Environmental and Medical Waste Management Plan

Punjab Health Sector Reforms Support Project

Acknowledgement

TRF acknowledges the cooperation and support of the Health Department, Government of Punjab, in completing this assignment. Mohammad Omar Khalid, Environment Consultant (mokhalid@comsats.net.pk), worked on this assignment and authored the present report.

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Date: January 2013

Islamabad

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Acronyms

AMS	Additional Medical Superintendent/Assistant Medical Superintendent	MEA	Monitoring and Evaluation Assistant
BHU	Basic Health Unit	MICS	Multiple Indicator Cluster Surveys
BMI	Body Mass Index	MO	Medical Officer
CITES	Convention on International Trade in Endangered Species	MO	Medical Officer
CTF	Combined Treatment Facility	MSM	Men who have sex with men
DFID	Department for International Development	MS	Medical Superintendent
DHQ	District Head Quarter (Hospital)	M&E	Monitoring and evaluation
DoH	Department of Health	NEQS	National Environmental Quality Standards
DMO	District Monitoring Officer	NGO	Non-governmental organizations
MWMFP	Medical Waste Management Focal Point	OP	Operational policy
EA	Environmental Assessment	OPD	Out patients department
ECA	Employment of Child Act	Pak-EPA	Pakistan Environmental Protection Agency
EDO	Executive District Officer	PEPA	Pakistan Environmental Protection Act
EHS	Environment, Health, and Environment	PEPC	Pakistan Environmental Protection Council
EIA	Environmental Impact Assessment	PHSRP	Punjab Health Sector Reforms Program
EMOC	Emergency Obstetric Care	PHSRSP	Punjab Health Sector Reforms Support Project
EMP	Environmental management plan	POPs	Persistent Organic Pollutants
EMWMP	Environmental and Medical Waste Management Plan	PPE	Personal protective equipment
EPA	Environmental Protection Agency	PRSP	Punjab Rural Support Program
GoPb	Government of Punjab	PVC	Poly-vinyl chloride
HCW	Health care waste	RHC	Rural Health Centre
HCWM	Health care waste management	SIM	Sector Investment and Maintenance (Loan)
HIV/AIDS	Human immunodeficiency Virus/ Acquired Immunodeficiency Syndrome	SWAp	Sector Wide Approach
HNP	Health, Nutrition and Population	THQ	Tehsil Head Quarter (Hospital)
HSRU	Health Sector Reform Unit	ToT	Training of trainers
ICMP	Infection Control Management Project	UNFCCC	UN Framework Convention on Climate Change
IDU	Injection Drug Users	U5MR	The under-five mortality rate
IEE	Initial Environmental Examination	WB	World Bank

IMR	Infant Mortality Rate	WMO	Waste Management Officer
LAA	Land Acquisition Act	WMP	Waste management plan
LOS	Laws of Seas	WHO	World Health Organization
MEA	Multilateral Environmental Agreement	WMT	Waste management team

Executive Summary

This document presents the Environmental and Medical Waste Management Plan (EMWMP) of the proposed Punjab Health Sector Reforms Support Project (PHSRSP), being initiated by Department of Health (DoH), Government of Punjab (GoPb), and being considered for financing by World Bank (WB) and Department for International Development (DFID). The present EMWMP has been prepared in compliance with the national regulatory requirements and WB Operational Policies.

The Project

The proposed project aims to support the implementation of the GoPb's medium term health program 2012-2015. The GoPb's program aims for a reduction in the morbidity and mortality in most common illnesses especially among the vulnerable groups, by (a) enhanced coverage, quality and access to essential health care especially for the poor and the vulnerable and in under developed districts; and b) improved DoH's ability and systems for accountability and stewardship functions. The project components include Improving Health Services; Strengthening Governance and Management Systems; and Improving the Capacities in Technical Areas for Equitable Health Services to All.

Policy and Regulatory Framework

The present Plan has been prepared in compliance with the World Bank Operational Policy 4.01, which requires environmental assessment of projects proposed for Bank financing.

The Plan essentially seeks to effectively implement the Hospital Waste Management Rules, framed by the Government of Pakistan in 2005. The Plan also broadly complies with the Pakistan Environmental Protection Act, 1997, which requires the proponents of every development project in the country to submit either an Initial Environmental Examination or an Environmental Impact Assessment to the concerned environmental protection agency.

Study Objective

The main objective of this assignment is to institutionalize environment and medical waste management plan in the DoH's Health Programme supported by World Bank and DFID. The study includes carrying out a situation assessment of the prevailing medical waste management practices in the government healthcare facilities in the

Province, and preparing an environment and medical waste management plan for these facilities.

Situation Assessment

The current situation of the medical waste management has been assessed based upon the literature review as well as field observations during visits to some healthcare facilities in the Province during the present study.

Literature review. A comprehensive country-wide survey was conducted in May 2007 covering a total of 78 health care facilities in four provinces, Azad Jammu and Kashmir, and Federal capital area. The study confirmed the dismal state of medical waste management in the country. The study results showed that only 30 percent of hospitals surveyed had Health Care Waste Management (HCWM) teams or Infection Control Teams in place; 41 percent had the guidelines or internal rules of the health care waste management; only 27 percent had the plan for healthcare waste management (HCWM) and of these, only 12 percent were applying the program for assessing the health care waste (HCW); 23 percent of the hospitals had regular training programs on the HCWM, and a similar percentage had received training on HCWM; about 67 percent of staff were aware about the hazards of HCW and its associated risk factors; and routine health surveillance for the staff was available in only 22 percent and reporting system existed in only 33 percent of the facilities. Another study from Lahore highlighted that majority (85.5 percent) of sweepers were aware of the fact that job is harmful for their health however they have to continue it for economic reasons. About 71 percent sweepers did not use any protective covering and thought that only rich nations take such measures. Most of the employee did not understand the meaning of “training” and only 14.5 percent employee were trained by the hospital authorities. The most dreadful aspect of hospital waste management was that hospital management did not take precautions for waste disposal as told by the sweepers. Majority (76.4 percent) of the sweeper said that hospital waste is directly thrown into the waste bins and 23.6 percent said that the part of the waste gets incinerated and rest gets recycled.

Field Observations. Eight healthcare facilities were visited to observe the medical waste management practices in different districts of the Province. About 38 percent of facilities visited had waste management committees headed by Medical Superintendent (MS) and designated Waste Management Officer (WMO). In smaller facilities, 62 percent of hospitals had designated head nurse for management of

medical waste, supported by sanitary workers. One third of the facilities visited had a waste management plan and guidelines in place based on internationally recognized standards, while two thirds of these facilities did not have any plan in place but underscore it is important. A third of the facilities had implemented a plan in accordance to expected standard and practices, another one-third were carrying out minimal plan while the remaining third lacked or had no plan in place no follow expected standard and practices. In all facilities, wastes were collected and moved to the point of transportation or direct disposal. Only one out of the eight facilities surveyed had central storage and proper handling for disposal. Others disposed directly into on site pit or handed over to municipality for transportation. One fourth of facilities had non-functional incinerator within their facilities. Others were relying on other facility with functional incinerator, were sending waste to a sister hospital for disposal or were using the services of Non-government Organization involved in medical waste management for treatment and disposal at a minimum charge.

Impacts and Mitigation

Health Hazards

Impacts. The health hazards for staff, patients, and nearby communities are by far the most significant potential risk associated with the healthcare facility operation. These are mostly caused by not following the infection control protocols, not using proper personal protective equipment (PPE), and not employing proper procedures for HCW collection, transportation, storage, and final disposal. In addition, recycling of medical waste also poses very serious health risks for the workers involved in recycling and also consumers using the recycled products.

Mitigation. Proper management of HCW and effective implementation of the Hospital Waste Management Rules of 2005 can minimize the risks both within and outside healthcare facilities. The first priority is to segregate wastes, preferably at the point of generation, into reusable and non-reusable, hazardous and non-hazardous components. Other important steps are the institution of a sharps management system, waste reduction, avoidance of hazardous substances whenever possible, ensuring worker safety, providing secure methods of waste collection and transportation, and installing safe treatment and disposal mechanisms.

Safety Hazards

Impacts. Safety hazards in the healthcare facilities are generally associated with handling of sharps (needles, cutters), gases, autoclaves, and other similar

equipment. Open burning of HCW also poses safety risks for the staff carrying out this activity. These hazards include risk of cuts, pricks, gas poisoning, burning, and other bodily injuries. The healthcare facility staff as well as the patients are susceptible to these safety hazards.

Mitigation. Strictly following standard operating procedures to handle sharps and proper use of PPE particularly prick-proof gloves and masks is of foremost importance to avoid safety hazards associated with sharps, gases, and others. In addition, thick/puncture resistant plastic bags to collect HCW and rigid/puncture proof boxes to dispose needles/other sharps will be used.

Soil and Water Contamination

Impacts. Soil and water contamination can be caused by the direct burial of infectious wastes within the facility premises, or at the municipal waste dumpling site if the healthcare waste is disposed along with the municipal waste. Open burning of infectious waste can also potentially cause soil contamination. Improper sewage disposal at the healthcare facility can also contaminate soil.

Mitigation. The infectious waste will be segregated from the other non-risk waste and will not be sent to the municipal waste dumping site/landfill, except where dedicated landfill for medical waste is available. If on-site burial of infectious waste is carried out, it will be done in lined pits. The sewage from the healthcare facilities within the cities will be discharged in city sewerage, otherwise on-site treatment such as septic tank and soaking pit will be constructed according to international standards.

Air Quality Deterioration

Impacts. Air quality deterioration can take place by open burning of the HCW. Similarly, incineration of infectious waste can also pollute the air. Of particular concern are dioxins which are produced by burning of the plastic and polyethylene products. The dioxins are carcinogenic and can affect the healthcare facility staff carrying out the waste burning, other nearby staff, patients, and nearby communities. Open burning of the HCW particularly if it contains plastics/polyethylene will be avoided since it produces dioxins in addition to other toxic gases.

Mitigation. If infectious waste is incinerated, then it will be ensured that i) incinerators specifically designed for HCW are used; ii) properly trained staff operate the incinerators according to standard operating procedures; iii) appropriately high

(more than 1200°C) temperature is achieved in the incinerator to avoid dioxin discharge; iv) the flue gases are properly treated (e.g. with the help of water scrubbers) before their release to the atmosphere; and v) there is no leakage of gases from the first chamber of the incinerator to avoid any release of dioxins before they can be destroyed in the second chamber.

Management Plan

Institutional arrangements. The overall responsibility of implementing the environmental and healthcare waste management issues particularly the present EMWMP will rest with the Program Director, Punjab Health Sector Reforms Program (PHSRP). Within PHSRP, a dedicated, fulltime specialist will be appointed as the Medical Waste Management Focal Point (MWMFP). At the district level, the Executive District Officer – Health (EDO-Health) of each district will be the focal point for performing/supervising the environment and healthcare waste management functions particularly implementing the present EMWMP in the respective district. Finally, at the facility level, the WMO will be designated as the focal point for EMWMP implementation. In addition, a Waste Management Team (WMT) will be constituted in each healthcare facility, and an appropriate officer designated as WMO in accordance with the Hospital Waste Management Rules of 2005.

Hospital waste management plan. Each healthcare facility will prepare and implement a waste management plan (WMP), in accordance with the Hospital Waste Management Rules of 2005. The Plan will include: i) a plan/layout of the healthcare facility showing waste disposal points for every ward and department, indicating whether each point is for risk waste or non-risk waste, and showing the sites for central storage facility for risk waste and central storage facility/arrangements for non-risk waste; ii) details of the types, numbers, and estimated cost of containers, waste bags, and trolleys required annually; iii) timetable including frequency of waste collection from each ward and department; iv) duties and responsibilities of each category of healthcare facility staff involved in waste generation and management; v) an estimate of number of staff required for waste management; vi) procedures for the management of waste requiring treatment such as autoclaving before final disposal; vii) planned waste disposal sites/methods; viii) contingency plans for storage or disposal of risk waste in the event of breakdown of incinerators; ix) training courses and program on waste management; and x) emergency procedures. Comprehensive documentation will be maintained for the implementation of each element of the WMP.

Environmental management plan. A site-specific environmental management plan (EMP) will be prepared and implemented for each facility to be renovated or rehabilitated.

Monitoring. The facility level monitoring will be carried out on the basis of the WMP and EMP of each facility. Monitoring checklists will be prepared on the basis of these Plans, to be filled periodically. The district level monitoring will be carried out with the help of Monitoring and Evaluation Assistants (MEAs) who already conduct monitoring of the DoH's healthcare facilities in their respective districts. In addition to the above, the Executive District Officer (Health) and his/her staff will also conduct random monitoring of the EMWMP in healthcare facilities. The HWMFP will also carry out random visits of the healthcare facilities in the Province to monitor the Plan implementation.

Review of Plan and Third Party Validation. The HSRU/DoH will conduct an internal review and commission a third party validation (TPV) of the EMWMP implementation on an annual basis. On the basis of these reviews, the EMWMP may need to be revised and updated.

Capacity building. The facility-level capacity building will be an integral part of the WMP discussed above. At the provincial level, the HSRU/DoH will plan and conduct training of trainers (ToT) for the selected relevant staff particularly WMT members from each district on the EMWMP implementation.

Documentation. The WMP of each facility will define the facility-level documentation requirements for EMWMP implementation. At the district level, the EDO (Health) will compile the District EMWMP report on a monthly basis and send it to the HSRU. The MEAs through DMOs will also send their filled checklists/data to the HSRU. At the provincial level, the MWMFP will compile the reports received from the EDOs (Health) and prepare overall project reports on EMWMP implementation on quarterly basis. These reports can be combined with the reports on infection control plan implementation.

EMWMP Implementation Approach

Implementation of the EMWMP will be carried out in close coordination with the implementation of Infection Control Management Project (ICMP), since both waste management and infection control aspects are inherently linked with each other. Under the Phase I of the national Infection Control Management Project, infection

control protocols have already been prepared. Under the Phase II of this project, these protocols are being implemented on pilot basis in one district each of Khyber Pakhtunkhwa, Punjab and Sindh provinces. Gujranwala district has been selected in Punjab for this purpose.

The Health Department of KP has taken the lead in implementing the ICMP, and a formal notification has been issued to formulate the Provincial Infection Control Committee. The Baseline Joint Assessment of the selected healthcare facilities in Mardan district has been carried out during July 2012, and three rounds of monitoring reports have so far been prepared for August, September, and October 2012. A similar approach is being followed in Gujranwala district for piloting the ICMP in the Punjab Province.

EMWMP Implementation Cost

The cost for EMWMP implementation has been estimated to be PKR 29 million. This includes the cost of MWMFP, TPV, and capacity building at provincial and district level. This cost will be covered through the Technical Assistance (TA) component of the Project. The detailed district-wise budgets need to be prepared after the preparation of the WMPs of each facility. The costs associated with the combined treatment facility will also be included in these budgets. The following estimates are for the activities to be carried out primarily at the provincial level.

1. Introduction

This document presents the Environmental and Medical Waste Management Plan (EMWMP) of the proposed Punjab Health Sector Reforms Support Project (PHSRSP). The Project is being initiated by Department of Health (DoH), Government of Punjab (GoPb), and being considered for financing by World Bank (WB) and Department for International Development (DFID). The present EMWMP has been prepared in compliance with the national regulatory requirements and WB Operational Policies. The EMWMP identifies potentially negative environmental impacts of the project and proposes appropriate mitigation measures to minimize impacts on environmental degradation and potential risks to human health.

1.1. Project Overview

The proposed project aims to support the implementation of the GoPb's medium term health program 2012-2015. The GoPb's program aims for a reduction in the morbidity and mortality in most common illnesses especially among the vulnerable groups, by (a) enhanced coverage, quality and access to essential health care especially for the poor and the vulnerable and in under developed districts; and b) improved DoH's ability and systems for accountability and stewardship functions.

The proposed project will have the following three components:

- Component I – Improving Health Services
- Component II - Strengthening Governance and Management Systems
- Component III: Improving the Capacities in Technical Areas for Equitable Health Services to All.

Further details of the project are presented later in the document.

1.2. Project Proponent

The proposed project will be implemented by the Department of Health, Government of Punjab, through the Punjab Health Sector Reforms Program. A brief introduction of the Department is presented below.

Health Department delivers quality healthcare services to the community through an efficient and effective service delivery system that is accessible, equitable, culturally acceptable, affordable and sustainable. Health Department aims to improve the

health and quality of life of all, particularly women and children, through access to essential health services.

Health Department strives to reform and strengthen the critical aspects of the health systems and enable it to:

- Provide and deliver a basic package of quality essential health care services
- Develop and manage competent and committed health care providers
- Generate reliable health information to manage and evaluate health services
- Adopt appropriate health technology to deliver quality services
- Finance the costs of providing basic health care to all
- Reform the health administration to make it accountable to the public.

The Health Department operates under the administrative control of Secretary Health, Punjab who is the head of provincial Health Department. The Health Department has two main functions; policy-making and regulatory function.

1.3. Regulatory and Policy Framework

The present Plan has been prepared in compliance with the World Bank Operational Policy 4.01 (OP 4.01), which states that "The Bank requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making"[1].

The Plan also seeks to effectively implement the Hospital Waste Management Rules, framed by the Government of Pakistan in 2005. The Plan also broadly complies with the Pakistan Environmental Protection Act, 1997 (PEPA 1997), which requires the proponents of every development project in the country to submit either an Initial Environmental Examination (IEE) or "where the project is likely to cause an adverse environmental effect," an Environmental Impact Assessment (EIA) to the concerned environmental protection agency (EPA). The IEE/EIA Regulations 2000 issued under the PEPA 1997 provide separate lists for the projects requiring IEE and EIA. (The Act, Regulations, and Rules are further discussed later in the document).

[1] Excerpts from WB OP4.01 – Environmental Assessment. January, 1999. (Further discussed later in the document.)

1.4. Study Objectives

The main objective of this assignment is to institutionalize environment and medical waste management plan in the DoH's Health Programme supported by World Bank and DFID. The specific objectives of the assignment are:

- To identify potential impacts of the proposed project on the natural and human environment of the area, to predict and evaluate these impacts, and determine their significance, in light of the technical and regulatory concerns,
- To propose appropriate mitigation measures that will be incorporated in the design of the project to minimize if not eliminate the potentially adverse impacts,
- To assess the compliance status of the proposed activities with respect to the national environmental legislation and WB's OPs,
- Conducting situation assessment for capturing current status of implementation, gaps, and capacity needs.
- Based on situation assessment and impact assessment, developing environment and medical waste management and capacity development plans that can be integrated with ongoing project activities.
- Costing the developed plans.

1.4.1. Study Scope

The present study covers all the components of the proposed PHSRSP with particular focus on activities under Component I that are likely to cause environmental and public health hazards.

The area where Project components would be located is referred to as the 'project area' in this report. Since the project will be implemented throughout Punjab, the project area will also be scattered throughout the province. The study addresses the potential environmental and social impacts that may be encountered during the design, construction and operational phases of the proposed project.

1.4.2. Study Methodology

The assignment methodology was essentially based upon the WB Operation Policies[2] and national environmental guidelines[3] - with necessary adaptation to cater the special needs of the project. The methodology is described in **Annex A**.

1.5. Document Structure

Chapter 2 discusses national legislation and regulations relevant to the environmental and social aspects of the Project. Also covered in the Chapter is the WB safeguard polices, national and international environmental guidelines, and multilateral environmental agreements.

Chapter 3 presents the simplified Project description.

Chapter 4 describes the current situation of the healthcare facilities with respect to the environmental and waste management aspects.

Chapter 5 identifies Project's potentially negative environmental and social impacts and proposes mitigation measures to address these impacts.

Finally, **Chapter 6** provides the Environmental and Medical Waste Management Plan for the Project.

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2 Discussed later in the document.

3 Guidelines for Preparation and Review of Environmental Report; Government of Pakistan, 1997. (Further discussed later in the document.)

2. Legal, Regulatory and Policy Review

This Chapter discusses national legislation and regulations relevant to the environmental and social aspects of the Project. Also covered in the Chapter is the WB safeguard polices, national and international environmental guidelines, and multilateral environmental agreements.

2.1. National Laws and Regulations

Pakistan's statute books contain a number of laws concerned with the regulation and control of the environmental and social aspects. However, the enactment of comprehensive legislation on the environment, in the form of an act of parliament, is a relatively new phenomenon. Most of the existing laws on environmental and social issues have been enforced over an extended period of time, and are context-specific. The laws relevant to the developmental projects are briefly reviewed below.

2.1.1. Pakistan Environmental Protection Act, 1997 [4]

The Punjab Environmental Protection Act, 1997 (the Act) is the basic legislative tool empowering the government to frame regulations for the protection of the environment (*the 'environment' has been defined in the Act as: (a) air, water and land; (b) all layers of the atmosphere; (c) all organic and inorganic matter and living organisms; (d) the ecosystem and ecological relationships; (e) buildings, structures, roads, facilities and works; (f) all social and economic conditions affecting community life; and (g) the inter-relationships between any of the factors specified in sub-clauses 'a' to 'f'*). The Act is applicable to a broad range of issues and extends to socioeconomic aspects, land acquisition, air, water, soil, marine and noise pollution, as well as the handling of hazardous waste. The discharge or emission of any effluent, waste, air pollutant or noise in an amount, concentration or level in excess of the National Environmental Quality Standards (NEQS) specified by the Pakistan Environmental Protection Agency (Pak-EPA) has been prohibited under the Act, and penalties have been prescribed for those contravening the provisions of the Act. The powers of the federal and provincial Environmental Protection Agencies (EPAs), established under the Pakistan Environmental Protection Ordinance 1983,[5] have also been considerably enhanced under this legislation and they have been given the

[4] The Provincial Government has recently adopted this Act as the Punjab Environmental Protection Act.

[5] Superseded by the Pakistan environmental Protection Act, 1997.

power to conduct inquiries into possible breaches of environmental law either of their own accord, or upon the registration of a complaint.

The requirement for environmental assessment is laid out in Section 12 (1) of the Act. Under this section, no project involving construction activities or any change in the physical environment can be undertaken unless an initial environmental examination (IEE) or an environmental impact assessment (EIA) is conducted, and approval is received from the federal or relevant provincial EPA. Section 12 (6) of the Act states that the provision is applicable only to such categories of projects as may be prescribed. The categories are defined in the Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000 and are discussed in **Section 2.1.2** below.

The requirement of conducting an environmental assessment of the proposed project emanates from this Act. The present Plan broadly addresses the requirements given in the Act.

2.1.2. Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000

The Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000 (the 'Regulations'), developed by the Pak-EPA under the powers conferred upon it by the Act, provide the necessary details on preparation, submission and review of the initial environmental examination (IEE) and the EIA. Categorization of projects for IEE and EIA is one of the main components of the Regulations. Projects have been classified on the basis of expected degree of adverse environmental impacts. Project types listed in Schedule I are designated as potentially less damaging to the environment, and those listed in Schedule II as having potentially serious adverse effects. Schedule I projects require an IEE to be conducted, provided they are not located in environmentally sensitive areas. For the Schedule II projects, conducting an EIA is necessary.

The proposed project falls under the Schedule II of the Regulations.

2.1.3. National Environmental Quality Standards

The National Environmental Quality Standards (NEQS), promulgated under the PEPA 1997, specify the following standards:

- Maximum allowable concentration of pollutants in gaseous emissions from industrial sources,

- Maximum allowable concentration of pollutants in municipal and liquid industrial effluents discharged to inland waters, sewage treatment and sea (three separate set of numbers).
- Maximum allowable emissions from motor vehicles.
- Ambient air quality standards.
- Drinking water standards
- Noise standards.

The above NEQS's are presented in **Tables B.1** to **B.6** in **Annex B**. Some of these standards will be applicable to the gaseous emissions and liquid effluents discharged to the environment as well as noise generation from the activities under the proposed project.

2.1.4. Hospital Waste Management Rules, 2005

Under these Rules, every hospital[6] is responsible for proper management of waste generated by it till its final disposal in accordance with provisions given in these Rules. The Rules require each healthcare facility to constitute a waste management team, and to prepare and implement a waste management plan. The Rules also include guidelines for waste segregation, collection, transportation, storage, and disposal.

These Rules will be applicable to the proposed project.

2.1.5. Land Acquisition Act, 1894

The Land Acquisition Act (LAA) of 1894 amended from time to time has been the de-facto policy governing land acquisition and compensation in the country. The LAA is the most commonly used law for acquisition of land and other properties for development projects. It comprises of 55 sections pertaining to area notifications and surveys, acquisition, compensation and apportionment awards and disputes resolution, penalties and exemptions.

No land acquisition is envisaged under the proposed project.

6 Hospital, as defined in the Rules, includes a clinic, laboratory, dispensary, pharmacy, nursing home, health unit, maternity center, blood bank, autopsy center, mortuary, research institute, veterinary institute, and any other facility involved in healthcare and/or biomedical activities.

2.1.6. Punjab Wildlife (Protection, Preservation, Conservation and Management) Act, 1974

This law has been enacted to protect the province's wildlife resources directly and other natural resources indirectly. It classifies wildlife by degree of protection, ie, animals that may be hunted on a permit or special license, and species that are protected and cannot be hunted under any circumstances. The Act specifies restrictions on hunting and trade in animals, trophies, or meat. The Act also defines various categories of wildlife protected areas, ie, National Parks, Wildlife Sanctuaries and Game Reserve.

This Act is not likely to be applicable for the proposed project since most of the project activities will be confined to the existing healthcare facilities which are usually located within urban areas/communities. However it will be ensured that no facility expansion or waste disposal is carried out inside any wildlife protected areas.

2.1.7. Forest Act, 1927

The Act authorizes Provincial Forest Departments to establish forest reserves and protected forests. The Act prohibits any person to set fire in the forest, quarry stone, remove any forest-produce or cause any damage to the forest by cutting trees or clearing up area for cultivation or any other purpose.

Much like the Punjab Wildlife Act described above, the Forest Act is also not likely to be applicable for the proposed project. No project activities will however be carried out in any protected forests, and no unauthorized tree cutting will be carried out for any facility expansion or waste disposal.

2.1.8. Punjab Local Government Ordinance, 2012

This ordinance, which is based upon the Punjab Local Government Ordinance of 2001 promulgated under the devolution plan, defines the roles of the district governments and also addresses the land use, conservation of natural vegetation, air, water and land pollution, disposal of solid waste and wastewater effluents, as well as matters relating to public health – aspects that are relevant to the proposed project.

2.1.9. Antiquity Act, 1975

The Antiquities Act of 1975 ensures the protection of cultural resources in Pakistan. The Act is designed to protect 'antiquities' from destruction, theft, negligence, unlawful excavation, trade and export. Antiquities have been defined in the Act as ancient products of human activity, historical sites, or sites of anthropological or

cultural interest, and national monuments. The law prohibits new construction in the proximity of a protected antiquity and empowers the Government of Pakistan to prohibit excavation in any area that may contain articles of archaeological significance.

Under this Act, the project proponents are obligated to:

- Ensure that no activity is undertaken in the proximity of a protected antiquity, and
- If during the course of the project an archaeological discovery is made, it will be protected and reported to the Department of Archaeology, Government of Pakistan, for further action.

This Act will be applicable in case of discovery of any antiquities during facility expansion or waste disposal as part of the proposed project. The 'chance find' procedures will be in place for this purpose.

2.1.10. Factories Act, 1934

The clauses relevant to the proposed project are those that address the health, safety and welfare of the workers, disposal of solid waste and effluents, and damage to private and public property. The Act also provides regulations for handling and disposing toxic and hazardous substances. The Pakistan Environmental Protection Act of 1997 (discussed above), supersedes parts of this Act pertaining to environment and environmental degradation.

2.1.11. Employment of Child Act, 1991

Article 11(3) of the Constitution of Pakistan prohibits employment of children below the age of 14 years in any factory, mines or any other hazardous employment. In accordance with this Article, the Employment of Child Act (ECA) 1991 disallows the child labour in the country. The ECA defines a child to mean a person who has not completed his/her fourteenth years of age. The ECA states that no child shall be employed or permitted to work in any of the occupation set forth in the ECA (such as transport sector, railways, construction, and ports) or in any workshop wherein any of the processes defined in the Act is carried out. The processes defined in the Act include carpet weaving, *biri* (kind of a cigarette) making, cement manufacturing, textile, construction and others).

The project proponent and their contractors will be bound by the ECA to disallow any child labour at the project sites/facilities.

2.1.12. Pakistan Penal Code, 1860

The Code deals with the offences where public or private property or human lives are affected due to intentional or accidental misconduct of an individual or organization. The Code also addresses control of noise, noxious emissions and disposal of effluents. Most of the environmental aspects of the Code have been superseded by the Pakistan Environmental Protection Act, 1997.

2.1.13. Acts Governing Healthcare Services

The following laws govern various aspects of the healthcare services in the Province:

- Public Health (Emergency Provisions) Ordinance, 1944
- West Pakistan Epidemic Diseases Act, 1958
- Punjab Vaccination Ordinance, 1958
- Punjab Juvenile Smoking Ordinance, 1959
- Punjab Prohibition of Smoking in Cinema Houses Ordinance, 1960
- Punjab Pure Food Ordinance, 1960
- Eye Surgery (Restriction) Ordinance, 1960
- Pakistan College of Physician & Surgeons Ordinance, 1962
- Medical and Dental Council Ordinance, 1962
- Allopathic System (Prevention of Misuse) Ordinance, 1962
- *Unani*, *Ayurvedic* and Homoeopathic Practitioners Act, 1965
- Pharmacy Act, 1967
- Medical Colleges (Governing Bodies) (Punjab Repeal) Ordinance, 1970
- Pakistan Nursing Council Act, 1973
- Drugs Act, 1976
- Medical and Dental Degrees Ordinance, 1982
- Punjab Health Foundation Act, 1992
- Punjab Transfusion of Safe Blood Ordinance, 1999
- Mental Health Ordinance for Pakistan, 2001
- University Of Health Sciences Lahore Ordinance, 2002

- Prohibition of Smoking and Protection of Non-Smokers Health Ordinance, 2002
- Protection of Breast-Feeding and Child Nutrition Ordinance, 2002
- Punjab Medical and Health Institutions Act, 2003
- Injured Persons (Medical Aid) Act, 2004
- King Edward Medical University Lahore Act, 2005
- Transplantation of Human Organs and Tissues Act, 2010
- Punjab Healthcare Commission Act, 2010.

However the above laws have a limited relevance for the environmental and waste management aspects.

2.2. Punjab Health Sector Strategy (Draft)

The Punjab Government is committed to the principle of universal health care for all members of the society - combining mechanisms for health financing and service provision - and improving the health status of the population. Punjab Health Sector Strategy is designed to pull together the big strands of work that will help make Punjab a healthier place to live in years to come. The Strategy will support the Department of Health (DoH) to progress further with a sense of direction, purpose and urgency by prioritizing policy related interventions consistent with availability of financial resources.

The Strategy is the outcome of a great deal of thinking, debate, evidence gathering and consultation across a wide range of stakeholders including governmental departments, health managers, service providers, private sector organisations, NGOs, development partners, individuals and local communities. This has been accompanied by national and international experience and evidence, as there are many interventions from which we can learn a great deal.

The Strategy attempts to address the key challenges faced by the Province relating to the health care. These include challenges in service delivery, efficient health sector governance and accountability, availability of adequate health workforce, Health Information Systems, Essential Drugs and Medical Technologies, and Healthcare Financing.

2.3. The World Bank Operational Policies

The WB Operating Policies (OPs) and Bank Procedures (BPs) relevant to the proposed project are discussed in the following sections.

2.3.1. Environmental Assessment (OP 4.01)

The World Bank requires environmental assessment (EA) of projects proposed for Bank financing to help ensure that they are environmentally sound and sustainable, and thus to improve decision making.[7] The OP defines the EA process and various types of the EA instruments.

The proposed project consists of activities which have environmental and social consequences, including:

- Health hazards associated with handling of medical waste for the workers at the healthcare facilities
- Health hazards associated with improper disposal of medical waste for the nearby communities
- Deterioration of air quality,
- Water contamination and consumption,
- Safety hazard.

Since none of the potential impacts of the project are likely to be large scale, unprecedented and/or irreversible, the project has been classified as Category B, in accordance with OP 4.01. Furthermore, the present study has been carried out in accordance with this OP, to identify the extent and consequences of these impacts, and to develop an environmental and medical waste management plan for their mitigation.

2.3.2. Involuntary Resettlement (OP 4.12)

The WB's experience indicates that involuntary resettlement under development projects, if unmitigated, often gives rise to severe economic, social, and environmental risks: production systems are dismantled; people face impoverishment when their productive assets or income sources are lost; people are relocated to environments where their productive skills may be less applicable and the competition for resources greater; community institutions and social networks are

[7] Excerpts from WB OP 4.12. WB Operational Manual. January 1999.

weakened; kin groups are dispersed; and cultural identity, traditional authority, and the potential for mutual help are diminished or lost. This policy includes safeguards to address and mitigate these impoverishment risks. [8]

The overall objectives of the Policy are given below.

- Involuntary resettlement will be avoided where feasible, or minimized, exploring all viable alternative project designs.
- Where it is not feasible to avoid resettlement, resettlement activities will be conceived and executed as sustainable development programs, providing sufficient investment resources to enable the persons displaced by the project to share in project benefits. Displaced persons will be meaningfully consulted and will have opportunities to participate in planning and implementing resettlement programs.
- Displaced persons will be assisted in their efforts to improve their livelihoods and standards of living or at least to restore them, in real terms, to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.

The project activities are not likely to cause any land acquisition or involuntary resettlement, therefore this OP is not triggered.

2.3.3. Natural Habitat (OP 4.04)

The conservation of natural habitats, like other measures that protect and enhance the environment, is essential for long-term sustainable development. The Bank therefore supports the protection, maintenance, and rehabilitation of natural habitats and their functions … [9]

All of the proposed project components would be located in areas where the natural habitat has already been significantly modified, as a result of human habitation and associated activities. Therefore the OP 4.04 is not triggered for the proposed project.

2.3.4. Forestry (OP 4.36)

The objective of this Policy is to assist the WB's borrowers to harness the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into

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[8] Excerpts from WB OP 4.12. WB Operational Manual. December 2001.

[9] Excerpts from WB OP 4.04. WB Operational Manual. June 2001.

sustainable economic development, and protect the vital local and global environmental services and values of forests.

None of the project components would be located inside any forested areas. Hence the OP 4.36 is not triggered.

2.3.5. Pest Management (OP 4.09)

Through this OP, the WB supports a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides (and fertilizers).

This OP is not relevant for the proposed project since none of the proposed activities will involve purchasing, handling, or using pesticides or fertilizers.

2.3.6. Safety of Dams (OP 4.37)

The Policy seeks to ensure that appropriate measures are taken and sufficient resources provided for the safety of dams the WB finances. However this OP is not relevant since the proposed project does not involve construction of dams.

2.3.7. Projects on International Waterways (OP 7.50)

This OP defines the procedure to be followed for projects the WB finances that are located on any water body that forms a boundary between, or flows through two or more states. This OP is not triggered since waterways are not relevant to the proposed project.

2.3.8. Cultural Property (OP 4.11)

The World Bank's general policy regarding cultural properties is to assist in their preservation, and to seek to avoid their elimination. The specific aspects of the Policy are given below. [10]

- The Bank normally declines to finance projects that will significantly damage non-replicable cultural property, and will assist only those projects that are sited or designed so as to prevent such damage.
- The Bank will assist in the protection and enhancement of cultural properties encountered in Bank-financed projects, rather than leaving that protection to chance. In some cases, the project is best relocated in order that sites and

[10] Excerpts from the OPN 11.03. WB Operational Manual. September 1986.

structures can be preserved, studied, and restored intact in situ. In other cases, structures can be relocated, preserved, studied, and restored on alternate sites. Often, scientific study, selective salvage, and museum preservation before destruction is all that is necessary. Most such projects will include the training and strengthening of institutions entrusted with safeguarding a nation's cultural patrimony. Such activities will be directly included in the scope of the project, rather than being postponed for some possible future action, and the costs are to be internalized in computing overall project costs.

- Deviations from this policy may be justified only where expected project benefits are great, and the loss of or damage to cultural property is judged by competent authorities to be unavoidable, minor, or otherwise acceptable. Specific details of the justification will be discussed in project documents.
- This policy pertains to any project in which the Bank is involved, irrespective of whether the Bank is itself financing the part of the project that may affect cultural property.

Since the project activities will be carried out in inhabited areas, it is unlikely that any sites of cultural, archaeological, historical, or religious significance will be affected. However, in case of discovery of any such sites or artefacts during the project implementation, the work will be stopped at that site and the provisions of this Policy will be followed. Additionally, the provincial and federal archaeological departments will be notified immediately, and their advice sought before resumption of the construction activities at such sites.

2.3.9. Indigenous People (OP 4.10)

For purposes of this policy, the term "Indigenous Peoples" is used in a generic sense to refer to a distinct, vulnerable, social and cultural group possessing the following characteristics in varying degrees:[11]

- self-identification as members of a distinct indigenous cultural group and recognition of this identity by others;
- collective attachment to geographically distinct habitats or ancestral territories in the project area and to the natural resources in these habitats and territories;

[11] Excerpts from the OP 4.10. WB Operational Manual. July 2005.

- customary cultural, economic, social, or political institutions that are separate from those of the dominant society and culture; and
- an indigenous language, often different from the official language of the country or region.

The OP defines the process to be followed if the project affects the indigenous people.

No indigenous people - with a social and cultural identity distinct from the dominant society that makes them vulnerable to being disadvantaged in the development process – are known to exist in Punjab. Therefore this OP is not triggered. However if such groups are identified during the project implementation, the proponents will develop an Indigenous People Development Plan, in compliance with the OP and get it approved by the Bank.

2.3.10. Projects in Disputed Areas (OP 7.60)

Projects in disputed areas may raise a number of delicate problems affecting relations not only between the Bank and its member countries, but also between the borrower and one or more neighbouring countries. In order not to prejudice the position of either the Bank or the countries concerned, any dispute over an area in which a proposed project is located is dealt with at the earliest possible stage. The Bank may proceed with a project in a disputed area if the governments concerned agree that, pending the settlement of the dispute, the project proposed for country A will go forward without prejudice to the claims of country B. [12]

This OP is not triggered since no part of Punjab province is located in any disputed territory.

2.3.11. Public Disclosure of Information (BP 17.50)

This BP deals with the World Bank policy on disclosure of information. It is a mandatory procedure to be followed by the borrower and Bank and supports public access to information on environmental and social aspects of projects. In accordance with this requirement, the present EMWMP will be disclosed to public.

[12] Excerpts from the OP 7.60. WB Operational Manual. November 1994.

2.3.12. Applicability of Safeguard Policies

Applicability of the WB safeguard policies – on the basis of the discussion in **Sections 2.2.1** to **2.2.10** above - with respect to the environmental and social issues associated with the proposed project is summarized below.

Operational Policy	Triggered
Environmental Assessment (OP 4.01)	Yes
Involuntary Resettlement (OP 4.12)	No
Natural Habitat (OP 4.04)	No
Forestry (OP 4.36)	No
Pest Management (OP 4.09)	No
Safety of Dams (OP 4.37)	No
Projects in International Waters (OP 7.50)	No
Cultural Property (OP 4.11)	No
Indigenous People (OP 4.10)	No
Projects in Disputed Area (7.60)	No
Public Disclosure of Information (BP 17.50)	Yes

2.4. Obligations under International Treaties

Pakistan is signatory of several Multilateral Environmental Agreements (MEAs), including:

- Basel Convention,
- Convention on Biological Diversity, Convention on Wetlands (Ramsar),
- Convention on International Trade in Endangered Species (CITES),
- UN Framework Convention on Climate Change (UNFCCC),
- Kyoto Protocol,
- Montreal Protocol,
- UN Convention to Combat Desertification,
- Convention for the Prevention of Pollution from Ships (MARPOL),

- UN Convention on the Law of Seas (LOS),
- Stockholm Convention on Persistent Organic Pollutants (POPs),
- Cartagena Protocol.

These MEAs impose requirements and restrictions of varying degrees upon the member countries, in order to meet the objectives of these agreements. However, the implementation mechanism for most of these MEAs is weak in Pakistan and institutional setup mostly non-existent.

The most applicable MEAs for the Project are Basel Convention, which addresses trans-boundary movement of hazardous wastes, and the Stockholm Convention on Persistent Organic Pollutants (POPs), under which certain chemicals such as dichloro diphenyl trichloroethane (commonly known as DDT) cannot be used.

2.5. Institutional Setup for Environmental Management

The apex environmental body in the country is the Pakistan Environmental Protection Council (PEPC), which is presided by the Chief Executive of the Country. Other bodies include the Pakistan Environmental Protection Agency (Pak-EPA), provincial EPAs (for four provinces, Azad Jammu and Kashmir. and Gilgit Baltistan), and environmental tribunals.

The EPAs were first established under the 1983 Environmental Protection Ordinance; the PEPA 1997 further strengthened their powers. The EPAs have been empowered to receive and review the environmental assessment reports (IEEs and EIAs) of the proposed projects, and provide their approval (or otherwise).

The proposed project would be located in Punjab. Hence this EMWMP will be sent to the Punjab EPA for review. In addition that Punjab EPA will also be involved during the implementation of the project for conducting inspections, monitoring and enforcement of standards/plans.

2.6. Environmental and Social Guidelines

Two sets of guidelines, the Pak-EPA's guidelines and the World Bank Environmental Guidelines are reviewed here. These guidelines address the environmental as well as social aspects.

2.6.1. Environmental Protection Agency's Environmental and Social Guidelines

The Federal EPA has prepared a set of guidelines for conducting environmental assessments. The guidelines derive from much of the existing work done by international donor agencies and non-governmental organizations (NGOs). The package of regulations, of which the guidelines form a part, includes the PEPA 1997 and the NEQS. These guidelines are listed below.

- Guidelines for the Preparation and Review of Environmental Reports,
- Guidelines for Public Consultation,
- Guidelines for Sensitive and Critical Areas,
- Sectoral Guidelines.

It is stated in the Pakistan Environmental Protection Agency Review of IEE and EIA Regulations, 2000 that the EIA or IEE must be prepared, to the extent practicable, in accordance with the Pakistan Environmental Protection Agency Environmental Guidelines.

2.6.2. World Bank Environmental and Social Guidelines

The principal World Bank publications that contain environmental and social guidelines are listed below.

- Health Care Waste Management Guidance Note
- Environment, Health, and Environment (EHS) Guidelines prepared by International Finance Corporation and World Bank in 1997.
- Pollution Prevention and Abatement Handbook 1998: Towards Cleaner Production
- Environmental Assessment Sourcebook, Volume I: Policies, Procedures, and Cross-Sectoral Issues.
- Social Analysis Sourcebook.

3. Project Description

This Chapter provides a simplified description of the proposed project.

3.1. Project Background

Pakistan needs to significantly improve its Health, Nutrition and Population (HNP) performance; otherwise the outcomes especially for the poor will remain an obstacle to its economic potential and growth. The present rate of progress is much lower than of its South Asian neighbours, and Pakistan is not on track to achieve the health-related millennium development goals (MDG) targets. There exists significant inequity in service access and utilization with little change since 1990 for the poorest and the rural population. Maternal and child health indicators have improved, but maternal mortality and fertility are still high; and only minimal progress has been made in improving nutritional outcomes of children and mothers over the last two decades, with 44 percent of children under five being stunted and 32 percent underweight, while 16 percent of pregnant women have Body Mass Index (BMI) below 18.5.

With about 60 percent of the total population, Punjab holds the key to Pakistan's progress towards attainment of the MDGs. Punjab's overall health outcomes are comparable to the national average but the pace of change remains slow and uneven with significant disparities among regions, rural-urban, and by economic status. Punjab has successfully reduced infant and child mortality over the past decade (reduction in Infant Mortality Rate (IMR) from 104 to 81) and reduction in under-five mortality from 133 to 97). The current IMR and the under-five mortality rate (U5MR) are similar to the national average but still about twice the levels of Bangladesh and Nepal. In addition, the comparison of two recent Multiple Indicator Cluster Surveys (MICS) (2003-4 and 2007-08) indicates stagnation in the reduction of child mortality. Furthermore, among four provinces the largest inequality in IMR is found in Punjab; the highest IMR is in rural Punjab at 98 per 1000 live births, and the lowest IMR in urban Punjab. Child nutrition, a key to lower early child morbidity and mortality, is in poor shape in Punjab with 34 percent of children under five moderately or severely underweight and 11 percent severely underweight. Similarly, only 57 percent of children aged 12-23 months in Punjab were fully immunized in 2008-09.

Maternal and reproductive health outcome and service indicators have shown a steady but far too slow progress. Punjab's maternal mortality ratio of 227 per 100,000 live births is somewhat lower than the national average of 276; however, only 43

percent of deliveries are assisted by skilled health personnel – 37 percent of deliveries in Punjab occur at health facilities with only 10 percent of deliveries in public facilities. In addition, still one in three pregnant women in Punjab receives no prenatal consultation. Punjab's current total fertility rate is 3.9, the lowest among Pakistan's four provinces and it also has the lowest unmet need for family planning at 23 percent, (indicating a potential to reduce fertility rates further if women could access contraceptives). However, these figures are comparable to rates in Sub-Sahara African countries and, in Asia, to rates in Nepal and Cambodia (25 percent). Furthermore, Punjab faces a concentrated epidemic of HIV/AIDS among high risk groups (sex workers, men having sex with men and injecting drug users) and a significant burden of endemic tuberculosis. The major cities in Punjab are known to have sizeable numbers of vulnerable or at risk populations for HIV/AIDS.

Punjab's slow progress in improving HNP outcomes is due to external and internal factors. Factors external to the health sector include persisting high levels of poverty mainly in the southern part of the province, low levels of education, inadequate availability of safe water and poor sanitation. Factors internal to the health sector are many and GoPb is struggling in delivering expected results to their people as performance remains less than desired due to weak management particularly at district level, lack of accountability mechanisms, low motivation of staff to perform and work in rural and remote southern districts and low public expenditure on health, even as compared to most developing countries. Provincial health expenditures increased from 0.3 percent of provincial GDP in 2000/01 to 0.5 percent in 2006/07, but have remained unchanged ever since.

The GoPb is demonstrating strong leadership in implementing reforms in health and education as it has realized that it must make progress on human development to build a productive workforce with its large and increasing share of youth. Currently, the GoPb is reviewing its health sector reform agenda, which would include contracting Basic Health Facilities to the Punjab Rural Support Program and ongoing investment for rehabilitation of health facilities. The plan would further include sector wide management and service delivery reforms to improve performance in the public sector but also would explore options to expand public-private partnerships. In addition, the DoH is in the process to reorganize itself in line with 18th Amendment to the Constitution to adapt to its enhanced role.

3.2. Project Objective

The development objective of the proposed project is to enable the GoPb to strengthen health systems and improve health services, particularly for the poor. Provision of technical and financial support through the proposed project would focus on: (a) service delivery and management reforms; (b) systems development interventions including generation and use of data for increased accountability; and (c) improved governance in the health sector and restructuring of the DoH to perform its enhanced stewardships functions in light of the 18th Amendment to the Constitution.

3.3. Project Context

The proposed project will support the implementation of the latter years of the GoPb's medium term health program 2012-2015 in the new Post-18th Amendment environment and initial years of the next phase. The GoPb's program aims for a reduction in the morbidity and mortality in most common illnesses especially among the vulnerable groups, by (a) enhanced coverage, quality and access to essential health care especially for the poor and the vulnerable and in under developed districts; and b) improved Department of Health's (DoH's) ability and systems for accountability and stewardship functions. The main pillars of the Government's strategy which is being developed are grounded in the following six building blocks of health systems development:

i) *Service Delivery*: Enhanced coverage and access to essential health care services especially for the poor and the vulnerable;

ii) *Human Resource for Health*: Improved human resource development and management;

iii) *Information*: Institutionalized evidence based decision making including managers, workers and beneficiaries to improve efficiency and effectiveness of health care delivery system;

iv) *Leadership and Governance*: Improved governance and regulations with strengthened accountability mechanisms;

v) *Health Care Financing*: Improved quality and efficiency of the sector expenditures, leading to a reduction in OOP; and

vi) *Health technologies*: Improved availability of medical products and use of health technologies.

The proposed project will use a Sector Wide Approach (SWAp) financed through a Sector Investment and Maintenance Loan (SIM) using a results-based financing mechanism, or possibly a P4R if the proposed new instrument is approved. The

project design will be based on the GoPb's strategic sectoral plan with a robust results framework and well defined qualitative and quantitative targets. The Bank anticipates providing in IDA funding USD135 million over a five year period to this program, accompanied by support from the Banks Health Results Innovation Trust Fund (USD 15 million) and co-financing from DFID (USD 100 million).

3.4. Project Components

The project will support the GoPb's program under the following three components:

Component I – Improving Health Services (US$150 million). The objective of this Component is to enhance coverage, quality and access to a package of essential health care services, especially for the poor and in underdeveloped districts of the province. The component will focus on districts mostly in the southern part of the province, where the health outcomes are lagging. The package will include the following services: neonatal, child, and maternal health, family planning, nutrition, and communicable diseases control. Primary Health care will be reorganized with expansion of 24/7 Comprehensive Emergency Obstetric Care (EMOC) services in all Rural Health Centres (RHCs) and selected Basic Health Units (BHUs). The following approaches will be used:

a) Contracting out model - management of all RHCs and BHUs in at least 15 districts with contracted management organizations responsible for health facilities including provision of preventive and primary health care to the catchment area population under a results-based contract linked to achieving district-wide annual performance targets for outputs;

b) Contracting in model - Strengthening the district health leadership in poor performing districts by deploying competitively selected managers through an internal or external selection process under performance based contracts; and

c) District Partnership model - Strengthening current district health management model with a focus on delivering better results. In addition, the component will support improvement of quality of secondary care services in the province through analytical work.

The component will also support specialized provision of preventive, treatment and care services for population subgroups vulnerable to HIV infection (IDUs, MSM and sex workers) in targeted cities.

Component II - Strengthening Governance and Management Systems (US$85 million). The objective of this Component will be to strengthen systems to enhance accountability and improve service delivery performance. This component will focus on the following two strategic areas:

a) Enhancing governance and accountability mechanisms including: i) Functional/capability review, organizational restructuring; ii) Regulatory and legislative reforms including operationalization of the Punjab Health Commission; and iii) strengthening social accountability through empowerment of communities/people by third part validation of results through Regular Health Facility Assessments and household survey; data dissemination for greater accountability; community-based monitoring/auditing using modern technologies; and facilitating development of public health surveillance system; the establishment of effective complaints mechanisms; and third party monitoring and auditing of performance and results.

b) Strengthening the DoH's management systems including: i) Human resource (HR) management systems focusing on development of HR strategy, establishment of HR cell, and separation of management cadre from the general cadre; ii) Strengthening evidence based decision making with a robust (internal and external) monitoring and evaluation (M&E) system to measure and disseminate results concurrently improving quality, through third party validation and use of data from District Health Information System; and iii) Improving procurement systems in the health sector through implementation of Public Procurement Regulatory Authority reforms.

Component III: Improving the Capacities in Technical Areas for Equitable Health Services to All (US$15 million). This component will support strengthening of existing analytical capacities in technical areas and health care financing and operational research, training. Health care financing aspect will focus on improving quality and efficiency of the sector expenditures, focusing on reducing OOP; enhancing public expenditures on primary and preventive service provision, exploring other models to finance hospital care, increasing non-salary expenditures, and piloting alternative financing models including health insurance/social protection.

3.5. Project Implementation Arrangements

The Planning and Development Board will be responsible for overall coordination of the reform program and will provide strategic guidance and enabling support for the project. The proposed project will be implemented through the provincial Department

of Health. Within the Department, the Health Sector Reform Unit (HSRU) will be responsible for coordination, monitoring and evaluation and management of reforms. In technical areas the Directorate General of Health Services office will take lead. The Department will rely heavily on the district level Departments of Health for implementation and regular monitoring and supervision. Implementation challenges are present at the district and sub-district level. The project will thus support measures to improve the capacity of both provincial and district managers for effective implementation. A reorganization of the Department of Health by technical and administrative functions is being looked into and as the new organizational structure becomes reality, the implementing units will be adjusted accordingly during the preparation phase.

3.6. Definition of Healthcare Waste Types[13]

Types of Healthcare Waste

Healthcare waste (HCW): The total waste stream from healthcare facilities, research facilities, and laboratories. HCW can be divided into municipal solid waste and special healthcare waste.

- ***No risk healthcare waste*** includes all waste comparable to domestic waste, such as packaging materials, non-infectious bedding, building rubble/demolition waste, hotel function waste (household, kitchen, administration), and other such wastes generated from patient wards and other patient care not related to medical care.

- ***Special healthcare waste*** always needs special attention and includes:

Sharps**:** All sharp objects that could cause a cut or puncture (whether infectious or not) including hypodermic needles, suture needles, injector tips, scalpels, lancets, knives, blades, razors, pipettes, and broken glass (non-exhaustive list).

Pathological waste: Body tissues, organs, body parts, human fetuses, animal carcasses, liquid waste blood, plasma, coagulated factors, and body fluids.

Redundant potential infectious waste**:** Disposable items contaminated with excreta, dressings, gowns, and gloves; containers with blood products, I.V. tubing,

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[13] Source: Health Care Waste Management Guidance Note. Lars M. Johannessen, Marleen Dijkman, Carl Bartone, David Hanrahan, M. Gabriela Boyer, Candace Chandra. Health, Nutrition and Population (HNP) Discussion Paper. World Bank, May 2000.

emptied peripheral dialysis fluid bags, intravascular access devices introducers, culture dishes, microbiological slides and cover slips, test tubes, vials, and vacutainers.

***Hazardous chemical waste*:** Any substance, liquid or solid, with at least one of the following properties: explosive, flammable, toxic, corrosive, locally chafing, reactive or genotoxic (carcinogenic, mutagenic, teratogenic) including cytotoxic drugs. Also, all containers contaminated by these substances.

***Pharmaceutical waste*:** All pharmaceutical products, drugs, drug residuals and therapeutic chemicals that have been returned from wards; have been spilled; are outdated, contaminated, or are to be discharged because they are no longer required. Particular attention will be given to these wastes in the segregation process, as they may otherwise be resold by waste pickers.

***Radioactive waste**:* Solids, liquids and gaseous waste contaminated with radio-nuclides. This type of waste is generated from in vitro analysis of body tissues and fluids, in vivo body organ imaging and tumor localization, and investigative and therapeutic procedures.

Pressurized containers: Containers holding gases used for anesthesia, oxygen delivery, or cleaning mechanisms. These can include gas cylinders, cartridges, and disposable aerosol cans. The most common types of gas are: ethylene oxide, oxygen, and compressed air.

WHO Definition for Special HCW [14]

Health Care Waste is defined as the total waste stream from a health care establishment, research facilities, laboratories, and emergency relief donations. HCW includes several different waste streams, some of which require more stringent care and disposal:

1. **Communal Waste** is all solid waste **not** including infectious, chemical, or radioactive waste. This waste stream can include items such as packaging materials and office supplies. Generally, this stream can be disposed of in a communal landfill or other such arrangement. Segregation of materials which are able to be reused or recycled will greatly reduce the impact burden of this waste stream.

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[14] Safe Management of Wastes from Health-Care Activities, WHO, 1999.

2. **Special Waste** consists of several different subcategories:

- *Infectious*: Discarded materials from health-care activities on humans or animals which have the potential of transmitting infectious agents to humans. These include discarded materials or equipment from the diagnosis, treatment and prevention of disease, assessment of health status or identification purposes, that have been in contact with blood and its derivatives, tissues, tissue fluids or excreta, or wastes from infection isolation wards. Such wastes shall include, but are not limited to, cultures and stocks; tissues; dressings, swabs or other items soaked with blood; syringe needles; scalpels; diapers; blood bags. Incontinence material from nursing homes, home treatment or from specialized health-care establishments which do not routinely treat infectious diseases (e.g. psychiatric clinics) is an exception to this definition and are is not considered as infectious health-care waste. Sharps, whether contaminated or not, will be considered as a subgroup of infectious health-care waste. These include syringe, needles, scalpels, infusion sets, knives, blades, and broken glass.
- *Anatomic:* consists of recognizable body parts.
- *Pharmaceutical:* Consisting of/or containing pharmaceuticals, including: expired, no longer needed; containers and/or packaging, items contaminated by or containing pharmaceuticals (bottles, boxes).
- *Genotoxic:* Consisting of, or containing substances with genotoxic properties, including cytotoxic and antineoplasic drugs; genotoxic chemicals.
- *Chemical:* Consisting of, or containing chemical substances, including: laboratory chemicals; film developer; disinfectants expired or no longer needed; solvents, cleaning agents and others.
- *Heavy Metals:* Consisting of both materials and equipment with heavy metals and derivatives, including: batteries, thermometers, manometers.
- *Pressurized containers:* Consisting of full or empty containers with pressurized liquids, gas, or powdered materials, including gas containers and aerosol cans.
- *Radioactive materials:* Includes: unused liquids from radiotherapy or laboratory research; contaminated glassware, packages or absorbent paper; urine and excreta from patients treated or tested with unsealed radio-nuclides; sealed sources.

4. Current Situation Assessment

This Chapter describes – separately on the basis of secondary sources and field investigations carried out as part of the current assignment - the prevailing situation of the healthcare facilities with respect to the environmental and waste management aspects.

4.1. MWM Practices in Pakistan - Literature Review

A comprehensive survey[15] was conducted in May 2007 in all four provinces, Azad Jammu and Kashmir, and Federal capital area. Overall fourteen health care establishments from each respective provinces/areas were included in the survey. One tertiary care hospital in public and private sectors, two secondary care hospitals in both public and private sectors and four first level care hospitals in both public and private sectors were surveyed. A total of 78 health care facilities were studied and data collected.

Out of 78 health care facilities visited, 28 percent were large hospitals (more than 100 beds), 10 percent medium sized hospitals (50-100 beds) and 23 percent small size hospitals (<50 beds). Thirty four percent facilities had out patients department (OPD) only. Of the total, 24 percent were tertiary care hospitals and 27 percent secondary care and 41 percent primary care hospitals or facilities. These included both the public and private sector health care facilities.

Thirty percent of hospitals surveyed had Health Care Waste Management (HCWM) teams or Infection Control Teams in place. Forty one percent had the guidelines or internal rules of the health care waste management while only 27 percent had the plan for healthcare waste management (HCWM) and of these, only 12 percent were applying the program for assessing the HCW. Twenty three percent of the hospitals had regular training programs on the HCWM, and a similar percentage had received training on HCWM. About 67 percent of staff were aware about the hazards of HCW and its associated risk factors. Routine health surveillance for the staff was available in only 22 percent facilities and reporting system existed in only 33 percent.

About 19 percent of hospitals did not have any kind of segregation of the hospital waste while in 27 percent sharps were segregated and at 21 percent sites infectious

[15] Hospital Waste Management in Pakistan. Fazli Hakim Khattak, Planning Commission, Government of Pakistan, Islamabad. 2009.

waste was separated from the sharps. Radioactive, pharmaceutical, anatomical and chemical waste was also separated in 3-11 percent hospitals. Separate containers for infectious and non infectious wastes were used in 48 percent of health care facilities and of these 32 percent were using properly labeled or color coded containers. Proper labeling/color coding was seen in only 5 percent wards, 8 percent operation theatres separately and 31 percent each in theatres and wards and only for 1 percent in OPDs.

The knowledge about HCW did not exist at all in 67 percent and 18 percent of the respondents did not have that much knowledge. In 30 percent of the facilities, highly infectious waste from laboratories was segregated and handled separately. Syringe and needles were treated by needle removers and needle cutters in 74 percent facilities.

Different types of containers were used in the health care facilities wherever a concept of minimal segregation exists. The simple plastic boxes were used in 47 percent facilities for sharps, while yellow color coded ones were used in 5 percent. Sharps were thrown in ordinary dustbins in 28 percent facilities and in card board boxes in 5 percent. In 15 percent facilities, no special handling for sharps was done. For segregation of waste, 39 percent were using plastic boxes, 33 percent dustbins, and 6 percent were using containers made of steel while 22 percent were not using any kind of containers for segregation of waste. Dedicated trolleys for internal transportation of the HCW bags were present in only 37 percent facilities. In 46 percent health care facilities, the waste handlers were provided with some kind of protective material and clothing.

Regarding temporary storage areas within the health care facilities, 45 percent of the facilities had temporary storage areas while 46 percent also had a central storage area. At temporary storage areas 31 percent were separating the general and hazardous wastes while in the central storage areas 33 percent were segregating the waste. The central storage areas in 35 percent of the facilities had closed doors and 27 percent had ceiling. About 30 percent facilities were washed periodically and only 6 percent were refrigerated. Easy access was present in 41 percent facilities which had central storage facilities. For onsite transportation, trolleys were used in 36 percent and two wheel bin containers in 22 percent. For off-site transportation, municipality vehicles were used in 50 percent while dedicated vehicles were used in 18 percent facilities.

No onsite treatment of hospital waste was performed in 60 percent of the facilities. Open fire was employed in 17 percent, incinerators in 18 percent and chemical disinfection in 1 percent. The disposal of treated or un-treated HCW in majority (66 percent) was done in municipal dumping sites. Mostly, the bags containing the HCW were thrown without proper burial (33 percent) or were buried along with the municipal waste (36 percent). Only small number of the facilities (11 percent) was keeping a record of the arrangements of waste disposal.

Most of the patients (77 percent) were using toilets at the health care facilities where the sewerage system in most of the instances (55 percent) led to open water source and only some (19 percent) went through the wastewater treatment plants and 8 percent to the septic tanks.

The study findings are summarized in the table below.

Table 4.1: Summary of Findings

Presence of HCWM Team or Infection Control Team	30 % of hospital surveyed
Presence of guidelines or internal rules of the health care waste management	40 % of hospital surveyed
Presence of plan for HCWM	27 % of hospital surveyed
Presence of program to assess HCWM	12 % of hospital surveyed
Regular trainings on HCWM	23 % of hospital surveyed
Awareness about the hazards of HCW	67 % of staff surveyed
Routine health surveillance for the staff	22 % of hospitals surveyed
No segregation for HCW	19 % of hospitals surveyed
Segregation of sharps	27 % of hospitals surveyed
Segregation of sharps from infectious waste	21 % of hospitals surveyed
Presence of separate containers for infectious and non-infectious waste	48 % of hospitals surveyed
Presence of properly color coded and labeled containers	32 % of hospitals surveyed

Presence of properly color coding and labeling	5 % of wards surveyed
Presence of properly color coding and labeling	8 % of operation theatres
Presence of simple plastic boxes for sharps	47 % of hospitals surveyed
Presence of yellow color coded boxes	5 % of hospitals surveyed
Practice of throwing sharps in ordinary dustbins	28 % of hospitals surveyed
Using plastic boxes for waste segregation	39 % of hospitals surveyed
Using dust bins for waste segregation	33 % of hospitals surveyed
Using metal containers for waste segregation	6 % of hospitals surveyed

Another study from Lahore highlighted that majority (85.5 percent) of sweepers were aware of the fact that job is harmful for their health however they have to continue it for economic reasons. About 71 percent sweepers did not use any protective covering and thought that only rich nations take such measures. Most of the employee did not understand the meaning of "training" and only 14.5 percent employee were trained by the hospital authorities. The most dreadful aspect of hospital waste management was that hospital management did not take precautions for waste disposal as told by the sweepers. Majority (76.4 percent) of the sweeper said that hospital waste is directly thrown into the waste bins and 23.6 percent said that the part of the waste gets incinerated and rest gets recycled. Thus the study findings suggests that disposal system of solid waste is not efficient and workforce engaged in its disposal is ignorant of risk involved and doing the job due to worst socio-economic state.[16.]

In another rapid assessment[17] carried out by the National Program for Prevention and Control of Hepatitis in 2006 involving 39 health facilities of various levels, it was found that 94 percent of the facilities had no arrangements for solid hospital waste management, 21 percent facilities could not give the estimated amount of waste

[16] Hospital Waste Management in Pakistan. Fazli Hakim Khattak, Planning Commission, Government of Pakistan, Islamabad. 2009.

[17] Ibid.

generated by them. Written protocols and procedures were not available in any of the visited facility but hospital staff was however; interested in training on the waste management.

A direct observational study conducted in year 2001 in a tertiary care hospital at Rawalpindi also observed that the hospital waste was neither properly segregated nor transported or disposed in scientific manner, thereby posing immense risk to patients, staff and even to public. Laboratory waste collected in the ordinary dust bins and emptied into open trolley and transported to open dumpsite within the hospital. Solid waste from wards and other sources was dumped in the open area within the hospital ground and removed sporadically by the municipality. Untreated liquid waste was disposed in the sewerage system.

According to another study,[18] segregation was not properly followed, in almost all of the nine allied public and private hospitals, as per WHO guidelines on HCWM, and Pakistan Biosafety Rules 2005 which recommend that hospital waste be separated in distinct groups with regard to the requirements of disposal and treatment.

Very few of the hospital departments were applying proper waste management practices. They were not fully aware of proper segregation at the point of collection. Primarily they lacked proper segregation and infection control practices. Contents aimed for various coloured baskets were found to be mixed in one container. General waste collected from each facility was dumped along with municipal solid waste for further disposal. Only the Combined Treatment Facility (CTF) practiced proper waste collection coded bins for disposal of waste.

Participants acknowledged that waste segregation issues were due to lack of training of medical and other staff including sweepers and ward servants. Hospital staff especially medical doctors were not following the proper steps during primary segregation of the waste because they were not interested, cooperative and complying with the procedures. The administration was least interested in directing staff to segregate the waste and there was no proper supervision for waste management practices in all of the hospitals.

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[18] Healthcare Waste Management (HCWM) In Pakistan: Current Situation And Training Options; Ramesh Kumar, Ejaz Ahmad Khan, Jamil Ahmed, Zulifiqar Khan, Mohamed Magan, Nousheen, Muhammad Ibrahim Mughal. Ayub Medical College, Abbottabad; 2010.

There were no proper waste collecting bins, and if there were any, they were insufficient in number. Majority of the public and private hospitals were not maintaining appropriate shifting of waste from smaller bins to large containers. They were also not using the plastic bags to line the bins.

The private sector hospitals were not practicing the needle cutter techniques. However four public sector hospitals were using the technique of needle cutter and the trainees were fully aware on the practical use of the needle cutters. Resource constraints were the main reason behind unavailability and lack of use of the needle cutters or safety boxes. At some places syringes were being cut together in leisure time but not as a sole responsibility of the medical staff that produced them. Therefore a large portion of syringes along with other plastic refuse was not transported to the CTF. This practice when explored further revealed that the practice led to pilferage of used syringes and sharps to the black market.

There was no proper availability of trolleys and colour coded bags for waste transport in both private and public sector hospitals. The waste was being collected in open trolleys once a day in the morning without using the proper standard operating procedures of waste transport to CTF for treatment and disposal.

The private hospitals did not have permanent vehicles for transporting the waste to the CTF hence they were using different kinds of locally used transport for this purpose. This also posed risk to the general public as the waste remained exposed during shifting to the CTF. In most government hospitals the transport mechanism was also lacking and they were using other vehicles such as ambulances for transporting the waste.

Another important reason behind poor HCWM in both private and public hospitals was reported to be poor remuneration paid to staff. Therefore the staff was not keen on obliging the standards of the HCWM in their departments. Majority of the staff did not consider proper and responsible waste handling as one of their important job at hospitals. For instance, doctors believed this as an extra burden on them as they only considered patient related work as their only job.

Staff in the hospitals was handling the waste without using the impervious gloves and face masks and was not aware of the potential hazards as per the WHO guidelines. This carelessness in wearing Personal Protection Equipment (PPE) was due to lack

of their intensive training. There was poor ownership by the administration regarding the PPE equipment provision to the staff in private as well as public hospitals.

The facility of incinerator was available and functional at CTF at only one public sector hospital. The others nine allied hospital were sending their waste to this hospital for final disposal. Due to the issue of segregation, the un-segregated waste from these all facilities was collected at CTF for their disposal where the waste sharps and other plastic items were separated and shredded and remaining waste were incinerated at 800 °C for a period of 6–9 hours. It was observed that the incinerator suffered damages many times due to presence of drips and vials with remains of fluid.

Observation of a few of the private hospitals also showed that they were frequently practicing open dumping of waste around their vicinities. Most hospitals were sending only infectious and biological waste to incinerator at CTF and plastic waste was usually being sold which would be later recycled. Ash generated at the incinerator unit at CTF was being dumped properly in a 4–5 feet trench for deep burial.

A total 414 hospital staff were trained in 10 public and private sector hospitals, of which five hospitals were major tertiary care settings and five were private hospitals. Additionally medical superintendent from all of the ten hospitals also participated in the trainings. About 42% trainees were females and the rest were males. They were all trained in HCWM practices.

Recycling of Medical Waste

Recycling business of healthcare waste further aggravates the health hazards of medical waste by extending and expanding the number of people exposed to this waste and the associated health hazards. According to a study[19], about 78 Percent of hospital employees surveyed reported that medical waste was being sold for profit earning. Plastic ware industry is the biggest buyer of used syringes, infusion and blood bags, plastic tubing, and other similar items. Scavenger boys, junk dealers, persons who are involved in the processing/recycling of healthcare waste and even the people using the recycled products could become victim of this heinous practice.

[19] Techno-Economic Disposal of Hospital Wastes in Pakistan. Mohammad Rafiq Khan, Fareed Fareedi, Beenish Rashid. Lahore School of Economics, Lahore. Pak J Med Res. Vol. 45, No. 2, 2006.

Most recently, the Punjab Environmental Protection Department (EPD) raided and sealed a medical waste recycling facility in Lahore. This was part of the Department's drive against such units during which four more units were also sealed.[20]

4.2. Field Observations

A rapid assessment was conducted with the help of visits to different types of healthcare facilities, and meeting with relevant stakeholders - to determine the current state of healthcare waste management in the Province. An attempt was made to cover different tiers of healthcare facilities, including large teaching hospitals, District Headquarter (DHQ) Hospitals, Tehsil Headquarter (THQ) Hospitals, Rural Health Centres (RHCs), and Basic Health Units (BHUs). During these visits, the questionnaire given in **Annex C** was used (this questionnaire can be modified in line with the tools used during the assessment of infection control initiative discussed later in the document).

Overview. Generally, the field observations confirmed the findings of the earlier studies discussed under literature review in **Section 4.1** above. Varying degree of compliance was observed to the standards such as Hospital Waste Management Rules of 2005 (discussed in **Section 2.1.4**). The awareness level regarding proper management of healthcare waste was found to be generally reasonable at the staff level, and waste segregation was carried out in most facilities. On the other hand, the final disposal of infectious waste was a major problem and in none of the facilities visited, the proper procedures and standards were completely implemented. Insufficient or no budgetary allocation was found to be one of the key reasons for poor management of infectious wastes.

Various aspects of the healthcare waste management observed during the field investigations are discussed below.

Waste Management Responsibility. Staff of all of the facilities visited were aware of the importance of proper healthcare waste management. However lack of focus and low priority resulted in inadequate budgetary allocations for waste management.

Waste Management Staff/Team. Most of the facilities visited had a designated waste management officer (WMO), and the larger facilities had also formed waste management committees. The head of the smaller facilities (MO), while a senior

[20] Source: Daily newspaper The Sun, dated 18 December 2012.

doctor in larger facilities (AMS in some cases) were designated as the WMO, supported by nurses and sanitary workers.

Waste Management Plan. Only some of the larger facilities had prepared waste management plans, while others had the Waste Management Rules of 2005 as the basic guidelines for managing waste.

Waste Segregation. Some of the facilities particularly large hospitals observed good practice in waste segregation, while others observed minimal segregation of waste. All of the facilities had colour-coded buckets, needle cutters, and safety boxes for sharps.

Waste collection and transportation. Waste collection was being done by sanitary workers and cleaners. However the use of protective clothing was lacking in most facilities. Only some of the facilities had waste collection trolleys. Use of plastic bags was observed in three facilities but others do not use bags in their waste buckets. The quality of these bags also seemed to be a problem and in some instances, these bags were found to be punctured and/or leaking. Inadequate budgetary allocation was cited to be the key reason behind no/inadequate usage of plastic bags and other non-compliance of the standards.

Waste storage. Other than one large hospital, none of the facilities had proper, central waste storage arrangements. One facility used the incinerator room for storage, while others disposed directly into the pit or with municipal waste.

Waste disposal. This was found to be by far the weakest link in the entire waste management system, and none of the facilities visited seemed to completely comply with the Hospital Waste Management Rules of 2005. Two of the facilities visited had incinerators but both are non-functional. Incineration is capital intensive and also requires trained manpower – both of these factors make it difficult for the healthcare facilities to first acquire and then properly operate and maintain the incinerators.

In smaller facilities, methods of disposal were mainly open pit/land burning within the facility premises. In some facilities, waste was collected by municipality and disposed of in landfills/garbage dumps.

Documentation. Only some of the larger facilities visited maintained record of waste generated and disposed.

Capacity building. Only in the larger hospitals, formal trainings were provided on waste management. Awareness raising posters were present in most of the facilities.

Pictures taken during site visits

Steel Sharp Cutter

Incinerator Side View

Waste Bin With Signals

Municipality Wast Collection Point 1

Wast Collection Bins

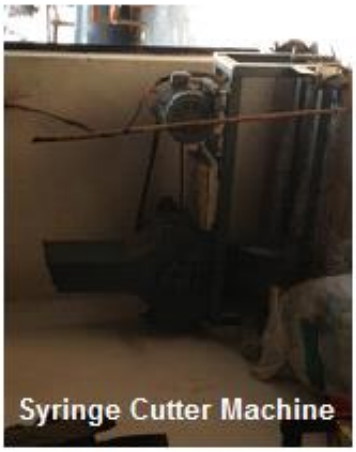
Waste Collection Buckets

Waste Buckets

Pit for Dumping Wastes

Pit Site for Burning Waste Chakwal DHQ

Wastes Bucket with Signs



Syringe Cutter Machine

Waste Bucket Chakwal DHQ

Waste Collection and Transportaion Trolly

Waste Drum-make Shift

Hygiene Managet Poster Chakwal DHQ

5. Impact Assessment and Mitigations

This Chapter identifies the potentially significant environmental impacts of the proposed activities and also recommends mitigation measures to address these impacts.

5.1. Overview [21]

Environment management in the healthcare sector comprises waste management, water and sanitation, infection control, occupational health, and safety of healthcare workers, patients, and nearby communities. Mitigation and management of these issues has an overarching impact on health service delivery by reducing the risk of infection, safety and health hazards, and providing a safe and hygienic healthcare infrastructure.

Among the environment management issues associated with the healthcare facilities, HCWM and infection control practices constitute the highest potential risk of environmental pollution and infection. While it is a challenge to collect data on direct correlation between disease burden and poor waste management and inadequate infection control practices, there is sufficient understanding and literature on the linkages and associated potential risks and hazards to the environment and human health.

The HCW includes all the waste generated by the healthcare establishment, research facilities, and laboratories. Most of the waste generated in the healthcare facilities can be treated as ordinary municipal solid waste. However, generally a small portion of the HCW requires special attention; these wastes include sharps (needles, razors, and scalpels), pathological waste, other potentially infectious waste, pharmaceutical waste, biological waste, hazardous chemical waste, and waste from microbiological laboratories.

Mismanagement of HCW poses risks to people and environment. The healthcare workers, patients, waste handlers, waste pickers, and general public are exposed to health risks from infectious waste, chemicals, and other special healthcare waste. Improper disposal of special healthcare waste, including open dumping and

[21] Adapted from Mainstreaming Environmental Management in the Health Care Sector in India – Tool-kit for Managers; Volume II. World Bank, February 2012.

uncontrolled burning, increases the risk of spreading infections and exposure to toxic emissions from uncontrolled combustion.

Proper management of HCW can minimize the risks both within and outside healthcare facility. The first priority in this respect is waste segregation, preferably at the point of waste generation. Other important steps are institution of the sharp management system, waste reduction, ensuring workers safety, providing secure method of waste collection and transportation, minimization of hazardous substances wherever possible (eg, PVC-containing products and mercury), and installing safe treatment and disposal mechanisms.

5.2. Impact Screening

Screening of the potential impacts associated with the proposed activities was carried out with the help of the matrix specifically tailored for the proposed project (see **Table 5.1**). With the help of this matrix, interaction of various project activities with various components/aspects of the environment was identified. This interaction was then categorized with respect to its severity of impacts, as follows:

- High negative impact: - 2
- Low negative impact: - 1
- Insignificant impact: 0
- No impact at all: N
- Low positive impact: + 1
- High positive impact: + 2.

With the help of the above ranking, less important/severe impacts were screened out from the ones which were more important, needing further discussion. As can be seen in **Table 5.1**, the following impacts were categorized as highly negative in severity:

- Health hazard for staff, patients, and nearby communities caused by not following infection control protocols, as well as improper waste segregation, collection, transportation, storage, and disposal.
- Safety hazards caused by various stages of improper waste management and handling of sharps, gases, autoclaves, and other similar equipment.
- Soil contamination caused by waste burial
- Air quality deterioration caused by waste burning and incineration
- Water contamination caused by waste burial and (improper) sewage disposal

The above aspects are discussed further in the following Section.

Table 5.1: Environmental Screening Matrix

Project Activities	Physical					Biological		Social and Socioeconomic											
	Soil	Air Quality	Surface Water	Groundwater	Water Availability	Natural Vegetation	Wildlife	Access	Noise	Cultivation	Livestock Grazing	Resettlement / Compensation	Safety Hazard	Employment	Infrastructure	Health Hazard for	Health Hazard for	Health Hazard for Patients	Historical/ Archeological Sites
Waste segregation	N	N	N	N	N	N	N	N	N	N	N	N	-2	0	N	0	-2	-2	N
Waste collection and transportation	N	N	N	N	N	N	N	N	N	N	N	N	-2	0	N	0	-2	-2	N
Waste storage	N	N	N	N	N	N	N	N	N	N	N	N	-2	0	N	-2	-2	0	N
Waste disposal (burial)	-2	N	-2	-1	N	N	0	N	N	N	N	N	-2	0	N	-2	-2	0	N
Waste disposal (burning)	-2	-2	-1	0	N	0	0	N	N	N	N	N	-2	0	N	-2	-2	0	N
Waste disposal (incineration)	0	-2	-1	0	N	0	0	N	N	N	N	N	-2	+1	N	-2	-2	0	N
Water supply	N	N	0	0	-2	N	N	N	N	N	N	N	0	0	N	0	-2	-2	N
Sewage disposal	N	0	-2	-2	N	N	N	N	N	N	N	N	0	0	N	-2	-2	-2	N
Renovation/Rehabilitation of facilities	-1	-1	-1	-1	-1	-1	0	-1	-1	0	0	0	-1	+2	-1	-1	-1	-1	0

Key: -2: High negative impact; -1: Low negative impact; 0: insignificant/negligible impact; +1: low positive impact; +2: High positive impact, N: no impact.

5.3. Impact Characterization and Assessment

Subsequent to the impact screening, various characteristics of the potential impacts including spatial extent (local, regional, global), nature (direct/indirect), temporal extent (temporary, permanent), reversibility, severity, and sensitivity of receptors were determined using the criteria defined in **Table A.2** of **Annex A**, while significance of impacts was assessed with the help of criteria given in **Table A.3** of **Annex A**.

The results of the impact characterization and assessment of the proposed project is given in **Table 5.2** below.

Table 5.2: Impact Characterization

Categories	*Health Hazards*	*Safety Hazards*	*Soil Contamination*	*Water Contamination*	*Air Quality Deterioration*
Nature	Direct	Direct	Direct	Indirect	Direct
Duration of impact	Long term	Long term	Long term	Long term	Long term
Geographical extent	Local	Local	Local	Local	Local
Timing	On going	On going	On going	On going	On going
Reversibility of impact	Reversible	Reversible	Reversible in long run	Reversible in long run	Reversible
Likelihood of the impact	Certain	Likely	Certain	Possibly	Likely
Impact consequence severity	Severe	Moderate to Severe	Severe	Moderate	Moderate to Severe
Significance of impact	High	Medium to High	High	Medium	Medium to High

5.3.1. Health Hazards

Potential Impacts

The health hazards for staff, patients, and nearby communities are by far the most significant potential risk associated with the healthcare facility operation. These are mostly caused by not following the infection control protocols, not using proper PPEs, and not employing proper procedures for HCW collection, transportation, storage, and final disposal.

In addition, recycling of medical waste also poses very serious health risks for the workers involved in recycling and also consumers using the recycled products.

Furthermore, contaminated/unsafe supply of drinking water can also pose health hazards for the staff and patients.

Mitigation Measures

Infection Control. The infection control protocols[22] will be strictly implemented to minimize health risks for the staff and patients.

HCWM. Proper management of HCW can minimize the risks both within and outside healthcare facilities. The first priority is to segregate wastes, preferably at the point of generation, into reusable and non-reusable, hazardous and non-hazardous components. Other important steps are the institution of a sharps management system, waste reduction, avoidance of hazardous substances whenever possible (e.g. PVC-containing products, mercury thermometers), ensuring worker safety, providing secure methods of waste collection and transportation, and installing safe treatment and disposal mechanisms.

Currently, each technology that ensures destruction or elimination of infectious and other types of special HCW potentially produces a secondary waste stream. When choosing an appropriate technology (e.g., incineration, autoclave, or microwave irradiation) for the type of HCW, the secondary waste stream and the affected population also needs to be taken into consideration. Weighing the balance of the technology (and its secondary waste stream) with the current problem (while assessing the cost benefit and available technologies) is a key point in decision-making. A comparison of different technologies and their secondary waste streams is in **Annex D**.

Quite often, successful HCW management includes several technologies within one facility. Creation of dioxins (dibenzo-p-dioxins) is of particular concern due to the possible carcinogenic nature of these compounds. Incineration can create dioxins, depending on the HCW material and the temperature (and scrubbers) of the incinerator plant. Plastics and chlorinated substances (such as dyes) can create dioxins when incinerated. Therefore, segregation of materials is vitally important.

[22] A set of 13 infection control protocols have recently been prepared under the Infection Control Management Project, National MNCH Program.

Furthermore, ensuring that the incinerator plant continually burns its materials at a temperature at or above 1200 °C will virtually eliminate dioxins from release. The following specific measures need to be implemented:

- Strict compliance of the procedures specified in the Hospital Waste Management Rules of 2005 (and other similar standards), in close coordination with the infection control protocols mentioned above.
- each healthcare facility needs to constitute a waste management team, and prepare and implement a waste management plan, and will follow prescribed guidelines/procedures for waste segregation, collection, transportation, storage, and disposal.
- Waste segregation will be carried out at the source
- Waste transportation according to the protocols defined in the Hospital Waste Management Rules.
- Waste disposal according to the various options presented in **Annex D**.
- Using all safety measures particularly PPEs for the staff handing wastes.
- Maintaining complete record of all the steps involved in HCW management on a regular basis.
- Measures to avoid and forestall any pilferage of medical waste particularly for recycling. These measures could include weighing the infectious waste at each stage of its handling till the disposal point and maintaining 'chain of custody' protocol whereby complete record is maintained for handing-over and taking-over of the medical waste with names, signatures, time and date, quantity, type, and possibly photographs. Such details will be included in the hospital waste management plan of each facility.
- Vaccination of the staff particularly for hepatitis A and B and tetanus.

Supply of safe drinking water. It will be ensured that a reliable and safe drinking water source is available at each healthcare facility. Water will be periodically tested against the national standards for drinking water (see **Section 2.1.3**).

5.3.2. Safety Hazards

Potential Impacts

Safety hazards in the healthcare facilities are generally associated with handling of sharps (needles, cutters), gases, autoclaves, and other similar equipment. Open burning of HCW also poses safety risks for the staff carrying out this activity. These hazards include risk of cuts, pricks, gas poisoning, burning, and other bodily injuries. The healthcare facility staff as well as the patients are susceptible to these safety hazards.

The construction activities for facility renovation/rehabilitation also pose safety risks for the construction workers, facility staff, as well as patients.

Mitigation Measures

Strictly following standard operating procedures to use sharps and proper use of personal protective equipment (PPE) particularly prick-proof gloves and masks is of foremost importance to avoid safety hazards associated with sharps, gases, and others. In addition, thick/puncture resistant plastic bags to collect HCW and rigid/puncture proof boxes to dispose needles/other sharps will be used.

For the facility renovation/rehabilitation/expansion activities, a site-specific Environmental Management Plan (EMP) will be prepared for each facility or a cluster of facilities. This EMP will include the site-specific mitigation measures to address safety hazards associated with the renovation/rehabilitation activities.

In addition, the IFC/WB EHS Guidelines will also be applicable to address the safety hazards discussed above. The Guidelines are presented in **Annex E**.

5.3.3. Soil Contamination

Potential Impacts

Soil contamination can be caused by the direct burial of infectious wastes within the facility premises, or at the municipal waste dumpling site if the healthcare waste is disposed along with the municipal waste. Open burning of infectious waste can also potentially cause soil contamination.

Improper sewage disposal at the healthcare facility can also contaminate soil.

Spillage of contaminated effluents such as oils and chemicals during the facility renovation/rehabilitation activities can also contaminate the soil.

Mitigation Measures

The infectious waste will be segregated from the other non-risk waste and will not be sent to the municipal waste dumping site/landfill, except where dedicated landfill for medical waste is available. If on-site burial of infectious waste is carried out, it will be done in lined pits.

The sewage from the healthcare facilities within the cities will be discharged in city sewerage, otherwise on-site treatment such as septic tank and soaking pit will be constructed according to international standards.

The EMP described earlier will include the site-specific mitigation measures to address the soil contamination caused by the renovation/rehabilitation activities.

In addition, the IFC/WB EHS Guidelines given in **Annex E** will also be applicable to address the soil contamination discussed above.

5.3.4. Water Contamination

Potential Impacts

Activities that can cause soil contamination can also cause water contamination. These include direct burial of infectious wastes within the facility premises, or at the municipal waste dumpling site if the healthcare waste is disposed along with the municipal waste. Open burning of infectious waste can also potentially cause water contamination.

Improper sewage disposal at the healthcare facility can also contaminate water resources.

Spillage of contaminated effluents such as oils and chemicals during the facility renovation/rehabilitation activities can also contaminate the water resources.

Mitigation Measures

Most of the mitigation measures to avoid soil contamination will also address the water contamination. These include lining the burial pit for infectious waste, waste segregation and not sending the infectious waste to municipal waste dumping sites, and using appropriate disposal/treatment arrangement such as septic tank for

sewage disposal. To address the water contamination that may be caused by the renovation/rehabilitation activities during the proposed project, a site specific EMP will be prepared as mentioned earlier as well.

In addition, the IFC/WB EHS Guidelines given in **Annex E** will also be applicable to address the water contamination discussed above.

5.3.5. Air Quality Deterioration

Potential Impacts

Air quality deterioration can take place by open burning of the HCW. Similarly, incineration of infectious waste can also pollute the air.

Of particular concern are dioxins which are produced by burning of the plastic and polyethylene products. The dioxins are carcinogenic and can affect the healthcare facility staff carrying out the waste burning, other nearby staff, patients, and nearby communities.

Construction activities for facility renovation/rehabilitation can also cause air quality deterioration.

Mitigation Measures

Open burning of the HCW particularly if it contains plastics/polyethylene will be avoided since it produces dioxins in addition to other toxic gases.

If infectious waste is incinerated, then it will be ensured that i) incinerators specifically designed for HCW are used; ii) properly trained staff operate the incinerators according to standard operating procedures; iii) appropriately high (more than 1200°C) temperature is achieved in the incinerator to avoid dioxin discharge; iv) the flue gases are properly treated (e.g. with the help of water scrubbers) before their release to the atmosphere; and v) there is no leakage of gases from the first chamber of the incinerator to avoid any release of dioxins before they can be destroyed in the second chamber. Furthermore, it will be ensured that the incinerator complies with the NEQS for gaseous emissions and ambient air quality (see **Section 2.1.3** for these standards).

In addition, the IFC/WB EHS Guidelines given in **Annex E** will also be applicable to address the air contamination discussed above.

6. Environmental and Medical Waste Management Plan (EMWMP)

This Chapter provides the management and implementation mechanism for the mitigation measures discussed in the previous Chapter.

6.1. Institutional Arrangements

The overall responsibility of implementing the environmental and healthcare waste management issues particularly the present EMWMP will rest with the Program Director, Punjab Health Sector Reforms Program (PHSRP). Within PHSRP, a dedicated, fulltime specialist will be appointed as the Medical Waste Management Focal Point (MWMFP). The MWMFP will maintain vertical and horizontal coordination to ensure effective implementation of the present Plan, and will be responsible for province-level monitoring, documentation, and reporting. S/he will also liaise with outside agencies, donors, and other stakeholders.

At the district level, the Executive District Officer – Health (EDO-Health) of each district will be the focal point for performing/supervising the environment and healthcare waste management functions particularly implementing the present EMWMP in the respective district. The EDO-Health will maintain coordination with the MWMFP for the implementation of the present Plan.

At the facility level, the WMO will be designated as the focal point for EMWMP implementation. The WMO will maintain coordination with the EDO-Health for the implementation of the present Plan.

The management company contracted for the operation of BHUs and RHCs will also appoint a focal point for EMWMP implementation among its staff. S/he will maintain coordination with the EDO-Health and MWMFP for the implementation of the present Plan.

Waste Management Team. In each healthcare facility, a Waste Management Team (WMT) will be constituted, and an appropriate officer designated as Waste Management Officer (WMO) in accordance with the Hospital Waste Management Rules of 2005. The WMT will be responsible for preparing and implementing Waste Management Plan (WMP) in the facility (the WMP is discussed later in the Chapter).

The roles and responsibilities of various personnel for the hospital waste management and implementation of the present Plan are summarized in **Table 6.1**.

Table 6.1: Roles and Responsibilities for EMWMP Implementation

Designation	Responsibilities
Program Director	Overall responsible for the implementation of EMWMP; Monitor and supervise MWMFP
Medical Waste Management Focal Point	Effective implementation of EMWMP; Coordination within DoH, with EDOs-Health; Coordination with EPD/EPA; Coordination with other agencies (WB, DFID, others); Visits to healthcare facilities to monitoring Plan implementation; Organizing trainings on provincial level; Producing quarterly progress reports and sharing with DoH, WB, and others.
EDO-Health of each district	Coordinate with MWMFP Coordinate with MOs and MSs/AMSs for the implementation of EMWMP Organizing trainings on district level Monthly reports to MWMFP on Plan implementation
WMO of each facility	Coordinate with EDO-Health Prepare WMP in accordance with the HWM Rules Provide monthly reports on EMWMP implementation to EDO-Health

6.2. Mitigation Plans

Two separate mitigation plans are presented in **Tables 6.2** and **6.3** below, for HCW management and facility renovation/rehabilitation/expansion, respectively. The mitigation plans describe the potential impacts and associated mitigation measures, and also assigns implementation and monitoring responsibilities.

Table 6.2: Mitigation Plan for HCWM

Activity	Potential Impact	Mitigation Measures	Responsibility	
			Mitigation	Monitoring
Waste segregation	Health and safety risks for staff and	Use of infection control protocol; Comply with Waste Management	WMO	MO/AMS; EDO (H);

Activity	Potential Impact	Mitigation Measures	Responsibility	
			Mitigation	Monitoring
	patients	Rules, 2005; Use of PPEs; Use of colour coded buckets with thick, puncture resistant plastic bags; Ensuring that bags are not punctured (disinfection of the bucket/area to be carried out in case of leakage from bags); Capacity building and training of staff including waste handlers; Awareness raising of patients and their attendants.		DMO/MEAs; MWMFP
Infectious waste collection and transportation	Health and safety risks for waste handlers	Use of infection control protocol; Comply with Waste Management Rules, 2005; Use of PPEs; Ensuring that waste bags are not opened or punctured during transportation; Ensuring that bags are not punctured (disinfection of the trolleys/area to be carried out in case of leakage from bags); Proper documentation and handover-takeover protocol along with 'chain of custody' protocol; Capacity building of staff including waste handlers; Implement measures to forestall any pilferage of medical waste for recycling.	WMO	MO/AMS; EDO (H); DMO/MEAs; MWMFP
Infectious waste storage	Health and safety risks for waste handlers	Use of infection control protocol; Comply with Waste Management Rules, 2005; Proper controlled-access storage; Ensuring that waste bags are not opened or punctured in the storage; Ensuring that bags are not punctured (disinfection of the trolleys /area to be carried out in case of leakage from bags); Use of PPEs; Weighing of waste; Proper documentation and handover-takeover protocol; Capacity building of staff including waste handlers; Security arrangements to avoid	WMO	MO/AMS; EDO (H); DMO/MEAs; MWMFP

Activity	Potential Impact	Mitigation Measures	Responsibility	
			Mitigation	Monitoring
		theft/pilferage.		
Infectious waste disposal (burial)	Health and safety risks for waste handlers, waste pickers; Soil and water contamination	Use of infection control protocol; Comply with Waste Management Rules, 2005; Use of PPEs; Proper documentation and handover-takeover protocol; Capacity building of staff including waste handlers; Using impervious lining in the pits to avoid soil and water contamination; Locating the pit at least 50 m from any water source; Using proper signage for pit location; Maintain complete record of waste disposal and pit location in each facility.	WMO	MO/AMS; EDO (H); DMO/MEAs; MWMFP
Infectious waste disposal (burning)	Health and safety risks for waste handlers; Air contamination	Use of infection control protocol; Comply with Waste Management Rules, 2005; Uncontrolled, open burning of infectious waste particularly containing plastics and PVC objects will be avoided to the extent possible; Proper documentation and handover-takeover protocol; Use of PPEs; Capacity building; Maintain complete record of waste disposal.	WMO	MO/AMS; EDO (H); DMO/MEAs; MWMFP
Infectious waste disposal (incineration)	Health and safety risks for incinerator operators and nearby communities; Air contamination.	Use of infection control protocol; Comply with Waste Management Rules, 2005; Proper documentation and handover-takeover protocol; Use properly designed for medical waste treatment, double chamber incinerators with wet scrubbers; Ensure that incineration is carried out at 1200 °C; Properly operate and maintain incinerators particularly to avoid leakage of gases from the first chamber; Ensure that dioxins are not released, and exhaust gases	WMO Or Incinerator operators if CTF is used.	MO/AMS; EDO (H); DMO/MEAs; MWMFP

Activity	Potential Impact	Mitigation Measures	Responsibility	
			Mitigation	Monitoring
		comply with NEQS; Maintain complete record of the key incinerator operation parameters (waste quantity incinerated, temperature in first chamber, temperature in second chamber, resident time, and others); Capacity building of operators; Use of PPEs.		
The above tasks with more facility-specific details will be part of the Waste Management Plan of each facility (discussed later in the Chapter)				
Non-risk waste	Contamination of soil and water, odour, proliferation of vectors (rodents, flies, others)	Non-risk waste will be disposed with the municipal waste; Proper storage arrangements (such as dumpsters) avoiding any spill-over/over-flowing; Regular transportation of waste from healthcare facility to the municipal waste disposal site.	Sanitary staff Municipality	MO/AMS; EDO (H) MEAs
Water supply	Health hazard for staff and patients	Ensure that drinking water complies with NEQS; Carry out water analysis periodically.	MO/AMS	MS; EDO (H) MEAs
Sewage disposal	Health hazard for staff and patients	Ensure that the treatment system (eg, septic tank) is properly working	MO/AMS	MS; EDO (H); MEAs

Table 6.3: Mitigation Plan for Facility Renovation/Rehabilitation

Activity	Potential Impact	Mitigation Measures	Responsibility	
			Mitigation	Monitoring
Excavation and construction	Soil erosion; Safety hazards; Noise generation	Prepare and implement site-specific EMP; Employing appropriate techniques such as stone pitching to avoid soil erosion; Using PPEs to minimize safety risks Protective fencing Use equipment with proper noise suppression (mufflers, silencers) Noise barriers if necessary	Contractor	EDO (W&S)
Material transport	Safety hazards; Noise generation; Traffic congestion	Prepare and implement site-specific EMP; Using PPEs to minimize safety risks; Enforce vehicle speed limit within	Contractor	EDO (W&S)

Activity	Potential Impact	Mitigation Measures	Responsibility	
			Mitigation	Monitoring
		the facilities; Use equipment and vehicles with proper noise suppression (mufflers, silencers); Prepare traffic management plan where necessary; Use alternate routes to minimize traffic congestion and road blockage.		
Material storage/ handling	Blockage of access routes	Prepare and implement site-specific EMP; Ensure that the construction material is stock-piled properly without causing any hindrance or blockage of roads/routes.	Contractor	EDO (W&S)
Oil/chemical storage / handling	Safety hazards Soil and water contamination	Prepare and implement site-specific EMP; Use standard practices to transport, store and handle fuels, oils, and other chemicals.	Contractor	EDO (W&S)
Site restoration	Left over construction material and scrap; Ditches or surplus soil (spoil)	Prepare and implement site-specific EMP; Remove all debris, excess construction material, scraps, and other wastes; Restore site.	Contractor	EDO (W&S)

6.3. Waste Management Plan

In accordance with the Hospital Waste Management Rules of 2005, each healthcare facility is required to prepare its facility-specific hospital waste management plan. The Plan will include:

- a plan/layout of the healthcare facility showing waste disposal points for every ward and department, indicating whether each point is for risk waste or non-risk waste, and showing the sites for central storage facility for risk waste and central storage facility/arrangements for non-risk waste
- details of the types, numbers, and estimated cost of containers, waste bags, and trolleys required annually
- timetable including frequency of waste collection from each ward and department
- duties and responsibilities of each category of healthcare facility staff involved in waste generation and management

- an estimate of number of staff required for waste management
- procedures for the management of waste requiring treatment such as autoclaving before final disposal
- Planned waste disposal sites/methods
- contingency plans for storage or disposal of risk waste in the event of breakdown of incinerators
- training courses and program on waste management
- emergency procedures.

Comprehensive documentation will be maintained for the implementation of each element of the WMP.

The waste management plan will be regularly monitored, reviewed, revised, and updated by the WMT as and when necessary.

The WMP will be prepared and implemented in close coordination with the infection control activities, in order to avoid duplication of efforts as well as gaps.

6.4. Implementation Cost of WMP

Cost estimates will be an integral part of the WMP of each facility, and these estimates will be included in the overall budget of the facility. The most important element of these estimates would be the cost of supplies and consumable items. One of the major problems being faced at the Infection Control Management Project (ICMP) piloting facilities in Mardan (further discussed later in the document) is the interruption in the supplies of these items – a situation which jeopardize the effectiveness of the entire initiative. A similar situation could be faced during the implementation of the present EMWMP. Therefore it is vitally important to ensure uninterrupted availability of these items, for the effective implementation on the WMP. Availability of these items will be included in the monitoring parameters as well.

6.5. Monitoring Plan

The purpose of environmental and waste management monitoring is to ensure that all the mitigation measures particularly WMPs are effectively implemented. To the extent possible and practical, this monitoring will be carried out in close coordination

with the similar monitoring to be carried out for the infection control protocols. Monitoring will be carried out at different tiers as discussed below.

6.5.1. Facility Level Monitoring

The facility level monitoring will be carried out with the help of mitigation plans given in **Tables 6.2** and **6.3**. The responsibility of carrying out monitoring of various tasks is also given in the same Plans. Further details of this monitoring will be included in the WMP of each facility. Monitoring checklists will be prepared on the basis of these Plans, to be filled periodically – frequency of filling these checklists will vary from once a day (eg, for waste management) to once a quarter (eg, for drinking water quality).

6.5.2. District/Provincial Level Monitoring

The district level monitoring will be carried out with the help of Monitoring and Evaluation Assistants (MEAs) who already conduct monitoring of the DoH's healthcare facilities in their respective districts. The monitoring proforma currently used by these MEAs may have to be modified to include the key parameters to be monitored per **Tables 6.2**.and **6.3**.

In addition to the above, the EDO (Health) and his/her staff will also conduct random monitoring of the EMWMP in healthcare facilities.

The HWMFP will also carry out random visits of the healthcare facilities in the Province to monitor the Plan implementation.

6.5.3. Review of Plan and Third Party Validation

The HSRU/DoH will conduct an internal review of the EMWMP implementation on an annual basis. The purpose of this review will be to determine the effectiveness and practicality of the mechanisms proposed in the present Plan to address the environmental and waste management issues associated with the healthcare facilities, and to determine improvement needs if any.

In parallel to the above, the HSRU/DoH will also commission a third party validation (TPV) of the EMWMP, on an annual basis, with a similar objective to determine the effectiveness and practicality of the mechanisms proposed in the present Plan to address the environmental and waste management issues associated with the healthcare facilities, and also to determine any improvement needs.

On the basis of the above reviews, the EMWMP may need to be revised and updated.

6.6. Capacity Building Plan

6.6.1. District/Provincial Level Capacity Building

The HSRU/DoH through the MWMFP and in coordination of the EDOs (Health) will plan and conduct training of trainers (ToT) for the selected relevant staff particularly WMT members from each district on the EMWMP implementation. The purpose of these trainings will be to prepare master trainers in each district, who after receiving these ToTs, will impart EMWMP trainings to the remaining WMT members and other relevant staff in their respective districts. The training plan will also address the frequent staff turn-over at the district and provincial levels.

HSRU/DoH will make all possible efforts to coordinate and coincide these trainings with the ones to be carried out for the Infection Control Protocols.

6.6.2. Facility Level Capacity Building

The facility-level capacity building will be an integral part of the WMP discussed in **Section 6.3** above. The capacity building plan will include details on training schedule, types of trainings, training contents, and training participants. The master trainers trained through the province/district level trainings discussed above will impart these trainings. These trainings will be coincided/combined with the ones for the infection control protocols. The training plan will also address the frequent staff turn-over at the facility level.

These trainings can be patched to a certification program so that each facility can then be legally mandated to have a certified waste management person on-site.

6.7. Documentation and Reporting

6.7.1. Facility Level Documentation

The WMP of each facility will define the facility-level documentation requirements for EMWMP implementation. The key aspects to be documented will include quantities of different categories of wastes generated/collected, treated, and disposed, disposal method, disposal location, complete record of monitoring discussed in **Section 6.5.1** above including any non-compliances observed, complete record of capacity building discussed in **Section 6.6.2**, and record of WMT meetings.

Each healthcare facility will provide EMWMP reports to the respective EDO (Health) on a monthly basis. The EMWMP aspects will be included in the reporting proforma currently being used by the healthcare facilities for this purpose.

6.7.2. District Level Documentation and Reporting

Each district through EDO (Health) will compile the District EMWMP report on a monthly basis and send it to the HSRU. The MEAs through DMOs will also send their filled checklists/data to the HSRU.

6.7.3. Province Level Documentation and Reporting

The MWMFP will compile the reports received from the EDOs (Health) and prepare overall project reports on EMWMP implementation on quarterly basis. These reports can be combined with the reports on infection control plan implementation. The MWMFP will also process the data received from DMOs and produce regular reports. These reports will also include EHWMP aspects.

The poorly performing facilities will be identified in the province level monitoring documentation.

6.8. Options for Facility Management

Currently, BHUs in some districts of the Province are being managed by the Punjab Rural Support Program (PRSP) which is an NGO formed by the Government. Using a similar but more comprehensive approach, the BHUs and RHCs in selected districts will be contracted out to appropriate management organizations under the proposed project (see **Section 3.4**).

For the contracted out facilities, implementation of the present Plan, forming the WMT, designating WMO, preparing WMP, and producing monthly reports will be the responsibility of the management company, which will also be required to appoint/designate an EMWMP focal point among its staff. **Appropriate clauses will need to be added in their contracts and performance criteria for this purpose.**

6.9. Options for Waste Disposal

Two broad categories of options have been discussed here: technical options and management option. These are discussed below.

6.9.1. Technical Options [23]

The choice of technology for waste treatment and disposal will always be driven by the objective of improving current health and environmental impacts**.** The technology choice will also be functional, safe, economically feasible, and sustainable. Choice of treatment/disposal technology needs to be made with cultural and religious sensitivities in mind.

A basic principle in all waste management schemes is to segregate wastes as early as possible in the waste stream and to find the simplest solution for each type of waste. The first step in treatment and disposal is to ensure that all regular healthcare waste that can safely be sent to the normal municipal waste management system is managed in this way. The remaining wastes (special HCW) have characteristics that need particular treatment and disposal. A set of technical requirements for this treatment and disposal is provided in **Table 6.4** below.

Table 6.4: Technical Requirements for Treatment and Disposal of Special HCW

Elimination of hazardous characteristics of the wastes	• Destruction of viable infectious organisms • Destruction of waste/used pharmaceuticals and medicines or transformation into harmless forms • Destruction of sharps and other materials capable of causing physical injuries • Final disposal or destruction of body parts, tissues, blood, and other organic material • Transformation of wastes into unrecognizable or inoffensive forms
Controls on processes	• Assured long term performance in eliminating the hazardous characteristics • Ability of the treatment and disposal system to cope with variations in waste composition and throughput
Environmental impacts of system	• Avoidance or minimization of secondary impacts from disposal system • Prevention of human access and/or scavenging activities • Control of contamination of land, air or water • Avoidance of disease vectors (such as insects and rodents.)

Controlled disposal in a sanitary landfill[24] may be an acceptable disposal option for some types of special healthcare waste but other types will – in ideal conditions – be treated before disposal. In any case, final disposal in a landfill will usually be required for the residues from a treatment system.

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[23] Adapted from: Health Care Waste Management Guidance Note. Lars M. Johannessen, Marleen Dijkman, Carl Bartone, David Hanrahan, M. Gabriela Boyer, Candace Chandra. Health, Nutrition and Population (HNP) Discussion Paper. World Bank, May 2000.

[24] No properly designed and managed sanitary land-fills exist in the Province.

Capability will also be carefully assessed when planning HCW disposition. Urban areas might have sophisticated incineration, sterilization, or disinfection technologies available, while rural areas might have limited options. When reviewing disposition plans, the technological standards are vital to a safe, appropriate plan. For instance, incineration may be considered when the incinerator can reliably reach temperatures over 1000 degrees (over 1200 degrees is necessary if burning sharps or infectious waste). Lower temperature incinerators produce greater amounts of toxic releases. Autoclave or microwave facilities may generate contaminated wastewater that needs treatment. Landfills will also be reviewed for appropriate liners and leachate collection systems, and will include ground water monitoring (if applicable). A reliable affordable local technological solution is preferable to infeasible (and therefore not implemented) solutions. A summary of treatment and disposal technologies is provided in **Annex D**.

6.9.2. Management Option for Waste Disposal

Combined Waste Management Facility

Currently, in most of the healthcare facilities in the province, the infectious HCW is either mixed with the non-risk waste and disposed through the municipal waste disposal mechanism, or disposed within the facility premises (mostly through open burning or direct burial), as discussed in **Chapter 4**. Only in a few instances (eg, Holy Family Hospital in Rawalpindi and Children Hospital in Lahore), infectious waste from different healthcare facilities is transported to central treatment facilities (incinerators). This approach can be replicated in other districts also, and it is proposed that at least one incinerator is available in each district of the province. This incinerator will collect/receive infectious waste from all the government hospitals, RHCs, and BHUs, and incinerate it collectively. Later, the private hospitals can also be covered under the same or similar arrangement.

Involvement of Private Sector

A similar example exists in the private sector, where a private hospital (Shalamar Hospital, Lahore - http://www.shalamarhospital.org.pk/) has established a Hospital Waste Management Company, which collects infectious waste from a number of mostly private healthcare facilities in Lahore and incinerates it at its facility on commercial basis. This approach will be replicated and private sector will be encouraged and incentivized to establish medical waste management facilities on commercial basis. This would also be in line with the 'contract out' approach being

proposed under the present project to engage management companies to manage BHUs and RHCs in some districts of the Province.

District Based WMP

It will be ensured under the proposed program that there are waste disposal facilities accessible to all the healthcare facilities in the Province. A centralized plan to identify waste disposal options in each district is needed in that regard, which may be prepared after the piloting phase, which is discussed in the Section below.

6.10. EMWMP Implementation Approach

Implementation of the EMWMP will be carried out in close coordination with the implementation of Infection Control Management Project (ICMP), since both waste management and infection control aspects are inherently linked with each other. Under the Phase I of the national Infection Control Management Project, infection control protocols have already been prepared. Under the Phase II of this project, these protocols are being implemented on pilot basis in one district each of Khyber Pakhtunkhwa, Punjab and Sindh provinces. Gujranwala district has been selected in Punjab for this purpose.

The Health Department of KP has taken the lead in implementing the ICMP, and a formal notification has been issued to formulate the Provincial Infection Control Committee. The Baseline Joint Assessment of the selected healthcare facilities in Mardan district has been carried out during July 2012[25], and three rounds of monitoring reports have so far been prepared for August, September, and October 2012. [26] A similar approach is being followed in Gujranwala district for piloting the ICMP in the Punjab Province. The various steps involved in this piloting are shown in **Figure 6.1**.

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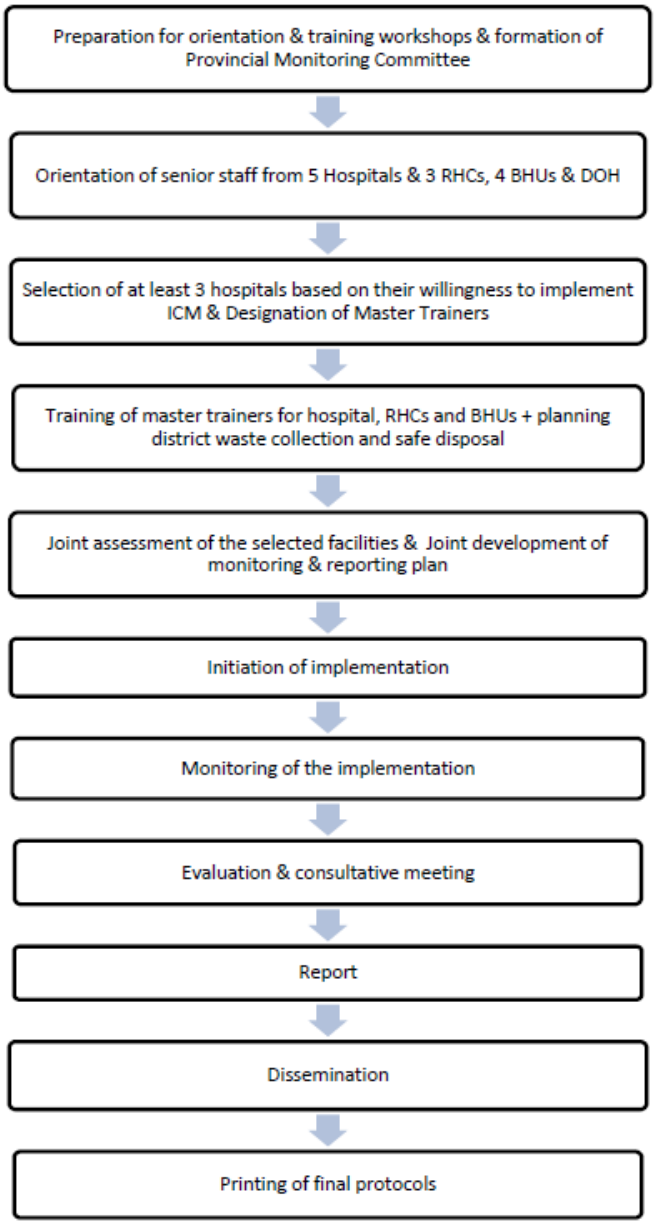
[25] Baseline Joint Assessment, Implementing and Piloting Infection Control Protocols in selected health facilities of Mardan. TRF/Arjumand and Associates, and Department of Health, KP. July 20112.

[26] a) First Monitoring Report, Implementing and Piloting Infection Control Protocols in selected health facilities of Mardan. TRF/Arjumand and Associates, and Department of Health, KP. August 2012. b) Second Monitoring Report, Implementing and Piloting Infection Control Protocols in selected health facilities of Mardan. TRF/Arjumand and Associates, and Department of Health, KP. September 2012. c) Third Monitoring Report, Implementing and Piloting Infection Control Protocols in selected health facilities of Mardan. TRF/Arjumand and Associates, and Department of Health, KP. October 2012.

Figure 6.1: Steps Involved in Piloting of Infection Control Management[27]



The present EMWMP will be seamlessly integrated with the ICMP, and will be included in the pilot phase in the Gujranwala district. Towards this end, the role of the provincial committee for infection control management will be expanded to include the HCW management issues as well.

Implementation of the EMWMP will also be initiated in a similar fashion, and its piloting will be initiated with Gujranwala district. To the extent possible, the activities such as capacity building and monitoring under the infection control plan and

[27] Source: Infection control Management Project, Phase II Plan, National MNCH program. TRF/Arjumand and Associates, 2012.

EMWMP will be combined, in order to conserve the resources and to adopt holistic approach.

6.11. EMWMP Disclosure

The GoPb will disclose the present Plan on its official website. The copies of Plan will be available in the office of the EDO (Health) in each district. The Plan will also be sent to WB's InfoShop.

6.12. EMWMP Implementation Cost

The estimates for EMWMP implementation cost is given in **Table 6.5** below. This cost will be covered through the Technical Assistance (TA) component of the Project.

The detailed district-wise budgets need to be prepared after the preparation of the WMPs of each facility. The costs associated with the CTF will also be included in these budgets. The following estimates are for the activities to be carried out primarily at the provincial level.

Table 6.5: EMWMP Implementation Cost

Description	Cost (PKR)	Notes
Manpower cost	9,000,000	150,000 × 12 × 5
TPV	5,000,000	See **Section 6.5.3** 1,000,000 × 5
Capacity building at province and district levels (ToTs)	10,000,000	See **Section 6.6** (20 trainings; 500,000 per training)
Capacity building at facility level	0	To be included in facilities' routine budgets.
Miscellaneous costs	5,000,000	
Total	**29,000,000**	

Annex A. Study Methodology

The assignment methodology was essentially based upon the WB Operation Policies[28] and national environmental guidelines[29] - with necessary adaptation to cater the special needs of the project. The methodology is described below.

1. Review the Project details

Necessary project details and related reports/documents were obtained from DoH, TRF and WB, in order to understand the project and its geographic, environmental, social, and temporal context. Meetings were held with the relevant personnel from the above-mentioned organizations.

2. Scoping

Scoping is essentially the process of identifying the significant issues relating to the proposed project and of determining the scope of the issues to be addressed in the Plan. The key tasks included: i) carrying out initial meetings; ii) holding stakeholder consultations; and iii) identifying the key aspects to be studied during the assignment.

3. Review of the Legislative and Regulatory Framework

The policy, legal, and administrative frameworks relevant to the environmental and medical waste management were identified and reviewed for their relevance to the project. The national environmental and medical waste management requirements and those of the co-financiers including WB and DFID were also reviewed. The relevant international environmental agreements to which the country is a party were also identified and reviewed.

4. Situation Assessment

The rapid situation assessment was conducted based on secondary document review and meetings described under the Task 2 above. An appropriate number of healthcare facilities in the Province were visited. An attempt was made to cover full range of facilities including above average, average, and below average facilities in terms of infrastructure, operation and maintenance, waste management particularly hospital waste management, and others. On the basis of these visits, the Situation

[28] Discussed in Chapter 2 of this report.

[29] Guidelines for Preparation and Review of Environmental Report; Government of Pakistan, 1997.

Assessment was carried out describing the current state and future trends of medical waste disposal in the province.

5. Impact Assessment

The project's likely positive and negative impacts associated with its sites, design, technology, and operation were predicted and assessed, in quantitative terms to the extent possible – particularly addressing medical waste and its hazards. The matrix given in **Table A.1** was used for this purpose. Various characteristics of the potential impacts including spatial extent (local, regional, global), nature (direct/indirect), temporal extent (temporary, permanent), reversibility, severity, and sensitivity of receptors were determined using the **Table A.2**. Based on this, the significance of each impact was characterized, with the help of criteria defined in **Table A.3**. Mitigation measures and any residual negative impacts that cannot be mitigated, and also the significance of the residual impacts were identified. The Project was also assessed with reference to the national regulatory requirements (eg, National Environmental Quality Standards - NEQS), and WB OPs.

Opportunities for environmental enhancement were also explored. The extent and quality of available data, key data gaps, and uncertainties associated with predictions was identified.

6. Preparation of Environmental and Medical Waste Management Plan

On the basis of impact assessment discussed in Task 7 above, the EMWMP was prepared, mitigation plan, compliance monitoring plan, effects monitoring plan, institutional arrangements, training needs, documentation and communication protocol, grievance redressal mechanism, cost of implementing EMWMP, and mechanism to integrate EMWMP with the Project (eg, through contractual clauses). The Plan identifies responsibilities and reporting relationships at the service delivery facility, EDO-Health and DG level during the project implementation.

The Plan also includes guidelines for adoption of Hospital Waste Rules of 2005 for management of risk and non-risk waste at the healthcare facilities.

The EMWMP also includes criteria to identify health facilities to be renovated for minimizing spread of infection and improving their environment and social impact.

Impact Screening, Characterization and Assessment Tools

The tools for impact assessment and characterization are presented in the following pages.

Table A.1: Environmental Screening Matrix

Project Activities	Physical					Biological			Social and Socioeconomic														
	Soil	Air Quality	Surface Water	Groundwater	Water Regime	Natural Vegetation	Terrestrial Wildlife	Aquatic Biota	Access	Noise	Cultivation	Livestock Grazing	Resettlement / Compensation	Safety Hazard	Employment	Infrastructure	Public Health	Cultural Issues	Gender Issues	Recreational Sites	Historical/ Archeological Sites		

Key: -2: High negative impact; -1: Low negative impact; 0: insignificant/negligible impact; +1: low positive impact; +2: High positive impact, N: no impact.

Table A.2: Impact Characterization

Categories	*Characteristics*
Nature	**Direct:** The environmental parameter is directly changed by the project. **Indirect:** The environmental parameter changes as a result of change in another parameter
Duration of impact	**Short-term**: lasting only for the duration of the project such as noise from the construction activities. **Medium-term**: lasting for a period of few months to a year after the project before naturally reverting to the original condition such as loss of vegetation due to clearing of campsite, contamination of soil or water by fuels or oil. **Long-term**: lasting for a period much greater than medium term impact before naturally reverting to the original condition such as loss of soil due to soil erosion.
Geographical extent	**Local, regional (spatial dimension)**
Timing	**Construction** and **Operation**
Reversibility of impact	**Reversible**: when a receptor resumes its pre-project condition **Irreversible**: when a receptor does not or cannot resume its pre-project condition
Likelihood of the impact	**Almost Certain:** Impact expected to occur under most circumstances **Likely:** Impact will probably occur under most circumstances **Possibly:** Impact may possibly occur at some time **Unlikely:** Impact could occur at some time **Rare:** Impact may occur but only under exceptional circumstances
Impact consequence severity	**Major (Severe)**: When an activity causes irreversible damage to a unique environmental feature; causes a decline in abundance or change in distribution over more than one generation of an entire population of species of flora or fauna; has long-term effects (period of years) on socioeconomic activities of significance on regional level. **Moderate**: When an activity causes long-term (period of years), reversible damage to a unique environmental feature; causes reversible damage or change in abundance or distribution over one generation of a population of flora or fauna; has short-term effects (period of months) on socioeconomic activities of significance on regional level. **Minor (mild)**: When an activity causes short-term (period of a few months) reversible damage to an environmental feature; slight reversible damage to

Categories	*Characteristics*
	a few species of flora or fauna within a population over a short period; has short term (period of months) effects on socioeconomic activities of local significance. **Negligible**: When no measurable damage to physical, socioeconomic, or biological environment above the existing level of impact occurs.
Significance of impact	Categorized as **High, Medium**, or **Low** Based on the consequence, likelihood, reversibility, geographical extent, and duration; level of public concern; and conformance with legislative of statutory requirements.

Table A.3: Impact Assessment

Probability of Occurrence of Impact	**Impact Severity**		
	Severe	**Moderate**	**Mild**
Certain	High Significance	High Significance	Medium Significance
Likely	High Significance	Medium Significance	Low Significance
Unlikely	Medium Significance	Low Significance	Low Significance

Annex B. National Environmental Quality Standards (NEQS)

The National Environmental Quality Standards (NEQS), promulgated under the PEPA 1997, specify the following standards:

- Maximum allowable concentration of pollutants in gaseous emissions from industrial sources,
- Maximum allowable concentration of pollutants in municipal and liquid industrial effluents discharged to inland waters, sewage treatment and sea (three separate set of numbers).
- Maximum allowable emissions from motor vehicles.
- Ambient air quality standards.
- Drinking water standards
- Noise standards.

The above NEQS's are presented in **Tables B.1** to **B.6** below. Some of these standards – particularly related to gaseous emissions, liquid releases, noise, and drinking water - will be applicable to the activities under the proposed project.

Table B.1: Selected NEQS for Waste Effluents

Parameter	Unit	Standards (maximum allowable limit)
Temperature increase	°C	< 3
pH value (acidity/basicity)	pH	6-9
5-day biochemical oxygen demand (BOD) at 20 °C	mg/l	80
Chemical oxygen demand (COD)	mg/l	150
Total suspended solids	mg/l	200
Total dissolved solids	mg/l	3,500
Grease and oil	mg/l	10
Phenolic compounds (as phenol)	mg/l	0.1
Chloride (as Cl)	mg/l	1,000
Fluoride (as F)	mg/l	10
Sulfate (SO_4)	mg/l	600
Sulfide (S)	mg/l	1.0
Ammonia (NH_3)	mg/l	40
Cadmium	mg/l	0.1
Chromium (trivalent and hexavalent)	mg/l	1.0
Copper	mg/l	1.0
Lead	mg/l	0.5
Mercury	mg/l	0.01
Selenium	mg/l	0.5
Nickel	mg/l	1.0
Silver	mg/l	1.0
Total toxic metals	mg/l	2.0
Zinc	mg/l	5
Arsenic	mg/l	1.0
Barium	mg/l	1.5
Iron	mg/l	8.0
Manganese	mg/l	1.5
Boron	mg/l	6.0
Chlorine	mg/l	1.0

Notes:

1. The standard assumes that dilution of 1:10 on discharge is available. That is, for each cubic meter of treated effluent, the recipient water body will have 10 m^3 of water for dilution of this effluent.
2. Toxic metals include cadmium, chromium, copper, lead, mercury, selenium, nickel and silver. The effluent will meet the individual standards for these metals as well as the standard for total toxic metal concentration.

Source: Government of Pakistan (2000) (SRO 549 (I)/2000).

Table B.2: NEQS for Industrial Gaseous Emissions

mg/Nm^3 unless otherwise stated

Parameter	Source of Emission	Standards (maximum allowable limit)
Smoke	Smoke opacity not to exceed	40% or 2 Ringlemann Scale or equivalent smoke number
Particulate matter [1]	(a) Boilers and furnaces: i. Oil fired ii. Coal fired iii. Cement Kilns	 300 500 300
	(b) Grinding, crushing, clinker coolers and related processes, metallurgical processes, converters, blast furnaces and cupolas	500
Hydrogen Chloride	Any	400
Chlorine	Any	150
Hydrogen fluoride	Any	150
Hydrogen sulphide	Any	10
Sulphur Oxides [2, 3]	Sulfuric acid/Sulphonic acid plants	5,000
	Other Plants except power Plants operating on oil and coal	1,700
Carbon Monoxide	Any	800
Lead	Any	50
Mercury	Any	10
Cadmium	Any	20
Arsenic	Any	20
Copper	Any	50
Antimony	Any	20
Zinc	Any	200
Oxides of Nitrogen [3]	Nitric acid manufacturing unit	3,000
	Other plants except power plants operating on oil or coal: i. Gas fired ii. Oil fired iii. Coal fired	 400 600 1,200

Explanations:

1. Based on the assumption that the size of the particulate is 10 micron or more.
2. Based on 1% sulphur content in fuel oil. Higher content of sulphur will cause standards to be pro-rated.
3. In respect of emissions of sulphur dioxide and nitrogen oxides, the power plants operating on oil and coal as fuel shall in addition to NEQS specified above, comply with the standards provided separately.

Source: Government of Pakistan (2000) (SRO 549 (I)/2000).

Table B.3: National Environmental Quality Standards for Ambient Air [30]

[30] Full text of the *Standards* is available at the Pak-EPA website: (http://www.environment.gov.pk/info.htm).

Pollutants	Time-weighted Average	Concentration in Ambient Air		Method of Measurement
		Effective from 1st July 2010	Effective from 1st January 2013	
Sulfur Dioxide (SO_2)	Annual Average*	80 µg/m^3	80 µg/m^3	Ultraviolet Fluorescence
	24 hours**	120 µg/m^3	120 µg/m^3	
Oxides of Nitrogen as (NO)	Annual Average*	40 µg/m^3	40 µg/m^3	Gas Phase Chemiluminescence
	24 hours**	40 µg/m^3	40 µg/m^3	
Oxides of Nitrogen as (NO_2)	Annual Average*	40 µg/m^3	40 µg/m^3	Gas Phase Chemiluminescence
	24 hours**	80 µg/m^3	80 µg/m^3	
Ozone (O_3)	1 hour	180 µg/m^3	130 µg/m^3	Non dispersive UV absorption
Suspended Particulate Matter (SPM)	Annual Average*	400 µg/m^3	360 µg/m^3	High Volume Sampling, (Average flow rate not less than1.1 m^3/minute).
	24 hours**	550 µg/m^3	500 µg/m^3	
Respirable Particulate Matter. PM_{10}	Annual Average*	200 µg/m^3	120 µg/m^3	β Ray absorption
	24 hours**	250 µg/m^3	150 µg/m^3	
Respirable Particulate Matter. $PM_{2.5}$	Annual Average*	25 µg/m^3	15 µg/m^3	β Ray absorption
	24 hours**	40 µg/m^3	35 µg/m^3	
	1 hour	25 µg/m^3	15 µg/m^3	
Lead (Pb)	Annual Average*	1.5 µg/m^3	1.0 µg/m^3	ASS Method after sampling using EPM 2000 or equivalent Filter paper
	24 hours**	2.0 µg/m^3	1.5 µg/m^3	
Carbon Monoxide	8 hours**	5 mg/m^3	5 mg/m^3	Non Dispersive Infra Red (NDIR)

Pollutants	Time-weighted Average	Concentration in Ambient Air		Method of Measurement
		Effective from 1st July 2010	Effective from 1st January 2013	
(CO)	1 hour	10 mg/m^3	10 mg/m^3	

*Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.

** 24 hourly /8 hourly values will be met 98% of the in a year. 2% of the time, it may exceed bu not on two consecutive days.

Source: Government of Pakistan (2010) (SRO 1062 (I)/2010).

Table B.4: NEQS for Motor Vehicles Exhaust and Noise [31]

(i) For In-use Vehicles

	Parameter	Standard (Maximum Permissible Limit)	Measuring Method	Applicability
1	Smoke	40% or 2 on the Ringlemann Scale during engine acceleration mode.	To be compared with Ringlemann Chart at a distance 6 or more. r	Immediate effect
2	Carbon Monoxide	6%	Under idling conditions: Non-dispersive infrared detection through gas analyzer.	
3	Noise	85 db (A).	Sound meter at 7.5 meters from the source.	

(ii) For new Vehicles

Emission Standards for Diesel Vehicles

(a) For Passenger Cars and Light Commercial Vehicles (g/Km)

Type of Vehicle	Category/Class	Tiers	CO	HC+ NOx	PM	Measuring Method	Applicability
Passenger Cars	M 1: with reference mass (RW) upto 2500	Pak-II IDI	1.00	0.70	0.08	NEDC (ECE 15+	i. All imported and local

[31] Full text of the NEQS is available at the Pak-EPA website: (http://www.environment.gov.pk/info.htm).

	kg. Cars with RW over 2500 kg to meet NI category standards.	Pak-II DI	1.00	0.90	0.10	EUDCL)	manufactured diesel vehicles with effect from 01-07-2012
Light Commercial Vehicles	NI-I (RW<1250 kg)	Pak-II IDI	1.00	0.70	0.08		
		Pak-II DI	1.00	0.90	0.10		
	NI-II (1250 kg< RW <1700 kg0	Pak-II IDI	1.25	1.00	0.12		
		Pak-II DI	1.25	1.30	0.14		
	NI-III (RW>1700 kg)	Pak-II IDI	1.50	1.20	0.17		
		Pak-II DI	1.50	1.60	0.20		

Parameter	Standard (maximum permissible limit)	Measuring Method
Noise	85 db (A)	Sound meter at 7.5 meters from the source.

(b) For Heavy Duty Diesel Engines and Large Goods Vehicles (g/Kwh)

Type of Vehicle	Category / Class	Tiers	CO	HC	NOx	PM	Measuring Method	Applicability
Heavy Duty Diesel Engines	Trucks and Buses	Pak-II	4.0	1.1	7.0	0.15	ECE-R-49	All Imported and local manufactured diesel vehicles with the effect 1-7-2012
Large goods Vehicles	N2 (2000 and up	Pak-II	4.0	7.0	1.10	0.15	EDC	

Parameter	Standard (maximum permissible limit)	Measuring Method
Noise	85 db (A)	Sound meter at 7.5 meters from the source.

Emission Standards for Petrol Vehicles (g/km)

Type of Vehicle	Category / Class	Tiers	CO	HC+ NOx	Measuring Method	Applicability
Passenger	M 1: With reference mass (RW) upto 2500 kg. Cars with RW over 2500 kg. to meet N1 category	Pak-II	2.20	0.50	NEDC (ECE 15 + EUDCL)	All imported and new models* locally manufactured petrol vehicles with

Type of Vehicle	Category / Class	Tiers	CO	HC+ NOx	Measuring Method	Applicability
	standards					effect from 1st July, 2009**
Light Commercial Vehicles	N1-I (RW<1250 kg)	Pak-II	2.20	0.50		
	N1-II (1250 kg>RW <1700 kg)	Pak-II	4.00	0.65		
	N1-III (RW>1700 kg)	Pak-II	5.00	0.80		
Motor Rickshaws & motor Cycles	2.4 strokes <150 cc	Pak-II	5.50	1.50	ECER 40	
	2.4 strokes>150 cc	Pak-II	5.50	1.30		

Parameters	Standard (maximum permissible limit)	Measuring Method
Noise	85 db (A)	Sound meter at 7.5 meters from the source

Explanations:	
DI:	Direct Injection
IDI:	Indirect Injection
EUDCL:	Extra Urban Driving Cycle
NEDC:	New Urban Driving Cycle
M:	Vehicles designed and constructed for the carriage of passengers and comprising no more than eight seats in addition to the driver's seat
N:	Motor vehicles with at least four wheels designed and constructed for the carriage of goods.
*	New model means both model and engine type change
**	The existing models of petrol driven vehicles locally manufactured will immediately switch ever to Pak-II emission standards but not later than 30th June, 2012

Source: Government of Pakistan (2009) (SRO 72 (KE)/2009).

Table B.5: National Standards for Drinking Water Quality[32]

[32] Full text of the Standards is available at the Pak-EPA website: (http://www.environment.gov.pk/info.htm).

Properties/Parameters	Standard Values for Pakistan
Bacterial	
All water intended for drinking (e.Coli or Thermotolerant Coliform bacteria)	Must not be detectable in any 100 ml samples
Treated water entering the distribution system (E.Coli or thermotolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml samples
Treated water in the distribution system (E.Coli or thermo tolerant coliform and total coliform bacteria)	Must not be detectable in any 100 ml samples In case of large supplies, where sufficient samples are examined, must not be present in 95% of the samples taken throughout any 12-month period.
Physical	
Color	≤15 TCU
Taste	Non objectionable/Accept able
Odor	Non objectionable/Accept able
Turbidity	< 5 NTU
Total hardness as $CaCO_3$	< 500 mg/l
TDS	< 1000
pH	6.5 – 8.5
Chemical	
Essential Inorganic	***mg/Litre***
Aluminum (Al)	≤0.2
Antimony (Sb)	≤0.005 (P)
Arsenic (As)	≤ 0.05 (P)
Barium (Ba)	0.7
Boron (B)	0.3
Cadmium (Cd)	0.01
Chloride (Cl)	<250
Chromium (Cr)	≤0.05
Copper (Cu)	2
Toxic Inorganic	***mg/Litre***
Cyanide (Cn)	≤0.05
Fluoride (F)*	≤1.5
Lead (Pb)	≤0.05
Manganese (Mn)	≤ 0.5
Mercury (Hg)	≤0.001
Nickel (Ni)	≤0.02
Nitrate (NO_3)*	≤50
Nitrite (NO_2)*	≤3 (P)
Selenium (Se)	0.01 (P)
Residual chlorine	0.2-0.5 at consumer end; 0.5-1.5 at source
Zinc (Zn)	5.0
Organic	
Pesticides mg/l	PSQCA No. 4639-2004, Page No. 4 Table

Properties/Parameters	Standard Values for Pakistan
	No. 3 Serial No. 20- 58 may be consulted.**
Phenolic compound (as phenols) mg/l	WHO standards: ≤ 0.002
Polynuclear Aromatic hydrocarbon (as PAH) g/L	WHO standards: ≤ 0.01v(by GC/MS method)
Radioactive	
Alpha Emitters bq/L or pCi	0.1
Beta Emitters	1

* indicates priority health related inorganic constituents which need regular monitoring.

** PSQCA: Pakistan Standards Quality Control Authority.

Source: Government of Pakistan (2010) (SRO 1063(I)/2010).

Table B.6: National Environmental Quality Standards for Noise [33]

Limit in dB(A) Leq *

Category of Area/Zone	Effective from 1st July 2010		Effective from 1st July 2012	
	Day time	Night time	Day time	Night time
Residential area	65	50	55	45
Commercial area	70	60	65	55
Industrial area	80	75	75	65
Silence zone	55	45	50	45

Notes:

1. Day time hours: 6:00 a.m. to 10:00 p.m.
2. Night time hours: 10:00 p.m. to 6:00 a.m.
3. Silence zone::Zones that are declared as such by the competent authority. An area comprising not less than 100 m around the hospitals, educational institutions, and courts.
4. Mixed categories of areas may be declared as one of the four above-listed categories by the competent authority.

* dB(A) Leq: Time weighted average of the level of sound in decibels on Scale A which is relatable to human hearing.

Source: Government of Pakistan (2010) (SRO 1064(I)/2010).

[33] Full text of the Standards is available at the Pak-EPA website: (http://www.environment.gov.pk/info.htm).

Annex C. Checklist Describing Current Situation in Healthcare Facilities [34]

Biomedical waste management			
Checklist for describing current hospital practices/situation			
Date:			
Filled by:			
S/N	**Description of hospital**		**Comments**
1.1	Name and location of hospital:		
1.2	Number of in-patients:		
1.3	Number of out-patient:		
1.4	Total number of beds:		
1.5	Total number of wards:		
1.6	Facility areas of specialization		
	Sorting, collection, storage, transportation	**Description of current situation**	**Comments**
2.1	Domestic waste that has not been in contact with biological waste (kitchen, clean plaster, tissues, dressings, plastics, papers, etc)		
2.2	Sharps (Needles, etc)		
2.3	Waste containing risk of infection		
2.4	Anatomical waste (body parts, tissues etc)		
2.5	Infectious waste (cultures of infectious agents/patients placed in isolation)		
2.6	Pharmaceutical waste (spilled, unused, expired drugs, medication receptacles)		
2.7	Waste containing heavy metals (batteries, broken thermometers)		
2.8	Chemical waste (disinfectants, leftover lab solvents)		
2.9	Pressurized containers (gas cylinders, aerosol cans)		
.2.10	Radioactive waste (treated urine, excreta, radioactive substances)		
	Staff	**Name, qualification, training**	**Comments**
3.1	Is someone responsible for waste?		
3.2	Who are the persons involved in handling, collecting, storing and transporting waste		

[34] This checklist can be modified in line with the tools used in the ICMP assessment (see **Section 6.6**.

	Waste policy	**Description**	**Comments**
4.1	Are there any national legislative provision for waste management? If yes, what are they?		
4.2	Is there any National waste management plan?		
4.3	Is there any waste management plan in the health facility?		
4.4	What is the local practice regarding biomedical waste		
4.5	Is any budget allocated to waste management?		
	Treatment and disposal	**Description**	**Comments**
5.1	Is the waste treated on-site? If yes how?		
5.2	Is the waste treated off-site? If yes by whom and how?		
5.3	Is there any waste treatment facility at the national/provincial level?		
5.4	Is there a landfill in the vicinity?		
	Training	**Description**	**Comments**
6.1	Has any waste management training been set up for hospital staff?		
6.2	Has any waste management training been set up for other staff?		
6.3	Has any waste management training been set up at the national or provincial level?		
6.4	Has any awareness program been conducted in the hospital and community? If yes by whom?		
	Protective measures	**Description**	**Comments**
7.1	Do people who handle waste have personal protective equipment (PPE) If so, what equipment is available to them? Is it appropriate? Is it worn?		
7.2	Are personal hygiene facilities available (wash basins, showers etc)? Do they work?		
7.3	Have all staff been vaccinated against hepatitis A and B and tetanus?		
7.4	Is there a procedure for dealing with accidental exposure to blood (AEB), or other body fluids or spills?		

Annex D. Comparison of Disposal Techniques[35]

Table D.1: Treatment and Final Disposal Technologies for Special HCW

Type of treatment	Advantages	Disadvantages
Safe land filling: Trench method where healthcare waste is buried in a trench excavated in other waste (Final disposal)	• Simple and inexpensive to operate • No specific construction costs required • Operates within readily available landfill system • Waste pickers are unable to access the • special healthcare waste	• Special healthcare waste is not treated and preserves potential infectiousness • High demand for coordination between collector and landfill operator • Reduces awareness among healthcare workers of need to segregate waste types • Potentially long transportation to landfill
Safe land filling: Separate disposal cell (Final disposal)	• Simple and relatively inexpensive to operate if operated in connection with existing landfill for other waste	• Special healthcare waste is not treated and preserves potential infectiousness • Requires a safe landfill with fencing • Requires control of scavenging and animals • Needs conscientious operation according to manual
Incineration : 1) Batch incineration 2) Dual chamber, or 3) Rotary kiln (Destruction treatment)	• Elimination of health risks • The waste is non-recognizable • Fully destroys micro-organisms and sharps • Reduces volume/mass of the waste • Destroys all types of organic waste (liquids, pharmaceuticals, and other solids) • Heat recovery possible • High quantities of waste can be treated (except for batch incinerator)	• High investment costs • Complicated to operate • Continuous monitoring required • High maintenance, especially for rotary kilns • Relatively high operation costs; costs rise with the level of sophistication of the emission controls system • For batch incinerator: limited capacity • Emits toxic flue gases (including dioxins and furans; level varies). Currently there is no accepted level of emission for dioxins and furans, however EU standards provide a good basis for comparison.

[35] Source: Health Care Waste Management Guidance Note. Lars M. Johannessen, Marleen Dijkman, Carl Bartone, David Hanrahan, M. Gabriela Boyer, Candace Chandra. Health, Nutrition and Population (HNP) Discussion Paper. World Bank, May 2000.

Type of treatment	Advantages	Disadvantages
		• Generates residue that needs safe landfilling • Any residue generated may be toxic
Steam Disinfection: Autoclave (Sterilization)	• Simple to operate • A known technology at healthcare facilities	• Relatively expensive to install and operate • Requires boiler with stack emissions controls • Relatively high maintenance costs • Cannot be used to treat some hazardous wastes, pharmaceuticals, and cytotoxics • Requires separate and additional packaging • Generates odors • Final disposal must be same as for untreated special healthcare waste • Generates contaminated wastewater that needs treatment.
Microwave: Microwave or radiowave irradiation (Disinfection)	• The shredding process reduces the volume of the waste (not mass)	• Highly sophisticated and complex • Relatively expensive to install • Only solids can be treated and only when shredded • Cannot be used to treat some hazardous wastes, pharmaceuticals, and cytotoxics • Highly skilled operator required • Expensive and difficult to maintain • Final disposal must be same as for untreated special healthcare waste • Generates contaminated wastewater that needs treatment
Chemical treatment: (Disinfection)	• The shredding process reduces the volume of the waste (not mass)	• Cannot be used to treat some hazardous wastes, pharmaceuticals, and cytotoxics • Highly skilled operator required • Expensive and difficult to maintain • Final disposal must be same as for untreated special healthcare waste • Generates hazardous water that needs treatment.

Table D.2: Comparisons with Technical Requirements

(Broad comparisons, based on general experience – individual examples will vary)

	Typical Current Practices				Typical Disposal Options – properly operated				
	On-site dumps	Open burning	Municipal dumps	On-site incineration	High temp. incineration	Autoclaving	Microwaving	Chemical sterilization	Sanitary landfill
Elimination of hazardous characteristics									
Destruction of infectious organisms	N	P	N	P – M	VG	G	G	G	G
Destruction of body parts, blood etc.	N	G	N	G	VG	P – M	P – M	P – M	G
Destruction of waste pharmaceuticals	N	G	N	G	VG	N	N	P – M	M – G
Destruction of sharps, etc	N	M	N	M	VG	P – M	P – M	M	M
Transformation of wastes	N	M	N	G	VG	M	M	M	G
Controls on process:									
Assured elimination of hazards	N	VP	N	VP	VG	M	M	M	M
Ability to cope with variations	G	P	G	P	VG	P	P	P	VG
Environmental Impacts:									
Avoidance of secondary impacts	P	VP	P	P	P – M	P – M	M	P – M	P – M
Prevention of human access	M	M	VP	G	VG	VG	VG	VG	M – G
Prevention of contamination of land	VP	P	VP	G	VG	VG	VG	VG	G
Avoidance of disease vectors	P	P - M	VG	VG	VG	VG	VG	VG	M

N: None; G: Good; VG: Very Good; M: Moderate; P: Poor; VP: Very Poor.

Direct disposal in a sanitary landfill may be the least expensive disposal option, if an acceptable landfill is located within reasonable transportation distance. However, some special healthcare wastes, such as cytotoxics, will not be put in a landfill. A dual chamber or rotary kiln incinerator can be used for treatment of this type of special healthcare waste. Pollution control systems (scrubbers, etc.) on incinerators are essential in order to avoid release of dioxins and other chemicals. The choice of an appropriate technology for treatment of the special wastes will depend on a range of local circumstances. Some examples are the state of the existing waste management system, the institutional capacity and the human resources available, and the costs of the different options in relation to the financial situation of the health sector.

A number of general comments can be made:

Incineration is not the same as burning. Proper incineration is a highly advanced technology that can adequately treat all types of special healthcare waste. The key parameters of controlled incineration are summarized as “TTT”: combustion at a sufficiently high **temperature** (between 1,000°C and 1,200°C in the combustion chamber) for a long enough **time**, in a combustion chamber with sufficient **turbulence** and oxygen for complete combustion to be achieved and problematic gases to be minimized.

An incinerator requires skilled operators, extensive flue gas emission controls and, frequently, imported spares and supplies. Properly controlled incineration is relatively expensive.

Incineration of wastes generates residues, including air emissions and ash. Environmental controls on incinerators in developed countries have been tightened in recent years, principally because of concerns over air emissions of pollutants such as dioxins and heavy metals.

The technology of small-capacity incinerators, for use by a single medical facility, is often rudimentary. These installations are not recommended, since they may constitute a serious air pollution hazard to the surrounding area. WHO recommends closing down small incinerators that are not operating satisfactorily.

Incineration is an option for certain types of HCW (and is the preferred method for some substances such as cytotoxins and other pharmaceuticals) but it needs to be carefully operated and controlled. Regulatory agencies in the United States and the European Union have adopted emissions limits for medical waste incinerators that include, among others, values for dioxins. It is recommended that incinerators installed under any major project pay attention to national regulations and/or look to the examples set in other countries such as in the EU Member States.

Autoclaving involves the heating of waste material, with steam, in an enclosed container at high pressure. At the appropriate levels of time (> 60 min), temperature (>121°C), and pressure (100 kPa) effective inactivation of all vegetative microorganisms and most bacterial spores can be achieved. Preparation of material for autoclaving requires segregation to remove unsuitable material and shredding to reduce the individual pieces of waste to an acceptable size.

Small autoclaves are common for sterilization of medical equipment but a waste management autoclave can be a relatively complex and expensive system requiring careful design, appropriate segregation of materials, and a high level of operation and maintenance support.

The output from an autoclave is non-hazardous material that can normally be landfilled with municipal waste. There is also a wastewater stream that needs to be disposed of with appropriate care and controls. Furthermore, large autoclaves may require a boiler with stack emissions that will be subject to control.

At present, the use of autoclaving, chemical disinfection or any other non-destructive technology like microwave or radiowave irradiation is not allowed for the treatment of special HCW such as organs, tissues, or amputated human body parts. Incineration or burial are the only accepted techniques for the treatment of such special type of HCW.

Microwave and Radiowave Irradiation involves the application over the wastes of a high energy electromagnetic field that provokes the liquid contained within the waste, as well as the liquid cell material of microorganisms, to oscillate at high frequency, heat up rapidly, and eventually cause the destruction of all infectious components of the waste. The technique takes place in enclosed containers at atmospheric pressure and temperatures below the normal water boiling point. The waste passes through a preparative process of segregation to remove undesirable material, then it is triturated, pulverized, and compressed prior to its disinfection.

Similar to the autoclaving technique, the output from a microwave or radiowave facility is considered non-hazardous and can be landfilled together with municipal waste. Since the technology does not involve the application of steam, there is a minimal generation of wastewater stream, and with the appropriate conditioning it can be recycled to the system.

Since electricity is the main source of energy for operating this technology, gas emissions are also minimal compared to incineration or even autoclaving, which requires the combustion of fuel for the generation of steam.

Chemical disinfection, used routinely in healthcare to kill microorganisms on medical equipment has been lately extended to the treatment of HCW. Chemicals (mostly strong oxidants like chlorine compounds, ammonium salts, aldehydes, and phenolic compounds) are added to the waste to kill or inactivate pathogens. This

treatment is most suitable for treating liquid wastes such as blood, urine stools or hospital sewage, but solid and highly hazardous HCW like microbiological cultures, or sharps must undergo a relatively complex and expensive preparative process of segregation shredding, and milling prior to the application of the chemical reagents. This technology requires special treatment of hazardous wastewater streams.

Land deposition of HCW is performed in the same manner as solid industrial wastes; that is, in a pit excavated in mature municipal waste at the base of the working face and immediately covered by a two-metre deep layer of fresh municipal waste. Alternatively, a specially constructed small fenced landfill pit or bunded area could be prepared on part of the site to receive only HCW. It will be covered immediately with soil after each load. For added health protection and odor suppression, it is suggested that lime be spread over the waste. In both cases it is essential to cover the HCW layer well enough to prevent animals or scavengers from re-excavating it. Landfilling is considered as a "bottom of the list" option for disposal of HCW, and is only recommended when the economic situation of the country does not permit access to environmentally safer technologies, such as the ones previously described.

Other technical issues:

Transport of special healthcare waste on public roads is inevitable under any system designed to treat and dispose of special healthcare waste outside the generating premises. Transportation of special healthcare waste will, as a minimum, be carried out by trained staff in a dedicated vehicle with closed containers. Recommended design criteria for special healthcare waste transportation vehicles are provided in the WHO handbook.

Operation and maintenance of equipment and facilities is essential for proper waste management. Good operation and maintenance requires trained and motivated staff, an adequate supply of consumables and spares, and a sufficient ongoing budget. Assessment of these matters must be a fundamental part of any decisions on choice of waste management treatment technology.

Annex E. WB/IFC EHS Guidelines

Please see the following pages for the EHS guidelines.

TRF is funded by UKaid from the Department for International Development and AusAID, and managed by HLSP