “Summary of Team Meetings held”*)

### 8.4 Procurement of Equipment

#### **Quantities:**

During the planning phase, the equipment quantities were calculated guided by the quantities estimated in the weighing exercise and from personal observation as there was no other record available for the disposal of waste. A presentation of the new waste management system was made to the waste management team on 7<sup>th</sup> December 2002. The task teams were established at this meeting and each team was given the documents “Options for Decision Making” (Refer to the Development Plan for Mbabane Hospital) The decision on what equipment to use was made by the members on the two teams and reports on their decisions were submitted to the WMO in mid January.

#### **Suppliers:**

The procurement of the equipment began as planned in the inception phase early in February and final orders were placed at the end of February. Local suppliers were used wherever possible. The sharps containers, pedal bins and speci-cans were purchased from ClinX in South Africa and imported into Swaziland. The manufacture of the wall holders and nursing trolley holders were made by a company in Swaziland. The manufacture of the trolleys proved problematic and after initially placing the order with the same company in Swaziland, the decision was taken to import the trolleys as extensive delays were anticipated from the engineering company.

Quotes were requested for the supply of containers and liners from three different companies and the decisions were made based on the quality of the product and price.

(*Ref. Annexure 18 “ Details of Suppliers and Equipment Purchased”.*)

#### **Delivery of Equipment:**

The initial delivery dates for the equipment were not honoured and resulted in the late start to the test. On the 11<sup>th</sup> June 2002 the following was reported at a meeting of the Waste Management Committee

- 90% of the equipment had been delivered and placed into the store
- 8 small bag holders and some sharps brackets had been positioned
- 3 transportation trolleys had been delivered with four extra wheels
- Extra white and black bins had been provided

The following outstanding issues were reported:

- 7 small bag holders are still to be delivered
- 3 pedal bins had been stolen from the storeroom

**Labelling and security of containers:**

All the reusable containers were stencilled with MBH and the unit abbreviation. The pedal bins have been chained to the walls to prevent theft. The labelling of the containers was finally undertaken by a local company.

**Fitting of the bag holders and brackets:**

The bag holders and brackets were fitted to the walls by a local company. Problems were initially experienced with some of the larger bag holders coming away from the wall and the cement crumbled under the pressure exerted by the rawl bolts. This was resolved by using long thinner screws.

## 8.5 Incinerator Servicing and Upgrade

The incinerator is run by the Bio-medical Department who report to the Public Works department. The hospital management have no overall authority over the maintenance of the incinerator as the services are contracted out on an annual basis by Public Works. At the time of the implementation of the pilot project, the servicing was done by Mamemelec Engineering (Pty) Ltd.

The initial assessment and inspections of the hospital incinerator identified a need to upgrade the incinerator. The consultant team visited Mamemelec Engineering and interviewed Mr. J.K Bhosa, the Technical Director. He informed us that there was no supervision over the operation of the incinerator and consequently there were many breakdowns. The temperature gauge and thermostat had been disconnected. In February S.A. Incinerator was contacted and they inspected the premises. Quotes for the repair were received and the consultant team decided on the following reparation:

<b>Task</b>	<b>Cost</b>
Upgrade with two near burners and control panel	R 19,252.00
Recast the full hearth	R 5,550.00
Supply new grit arrester and stoking tools	R 1,922.00
Supply and fit new breeze block	R 1,700.00
Travel and Labour	R 8,900.00

A separate report “Report on the Incinerator at Mbabane Hospital” refers to the details of the condition of the incinerator with photographs, S.A. Incinerator report on the condition and the upgrade that took place on the week of 27<sup>th</sup> March 2002.

## 8.6 Removal of Ash

The accumulation of ash was removed by the Municipality in March. The ash from the newly repaired incinerator was considerably reduced with better burning

of the waste. The ash was now allowed to cool down overnight before being scraped out of the hearth and collected into black plastic bags. Arrangements were made with the municipality to collect the bag of ash from the bottom of the gravel road four times a week.

#### 8.7 Roadway to the Incinerator

The roadway to the incinerator was also identified early in the project as a critical area for improvement. The present gravel surface is easily eroded in the rain with deep gullies and an uneven surface making the road difficult to negotiate. The department of public works, the municipality, the SEA, Ramboll and the hospital management have had extensive discussions on the requirements and the funding. At a meeting on the 8<sup>th</sup> February in the Hospital Administrator's office it was recorded that the costs for upgrading the road would be included in the construction costs allocated by the SEA.:

Re-grading of the road took place in July 2002. However, by November 2002 negotiations were still underway for the final surfacing of the roadway.

#### 8.8 Storage Requirements

##### **Equipment store**

With the threat of theft high on the priority list, the security of the new equipment was important. Negotiations began early on the in the project to identify a secure store for the delivery of the new equipment. It was only after the theft of three pedal bins from the hospital storage that a new storage area was allocated. This store provided better security and one store clerk was made responsible for the equipment. No problems have since been experienced.

##### **Intermediate Stores**

Intermediate storage areas were identified for the 6 test site areas. Ward 18 required some construction to take place as the area identified was situated in the courtyard outside and there was no protection against the weather. A drawing was submitted by the public works for a partitioning to be erected against the wall. As no funding has been forthcoming, this construction has not taken place.

GOPD identified an external room for the storage area. The door was fixed and a lock fitted.

##### **Central Storage**

An open area to the west of the main hospital building was identified as the new site for the central storage area. It is on the main circular route around the hospital and provides easy access for the municipal truck. A presentation was made by Mr. Tony Qwabe from NPW&T on the draft design for the central storage area on 1<sup>st</sup> March. Funds for the erection of this building have not been forthcoming so the pilot test has been completed without the new building. It was resolved at a meeting of 26<sup>th</sup> June to use the area allocated in the interim and this was agreed with the Orderlies on 18<sup>th</sup> June.

## 8.9 Transportation

A resolution was passed at a meeting with the Orderlies on 18<sup>th</sup> June that the new transportation trolleys would be used only for the test site areas. The trolleys would be cleaned and replaced in the administrative block for safe keeping. Control of the trolleys was the responsibility of the Senior Orderly.

## 8.10 Weighing of the Waste

An attempt was made to set up a system for the weighing of the waste during the three month period of the pilot test. Scales were provided by the hospital in only two areas. An additional scale was purchased by the project team for Theatre.

This exercise was not successful due to:

- No scales made available in three of the areas
- Illiterate persons in some areas
- Lack of supervision and enforcement

## 8.11 Training and Awareness

The 5<sup>th</sup> March marked the beginning of the training and awareness programme with a full day workshop. The Training Task Team carried out two working sessions on 10<sup>th</sup> and 11<sup>th</sup> April to agree on the training and awareness programme. A Human Resources consultant was obtained to assist with the compilation of the knowledge and skills training sessions. These were compiled during the week of 20<sup>th</sup> May.

Informal meetings and discussions were held for the development of the training manuals and awareness material and regular feedbacks were recorded in the minutes of the Steering Committee.

### Orientation

The orientation phases one and two took place during the weeks 29<sup>th</sup> April and 6<sup>th</sup> May. Orientation phase three – the official launch was delayed due to difficulties in development and printing of the promotional material and the availability of ministers of the SEA and MHSW. This was finally arranged by the Hospital Management and took place on 25<sup>th</sup> September 2002.

A programme for the Launch was drawn up and included a song written by the staff, a poem written and narrated by two staff members, a drama presented by a Senior Orderly. Speeches were given by the SEA, Mbabane City Council and MHSW. Refreshments were provided by the project.

### Knowledge Training

Two knowledge sessions – one for nurses and one for orderlies - was conducted with the assistance of the Health Care Consultant and the HR Consultant. Further knowledge training sessions were conducted during the week of 3-7<sup>th</sup> June by the Training Task Team and the Waste Management Officer.

In total 51 persons attended the six formal knowledge training sessions. The table below shows the division of the numbers per unit and per 5 categories of staff:

<b>Unit</b>	<b>Supervisor</b>	<b>Nurses</b>	<b>Ass. Nurses</b>	<b>Orderlies</b>	<b>Other Prof. Staff</b>	<b>Total</b>
I.C.U.	1	4	0	3		8
O.T.	2	2	0	2		6
LAB	0	0	0	2	1	2
Ward 18	2	4	0	3		9
Maternity	2	3	0	0		5
GOPD	2	4	2	0		8
Other	6	3	0	0		9
Incineration	0	0	0	3		3
<b>Total</b>	<b>15</b>	<b>20</b>	<b>2</b>	<b>13</b>	<b>1</b>	<b>51</b>
<b>Total Reqd</b>	<b>21</b>	<b>64</b>	<b>22</b>	<b>36</b>	<b>7</b>	<b>150</b>
<b>Gap</b>	<b>6</b>	<b>44</b>	<b>20</b>	<b>23</b>	<b>6</b>	<b>99</b>

The training sessions were poorly attended with late starts. This created some time limit pressures. The Supervisors indicated that it was not easy for them to release staff to attend the training sessions. During a Task Team Meeting held on 23<sup>rd</sup> July, it was agreed with the Supervisors that they would cascade the knowledge training down within their units using the material provided.

### **Skills Training**

The skills training sessions were carried out simultaneously with the distribution of the equipment as follows:

- Friday 27<sup>th</sup> June: Laboratory and Ward 18
- Monday 1<sup>st</sup> July: Theatre and G.O.P.D.
- Tuesday 2<sup>nd</sup> July: Maternity and I.C.U.

In addition, three Incinerator Operators received training on the correct operation of the incinerator by S.A. Incinerator when it was upgraded in April.

### **Awareness Activities**

The pamphlets and posters were approved at a meeting of the Task Teams at a meeting on 6<sup>th</sup> August. A competition was arranged with the pilot sites for the design to be printed on the T-Shirts. The winning design came from Theatre. The pamphlets, written and distributed in English for the Doctors and Nurses and in Siswati for the Orderlies were distributed to all the pilot test site staff at the official launch. The posters and T-shirts were also printed and distributed in September.

## 8.12 Code of Practice, Protocols and Procedures

Drafted protocols were distributed at the Senior Management Workshop on 22 August and the three groups (Nursing, Administration and Infection Control) gave specific input. Procedures where applicable, were also devised. The following protocols and procedures were drafted:

<b>No.</b>	<b>Nursing and Infection Control</b>
NUR 01	Sharps Handling and Disposal
NUR 02	Management of Body Fluids, Mercury & Gluteraldehyde
NUR 03	Hand Washing
NUR 04	Exposure to Blood-borne Pathogens
NUR 05	Hepatitis B Immunisation
NUR 06	Management of HC Waste
NUR 07	Safe Storage of Waste within the Units

<b>No.</b>	<b>Administration</b>
ADMIN 01	Safe Storage of Waste – Central Storage
ADMIN 02	Personal Protective Equipment for handling, Transporting and Disposal of Waste
ADMIN 03	First Aid for Non-nursing Staff
ADMIN 04	Distribution of Equipment
ADMIN 05	Cleaning of Bins and Trolleys
ADMIN 06	Transportation of Waste
ADMIN 07	Treatment of Waste
ADMIN 08	Disposal of Waste
ADMIN 09	Emergency Response
ADMIN 10	Incident Reporting

At the workshop on the 22 August the following process for the approval of the protocols was agreed as follows:

1. Revised protocols to be submitted to the Hospital Administrator and Matron I
2. The Protocols will be reviewed by the Senior Management and approved by the Senior Medical officer
3. Thereafter they will be revised if necessary before being distributed to the relevant persons.
4. In-Service training department will be responsible for the dissemination and training in the new protocols in the Nursing sectors
5. Hospital Administrator will be responsible for the policies in the Non-Nursing sectors.

As the process for writing and approval of the protocols was long and the official approval and distribution had not taken place at the distribution of the equipment, critical procedures for the use of the equipment, distribution of the equipment, collection and transportation were documented and used in the training manuals. Ex-

tensive coaching took place on the job for the correct application and use of the equipment.

### **Code of Practice Booklet**

A Code of Practice booklet that contained the critical procedures that were trained and coached as well as information on the system, specifications of equipment, incident report and emergency procedures was drafted and a copy given to the Waste Management Officer for distribution and comment at the end of November.

### **Procedures for the distribution of equipment:**

On the 14<sup>th</sup> June the members agreed on the distribution procedures to be followed. These are recorded in detail in the minutes of the meeting held on that day. The ordering would take place daily at specified times as the store was away from the store clerk's office and there was no telephone there. The Store Clerk was to keep a record of all the equipment delivered and ordered from the store.

### **Collection and transportation routines:**

The collection schedules and routines were requested from the Senior Orderly on the 1<sup>st</sup> March. Routines were written out and presented to the hospital administrator who indicated some concerns with the proposal. The main concerns raised were that the Orderlies are not well disciplined and do not work well as a team. They take the waste out independently. The proposed schedules required discipline and co-operation. At a meeting held on 18<sup>th</sup> June with good representation from the Orderlies in the test site areas, the schedules were redrafted and a resolution was passed that they would team up to share the trolleys and transport the risk waste to the incinerator at the stipulated times.

## 9. MONITORING AND EVALUATION OF THE PILOT TEST

### 9.1 Monitoring and review framework

The main purpose of the pilot projects was to inform the national solid waste management strategy and, from the lessons learnt, to give recommendations for improvement. In order to extract the experience and learning lessons it is necessary to have a well-defined monitoring and review framework that clearly describes the issues at both institutional and national level. The monitoring programme for the health care pilot project was based on the document, "Extracting experience and learning lessons from pilot projects for the purpose of developing the National Solid Waste Management Strategy – Monitoring and review frame for health care risk waste management at Mbabane Hospital. Ref: Annexure 19)

### 9.2 Monitoring Programme for the 6 Pilot Test Sites

Apart from the importance of extracting the learning lessons from the test site, the hospital management believed that the main focus of the monitoring programme was to measure the viability of the system for replication into the rest of the hospital. At a Senior Management workshop specific objectives of the monitoring were agreed as follows:

- To assess whether the waste is disposed of safely and in an environmentally friendly manner.
- To assess the viability of the new system for the whole of the Mbabane Government Hospital in terms of human resources and equipment.
- To assess the cost effectiveness and benefit to the hospital
- To assess the quality of the system and given recommendations for improvement
- To assess the level of commitment and awareness

With the time delays experienced for the distribution of the equipment, the monitoring programme had to be completed within 4 months. It is therefore not possible to evaluate the long term sustainability of the system, particularly with regard to the costs for the replacement of equipment, emergency response and incident reporting.

The monitoring of the system is largely of a qualitative nature involving observations, interviews with important role players, physical inspections, checklists, report forms, and questionnaires.

The following checklists were used:

*(Ref: Annexure 20 – Monitoring Checklists)*

The monitoring and review programme was divided into the following categories:

- Structure (Organisational, financial and staffing)
- System Tools (Equipment, procedures, guidelines and legal instrument issues)
- Skills Development and Awareness Raising Issues
- Inter-relations between stakeholders (at local level)

The responsibility for the monitoring was divided between Senior Management and Supervisors, Task Team Members, the Waste Management Officer and the Sub-consultant.

The following programme for the monitoring of the safe use of the equipment and to determine the viability of the system for the rest of the hospital was drawn up and agreed at the Senior Management Workshop

### Process for Monitoring

<b>Senior Management Hospital Manager and Administrator, Matrons</b>	<b>Line Management Unit Supervisors, Heads of departments</b>
Conduct weekly inspections in six test sites with WMO of all areas in the test	Conduct 3 inspections weekly using the Performance Inspection Check list
Evaluate daily the stock requirements from the units	Weigh the waste daily and record results
Collect the weekly inspection reports from the 6 test sites and evaluate	Collect all incident reports and suggestions and report weekly.
Check on stock levels weekly	Write a weekly report
Carry out remedial action on issues arising out of inspection reports arising out of weekly evaluation	Take action on outstanding issues identified in inspections and reports as soon as possible

<b>Test Task Team Members</b>	Employees
Conduct inspections weekly using the Test Criteria Inspection checklist	Report all incidents
Collect all reports from the six test sites on incident or suggestions received.	Make suggestions for improvements
Evaluate findings and report back to management	
WMO to conduct weekly inspections in the six test sites	
<b>Training Task Team Members</b>	
Assess the extent of the training conducted	
Questionnaires to test level of knowledge	
Questionnaires to establish in a qualitative manner how the training was received.	
Focus groups conducted for those who attended the training and those who did not	

In addition in order to measure the success of the training materials and sessions that were conducted, a group of trainees were convened and they were asked 10 pre-determined questions with regard to the material and the training sessions. To assess the knowledge understanding, Individual questionnaires were distributed to trainees for their completion.

### 9.3 Application of the monitoring programme

The monitoring programme commenced at the beginning of July and ran until the end of November. The Waste Management Officer and Unit Supervisors carried out their inspections regularly. Input from the Senior Management was limited. The culture of reporting of incidents has not been accepted in the hospital so no formal reporting or investigation of incidents took place.

Individual interviews of 45 minutes were held together with the Capacity Building Consultant and selected role-players operating within the system. Pre-determined questions were asked.

The Unit Supervisors on a weekly basis submitted reports. The Waste Management Officer on a monthly basis submitted reports. There were very few reports received from senior management.

Three progress reports were compiled by the Sub-consultant based on personal observations and inspections conducted and from the weekly and monthly hospital reports received. (Ref: Annexure 21 - "Monitoring and Evaluation Reports")

### 9.4 Summary of the findings

A brief summary of the key results of the monitoring and evaluation of the test has been compiled under the framework categories of:

- Organisational Structure
- System Tools and procedures
- Skills Development and Awareness Raising Issues
- Inter-relations between stakeholders (at local level)

#### 9.4.1 Organisational Structure

- The administrative aspects of waste management were well managed during the pilot test, particularly with the control over the distribution of the equipment.
- The appointment of the Waste Management Officer from MHSW proved to be very successful
- The Steering Committee and Task Teams provided a good basis for the implementation of the new system
- The lines of reporting are sometimes confused with a tripartite system of management practised in the hospital.
- Response to issues raised and actions required from meetings is generally slow with the exception of some unit supervisors who exercise an above average level of control.

- The monitoring programme was carried out well by the WM Officer and Supervisors. No monitoring reports were submitted by Senior Management due to a combination of lack of discipline / attitude coupled with a lack of monitoring skills.
- Enforcement of standards is difficult without accountability or incentives.
- The level of supervision and discipline within the units varies significantly depending on the degree of control exercised by the individual Supervisors
- There is very little control or discipline exercised over the orderlies. The collection and transportation routines and standards were not followed. This resulted in many breakdowns in the system.
- There is no specific budget allocation for waste management.

#### 9.4.2 System Tools and Procedures

##### Equipment:

- A dedicated and secure storage for all new equipment has proved to be an absolute necessity to ensure proper distribution and security of all containers and liners purchased.
- The size and shape of sharps containers and speci-cans were good
- Positioning of all disposable and re-usable containers was generally good with exceptions only outside theatre.
- Miss-segregation still occurs in all areas due to negligence, awareness
- Stands were working well in all areas.
- The Quality of the liners was good. The smallest size liner was too small and will need to be increased in size.
- Nursing trolley bag holder was well received in all areas
- Wall mounted brackets and holders were well received.
- Sharps brackets (particularly on the drip-stand in theatre) were well received.
- The fixing of the holders to the walls was initially problematic with some coming loose. The local biomedical department did not have the capacity to do the work.
- The swing lid on the 8 litre sharps container created problems of accessibility and cleanliness
- Kick-about trolleys were used effectively, although more are needed
- Theft of pedal bins remained a problem unless fixed to the wall
- Transportation trolleys were not successful as it was too heavy for one person and the Orderlies did not want to team up.
- There was an improvement in the incineration process after upgrade.
- The ash pile was removed and an alternative method introduced to prevent pile up occurring
- Storage areas were not built due to lack of promised funds
- Roadway had not been prepared

##### Procedures:

- Closing of the liners with rubber bands proved to be the more effective, economical and user-friendly method
- Distribution of equipment was well managed and good statistics are recorded of quantities used.
- Many of the 'do not .. behaviours' were addressed. Sharps containers are now not emptied, the waste was not pushed down, better handling now takes place
- The formation of an Infection Control committee was a direct result of the standards introduced in the pilot test sites
- Overfilling of the containers was frequently experienced.
- Personal protective equipment is not always available and worn
- Collection and transportation routines not carried out according to agreed routines due to lack of supervision, discipline and difficulties with cooperative working ethics
- Operating two systems – the new with the existing – compounded the transportation routines and the use of the trolleys
- There was a general improvement during the pilot project in the level of cleanliness, although it is still not to acceptable standards
- Procedures for incineration not followed due to a number of factors such as change in operators, lack of awareness of the correct methods, late arrival of the waste from the hospital, lack of diesel, and two major breakdowns of the incinerator.
- The destruction of the sharps containers raised some issues with lids cut off for re-use. Strict supervision was necessary for the destruction of the sharps and speci-cans.
- The weighing of the waste was not successful due to a lack of scales in some areas and lack of supervision and enforcement from the supervisors.
- Protocols, procedures and code of practise booklet written but not yet approved by senior management
- Legislation in relation of waste (Regulations 2000) is not known in the hospital and they are not enforced
- New legislation for Occupational Health and Safety promulgated in September 2002 so not yet implemented in the hospital
- Attendance at meetings and training sessions was poor due to workload, attitude and discipline

#### 9.4.3 Skills Development

- The training sessions were severely hampered by the lack of resources.
- Attendance at the training sessions was disappointing due to perceived or real workload and authoritative support.
- Language and level of education influenced the comprehension rate at the lower levels.
- The 'train the trainer' concept was not successful due to time constraints, capacity, knowledge and experience in facilitation although the group interviewed still believed that this was the preferred way.

- The informal on-the-job coaching was the more successful method for disseminating information. The success of this varied depending on the commitment of the individual supervisors.
- The training and awareness materials were well received. Distribution of the information was not well managed and many said they have not received the information.
- Good support was received from Public Health Department with artwork for promotional material.

#### 9.4.4 Inter-relations:

- The relationship between senior management and MSHW appears to be cordial and co-operative.
- Senior Management appears unwilling or they are unable to apply disciplinary action for deviations from accepted standards.
- The inter-relation between senior management and middle management is a complex one as the lines of authority and accountability are blurred with a tripartite system of management.
- The relationships between the supervisors and the nursing staff is generally not problematic but does vary depending on the level of authority exerted and the relationship established by the Supervisors
- The relationships between the Supervisors and the orderlies are very strained in most areas. The Supervisors appear unable to exercise authority over the Orderlies.
- The inter-relationship between the two Senior Orderlies and the Orderlies has been difficult to assess. There is no clear distinction of responsibilities for the Orderly's actions between the Supervisor and the Senior Orderly. Discipline is therefore difficult as the Orderlies manipulate the dual reporting structure.

#### 9.4.5 List of Incidents occurring during the pilot test:

Several major incidents occurred during the pilot test period that had a negative impact. The incidents were verbally reported to the Senior Management and action was taken to correct or improve the situation. No formal reports or investigations were carried out to determine the root causes

The table below lists the more critical events that took place:

<b>Incident</b>	<b>Action taken</b>
Theft of two new pedal bins from the equipment store	Dedicated and secure equipment store allocated for waste management
Sharps container with lid cut off found in possession of the general public	All full numbered sharps containers were transported by the unit Orderlies to the equipment store where they were collected for destruction

<b>Incident</b>	<b>Action taken</b>
	under supervision
Two full sharps containers went missing	Supervisor followed up and they were found in a cupboard of another unit not part of the test
Incinerator ran out of diesel. (several times) Greater quantities of diesel were being used. Two causes were discussed: Theft and greater use due to the secondary burner.	Incinerator operator was changed and a daily measuring of the level using a dip stick was introduced
Temperature probe from the second burner on the incinerator was found to be faulty and was removed by the Service Provider	CTA arranged with Service provider for another probe to be installed
Fire on roof on incinerator due to hot paper and cardboard ash falling on dry leaves	Fire Brigade called to extinguish the blaze. Leaves were removed.
Electrical malfunction of the incinerator due to water leaking from roof of incinerator housing. The fire had damaged the roof	Temporary housing erected over the electrical switchgear and works order submitted for the roof to be replaced.

#### 9.4.6 Needlestick injuries:

Needlestick injuries are not formally reported nor investigated, as the culture of reporting and investigating any incident has not yet been established within the management norms. No reports of needlestick injuries were reported, verbally or otherwise during the pilot test.

#### 9.5 Lessons Learnt

The process of change management is a slow and complex one requiring sufficient time for the paradigm shift to occur. The main objective of the pilot test was to identify the learning lessons so that the necessary changes in structure, system tools, skills development and inter-relations can be instigated, thus facilitating the change process for replication of the system. The lessons arising out of the health care pilot project are summarised here.

##### 9.5.1 Structure (Organisational, financial and staffing)

The organisational structures established for the pilot project were successful and did encourage participation at all levels. The appointment of a champion in the form of the Waste Management Officer was pivotal in the day to day operation of the system.

The system of management control such as supervision, monitoring and enforcement is fragmented and uncoordinated. There is no quality framework in place to link the waste management system to, and it was therefore difficult to integrate it into existing structures. There is a need for a quality assurance programme that includes good document control, defines role and responsibilities and sets up processes and incentives to ensure that the workers are made accountable for their outcomes.

There is no specific budget allocation for waste management. The impact of decisions made outside of the hospital for the purchase of plastic liners, containers and bins is not fully understood and has a low priority rating. Funds are frequently not available so that both the quantity and quality of the equipment purchased is compromised.

The hospital management often find their hands tied when required to carry out disciplinary action. Frequent delays are experienced with the process, as applications are not judiciously or promptly expedited at the MHSW and the emphasis is lost through long delays.

#### 9.5.2 System Tools (Equipment, procedures, guidelines and legal instrument issues)

The equipment introduced in the liner-based system was well received within the pilot test site areas, with the exception of the trolleys. Where previously no system existed, the equipment implemented has gone a long way to improving the standards of waste management. The viability (sustainability) of the system is however dependant on the availability of the equipment, money and supportive management structures.

The availability of funds to purchase the required equipment is critical. The conservative spending of money must be encouraged and certain savings can be achieved, e.g. by reducing the microns of the plastic liners slightly or monitoring the quantity used etc, provided this is done without compromising the quality and safety standards of the equipment.

The correct budget allocations and purchasing of the equipment is not presently supported by good tender specifications and guidelines from the ministry. These are essential to prevent the purchasing of low quality equipment.

Another aspect to the sustainability of the project is the availability of the equipment locally. The controls over importation of equipment make it difficult for the hospital management to purchase the correct type and quality from South Africa.

The hospital management have little control over the condition of the incinerator as this is left with the Bio medical department of Public Works. The frequent

break down of this critical piece of equipment is a cause for concern. Although the upgrade does ensure that better burning takes place, the incinerator is still not up to international standard for emissions into the environment. The standards for the operation of the incinerator are jeopardized by the standard of education of the incinerator operators as they are unable to understand the engineering aspects of their work.

There was a notable improvement in the general cleanliness of the hospital during the pilot project period. During this time, an Infection Control body was established in the hospital as a direct result of the issues highlighted during the implementation of the system. This body could play an extremely important role in improving the standards in and around the hospital and must be encouraged.

Limited legislation is in place with the Regulation 2000 and the more recent Occupational Health and Safety Act 2002. This legislation is not known and the regulatory and certification requirements have not been met. Although there is room for improvement of the existing legislation, the promulgation of existing or additional legislation will not be effective if not supported by a good monitoring body.

### 9.5.3 Skills Development and Awareness Raising Issues

Training in itself is not necessarily a panacea for what ails the institution. SIMPA do offer supervisory training programmes and other management tools. However, the hospital has recently not availed themselves of the opportunity to equip their staff.

There are presently no waste management courses available. Awareness and a broader understanding within the institution could be improved through formal courses that include the legal requirements, the macro environmental issues, infection control and safety and the like. The skills development in waste management is however, essentially a coaching or on-the-job learning experience that must be coupled with good supervisory/ mentoring skills and a monitoring/ enforcement culture.

### 9.5.4 Inter-relations between stakeholders within the health care institution

A major setback throughout the pilot project was the inter-relations within the Orderlies ranks, between the Orderlies/ Supervisors and the apparent inability on the part of senior management to support the protocols and working routines. The Orderlies added additional fuel to an already complex situation by frequently manipulated the dual reporting structure between the Senior Orderlies and the Supervisors.

The dynamics involved within the health care institutions with regard to the many associated disciplines such as food preparation, cleaning and incineration, laboratory etc. have historically proved to be difficult to manage as they are outside of the core business of nursing. A route that has more recently been taken in S.A. is to contract out these services to private companies.

## 10. REVISION OF THE STRATEGY

The health care pilot project has successfully implemented an improved waste management system into the six pilot test areas of the hospital. The learning lessons described above have highlighted some important aspects that should be considered and integrated into the Solid Waste Management Strategy.

These will be discussed under two main headings:

1. Institutional
2. Technical

### **Institutional**

- Introduce a quality assurance framework (e.g. ISO 9000 and/or an Occupational Health and Safety system (e.g. OHSAS 18000 or NOSA) within the institution, preferably with an external accreditation.
- Investigate the possibility of greater autonomy within the hospital with regard to the allocation of funds.
- Write health care waste management guidelines or codes of practice for the institution that allocates responsibility and ensures the correct authority is established
- Empower and equip the Infection Control function within the institution
- Apply for the additional post to be created for a health care environmental officer.
- Set up a good monitoring or inspectorate within the institutions to ensure that existing legislation is adhered to
- Establish Occupational Health and Safety structures as required by the new Occupational Health and Safety Act within the health care institution
- Establish a Waste Management Course with external organisations (SIMP or private) that includes legislative, environmental, safety and health issues
- Encourage an ethos of good management through the application of supervisory and monitoring skills. All line managers should attend management courses when promoted to supervisory level
- Investigate the possibility of contracting out the collection, cleaning and internal transporting of the waste.
- Introduce a regular incident reporting and investigation methodology - link to Occupational Health and Safety Act requirements.

## **Technical**

- Devise tender specifications for the institution (MHSW) in line with international standards for the purchasing of good quality equipment
- Involve local small businesses with a view to ensuring that good quality equipment is available locally
- Investigate the feasibility of a centralised treatment facility that includes alternative technologies to incineration
- Give a budget allocation specifically for waste management equipment and establish a better understanding during the budget process of the importance of waste management.

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