MASTER PLAN FOR HEALTHCARE WASTE MANAGEMENT
WEST BANK/GAZA STRIP

Revised Draft
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Table of Contents

Table of Contents 2

List of Figures 4
List of Tables 4
Acronyms 5

1. Introduction 6
   1.1 Project background 6
   1.2 Objectives of Master Plan 6
   1.3 Guide to report structure 7

2. Assessment of national healthcare waste systems 8
   2.1 Introdution 8
   2.2 Estimation of HCW generation in WB/GS 8
   2.3 Segregation and storage 8
   2.4 Collection and transportation of HCW 9
   2.5 Treatment and disposal facilities 10
   2.6 In-house HCW management 11
   2.7 Cost of HCWM 11
      2.7.1 Financing and costs 11
      2.7.2 Government Budget 11
   2.8 Legal and Institutional framework 12
      2.8.1 Legal Capacity 12
      2.8.2 Institutional capacity 12

3. Options for HCW facilities 14
   3.1 Introduction 14
   3.2 Strategic Decisions 14
      3.2.1 Reduction of Generated Waste 14
      3.2.2 Centralization and Decentralization 14
   3.3 Technical Options 15
      3.3.1 Selection Criteria 15
      3.3.2 Initial scoping of HWC treatment technologies for further appraisal 16
      3.3.3 Screening of Options for HCW 18
      3.3.4 Scoring of options 19

4. Reinforcement of legal framework and designation of responsibilities 26
   4.1 Introduction 26
   4.2 Legal Framework 26
   4.3 Designation of Responsibilities 26
      4.3.1 Nationally 27
4.3.2. Locally

5. Reinforcement of HCW Management practices

5.1. Management Plans

5.1.1. Management Plans for HCFs

5.1.2. Management Plan for Collection/Transportation Agencies (HCW Department within Municipalities)

5.1.3. Management Plan for Treatment facilities

5.2. Administrative Mechanisms

5.3. Development of financial resources

6. Set-up of awareness raising and training

6.1. Awareness Raising

6.1.1. Nationally

6.1.2. Locally

6.2. Training

7. Implementation Plan and Timeframe

7.1. Objectives of the Implementation Plan

Annex 1 Guidelines for HCWM
List of Figures

Figure 1  General responsibilities of the main governmental players in relation with HCWM ..... 13
Figure 2 Different types of waste and the different long and short term treatment solutions. .... 25
Figure 3 Roles and responsibilities between different stakeholders involved in the management of health care waste .............................................................................................................. 28

List of Tables

Table 1 Selection criteria for appraisal treatment technology options ........................................ 16
Table 2 Technical options and their ability to treat different categories of waste ...................... 17
Table 3 Screening of treatment technologies against selection criteria .................................... 18
Table 4 Weighting factors developed by the Consultant and Gaza Stakeholders ....................... 20
Table 5: Weighted appraisal of short-term treatment options ...................................................... 20
Table 6: Weighted appraisal of long-term treatment options ....................................................... 22
Table 7 Summary of different roles and responsibilities of different stakeholders involved in the management of MHCW ........................................................................................................ 29
Acronyms

EQA  Environmental Quality Authority
EU  European Union
GS  Gaza Strip
HCF  Health Care Facility
HCFs  Health Care Facilities
HCW  Health Care Waste
HCWM  Health Care Waste Management
METAP  Mediterranean Environmental Technical Assistance Program
MO  Military Orders
MoH  Ministry of Health
MoLG  Ministry of Local Government
NGOs  Nongovernmental Organizations
PNA  Palestinian National Authority
PSP  Private Sector Participation
SW  Solid Waste
SWM  Solid Waste Management
UNDP  United Nations Development Program
WB  West Bank
WHO  World Health Organizations
WMO  Waste Management Officer
1. Introduction

1.1 Project background
The current population in the West Bank (WB) and Gaza Strip (GS) stands at approximately 3 million persons with annual growth set at 4.8%\(^1\). This rapid population growth has been associated with expansion in public services including healthcare services.

The lack of policies, strategies and enforcement of legislation for the handling and disposing of health care waste (HCW) has resulted in poor management of such waste. As a result, many health care establishments are increasingly exposing patients, medical and support staff in health care facilities to health risks. Moreover, improper management of HCW in WB and GS is having serious implications for public health and the general environment.

In order to mitigate the health problems associated with healthcare waste, funding has been provided through the Regional Solid Waste Project in METAP Mashreq and Maghreb Countries to develop a Master Plan for the management of Healthcare Waste in the WB and GS. This report is the result of research that has been carried out in the WB/GS to identify the current situation related to healthcare waste management (HCWM) and discussions that have been held with experts in the field in order to identify the best fit solution for the healthcare waste issue in WB/GS.

A draft of this Master Plan report has been reviewed and discussed with several stakeholders from Gaza and West Bank such as MoH, EQA, municipalities and others. Revisions and modifications have been made based on consultations and outcomes from the different workshops and meetings.

1.2 Objectives of Master Plan
The objective of the National Master Plan for healthcare waste management is to establish a framework for a wide course of activities designed to optimally use the available resources and opportunities to improve the HCW management situation in WB/GS.

Once an understanding of the existing situation had been grasped, it was possible to conduct a rapid appraisal of technical treatment options that could be used to treat HCW. The Master Plan is therefore based on the technical options that have been identified in addition to the legal, institutional, management, financial changes that should be taken in order to bring about improvement in HCWM. Long and short term objectives discussed

\(^1\) UNDP, 2002, Arab Human Development Report, Creating Opportunities for Future Generations
are put along with developed specific actions for their implementation according to the action plan proposed is Section 7.

1.3 Guide to report structure
The report begins in Chapter 2 with a brief overview of the situation related to HCWM in WB/GS. This includes details on quantities, management practices (segregation, collection, treatment practices, etc) in addition to an overview of the legal and institutional framework that is currently in operation.

Chapter 3 identifies the options for HCW treatment facilities and goes through the steps that have been taken to appraise the options and to identify technical options that would be suitable in the first instance for the short term and then for the long term once more institutional and legal capacities have been strengthened.

Chapter 4 identifies what needs to be done in order to strengthen the legal framework and makes recommendations for the designation of responsibilities for the various actors at different levels involved in the HCW management chain. A distinction is made between requirements at the national and local levels.

Chapter 5 makes recommendations for the reinforcement of HCW management practices including the necessity for management plans to be written and implemented for the various players in the HCW management chain. For example, while there will be similar themes for all management plans, the focus for a HCF will vary from that of a treatment facility. Recommendations are also made for administrative mechanism that should be established by and through EQA.

Chapter 6 discusses the need to develop financial resources for the successful implementation of HCW management practices in WB/GS.

Chapter 7 identifies the need for awareness raising and training and makes recommendations for how this should be implemented. Again, a distinction is made between national and local needs.

Chapter 8 sets out a suggested timeframe for the implementation of the Master Plan.

**Annex 1 includes the national guidelines for HCWM. These have been based mainly on international best practice (e.g. WHO guidelines) and have been adapted to fit the local situation. In 2001, The Ministry of Health has also drafted guidelines for HCW management in Palestine that were also based on WHO guidelines and these were looked at as well and are included in the Annex.**
2. Assessment of national healthcare waste systems

2.1. Introduction
In order to be able to develop a comprehensive and reliable Master Plan for the management of Healthcare waste it is firstly important to gain an understanding of the situation that currently exists on the ground. For this reason a full assessment of HCW in WB/GS was conducted that involved interviewing a number of carefully selected HCWF and by conducting a sampling campaign in a variety of facilities, i.e. measuring and assessing the waste that was being produced over a 7 day period. This section provides a brief overview of the findings of this initial assessment.

2.2. Estimation of HCW generation in WB/GS
None of the healthcare facilities in WB and GS keep records on generation rate or quantities of healthcare waste. However, the sampling campaign estimated the volume of HCW being generated in the WB and GS; currently WB healthcare facilities produce 1.29kg/bed/day while those in the GS produce 1.3 kg/bed/day.

These figures from the sampling campaign compare with previous estimations which stood at 1.27 Kg/bed/day of HCW is being generated in the WB (Atyani, 1998) and 1.36 kg/bed/day in Jordan (Qusus, 1988) which has similar treatment practices and culture.

In addition, the draft guidelines developed by MOH in 2001 mentioned quantities of 0.93 Kg/bed/day of HCW generated in GS, and 1.23 Kg/bed/day of HCW generated in the WB in Ramallah Hospital.

Based on the results of the survey, none of the questioned HCFs has a source reduction plan in place and only 1 HCF claimed to have any sort of recycling provision.

2.3. Segregation and storage
During the survey in Gaza Strip, it was found that only one third of the HCFs have special bags in use for HCW collection; all other facilities consequently collecting all types of HCW together with domestic waste. Sharp items in particular are being collected in special boxes (and sometimes special plastic bottles) as a result of the WHO donating a certain number of boxes; but again this is happening in only a limited number (38%) of HCF. Color coding of HCW according to its type is recognized as being a useful tool, although only 5% of HCF to currently have system for color coding. Even the labeling system for the containers does not exist according the results of the questionnaire. A fundamental issue that was highlighted by more than half of those interviewed was that there are frequently insufficient waste containers to handle the volume of healthcare waste that is generated. Only one quarter of HCFs questioned has some sort of separation of HCW at the point of generation and there are no special carts or special routes to transport waste.
The majority of HCFs have no storage rooms for the waste. More than 80% of facilities in GS have no kind of secure storage for HCW. The waste bags are piled in the toilets or sometimes in the kitchens, which is aesthetically not accepted and can be considered as a serious hygienic problem.

In the West Bank, the survey results showed that there is no segregation of waste except for sharps. Two thirds of HCFs have acceptable sharp boxes (sometimes plastic bottles). Less than fifty percent segregate other types of waste like waste generated in operating theatres and labs which includes infectious and pathological waste. Only 7.6% of the facilities use color coding (they use red or yellow bags for infectious waste). One third of HCFs lacks proper onsite storage containers. It is very common that all healthcare waste is mixed with the general waste in open baskets that are lined with very thin plastic bags. The bags are not strong enough and in many cases can be easily punctured allowing leakage and spillage to occur. Labeling of containers is not used and there is no way to distinguish between waste coming from the kitchens or that from the laboratories.

In most hospitals in WB, there are no special carts or special routes to transport the waste. The corridors and the passengers' elevators are used. Hence, patients, workers and visitors could be subjected to health risks. Twenty five percent of the hospitals have no storage facilities and use the same containers which are located in the streets dedicated for municipal waste. Most of these containers have no protection against animals.

2.4. Collection and transportation of HCW

Waste is generally collected by the municipality in each city but the collection frequency is left uncontrolled. Only 15% of the HCFs which were surveyed during the first phase of this project have special containers for offsite transport. The workers in the Solid Waste Department, (sometimes called Health Department), in each municipality are responsible for collecting all containers and they do not distinguish between healthcare waste and domestic waste. All types of waste are transported in the same vehicle and there is no training provided for the waste collectors. No instructions are given to them on how to act in case of spillages. Some municipalities provide vaccination for the workers against Hepatitis B and Tetanus randomly.

The transport vehicles are generally not specially designed for HCW transport (sometimes being no more than open refuse vans or compactors) and do not engage in management practices suited for HCW such as labeling and daily cleaning. The municipalities, which are mostly responsible for HCW transport, make no differentiation between waste collected from residential areas and that collected from HCF; this obviously leads to a mixing of waste in the same truck and being taken to the same end dump site.

During the current political crisis there are many environmental problems connected with solid waste transport in the area. The abnormal situation resulting from the closure of the main road to landfills by Israeli tanks and security checkpoints forces the municipality not to use the main road. The alternative new agricultural roads have increased the distance 2 to 4 times. In addition, these new roads are in very bad condition. The tight closures of the main road led to the following problems:
- Decreased lifespan of the vehicles
- Increased fuel cost used for transport.
- Increased maintenance cost of the transport vehicles.
- Increased environmental and health impacts in areas of new unpaved roads.

None of the cities in the WB has a sanitary landfill so far but each has its own random dumping site. In some cases, the waste is transported many kilometres but there is no access to the dumping site due to Israeli checkpoints or closures like the case in Ramallah and Albireh who started using the same site few years ago. Last year Albireh Municipality received Israeli Military instructions that limit their accessibility to the site from Sunday to Friday.

2.5. Treatment and disposal facilities

Gaza Strip
From the survey that was conducted under the first phase of this project, results show that 70% of the collected HCW in GS is being incinerated, while 20% is being burnt in the open air, frequently in bins (resulting in concerns over public health). The remaining collected HCW and the ash from the incineration invariably end up in municipal waste dumps. No documentation or registry of any data on incinerated items is made. In some cases the situation has arisen in Gaza where HCW has been witnessed in and around general bins in major urban centers and includes theatre waste, infectious waste, sharps (scalpels, catheters, syringes, etc) plus general waste from HCF. Where HCFs have the capacity to treat infectious and pathological waste themselves (30% of HCFs in Gaza) more than 90% of the HCW is incinerated.

With regards to liquid waste 95% in GS is disposed of in the sewer system. It is unclear where the remaining 5% ends up, but most likely it gets disposed of along with the solid waste, subsequently ending up in municipal sites.

West Bank
In the WB, many hospitals are using autoclaving to treat positive bacterial cultures, blood samples, syringes or any waste produced from testing or treatment of patients who are infected by AIDS. In other hospitals, waste from isolation rooms, if available, is dealt with as general waste. As mentioned previously and according to the results of the survey, most of the waste (about 65%) is disposed of in open dumping site, 15% is disposed of by open burning, and less than 10% is incinerated. Incinerators are only available in Nablus and Jericho cities and were part of a Spanish donation to the Ministry of Local Government. During the survey carried out as part of this project, the incinerator in Jericho was out of order while the one in Nablus was working with very low efficiency in such a way that waste items can still be recognized after being incinerated. The incinerator has a very low chimney and research which was carried out by Chemical Engineering Department at Al-Najah University showed that this incinerator is polluting the atmosphere and should not be used.

Similar to the situation in the GS, the liquid waste, which contains pathogens, blood and hazardous chemicals, about 92% of it is disposed of in the public sewer system. It is likely that the remaining part is disposed of together with solid waste.
2.6. In-house HCW management

Within the HCFs there is little coordinated management of HCW and no written records of waste management practices. There is no segregation of HCW which is subsequently mixed with the general municipal waste. The only exception to this is for sharps which are collected separately from the rest of the waste. No labeling of the waste is made and most of the HCFs do not have any onsite storage facilities.

With regards to onsite HCW transport some HCFs have simple equipment such as trolleys and/or some sort of wheeled containers in each department. The remaining facilities do not have sufficient equipment for this task. The contractors who are in charge of onsite transportation do not get sufficient training and mostly are not vaccinated. In addition most of the waste handlers are not provided with adequate protective clothing.

2.7. Cost of HCWM

2.7.1. Financing and costs

Financial issues are one of the main weaknesses of different PNA institutions. In the field of HCW services, there is a severe lack of financial resources for all of the players involved in this sector. This has made it difficult for them to carry out their duties and to develop creative initiatives to improve standards. The main proportion of the finances that are available for HCWM originate with donors but often capital costs are provided with no provision being made for continued operation. Currently, there is no cost sharing amongst HCW stakeholders. Enhancing cost sharing by other stakeholders could be one area for intervention in the future strategy.

2.7.2. Government Budget

According to the MOH's financial report in 2003, the total allocated budget for capital and operational costs were 18 million NIS (about US$ 4 million) for Gaza Strip and West Bank to cover all HCW services. The main part of the budget came from donors agencies and a limited proportion came from revenues of health services. According to the Palestinian Health Information Center, the total income generation of MOH is 77.129 Million NIS (around US$ 17.5) for the year 2003. The break down of the income fees is as follows:

<table>
<thead>
<tr>
<th></th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospitals fees</td>
<td>4,455,212 NIS</td>
</tr>
<tr>
<td>Primary Health Care fees</td>
<td>7,025,012 NIS</td>
</tr>
<tr>
<td>Health Insurance fees</td>
<td>65,649,000 NIS</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>77,129,224 NIS</strong></td>
</tr>
</tbody>
</table>

At the level of municipalities, which played an important role in HCW and based on the municipalities’ records, it has been found that the financial resources and performance of the solid waste service is weak. It is dependent upon the donation and revenues of other services for it to function. The costs of vehicles and equipment (for waste transport/disposal) come from donation budget.
The only source of revenues for SWM is the solid waste removal fees collected by the municipalities. Because of Intifada-induced effects, revenues from solid waste removal fees have witnessed significant fluctuations and a tremendous decrease in revenues in the period 1999 – 2004. Depending on a single source of revenues makes the financial status of SWM vulnerable. With regard to collected fees, they do not go into an earmarked budget. The waste fees like any fees of other municipal services are considered as a municipal source of income and all these fees are put together as one budget line in the municipality's income.

2.8. Legal and Institutional framework

2.8.1. Legal Capacity

Further to the Oslo-II agreement, July 1999 saw the enactment of the Palestinian Environmental Law which includes HCW within its definition for hazardous waste, i.e. [Hazardous waste is] ‘waste generated by the various activities and operations or the ash thereof, which maintains the characteristics of hazardous substance, which have no usage, such as atomic waste, healthcare waste or refuse emanating from the manufacturing of pharmaceutical products, medicines, organic solvents, dyes, paints, pesticides or any other similar hazardous substance.’, however, this definition is loose and could be interpreted in other ways.

This Environmental Law of 1999 identifies the Ministry of Environmental Affairs (which became the Environmental Quality Authority (EQA) in 2002) in co-ordination with other competent bodies as being responsible for specifying legislation for managing hazardous waste (in the form of orders and directives) and for issuing one or more lists of what constitutes hazardous wastes. The management of the waste includes storing, use, treatment, handling and disposal, therefore relating not only to HCF, but also those who have responsibility for the collection, transport, treatment and disposal of the HCW. To date, these orders and directives have not yet been elaborated and implemented into law and the lists of hazardous waste still wait to be introduced into the law.

To date the municipal Law No. 1 of 1934 is still in use. Article No. 96 of this law which describes the duties of the local authority lists the collection and disposal of wastes in the eighth provision.

As a result of week and ill enforced legislation, little provision is currently made for HCWM.

2.8.2. Institutional capacity

A large number of institutions are still concerned with and, in fact are playing a role in HCW with no clear regulations, laws or by laws. Figure 1 shows general responsibilities of the main governmental players in relation with HCWM.

On the national level, the responsibilities are supposed to be distributed between the Ministry of Health, Environmental Quality Authority and the Ministry of Local Governments (Municipalities). As was outlined by related health authorities; waste collection, handling and on site storage are the responsibility of waste pickers who are under the health care facility administration. However, there is no defined structure, job descriptions or line of authority for health care waste systems for a number of reasons including:

1- In PHC centres it is usually a one person job;
2- Some hospitals have contracted a private contractor to collect and handle the waste;
3- The mistaken understanding of the medical or nursing staff that receiving the waste pickers reports undermines their status;
4- There are no national or internal regulations which outline the responsibilities in this sector.

This has led to a weak system currently being in place which is made even weaker by the lack of training being given to staff.

Figure 1 General responsibilities of the main governmental players in relation with HCWM.
3. Options for HCW facilities

3.1. Introduction
There is currently a wide range of technical options that could be used for the treatment of healthcare waste. However, in order to produce a short list of technical options that would be most suitable in the context of the WB and GS, it was necessary to firstly carry out a rapid appraisal of options that would remove the less favourable options and focus attention on those technologies that would be the most likely solutions for HCW treatment. Both long and short term options have been considered – these vary slightly based on the different needs and institutional/legal capacities that are currently in existence and which will be strengthened over time.

The appraisal system that was used was based on a simplified, generic assessment and was used as a relatively rapid decision making tool to select options for further detailed appraisal.

3.2. Strategic Decisions
There are many considerations that need to be taken into account before making any strategic decisions related to the management and treatment of healthcare waste.

3.2.1. Reduction of Generated Waste
Significant reduction of the waste generated in health-care establishments is one of the issues that should be taken into consideration. Minimization of HCW may be encouraged by the implementation of certain policies and practices, including the following:

- Source reduction: measures such as purchasing restrictions to ensure the selection of methods or supplies that are less wasteful or generate less hazardous waste (such as physical steam disinfection rather than chemical disinfection)
- Recyclable products: use of materials that may be recycled, either on-site or off-site.
- Good management and control practices: apply particularly to the purchase and use of chemicals and pharmaceuticals.
- Waste segregation: careful segregation (separation) of waste matter into different categories helps to minimize the quantities of hazardous waste.

3.2.2. Centralization and Decentralization
The relationship between the local and central governments is defined by constitutions and laws. In the West Bank and Gaza, political and administrative circumstances led to decentralization. As a result of the Israeli occupation and the lack of a Palestinian central government, institutions took control of services. The people supported and continue to
support the municipalities and NGOs that provide services in solid waste management, health, education, agriculture, manufacturing and research.

We are proposing that HCWM operations are decentralized as far as possible. In other words, operational decisions and budgeting for individual HCFs will be taken locally. With regard to collection and transport, each municipality should plan and budget for its own requirements, based on the local needs. The operation of the various treatment units (incinerators, etc) will be carried out locally, but taking into account wider (eg. national) needs, based on the strategic overview and demand provided by EQA.

A degree of planning and overall demand prediction should be made centrally, by the EQA, with assistance from MoH.

A key issue which should also be managed centrally is the setting up of an overall regulatory regime, including management guidelines and procedures and monitoring guidelines and procedures. Legislation, including relating to monitoring and enforcement, as well as procedural guidelines (segregation, types of treatment permitted, etc), should be developed and implemented centrally by EQA, with assistance from MoH. However, the implementation of the regulatory functions can be devolved to local offices, provided there is effective central follow up.

3.3. Technical Options

In the long-term, once legal and institutional issues have been addressed, different technical options may provide a better solution. For this reason technical options have been appraised twice in order to identify short and long-term solutions.

During the appraisal of different technical options, it is important to recognise that a distinction needs to be made between short-term and long-term technical options; where one option may be the most appropriate as an immediate solution, based on the current circumstances (institutional capacity, etc).

3.3.1. Selection Criteria

For the purposes of appraising technical options a number of selection criteria were developed under five main criteria categories: human, environmental, technical, economic and legal criteria. These are set out in Table 1.

The preferred scenario column identifies the ideal situation; for example, ideally training requirements for the technologies should be as low as possible to ensure that operation is maintained efficiently at all times.

It is important to appraise each of the treatment options against all the selection criteria in order to obtain an overall understanding of whether the technology is able to perform well against all criteria categories (see Table 1).
For example, one technology may have very low operational costs, while having poor environmental performance. Once weighting has been added to the criteria, scoring can be assigned to each of the options to find the most suitable option, (this is explained further in the coming sections). The results of the appraisal are summarised in the following tables.

Table 1 Selection criteria for appraisal treatment technology options

<table>
<thead>
<tr>
<th>Criteria Categories</th>
<th>Selection Criteria</th>
<th>Preferred Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. Human</strong></td>
<td>• Training requirements</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>• Occupational health &amp; safety</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>• Community and staff acceptance</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>• Resistance to tampering</td>
<td>High</td>
</tr>
<tr>
<td><strong>B. Environmental</strong></td>
<td>• Microbial inactivation efficacy</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>• Emissions and waste residues</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>• Noise and odour</td>
<td>Low</td>
</tr>
<tr>
<td><strong>C. Technical</strong></td>
<td>• Ability to treat wide range of waste</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>• Ability to reduce volume and mass of waste</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>• Space requirements</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>• Ease of operation</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>• Need for utilities and auxiliaries</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>• Proven technology/reliable</td>
<td>High</td>
</tr>
<tr>
<td><strong>D. Economic</strong></td>
<td>• Investment costs</td>
<td>Low</td>
</tr>
<tr>
<td></td>
<td>• Operational costs</td>
<td>Low</td>
</tr>
<tr>
<td><strong>E. Legal</strong></td>
<td>• Institutional acceptance</td>
<td>High</td>
</tr>
<tr>
<td></td>
<td>• Regulatory acceptance</td>
<td>High</td>
</tr>
</tbody>
</table>

3.3.2. Initial scoping of HWC treatment technologies for further appraisal

Currently there is a wide spectrum of available technologies for the treatment of infectious medical waste, the commonest of which includes incineration, steam sterilization, gas sterilization, chemical disinfection, thermal inactivation, irradiation and microwave treatment. Not all of these technologies are suitable for each type of healthcare waste and therefore in order to be the most useful investment it is necessary to identify the option that will be able to deal with the widest range of waste types whilst at the same time satisfying other restrictions that may be placed on any technical treatment options in Gaza and the West Bank.

In order to provide a short list of technical options that would be appraised in more detail against all of the selection criteria outlined above in Table 1, all technical options were assessed based on existing knowledge of effectiveness of the treatment for each type of waste category. In the WB/GS it is more appropriate to have options that are able to treat as wide a range of HCW as possible. Table 2 shows different technical options and their ability to treat different categories of waste as per WHO guidelines.
### Table 2: Technical options and their ability to treat different categories of waste

<table>
<thead>
<tr>
<th>Technical Option</th>
<th>Waste Category</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotary kiln</td>
<td>yes</td>
<td>could be a industrial cement or steel kiln</td>
</tr>
<tr>
<td>1,000 kg/h</td>
<td>yes</td>
<td></td>
</tr>
<tr>
<td>2-chamber incineration 800-900 degC</td>
<td>yes</td>
<td>small quantities</td>
</tr>
<tr>
<td></td>
<td>yes</td>
<td>only if two chamber incineration is not affordable</td>
</tr>
<tr>
<td>1-chamber incineration 850-900 degC</td>
<td>yes yes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>yes</td>
<td>locally manufactured and cheap</td>
</tr>
<tr>
<td>Chemical disinfection</td>
<td>no yes</td>
<td>Okhonna</td>
</tr>
<tr>
<td>Low temperature sterilization</td>
<td>no yes</td>
<td>no metal parts</td>
</tr>
<tr>
<td>Microwave low temperature sterilization</td>
<td>no yes</td>
<td>internal shredder, no metal parts will damage</td>
</tr>
<tr>
<td>High-temperature sterilization</td>
<td>no yes</td>
<td>inculding autoclaves, grinders and shredders</td>
</tr>
<tr>
<td>Extermination</td>
<td>no yes</td>
<td>on-site or off-site</td>
</tr>
<tr>
<td>Safe burial on hospital premises</td>
<td>yes yes</td>
<td>this is generally regarded as the last option</td>
</tr>
<tr>
<td>Infiltration</td>
<td>no no</td>
<td>including personal attendance</td>
</tr>
<tr>
<td>Engineered or sanitary landfill</td>
<td>no no</td>
<td>not allowed</td>
</tr>
<tr>
<td>Municipal landfill</td>
<td>no no</td>
<td></td>
</tr>
<tr>
<td>Discharge to sewer</td>
<td>no no</td>
<td>not allowed</td>
</tr>
<tr>
<td>Selected with yes</td>
<td>3 6 4 5 6 7 5 3 0</td>
<td>small quantities</td>
</tr>
<tr>
<td>Not considered</td>
<td>irradative processes</td>
<td></td>
</tr>
<tr>
<td>Low temperature dry heat processes</td>
<td>High heat thermal processes (pyrolysis)</td>
<td></td>
</tr>
<tr>
<td>Biological processes</td>
<td>Other chemical processes (enire, different vendor solutions)</td>
<td></td>
</tr>
</tbody>
</table>

**Important remarks:**
- The prerequisites for selection of a treatment and disposal option are proper segregation of different categories of waste.
- Domestic (food, plastic) waste is considered as municipal waste.
- Thermometers (mercury) and pre should never be incinerated.
- No option for disposal of radioactive waste.
3.3.3. **Screening of Options for HCW**

Of the 14 technical options that were initially identified, 9 have been selected for further appraisal. The other options were rejected based on the fact that they are either not permitted under legislation or for other reasons.

The 9 technologies that were selected in the exercise above are appraised further against each of the selection criteria of Table 1. These are set out in Table 3. The score per criteria used in the assessment is divided into 4 levels as follows:

- -2 - - does not meet preferred scenario
-1 - meets the minimum preferred scenario
0 neutral/no effect
1 + meets the preferred scenario
2 + + exceeds the preferred scenario

### Table 3 Screening of treatment technologies against selection criteria

<table>
<thead>
<tr>
<th>Selection Criteria</th>
<th>Treatment Technology</th>
<th>Two chamber incineration</th>
<th>Small scale incinerator</th>
<th>Chemical disinfection</th>
<th>Low temperature Autoclave</th>
<th>Low temperature Microwave</th>
<th>Needle destruction</th>
<th>Encapsulation</th>
<th>Safe burial on hospital premises</th>
<th>Sanitary landfill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human</td>
<td></td>
<td>0</td>
<td>-4</td>
<td>-3</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>5</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Training requirements</td>
<td></td>
<td>-1</td>
<td>-2</td>
<td>-1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Occupational health &amp; safety</td>
<td></td>
<td>1</td>
<td>-1</td>
<td>-1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Community and staff acceptance</td>
<td></td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Resistance to tampering</td>
<td></td>
<td>-1</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Environmental</td>
<td></td>
<td>5</td>
<td>-3</td>
<td>-1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>-1</td>
<td>-1</td>
<td>0</td>
</tr>
<tr>
<td>Microbial inactivation efficacy</td>
<td></td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Emissions and waste residues</td>
<td></td>
<td>2</td>
<td>-2</td>
<td>-1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>-1</td>
<td>-1</td>
<td>1</td>
</tr>
<tr>
<td>Noise and odour</td>
<td></td>
<td>1</td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-1</td>
</tr>
<tr>
<td>Technical</td>
<td></td>
<td>1</td>
<td>0</td>
<td>-4</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Ability to treat wide range of waste</td>
<td></td>
<td>2</td>
<td>1</td>
<td>-1</td>
<td>1</td>
<td>1</td>
<td>-1</td>
<td>-1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Ability to reduce volume and mass of waste</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Space requirements</td>
<td></td>
<td>-1</td>
<td>-1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>-1</td>
<td>-1</td>
<td>-2</td>
</tr>
<tr>
<td>Ease of operation</td>
<td></td>
<td>-2</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
3.3.4. **Scoring of options**

The assessment of the potential treatment options is based on the selection criteria that fall under the five main criteria categories (A-E) as described above in section 5. The weighting factors that were used are based on expert judgment resulting from past experience.

The score per criteria used in the assessment, divided into 4 levels, is based on the -2 to +2 scores that were assigned in Table 3. The total score for each technology option was counted (e.g. for two chamber incinerator the total score for human criteria is 0, while for environmental criteria it is 5) and multiplied with the following weighting factors which have been assigned differently for short and long-term priorities based on the existing situation in the WB/GS and changes that are needed for the future. Table 4 lists the weighting factors developed. We have included also in that table a column showing the weighing factors developed during the workshop that was held in Gaza and that is slightly different than the numbers put by the Consultant. The difference is due to the local situation at Gaza and different perspectives of the different criteria. However, the final ranking results extracted from both ratings were very similar with slight differences. Since calculations need to be based on one of the ratings, the Consultant’s rating was used.

The existing situation and different considerations taken into account when putting the weighing factors included:

- Prevailing regulations
- Available options in the region
- Quantities of generated waste
- Availability of qualified personnel
- Technologies available on the market
- Available options for final disposal
- Environmental aspects
- Available space on hospital premises
- Related cost
Table 4: Weighting factors developed by the Consultant and Gaza Stakeholders

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Consultant’s Rating</th>
<th>Gaza Stakeholders Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Weighting Factor (%)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Short term</td>
<td>Long Term</td>
</tr>
<tr>
<td>A. Human</td>
<td>25</td>
<td>20</td>
</tr>
<tr>
<td>B. Environmental</td>
<td>15</td>
<td>35</td>
</tr>
<tr>
<td>C. Technical</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>D. Economical</td>
<td>20</td>
<td>25</td>
</tr>
<tr>
<td>E. Legal</td>
<td>25</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

The score is determined using the equation:

\[
\text{Total Score} = \sum (\text{score} \times \text{weighting factor})
\]

Results for the weighted appraisal of screened options are presented below. Table 5 identifies short term options while Table 6 identifies long term options.

Table 5: Weighted appraisal of short-term treatment options

<table>
<thead>
<tr>
<th>Treatment technology</th>
<th>A Human</th>
<th>B Envi.</th>
<th>C Tech.</th>
<th>D Econ.</th>
<th>E Legal</th>
<th>Total Score</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two chamber incineration</td>
<td>25</td>
<td>75</td>
<td>15</td>
<td>-80</td>
<td>-25</td>
<td>-15</td>
<td>7</td>
</tr>
<tr>
<td>Small scale incinerator</td>
<td>-100</td>
<td>-45</td>
<td>0</td>
<td>40</td>
<td>0</td>
<td>-105</td>
<td>8</td>
</tr>
<tr>
<td>Chemical disinfection</td>
<td>-75</td>
<td>-15</td>
<td>-60</td>
<td>-20</td>
<td>50</td>
<td>-120</td>
<td>9</td>
</tr>
<tr>
<td>Low temperature Autoclave</td>
<td>75</td>
<td>30</td>
<td>30</td>
<td>0</td>
<td>50</td>
<td>185</td>
<td>1</td>
</tr>
<tr>
<td>Low temperature Microwave</td>
<td>100</td>
<td>30</td>
<td>30</td>
<td>-40</td>
<td>50</td>
<td>170</td>
<td>3</td>
</tr>
<tr>
<td>Needle destruction</td>
<td>100</td>
<td>0</td>
<td>30</td>
<td>0</td>
<td>50</td>
<td>180</td>
<td>2</td>
</tr>
<tr>
<td>Encapsulation</td>
<td>125</td>
<td>-15</td>
<td>15</td>
<td>-20</td>
<td>50</td>
<td>155</td>
<td>4</td>
</tr>
<tr>
<td>Safe burial on hospital premises</td>
<td>75</td>
<td>-15</td>
<td>60</td>
<td>-20</td>
<td>50</td>
<td>150</td>
<td>5</td>
</tr>
<tr>
<td>Sanitary landfill</td>
<td>100</td>
<td>0</td>
<td>30</td>
<td>-20</td>
<td>0</td>
<td>110</td>
<td>6</td>
</tr>
</tbody>
</table>
Short term solutions

As a result of the weighted appraisal, four options can be identified based on WHO guidelines:

- **Low temperature autoclave**

  Autoclaving is an efficient wet thermal disinfection process. Typically, autoclaves are used in hospitals for the sterilization of recyclable items, and these units allow for the treatment of only limited quantities of waste. They are therefore generally used only for highly infectious waste, such as microbial cultures and sharps. Even a general hospital with very limited resources should be equipped with an autoclave, but a district hospital may well not have one.

- **Needle destruction**

  The needle is inserted into a closed box and makes contact with an electrical device that destroys it. Ashes are stored in an attached container.

- **Encapsulation off site**

  Encapsulation is recommended as the easiest technology for the safe disposal of sharps. Sharps are collected in puncture-proof and leak-proof containers, such as high-density polyethylene boxes, metallic drums, or barrels. When a container is three-quarters full, a material such as cement mortar, bituminous sand, plastic foam, or clay is poured in until the container is completely filled. After this material has dried, the container is sealed and may be landfilled, stored, or buried inside the hospital premises. It is also possible to encapsulate chemical or pharmaceutical residues together with sharps.

- **Safe burial on HCF premises**

  In certain health-care establishments in remote locations, temporary refugee camps, and areas experiencing exceptional hardship, safe burial of wastes on hospital premises may be the only rational option available at times. The design and operation of the burial pit is as described above. To limit risks to health and of environmental pollution, some basic rules should be applied:

  - Access to the disposal site should be restricted to authorized personnel only.
  - The burial boundary should be lined with a material of low permeability (e.g. clay), if available.
  - Only hazardous health-care waste should be buried.
  - Large quantities (over 1kg) of chemical wastes should not be buried at the same time; burial should be spread over several days.
  - The burial site should be managed in the same way as a landfill, with each layer of waste being covered with a layer of earth to prevent development of odors and infestation by rodents and insects.
The safety of waste burial relies critically on operational practices. Safe on-site burial is practicable for only relatively limited periods of time, e.g. 1-2 years, and for relatively small quantities of waste, say up to 5-10 tonnes in total. Where these limits are exceeded, a longer-term solution, involving treatment of the waste or disposal at a municipal solid waste landfill, will need to be found.

Low temperature microwave was not chosen although it was ranked as number 3 in Table 5 because of several drawbacks:

- high investment cost;
- increased waste weight;
- Not suitable for all waste types;
- Potential contamination of shredder, exposure to pathogens; and
- Uncharacterized air emissions

### Table 6: Weighted appraisal of long-term treatment options

<table>
<thead>
<tr>
<th>Treatment technology</th>
<th>A (Human)</th>
<th>B (Envir.)</th>
<th>C (Tech.)</th>
<th>D (Econ.)</th>
<th>E (Legal)</th>
<th>Total Score</th>
<th>Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two chamber incineration</td>
<td>0</td>
<td>175</td>
<td>15</td>
<td>-100</td>
<td>-5</td>
<td>85</td>
<td>4</td>
</tr>
<tr>
<td>Small scale incinerator</td>
<td>-80</td>
<td>-105</td>
<td>0</td>
<td>50</td>
<td>0</td>
<td>-135</td>
<td>8</td>
</tr>
<tr>
<td>Chemical disinfection</td>
<td>-60</td>
<td>-35</td>
<td>-60</td>
<td>-25</td>
<td>10</td>
<td>-170</td>
<td>9</td>
</tr>
<tr>
<td>Low temperature Autoclave</td>
<td>60</td>
<td>70</td>
<td>30</td>
<td>0</td>
<td>10</td>
<td>170</td>
<td>1</td>
</tr>
<tr>
<td>Low temperature Microwave</td>
<td>80</td>
<td>70</td>
<td>30</td>
<td>-50</td>
<td>10</td>
<td>140</td>
<td>2</td>
</tr>
<tr>
<td>Needle destruction</td>
<td>80</td>
<td>0</td>
<td>30</td>
<td>0</td>
<td>10</td>
<td>120</td>
<td>3</td>
</tr>
<tr>
<td>Encapsulation</td>
<td>100</td>
<td>-35</td>
<td>15</td>
<td>-25</td>
<td>10</td>
<td>65</td>
<td>7</td>
</tr>
<tr>
<td>Safe burial on hospital premises</td>
<td>60</td>
<td>-35</td>
<td>60</td>
<td>-25</td>
<td>10</td>
<td>70</td>
<td>6</td>
</tr>
<tr>
<td>Sanitary landfill</td>
<td>80</td>
<td>0</td>
<td>30</td>
<td>-25</td>
<td>0</td>
<td>85</td>
<td>4</td>
</tr>
</tbody>
</table>

### Long-term Solutions

As a result of the weighted appraisal four options can be identified based on WHO guidelines:

- Low temperature autoclave

Same as mentioned above in the short term solutions.
• Needle Destruction

Same as mentioned above in the short term solutions.

• Two chamber incineration 800-900°C

Incineration can be usually done on site at the HCFs, and off site by municipalities. Although on-site treatment of medical waste can greatly reduce medical waste management costs, it is not for every hospital. On-site regulated medical waste treatment is a significant responsibility. Operating a treatment unit requires meaningful management oversight to ensure that wastes are safely managed in compliance with the Medical Waste Management Plan, to protect workers’ safety, and to be prepared to respond to accidents, should they occur. Routine maintenance is essential to minimize downtime—as is a backup plan for autoclave down time. The hospital’s physical layout (considering possible operating noise and odorous emissions) and staffing must be able to accommodate the operation. For hospitals willing to take on this responsibility, the payoff includes cost savings, reduced accident risk (by eliminating off-site transport of untreated regulated medical waste), and the ability to ensure direct compliance with all elements of the Medical Waste Management Plan. Off-site medical waste treatment passes some responsibilities to the municipality or the private sector (if involved in the future)—but at a price (about twice the cost of on-site treatment). The hospital has to count on the municipality (or private sector if involved) to ensure the hospital’s compliance with the Medical Waste Management Plan. Risks include accidents releasing the hospital’s regulated medical waste, possible service interruptions, and improperly treating wastes.

Therefore, the role of EQA is essential in monitoring of treatment held at landfills or incinerators off site by municipalities. If any hospital relying on off-site waste management services (outsourced to private sector), it should routinely audit its vendor to minimize these risks.

Two incinerators are available in Nablus and Jericho cities and were part of a Spanish donation to the Ministry of Local Government. However, the one in Jericho is out of order and the one in Nabulus is working with very low efficiency. It should be investigated if these incinerators can be maintained and put back into proper operation along with new installed treatment technologies.

• Engineered or sanitary landfill

Waste may be landfilled in municipal disposal sites if it cannot be treated before disposal. However, health-care waste should not be deposited or scattered on the surface of open dumps. If landfilling is planned, the following minimal requirements should be met:

  • measures established by a municipal authority for the rational and organized deposit of municipal wastes that could be used to dispose of health-care wastes;
• if possible, engineering work instigated by the municipal authority to prepare the disposal site to retain wastes more effectively;
• rapid burial of the health-care waste, so that human or animal contact is as limited as possible.

In addition, it is recommended that health-care waste is deposited in one of the following two ways:

• in a shallow hollow excavated in the mature municipal waste, in the layer below the base of the working face, where it is immediately covered by a 2-m layer of fresh municipal waste; scavenging in this part of the site must be prevented.
• in a deeper pit (1-2m) excavated in mature municipal waste (at least 3 months since being landfilled) which is then backfilled with the mature waste that was dug out; again, scavenging in this part of the site must be prevented.

Alternatively, a specially constructed small burial pit could be prepared to receive health-care waste only. The pit can be 2m deep and filled to a depth of 1m. Each load of waste should be covered with a soil layer 10-15cm deep. (Lime may be placed over the waste if coverage with soil is not possible.) In case of a disease outbreak involving especially virulent pathogens (such as the Ebola virus), both lime and soil cover may be added. Access to this area should be restricted and closely supervised by the responsible staff to prevent scavenging. An example of dedicated pit design is shown in Fig. 8.12 (page 109).

Before health-care wastes are sent for land disposal, it is prudent to inspect the proposed landfill site to ensure that there is satisfactory control of waste deposition.

Low temperature microwave was not chosen again because of the drawbacks of this technology mentioned in the short term options above.

Below Figure 2 shows the different types of waste and the different long and short term solutions discussed above.
Figure 2 Different types of waste and the different long and short term treatment solutions.

**Hospital care waste**

- **Sharps**
  - **Human anatomical waste**
    - **Safe burial on-site**
  - **Infectious waste**
    - **Highly infectious waste**
      - **Shredding and autoclave**
    - **Blood and body fluids**
      - **Landfill**
  - **Cytotoxic waste**
    - **Smaller volumes**
  - **Pharmaceutical waste**
  - **Other hazardous waste**
  - **Radioactive waste**

**Short term solution**

- **Bigger volumes**
  - **Encapsulation off-site**
  - **Special storage**

**Long term solution**

- **Sanitary landfill**
  - **Two chamber incinerator**
4. Reinforcement of legal framework and designation of responsibilities

4.1. Introduction
As discussed in Section 2.8 the legal framework and institutional capacity related to the management of healthcare waste is very weak in the WB/GS and therefore needs to be addressed if change is to take place. The following section identifies a number of strategic actions that should be taken in order to achieve these changes.

4.2. Legal Framework
There is no implemented legislation in the WB/GS that covers the management of HCW and therefore much work needs to be done to change this and to bring into force effective legislation. Legislation that is drafted should include the following aspects:

- Definitions of HCW (Annex 1 includes recommended definitions)
- A requirement for specific HCW management practices at all levels (i.e. from generation to final disposal)
- Clear delegation of responsibility for implementing different aspects of the law.
- Training requirements

Following the development of a clearly defined HCWM law the following should also be developed:

**Regulations:** Regulations should be drafted to implement the new HCWM law. These should include the development of draft standards and norms to facilitate the management of both solid and liquid HCW. Such regulations would cover:

- Rules for separation and identification of waste
- Rules for collection and transport of medical waste
- Rules for registration of waste
- Rules for treatment and disposal of waste
- Requirements for administrative and financial mechanisms

**Guidelines:** Guidelines to provide practical and technical advice for those who are required to implement the regulations should be drafted (Annex 1 includes an example of such guidelines for WB/GS).

**Permits:** As defined by the new legislation a system of permits for designated bodies for the collection, transport and final disposal of HCW should be introduced.

4.3. Designation of Responsibilities
Based on the new legislation that will be developed, responsibilities for all players involved in HCWM should be established. In this subsection main responsibilities are outlined at the national and local levels.
4.3.1. **Nationally**

The implementation of the medical waste master plan requires that all tasks and responsibilities be well defined between stakeholders and actors involved in the management of healthcare waste. With this in mind the following recommendations should be considered:

**Overall:**
Segregation and management of HCW inside HCFs will remain the responsibility of the HCF itself, under the supervision of the MoH. Once the HCW leaves the HCF, it will be the responsibility of the municipalities to collect and transport the HCW to its final destination. Disposal of HCW in landfill sites will be the responsibility of the municipalities. Treatment facilities (incinerators, autoclaves, etc) will be the responsibility of the operator in each case (could be a HCF under the supervision of MoH, could be a municipality). However, overall regulatory responsibility will lie with the EQA, with technical assistance from the MoH, where necessary.

**EQA:**
EQA will continue to have overall responsibility for the regulation of HCW according to the Law. This includes drafting, issuance and enforcement of laws, regulations, instructions and guidelines related to HCW. Effectively, EQA will be the overall regulator, in terms of the end results of HCW Management (clean streets, effectively managed landfill sites, properly functioning treatment centres, etc).

In order to perform this function, EQA will need technical advice and assistance from the Ministry of Health. We suggest that EQA establishes a **HCW unit**, which will be staffed by a Director and a small technical team. However, EQA will need technical assistance from MoH, and will need to coordinate with HCFs and other players. We suggest that the EQA establishes a **HCW Advisory Committee**, which will meet regularly and on request, to advise the HCW Unit. This committee should consist of representatives from all the key players, including MoH, HCFs, municipalities, MoLG, NGOs, etc. However, the committee is advisory, and the overall executive responsibility remains with the Director of the HCW Unit.

We are recommending that MoH retain their role of regulator of HCW practices within HCFs – see below. However, once the HCW leaves the HCF, responsibility for the overall supervision and monitoring lies with EQA. EQA should inspect the plans and procedures and equipment used by the municipalities to collect and transport the HCW to the various treatment or disposal locations, follow up on the final destination of the various categories of HCW, inspect the various storage, treatment or disposal facilities, and issue violation notices where necessary.

**MoH:**
As well as sitting on the **HCW Advisory Committee**, and providing technical advise to EQA on the drafting of laws, regulations and guidelines, (and on monitoring and inspection, where necessary), MoH should have a direct role in the regulation and monitoring of all aspects of HCW management inside HCFs, including the onsite storage and segregation of HCW. MoH should have the right to inspect HCFs for HCW issues, request HCW management plans, inspect staff qualifications, inspect segregation and storage procedures,
issue violation notices where required, and take remedial action in circumstances where the HCFs don’t perform properly. This derives from MoH’s existing role of regulation of other functions of HCFs.

**Municipalities:**
They will remain responsible for the collection, transportation, treatment and disposal of HCW. Where the private sector is invited to assist, the operational responsibility remains with the municipality. Once HCW leaves the HCFs, it is the role of the EQA to monitor and regulate the work of the municipalities, in terms of the end result.

**MoLG:**
Its role is to supporting municipalities in managing budgeting and finances.

---

**Figure 3 Roles and responsibilities between different stakeholders involved in the management of health care waste**

<table>
<thead>
<tr>
<th>Healthcare Waste Chain</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>REGULATION</strong></td>
</tr>
<tr>
<td>EQA</td>
</tr>
<tr>
<td>With assistance from MoH and HCW Advisory Committee</td>
</tr>
</tbody>
</table>

| **OPERATION** |
| Treatment options: Some will be operated by municipalities (ex. Landfills), others maybe by HCF (ex. Incinerators) |
| Low Temperature Autoclave |
| Needle Destruction |
| Encapsulation off site |
| Safe Burial on HCF |
| Premises |
| Two Chamber Incineration |
| Sanitary Landfill |

| **Municipalities** |
| Collection Transportation |

| **HCF** |
| Production, Segregation and Storage |
Below Table 7 shows proposed summary of different roles and responsibilities of different stakeholders involved in the management of MHCW.

<table>
<thead>
<tr>
<th>Responsibilities</th>
<th>Institutions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EQA</td>
</tr>
<tr>
<td><strong>Operational Issues</strong></td>
<td></td>
</tr>
<tr>
<td>HCF-Production of HCW, segregation and storage</td>
<td></td>
</tr>
<tr>
<td>Collection and transportation</td>
<td>√</td>
</tr>
<tr>
<td>Treatment (landfills and incinerators)</td>
<td>√</td>
</tr>
<tr>
<td><strong>Regulatory</strong></td>
<td></td>
</tr>
<tr>
<td>Legal framework</td>
<td>√</td>
</tr>
<tr>
<td>Monitoring of collection and transportation</td>
<td>√</td>
</tr>
<tr>
<td>Monitoring of treatment (at HCF and landfills)</td>
<td>√</td>
</tr>
</tbody>
</table>

√ = Main role  
∞ = Supporting role

4.3.2. Locally

On the local level, actors involved in the implementation of the Master Plan include healthcare facilities, collection agencies and treatment facilities. Tasks and responsibilities should be clearly defined at each level and a summary of these are included in the following section. In addition the guidelines that are included in Annex 1 expand on these main responsibilities by identifying roles and job specifications for a wide range of staff that should be involved to make a successful waste management team.

² Possible in the future
Healthcare Facilities

It is proposed that tasks and responsibilities for waste management in the HCF be organized into four levels:

- **Level 1**: The Head/Manager of Healthcare facility should have the responsibility for setting up a waste management team and to ensure that a waste management plan is written (and updated) for the HCF. They should ensure that the national guidelines are being followed and that training of staff with regards to HCWM is carried out.

- **Level 2**: Waste Management Officer (WMO) is to answer to the Manager of the HCF and should be responsible for the day to day managing and monitoring of the waste management system in the HCF. Tasks and responsibilities should include supervision and involvement of the waste management system that is set up, upgrading and maintaining procedures and work instructions, organizing training programmes for employees who have contact with HCW, incident management and control, registration of waste, inspection, monitoring and control, collection and transport of waste from the point of generation to the final storage location and stock control.

- **Level 3**: This level includes all staff that are in contact with HCW as part of their official role. This includes support staff, department heads, infection control, pharmacists, radiation officers, hospital engineers, matrons and nursing staff. All staff have a responsibility to a greater or lesser extent for collecting and transporting waste from the point of generation to the final storage location.

- **Level 4**: Department heads are to be responsible for ensuring effective communication between the Waste Management Officer (Level 2) and the departments.

Between all four levels and in each HFC the following roles are suggested:

- Head of Hospital (hospital manager)
- Waste Management Officer (if already designated)
- Heads of Hospital Departments
- Infection Control Officer
- Chief Pharmacist
- Radiation Officer
- Matron (or Senior Nursing Officer)
- Hospital Engineer
- Financial Controller
- Nursing Staff
- General Assistants and Ward Helpers

At the very least the key personnel who should be actively involved in HCWM include:
- Head of hospital
- Waste management officer
- Department heads
• Matron
• Nursing staff

Collection/transportation Agencies

In most cases this is likely to be a department within the Municipalities. However, for clarify they are referred to as collection/transportation agencies should be charged with the legal responsibility for collection and transport of HCW from healthcare facilities that meet the requirements established in the new HCW legislation and guidelines (The HCWM guidelines in Annex 1 includes an overview of collection and transport practices that should be followed). As with HCFs it is proposed that tasks and responsibilities for waste management in collection/transportation agencies should be organized into three levels:

**Level 1:** This is the senior management level and should be filled by the head of the HCW department within the collection/transportation agency. They should have responsibility for planning the activities and functioning of the collection/transportation agency. This person should act as a contact person between the HCFs and the agency and between the treatment facilities and the agency. In addition they should be in communication with EQA and MoLG.

**Level 2:** This level is for a waste coordinator. Tasks and responsibilities include assisting in the supervision and improvement of the waste collection system; upgrading and maintaining collection procedures and work instructions; organizing training programmes for waste collection employees; developing a route planner; administration and registration of waste; inspection, monitoring and control of the waste handling, collection and transport of HCW from the HCFs to the treatment sites. This person should be under the direct supervision of the senior manager at Level 1.

**Level 3:** This level is on the ground waste collection and will be filled by waste collection employees. They should be responsible for the transport and delivery of HCW from the medical facilities to the treatment facilities in accordance with the documented procedures and instructions.

Treatment Facilities

Again, it is likely that the treatment facilities will initially be owned and run by the Municipalities although in the future, they may be tendered out to the private sector. Full details of tasks and responsibilities should be developed based on the final selection of treatment technologies. However it is proposed that in general tasks and responsibilities should be split into three levels as set out below. It should be noted that, depending on the size of the facility and the HCW system a number of roles that are described at the various levels may be filled by one person:

**Level 1:** This is a senior management level and should be filled by the head of the treatment facility. Tasks should include overall management of the treatment site. They should act as the contact person between the treatment facility and the HCFs and/or the collection agencies and with any other bodies involved. They should plan training programmes for the
employees at the treatment plant and be responsible for following up on requests for resources for equipment and logistics.

*Level 2:* This level is for a waste coordinator and tasks and responsibilities should include assisting in the supervision and improvement of the waste treatment system; upgrading and maintaining treatment procedures and work instructions; facilitating training programmes for waste treatment employees; administration and registration of received and treated waste; inspection, monitoring and control of the handling and treatment of medical waste.

*Level 3:* This level is for the technical workers actually dealing with the treatment technologies. Staff working with the machines should do so in accordance with the documented procedures and instructions.
5. Reinforcement of HCW Management practices

This section discusses the need for each HCF to reinforce their HCW management practices which are currently very weak and in some instances non-existent. It should be a requirement on each HCF in WB/GS to develop a comprehensive healthcare waste management plan which will set out all management aspects. These should be approved by EQA.

5.1. Management Plans

Full details of the procedures that should be incorporated into the management plans are provided in Annex 1. However a brief summary is included in the sections below.

5.1.1. Management Plans for HCFs

The Waste Management Officer is to be responsible for writing the HCW Management Plan in which the following sections should be included:

- Legislative context
- Definitions/classification of waste
- Segregation requirements
- Collection requirements
- On-site transportation requirement
- Storage requirements
- Cleaning requirements
- Definition of roles and responsibilities within the HCF
- Training schedule/plan for the HCF
- Health and safety practices for workers
- Details of contingency plan for emergency situations

It is the overall responsibility of the Head of the HCF to ensure that they cover all aspects and that they are fully implemented.

5.1.2. Management Plan for Collection/Transportation Agencies (HCW Department within Municipalities)

Collection/transportation agencies should also be required to develop a comprehensive management plan for the role they play in the HCW management chain. This should be written by the senior manager of the HCW Department within the collection/transportation agency (Municipalities). The management plan should include the following:

- Legislative context
- Details of what type of waste bags will be collected
- Labeling specifications
- Consignment notes
- Training requirements and schedules
- Health and safety of workers
- Cleaning and maintenance requirements
• Contingency plan for emergencies
• Specifications for transportation equipment

5.1.3. **Management Plan for Treatment facilities**
The management plan for the treatment facilities will very much depend on the technology that is used at the site. However, in general their management plans should include the following:

• Legislative background
• Roles and responsibilities
• Treatment technology specifications
• Training requirements and schedules
• Cleaning and maintenance requirements

5.2. **Administrative Mechanisms**
In addition to the requirement of developing a HCW Management plan it is recommended that a regulatory framework is set up to follow a cradle to grave approach. The regulatory framework should include the following:

• Periodic employee medical checkups should be planned for by each actor in the HCWM chain (i.e. producers, collectors and treatment).

• Auditing of training at all levels of the HCWM chain should be carried out by the MoH inspection teams. Where in-house training is not available, resources from outside should be considered. However, it is anticipated that over time in-house capabilities will have developed to an adequate level.

• Routine inspection of the HCFs and collection/transport and treatment facilities should be carried out. Primarily this should be carried out locally by audit teams from within the facilities and nationally by the MoH inspection teams.

• At each point in the HCWM chain each actor should develop a corrective and preventative action system for their area of responsibilities which addresses potential problems and how attempts should be made to avoid these issues by undertaking preventative actions. This system should be administered by the various actors themselves.

• It is recommended that management review meetings are held to evaluate the state of the HCW Master Plan and to review problems that are arising during the implementation. These meetings should be administered locally by the various actors in the plan and nationally by the Healthcare Waste Review Committee.
5.3. Development of financial resources

There is a definite need to set up clear and realistic financial and economic instruments for the efficient and safe management of HCW in WB/GS. In order to achieve this, the following is recommended:

- A clear and realistic budget should be written for review by donors and for potential private sector involvement.

- A realistic fee for HCW collection should be introduced to allow cost recovery. These should be fed back into the devised budget rather than going into the general municipal budget which is what is happening now.

Currently collection fees for solid waste are collected by the municipalities. The continuation of this is dependent on whether the collection/transport agencies and treatment facilities remain in the hands of the municipalities or private sector investors. However, where it remains with the municipalities it is recommended that collection of fees stays the responsibility of the municipalities and should be based on the ‘polluter pays’ principal, i.e. the amount charged will be dependent on the volume of registered waste collected.
6. Set-up of awareness raising and training

6.1. Awareness Raising

In order for any progress to be made in the management of HCW in the WB/GS it is essential to ensure that all parties involved are kept fully aware of progress and developments that are taking place. Communication channels between those directly involved: HCFs, collection agencies and treatment facilities (the actors) and other stakeholders such as EQA, MoH and MoLG, etc. should be clearly defined to all and maintained. Awareness raising activities can be divided between national and local levels as set out below.

6.1.1. Nationally

The implementation of effective HCW management will be dependent on communication channels between the actors and stakeholders in HCWM being well defined and maintained. It is therefore recommended that the following should be considered:

- EQA should be the communication focal point between the various ministries involved in HCWM.
- It is recommended that EQA is copied into all communication between other ministries.
- It is recommended that a direct line of communication is established between the advisory HCW Review Committee and EQA.

6.1.2. Locally

On the local level it is important to keep clear communication channels open between the HCFs, the collection/transportation agencies and the treatment facilities (Municipalities) in addition to communication with EQA and other ministries. It is therefore recommended that the following should be considered:

- It is recommended that MoH inspection teams should communicate with the contact person that is identified in a HCF (Level 2: Waste Management Officer) whenever an environmental violation is observed. The inspection teams should, where necessary raise the subject of violation with the MoLG and EQA where necessary.
- Periodic communication should also be maintained between MoH inspection teams and the WMO in order to check up on general management within HCFs.
- It is recommended that direct and continuous communication between the Waste Management Officer in the HCFs and the collection agency should be established in order to solve minor problems that may arise during the waste collection activities. Where problems continue to persist, the MoH inspection team should be involved.
6.2. Training

It will be essential to train all persons who handle or have jobs relating to HCW. In-service education and training on the management of waste, e.g. identification, packaging, safe handling, containment, emergency procedures, storage and transportation of these materials should be provided to employees at all levels. Training can be divided into three main categories:

- Employees who have direct patient contact (medical doctors, nurses, and assistant nurses).
- Employees responsible for patient support services such as cleaning equipment and room and maintaining indirect service to patients (cleaners, porters, auxiliary staff and waste handlers).
- Employees who have no direct or indirect contact but need to be knowledgeable about waste management policies of the HCFs (HCF managers and administrative staff responsible for the implementation of regulations on health waste management) and at the national policy and management level (EQA, MoH, MoLG).

Training should be conducted on a regular basis; intervals between each course should be set according to new employees, expansion of responsibilities or changes in the health-care waste policy. The trainers can evaluate the participants understanding and based on that can judge if more training courses are needed.

**New Employees:**

All newly hired employees should receive basic waste handling as part of their orientation. New employees should also not work with hazardous or infectious waste until he/she has demonstrated an ability to carry such work out effectively.

**Existing Employees:**

All existing employees should receive annual on-the-job training on waste management procedures. All training is to be documented.

Annex 1 contains the HCW management guidelines which outlines in more details the training requirements for each level of employee.
7. Implementation Plan and Timeframe

7.1. Objectives of the Implementation Plan

The objective of the Implementation Plan is to set out the specific short and long term actions needed to accomplish the objectives of the Master Plan in achieving a sustainable HCWM in WB and GS.

This covers the implementation of institutional and regulatory supporting initiatives which are required as pre-requisites for successful and sustainable management of HCW.

The HCW Advisory Committee that will be formed to support EQA and provide advice to the HCW unit should supervise the overall implementation of the HCWM plan. The members should meet on a regular basis (a minimum every three months). As mentioned in section 4.3.1, this committee should consist of representatives from all the key players, including MoH, HCFs, municipalities, MoLG, NGOs, etc in order to obtain a broad consensus for the implementation of the HCWM plan. The involvement of Bilateral or Multilateral Agencies should also be sought to obtain, inter alia, a potential financial support for the implementation of the Plan.

A typical time frame for an implementation plan is around five-years. For each action, it is necessary to set-up indicators of achievement that will help the regular monitoring of the Plan.

The table below identifies institutional and regulatory actions, and short and long term actions that will build on the results of the institutional supporting initiatives to further promote and establish good management practices of HCW.

The implementation Plan is set out in components, specific actions, verifiable indicators, implementers, and implementation schedule. The costing of the different actions will be looked at in Task 6 The feasibility Study Report.

The schedule identifies which year (Y) and which months (M) the activity is to take place in. This time scale is a proposed one and may be amended by the stakeholders, where appropriate.
# To implement number of institutional and regulatory supporting initiatives (0-3 years)

To implement a number of institutional and regulatory supporting initiatives (IN5). These are to be carried out during 2006 – 2008 in order to build a solid foundation for HCWM in WB and GS.

<table>
<thead>
<tr>
<th>Component</th>
<th>Action</th>
<th>Output/verifiable indicators</th>
<th>Means of verification</th>
<th>Implementati on schedule</th>
<th>Implementers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Enforcement of new HCW law to cover medical HCW definitions, management requirements at all levels, clear delegation of responsibility for regulation, operation and monitoring, and training requirements. 1. List all health care waste activities at all levels 2. Develop a matrix to identify levels of responsibility for each activity that will fall on municipalities, regional authorities, private contractors and the MoLG and EQA. 3. Draft of new HCW law</td>
<td>HCW definitions, management requirements and clear delegation of responsibility included in new HCW legislation</td>
<td>Approval and adoption of new legislation by EQA</td>
<td>Y1, M1-6</td>
<td>EQA, MoH, MoLG, relevant experts</td>
</tr>
<tr>
<td>2.</td>
<td>Regulations to implement the new HCW law 1. Draft new regulations to implement the new HCW law to include: • Rules for separation and identification of waste • Rules for collection and transport of medical waste • Rules for treatment and disposal of waste • Requirements for administrative and financial mechanisms</td>
<td>HCW new regulations drafted</td>
<td>Approval and adoption of new regulations by EQA</td>
<td>Y1, M1-6</td>
<td>EQA, MoH, MoLG, relevant experts</td>
</tr>
<tr>
<td>3.</td>
<td>Develop guidelines to provide practical and technical advice to stakeholders involved in implementing above regulations 1. Identify compliance requirements (based on contracts and legislation) for HCW activities and prepare guidelines for EQA compliance monitoring for each of the HCW services. This should include, amongst others: • Collection • Treatment • Transport • Landfill site management</td>
<td>HCW guidelines drafted (Annex 1 included example of such guidelines)</td>
<td>Guidelines approved and adopted by EQA</td>
<td>Y1, M6-12</td>
<td>EQA, relevant experts</td>
</tr>
<tr>
<td>4.</td>
<td>Establish effective HCW unit at EQA which will hold and champion the changes in the HCW sector 1. Based on legislation, identify and specify scope of HCW unit within the EQA</td>
<td>HCW Unit scope of activity paper</td>
<td>HCW Unit scope of activity paper approved by EQA</td>
<td>Y1, M6-12</td>
<td>EQA</td>
</tr>
<tr>
<td>5.</td>
<td>Establish an Advisory Committee at EQA 1. Coordinate with stakeholders and establish HCW committee</td>
<td>Establishment of the committee with written scope of work</td>
<td>Approval of scope by EQA and other stakeholders</td>
<td>Y1, M6-12</td>
<td>MoH, HCFs, municipalities, MoLG, NGOs</td>
</tr>
<tr>
<td>6.</td>
<td>Recruit additional staff 1. Identify staffing needs based on new role of EQA</td>
<td>Staffing requirement list</td>
<td>Staffing requirement list approved by EQA</td>
<td>Y1, M8</td>
<td>EQA, municipalities</td>
</tr>
<tr>
<td></td>
<td>2. Develop detailed job descriptions for all levels</td>
<td>Job descriptions for all identified staff positions</td>
<td>Job descriptions approved by EQA</td>
<td>Y1, M8</td>
<td>EQA, municipalities</td>
</tr>
<tr>
<td></td>
<td>3. Advertise for job positions</td>
<td>Job advertisements</td>
<td>Job advertisements published</td>
<td>Y1, M9</td>
<td>EQA, municipalities</td>
</tr>
<tr>
<td></td>
<td>4. Conduct interviews for each post</td>
<td>Interviews conducted as planned</td>
<td>Interview records</td>
<td>Y1, M10</td>
<td>EQA, municipalities</td>
</tr>
<tr>
<td></td>
<td>5. Select new staff</td>
<td>New staff selected and hire</td>
<td>Employment contracts</td>
<td>Y1, M11-12</td>
<td>EQA, municipalities</td>
</tr>
<tr>
<td>7.</td>
<td>Provide training to all staff to meet new expectations and responsibilities 1. Carry out a training needs assessment</td>
<td>Training need assessment paper</td>
<td>Training need assessment paper approved by EQA</td>
<td>Y2, M1-6</td>
<td>EQA relevant experts, municipalities,</td>
</tr>
<tr>
<td></td>
<td>2. Develop objectives oriented training programmes and training material for each level of employee</td>
<td>Training programme and training material</td>
<td>Training programme and training material approved by</td>
<td>Y2, M6-8</td>
<td>EQA relevant experts, municipalities,</td>
</tr>
<tr>
<td></td>
<td>3. Organise and conduct training courses</td>
<td>Training course held as planned</td>
<td>Training course attendance forms</td>
<td>Y2, M8-11</td>
<td>EQA relevant experts, municipalities,</td>
</tr>
<tr>
<td></td>
<td>4. Evaluate training and determine additional training needs</td>
<td>Training course evaluated through evaluation forms</td>
<td>Training course evaluation forms</td>
<td>Y2, M11-12</td>
<td>EQA relevant experts, municipalities,</td>
</tr>
</tbody>
</table>
### To implement number of Short Term Actions (0-2 years): To implement a number of short term actions to be carried out during 2006 – 2007

<table>
<thead>
<tr>
<th>Component</th>
<th>Actions</th>
<th>Output/verifiable indicators</th>
<th>Means of verification</th>
<th>Implementatio n schedule</th>
<th>Implementers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Two incinerators in Nablus and Jericho fixed and in operation</td>
<td>1. Perform needed maintenance for the two incinerators</td>
<td>Incinerators are back in operation</td>
<td>HCW treated in incinerators</td>
<td>Y1, M1-2</td>
<td>EQA, MoLG in conjunction with municipalities</td>
</tr>
<tr>
<td>2. HCFs improve separation and segregation of HCW according to the national guidelines</td>
<td>1. Training of all relevant employees dealing with HCW. Conducting of training workshops</td>
<td>Training certificates for trainees</td>
<td>Adoption of the HCW guidelines at HCFs</td>
<td>Y1, M2-4</td>
<td>HCF, EQA, MoLG</td>
</tr>
<tr>
<td>3. Purchase of special vehicles for transportation of HCW</td>
<td>1. Conduct a needs assessment for the number of needed special vehicles for the transportation of the segregated HCW with estimated price and needed drivers.</td>
<td>List of needed new vehicles with cost estimation</td>
<td>Adoption of the HCW guidelines at HCFs</td>
<td>Y1, M4-8</td>
<td>HCF, EQA, MoH, relevant experts</td>
</tr>
<tr>
<td>4. Purchase and use of new short term treatment technologies</td>
<td>1. Purchase and/or implementation of the new short term treatment technologies and distributing them according to need and geographic areas. • Low temperature autoclave • Needle destruction • Encapsulation off site • Safe burial on HCF premises</td>
<td>HCW treated with above technologies after segregation</td>
<td>Operation of new purchased equipment</td>
<td>Y2, M1-12</td>
<td>EQA, HCFs, MoH</td>
</tr>
</tbody>
</table>

### To implement number of Long Term Actions (3 years): To implement a number of long term actions to be carried out during 2008 – 2010

<table>
<thead>
<tr>
<th>Component</th>
<th>Actions</th>
<th>Output/verifiable indicators</th>
<th>Means of verification</th>
<th>Implementatio n schedule</th>
<th>Implementers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Purchase and use of new short term treatment technologies</td>
<td>1. Purchase and/or implementation of the new long term treatment technologies and distributing them according to need and geographic areas. • Low temperature autoclave • Needle destruction • Two chamber incineration • Engineered of sanitary landfill</td>
<td>HCW treated with above technologies after segregation</td>
<td>Operation of new purchased equipment</td>
<td>Y3-5</td>
<td>EQA, HCFs, MoH</td>
</tr>
<tr>
<td>2. Installation of above technologies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Training of staff on operation and maintenance of above technologies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Operation of treatment technologies</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Annex 1 Guidelines for HCWM