



WHO-CEHA/GAVI

Project for Development of a  
National Health Care Waste Management  
Implementation Plan of Pakistan

Government of Pakistan

Federal Ministry of Health



In Collaboration with Health Services Academy (HSA), Ministry of Health  
Islamabad, Pakistan  
and Centre for Environmental Health Activities (CEHA),  
World Health Organization  
Amman, Jordan

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## Summary

It is our immense pleasure and an honor to perform this national duty in order to serve the people of Islamic Republic of Pakistan. This plan is based on the results of the extensive survey done in all provinces of Pakistan and on extensive expert consultations from all over Pakistan through departmental representation of both public and private sectors. The Plan deals with the current scenario of the hospital waste handling in both Government and private sector and it proposes to establish Central Hospital Treatment Facility for major hospitals in the provincial capitals and districts of Pakistan. The plan includes extensive training of the health care functionaries to sensitize them about the proper handling of the Hospital waste. The plan not only provides management of Hospital waste in teaching hospitals in the Government sector but also involves large hospitals in the private sector. This plan is to be implemented for the period of 2008-2010 in Pakistan. We hope and pray that it may achieve its desired target and objectives and pose a significant impact in terms of cutting down on the burden of disease due to partial or non-management of Health Care Waste in the country. This plan has also become unique in the EMRO region in the sense that it recommends subsidized provision of safe syringes by the government in order to curb the menace of resale of unsafe and used syringes.

I thank all the team /project steering committee members for their personal interest and professionalism in deliberation and inputs in bringing this document on the table of decision makers and implementers. Nonetheless, our special thanks to WHO/CEHA, Mr. Raki Zghondi (UHE), Regional Advisor, WHO Pakistan and Federal Ministry of Health, for giving us a great opportunity to do service to the nation through this National Action Plan.

Please feel free to send your feed back to Environmental Health Unit, Health Services Academy, Ministry of Health.

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## **ABBREVIATIONS AND ACRONYMS**

AIDS	Acquired Immuno Deficiency Syndrome
CBO	Community Based Organization
CEHA.....	Center for Environmental Health Activities
DHIS	District Health Information System
EPI	Expanded Programme on Immunization
GAVI	Global Alliance for Vaccines and Immunization
HepB	Hepatitis B
HepC	Hepatitis C
HCFs.....	Health Care Facilities
HCW	Health Care Waste
HCWM	Health Care Waste Management
HCWMO.....	Health Care Waste Management Officer
HIV	Human Immunodeficiency Virus
HSA.....	Health Services Academy
ICC.....	Infection Control Committee
KAP	Knowledge Attitude and Practice
LG	Local Government
MOH	Ministry of Health
MoE	Ministry of Environmental
NGO	Non-Governmental Organization
NWFP.....	North West Frontier Province
Pak EPA.....	Pakistan Environment Protection Agency
PHC.....	Primary Health Care
POA	Plan of Action
STC	Short Term Consultant
STI	Sexually Transmitted Infections
TST	Time, Steam, Temperature (Indicator device for sterilization cycles)
SIGN	Safe Injection Global Network
WHO	World Health Organization

## INTRODUCTION

The Federal Government of Islamic Republic of Pakistan has undertaken an initiative to implement a National Action Plan for Health Care Waste Management in order to protect the health of the people by preventing them from the diseases spread as by-product of the health care they received within and outside the health care establishments.

The project has conducted a nation-wide survey on the subject and analyzed scenario of health care waste management right from major tertiary hospitals to the first-level health care facilities. This also catered the private sector. The Hospital Waste Management Rules of 2005 and Waste Management Guidelines is the legal framework already in place to facilitate the implementation process.

Under the health care waste management plan Govt. of Pakistan proposes to institutionalize a Health care Waste Management System for the whole healthcare system in the country. As per the bio medical waste handling rules a proper system of segregation, storage, transportation and end disposal has been proposed to be implemented in all institutions, from tertiary level to the primary level. The plan proposes to dispose health care waste by minimum incineration and integrating safe alternatives like secured landfill, shredding, autoclaving, etc. The plan initially proposes to establish central hospital treatment facility as PILOT PROJECTS in four provincial capitals followed by improved replicated projects in each district through district governments to cover all private and government hospitals. The plan would be implemented with the active participation of NGOs, private health care providers Pakistan Medical Association (PMA) and CCBs (City Community Boards).

The overall aim of the plan is to improve the health care waste management system in the health sector, both public and private, in Pakistan and thus to decrease the burden of infectious disease through an integrated implementation. The specific objectives being to (1) identify and empower the already existing legal and regulatory framework (2) rationalize the HCWM

practices within the health care facilities of the country (3) recommend development of specific resources dedicated to HCWM (4) launch capacity building and training measures (5) set-up a monitoring plan (6) reduce the pollution associated with HCWM

A major component of the plan is professional training of all the stakeholders to ensure the understanding of proper disposal of health care waste, safety of the health personnel and people. A sustainable model has been proposed for the health institutions including a stringent system of monitoring and supervision right from the provincial level up to the hospitals. This also includes information on health care waste management system in the hospitals within the District Health Information System. The plan aims to generate a massive awareness in the community about the need for the safe disposal of bio medical waste.

According to United Nation's statistics, hospitals in Pakistan generate 250,000 a tonne of waste annually of which, 15 tonnes of waste is produced daily in the Punjab<sup>1</sup>. A study conducted by a non-governmental organization reveals that 80,000 tonnes of solid waste is produced daily in the country. The hospital waste component is just 15 to 20 per cent, but when the hospital waste is thrown or dumped with the municipal waste, it contaminates the entire lot. Studies in Pakistan show that around 2.0 kg of waste/bed/day is produced out of which 0.1-0.5 can be categorized as risk waste<sup>2</sup>.

The toxic waste generated by hospitals includes used syringes, bandages, glucose bottles, blood bags and other medical instruments. On the one hand, this hospital waste spread diseases and on the other, it also becomes the target of scavengers who collect used syringes which are recycled and re-sold in the market. These recycled syringes also carry all kinds of infections, bacteria and

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<sup>1</sup> Hospital Waste Fact Sheet by WWF.

<sup>2</sup> Iliyas M, Editor, Community medicine and public health. 4th ed. Karachi: Time Publishers, 2003.

viruses. According to an estimate by a government agency, about 50 per cent of the syringes sold in the market are recycled.

There are several methods to properly dispose off the hospital waste. In Pakistan pre-dominant method of choice is incineration. At certain level, crude landfill method is applied, but according to health experts not a single landfill is constructed on scientific lines. Incinerators installed at various places also do not have proper filters and scrubbers and when hospital waste is burnt, toxic gases like dioxin, furans and chemicals are discharged in the air which are carcinogenic. Only a few hospitals have proper incinerators. Health experts recommend that the hospital waste should be segregated from the solid waste and stored in special containers. Proper landfills should be constructed and all incinerators should use / install filters and scrubbers and follow incinerator guidelines based on good management practices in conformity with safe international standards.

## CURRENT HCW MANAGEMENT SITUATION

According to the survey conducted, in both public & private health sector, prior to put National Action Plan (NAP) in black & white, currently, in all the four provinces (Punjab, NWFP, Sindh and Balochistan, and AJ&K (Azad Jammu & Kashmir), majority of the hospitals at all three tiers of health care delivery didn't have either a HCWM Team or Infection Control Team. The already notified Hospital Waste Management Rules (2005) were not enforced in majority of hospitals or they were not having proper health care waste management guidelines established at the facilities. Consequently, they were not having any plan for management of health care waste as well. Most of the time plastic boxes were being used for the disposal of the sharps and for the labs highly infectious waste was not being separated among most of them. For segregated waste, where existed, either plastic containers or dustbins were being used. Within wards of the hospitals, in the most instances, the general and hazardous waste were kept together at temporary storage areas. The central storage facility was not refrigerated. At most of the times, on-site treatment was not available. Where it was available it was either improper incineration or open burning of the waste. Chemical disinfection was almost non-existent. For off-site transport, open (mostly) municipality vehicles were being used. As part of the final disposal option, the HCW bags were either buried along with the municipal waste or thrown away over the municipal waste dumps. Some times they were burnt as well and that burning was usually open burning. Almost all of the facilities didn't keep the record of the waste disposal. Local HCWM plan was non-existent, with the exception of a few places. No proper inspection system for HCWM was found in the hospitals. No Separate fixed budget for HCWM was allocated and neither the operational cost was being taken care off. .

Of the total waste generated, it is estimated that approximately 10% is hazardous, 85% is general (non risk) waste while a small percentage (5%) is labeled as highly hazardous. Currently, most of the hospital biomedical waste is

being disposed off, without treatment along with municipal solid waste and by burning. The untreated liquid waste from the health institutions is being let into general drainage.

The status of poor waste management currently practiced in the state poses a huge risk towards the health of the general people, patients, and professionals, directly and indirectly through environmental degradation. Communicable diseases like gastro-enteritis, hepatitis – A, B and C, respiratory infections and skin diseases are associated with hospital waste either directly as a result of waste sharp injuries or through other transmission channels. The hosts of micro organisms responsible for infection are entero-cocci, non-haemolytic streptococci, anaerobic cocci, clostridium tetani, klebsheilla, HIV and HBV.

The potential risk to health care workers comes from the handling of infected sharps; 60 percent of them sustain an injury from sharps knowingly or unknowingly during various procedures. The practice of re-sheathing the needle after use is the major factor for needle stick injuries. Through poor waste management practices, all health care workers (nurses, doctors, lab technicians), service personnel, rag pickers and the general public are at risk of contracting infections while handling, storage, and treatment. Incinerators, wherever installed, according to Pak EPA, are operating at sub-optimal conditions are an added environmental and health hazard.

## **ACTION PLAN COMPONENTS**

### **Implementation Strategy for the HCWM Plan**

#### **1) Decentralized decision making and PPP networking (During Pilot & Replication phase at Provincial & District level)**

The health care waste management would be a major area for public private partnership, unless the district level authorities are involved in the plan with a sense of ownership and belonging, the programme would not yield desired results. In order to ensure better implementation a lot of flexibility is to be provided so that the district programme managers could implement the programme suiting the local requirements. The programme is proposed to be implemented with the active participation of Pakistan Medical Association (PMA), district level government authorities, local bodies, NGOs and private health care providers. It is proposed that for each district, the district collector would provide the necessary guidance and support as well as would be responsible for bringing an effective coordination between various players. Each district Society (CCBs) would provide a central hospital platform for both government and private health institutions for proper implementation of biomedical waste management rules.

The district Society would purchase one or two vehicles depending upon the number of beds available in both public and private sector institutions, as well as the size of the district. These vehicles are to be utilized for collecting the biomedical waste from the health institutions. The district Society would also provide a central hospital treatment facility i.e. land, equipment and necessary infrastructure for safe disposal of biomedical waste as per the rules. These central hospital facilities will be utilized both by the private and the government health institutions.

The District level Monitoring society would meet once a month and sort out any operational issues. This arrangement would ensure active participation of all the players and would help to evolve an effective public private partnership. This model is a self-sustaining model as there is too little dependence on government financing and support. It would ensure the running of waste management facility without any disruption even after the project period is over.

Procurement of HCWM materials for each facility is by the project. For the CHTFs One time procurement of the equipments and vehicles will be by the project and later by the partner who is maintaining the CHTF.

Until the establishment of CHTFs, the training and awareness would go on.

#### **E. Involvement of NGOs**

The NGOs will be given training for hospital waste management to enable them to spread awareness about the risks involved in the disposal of hospital waste among the patients, people, rag pickers etc. and also to impart knowledge about the precautionary measures against the risks associated. It is also proposed to utilize the services of NGOs in highlighting community's role in biomedical waste management.

The NGOs would play a crucial role in providing training to the health care providers about the proper system of biomedical waste. Several aspects of training like classification of biomedical waste, colour coding, treatment of hazardous and non hazardous waste etc. would be included in the training programme by the NGOs. NGOs have also been included as members at the state and district level society to advice and assist the government in the health care waste management plan. The NGOs would be encouraged to work as watchdogs and whistle blowers in the entire health care waste management activity.

#### **3) IEC-Activities**

Awareness to be created among the community and Private health providers by the NGOs about the Health Care Waste Management, method of collection , storage, transportation disposal, and the end treatment at the CHTF. Health personal &paramedical workers should be sensitized in segregation and safe disposal of Health Care Waste, risks in HCWM, etc. The IEC activities will be given through mass media, and also the methods as suggested by the consultant of BCC. Various workshops have been planned during which time sensitization will be done

#### **4) Capacity building for Health Care Waste Management**

Training and sensitization of various functionaries in the health care systems as well as outside the health care systems is vital for the successful implementation of hospital waste management plan in the province. The training will focus on simple principles of waste management; employee's responsibility; employer's role in waste management programme; and standard operative procedures for waste management. Regular programmes will be conducted for training of all hospital personnel including the senior medical officers.

#### **Training Plan**

The Project Management Unit will identify suitable Public Sector Public Health School, a public sector training sector or NGO/Training institute for conducting various training programmes for strengthening hospital waste management in the province. For the NGO, it should have been certified by GOP / EPA to have the requisite professional qualification for under taking the training programmes in health care waste management (if applicable, i.e. if no NGO is found eligible for imparting trainings then EHU or Center of Excellence will also do the trainings). The organization (public, private NGO), as a general, should have experience in training health professionals in this field. They should have well trained staff in sufficient numbers and required management expertise to organize and carry out the training. The training of **trainers (TOT)** will be organized by concerned health authorities (Center of Excellence in HCWM) in the identified training institute. At least two medical officers from each district will be selected for training of

trainers. These medical officers will act as facilitators for the training to others at the facility level in the district.

Staff education programmes will include

- a) information on, and justification for, all aspects of hospital waste management policy;
- b) information on the role and responsibilities of each hospital staff members in implementing the policy and the Rules; and
- c) Technical instructions, relevant for the target group, on the application of waste management practices.

The state level officials will be given training in the policy framework, planning and legal aspects. The provincial level officials will also be trained in implementing and monitoring the hospital waste management at the provincial level. The district level officials will be trained in implementing the hospital waste management at the district level. The medical officers at the facility level will be trained in planning, implementing and monitoring the hospital waste management plan at the facility level.

The training for nursing, Para-medical staff, laboratory technicians will be conducted at the district hospitals and by NGO. For the ward boys, sanitary workers at the municipality and the class IV employees the training will be conducted at the hospital site.

The training programme will be carried out through out the province during the first & second year of the project .Suitable retraining and refresher training will be planned during the fourth and fifth year of the project to sustain the momentum  
The implementation schedule is hereby given on the nest page.

## **Objectives of the National Plan on Health Care Waste Management**

The following are the general objectives of the national plan of HCWM:

- a) Establishing standardized, routine and homogenized management procedures in all the HCFs in the country
- b) Identifying hazardous HCW streams inside and outside HCFs
- c) Implement a tracking system that enables to monitor and control hazardous HCW production and management in HCFs.
- d) Reducing occupational risk and control nosocomial infections as well as protect environment.
- e) Enabling to treat the waste at a reasonable cost and reducing environmental pollution.

The specific objectives, over which the action plan has been elaborated, are:

- 1) Develop the legal and regulatory frameworks for HCWM
- 2) Rationalize the HCWM practices within the HCFs of the country
- 3) Develop specific financial resources dedicated to HCWM
- 4) Launch capacity –building and training measures
- 5) Set-up a monitoring plan
- 6) Reduce the pollution associated with HCWM

The rest of the document discusses and proposes the log frames in terms of the action plans for each of the specific objectives.

## Health sector's Present Situation

Pakistan at the time of independence inherited a weak health system comprising of only 78 doctors and one medical college with wide spread communicable diseases. In the first 25-30 years , health received quite a priority and by 1998, 830 hospitals with 86, 921 beds, about 90,000 doctors and 7,000 PHC units were established (*Pakistan Health and Population Welfare Facility Atlas 2002/2003*). This by 2001-02, the total number of health facilities reached to a number of 12,000 with 92,000 doctors and 28900 nurses. Similarly, by 2001, toatal number of hospitals became 907, MCHs 879, RHCs 542, BHUs 5230 with total bed strength of 97945 and population per bed became 1490.

At present. Pakistan has a well laid out health infrastructure both in the urban as well as in rural areas. The health infrastructure in public sector in Pakistan is as given below:

**Table 1: Health Infrastructure in Public Sector**

<b>Health Facilities</b>	<b>Number</b>
Medical Colleges	32
Hospitals	919
Dispensaries	4,632
Basic Health Units and Sub Health Centers	5,334
Maternity and Child Health Centers	907
Rural Health Centers	556
TB Centers	289
Beds in hospitals and dispensaries	101,490
Registered doctors	117,905*
Registered dentists	6,732*
Registered Lady Health Visitors (LHVs)	7,073*

<b>Health Facilities</b>	<b>Number</b>
Registered Midwives	23,897*
Registered nurses	51,270
<b>Population Per</b>	
Hospital bed	1,516*
Doctors	1,305
Nurses	22,869*

\*Dynamic (up to 2005-06)

In addition to above, Pakistan also has a number of maternity homes, dispensaries and health posts run by private and public-private sectors and the waste generated per bed per day is approximately 1 to 1.5 kgs (152235 Kgs in total/day).

The existing nature of biomedical waste generated by these hospitals is as follows:

- Human tissue, Organs, body parts and placenta etc from OT, Pathological waste, Animal waste, Soiled Waste and Microbiology and Biotechnology Waste.
- Cotton, gauze dressings, POP's soiled with blood, pus and other human discharges.
- All types of plastic i.e. plastic syringes, I.V. lines, I.V. bottles, bags.
- Discarded medicines and Cytotoxic drugs, and solid chemical waste.
- Soiled linen of patients from isolation wards, intensive care units, wards, OT and labour rooms.
- Left over food in patients and visitors plates, fruits waste
- Unsoiled dressings, gauze, cotton and Stationary.
- Needles, blades and Vials.
- Broken glass, bottles, tubes, Vials, Petri dishes.
- Microbiological and other pathological waste
- Liquid waste from wards, Department and autopsy room.

- Silver nitrate from Radiology department.
- Mercury waste: Broken thermometers and sphygmomanometer
- Blood bank waste: Discarded expired infected blood or its products.
- Placenta, waste from OT , Soiled Waste and Microbiology waste
- Cotton, gauze dressings soiled with blood, pus and other human discharges.
- All types of plastic i.e. plastic syringes, I.V. lines, I.V. bottles, bags.
- Discarded medicines and solid chemical waste.
- Soiled linen of patients wards, OT and labour rooms.
- Left over food in patients and visitors plates, fruits waste,
- unsoiled dressings, gauze cotton and stationary.
- Needles, blades, broken glass, bottles, tubes and Vials.
- Liquid waste from wards
- Silver nitrate – X-ray department.

The nature of health institutions in private sector varies widely. The private sector institutions are generally nursing homes, clinics, dispensaries etc. Private sector has also established a large number of laboratories and blood banks. In urban areas especially in Municipal Corporation, private sector has also established huge corporate hospitals. The nature of waste generated in these institutions is according to the type of the institutions. The data about various types of institutions is currently not available. Other than few corporate hospitals most of the private sector hospitals, dispensaries and clinics do not have proper health care waste management system.

### **Current Status of Establishment of CHTF**

It is recommended that GOP should establish Central hospital Treatment Facilities in provincial capitals as pilot projects and through action research, these may be replicated in districts through District governments.

### **Current Legislative Frame work**

The Government of Pakistan's Hospital Waste (Handling and Management) Rules, 2005 are now in place and needs enforcement through MoE. The Rules, besides identifying the waste categories, also specify the possible treatment and disposal methods in addition to the standards laid down for the same.

The EPA is the enforcement authority which monitors and supervises the implementation of the Biomedical waste Management Rules.

### **Health care Waste Management Action Plan**

The Ministry of Health, Government of Pakistan has developed a Health care Waste Management plan of action for the safe disposal of the biomedical waste in accordance with the guidelines of the MoE, Government of Pakistan. Government has decided to work out a plan for setting up large central hospital treatment facilities for provincial capitals for collection, treatment, storage and safe disposal of the biomedical waste. At the CHTFs, limited incineration, shredding and deep burial method would be followed. District Collectors or central teaching hospitals would provide land for establishing CHTF. The proposed hospital waste management plan is consistent with the Hospital Waste Management Rules, 2005, Ministry of Environment, Islamabad.

### **Minimum incineration is proposed for the management and disposal of the hospital waste.**

Hospital Waste disposal is a multifaceted activity in which different stages as given below are highly interdependent both technically as well as organizationally. The key steps to ensure safe management of biomedical waste from cradle to grave are as follows;

1. Generation
2. Segregation
3. Collection within the hospital
4. Treatment within the hospital

5. Storage
6. Transportation
7. Measurement and Monitoring
8. End treatment
9. Disposal

### **Proposed functioning of the Health care waste management system:**

Central hospital in a provincial capital will engage private NGO / reputable firm to ensure transportation of segregated waste from other private and public hospitals. All hospitals will follow Hospital Waste Management Rules, 2005 and Ministry of Environment guide lines. Each hospital will collect their waste from various collection spots (Departments) according to the categorization and will store them in the storage rooms in their premises. Vehicles arranged for collection of the waste will collect the wastes from the hospital to the Central hospital Treatment Facility once in two days. Numbers of vehicles are allotted according to the number of beds in each provincial capital. This system will act as Pilot model in four provinces. Same will be replicated in other districts at a later stage.

### **Method of Health Care Waste collection, treatment and final disposal at CHTF.**

1. Human tissue body parts & placenta collected form OT, labour rooms & wards are segregated and collected in yellow plastic bags kept in yellow buckets. This is disposed off by incineration in the central hospital treatment facility.
2. Cotton, gauze dressing, POP's soiled with blood, pus and other human discharges. Unsoiled dressing, gauze and cotton collected from all the wards, OT, Labour room, Lab, ICU, isolation wards are collected in the red drums. At the CHTF after auto claving deep burial /secure land fill is done. All types of plastics like plastic syringes, IV bottles, plastic bags, IV lines are collected in red drum treated in the hospitals by hypo-chlorite solution for 30 minutes and transported to the CHTF. At the CHTF, auto clave / shredding will be done except the plastic bags followed by secured land fill. For plastic bags recycling method will be followed.
3. Discarded medicines cyto toxic drugs and heavy chemicals collected from the stores are sent to the CHTF for secured land filling.

4. Solid linen of patients from all the wards are treated with 1% hypo chlorite solution for 30 minutes and washed in laundry and reused after wash.
5. Left over foods in patient's plates, fruit waste collected from all wards in green buckets and send to municipal land fill.
6. a. Needles, blades and vials collected from all wards are mutilated by needle destroyer\needle cutter and then put into sharp container with 1 % hypochlorite solution and after auto claving encapsulation is done at CHTF.  
b. Broken glasses, bottles, tubes, vials /Petri dishes from all the wards are collected in yellow bags treated by 1 % hypochlorite solution and after auto claving sold to vendors for recycling at CHTF.
7. Toxic drugs and expired drugs from medical stores from all departments are collected in the yellow bags and disposed at central hospital treated facility by secured land filling.
8. Micro biology and other pathological wastes collected from wards in red buckets treated with 5% hypo chlorite solution for 30 minutes and discarded into the drainage.
9. Liquid wastes from wards, departments and autopsy from all wards in red buckets treated with 5% hypo chlorite solution for 30 minutes and discarded into the drainage.
10. Nuclear waste is segregated as per PNRA provision
11. Silver nitrate from X- ray department is collected in plastic container segregated and disposed at CHTF by secured landfill after recovery of silver.
12. Broken thermometers and sphygmomanometers are collected in glasses containing water and disposed off at CHTF by encapsulation.
13. Chemicals used in disinfection are treated with 5% hypo chlorite solution for 30 minutes and discarded into the drainage.
14. Heavy chemicals containers, aero containers collected from OT, surgical and other departments are treated with 5% hypo chlorite solution and mutilated in shredder at CHTF and sold to vendor.

15. Discarded and expired infected blood or its products collected from blood banks in red buckets and treated with 5% hypo chlorite solution for 30 minutes and liquid is discarded into the main drainage.

**A detailed table giving the type of waste, location, colour coding, in situ treatment, transportation, end treatment and disposal is given below:**

**Table 2: Type of waste, location, colour coding, in situ treatment, transportation, end treatment and disposal**

S. No.	Type of Waste	Location	Segregation	Institution Treatment	Storage	Transportation	End Treatment at CHTF	Final Disposal
								At the Central hospital treatment facility
1	Human tissue, body parts and placenta	OT, Labour room, Wards	To be collected in yellow bags kept in yellow buckets	-	Storage site	Transported by waste collection covered vehicle	---	Incineration
2	Cotton, gauze dressing, Pop's soiled with blood, pus and other human discharges. Unsoiled dressing, gauze and cotton	All wards, OT, Labour rooms, Lab, ICU, Acute wards, Isolation wards	Red bucket lined with red plastic liners stored in red drums with plastic liners	-	Storage site	Transported by waste collection covered vehicle	Autoclave	Deep burial/ Secure landfill
	<b>All types of plastics i.e. plastic syringes, I.V. lines, I.V. bottles, bags</b>	All wards and departments	Red buckets stored in Red drum lined with Red plastic liner	5% Hypo chlorite solution for 30 minutes	Storage site	Transported by waste collection vehicle	Autoclave and shredding	secure landfill & Bags disposed by Recycling

S. No.	Type of Waste	Location	Segregation	Institution Treatment	Storage	Transportation	End Treatment at CHTF	Final Disposal
								At the Central hospital treatment facility
3.	Discarded medicines and Cytotoxic drugs and heavy chemicals	Stores	Red bucket lined with Red plastic liners, stored in Red drums with plastic liners	-	Storage site	Sent waste collection covered vehicle	No treatment required	Secured landfill
4.	Soiled linen of patients	OT, Labour room, ICU, Isolation ward, Acute wards	White drum with 1% Hypo chlorite solution	1% Hypochlorite solution for 30 minutes	--	Laundry vehicle	Washed in laundry	Reused after wash
5.	Left over food in patients plates, fruit waste,	All wards and departments	Green bucket lined with green plastic liners, stored in green drums with plastic liners	-	---	Transported by vehicle	No treatment is required	Municipal landfill

S. No.	Type of Waste	Location	Segregation	Institution Treatment	Storage	Transportation	End Treatment at CHTF	Final Disposal
								At the Central hospital treatment facility
6.	Needles, blades and Vials	All wards departments All wards departments	Disposal by needle destroyer then put in sharps container with hypochlorite solution 1%	1% hypochlorite for 30 minutes	Storage site	Transported by vehicle	Autoclave	Encapsulation
	Broken glass, bottles, tubes, Vials, Petri dishes	All wards departments All wards departments	Put in yellow bag/jar with hypochlorite solution 1%	1% hypochlorite for 30 minutes	Storage site	Transported by vehicle	Autoclave	Sold to vendor for recycling
7.	Toxic drugs and expired drugs	Kept at medical stores after collection from department	Kept in secured box in medical stores, then put in yellow bags	-	Storage site	Transported by vehicle	No treatment required	Secure land filling

S. No.	Type of Waste	Location	Segregation	Institution Treatment	Storage	Transportation	End Treatment at CHTF	Final Disposal
								At the Central hospital treatment facility
8.	Microbiology and other pathological waste	Labs	Red bucket	5% Hypochlorite solution for 30 minutes & discarded in drainage	--	--	-	-
9	Liquid waste from wards, Department and autopsy room	All wards/ Autopsy rooms	-	5% Hypochlorite for 30 minutes & discarded in drainage	-	--	-	-
10	Nuclear waste	-	As per BARC Provision	-	---	-	-	-
11	Silver nitrate from X-Ray epts..	X-Ray epts..	Plastic containers	-	Storage site	Transported by vehicle	-	SLF after recovery of silver

S. No.	Type of Waste	Location	Segregation	Institution Treatment	Storage	Transportation	End Treatment at CHTF	Final Disposal
								At the Central hospital treatment facility
12	Broken thermometers and sphygmomanometer	All wards/ Departments	Glass bottle with water	-	Storage site	Transported by vehicle	-	Encapsulation
13	Chemicals used in disinfection	All wards and departments	-	5% Hypo chlorite for 30 minutes & discarded in drainage	-	-	-	-
14	Heavy chemicals containers/ aerosol containers	OT, Surgery Depts., other Depts.	Collection point	5% Hypo Chlorite for 30 minutes	Storage site	Transported by vehicle	Mutilated in shredder	Sold to Vendor

S. No.	Type of Waste	Location	Segregation	Institution Treatment	Storage	Transportation	End Treatment at CHTF	Final Disposal
								At the Central hospital treatment facility
15	Discarded expired infected blood or its products.	Blood bank	Red bucket with 5%hypo chlorite solution	5%hypo chlorite solution for 30 minutes and liquid discarded in main drainage	---		--	---

Any Health care facility which does not have access to CHTF will dispose their health-care waste after treatment by deep burial at the respective sites, provided landfill is properly designed and monitored. Besides, regional incinerator facility for pathological waste can be worked out at each district level at a later stage.

## LEGAL AND REGULATORY FRAMEWORK

Pakistan is one of the fortunate countries among the developing world having legal and regulatory framework in place in the form of Hospital Waste Management Rules 2005 under Environment Protection Act (1997). These rules are placed at Annex-III. Similarly, the Hospital waste Management Guidelines are also formulated on the basis of these rules.

### Gaps and lacunae in the legal and regulatory framework:

1. Overall, the HWM Rules need to be reviewed and the TORs for the reviewers should be developed on urgent basis by Ministry of Environment because:
  - a. The HWM Rules of 2005 don't fix responsibility for HCWM within and outside health facilities.
  - b. The Hospital Waste Management Teams consist of almost 25 persons whose meetings and coordination can most of the times be a problem for the management.
  - c. The segregation need to be done in two major separate forms i.e. infectious and non-infectious waste.
  - d. The Waste Management Teams can work in major tertiary care hospitals, but in smaller hospitals and clinics, the **infection control committees** should be constituted.
  - e. There should be dedicated officers at district or provincial level for the HCWM in the respective district or province.
  - f. Strengthening the institutional framework and capacity related to EH including HCWM
2. The constitution of Federal and Provincial Environmental Health Units (EHUs) and Inspectorate Hospitals through their respective PC-1s, and delegation of legal powers, under PEPA 1997, to inspect and propose penalty in coordination with the Pak EPA has to be incorporated within rules.

3. The Hospital Waste Management Teams in small hospitals (BHUs, RHCs) should consist of a small workable committee consisting of In charge Medical Officer, Lady Health Visitor, Medical Technician and sanitary staff supervisor. The same can also be provided in the private sector hospitals. This committee can be enhanced with a few pertinent members in THQ (Tehsil Head Quarter) level. One member from the stakeholder who is involved in running the combined incineration facility should also be co-opted on that committee.

**Table 3: Action Plan and Budget Proposal for Legal and Regulatory Framework**

<b>Actions</b>	<b>Activity</b>	<b>Time lines</b>	<b>Costs US\$</b>
Immediate	Review of the Rules 2005 on HWM. One week services of a legal expert And Establishment of Inspection System for Enforcement of the Rules ☺ Feedback form EHUs to Inspection System + part of Inspection System)	Mid year 2008	15,000/=
Short-term	Sections 16-22 of HWM Rules 2005 to be referred Set up EHUs and Health Care Waste Management Information System through DHIS. Estimated For Five years for EHU 07in No. +DHIS for 07 in No.	End year 2008	2.5 (M) 3.0 (M)
<b>Total</b>			<b>US \$ 5.515 Million</b>

## **Rationalize the HCWM practices within the HCFs of the country**

As has been evident from the basic survey conducted, the HCWM practices within the health care facilities are not according to the guidelines established hence posing great harm to the health of the workers, patients and their attendants. To rationalize these practices, all the three tiers of the health care delivery system need to devise mechanisms to implement the facility plans and improve the HCWM practices within the system.

To achieve this major target, following actions should be taken on short-term basis:

1. The Hospital Waste Management Rules 2005 (to be revised as under legal and regulatory framework, should give reference to the draft guidelines for HWM).
2. These guidelines should be re-named as the INSTRUCTIONS and these should be reviewed by the experts in accordance with the reviewed Rules. Pertaining to the recent flow of emergencies at national levels, Inclusion of HCWM during emergencies in INSTRUCTIONS is also mandatory and the Rules should give clear instructions for the Standard Operating Procedures to be followed in case of emergencies.
3. Development of HWM Plans in Health Care Establishments at Federal, Provincial and District levels both in Public and Private Sectors made mandatory by the provincial and federal health authorities.
4. Resource allocation for the procurement of equipment for internal management of HCW without treatment facilities activities (Trolleys, Containers, color coded plastic bags, Personal Protective Equipments, Vaccination etc.) by the respective government.
5. Destruction of sharps , syringes, I/V sets, canulae etc at the source of generation (hospitals i.e medical, surgical , emergency departments etc) by shredder, encapsulation etc, in order to avoid reuse by the Health Care Providers

6. Procurement of the SUBSIDIZED SAFE SYRINGES by the respective government (federal and provincial), made available to the public through standard outlets and ensured safe. This one action is unique in Pakistan's perspective, but would be most beneficial in order to discourage re-sale of syringes. Coupled intervention is of-course the complete destruction of the syringes at the source of generation. One may ask the financial implications of production and supply of the subsidized syringes that the Govt. may bear. Obviously, this cost can no way be more than the one is being paid in treating millions of patients suffering from chronic Hepatitis B&C and HIV/AIDS. The cost effectiveness of the intervention in quantifiable term can also be easily derived by the financial experts (*this suggestion has been appreciated by the Federal Ministry of Health and recommended for immediate take-up during the consultative workshop of finalizing the draft*)
  
7. For the long-term planning, *Liquid Waste Management* should be taken care off in an appropriate manner.

**Table 4: Action Plan with Budget Proposal for Rationalizing the HCWM Practices within HCFs.**

<b>Actions</b>	<b>Activity</b>	<b>Time lines</b>	<b>Cost (US\$)</b>
Immediate	Review of guidelines (Instruction) according to reviewed rules	Mid 2008	20,000/=
Short-term	Resource allocation for the procurement of equipment for internal management of HCW without treatment facilities activities (Trolleys, Containers, color coded plastic bags, Personal Protective Equipments, Vaccination etc.).	End 2008 (in PSDPs through federal and provincial PC-1s)	2 Million.
Long-term	Protocols for Liquid Waste Management to be developed	Mid 2009	10,000/=
<b>Total</b>			<b>203,0000/=</b>

## **Develop specific financial resources dedicated to HCWM**

The study conducted for the situation analysis of the HCWM in Pakistan, showed significant impact of non-budgeting for the HCWM, rendering budget allocation for HCWM as one of the most essential parts of National Plan of Action on HCWM in Pakistan. It is also understood that without specific financial resources, it is almost impossible to get sustainable improvements in HCWM. Where ever there is budgeting for the health –care delivery, there must be budgeting for the proper HCWM that the health care delivery system generates unintentionally. This envisages capital and recurring costs of the HCWM in HCFs at district, provincial and federal levels. It also becomes more imperative where there is centralized treatment facility for a number of hospitals. It also involves special recovery systems and allocative effectiveness and efficiency of the amount dedicated to HCWM by the financier (government and private sector in their own arenas).

Since the subject of health in Pakistan is a devolved subject and the financial obligations lie with the provincial and district governments. Apropos to the base-line survey conducted, there is no HEAD in the budget allocations for the health care establishments specifically dedicated to the Health Care Waste Management. Principally (polluter pays), each health –care establishment should be financially and ethically liable for safe management of any waste it generates. For the public sector, it should be the regular budget that would cater for it and for private sector, the organization is bound to manage from their own resource generation. However, the direct cost must not be borne by the client. The costs of separate collection, appropriate packaging, and on-site handling are the *internal* to the establishment and paid as labour and supplies costs. The costs of off-site transport, treatment, and, final disposal are *external* and paid to the contractors who provide the service. Major costs pertain to development of infrastructure. However, the most cost effective option should be considered. The financial

resources available from the public and private sectors will necessarily influence the choice of system and the standards of operation and these may vary from system to system but remain within the main framework and objectives of the National Action Plan on Health Care Waste Management.

The actions pertaining to such a plan harbor setting-up of specific budget lines in the accountancies at all levels from HCFs to the DoH and MoH. Detailed estimation of costs associated with the implementation of the HCWM plans in the HCFs as well as municipal, district, provincial and federal (central) levels. Defining and setting-up specific mechanism for recovery of the costs in a centralized system with the identification of the institution in-charge for the implementation of the recovery system with given necessary tools.

These actions should be backed up by a cross check mechanism for efficient control over the allocations. The responsibilities for over sighting be distributed among the staff at DoH/MoH levels and at the HCF level.

Thus there are two main aspects of development of specific financial resources for the Health Care Waste Management System, i.e.

1. Establishing of budget lines for HCWM i.e. Opening **HEAD of Account** within regular budgets of Public Sector hospitals in all provinces and federal areas. Private sector must have their internal budgetary mechanism.
2. Establishment of cost recovery mechanisms and responsible body for the mechanism.

The cost estimated for cost recovery mechanism by the responsible body is given as below:

**Table 5: Action Plan with Budget Proposal for Development of specific financial resources dedicated to HCWM**

Actions	Activity	Time lines	Cost (US\$)
Short Term	Establishment of cost recovery mechanisms and responsible body,	End 2008	50,000/=

## **Launch capacity –building and training measures**

The federal, provincial and district health authorities should ensure that all the hospitals have had prepared and implemented the HCWM plans. That is to follow all the component of the plan including the trainings programs for the HCW handlers, including medical and non-medical staff. The preparation of the training curricula for facilitators and participants, in order to assess their level of knowledge, attitude and practice. The quality of the training courses is maintained and sustained through refresher courses. Reviewing the curricula of the medical and nursing institutes/colleges, both in public and private sectors and ensuring the proper training is imparted to the students regarding HCWM. The following target groups are therefore identified:

- Regulators and decision makers (*awareness*)
- Federal, provincial, district, and tehsil authorities
- HCF administration (both public and private) including veterinary medicine
- HCF medical and non-medical staff
- Private operators where ever applied (e.g CHTF)
- General public.

Coupled with the above-mentioned efforts, following are the key efforts to be done in order to have capacity building and proper training measures set in:

- Launching national awareness campaign for the target groups
- Developing training programs and train master trainers
  - Identify the training need and the groups to be trained in the health facilities;
  - Train trainers.
- Train all staff involved in health care waste management

- Train health staff in health facilities (doctors, nurses, midwives), health and sanitation technical teams at district level, municipal technical services supervisors;
- Train waste handlers in health facilities (ward attendants, ground workers, cleaners, etc.).
- Organize regular welcome training sessions in the HCFs for all new staff members
- Review the curricula in the medical faculties and schools for nurses and paramedics

In addition the following groups should also be sensitized or trained on sound management of HCWM:

- NGOs
- CBOs
- Traditional healers (hakims, others)
- Homeopaths
- Homecare givers
- Acupuncturists
- Pharmacists
- Non-qualified so-called-health practitioners (dental and medical)

The awareness program will be launched after securing budgetary and technical backups.

It is very much imperative that there are **Certified Training and Research Centers** for imparting the trainings. The Health Services Academy is the certified training and research center for HCWM in Pakistan, by WHO at the moment. There will be standard certified training programs developed and the trainers once given full training will achieve the recognition of certified trainers for HCWM.

Generally for capacity building and training, the financial implications will harbor the following components:

1. Training programs
  - a. *Training materials*
  - b. *Training of the Master Trainers*
  - c. *Refreshing trainings*
2. *Awareness raising of the community about safe syringes (subsidized and ensured safe by the Govt. compared to the Health Care Cost versus recurring cost of the syringes)*

**Table 6: Activity Plan with Budget Proposal for Launching Capacity Building and training Measures**

<b>Actions</b>	<b>Activity</b>	<b>Time lines</b>	<b>Cost (US\$)</b>
Immediate	Capacity building for all target groups (first round of immediate need addressing with pilot projects in federal and provincial levels)	Mid 2008	<b>0.5 Million</b>
Short Term	Trainers of Master Trainers : training visits (overseas):	Mid 2008	<b>0.5 Million</b>
Short Term	Development of a National Training Program for the four layers: training (didactics +Practicum), education, awareness & advocacy on international standards.	End 2008	<b>50,000</b>
Short Term	Development of different types of training materials for all layers.	End 2008	<b>0.5 Million</b>
Long Term	Establishment of a National Certified Training Center (e.g. HSA) for HCWM (through PC-1)	2008-2012	<b>1.5 Million</b>
<b>Total</b>			<b>3.05 (M)</b>

## Set-up a monitoring plan

A monitoring plan is important for a sound implementation of the project. It is to be documented that the project's process is according to the planning done in the initial phase. The set-up of a monitoring plan as well as adequate control procedures at national, regional and health facility levels is a key issue to ensure sustainability. Regular reporting and field visits as well as a good information system to store and analyze data are the basis of an efficient monitoring plan. Ideally the following figure depicts the scope of the monitoring in a planning cycle and its usage in implementation.

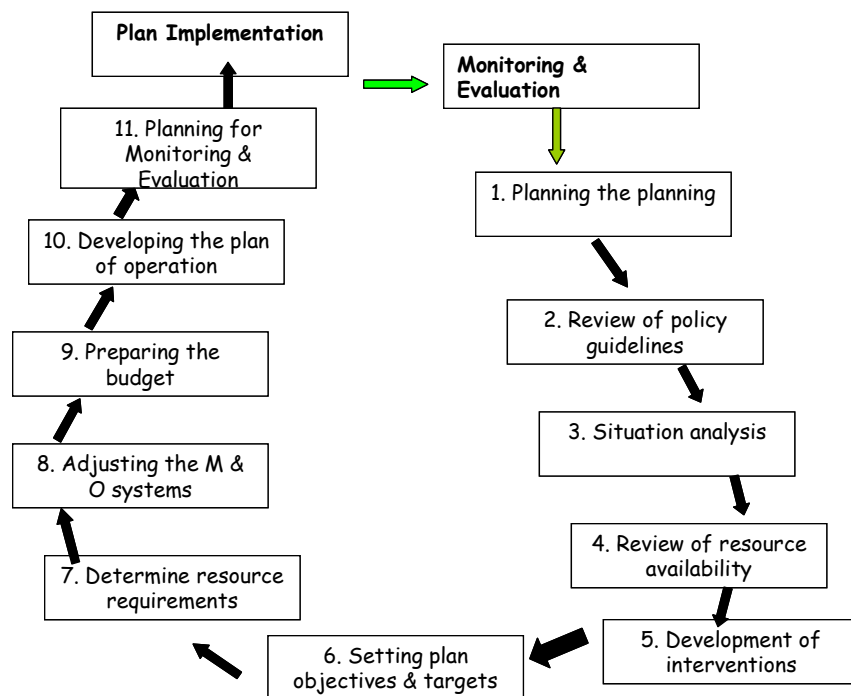


Fig 1. The Planning Cycle , adopted from DHP Manual: © AA Kielmann

### Monitoring Plan Components:

Monitoring is an essential part of any plan. Health care waste management is also not very different issue. It demands continuous efforts on part of every responsible person in each health establishment either it is a public or a private

one. Thus during the upgrading phase, the process of HCWM has to be investigated and recorded properly. Sustainability demands regular monitoring to maintain the achieved standards. That also assures quality management and continuous improvement in the system. This also refers to measure the effectiveness and efficiency of the program and the Ministry/Department of Health and Pak EPA/EPD along with co-opted members from private sector can influence the process in a positive direction.

Whereas, the HCWM Plan is to be implemented over a five years time period and implementation process will be monitored as depicted below:

**Table 7: Lay out of the Monitoring and Evaluation Plan**

<b>Objectives</b>	<b>Time lines</b>	<b>Responsible Agency/Department</b>
Institutional and legal framework	Year one (first six months)	MoH, DoH and Provincial EPA
Planning of activities	Year one (first six months)	Department of Health (DoH)
Setting-up reliable information system	Year one (First six months)	MoH an DoH
Implementation of plan facility-wise	Year one (second six months)	MoH/DOH/EPA
Weekly follow-up with control and compliance to the HCWM activities as per SoPs	Weekly + monthly reports Six monthly report	DoH to Provincial authorities MoH
Training	First two years	DoH/MoH, Stakeholders

<b>Objectives</b>	<b>Time lines</b>	<b>Responsible Agency/Department</b>
Awareness	Yearly	DoH/CBOs/NGOs, PMA
HCWM Program Evaluation(mid-way)	1.5 years (mid 2009)	MoH/MoE/Pak EPA/international Consultant
HCWM Program Evaluation at the end i.e 3 <sup>rd</sup> Year	Year 03	International Consultant, DoH/MoH/Pak EPA

***Indicators to be measured***

1. HCW management structure: reduction of waste, increase in efficiency; standard of hygiene;
2. awareness of staff and patient; statistical data on waste generation; financial resources;
3. functioning of responsibilities; training and awareness creation activities; monitoring and recording activities;
4. HCW collection: sufficient and appropriate collection containers; efficiency of waste segregation; frequency of waste removal; environmentally friendly handling of waste;
5. HCW transportation and storage: cleanliness and functioning of transport equipment; execution of recommended transport procedures; status of storage facilities; cleanliness; separate storage of hazardous items; emergency equipment; lock and safety measures; responsibilities;
6. HCW treatment: incinerator for infectious waste; proper functioning of incinerator (minimum incineration),
7. maintenance procedure; safety regulation for operation; safe disposal of ash; responsibilities;
8. sewage system; functioning of septic tanks; maintenance procedure; wastewater treatment;

9. HCW disposal: proper operation of landfill site; proper operation of waste pit for infectious waste; transport of chemical and radioactive waste; responsibilities;

General cleanliness: containers not overfull; no used sharps outside or protruding from sharps containers; no foul-smelling waste in facility or on premises; no litter in facility or on premises; no littering on premises; waste pits not overfull.

This activity will also need a baseline development i.e. a specific form to be developed in order to collect the information which could be compared afterwards and the hospitals to report to DoH on that particular form OR the whole reporting system can be part of the National Health Information System. The establishment of HCWM plan shall progressively lead the medical institutions and the administrative authorities to consider HCWM as a routine issue to cope with and reinforce progressively their organizational capacities. The MoH shall oblige the major hospitals to formally nominate a Health Care Waste Management Officer (HCWMO) and an Infection Control Committee (ICC). The HCWMO in coordination and cooperation of the ICC shall co-ordinate and supervise the whole HCWM system. He/she will have sufficient authority to ensure that all the hospital staff complies with the HCWM plan. In each and every medical institution, the roles, responsibilities and duties of the medical and non-medical staff regarding HCWM shall be well-defined in standardized personal job descriptions.

- Annual reporting of the HCFs to the supervising administrative authorities, with the set-up of annual HCWM plans
- The gathering and the review of the reports by districts and provincial authorities and the adequate review of the HCWM Plans at their levels , based on the information provided by the HCFs. These plans should contain at least:
  - An inventory on existing treatment and disposal facilities in each HCF

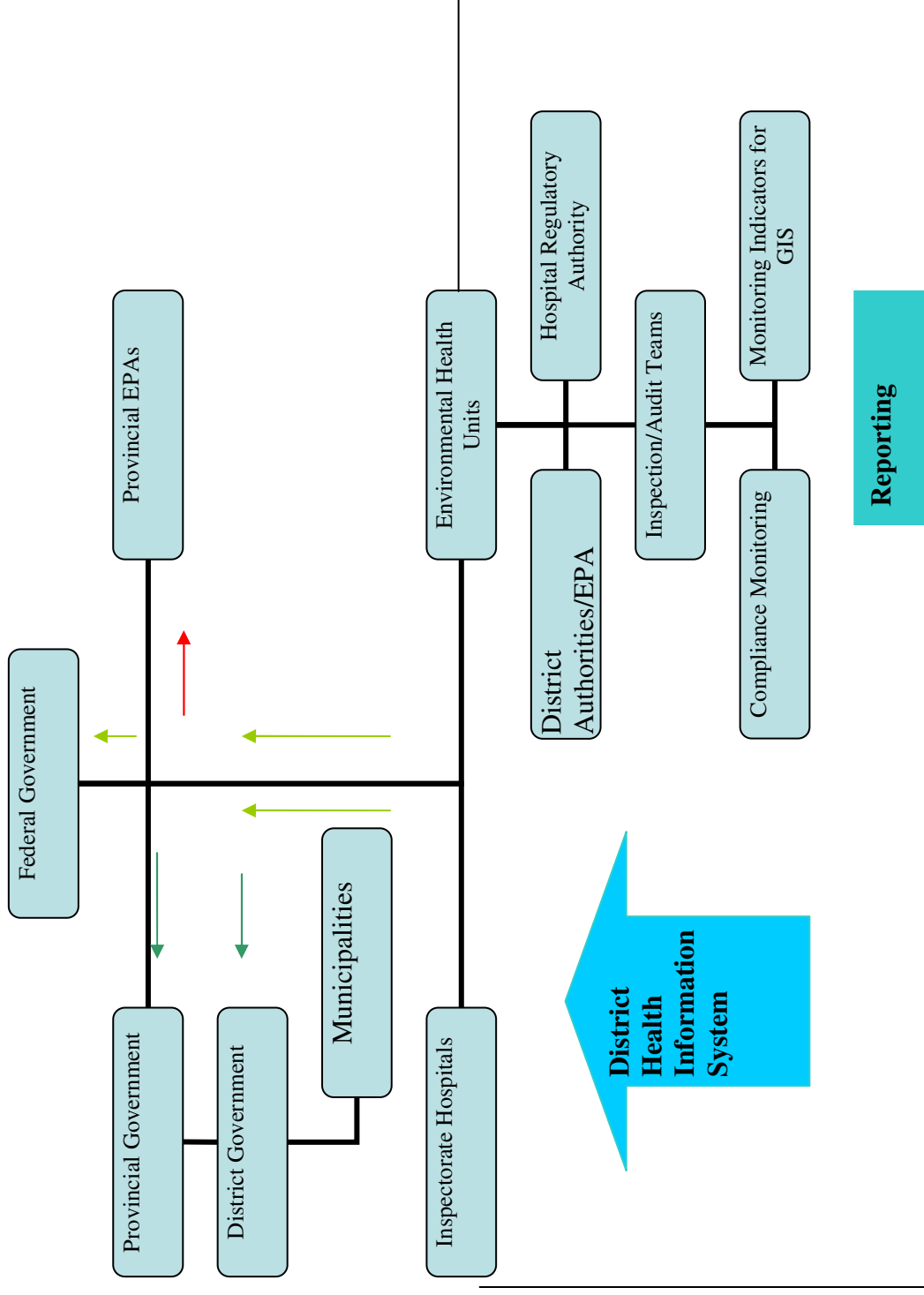
- A compilation of the needs of each HCF and respective recommendations
  - An estimation of the budget to be allocated for the management of HCW for the coming fiscal year
  - A strategy in place to improve the management of HCW in the province
  - A provisional agenda for the monitoring of the disposal facilities in the HCFs.
- This data to be integrated into the National Health Information System (DHIS) to have the better knowledge of the status of HCWM practices in the medical institutions and provinces/districts.
  - Carrying out the regular inspections to verify at least that the segregation procedures are being respected and safety measures applied.
  - The backstopping of the different HCFs by providing the feedback on the problems observed and giving appropriate training/advice to correct/improve current practices.

These components will be broadly ensured through:

1. Regular reporting through DHIS
2. Planned bi-annual inspections by EHUs and inspectorate Hospitals
3. Evaluation of the program components at the end of the project

The overall goal, through set objectives, of the monitoring program will be catered as per the functional organogram for the monitoring mechanism. The key players in this organogram are the Federal and provincial EHUs, Inspectorate Hospitals, EPAs and Hospital Regulatory Authorities (wherever exist). They will form the combined inspection/audit teams which will conduct bi-annual inspections/audits of the facilities. The regular DHIS will work through normal channel; however the information would also lie with the inspection teams who will also verify them on the inspections as far as HWM System is concerned.

**Fig 2: Proposed Organogram for Monitoring Mechanism**



Technical Cooperation exists among Federal, Provincial and District governments. Inspection teams report to EHU units (Environmental Health Expert, EPA Officer, Officer for Inspectorate Hospitals, Officer designated to HRA, where ever exists)

The teams will report to the EHUs and the information will travel to the District, Provincial and Federal Authorities (including EPAs) with recommendations and actions proposed. It is suggested that during the first half of the project, emphasis of the recommendations should be towards identifying gaps and suggestions for improvements with minor penalties if required. However, in the latter half, the law should prevail strictly in case of defaulters.

## Plan of Action:

**Table 8: Activity Plan with Proposal for Budget for Monitoring Plan**

<b>Actions</b>	<b>Activity</b>	<b>Time lines</b>	<b>Cost (US\$)</b>
Short Term	Development of Monitoring Program by Consultants e.g Monitoring of Health Care Providers HWM practices, monitoring of HCWM with in hospitals, provision of monitoring and evaluation with in legal framework	Mid 2008	<b>50,000</b>
Short Term	Planned bi-annual Inspections by the Inspection Teams (EHUs, IH, EPAs, HRA)	End 2008	<b>50,000/=</b>
Short Term	Development of GIS for Environmental Health and Health Care Waste Management	Mid 2008	<b>50,000/=</b>
Long Term	Program components evaluation end project	Mid 2012	<b>200,000/=</b>
<b>Total</b>			<b>350,000/=</b>

The establishment of the institutional framework for monitoring, inspection, evaluation and reporting mechanisms remain non-budgeted.

## RECOMMENDATIONS FOR POLLUTION REDUCTION WITH HCWM ACTIVITIES

1. Modern incinerators in Central Health Care Waste Treatment Facilities because of their fairly low cost and operating skills requirements;  
*Incinerator + Autoclave + Microwave*
2. Pit latrine in rural health posts, because of very low HCW production.
3. Autoclave, microwaves systems are surely more efficient and environmentally sound, and should be used where ever applicable and cost-effective.
4. Chemical disinfection requires chemical products permanently and qualified staff for operating; the disinfected wastes must also be sent to landfill disposals or other systems of disposal after such treatment. Chemical disinfection this method gives highly efficient disinfection, and some chemical disinfectants are not expensive. As for drawbacks, the method requires highly qualified technicians for operating and it is inadequate for pharmaceutical, chemical and some types of **infectious waste**. In central, general and provincial hospitals, which produce rather important quantities of HCW, these should be disinfected with chemical products (in addition to other methods in order to reduce burden over the system), then evacuated to the public landfills where specific areas have been prepared before hand.
5. Disposal at municipal landfills; in case hazardous health-care waste cannot be treated or disposed elsewhere, direct burying in the municipal landfill should be recommended. To prevent the important disease burden currently created by these wastes, it is necessary, to prepare specific areas for HCW disposal, to limit access to this place (wire fencing and lock) and to bury the waste quickly to avoid contact with people or animals. **It is a temporary solution before more suitable treatment methods are found.**

6. Burying inside hospital premises; In health centers where the HCW production is small, a ditch should be dug. Its bottom and walls must be cemented (or stabilized) to avoid contamination of the water table and prevent the walls from collapsing. The HCW thrown in the ditch must be covered with sand. The same procedure is repeated every time a new quantity of HCW is disposed, until the hole is full; in such a case, another hole is dug nearby. The hole must be protected (fence/lock) to avoid access and accidents. The main drawback is that burial places are not always available inside the health centers.
7. In all cases, the principle of waste segregation at source of production must be seriously respected, to minimize the contamination of general wastes by the infectious ones.
8. Centralized business models be encouraged by the Government through public-private partnership including tax exemptions/subsidies/facilitation. .

### **Action Plan with budgeting:**

**Table 9: Activity Plan with proposed budget for control of pollution reduction due to HCWM activities.**

<b>Actions</b>	<b>Activity</b>	<b>Time lines</b>	<b>Cost (US\$)</b>
Short Term	Cleaner technologies e.g Autoclaves, shredders etc. after treatment (autoclaving, disinfection etc.) for CHTF.	Mid 2008	<b>5.0 (M)</b>
Short Term	Four modern double chambered incinerators fitted with flue gas cleaning system per province (having maximum capacity and state of art)	End 2008	<b>10 (M).</b>
Short Term	Development and review of National Environmental Quality Standards for Emissions from Incinerators	Mid 2008	<b>50,000/=</b>
<b>Total</b>			<b>15.05 (M)</b>

**Annex-I**

**Example of the Implementation Schedule for a three years HWM Implementation Program.**

**Table 10 : Implementation Schedule**

<b>Activities</b>	<b>Year 0</b>	<b>Year 2008</b>	<b>Year 2009</b>	<b>Year 2010</b>
<b>Establishment</b>				
Formation of State level, District level and Hospital level monitoring committees		****		
<b>Starting of HCWM</b>				
Application to Prescribed Authority as per Form 1 for sanction		****		
<b>Identifying Training Institution / University</b>				
Preparing training contents and modules for State, District level officials, Medical Officers, Nursing Staff and others		****		
<b>Conducting Training</b>				
HCWM Training for State Officials		****		
HCWM Training for Chief MO/Joint Director Of Health Services & Others		****		
TOT for HCWM		****		
HCWM Training for Medical Officers		****	****	
HCWM Training for Nursing and Para-medical staff		****	****	
HCWM Training for Laboratory Technician and		****	****	

<b>Activities</b>	<b>Year 0</b>	<b>Year 2008</b>	<b>Year 2009</b>	<b>Year 2010</b>
Blood bank Technician				
HCWM Training for NGOs		****	****	
HCWM Training for Municipal Corporation Health Officers		****		
Training for Ward boys/Class IV workers of House keeping, Laundry and Mortuary, sanitary workers		****	****	
<b>Procurement and Distribution of HCWM Material</b>				
Procurement of HCWM Material		****		
Distribution of HCWM Material at the facility level		****	****	
<b>Civil Works for HCWM at the Facility Level</b>				
Constructing storage facility		****	****	
<b>Establishment of CHTF</b> ( 4 districts in Phase I Pilot & ----- districts in Phase II -replication)		****	****	****
<b>Awareness</b>		****	****	****
<b>Monitoring and Evaluation</b>				
Monitoring of activities by province Level Committee		****	****	****
Monitoring of activities by District Monitoring Committees		****	****	****
Monitoring of training activities		****	****	****
<b>Assessment/Summative Evaluation</b>				
Conducting an assessment on HCWM practices by providers in hospitals by an Independent Agency				****