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REPUBLIC OF SIERRA LEONE

HEALTHCARE WASTE MANAGEMENT PLAN

The West Africa Regional Disease Surveillance Systems Enhancement (REDISSE) Project

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ABBREVIATIONS AND ACRONYMS

APCD	Air Pollution Control Device
BACT	Best Available Control Technology
BOD	Biological Oxygen Demand
CE	Combustion Efficiency
COD	Chemical Oxygen Demand
CSSD	Central Sterile Supply Departments
EHD	Environmental Health Division
EIA	Environmental Impact Assessment
EPA	Environmental Protection Act
HCW	Healthcare Waste
HCWM	Healthcare Waste Management
HF	Health Facility
HIV	Human Immunodeficiency Virus
IMSWM	Integrated Municipal Solid Waste Management
INWMP	Integrated National Waste Management Policy
ISO	International Standards Organization
LCA	Life Cycle Assessment
LDO	Light Diesel Oil
LLWAC	Local Liquid Waste Advisory Committee
LSWAC	Local Solid Waste Advisory Committee
LWM	Liquid Waste Management
LWMPs	Liquid Waste Management Plans
MoHS	Ministry of Health and Sanitation
MSW	Municipal Solid Waste
NGOs	Non-Governmental Organizations
NSIs	Needle Stick Injuries
OH&S	Occupational Health and Safety
PPE	Personal Protective Equipment
SLI	Starting Light Ignition
SOPs	Standard Operating Procedures
TLWAC	Technical Liquid Waste Advisory Committee
VOC	Volatile Organic Compound
WC	Water Closet
WMP	Waste Management Plan

1. Introduction

1.1 Project background

The West Africa Regional Disease Surveillance Systems Enhancement Project (REDISSE) will be implemented as an interdependent series of projects (SOP) that will eventually engage and support all 15 ECOWAS member countries. This is the first project in the series, REDISSE-SOP1 which targets both extremely vulnerable countries (Guinea, Sierra Leone and Liberia) and countries which have more effective surveillance systems and serve as hosts for important regional assets (Nigeria and Senegal). Phase 2 (REDISSE-SOP2) is expected to be delivered in the second quarter of Fiscal Year 17 (FY17). The estimated project financing for REDISSE-SOP2 is US$102 million. FY17 delivery of this project will allow additional time for consultations, assessments and planning needed to ensure country readiness. REDISSE-SOP2 countries will include: Cote d'Ivoire, Guinea Bissau, Ghana, Togo, Benin and possibly Gambia. Together, REDISSE SOP 1&2 constitute a block of equatorial, coastal countries with shared borders and similar epidemiologic profiles which extends from Senegal in the west to Nigeria in the east. The series of projects will be implemented in the context of the African Integrated disease surveillance and Response Strategy, international standards and guidelines of World Health Organization (WHO), World Organization for Animal Health (OIE), and Food and Agriculture Organization of the United Nations (FAO), fostering a One Health Approach. It will support the countries to establish a coordinated approach to detecting and swiftly responding to regional public health threats. Cooperation among West African countries to prevent and control potential cross-border diseases is a regional public good. The regional benefits and positive externalities of effective disease surveillance and response are substantial. The West African Health Organization (WAHO) and the Regional Animal Health Center (RAHC) (Centre Regional de Santé Animale-CRSA, based in Bamako), both of which are affiliated with ECOWAS, will be responsible for the regional coordination, as well as implementation of specific regional activities and day-to-day oversight of the Project. Collective action and cross-border collaboration are emphasized throughout the Project: (i) the Project will support countries' efforts to harmonize policies and procedures; (ii) countries will be empowered to engage in joint planning, implementation and evaluation of program activities across borders at regional national and district levels, and; (iii) the Project will promote resource sharing of high cost specialized assets such as reference laboratories and training center and pooled procurement of difficult to access commodities.

Most recent estimates show that communicable diseases (CDs) account for more than one third of the global disease burden and that most of this burden falls on the countries of West Africa. Countries in this region are at high-risk for infectious disease outbreaks including those of animal origins (zoonotic diseases). The World Health Organization (WHO) has documented that of the 55 disease outbreaks that were reported in Africa over the last decade, 42 took place in West Africa. Some common outbreaks in the region include Cholera, Dysentery, Malaria, Hemorrhagic fevers (e.g. Ebola virus disease, Rift Valley fever, Crimean-Congo fever, Lassa fever, and Yellow fever), and Meningococcal Meningitis. West Africa also bears a disproportionate burden of malaria, TB, HIV and neglected tropical diseases, many of which are at risk of resurgence due to drug and insecticide resistance.

Over the last four decades, the world has witnessed one to three newly emerging infectious diseases annually. Of infectious diseases in humans, the majority has its origin in animals ("zoonotic" diseases), with more than 70% of emerging zoonotic infectious diseases

coming from wildlife. Recent outbreaks such as Ebola Viral Disease (EVD), H7N9 avian influenza, Middle East Respiratory Syndrome (MERS-CoV), Marburg virus, Nipah virus infection, bovine spongiform encephalopathy and HIV/AIDS showcase the catastrophic health and economic effects of emerging zoonotic diseases. The West Africa region is both a hotspot for emerging infectious diseases (EIDS) and a region where the burden of zoonotic diseases is particularly high. In this region, emerging and re-emerging diseases at the human-animal-ecosystems interface are occurring with increased frequency. As evidenced by the recent Ebola epidemics in Guinea, Sierra Leone, and Liberia, and the re-occurrence and spread in of Highly Pathogenic Avian Influenza (HPAI) (H5N1), highly contagious diseases can easily cross borders in the region through the movements of persons, animals and goods.

The major drivers of the emergence of novel infectious diseases are human behavior, demographic change, technology and industry, economic development, land use, international travel and trade, microbial adaptation and change, breakdown of public health measures and bioterrorism. The population of sub-Saharan Africa has doubled between 1975 and 2001, and the African Population and Health Research Center predicts a further increase, up to 1.9 billion by 2050. Urban population densities have dramatically increased, by 223%, 178%, and 275% respectively in Guinea (1960-2012), Sierra Leone and Liberia (1961-2013) due largely to migration from rural to urban areas. The link between deforestation and infectious disease outbreaks is well documented; deforestation and encroachment into natural habitats is also claimed to be responsible for EVD outbreak in West Africa. According to FAO data, Western Africa is suffering deforestation at twice the world rate approximately. Deforestation has been particularly severe in Nigeria, but also in Guinea and Sierra Leone, with much of the landscape being replaced with forest-agricultural mosaics. Civil war and social turmoil have also been common in West Africa. The social instability and its consequential population relocation and breakdown of governments provide fertile ground for the rampant spread of infectious diseases.

The impacts of infectious disease outbreaks can be devastating to the fragile social and economic situation of countries. The World Bank estimated a global cost of US$3 trillion in the case of a severe pandemic such as the 1918 Spanish Flu; an estimate that is comparable to the impact of the 2008 global financial crisis. In the West Africa region, the recent Ebola Virus Disease outbreak clearly eroded hard-won gains in the fight against poverty, including gains in human development and economic growth in Guinea, Liberia and Sierra Leone, as well as in the entire region. In these three countries, the estimated forgone output reached US$1.6 billion, which represents over 12% of the countries' combined outputs. The outbreak also resulted in school closure for at least 6 months and over 16,600 children lost one or both parents to the epidemic. Overall, the estimated loss in Gross Domestic Product (GDP) for the 15 countries in the ECOWAS region was approximately US$1.8 billion in 2014, and was expected to rise to US$3.4 billion in 2015 and US$4.7 billion in 2016. These add to the ongoing burden of neglected and endemic human and animal diseases, including zoonosis.

Animal health is critical to public health and to the sustainable growth of the livestock sector. Livestock farming plays an important role in the ECOWAS region, contributing an average of 44% to its agricultural GDP. Livestock farming concerns virtually all rural households and is a crucial factor in combating rural poverty (see map below), both directly, through the income it generates, and indirectly, in allowing agriculture intensification and contributing to food security, nutrition and broader economic development. ECOWAS as a whole has a trade deficit in animal products and this trade deficit is particularly acute in the coastal countries. Demand for livestock products is expected to continue to grow significantly in the next decades, based on demographic trends, and propelled by increased urbanization and

incomes. This evolution implies higher risks of occurrence of disease (frequency and/or severity), and higher impact of these diseases.

1.2 Project Development Objective (PDO) and Guiding Principles of the REDISSE

The project's development objective (PDO) is to strengthen national and regional cross-sectoral capacity for collaborative disease surveillance and epidemic preparedness in WestAfrica. It will address systemic weaknesses within the animal and human health systems that hinder effective disease surveillance and response.

1.3 Sectoral and institutional Context

Like in other developing countries, the performance of health systems in many countries in West Africa is weak. They suffer from chronic insufficient financial and human resources, limited institutional capacity and infrastructure, weak health information systems, prevailing inequity and discrimination in availability of services, absence of community participation, lack of transparency and accountability, and a need for management capacity building. Public sector spending on health is generally low. Only Liberia exceeded the Abuja target of 15% of Gross Government Expenditure (GGE) allocated to health. Out of pocket spending on health was high ranging from a low of 21% in Liberia to a high of 76% of total health expenditure in Sierra Leone. Guinea, Liberia and Sierra Leone have low density and inequitable distribution of health services and health workers as a result of low production, low motivation, inadequate training, lack of quality supplies and the loss of health workers, particularly physicians and nurses to emigration (a.k.a. brain drain). This was further aggravated during the EVD outbreak, which took a high toll on the lives of health workers.

Country led self-assessment on disease surveillance, preparedness and response capacity in Guinea, Liberia, Nigeria, Senegal and Sierra Leone as well as the lessons learnt from the EVD outbreak revealed some key weaknesses of health systems in terms of infectious disease surveillance, epidemic preparedness and response. These include: (i) a fit for purpose health workforce for disease surveillance, preparedness and response is lacking at each level of the health pyramid; (ii) community level surveillance and response structures either do not exist or need significant improvement; (iii) there is limited availability of laboratory infrastructure in place for timely and quality diagnosis of epidemic-prone diseases; (iv) lack of interoperability of different information systems hampers analysis and utilization of information for decision making and actions for disease mitigation measures; (v) infection prevention and control standards, infrastructure and practices are generally inadequate; (vi) management of the supply chain system is weak and inefficient; and (vii) there are significant gaps in regional level surge capacity for outbreak response, stockpiling of essential goods, information sharing and collaboration. Similar findings were also documented by the Global Health Security Agenda baseline assessments in a number of countries including Liberia, and Sierra Leone.

After the EVD outbreaks, health system recovery and strengthening plans were developed for at least the next five years in Guinea, Liberia and Sierra Leone. Building up a resilient health system to effectively respond to health emergencies has universally been identified as one of the strategic pillars in the plans. At the national level, broad-based health system strengthening committees or similar structures have been established to lead and

coordinate the efforts for strengthening the national health system in the three countries. With the help from USAID, a plan for health system strengthening was also developed in Senegal. In all five countries REDISSE will build on and complement the ongoing health system strengthening initiatives of the national governments that are supported by the Bank and other development partners.

Animal Health

The animal health sector in the ECOWAS region is characterized by a high incidence and prevalence of infectious diseases communicable diseases, both zoonotic and non-zoonotic, impacting veterinary and public health, trade, rural development and livelihoods. Among the most serious infectious diseases, contagious bovine pleuropneumonia (CBPP), foot and mouth disease (FMD), African Swine Fever (ASF), Rift Valley Fever (RVF), Peste des Petits Ruminants (PPR), African Animal Trypanosomiasis (AAT), highly pathogenic avian influenza (HPAI), and rabies are highlighted by ECOWAS and the GF-TADs for Africa. A recent summary of evaluations of Veterinary Services by the World Organization for Animal Health (OIE) in ECOWAS countries highlighted the services' lack of budgetary resources and mismatch between the human resources required and those actually available for preventing and controlling animal diseases. In terms of the strategic action required to sustain animal health, all of the countries identified the need to improve the coverage of their surveillance programs as well as the control of high-priority animal diseases. Lack of preparedness, insufficient human, physical and financial resources, and the lack of cross-sector collaboration were again emphasized by the FAO and OIE as causes for failure to address promptly and efficiently the resurgence of highly pathogenic avian influenza in the region.

Improvement of animal health requires increased and sustained investments in national Veterinary Services to meet international standards of quality defined by the OIE. Any country failing to prevent, detect, inform, react and control sanitary issues, such as infectious diseases or antimicrobial resistance places other countries at risk, hence the importance of regional approaches. All countries in the region have engaged in the OIE Performance of Veterinary Services (PVS) Pathway, a program which provides independent qualitative (PVS evaluation) and quantitative (PVS Gap Analysis) evaluations of Veterinary Services, identifying their strengths and weaknesses, prioritizing interventions and costing activities needed to address deficiencies. Some countries have also received support to review their veterinary legislation.

Insufficient government funding and limited interest from donors to support Veterinary Services have not allowed significant progress to date in addressing systemic issues. Some important programs are worth noting though in the animal health sector, such as the EPT2 program, financed by USAID and implemented in many of the ECOWAS countries, through FAO and other implementing agencies; FAO support to HPAI infected countries; and, AU-IBAR support through the Vet-Gov program. In the last 15 years, two main regional and global programs significantly contributed to strengthening national Veterinary Services, namely the PACE program and the World Bank financed Avian Influenza Global Program which were implemented in many countries of the region. The lessons and best practices derived from these two programs are reflected in this project. The RESEPI and RESOLAB networks were also supported and facilitated by FAO under different projects and handed over in 2012 to ECOWAS.

Animal health is seen as a priority by the two regional economic communities in West Africa. ECOWAS and WAEMU have set a target of harmonizing national animal health systems. WAEMU, which covers 8 countries in the region, has moved forward on a number of fronts in particular on the harmonization of regulations on veterinary medicinal products, but

progress has been slow due to administrative, human, organizational and financial constraints. In 2012, ECOWAS member countries declared the Regional Animal Health Center (RAHC)—an informal platform originally set up in 2006 by OIE, FAO and AU-IBAR as the ECOWAS specialized technical center for animal health. An operational plan for RAHC was developed in August 2014. However, delays in staff recruitment and establishment of a dedicated operational budget have kept the institution from implementing this plan and rolling-out activities in accordance with its mandate. The RAHC is currently supported through a limited number of initiatives with specific objectives, including to further develop the One Health agenda in the region, and to develop Integrated Regional Coordination Mechanisms for the Control of TADs and Zoonosis' (IRCM). The WB-financed Regional Sahel Pastoral Support project (PRAPS), which supports the improvement of animal health in 6 West African Sahel countries, also specifically aims at contributing to the operationalization of the RAHC.

Tackling multi-sectoral issues efficiently requires working across sectors and disciplines. Yet, very few countries have adopted coordinated approaches, along the lines of the "One Health" concept. The response to the HPAI crisis since 2005 contributed to enhancing cooperation between the human and veterinary health sectors in many countries in the region, but in the absence of a dedicated program incentivizing such a joint approach, silos remain established. Nonetheless, important lessons have been learned and experience gained, and successful regional programs for the control of selected priority diseases, both within and outside the region, have demonstrated the efficiency of a regionally coordinated approach to diseases surveillance and response.

The Development Partner landscape in the sub-region is complex, particularly in the three countries most affected by the 2014-2015 EVD epidemic. The Ebola outbreak triggered a significant international response that brought many partners together to address the crisis and support the post-Ebola agenda of health systems recovery and strengthening. It also highlighted the need to focus attention on building the capacity for disease surveillance and response in the sub-region for both human and zoonotic diseases. The development partners engaged on these issues in the sub-region include major donor organizations including development banks, multilateral and bilateral donors and private foundations; UN systems agencies; technical agencies such as the US and China Center for Disease Control and Prevention; academic and research institutions and large numbers of international and local non-governmental organizations. As noted in Annex 2, in this type of environment duplication of effort, inefficient use of resources and failure to address resource, policy and programmatic gaps is a substantial risk. It is expected that there will continue to be an influx of funds and other forms of support to the region, in particular, to the three EVD affected countries (Guinea, Sierra Leone, and Liberia) in the next three to five years. As a result, coordination of resources and activities offered by the various partner organizations will remain a significant challenge for national governments. Therefore, coordination mechanisms at both national and regional levels that engage both the human and animal health sectors need to be developed to maximize the impacts of the increasing support and foster sustainability of the anticipated outcomes. The World Bank's convening power will be highly instrumental in forging a coalition of national, regional, and global technical and financial institutions to support the disease surveillance and epidemic preparedness agenda in West Africa.

The World Bank is well placed to mobilize substantial financing for this multi-sector initiative and to convene premier technical and financial partners engaged in the field of disease surveillance and epidemic preparedness. The World Bank has strategically engaged with a core group of development partners including those implementing the Global Health Security Agenda

(GHSA) in the development of the REDISSE project. The REDISSE project itself will provide resources to regional institutions and national governments to establish the needed coordinating mechanisms.

By the nature of the REDISSE project, some wastes, especially health care waste shall emanate in the course of implementation lead. To this end, it has become necessary that health care waste management (HCWM) plan be developed that will ensure best practices and thus reduce at risk healthcare workers, patients, and communities at large who would be exposed both within Health Facilities (HFs) and the surrounding communities.

1.4 Project location

REDISSE will be implemented in five counties: Guinea, Liberia, Nigeria, Senegal and Sierra Leone. This HCWMP relates to activities that will happen in Liberia

1.5 Project Components

The REDISSE project comprises of 5 components as follows:

Component 1: Surveillance and Information Systems. ***Total costs including contingencies US$62.32 million equivalent of which US$50 IDA Credit and US$12.32 million MDTF***

This component will support the enhancement of national surveillance and reporting systems and their interoperability at the different tiers of the health systems. It will support national and regional efforts in the surveillance of priority diseases (including emerging, re-emerging and endemic diseases) and the timely reporting of human public health and animal health emergencies in line with the IHR (2005) and the OIE Terrestrial Animal Health code. Component 1 comprises of three sub-components:

Sub-Component 1.1 Support coordinated community-level surveillance systems and processes across the animal and human health sectors (US$27 million).

This sub-component will involve the strengthening of community-level surveillance structures and processes in countries where gaps exist for detecting events in communities (human and animal). This will entail improving community-level surveillance capacity for active, passive and rumor surveillance including in cross-border areas, and the development and implementation of a plan to ensure adequate territorial coverage for surveillance from the community to the central level.

Sub-Component 1.2 Develop capacity for interoperable surveillance and reporting systems ($20 million)

Sub-component 1.2 will support: (i) assessment of existing human and animal health surveillance systems and networks for prioritization of interventions within and across key sectors; (ii) review and update of national and regional disease priorities, and review and development of harmonized guidelines, protocols and tools to enhance surveillance and reporting processes; (iii) development of common methodologies and protocols for efficient flow and utilization of surveillance data (applicable to both public and private actors involved in disease surveillance); (iv) development of the required information communication and technology

(ICT) infrastructure to facilitate cross-sectoral interoperability of surveillance and reporting systems at the national and regional level; and (v) establishing the necessary linkage of surveillance and reporting systems to national incidence management systems.

Sub-Component 1.3 Establish an early warning system for infectious disease trends prediction (US$14 million)

This sub-component will involve the establishment of an early warning system including the use of Geographic Information System (GIS) techniques to study infectious disease patterns and make predictions on evolution of disease outbreaks, including zoonosis'' and identify potential high risk areas for disease outbreaks in the region. Activities under this will support the monitoring of trends that occur in infectious diseases such as antimicrobial resistance (AMR) and insecticide resistance, and the impact of climate change on infectious disease outbreaks in the region.

Component 2: Strengthening Laboratory Capacity (*US$58 million)*

The objective of this component is to establish networks of efficient, high quality, accessible public health, veterinary and private laboratories for the diagnosis of infectious human and animal diseases, and to establish a regional networking platform to improve collaboration for laboratory investigation. This component is divided into three sub-components.

Sub-Component 2.1 Review, upgrade and network laboratory facilities (US$28 million)

This sub component will include: (i) assessment of existing human and animal health laboratory facilities and networks for prioritization of interventions; (ii) increasing laboratories services, and biosafety and biosecurity; (iii) support for improved supply chain management including the establishment of efficient inventory tracking and management systems; (iv) technical support for integrated laboratory information systems and the interoperability with disease surveillance and reporting systems; and (v) support to the strengthening of quality assurance systems for diagnostic services.

Sub-Component 2.2 Improve data management and specimen management (US$12 million)

This sub-component will support strengthening specimen management including: (i) streamlining the laboratory specimen referral process, including use of strengthened sub-national laboratories for diagnosis rather relying on a central laboratory; where possible and (ii) improving efficiency of specimen transport and disposal systems including through the use of private sector partnerships, and the use of accredited private laboratory networks for case confirmation. In addition, measures to improve data management will include: (i) strengthening the competencies of laboratory personnel to analyze and use laboratory surveillance data; (ii) strengthening laboratory data management systems to 'report up' and 'report down' more effectively; (iii) achieving interoperability between data management systems, where possible.

Sub-Component 2.3 Enhance regional reference laboratory networking functions (US$18 million)

This sub-component will provide support to improving quality assurance, notably (i) development of common standards, quality assurance systems, procedures and protocols; (ii) introduction of peer review mechanisms; (iii) application of the WHO/AFRO five-step

accreditation process and technical assistance to support accreditation of laboratories; and (iv) support inter-laboratory external quality assessments among the participating countries and recruitment of experts to provide mentorship to laboratories. It will: (i) strengthen existing and possibly identify new regional reference laboratories for specific diseases or diagnostic techniques, (ii) strengthen regional networking and information sharing between countries; and (iii) harmonize laboratory quality assurance policies across countries in the region, based on international standards.

Component 3: Preparedness and Emergency Response (*US$34 million)*

This component will support national and regional efforts to enhance infectious disease outbreak preparedness and response capacity. It will be made up of two sub-components:

Sub-Component 3.1 Enhance cross-sectoral coordination and collaboration for preparedness and response (US$16 million)

This sub-component will support (i) partnership building activities (including the private sector) for outbreak preparedness and disaster risk management; (ii) improvement and harmonization of policies, legislations, and operating procedures that includes representation from other relevant sectors including environment, customs/immigration, education, law enforcement; and (iii) explore the establishment of national and regional financing mechanisms to ensure swift mobilization of resources for animal health and public health emergencies.

Sub-Component 3.2 Strengthen Capacity for emergency response (US$18 million)

This sub-component will support the strengthening of emergency operations centres (EOC) and surge capacity at the national and regional levels. Activities under this sub-component will support (i) the establishment and management of a database of multidisciplinary rapid response teams (MRRTs) that will be available for rapid deployment; (ii) the development and management of stockpiling mechanisms (virtual and physical) to ensure availability of supplies to countries during an emergency response; and (iii) the swift mobilization and deployment of resources in response to major infectious disease outbreaks.

Sub-Component 3.3 US$0 Component for emergency response.

When a major outbreak affects the livelihoods of project beneficiaries, governments may request the World Bank to reallocate project funds to support mitigation, response and recovery. Detailed operational guidelines acceptable to the World Bank for implementing the REDISSE US$0 component for emergency response activity will be prepared at the national level during the first year of the project's implementation. All expenditures under this activity will be in accordance with paragraph 12 of World Bank OP 10.00 (Investment Project Financing) and will be appraised, reviewed, and found to be acceptable to the World Bank before any disbursement is made. Disbursements will be made against an approved list of goods, works, and services required to support crisis mitigation, response and recovery. Triggers and implementation details of the $0 component will be clearly outlined in the Project Implementation Manual (PIM) acceptable to the World Bank.

Component 4: Human resource management for effective disease surveillance and epidemic preparedness (*US$47 million).*

This component will include two sub-components.

Sub-Component 4.1 Health Workforce mapping, planning and recruitment (US$25 million)

This sub-component includes; (i) assessments of current workforce in terms of quantity, geographical distribution and capacity (including private actors); (ii) strengthening capacity for human resource management for disease surveillance and response; (iii) supporting the capacity of governments to recruit health workers and create an incentive environment which encourages skilled individuals to work for the public sector; and (iv) using private actors to deliver public sector activities through delegation of power (e.g. sanitary mandates for veterinarians).

Sub-Component 4.2 Enhance Health Workforce training, motivation and retention (US$22 million)

This sub-component includes training to develop human resource capacity in surveillance, preparedness and response. Cognizant of the importance of community involvement in disease surveillance, a key lesson from the Ebola crisis, the project places emphasis on training at the community level, rather than focusing solely on higher level cadres.

The project will analyze and seek to address the incentive environment within which healthcare workers operate. Armed with an improved understanding of this environment, the project will seek to implement activities which create incentives which not only draw those with relevant skills to the public sector, but also improve staff motivation and retention.

Component 5: Institutional Capacity Building, Project Management, Coordination and Advocacy (*US$41 million)*

This component focuses will include two sub-components:

Sub-component 5.1 Project coordination, fiduciary management, monitoring and evaluation, data generation, and knowledge management (US$30 million)

Under this sub-component, REDISSE will (i) strengthen the capacities of national and regional institutions to efficiently perform core project management functions including operational planning, financial management, procurement arrangements, and environmental and social safeguards policies in accordance with World Bank guidelines and procedures; (ii) enhance M&E systems including routine health management and information systems (HMIS) and other data sources, including bi-annual Joint External Evaluations (JEE) of IHR (2005) and the PVS pathway; (iii) manage operational research program and economic analysis of disease outbreaks and epidemics in the ECOWAS region implemented by national and regional institutions; (iv) promote the design of impact evaluation studies to measure impact of project interventions; and (v) coordinate the roles of existing national and regional institutions to better support the planned project activities. Both the R-PCU and the individual N-PCUs will work closely with national environmental and social agencies to ensure due consideration of their respective legislations.

REDISSE will also finance the generation of data on animal and human health activities in the ECOWAS countries, which is critical to guide and calibrate investments.

Sub-component 5.2 Institutional support, capacity building, advocacy, and communication (US$11 million)

This sub-component will help assess and build capacities at national and regional level. It will provide technical and investment support to enhance provision of services by WAHO and other cross-cutting regional institutions or organizations relevant to animal and human health sector development. To this end, the project will support: (i) the conduct of capacity gap analysis (including staffing, skills, equipment, systems, and other variables); (ii) identify potential synergies and cross-fertilization possibilities among various operations pertaining to disease surveillance and response, using a progressive pathway for OH operationalization at country level, supported by regional institutions; and (iii) establishment or upgrading of national public health institutions. REDISSE will also assist in supporting greater engagement and coordination of the five countries in regional decision- and policy-making processes in ECOWAS, as well as among regional public and non-public organizations.

REDISSE will support advocacy and communication for sustained One Health approach. This will include: (i) generation and dissemination of lessons learned at the national and regional levels through One Health (OH) national and regional platforms respectively; and (ii) raising awareness on strategic issues at the decision and policy levels of countries, and regional economic communities to increase and sustain allocation of resources for disease surveillance, preparedness and response.

1.6 Strategy for Preparing the Relevant Safeguard Instruments

The Bank considers that REDISSE is a category B project. The project triggers two World Bank safeguards policies dealing with Environmental Assessment (OP/BP 4.01) and Pest management (OP/BP 4.09) respectively. Three safeguards instruments have been prepared for the project: (i) Medical waste Management Plan; (ii) Integrated Pest Management Plan; and (iii) Environment and Social Management Framework.
For this current Plan, the **Healthcare Waste Management Plan prepared for the Health Sector Development System Strengthen Project in January, 2016 has been reviewed with additional inputs that reflect the REDISSE project.** The intent of a WMP is to recommend feasible and cost-effective measures to prevent or reduce significant adverse impacts to acceptable levels.

Among essential health personnel, cadres at all levels will benefit from project support. The Ministry's capacity to plan, coordinate, and monitor interventions in the health sector will be enhanced. Support will be provided to seven central-level directorates and all fourteen DHMTs. The seven directorates are as follows: Primary Health Care; Reproductive and Child Health; Training; Hospital and Laboratory Services; Health Systems, Policy Planning and Information; Environmental Health and Sanitation; and Financial Resources.

The ESMF is based on the World Bank's environmental and social safeguard policies as well as EPA and MOHS policies.

1.7 Approach and methodology for the ESMF preparation

The aim of the ESMF is to establish procedures for initial screening of the negative impacts which would require attention, prior to site-specific project implementation. Key specific objectives for the assessment are:

(i) To assess the main potential environmental and social impacts of the planned and future project activities.

(ii) To recommend environmental and social screening process for project sites and sub-project activities.
(iii) To review environmental policies of Government for project implementation and relevant World Bank Operational Policies to be triggered by the project.
(iv) To develop an environmental management plan for addressing negative impacts during sub-project implementation.
(v) To recommend appropriate further environmental work, including preparation of the site-specific ESIAs/ESMPs for sub-projects.
(vi) To recommend appropriate capacity building for environmental planning and monitoring in the project activities.

The ESMF outlines an environmental and social screening process, focusing on the following steps:

(i) completion of the Environmental and Social Screening Form (ESSF);
(ii) carrying out the appropriate level of environmental work;
(iii) review and clearance of the screening results;
(iv) preparation of EIA reports, where this may be necessary and;
(v) Preparation of Environmental Management Plan.

Environmental and Social Screening should be undertaken for each of the proposed sub-project in order to ascertain specific environmental and social impacts. Environmental and social management plans will be prepared to identify, assess and mitigate, as appropriate, all potential negative impacts.

2. Legal, Regulation and Administrative Framework

2.1 Sectoral policies and strategies

The project will support the completion of the Environmental Health Policy and Strategy. Other policies and strategic framework include:

Integrated National Waste Management Policy and Integrated National Waste Management Strategic Plan

The Integrated National Waste Management Policy (INWMP) and Integrated National Waste Management Strategic Plan (INWMSP) (2011) serve as a common guiding reference for the implementation of the "Libreville Declaration on health and environment". Among other issues, the Declaration emphasizes the implementation of 11 priority interventions which include strengthening the waste management system as a strategy for efficiency and effectiveness in the provision of quality services for improved health outcomes.

2.2 Legal framework

The Environmental Protection Agency Act, 2008

The Act was signed as a legal document in September 2008 and amended in July 2010. Following the enactment of this Act, a National Environment Protection Board was established within the Environment protection Agency. The Board facilitates coordination, cooperation and collaboration among Government Ministries, local authorities and other governmental agencies, in all areas relating to environmental protection. The Agency, subject to the Act, also coordinates environmentally related activities and acts as the focal point of national and international environmental matters, relating to Sierra Leone.

The Act empowers a separate environmental protection Agency with the overall mandate of setting and monitoring environmental standards.

In compliance with the third schedule of the EPA Act, 2008 and EIA is required to contain a true statement and description of the following:

(i) Location of the project and its surroundings;
(ii) Principle, concept, and purpose of the project;
(i) Description of the possible impacts on the ecosystem and its locality;
(ii) Direct or indirect effects the project is likely to have on the environment;
(iii) Social, economic, and cultural effects that the project is likely to have on people and society;
(iv) Consultation with the communities, interested parties, and Government Ministries
(i) Actions or measures taken to avoid , prevent, change, mitigate, or remedy the likely effect on people and society;
(ii) Any alternatives to the project;
(iii) Natural resources and the localities to be used in the project;
(iv) Plans for decommissioning the project; and

(v) Other information for proper review of the potential environmental impact of the project.

The second schedule of this Act, gives several factors for determining whether a potential project requires the preparation of an EIA. These factors are given below as stated in the schedule.

(i) The impact on the community.
(ii) The location of the project.
(iii) Whether the project transforms the locality.
(iv) Whether the project has, or is likely to have, a substantial impact on the ecosystem.
(v) Whether the project results in the diminution of the aesthetic, recreational, scientific, historical, cultural or other environmental quality of the locality.
(vi) Whether the project endangers any species of flora or fauna or the habitat of the flora and fauna of the locality.
(vii) The scale of the project.
(viii) The extent of degradation of the environment.
(ix) Whether the project will result in an increased demand for natural resources in the locality.
(x) The cumulative impact of the project together with other activities or projects on the environment.
(xi) The contents of the EIA.

Local Government and Administration

The enactment of the Local Government Act in 2004, paved the way for the establishment of local government councils that replaced the appointed local councils or management committees, which are accountable and answerable to the local communities.

The Local District and or Town Council is the highest political authority in the locality, with legislative and executive powers, and responsible for promoting the development of the locality and the welfare of the people in the locality with the resources at its disposal (The Local Government Act 2004). The local council is responsible among other things, for the mobilization of human and material resources necessary for overall development and welfare of the people of the locality; promoting and supporting productive activity and social development; initiating and maintaining programmes for the development of basic infrastructure and provide works and services; initiate, draw up and execute development plans for the locality; oversee Chiefdom Councils in the performance of functions delegated to them by the local councils; determine the rates of local taxes and approved the annual budgets of Chiefdom Councils and oversees the implementation of such budgets. The local council is also responsible for the formation of committees.

Public Health Act, 1960

The Public Health Act (1960) Consistent with the current legislation, Local Councils (and other local level structures) section 121 gives a clear mandate for implementation of premises inspection, and provide strategic direction and back up support to enable council to perform their roles effectively. With the adoption of the Expanded Sanitary Inspection Compliance, Monitoring and Enforcement (ESICOME), MoHS seeks to: (i) target the owners and occupants of domiciles and commercial premises; and (ii) ensure that they develop and maintain good sanitation on their properties and environs. The project will support the reviewing Public Health Ordinance (1960).

The Persons with Disability Act, 2011

Establish the National Commission for Persons with Disability, to prohibit discrimination against persons with disability, achieve equalization of opportunities for persons with disability and to provide for other related matters.

The Right to Access Information Act, 2013

The Act provided for the disclosure of information held by public authorities or by persons providing services for them and to provide for other related matters.

2.3 The World Bank safeguard policies

The World Bank has keen interest in protection of the environment, for investment projects they support, in line with its ten environmental safeguards policies. These policies provide guidelines, aimed at preventing and mitigating undue harm to people and the environment, when implementing development projects. The environmental safeguard policies, which provide a platform for the participation of stakeholders in project design and implementation, are the following:

(i) Environmental Assessment (OP/BP 4.01) (Forests (OP/BP 4.36)
(ii) Involuntary Resettlement (OP/BP 4.12)
(iii) Indigenous Peoples (OP/BP 4.10)
(iv) Safety of Dams (OP/BP 4.37)
(v) Pest Management (OP 4.09))
(vi) Physical Cultural Resources (OP/BP 4.11)
(vii) Natural Habitats (OP/BP 4.04)
(viii) Projects in Disputed Areas (OP/BP 7.60)
(ix) Projects on International Waterways (OP 7.50)

Interventions with any of the attributes listed below will be ineligible for support under the proposed emergency support:

Sub-projects concerning significant conversion or degradation of critical natural habitats, including, but not limited to, any activity within:

(i) Wildlife reserves

(ii) Ecologically-sensitive marine and terrestrial ecosystems
(iii) Parks or sanctuaries
(iv) Protected areas, natural habitat areas
(v) Forests and forest reserves
(vi) Wetlands
(vii) National parks or game reserves
(viii) Any other environmentally sensitive areas
(ix) Any areas near disposal sites or requiring significant expansion into an existing disposal site.
(x) Use of pesticides that fall in WHO classes IA, IB, or II.

Sub-projects requiring land acquisition or resulting in involuntary resettlement and/or permanent or temporary loss of access to assets or loss of assets for the project affected populations.

The project triggers operational policy OP 4.01 on Environmental Assessment, as construction of new facilities and rehabilitation of facilities have potential of some negative impacts, which requires that appropriate mitigation measures are put in place. The Policies on Natural Habitats (OP4.09) and Forests (OP4.36) are not triggered as the Project activities will not involve conversion or degradation of critical or sensitive natural habitats and forests. The Policies on Indigenous Peoples (OP 4.10) and Involuntary Resettlement (OP4.12) are also not triggered as no indigenous peoples are expected to be present in the project area and the project does not involve any involuntary land acquisition.

World Bank's categorization of projects

Environmental consequences should be recognized early in the project cycle; and taken into account in project selection, siting, planning and design. In so doing, adverse environmental and social impacts may be prevented, minimized, mitigated and/or compensated for; and positive impacts may be enhanced. The World Bank's Environmental Assessment includes the process for mitigating and managing environmental and social impacts throughout project implementation and the Environmental Assessment Sourcebook (1993) and its updates (1996, 1997) provide technical guidance. The World Bank's categorization of projects, with respect to significance of environmental impacts is as follows:

(i) Category "A": A proposed project is classified as Category "A" if it is likely to have significant adverse environmental impacts that are sensitive, diverse, or unprecedented. These impacts may affect an area broader than the sites or facilities subjected to the physical works. Environmental Assessment for a Category "A" project examines the project's potential negative and positive environmental and social impacts, compares them with those of feasible alternatives (including the "without project" situation), and recommends any measures needed to prevent, minimize, mitigate or compensate for adverse impacts and improve environmental performance. For a Category "A" project, the borrower is responsible for preparing a report, normally an EIA (or a suitably comprehensive or sectoral EIA) that includes as necessary, elements such as environmental audits or hazard or risk assessments.

(ii) Category "B": A proposed project is classified as Category "B" if its potential adverse environmental and social impacts (on human populations or environmentally important areas including wetlands, forests, grasslands, and other natural habitats) are less adverse than those of Category "A" projects. These impacts are site-specific; few if any of them are irreversible; and in most cases mitigation measures can be designed more readily than for Category "A" projects. The scope of EIA for a Category "B" project may vary from project to project, but it is narrower than that of Category "A" EIA. Like Category "A" EIA, it examines the project's potential negative and positive environmental and social impacts and recommends any measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

(iii) Category "C": A proposed project is classified as Category "C" if it is likely to have minimal or no adverse environmental impacts. Beyond screening, no further EA action is required for a Category "C" project.

(iv) Category "Fl": A proposed project is classified as Category "Fl" if it involves investment of Bank funds through a financial intermediary, in subprojects that might result in adverse environmental impacts.

The sub-project being financed under the project fall under B: because the environmental impacts are easily identified and can be mitigated. All of the identified negative impacts can be reduced or in some cases avoided, with timely implementation of the mitigation measures through the following system:

(i) Environmental and social screening of sub-projects using a screening form attached as annex 3. The screening process will be done to appraise environmental and social risks and identify potential mitigation measures in advance.

(ii) Preparation of Environmental and Social Management Plan (ESMP) for individual sub-projects to guide the implementation of mitigation measures.

(iii) This Medical Waste Management Plan (WMP) in each facility.

3. Environment and social impact process

3.1 Impact identification methodology

Table 1: Potential environmental and social impacts

ENVIRONMENTAL IMPACTS	
Planning Phase	
Physical Restrictions on building space.	The size of the health care facilities premises are either too small, with little room to expand outwards or on steep slopes with high erosion potentials. All construction is expected to be within the existing premises and therefore there is no requirement for land acquisition.
Construction Phase	
Flora and Fauna	The rehabilitation, refurbishment and upgrading of existing healthcare facilities could result in some clearing and depletion of vegetation that could result in loss of tree/plant cover within the existing premises.
Soil and Land Pollution	Earth-moving equipment such as excavators will be used in excavation work. This could potentially/temporarily decrease the drainage of the area resulting in water logging.
	The risk of accidental discharge of hazardous products, leakage of hydrocarbons, oils or grease from construction machinery also constitute potential sources of soils and water pollution.
Vehicular Traffic	Construction works will result in a higher volume of traffic around the healthcare facilities and within the neighborhood. This could result in obstruction of normal traffic, disruption of access of the community and road safety around the construction site. The noise and movement could also affect normal hospital operations while impacting patient well-being through noise and dust.
Waste Management	Activities at construction sites will produce construction wastes such as excavated soils and cement bags, paint drums, brick and concrete rubble, metal, broken glass, timber waste and debris. Excavated wastes could obstruct the general public, the movement of the workers and vehicles as well as affect the aesthetics of the environment.
	Old buildings have asbestos and PCBs, which if dismantled or disposed haphazardly, can result in serious pollution and health impacts.
Ambient air quality	Air Quality will be impacted by emissions from vehicles, earthmoving equipment and released particulate matters. Demolition to modify the built environment will lead to considerable levels of cement dust which can affect workers and patients. Deteriorated indoor air quality will be of critical effect to especially asthmatic construction workers, patients and health workers, with either minor or severe health impact depending on level and duration of exposure.
Water pollution	Wastewater discharges from construction activities or onsite

	sewage system and rainwater run-off can run into surface waters will impact water quality by causing changes to its physical, chemical and biological properties.
SOCIAL AND HEALTH IMPACTS	
Planning Phase	
Disruption of Services	Healthcare services can get disrupted, and there is need for clear agreement on when and how the promised extension and refurbishments will be undertaken.
Construction Phase	
Disruption of Utilities Service	The excavation and civil works may cause temporary disruptions of utility services such as electricity communication and water. This could impact the provision of services and also the neighborhood communities.
Temporary disruption of healthcare services	Since facilities under renovation will not be closed, they will experience shortages of working space. Thus modifications of buildings in which medical services are provided may entail moving patients or equipment from one area or room to another. This may cause temporary disruption in delivery of health services to patients.
Occupational Safety and Health	The safety of the local population may be at risk during construction activities. The movement of trucks to and from the site, the operation of various equipment and machinery and the actual construction activities will expose the workers to work-related accidents and injuries. Pollutants such as dust and noise could also have negative implications for the health of workers and near-by communities.
Impacts of construction activities on patients, healthcare staff and other stakeholders.	Refurbishment work undertaken in the same buildings having patients has potential to cause injuries to patients or health workers. At all sites, renovation works will have the following potential hazards to staff and patients:
	Exposure to asbestos containing materials. (Old Buildings with asbestos roofs).
	Falling from tripping on building materials.
	Noise and vibrations during demolition
	Injury from falling or flying debris when demolishing walls
	Cracking of existing structures from vibrations
	Spillages and dust during transportation of materials
Noise	Noise and vibration caused by machines, site vehicles, pneumatic drills etc. during construction activities can be a nuisance to patients and the community.
Traffic	Communities around the rehabilitation sites will experience heavier human and vehicular traffic. Construction related activities will be a nuisance to road users e.g. storage of construction stones by the roadside.
Inflow of construction workers	While most workers may originate from the local community where they have families, there might be others from distant places and working away from their families. Management of security, water and sanitation and waste will be the responsibility of the contractor.
Poor Stakeholder Participation	Despite various efforts (e.g. newspaper notices, bulletins at the potential sites, announcement at various local meetings) to reach

	out to people affected by the project, there has been relatively low participation of communities, staff members and other stakeholders during project planning and designing.
	Note that stakeholder participation will take place both centrally and at the district level.
Operation Phase	
Improved medical services at healthcare facilities	The project will have positive impact on the health of the people through easing access to quality medical care currently nonexistent at these facilities. Renovation of facilities and installation of medical equipment will enable currently ineffective healthcare facilities to provide new or improved services to patients such as maternity.
Employment opportunities	Equipping healthcare facilities with modern equipment, enabling provision of new healthcare services and resultant increase in visiting patients may create additional long-term technical and non-technical job opportunities for medical professionals, janitors, security guards, etc.
Air pollution from onsite incinerators	Incineration of unsegregated health care waste can result in localized pollution of air with pollutants such as respirable ash, furans and dioxins. Dioxins are known to promote cancers in humans. Downwash of incinerator emissions has potential to degrade indoor air quality of healthcare buildings or those of nearby offsite buildings. The model chosen by UNOPS and UNFPA has been tested for air pollution and residual smoke are considered within an acceptable range (Lab results are available).
Community health risk due to improper waste management	Improper infectious waste disposal can cause public health risks due to environmental pollution: impaired air quality, wastewater/sewage handling, storm water contamination of water courses or when adults and children rummage through raw waste stockpiles.
Occupational health and safety risks	Medical facilities are a potential source of infectious waste in gaseous, liquid or solid forms. These could pose unsafe conditions for healthcare staff. Of particular concern are janitors handling infectious waste (including sharps) without adequate protective gear, storage of sharps in containers that are not puncture-proof and management of radioactive waste at healthcare facilities where x-ray equipment will be installed. While some OHS risks will be borne by new equipment or services introduced after renovation or upgrade of facilities, most other effects are existing (hence cumulative) and would only be exacerbated by increased scale of healthcare services.
Improved aesthetics and life of healthcare facilities	Renovation will allow better healthcare services to be provided to communities.

3.1.2. Mitigation measures

Since only sub-projects with minor impacts are eligible, these are easily mitigated through the application of sensible site selection criteria, good construction practices and

diligent management practices in the operational phase. This may include proper silting of infrastructure to avoid and minimize impacts, construction contract procedures for dealing with "chance finds," control of dust generation and prevention, waste management and technology for toilet facilities like leaching fields, organic composting, and septic tanks

There is a possibility that sub-project activities may result in damage to physical cultural property unless these are identified. Sub-project proposals with activities that may occur in areas with possible physical cultural resources will specify procedures for identifying physical cultural property and for avoiding impacts on these, including:

(i) Consultations with the appropriate authorities and local inhabitants to identify known or possible sites during sub-project planning;
(ii) Siting of sub-project activities to avoid identified sites (including identifying such areas in protected and natural resource management planning and zonation);
(iii) "Chance finds" procedures will include cessation of work until the significance of a "find" has been determined by the appropriate authorities and local inhabitants, and until fitting treatment of the site has been determined and carried out;
(iv) Construction contract procedures will include the same procedures for dealing with "chance finds;"
(v) Buffer zones or other management arrangements to avoid damage to cultural resources such as "sacred" forests and graveyards. Local communities to which these areas belong should decide access procedures and should not be excluded from accessing these areas.

The ESMF stresses community participation since local knowledge is important in identifying, designing and planning the implementation of practical mitigation measures. It is especially important where the success depends on community support and action, both in implementing mitigation measures and in monitoring their success.

3.2 Preparation of safeguards instruments

The environmental and social impact assessment process will identify and assess the potential environmental and social impacts of the proposed construction activities, evaluate alternatives, as well as design and implement appropriate mitigation, management and monitoring measures. These measures will be captured in the Environmental and social Management Plan (EMP) which will be prepared.

This ESMF includes an EMP-checklist which can be used as the Environmental Management Plan (EMP) for individual sub-activities once identified during the scoping identification phase. (Annexes 3 and 4) For each sub-activity in which the specific buildings/sites for rehabilitation, and/or demolition and complete reconstruction is known, the EMP-checklist is completed. The checklist has three parts:

(i) Part 1 includes the descriptive part that describes the project specifics in terms of the physical location, institutional arrangements, and applicable legislative aspects, the project description, inclusive of the need for a capacity building program and description of the public consultation process. This section could be up to two pages long. Attachments for additional information can be included. (This is the ESSF, Part 1 as detailed in Annex 3).

(ii) Part 2 includes the environmental and social screening of potential issues and impacts, in a simple Yes/No format followed by mitigation measures for any given activity. Currently, the list provides examples of potential issues and impacts. This list can be expanded to specific site issues and /or impacts; and good practices and mitigation measures. (Annex 4)

(iii) Part 3 will include the monitoring plan for activities during project construction and implementation. It retains the same format required for current EMPs. It is the intent of this checklist that Part 2 and Part 3 be included as bidding documents for contractors. (Annex 4).

The EMP-checklist which is to be filled out for each sub-project, will be used to determine the type and scope of the environmental and social safeguards impacts. The practical application of the EMP-checklist would include filling in of Part 1 to obtain and document all relevant site characteristics. In Part 2 the type of foreseen works, would be checked, and the completed tabular EMP is additionally attached as integral part to the works contract and, analogous to all technical and commercial terms, that is signed by the contract parties. Part 3 of the EMP-checklist, the monitoring plan, is designated for the Contractor responsibility, to be supervised by the integrated Health Project Administration Unit (IHPAU)

The Consultant with the help of the IHPAU will prepare the EMPs in consultation with affected peoples and with relevant NGOs, as necessary. The EMP will be submitted to the Implementing Agency, for review, and the approved EMPs must be well maintained for subsequent review by the Bank. If there are any sites, which are seen to have potentially larger risks and impacts, or if there are social issues or those sites where land will need to be acquired, the draft EMPs must be sent to the Bank for approval prior to finalization and starts of construction works.

All such site-specific EMPs will be disclosed at the sites (translated in local language) and consulted with neighboring communities, project affected persons and key community representatives before the mitigation actions are finalized and the contractor starts civil works on the ground. The record of such consultations must be documented and maintained by the Implementing Agency.

3.3 Application and review of safeguards instruments

The IHPAU and other relevant body will supervise and monitor the overall safeguards implementation process and prepare a progress report on the application of safeguards policies during the planning, design, and construction phases of the Project. The Monitoring and evaluating officer will develop the reporting requirements and procedures to ensure compliance of the contractors. Environmental consultants will be hired by the World Bank to support the IHPAU, in conducing public consultation and public awareness programs; and carry out periodic training for field engineers and contractors as appropriate.

Appropriate mitigation measures will be included in the bidding documents and contract documents to be prepared by the IHPAU. Compliance by the contractors will be monitored in the field by the project field observers, working under close supervision. The performance of the contractors will be documented and recorded for possible later review. Sample Environmental Safeguards procedures for inclusion in the technical specifications of construction contracts are provided in Annex 6.

3.4 Institutional and implementation responsibilities

3.4.1 Integrated Health Project Administration Unit (IHPAU)

The IHPAU will be housed in the office of the Permanent Secretary of the Ministry of Health and shall be responsible for the following:

i) Procurement and financial management of all REDISSE operations; Ensure adherence to all World Bank group implementation and reporting guidelines; iii) Prepare project progress report which will be sent to the regional secretariat (WAHO) and World Bank; iv) Ensure consultations with stakeholders during each stage of project implementation; v) Coordination and collaborations with stakeholders including relevant agencies and departments of Ministries of Health and Agriculture; vi) Take the lead in partnership with other stakeholders in advocacy and enlightenment programs as necessary for result oriented implementation of REDISSE HCWMP and vii) day to day planning and operations of REDISSE including HCWMP implementation and monitoring.

Directorate of Environmental Health and Sanitation

Within the MOHS, the Directorate of Environmental Health and Sanitation is responsible for (i) policy formation, regulation and standards setting (ii) resource mobilization;(iii) information, education and advocacy; and (iv) monitoring and oversight of the efforts of all health care providers and development partners at all level relating to environmental health and sanitation activities. Responsibilities for water supply and sanitation are defined in: (i) the Public Health Ordinance (1960); (ii) the Local Government Act (2004), which devolves the water supply and sanitation responsibilities to Ministry of Local Government and Rural Development; and the Public Health Act (1996, amended 2004). Consistent with the legislation, Local Councils (and other local level structures) have a clear mandate for the implementation of premises inspection, with MoHS providing strategic direction and back-up support to enable Councils to perform their roles effectively. With the adoption of the expanded Sanitary Inspection Compliance, Monitoring and Enforcement (ESICOME), MOHS seeks to: target the owners and occupants of domiciles and commercial premises and ensure that they develop and maintain good sanitation on their properties and environs.

The Directorate of Primary Health Care is responsible for management of the DHMTs and will oversee the DHMT strengthening subcomponent, with implementation support from DHSPPI. With assistance from the IHPAU, the MoHS will contract services to conduct the DHMT assessment, develop a management training curriculum, and implement the agreed-on capacity building measures. MoHS will also oversee the recruitment of Health Management Officers to be embedded at each of the DHMTs. The Health Management Officers will support the District Medical Officer and the DHMT with day to day operations, focusing especially on strengthening the monitoring and evaluation systems (HMIS, MDSR, SLA, etc.) and the use of information for decision-making (by the DHMT, Local Councils, facilities, etc.). DHMTs will provide inputs to the terms of reference for the recruitment of the Health Management Officers.

As the district level structure of the MOHs, District Health Management Teams (DHMTs) are the primary implementers of the Basic Package of Essential Health Service and National Health Sector Strategic plan. As such they are responsible for planning,

implementing and monitoring health service provision: training personnel; engaging with communities; supply equipment and drugs to health facilities within the district: collecting data from PHUs and reporting it to the national level; and generally ensuring that quality and equitable health service reach the population within the district. The DHMTs leadership and management roles are essential to health service delivery within the district, and to the recovery of the health system post Ebola.

The Directorate of Primary Health Care will be responsible for overseeing the Community Outreach Component of the HSDSSP. This component will strengthen the national CHW program, originally launched in 2012 and currently under revision, by providing financial incentives to community health workers, and by providing more regular and robust supervision from peer supervisors to CHWs. These two areas have been chosen given that lack of supportive supervision and limited incentives have been highlighted as two weaknesses of the current national CHW program.

3.5 ESMF Iimplementation Rresponsibilities: overview

The Directorate of Environmental Health and Sanitation (DEHS) in Collaboration with Environmental Protection Agency (EPA) has the overall responsibility for ensuring that environmental and social issues are adequately addressed within the sub-project cycle, and also to develop and collate the environmental Safeguard document. The sub-project implementers are responsible for actual preparation and implementation of required safeguard procedures and measures. The World Bank will finance workshops on the safeguard policies for stack holders, staffs, implementers and other MDA's. The World Bank will be responsible for general supervision of implementation.

Ministry of health and sanitation

(i) Responsible for carrying out EI;
(ii) Consults project-affected groups and local NGOs;
(iii) Provides relevant information in timely manner prior to consultation in a form; and
(iv) Language understandable and accessible to groups being consulted.

Project implementing unit

(v) Have key processes in Operational Manual;
(vi) Provide technical support for safeguard screening to implementers;
(vii) Review safeguard documentation;
(viii) Maintain safeguard documents for all subprojects; and
(ix) Monitor subproject compliance with mitigation plans.

Table 2: Responsibilities for ESMF implementation

Project Phase	MOHS/EPA	Implementers
Screening	Inform and advise applicants and other stakeholders of the ESMF procedures Review Letter of Interest and screen for potential safeguard issues, and advise applicants regarding the nature and content of the safeguard documents and measures to be prepared	Assess any potential safeguard issues early in the preparation process, including screening for the presence of indigenous peoples Describe potential safeguard issues in the Letter of Interest
Preparation	Advise applicants on safeguard issues, as needed	Undertake safeguard required processes, such as consultations with local communities, environmental review, and social assessment If needed, design safeguard measures and prepare safeguard documents, such as an Indigenous Peoples Plan (IPP) and a Process Framework (PF) with the participation of local communities If applicable, disclose draft safeguard documents with the sub-project proposal to affected communities prior to final review of proposal by the project
Review and approva	Review sub-project proposal for safeguard impacts and social risks Assess the adequacy and feasibility of the safeguard assessment and consultation process. If needed, request further steps Assess the adequacy and feasibility of the safeguard measures and documents. If needed, request appropriate changes to these and re-assess prior to final approval If indigenous peoples are affected, ascertain that they have provided their free, prior and informed consent to sub-project activities affecting them. Sub-projects affecting indigenous peoples cannot be approved without such agreement Assess the capacity of the applicant to implement safeguard measures If applicable, publicly disclose safeguard related information on the web after sub-project approval	Submit sub-project proposal with safeguard measures and documents (e.g. social assessment, environmental review, IPP, PF), if required If requested by SOS, take additional steps to meet ESMF and safeguard policy provisions. Re-submit proposal with revised safeguard measures and documents, as needed
Implementatior	Supervise and review environmental and social safeguard documents (IPP, PF) and issues during sub-project implementation. If needed, request changes to safeguard measures and/or implementation of these Review and approve Plan of Actions that are required to be prepared during implementation of sub-projects restricting access to natural resources (as will be described in the PF for sub-projects with potential impacts from such restrictions)	Disclose final safeguard documents (e.g. IPP, PF), if any, to affected communities Monitor and document the implementation of safeguard measures. When indigenous peoples are affected, include them in participatory monitoring and evaluation exercises Prepare Plan of Actions for sub-projects restricting access to natural resources (as per the PF prepared). Monitor and document implementation of these plans
Evaluatior	Ensure inclusion and review of environmental and social safeguard issues and outcomes in mid-term and final sub-project evaluation and reporting, including concerning any lessons learned	Evaluate the implementation and outcomes of safeguard measures. When indigenous peoples are affected, include them in participatory evaluation exercises

3.6 Environmental and social monitoring

Throughout the sub-project review process, the DEHS will maintain contact with the implementers to obtain clarification on information provided and the preparation process in general. It may request additional steps, information and documentation as needed to meet the objectives of the ESMF. There are two key decision points during the sub-project preparation process. A screening of sub-project proposals (Letter of Interest) will identify

potential safeguard issues and ascribe preparation procedures to further assess potential impacts and design mitigation measures, as needed. A review of the final sub-project proposal will, besides reviewing the general proposal against the project objectives and procedures, assess the adequacy of the sub-project's preparation process and implementation measures vis-à-vis the safeguard issues, including:

(i) Compliance with this ESMF, EPA policies, and resolutions, and World Bank environmental and social safeguard policies ;
(ii) Potential for the project to cause adverse environmental impacts;
(iii) Potential for the project to cause adverse social impacts;
(iv) Adequacy and feasibility of the proposed safeguard mitigation measures and monitoring plans, including any Indigenous Peoples Plan or Process Framework for restrictions of access to resources; and
(v) Capacity of the applicant to implement any required safeguard-related measures during the preparation and implementation of the project.

This review may find the safeguard process and measures satisfactory, or may find the need for further discussion with, and steps by, the applicant to achieve the objectives of this ESMF, including revising safeguard measures and documents as appropriate. If the risks or complexity of particular safeguard issues outweigh the benefits, the sub-project should not be approved as proposed. For sub-projects affecting indigenous peoples their free, prior and informed consent is required.

During sub-project implementation, safeguard issues are tracked along with performance toward sub-project objectives. At each performance reporting stage, DEMS will revisit the safeguard issues to assess their status and address any issues that may arise. In cases where the implementers implementing a safeguard instrument or other mitigation measures, they will report on the progress of such implementation similar to that which they are doing for other project elements. The intent of this process is to ensure that the environmental and social safeguard issues are continually monitored and mitigated throughout project implementation.

The DEHS will monitor the implementation of safeguard issues during sub-project implementation. It will review and approve Plan of Actions that are required to be prepared during implementation of sub-projects restricting access to natural resources. The World Bank will include supervision of safeguard issues in its regular supervision of the project. The key responsibilities of the project implementers and stakeholders are described in further detail.

Implementation and Supervision undertaken by all Directorates implementing the various sub-project includes:

(i) Preparing contracts with environmental clauses for Directorates and communities executing subprojects.
(ii) Undertake site visits to ensure that environ-mental criteria and mitigation measure, as required by contracts, have been incorporated into subprojects.
(iii) Require changes to subproject design and/or implementation if unforeseen impacts occur.
(iv) Approval required to issue final payment for subproject implementation.

Monitoring of the ESMF by the DEHS in collaboration with EPA:

(v) Identify potential problems at an early stage of implementation of the project and propose possible solutions.
(vi) Provide constant feedback on the extent to which the projects are achieving their goals.
(vii) Evaluate the extent to which the project is able to achieve its general objectives and deadlines.
(viii) Monitor the efficiency with which the different components of the project are being implemented and suggest improvements.
(ix) Evaluate the extent to which the project is able to achieve its general objectives and deadlines. Site visits during subproject execution and operation to assess how environmental screening and mitigation measures are succeeding or have succeeded in minimizing impacts.
(x) ESMF and EMWMP monitoring will be done quarterly joint at central level and annually at central and district level.
(xi) Visit sites during subproject execution and operation to assess how environmental screening and mitigation measures are succeeding or have succeeded in minimizing impacts.

The co-ordination structure should be set up by the project implementing unit. The Directorate of Environmental Health and Sanitation in collaboration with EPA should take the lead in developing the ESMF regulations and technical guidelines.

3.7 Budget and timeline

3.7.1 Monitoring and evaluation budget

Table 3: Monitoring and evaluation budget

Item	unit	unit type	unit	unit type	unit cost	total cost per month	Total cost pe year	Total cost for 3 years	Total cost ir dollars
Printing of checklist &supervision tools	3	pages	40	copies	5000	600000	7200000	21600000	4320
Replicating checklist	3	pages	40	copies	5000	600000	7200000	21600000	4320
Printing of ESMF&HCWMP Document	80	pages	80	copies	10000	64000000	84000000	84000000	16800
Staff DSA for supervision of construction and Rehabilitation	3	staff	13	days	350000	13650000	163800000	491400000	98280
Top up cards	1	top up	3	staff	200000	600000	7200000	21600000	4320
Fuel for field visits	3	staff	13	staff	250000	9750000	117000000	351000000	70200
DSA for Drivers	3	Drivers	13	Days	150000	5850000	70200000	210600000	42120
External Auditor	1	person	35	days	1000000	35000000	35000000	105000000	21000
Laptop for data collection/report writing	2	Laptop	2	Laptop	6000000	12000000	12000000	36000000	7200
Internet	1	modem	1	modem	1000000	1000000	1000000	3000000	600
internet running cost	1	modem	1	modem	400000	400000	4800000	14400000	2880
				Total	**9370000**	**143450000**	**509400000**	**1528200000**	**305640**

3.7.2 Implementation timeline

Table 4: Project implementation timeline

Objectives	2015				2016				2017				2018				2019			
	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4	Q 1	Q 2	Q 3	Q 4
Support for PHU staff/Training (Supply)																				
Capacity building and skills transfer through in-service training and on the job mentoring																				
completion of the national Environmental Health Policy and																				
Drafting of the revised Public Health Ordinance																				
Training of 400 Public Health Aide																				
Clinical residency training																				
Recruitment and deployment of the health professional																				
Project management monitoring and evaluation																				
Health Care will be responsible for overseeing the Community Outreach Component of the HSDSSP																				
DHMT leadership & management capacity strengthening																				
Health Systems, Policy, Planning & Information																				

3.8 Public consultation and disclosure

Key documents prepared to address safeguard issues need to be publicly disclosed according to the World Bank disclosure policy. Should the project implementers be required to develop a stand-alone environmental review or social assessment, an Indigenous Peoples Plan (IPP), or a Process Framework (PF), these documents will be disclosed to local communities in a form, manner and language appropriate for the local context. Disclosure will occur in two phases:

(i) Disclosure of assessment documents (e.g. social assessment and environmental review) and draft safeguard documents (e.g. IPP and PF) during project preparation and prior to final review and approval of the sub-project proposal. Disclosure during sub-project preparation aims to seek feedback and input from local communities, and as appropriate other stakeholders, on the sub-project proposal and safeguard measures and documents.

(ii) Disclosure of final safeguard documents prior to sub-project implementation to inform local communities of implementation measures concerning safeguard issues.

The project will disclose information of approved sub-projects, including any safeguard issues, through consultation meeting and validation meeting. Stakeholders can inquire further documentation and raise their concerns or recommendations to the Document.

The key stakeholders include individuals suffering from EVD, affected communities, healthcare workers, the donor community, the implementing Ministries and related government agencies specially set up to help implement the joint EVD Outbreak Response Plan within the three hardest hit countries. The draft ESMF that will be prepared during implementation, will be publicly consulted on and disclosed in-country (and globally through the World Bank Info Shop) in a form and language appropriate for public comprehension prior to its finalization. All comments provided during these consultations will be recorded, and included in the final ESSAF and any subsequent safeguard instruments which will be developed as required.

4. Healthcare Waste Management Plan

4.1 Overview

4.1.1. Purpose of the HCWMP

The intent of an HCWMP is to recommend feasible and cost-effective measures to prevent or reduce significant adverse impacts to acceptable levels. Particular attention is given to outlining best management practices and design measures which should be put in place to ensure that environmental impacts are minimized during civil works activity and that human health and environmental concerns are fully addressed on an ongoing basis during project implementation. Best management practices and mitigation measures are detailed by activity in the following sections.

4.1.2. National Action Plan

The MOHS must develop a step-by-step strategy to improve the management of HCW in the HCFs of the country and reduce significantly the occupational risks associated with the current practices. The strategy should show clearly the medium- and long-term objectives to be achieved and reflect the integrated effort that is necessary to set-up safe and environmentally sound HCWM practices. Whenever possible, it should underline the institutional and individual responsibilities as well as define the monitoring and administrative procedures. There are four objectives contained in the National HCWM Plan, namely:

(i) Objective 1: Develop the Administrative Framework for the Implementation of the National Action Plan
(ii) Objective 2: Develop HCWM Legal and Regulatory Framework
(iii) Objective 3: Standardize Healthcare Waste Management Practices
(iv) Objective 4: Strengthen Institutional Capacities of HCWM Stakeholders

A three-step approach is proposed for implementation of the National Action Plan:

Step 1: Organize a National Workshop to validate the National HCWM Plan and the strategy that is proposed.

The National workshop should focus on amending and validating the National HCWM Plan and National HCWM Guidelines. The implementation of the HCWM plan will require a regular commitment and monitoring. Thus participative decisions should be taken during the workshop to ensure a good cooperation between all the stakeholders for the future implementation of the plan. The following institutions should participate in the workshop:

Step 2: Establish the institutional framework to initiate the HCWM plan: recruit a Project Coordinator and form a National Steering Committee for HCWM

The DEHS in collaboration with EPA and the National Steering Committee for HCWM should supervise and monitor the overall implementation of the HCWM plan. The Steering Committee should meet on a regular basis (every months minimum). They should be divided into specific Work Groups aiming at implementing specific portions of the NHCWM plan.

It is recommended that the Ministries of Health and Environment seek external support such from EPA and other Environmental related agencies. The tasks of the National Steering Committee should be the following:

(i) Nominate a project coordinator and compose the work groups;
(ii) Establish the criteria for the monitoring of the HCWM plan during its implementation;
(iii) Designate the administrative authorities in charge of the implementation of the HCWM plan at state and LGA levels;
(iv) Select HCFs and states where the National HCWM plan could be tested in a first step;
(v) Set-up intermediary and final evaluations of the implementation of the HCWM plan.

A Project Coordinator (PC) should be assigned a full time position during the overall duration of the implementation of the plan. He/she should have excellent organizing, managing and communication skills. It is recommended that the PC should receive periodic external support.

Step 3. Launch the National Action Plan.

The implementation of the four objectives contained in the National HCWM Plan requires the development of specific actions. They are included in the National Action Plan (NAP) presented hereafter. The plan should be periodically monitored and reviewed. As mentioned previously, a typical timeframe for a NAP is around 3 years.

Table 5: Cost estimate of National Action Plan

	Actions	**Unit**	**Quantity**	**Unit cost (USD)**	**Total (USD)**
Objective 1: Develop Administrative System for NHCWMP Implementation					
1.1.1	District support visit to set up District Steering Committee on HCWM (12 district)		12	7,000	84000
1.2.1	Develop Evaluation criteria tools		1000	4	4000
1.3.1	Set up a structure for co -ordination and follow up of the HCWM plan; develop regulations and guidelines for HCWM	Mond ays	60	200	12000
Objective 2: Develop HCWM Legal and Regulatory Framework					
2.2.1	Validate National guidelines for HCWM		3	3,000	
2.3.1	Collation and harmonization of existing relevant environmental and health documents		-	-	-
2.3.2	Develop HCWM guidelines and SOPs		30	200	6,000
Objective 3: Standardize HCWM Practices					
3.1.3	Enforce the use of colour coded containers for specific HCW at all facilities		1000	15	15,000
3.1.4	Organize national, and District level workshop for stake holders on HCWM practices		4	3,000	12,000
3.5.1	Create awareness on HCWM activities (WM meetings)		5,280	710	11,500
Objective 4: Strengthen Institutional Capacities of HCWM Stakeholders					
4.3.3	Develop guidelines for training		50	200	10,000

4.2 Institutional framework

4.2.1 Responsibilities

At the national level, the HCWM Plan is part of the Government's Environmental Health strategy, of which it is an important component. Implementation will be coordinated by the EHD of the MoHS, in concordance with other stakeholders (EPA, CBOs and NGOs) who will participate in a range of activities from implementation to supervision.

Part of improving HCW management involves clarifying who is responsible for what functions and identifying the fields of competencies of each institutional actor involved in this process. A brief synopsis of functions and competencies is provided below.

At the central level: The MoHS is responsible for national health policy and ensures the guardianship of the health facilities. The Department of Preventive Health Services (Environmental Health Section) will take the lead in coordinating implementation of the HCWM plan because: (i) it is part of its mission, (ii) it has competent staff in this field, and (iii) it has decentralized services at district level. The Health Education Service Unit has a role to play because it is concerned with activities of public information and awareness rising.

At the district level/city council level: The City Assemblies and District Assemblies will need to put in place arrangements to make sure that HCW are not mixed with general wastes in their public landfills. They should also give their opinion about the HCWM plan activities proposed for health facilities in their jurisdiction, in case some may have negative impacts on the local population's health. Coordination of the monitoring and reporting on implementation of the HCWM POA will be exercised by the Health Team, in particular the Environmental Health Officer.

At the health facility level: The manager of each health facility shall be responsible for HCWM in his/her establishment. S/he must ensure that a HCWM plan is prepared and then watch to ensure that procedures and regulations are respected. S/he must designate the teams charged with HCW segregation, collection, transportation and treatment.

Table 6: Implementation responsibilities by Component

Strategies	Activities	Levels of implementation	Who is responsible	Objectively verifiable Indicators	Means of verification	Risk Assumptions
1.1 Develop National HCWMG Stakeholder Support	1.1.1 Organise national workshop to modify and validate the HWMG and set-up specific task groups	National and District		HCWMG modified and validated	Report of the workshop	Availability of funds
1.2 Identify coordination	1.2.1 Set-up a National Steering Committee on HCWM Establishment of District Steering Committees	National/District	IHPAU	Membership list, stipulation of objectives, scheduling of regular meetings	Minutes of meetings held	
	1.2.2 Designate of a National/ District Coordinator Designate of HCWM Officers at Council	National and District	MOHS/DEHS/Council	Job description with clear listing of tasks	Name of coordinator	Funds required
1.3 Develop National and District evaluation and reporting system	1.3.1 Establish evaluation criteria for HCWM	National and District	MOHS/DEHS	Established indicators	Reports of indictors	
	1.3.2 Establishment of District Steering Committees			Membership list, stipulation of objectives, scheduling of regular meetings	Minutes of meetings held	
1.4 Identify implementing agents	1.4.1 Designate of HCWM Officers at agencies	National and District	NGO/CBO	Job description with clear listing of tasks	Identifiable agent HCWM	

	Support private initiatives and partnership in HCWM				Officer	
Develop HCWM Legal and Regulatory Framework	Develop HCWM guidelines and SOP	National and District	MOHS/DEHS			
1.5 Make the general public aware of the risks linked to HCW	Television messages Radio messages Posters in health facilities	National and District facilities	IHPAU/NGO/CBO/	Reaching the public	Presentation on National TV, Local radios	
1.6 Support the execution of HCWM Plan	Monitor the execution (national and local level) Evaluation of the HCWM POA (halfway and final)		IHPAU /DEHS/ Council	Plan HCWM activities	Plan HCWM activities develop	
1.7 Standardise HCWM Practices	Ensure adherence to WB guidelines on HCWMP by enforcing the use of color coded containers for specific HCW at all facilities Organize national, and District level workshop for stake holders on HCWM practices	National and District	IHPAU			

4.2.2 Potential partners and field of intervention

Delivery of essential health services and the fight against Ebola and proper waste management relies on the involvement of a wide range of actors -- public and private sectors, NGOs, and civil society. It is therefore necessary to establish a partnership framework to identify the roles and responsibilities of each category of actor.

Table 7: Potential field of intervention

Actors	**Potential field of intervention**
Technical services of the Government (MoHS)	Inform the local and national authorities. Facilitate co-ordination of HCWM plan activities. Supply technical expertise. Develop guidelines for HCWM Develop M&E tools execute control and monitoring of activities train the health staff/supervisors monitoring and evaluation of HCWM Implementation of the service Level agreement. Over sees the planning process and implementing the recovery phase.
Directorate of Environmental Health and Sanitation	Will monitor ESMF and EMWMP
The government level	Coordinate the post Ebola recovery planning in all sectors
City councils/district governments	Participate in the mobilization of populations ensure HCW are properly disposed in their landfill. Participate in training, monitoring and evaluation
World Bank project team & safeguard specialists	.Conduct supervision Provide safeguard enhancement Ensure Policies are followed Conduct reviews
Environmental protection Agency	To ensure effective protection and management of the environment. Review and clear sub-projects according to EPA Act 2008 as amended in 2010 Issue EIA licenses Monitor the compliance level of projects
Private operators	Invest in HCWM (e.g., treatment, transport, disposal) Supervised and monitor by MHS operate as sub-contractors (City Assemblies / District Government Health Facilities) Monitor by MOHS.
NGOs and CBOs	Inform, educate and make population aware participate in / offer training activities
Ministry of Works	Provide Infrastructural development
Min. of Lands, Housing, Country Planning and the	Provide primary disposal sites and landfill sites

Environment	
Directorate of Environmental Health and Sanitation	Revitalization of the existing Public Health Aide Improve the implementation of the environmental strategy
Primary Health Care	Strengthen the existing community Health Worker cadre and their linkages to the Peripheral Health Units
Directorate of Health System and planning	Planning and supervision monitoring and evaluation (HMIS development, publication of the quarterly HMIS bulletin organization of special sector studies (NHA, health sector financing strategy)
Training Institution	Training of health personnel at District and regional Hospital Specialists in the areas of obstetrics and gynecology, pediatrics, surgery, internal and family medicine
Hospital and Laboratory	Strengthen community level engagement Enhance facility -level services and ensure emergency transport, especially for pregnant women, from communities and PHUs to the District Hospitals
EERP, Global Fund and GAVI	Support an Integrated Health Project Administration Unit (IPHAU)
Emergency Medical Service	Responsible for the overall direction and policy, standard (including clinical and operational), licensing of emergency services operators
IHPAU	Will oversee the fiduciary elements of all externally financed projects with a view to improving their capacity for procurement, financial auditing and monitoring.
Public health facilities / Private health facilities	Participate in training activities supply staff with security equipment elaborate internal plans and guidelines about HCWM allocate financial resources for HCWM ensure HCW management plan is implemented

4.2.3 Institutional arrangements

The overall responsibility of implementing the environmental and healthcare waste management issues particularly the present EMWMP will rest with the Project implementers, Directorate of Environmental Health and City Council. A public health superintendent will be appointed by the integrated health project administration unit (IHPAU) 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 District Environmental Health Superintendent 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 District Environmental Health Superintended. At the facility level, the WMO will be designated as the focal point for EMWMP implementation. The WMO will maintain coordination with the District Environmental Health Superintendent for the implementation of the present Plan. The management company contracted for the waste management operation will also appoint a

focal point for EMWMP implementation among its staff. S/he will maintain coordination with the District Environmental Health Superintendent 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. The WMT will be responsible for preparing and implementing Waste Management Plan (WMP) in the facility. The roles and responsibilities of various personnel for the hospital waste management and implementation of the present Plan are summarized in the table below.

Table 8: Role and responsibilities of personnel

Programs Director	Overall responsible for the implementation of EMWMP; Monitor and supervise MWMFP Medical
Medical Waste Management Focal Point	Effective implementation of EMWMP; within Ministry, with DEHS; Coordination with CC/EPA; Coordination with other agencies (WB, others); Visits to healthcare facilities to monitoring Plan implementation; Organizing trainings on provincial level; Producing quarterly progress reports and sharing with MOHS, WB, and others.
EHS of each district	Coordinate with MWMFP Coordinate with Directorate for the implementation of EMWMP Organizing trainings on district level Monthly reports to MWMFP on Plan implementation
WMO of each facility	Health; Coordination with CC/Massada; Coordination with other agencies ; Visits to healthcare facilities to monitoring Plan implementation; Organizing trainings on provincial level; Producing quarterly progress reports and sharing with MOHs, , and others. Directorate Coordinate with DEHS Prepare WMP in accordance with the HWM Rules Provide monthly reports on EMWMP implementation to DEHS

The Ministry of Health and Sanitation (MoHS) will be responsible for the improvement of the institutional and legal framework. These activities should be conducted in the first year of the programme by the Department of Preventive Health Services (DPHS) and through the Environmental Health Division (EHD).

At the local level, the control and monitoring of HCWM plan implementation should be done by the district team which will ensure monthly monitoring, while the yearly follow up will be realized by the EH department.

The evaluation of the HCWM Plan should be assigned to international consultants (under supervision of the EH department), to ensure objectivity. This evaluation should be

done halfway through (at the end of the 2nd year) and at the end of the first phase of the program (year 5).

4.3 Monitoring Methodology

4.3.1 Overview

The MoHS will monitor and evaluate the progress and outcomes of the interventions supported by the project through its structural units (The Directorates). The area-specific M&E responsibilities for the project mirror those reflected in the MoHS Strategic Plan, thus complementing the monitoring of the MoHS strategic objectives to which the project would contribute. Hands-on support and guidance to the M&E function of the implementing Directorates will be provided by experienced M&E staff and will be strengthened through in-service training and external capacity-building activities under the project management component. In addition, given the issues with data consistency, the quality and reliability, M&E capacity building is aimed at strengthening MoHS institutional capacity for M&E. Responsibility for aggregating the collected M&E data and reporting it to the World Bank and relevant government agencies as part of annual implementation progress reports rests with the IHPAU.

4.3.2 Data source and frequency of reporting

To the extent possible, progress on results will be monitored using routine data sources, such as those available from the information systems (DHIS2) and administrative records of the MoHS and affiliated agencies.

The MoHS, through the IHPAU, will annually report on most of the indicators for which data sources will be provided through administrative data sources and annual surveys. For a limited number of other indicators, survey data would be provided at larger intervals. This will be conducted at the beginning, middle, and end points of project implementation. Monitoring and Supervision will be done on a quarterly basis and as well annually. The list of planned surveys will be monitored and supervised during the period of implementation. Evaluation of project implementation will be done at the mid-term review and project closing.

At district level, the Local Government Act 2004 and other legislation, provide the Local council and local level structures with a clear mandate for the inspection of domiciliary and commercial premises. At district level, inspection team will comprise one public health inspector and one or more public health Aide (PHA), trained by the project. Under the supervision of the District Health Superintendent (DHS) and local Council officer in charge of Environmental sanitation, the inspection team will be responsible for carrying out the regular ESICOME activities, complying with established work plans and comprehensive check lists.

The daily operation of inspection team shall be recorded day by day and records will be inspected by the DHMT's District Health Environmental Officer (Zonal EH) supervisors on weekly basis except in emergencies or as the need may arise. Monthly reports completed by the EHO will be submitted to Council for compilation using the prescribed forms including narratives of field notes. The DHS will forward the report to the DEHS, where the Director of Environmental Health and Sanitation will collate the district summary reports into a national monthly summary and submit to the CMO. The CMO will then submit the

monthly report to the minister of Health and sanitation with copies to the Minister of Local Government and Rural Development.

4.3.3 Sustainability

From an institutional perspective, this project's sustainability is likely. The Government has shown its commitment to health sector reform for more than a decade and has used information to refocus attention on the new burden of disease, Ebola. At the same, there is strong commitment to maintaining the earlier achievements by the continued strengthening of the free Health care. Of particular importance for sustainability is the improvement of the Health Care Data System, which would bring higher-quality data that would be collected and reported in real time from the primary source. There will also be accountability and feedback mechanisms introduced in the data submission system. As in the past, greater autonomy and flexibility in the public hospital system will be part of this project, as will the kind of efforts to build capacity that were successfully begun previously. This project would increase efficiency by introducing learning modalities, efficiency gains in hospital management, and improved targeting for screening and preventive health behaviour activities.

4.4 Mitigation

4.4.1 Mitigation measure or environmental and social impacts

The operation of incinerators has negative impacts on environment and health. However, the quantities of HCW to be incinerated daily by each establishment are quite small, so environmental and health impacts will not be significant and the harm caused will not be great. Nevertheless, the following measures should be taken:

(i) When installing incinerators inside health facility grounds, a location should be selected that is distant from the admission rooms and health care rooms.
(ii) To minimize noise disruption and smoke discomfort during working hours of the facility, the incinerator should be operated at night.
(iii) To reduce polluting by-products from solid wastes incineration, non-chlorine plastic containers should be promoted; for example, they should be recommended as dustbins for waste collection.
(iv) Incinerators should operate at sufficiently high temperature to get rid of dioxins and should also have efficient scrubbers.

For the large central disposal sites, wire fencing and locks should be installed to reinforce security and to minimize the access of scavengers and children. These protection measures will allow site managers to: (i) control and regulate access to the landfill, (ii) identify the scavengers and (iii) make users aware of danger.

Implementation of the HCWM Plan might have negative social impacts on scavengers earning their daily living at landfills. Their income may decrease as a result of well-organized management of HCW, particularly when segregation is done at source. Health facilities should explore developing a mechanism for giving local scavengers non-infectious reusable objects (such as empty bottles), for example, authorizing them to collect items according to well defined modalities.

For the populations neighboring the landfills, the risks of being driven away and resettled in other areas are minor. Generally, these populations did not settle around the landfills. Rather, the disposals sites have been created inside these districts.

(i) There are cultural issues relating to disposal of anatomical wastes (amputated body parts, placenta, etc.), which communities may be strongly sensitive to. These cultural aspects should be taken into account in each health facility HCWM action plan, to better ensure the acceptability of disposal methods. For example: the placenta could be buried or put in septic pits, as it is the case presently in some health facilities;

(ii) anatomical wastes (such as body parts) can be buried inside the hospital; • Liquid wastes from washing of the dead are generally evacuated in septic pits

4.4.2 Mitigation plan

Two separate mitigation plans are presented in Table 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 9: Mitigation plan

Activity	**Potential Impact**	**Mitigation Measures**	**Responsibility Monitoring**
Waste segregation	Health and patient safety risks for staff and	Use of infection control protocol; Comply 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 with Waste Management	MOHS, WMO; DEHS;
Infectious waste collection and transportation	Health and safety risks for waste handlers	- Use of specialized trollies to move wastes from point of generation to storage and final disposal. - No waste handlers should carry waste bags on their shoulders or on their bodies.	WMO MOHs; DEHS, MWMFP, Massada
Infectious waste storage	Health and safety risks for waste handlers	The duration in which waste is stored should not be more than 72 hours	
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;	

Activity	Potential Impact	Mitigation Measures	Responsibility Monitoring
		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. Burial pits should at least be two (2) meters above water table. Hydro geo physical survey to determine the water table of disposal site. Properly lined pit to avoid seepage.	
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. A burning pit should be constructed to avoid open burning of infectious wastes.	
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 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.	WMO or Incinerator operators
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; DEHS Massada
Water supply	Health hazard for staff and	Ensure that drinking water complies with NEQS; Carry out water analysis	MWR

Activity	Potential Impact	Mitigation Measures	Responsibility Monitoring
	patients	periodically. Collaboration with the Ministry of water resources and water Directorate to ensure that there is proper water supply.	
Sewage disposal	Health hazard for staff and patients	Ensure that the treatment system (e.g., septic tank) is properly working	CC

4.5 Budget and timeline

4.5.1 Monitoring and Evaluation budget

Table 10: Monitoring and evaluation budget of the HCWMF

Item	Unit	unit type	unit	unit type	unit cost (SLL)	Total cost per month	Total cost per year	Total cost for 5 years	Totalcost ($)
printing of tools	3	Pages	11	copies	20000	660000	7920000	39600000	7920
replicating checklist	3	Pages	11	copies	20000	660000	7920000	39600000	7920
staff DSA	4	Staff	5	days	350000	7000000	84000000	420000000	84000
top up	1	top up	4	staff	200000	800000	9600000	48000000	9600
Fuel	4	Staff	4	staff	250000	4000000	48000000	240000000	48000
DSA for Drivers	4	Drivers	4	Driver	150000	2400000	28800000	144000000	28800
Independent auditor	1	Person	11	days	1000000	11000000	132000000	660000000	132000
				Grand Total	**4000000**	**53700000**	**644400000**	**3222000000**	**644400**

4.5.2 Implementation timeline

Table 11: Implementation timeline of the HCWMF

	2016				2017				2018				2019			
Objectives	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Develop National HCWMG Stakeholder Support Identify coordination																

committee																
Capacity building and skills transfer through in-service training and on the job mentoring																
Develop National and District evaluation and reporting system																
Develop HCWM Legal and Regulatory Framework																
Standardise HCWM Practices																
Develop HCWM guidelines and SOP																
Make the general public aware of the risks linked to HCW																
Monitoring and Evaluation of HCWM plan																

ANNEX 7: Procedures for health care waste management

I. Packing and Labeling Requirements

GENERAL

Segregation of regulated medical waste at the point of generation is essential to ensure proper handling and worker safety. Waste generators are responsible for ensuring that regulated medical waste is discarded directly into clearly identifiable containers and labeled as described below. Regulated medical waste must be packaged and labeled before it is stored, treated, transported or disposed of. Persons packaging regulated medical waste shall wear heavy gloves of latex (22 mil gauge minimum) or equivalent material and other items consistent with level of hazard.

PACKAGING

This section refers to waste accumulated at the site of generation.

(i) All bags containing regulated medical waste shall be red in color and leak proof, including bags used in steam sterilization. Any waste contained in red bags shall be considered regulated medical waste and handled as such.
(ii) Free liquids shall be contained in sturdy highly leak resistant containers that resist breaking.
(iii) Sharps shall be placed directly in rigid puncture resistant containers at the point of generation.
(iv) All bags and containers shall be labeled according to the labeling section below.
(v) Bags and containers shall be placed in a fiberboard disposal box immediately once full or treated via steam sterilization.
(vi) Regulated medical waste shall be placed in the red bags and corrugated fiberboard boxes that are provided by the hospital
(vii) One bag shall be used to line the box.
(viii) Liquids may be placed in the box; however free liquids in excess of 20cc shall be contained in sturdy highly leak resistant containers that resist breaking, prior to being placed in the box.
(ix) Sharps containers shall be closed and placed inside a plastic bag prior to being placed in the box.
(x) The contents of the box shall not exceed 40 lbs.
(xi) When the bag is full, it shall be sealed by lapping the gathered open end and then binding it with tape or a closing device such that no liquid can leak. The box shall be closed and all seams shall be taped with clear packaging tape to prevent leakage.

LABELING

This section refers to labeling bags and containers at the site of generation.

(i) All bags and containers shall display a label with the biological hazard symbol and the words “regulated medical waste,” “biohazard,” “biohazardous waste” or “infectious waste.”

(ii) The label shall be securely attached to the outer layer of packaging and be legible. The label may be a stick-on or tied-on tag affixed to the package or pre-labeled package.
(iii) The disposal boxes come pre-printed with the applicable labeling required for transport. Indelible ink shall be used to complete the generator information section on the box.
(iv) Prior to putting any waste in the box, the following generator information shall be completed: generator ID Number, name, address, and phone number.

The date of shipment and manifest number will be completed by the contractor when the waste is picked up.

II. Waste Storage

GENERAL

Storing small quantities (less than 64 gallons) of regulated medical waste awaiting transportation to a collection area or disposal site is permissible as long as the packaging and labeling requirements and conditions are met.

Treatment and Disposal.

GENERAL

Regulated medical waste shall be disposed of only by:

(i) steam sterilization (autoclaving) followed by placement in the solid waste stream; or
(ii) incineration by a licensed regulated medical waste disposal facility.

STERILIZATION

Whenever regulated medical waste is treated in a steam sterilizer, the waste shall be subject to the following operational standards (at one hundred percent steam conditions and all air evacuated):

(i) Temperature of not less than 250 degrees Fahrenheit for 90 minutes at 15 pounds per square inch of gauge pressure;
(ii) Temperature if not less than 272 degrees Fahrenheit for 45 minutes at 27 pounds per square inch gauge pressure; or
(iii) Temperature of not less than 320 degrees Fahrenheit for 16 minutes at 80 pounds per square inch gauge pressure.

Note: In the event that an autoclave unit does not operate at optimum temperatures the device shall not be used, and will clearly and legibly tagged “DO NOT USE” and state the reason, along with the signature of person placing tag.

STERILIZATION CONTROLS AND RECORDS

Each package of waste sterilized must have a tape attached that will indicate if the sterilization temperature has been reached. Waste is not satisfactorily sterilized if the indicator fails to indicate proper temperature was achieved during the process.

A log shall be kept at each steam sterilization unit that is complete for the proceeding three-year period. Entries shall include date, time, and operator of each usage; the type and approximate amount (pounds) of waste treated; the post sterilization reading of the temperature sensitive tape, dates and result of calibration and monthly effective testing with B. stearothermophilus.

Note: Waste shall not be compacted or subjected to violent mechanical stress before sterilization. After sterilization, it may be compacted in a closed container.

DISPOSAL

The health officer is responsible to remove regulated medical waste generated in the hospital. Regulated medical waste shall only be transported for disposal by transporters. Treated waste contained in red bags and steam sterilized shall be placed in orange plastic bags, sealed and disposed of via the solid waste stream. The bag shall have a label placed on it with the following message in indelible ink and legible print of a 21 point or greater typeface stating:

"The generator certifies that this waste has been treated and is no longer regulated medical waste.
Treated: _____ (include date treatment performed)
Generator: (include name, address, and telephone number of generator"

III. Transporting Waste

GENERAL

Regulated medical waste shall only be transported from point of generation to a storage area or to designated steam sterilized for treatment. Prior to transporting, the red bags must be placed in an outer container, such as polyethylene bucket or corrugated fiberboard box and labeled in accordance with section four.

Training

GENERAL

Departments and laboratories generating regulated medical waste shall instruct assigned personnel in packaging, labeling, and storage and disposal requirements of this guide. Additionally, individuals assigned to treat regulated medical waste by steam sterilization shall attend blood borne pathogen training and shall be aware of autoclave temperature, pressure, time, and performance testing and record keeping requirements. Records of training shall be maintained by each generator for verification.

IV. Management of Waste Spills

GENERAL

Spills of regulated medical waste must be cleaned up immediately to prevent further contamination of the area. This shall be handled only by personnel who have met all training requirements. Departments and laboratories shall maintain a supply of the following:

(i) Materials: Material designed to absorb liquids, such as absorbent pads or blankets, depending on quantity of liquid waste likely to be present.

1. One gallon of hospital grade disinfectant effective against mycobacteria, with a spray bottle capable of discharging its content in a mist and stream.

(ii) Red plastic bags, sealing tape and biohazard labels or tags. The bags shall be large enough to over-pack containers normally used to store regulated medical waste.

Note: These materials should be kept within the vicinity of any area where regulated medical waste is managed; however, the materials may be kept in a central location in a building as long as the materials are easily accessible and a rapid and efficient cleanup of spills can be accomplished.

SPILL CONTAINMENT AND CLEAN UP

Upon spilling waste or finding regulated medical waste that has been spilled, take immediate steps to prevent further loss of material by establishing a barrier around the material to prevent its spread. Then take the following steps:

(i) Leave the area until the aerosol settles (if applicable).
(ii) Clean up crew shall don personnel clothing and secure the spill area.
(iii) Spray the broken containers of regulated medical waste with disinfectant.
(iv) Place broken containers and spillage inside over-pack bags, minimizing exposure.
(v) Disinfect the area and take over steps deemed appropriate.
(vi) Clean and disinfect non-disposable items.
(vii) Clean and disinfect protective clothing before removing.
(viii) Remove protective clothing and place disposable items in waste bag.
(ix) Replenish containment and cleanup kit.

Prepare a waste report documenting the date, location, nature of regulated medical waste involved, and describe the incident, cleanup procedures and disposition of wastes. Forward on copy to the Directorate of Environmental Health and Sanitation.

V. Definition and characterization of health-care waste

Waste from infected patients in isolation wards includes excreta, dressings from infected or surgical wounds, and clothes heavily soiled with human blood or other body fluids. Waste from non-infective patients and that is not contaminated with blood or body fluids may be considered non-infectious. In low-resource settings, the infection- control or

medical personnel should determine whether waste from non-isolation ward patients should be classified as infectious waste. They should apply the principles of the chain of infection to assess the risk of disease transmission from local practices used in the collection, handling, transport, treatment and disposal of waste.

Pathological waste could be considered a subcategory of infectious waste, but is often classified separately – especially when special methods of handling, treatment and disposal are used. Pathological waste consists of tissues, organs, body parts, blood, body fluids and other waste from surgery and autopsies on patients with infectious diseases. It also includes human fetuses and infected animal carcasses. Recognizable human or animal body parts are sometimes called anatomical waste. Pathological waste may include healthy body parts that have been removed during a medical procedure or produced during medical research.

Pharmaceutical waste, including genotoxic waste Pharmaceutical waste includes expired, unused, spilt and contaminated pharmaceutical products, prescribed and proprietary drugs, vaccines and sera that are no longer required, and, due to their chemical or biological nature, need to be disposed of carefully. The category also includes discarded items heavily contaminated during the handling of pharmaceuticals, such as bottles, vials and boxes containing pharmaceutical residues, gloves, masks and connecting tubing.

Genotoxic waste is highly hazardous and may have mutagenic (capable of inducing a genetic mutation), teratogenic (capable of causing defects in an embryo or fetus) or carcinogenic (cancer-causing) properties. The disposal of genotoxic waste raises serious safety problems, both inside hospitals and after disposal, and should be given special attention. Genotoxic waste may include certain cytostatic drugs (see below), vomit, urine or fasces from patients treated with cytostatic drugs, chemicals and radioactive material. Technically, genotoxic means toxic to the deoxyribonucleic acid (DNA); cytotoxic means toxic to the cell; cytostatic means suppressing the growth and multiplication of the cell; antineoplastic means inhibiting the development of abnormal tissue growth; and chemotherapeutic means the use of chemicals for treatment, including cancer therapy. Cytotoxic (chemotherapeutic or antineoplastic) drugs, the principal substances in this category, have the ability to kill or stop the growth of certain living cells and are used in chemotherapy of cancer. They play an important role in the therapy of various neoplastic conditions, but are also finding wider application as immunosuppressive agents in organ transplantation and in treating various diseases with an immunological basis. Cytotoxic drugs are most often used in specialized departments, such as oncology and radiotherapy units, whose main role is cancer treatment. Their use in other hospital departments and outside the hospital in clinics and elsewhere is also increasing. Cytostatic drugs can be categorized as follows:

(i) alkylating agents: cause alkylation of DNA nucleotides, which leads to cross-linking and miscoding of the genetic stock;
(ii) antimetabolites: inhibit the biosynthesis of nucleic acids in the cell;
(iii) mitotic inhibitors: prevent cell replication.

VI. Safe management of wastes from health-care activities

Cytotoxic wastes are generated from several sources and can include the following:

(i) contaminated materials from drug preparation and administration, such as syringes, needles, gauzes, vials, packaging;
(ii) outdated drugs, excess (leftover) solutions, drugs returned from the wards;
(iii) urine, fasces and vomit from patients, which may contain potentially hazardous amounts of the administered cytostatic drugs or of their metabolites, and which should be considered genotoxic for at least 48 hours and sometimes up to 1 week after drug administration. In specialized oncological hospitals, genotoxic waste (containing cytostatic or radioactive substances) may constitute as much as 1% of the total health-care wastes.

GUIDING PRINCIPLES

Health-care facility managers have a "duty of care" (often required by national regulations) to ensure that waste is kept under control at all times within a health-care facility and disposed of safely either onsite or offsite. Proper segregation, onsite storage and transportation systems are continuous sequence of safe keeping at each step in the process, from the point of generation of waste to its final treatment or disposal. Each step in the concept of managing the "waste flow" is given below. The following general principles of waste segregation, storage and transportation relate to the control of waste flow from generation to disposal:

(i) health-care waste is generated in a medical area and should be segregated into different fractions, based on their potential hazard and disposal route, by the person who produces each waste item;
(ii) separate containers should be available in each medical area for each segregated waste fraction;
(iii) waste containers when filled should be labelled to help managers control waste production;
(iv) closed local storage inside or near to a medical area may be needed if wastes are not collected frequently;
(v) hazardous and non-hazardous wastes should not be mixed during collection, transport or storage;
(vi) collected waste is often taken to central storage sites before onsite or offsite treatment and disposal;
(vii) staff should understand the risks and safety procedures for the wastes they are handling.

SEGREGATION SYSTEMS

The correct segregation of health-care waste is the responsibility of the person who produces each waste item, whatever their position in the organization. The health-care facility management is responsible for making sure there is a suitable segregation, transport and storage system, and that all staff adhere to the correct procedures.

Segregation should be carried out by the producer of the waste as close as possible to its place of generation, which means segregation should take place in a medical area, at a bedside, in an operating theatre or laboratory by nurses, physicians and technicians. If classification of a waste item is uncertain, as a precaution it should be placed into a container used for hazardous health-care waste. The simplest waste-segregation system is to separate

all hazardous waste from the larger quantity of nonhazardous general waste. However, to provide a minimum level of safety to staff and patients, the hazardous waste portion is commonly separated into two parts: used sharps and potentially infectious items. In the latter, the largest components are typically tubing, bandages, disposable medical items, swabs and tissues. Consequently, the segregation of general, non-hazardous waste, potentially infectious waste and used sharps into separate containers is often referred to as the "three-bin system". Further types of containers can be used for other categories of wastes, such as chemical and pharmaceutical wastes, or to separate out pathological waste, where it is to be handled and disposed of in different ways from the other portions of the waste flow.

WASTE CONTAINERS, COLOUR CODES AND LABELS

Ideally, the same system of segregation should be in force throughout the country. Colour coding makes it easier for medical staff and hospital workers to put waste items into the correct container, and to maintain segregation of the wastes during transport, storage, treatment and disposal. Colour coding also provides a visual indication of the potential risk posed by the waste in that container.

WASTE CONTAINERS: SPECIFICATIONS AND SITTING

Waste containers can come in many shapes and sizes and be made from different materials. Many modern waste containers are designed for automated systems that empty their contents into the waste-disposal system and wash and disinfect them mechanically. At the other end of the scale, waste containers may also be made out of reused plastic and metal containers. In all cases, they should be sturdy and leak-proof, and (except for sharps containers) lined with a sturdy plastic bag. The recommended thickness of bags for infectious waste is 70 µm (ISO 7765 2004). Plastics used for either containers or bags should be chlorine-free. Not all plastic bags can withstand temperatures of 121C, and some can melt during an autoclave process. Containers should have well-fitting lids, either removable by hand or preferably operated by a foot pedal. Both the container and the bag should be of the correct colour for the waste they are intended to receive and labelled clearly. Mixing colours – such as having yellow bags in black bins – should be avoided, because it will increase the potential for confusion and poor segregation. Since sharps can cause injuries that leave people vulnerable to infection, both contaminated and uncontaminated sharps should be collected in a puncture-proof and impermeable container that is difficult to break open after closure. Performance specifications for these containers are given in WHO (2007).

Sharps containers may be disposable or designed for disinfection and reuse. Disposables are boxes made of plasticized cardboard or plastic; reusable designs are plastic or metal. Low-cost options include the reuse of plastic bottles or metal cans. If this is to be done, the original labels should be removed or obscured, and the containers should be clearly relabeled as "Sharps containers". The appropriate waste receptacle (bags, bins, sharps boxes) should be available to staff in each medical and other waste-producing area in a health-care facility. This permits staff to segregate and dispose of waste at the point of generation, and reduces the need for staff to carry waste through a medical area. Posters showing the type of waste that should be disposed of in each container should be posted on walls to guide staff and reinforce good habits. Segregation success can be improved by making sure that the containers are large enough for the quantity of waste generated at that location during the period between collections. Up-to-date waste audit data can be used to assess the volume and

type of waste containers necessary, since waste managers also need to spend time with staff in medical areas identifying the type of work that is undertaken. No two areas will be the same.

Medical staff should be encouraged to think of waste disposal as part of a patient's treatment, so all aspects of the care process are completed at the bedside or treatment room. If intervention at the bedside is required, a waste container should be taken to the bed. Sharps bins are also sometimes taken to a patient for drug administration or blood sampling. A mobile trolley with infectious waste and sharps containers may therefore be more versatile and should be given serious consideration. The alternative is establishing a limited number of locations in a medical area where general waste (black bags) and infectious health-care waste (yellow bags and sharps containers) are placed. The locations should be away from patients; typical sites are the sluice (utility) room, treatment room and nurses' station. Where containers for segregating hazardous and non-hazardous health-care wastes are in use, they should be located close together, wherever possible. Containers for infectious waste should not be placed in public areas because patients and visitors may use the containers and come into contact with potentially infectious waste items. Static bins should be located as close as possible to sinks and washing facilities, because this is where most staff will deposit gloves and aprons after treating patients. If the general waste container is closest to the sink or under a towel dispenser, it will encourage staff to place towels into the non-infectious receptacle. Containers should be of similar size to overcome the observed tendency for staff to put waste in the largest receptacle. Unless patients are known or suspected to have readily transmitted infections, the assumption should be that general waste generated in a medical area is of low risk. However, if there is a known communicable infection (e.g. methicillin-resistant Staphylococcus aureus, tuberculosis or leprosy), all waste used in and around the patient should be classed as an infection risk and placed in the yellow, potentially infectious waste container. This "blanket" approach to all waste being assumed to be infectious can be avoided where there is a high level of training and communication between the clinical and support staff. Waste from each patient should be treated according to their known infection status.

Table: Segregation of healthcare waste

Waste category	Typical waste items	Type of container	Colour or mark/sign
Non-sharps wastes	Infectious, pathological wastes and some pharmaceutical and chemical residues	Leak-proof container or plastic bag in a holder	Yellow or special mark or sign
Used sharps	Syringes with needles, sutures, blades, broken glass	Leak- and puncture proof sealable container, box or drum bearing the word "contaminated sharps	Yellow or special mark or sign
General waste	Similar to municipal wastes, not contaminated by hazardous substances	Container or plastic bag in a holder	Black or special mark or sign

Table: Waste type classification, color coding description

Infectious Clinical Waste Hazardous	Poses a known or potential risk of infection including anatomical waste, diagnostic specimens, regent or test vials. Potentially infectious waste, autoclave and laboratory waste. Poses a known or potential risk of infection including anatomical waste, Human tissue, body parts and placenta	
Cytotoxic and Cytostatic drugs Hazardous	Hormone and cancer treatment medicinal waste must be separated from other medicinal waste as they are classed as hazardous. Located list can be found in BNF or NIOSH list of medicines. Failure to segregate from non-hazardous medicines will mean that the waste must be treated as hazardous and incur associated hazardous waste charges	
Offensive/non-infectious waste Non Hazardous	Healthcare waste which is classed as infectious, including nappy, incontinence, sanitary waste and other waste produced from human hygiene.	
Pharmaceutical waste Non Hazardous	Includes expired, unused, contaminated and spilt pharmaceutical drugs, products and vaccines. Including bottles, boxes or vials with residues. Also including products contaminated from the use of handling pharmaceuticals including gloves, masks, connecting tubes, syringe bodies and drug vials.	
Controlled drugs Non Hazardous	Controlled drugs must be denatured to render them safe and without value and then disposed of with other nonhazardous waste medicines	
General Waste:	Card box, paper, kitchen waste, food waste etc.	

Table: Method of health care waste collection, treatment and final disposal

S. No.	Type of Waste	Location	Color coding	Segregation	Institution Treatment	Storage	Transportation	End Treatment
1	Human tissue, body parts and placenta	OT, Labour room, Wards	Infectious Clinical Waste Hazardous. Poses a known or potential risk of infection including anatomical waste, Human tissue, body parts and placenta	To be collected in red plastic bags kept in tight lid buckets	Waste Management Unit	Storage site	Transported by waste collection covered vehicle	Incinerator

2	Cotton, gauze dressing, Pop's soiled with blood, pus and other human discharges. unsoiled dressing, gauze and cotton	All wards, OT, Labour rooms, Lab, ICU, Acute wards, Isolation wards	Infectious Clinical Waste Hazardous Poses a known or potential risk of infection including anatomical waste, diagnostic specimens, regent or test vials	Bucket lined with yellow plastic liners.	Waste Management Unit	Storage site	Transported by waste collection covered vehicle	Autoclave
3	All types of plastics i.e. plastic syringes, I.V. lines, I.V. bottles, bags	All wards and departments	Infectious Clinical Waste Hazardous Poses a known or potential risk of infection including anatomical waste, diagnostic specimens, regent or test vials	Buckets lined with yellow plastic liner	5% Hypo chlorite solution for 30 minutes	Storage site	Transported by waste collection vehicle	Autoclave and shredding

4	Discarded medicines and Cytotoxic drugs and heavy chemicals	Stores	Hormone and cancer treatment medicinal waste must be separated from other medicinal waste	Bucket lined with yellow plastic liners,	Pharmacy Board	Storage site	Sent by waste collection covered vehicle	Deep burial
5	Soiled linen of patients	OT, Labour room, ICU, Isolation ward, Acute wards	Offensive/non-infectious waste Non Hazardous Healthcare waste which is classed as non-infectious, including nappy, incontinence, sanitary waste and other waste produced from human hygiene	1 drum with 1% Hypo chlorite solution	1% Hypochlorite solution for 30 minutes	Storage site	Laundry vehicle	Washed in laundry

6	Organic waste	All wards and departments	Infectious Clinical Waste Hazardous Poses a known or potential risk of infection including chemical reaction	black bucket lined with plastic liners	Waste Management unit	Storage site	Transported by Municipal vehicle	No treatment is required
7	Needles, blades and Vials	All wards departments and all wards departments	Infectious Clinical Waste Hazardous Potentially infectious waste, autoclave and laboratory waste	Mutilation by needle destroyer then put in sharps container with hypo chlorite solution 1%	1% hypochlorite for 30 minutes	Storage site	Transported by vehicle	Auto clave
8	Broken glass, bottles, tubes, Vials, Petri dishes	All wards departments All wards departments	Infectious Clinical Waste Hazardous Potentially infectious waste, autoclave and laboratory waste	Put in yellow/black bag/jar with hypo chlorite solution 1%	1% hypochlorite for 30 minutes	Storage site	Transported by vehicle	Auto clave

9	Toxic drugs and expired drugs	Kept at medical stores after collection from department	Controlled drugs must be denatured to render them safe and without value and then disposed of with other nonhazardous waste medicines.	Kept in secured box in medical stores, then put in yellow bags	Pharmacy Board	Storage site	Transported by vehicle	No treatment required
10	Microbiology and other pathological waste	Labs	Infectious Clinical Waste Hazardous Poses a known or potential risk of infection including anatomical waste, diagnostic specimens, regent or test vials	Tight lid bucket	5% Hypochlorite solution for 30 minutes &discarded in drainage	Storage site	Transported by vehicle	Auto clave

11	Liquid waste from wards, Department and autopsy room	All wards/ Autopsy rooms	Infectious Clinical Waste Hazardous Poses a known or potential risk of infection including diagnostic specimens, regent or test vials and liquid waste	Tight lid bucket	5% Hypo chlorite for 30 minutes &discarded in drainage	Storage site	Transported by vehicle	In Toilet/drainage
12	Broken thermometers and sphygmomanometer	All wards/ Departments	Infectious Clinical Waste Hazardous Poses a known or potential risk of injure including radioactive waste	Glass bottle with water	Waste Management Unit	Storage site	Transported by vehicle	Deep burial-
13	Chemicals used in disinfection	All wards and departments	Infectious Clinical Waste Hazardous Poses a known or potential risk of infection including chemical reaction	Waste Management	5% Hypo chlorite for 30 minutes &discarded in drainage	Storage site	Transported by vehicle	In Toilet/drainage

14	Heavy chemicals containers/ aero containers	OT, Surgery Depts., other Depts.	Infectious Clinical Waste Hazardous Poses a known or potential risk of infection including chemical reaction	Collection point	5% Hypo Chlorite for 30 minutes	Storage site	Transported by vehicle	Mutilated in shredder
15	Discarded expired infected blood or its products.	Blood bank	Infectious Clinical Waste Hazardous Poses a known or potential risk of infection including blood tissue products waste	Tight Lid bucket with 5%hypo chlorite solution	5% hypo chlorite solution for 30 minutes and liquid discarded in main drainage	Storage site	Transported by vehicle	Incinerator
16	Card boxes, kitchen waste, papers, cartons	Office, kitchen, store	General Waste: These are waste that are not Infectious/hazardous.	Tight Lid bucket/plastic bag	Burning pit	Storage site	Transported by vehicle	Burnt in a burning pit

Collection within the health-care facility

Collection times should be fixed and appropriate to the quantity of waste produced in each area of the healthcare facility. General waste should not be collected at the same time or in the same trolley as infectious or other hazardous wastes. Waste bags and sharps containers should be filled to no more than three quarters full. Once this level is reached, they should be sealed ready for collection. Plastic bags should never be stapled but may be tied or sealed with a plastic tag or tie. Replacement bags or containers should be available at each waste-collection location so that full ones can immediately be replaced. Waste bags and containers should be labelled with the date, type of waste and point of generation to allow them to be tracked through to disposal. Where possible, weight should also be routinely recorded. Anomalies between departments with similar medical services or over time at one location can show up differences in recycling opportunities, or problems such as poor segregation and diversion of waste for unauthorized reuse. Collection should be daily for most wastes, with collection timed to match the pattern of waste generation during the day. For example, in a medical area where the morning routine begins with the changing of dressings, infectious waste could be collected mid-morning to prevent soiled bandages remaining in the medical area for longer than necessary. Visitors arriving later in the day will bring with them an increase in general waste, such as newspapers and food wrappings; therefore, the optimum time for general and recyclable waste collection would be after visitors have departed. In comparison with this general type of medical area, a theatre would generate a high proportion of potentially infectious waste and could have several collections during the day to fit in with the schedule of operations. A child and maternal health clinic might generate primarily sharps waste from injections, which would be collected at the end of each working day.

Interim storage in medical departments

Where possible, hazardous waste generated in medical areas should be stored in utility rooms, which are designated for cleaning equipment, dirty linen and waste. From here, the waste can be kept away from patients before removal, then collected conveniently and transported to a central storage facility. This is known as interim or short-term storage. If utility rooms are not available, waste can be stored at another designated location near to a medical area but away from patients and public access. Another possibility for interim storage is a closed container stationed indoors, within or close to a medical area. A storage container used for infectious waste should be clearly labeled and preferably lockable.

Onsite transport of waste

GENERAL REQUIREMENTS

Onsite transport should take place during less busy times whenever possible. Set routes should be used to prevent exposure to staff and patients and to minimize the passage of loaded carts through patient care and other clean areas. Depending on the design of the health-care facility, the internal transport of waste should use separate floors, stairways or elevators as far as possible. Regular transport routes and collection times should be fixed and reliable. Transport staff should wear adequate personal protective equipment, gloves, strong

and closed shoes, overalls and masks. Hazardous and non-hazardous waste should always be transported separately. In general, there are three different transport systems:

- Waste transportation trolleys for general waste should be painted black, only be used for non-hazardous waste types and labelled clearly "General waste" or "Non-hazardous waste".
- Infectious waste can be transported together with used sharps waste. Infectious waste should not be transported together with other hazardous waste, to prevent the possible spread of infectious agents. Trolleys should be coloured in the appropriate colour code for infectious waste (yellow) and should be labelled with an "Infectious waste" sign.
- Other hazardous waste, such as chemical and pharmaceutical wastes, should be transported separately in boxes to central storage sites. The use of waste chutes in health-care facilities is not recommended, because they can increase the risk of transmitting airborne infections.

Transport trolleys

Health-care waste can be bulky and heavy and should be transported using wheeled trolleys or carts that are not used for any other purpose. To avoid injuries and infection transmission, trolleys and carts should:

- be easy to load and unload;
- have no sharp edges that could damage waste bags or containers during loading and unloading;
- be easy to clean and, if enclosed, fitted with a drainage hole and plug;
- be labelled and dedicated to a particular waste type;
- be easy to push and pull;
- not be too high (to avoid restricting the view of staff transporting waste);
- be secured with a lock (for hazardous waste); and
- be appropriately sized according to the volumes of waste generated at a health-care facility. Waste, especially hazardous waste, should never be transported by hand due to the risk of accident or injury from infectious material or incorrectly disposed sharps that may protrude from a container.

Spare trolleys should be available in case of breakdowns and maintenance. The vehicles should be cleaned and disinfected daily. All waste bag seals should be in place and intact at the end of transportation.

Routing

Separate hazardous and non-hazardous routes should be planned and used. In general, a waste route should follow the principle "from clean to dirty". Collection should start from the most hygienically sensitive medical areas (e.g. intensive care, dialysis, theatres) and follow a fixed route around other medical areas and interim storage locations. The frequency of collection should be refined through experience to ensure that there are no overflowing waste containers at any time. Biologically active waste (e.g. infectious waste) must be collected at least daily. A routing plan would be influenced by:

- waste volume and number of waste bags or containers

•waste types
• capacity of the waste storage within medical areas and at interim storage areas
•capacity of the transportation trolleys
•transport distances and journey times between the collection points.

Central storage inside health-care facility

A storage location for health-care waste should be designated inside the health-care facility. Space for storing wastes should be incorporated into a building design when new construction is undertaken; for an example, see the Guidelines for design and construction of hospitals and health care facilities (Facility Guidelines Institute, 2010). These storage areas should be sized according to the quantities of waste generated and the frequency of collection. The areas must be totally enclosed and separate from supply rooms or food preparation areas. Loading docks, space for compactors and balers for cardboard, staging areas for sharps boxes, recycling containers and secure storage (e.g. for batteries) should all be provided. Storage facilities should be labelled in accordance with the hazard level of the stored waste. Typical signs advising the hazard posed by waste should be used. In general, there are four different kinds of waste-storage areas:

•non-hazardous or general waste;
•hazardous waste;
•infectious and sharps waste;
•chemical and hazardous pharmaceutical waste; and
•radioactive waste.

Infectious waste storage

The storage place must be identified as an infectious waste area by using the biohazard sign. Floors and walls should be sealed or tiled to allow easy disinfection. If present, the storage room should be connected to a special sewage system for infectious hospital wastewater. The compacting of untreated infectious waste or waste with a high content of blood or other body fluids destined for offsite disposal (for which there is a risk of spilling) is not permitted. Sharps can be stored without problems, but other infectious waste should be kept cool or refrigerated at a temperature preferably no higher than 3C to 8C if stored for more than a week. Unless a refrigerated storage room is available, storage times for infectious waste (e.g. the time gap between generation and treatment) should not exceed the following periods:

•temperate climate - 48 hours in summer
•warm climate - 48 hours during the cool season - 24 hours during the hot season.
Pathological waste storage

Pathological waste and the growth of pathogens it may contain are considered as biologically active waste, and gas formation during storage should be expected. To minimize these possibilities, the storage places should have the same conditions as those for infectious and sharps wastes. In some cultures, body parts are passed to the family and are buried in designated places. They should be placed in sealed bags to reduce infection risks before release to the public.

Pharmaceutical waste storage

Pharmaceutical waste should be segregated from other wastes and local regulations followed for final disposal. In general, pharmaceutical wastes can be hazardous or non-hazardous, and liquid or solid in nature, and each should be handled differently. The classification should be carried out by a pharmacist or other expert on pharmaceuticals. The pharmaceutical waste streams that are listed below can be distinguished (WHO, 1999):

-Pharmaceutical waste with non-hazardous characteristics that can be stored in a non-hazardous storage area - ampoules with non-hazardous content (e.g. vitamins);
-fluids with non-hazardous contents, such as vitamins, salts (sodium chloride), amino salts;
-solids or semi-solids, such as tablets, capsules, granules, powders for injection, mixtures, creams, lotions, gels and suppositories;
-aerosol cans, including propellant-driven sprays and inhalers.
-Hazardous waste that should be stored in accordance with their chemical characteristics (e.g. genotoxic drugs) or specific requirements for disposal (e.g. controlled drugs or antibiotics)
-controlled drugs (should be stored under government supervision);
-disinfectants and antiseptics;
-anti-infective drugs (e.g. antibiotics);
-genotoxic drugs (genotoxic waste); and
-ampoules with, for example, antibiotics.

Genotoxic waste is highly toxic and should be identified and stored carefully away from other health-care waste in a designated secure location. It can be stored in the same manner as toxic chemical waste, although some cytotoxic waste may also carry a risk of infection.

Chemical waste storage

When planning storage places for hazardous chemical waste, the characteristics of the different chemicals to be stored and disposed of must be considered (inflammable, corrosive, explosive). The storage place should be an enclosed area and separated from other waste storage areas. When storing liquid chemicals, the storage should be equipped with a liquid- and chemical-proof sump. If no sump is present, catch-containers to collect leaked liquids should be placed under the storage containers. Spillage kits, protective equipment and first aid equipment (e.g. eye showers) should be available in the central storage area. The storage area itself should have adequate lighting and good ventilation to prevent the accumulation of toxic fumes.

To ensure the safe storage of chemical wastes, the following separate storage zones should be available to prevent dangerous chemical reactions. The storage zones should be labelled according to their hazard class. If more than one hazard class is defined for a specific waste, use the most hazardous classification:

• explosive waste;
•corrosive acid waste;
•corrosive alkali waste (bases);

•toxic waste;
•flammable waste;
•oxidative waste;
•halogenated solvents (containing chlorine, bromine, iodine or fluorine); and
•non-halogenated solvents.

Liquid and solid waste should be stored separately. If possible, the original packaging should be taken for storage too. The packaging used to store and transport chemical wastes offsite should also be labelled. This label should have the following information: hazard symbol(s), waste classification, date, and point of generation (if applicable).

The storage area for explosive or highly flammable materials must be suitably ventilated above and below, with a bonded floor and constructed of materials suitable to withstand explosion or leakage.

Documentation of the operation of storage places

Keeping clear records of the wastes stored and their treatment and disposal dates is important to ensure a good control of waste management. Some countries have strict legal requirements to achieve a high level of safety. The following forms of additional documentation are suggested:

•a written spill contingency plan;
•a weekly store inspection protocol;
•protocols for using, repairing and replacing emergency equipment;
•training system and documentation (names of trained staff, job descriptions, form of training, date of training, date for refresher or revalidation training);
•hazardous waste storage documentation; and
•collection of relevant material safety data sheets.

Logistic staff

Drivers of vehicles carrying hazardous health-care waste should have appropriate training about risks and handling of hazardous waste. Training on the following issues should be included:

• relevant legal regulations;
• waste classifications and risks;
• safe handling of hazardous waste;
• labelling and documentation;
• emergency and spillage procedures; and
In addition, drivers should be declared medically fit to drive vehicles.

In case of accident, contact numbers or details of the emergency services and other essential departments should be carried in the driver's cab. For safety reasons, vaccination against tetanus and hepatitis A and B is recommended, and vaccination and training details of staff should be recorded.

Vehicle requirements

A fundamental requirement is for the vehicle transporting hazardous waste to be roadworthy and labelled to indicate its load, and its payload to be secured to minimize the risk of accidents and spillages. Any vehicle used to transport health-care waste should fulfil several design criteria:

- The body of the vehicle should be of a suitable size commensurate with the design of the vehicle.
- There should be a bulkhead between the driver's cabin and the vehicle body, which is designed to retain the load if the vehicle is involved in a collision.
- There should be a suitable system for securing the load during transport.
- Empty plastic bags, suitable protective clothing, cleaning equipment, tools and disinfectant, together with special kits for dealing with liquid spills, should be carried in a separate compartment in the vehicle.
- The internal finish of the vehicle should allow it to be steam-cleaned and internal angles should be rounded to eliminate sharp edges to permit more thorough cleaning and prevent damage to waste containers.
- The vehicle should be marked with the name and address of the waste carrier.
- An international hazard sign should be displayed on the vehicle and containers, as well as an emergency telephone number.
- The driver should be provided with details of the waste being carried.

Vehicles or containers used for transporting health-care waste should not be used for transporting any other material. Vehicles should be kept locked at all times, except when loading and unloading, and kept properly maintained. Articulated or demountable trailers (temperature-controlled if required) are particularly suitable, because they can easily be left at the site of waste production. Other systems may be used, such as specially designed large, closed containers or skips. Open-topped skips or containers are unsuitable because they fail to isolate waste from the general public during transportation, and should not be used for health-care waste. Where the use of a dedicated vehicle cannot be justified, a bulk container that can be lifted onto a vehicle chassis may be considered. The container may be used for storage at the health-care facility and replaced with an empty one when collected. Refrigerated containers could be used if the storage time exceeds the recommended limits described previously, or if transportation times are long. The same safety measures should apply to the collection of hazardous health-care waste from scattered small sources, such as clinics and general practice surgeries.

Labelling of the transport vehicle

The transport vehicle should be labelled according to the type of waste that is being transported. The label that is displayed will depend on the United Nations classification of the waste.

Cleaning of container and vehicle

Vehicles and transporting containers used for the transportation of waste should be cleaned and disinfected daily after use. Mechanical cleaning, combined with soaps and detergents, which act as solubility promoting agents, can be used. Cleaning and disinfection

have to be carried out in a standardized manner or by automated means that will guarantee an adequate level of cleanliness. A standard operating procedure for cleaning should be prepared and explained to cleaning staff. In addition, a schedule for preventive maintenance should be set up for all equipment and vehicles used in the transportation process.

Transport documentation

Before sending hazardous health-care wastes offsite, transport documentation (commonly called a "consignment note" or "waste tracking note") should be prepared and carried by the driver. A consignment note should be designed to take into account the control system for waste transportation in operation within a country. If a waste regulatory authority is sufficiently well established, it may be possible to pre-notify the agency about a planned offsite transport and disposal of hazardous health-care waste and to obtain the agency's approval. Anyone involved in the production, handling or disposal of health-care waste should recognize that they have a general "duty of care" – that is, an obligation to ensure that waste handling, treatment and disposal and the associated documentation comply with the national regulations.

The consignment note for a vehicle carrying a hazardous health-care waste load should include the following information in case of accidents or official inspection:

- waste classes;
- waste sources;
- pick-up date;
- destination;
- driver name;
- number of containers or volume; and
- receipt of load received from responsible person at pick-up areas.

This information allows quick and effective countermeasures to be taken in the event of an accident or incident. Weight of waste is useful for commercial treatment and disposal operators who bill health-care facilities for their waste services. On completion of a journey, the transporter should complete a consignment note and return it to the waste producer.

Segregated waste should be kept separated until final disposal. General waste should follow a municipal waste disposal route, if available, and sharps and non-sharps wastes should be treated and disposed of using the best available practices based on the minimum options.

Segregation and packaging

All containers and bags should be filled to three quarters of their capacities to avoid spillage and kept covered to prevent casual access by people or disease vectors. Should colour coding of plastic bags and containers not be possible, signs or marks can be put on containers to differentiate between hazardous health-care waste and general waste. Segregated waste should be regularly removed and safely stored to reduce the risk of transmission of pathogens and improve general standards of cleanliness and hygiene in medical areas. If plastic bags are not available, containers for non-sharps wastes should be washed and disinfected after being emptied. Body parts should be safely stored and disposed of according to local culture and customs.

Collection

Exclusively allocated carts or trolleys with lids should be used to collect and transport health-care waste. Carts should be regularly cleaned and disinfected. Highly infectious wastes (e.g. laboratory wastes and wastes from persons with contagious diseases) should be collected quickly and carried to a single, secure central storage area; on no account should collected waste be left anywhere other than at a central storage point.

Storage

Segregated waste should preferably be stored in specific restricted areas. The storage area should be a locked room or guarded enclosure. If this is not available, large containers with lids may be used for temporary storage of segregated waste and should be placed in restricted areas to minimize contact with people and animals. Mark the storage area with the biohazard symbol, or put a sign or mark that is understood locally to differentiate between hazardous and non-risk wastes.

Treatment and disposal

Gradual change and improvement in waste-treatment and disposal practices are normal as resources and confidence of local decision-makers returns. Should resources not be available, minimal treatment and disposal practices should continue to be used as follows:

(i) onsite burial in pits or trenches;
(ii) disposal in special cells in municipal dumping sites;
(iii) burning in pits and then covering with soil;
(iv) incineration in low-cost double-chamber incinerators;
(v) encapsulation of sharps wastes or small quantities of pharmaceuticals followed by onsite burial or burial in special cells in municipal dumping sites;
(vi) incineration in high-temperature industrial incinerators (provided that there is a safe means of transportation);
(vii) disinfection of infectious and sharps wastes with a small autoclave (when resources are available); non-sharps disinfected wastes should join the general waste stream.

The following waste categories should not be incinerated:

(i) mercury thermometers (preferably collect for mercury recovery);
(ii) pressurized containers (safe burial in pits);
(iii) polyvinyl chloride (PVC) plastics such as intravenous sets, catheters and PVC containers for sharps(safe burial in pits);
(iv) vials of vaccines (safe burial in pits);
(v) anatomical wastes or body parts (safe burial in pits). The following is a summary related to some minimum treatment and disposal options.

ONSITE BURIAL IN PITS

Dig a pit 1–2m wide and 2–3m deep. The bottom of the pit should be at least 2m above the groundwater. Line the bottom of the pit with clay or permeable material. Construct an earth mound around the mouth of the pit to prevent water from entering. Construct a fence

around the area to prevent unauthorized entry. Inside the pit, place alternating layers of waste, covered with 10cm of soil (if it is not possible to layer with soil, alternate the waste layers with lime). When the pit is within about 50cm of the ground surface, cover the waste with soil and permanently seal it with cement and embedded wire mesh.

BURIAL IN SPECIAL CELLS IN DUMPING SITES (IF AVAILABLE IN THE AFFECTED AREA)

Cells to contain waste can be used when burying waste in dumping sites. The cell should be at least 10 m long and 3m wide, and 1–2m deep. The bottom of the cell should be at least 2m above the groundwater. The bottom of the cell should be covered by soil or a material with low permeability. The waste in the cell should be covered immediately with 10-cm layers of soil to prevent access by people or animals (in diseases outbreaks, preferably spread lime on waste before covering with the soil). It is strongly recommended that health-care waste be transported in a safe manner to minimize public exposure to bio contaminated wastes.

LOW-COST DOUBLE-CHAMBER INCINERATORS

Double-chamber incinerators may reach a temperature of about 800C with a residence time of more than one second in the second chamber to kill pathogens and break down some of the particulates in the outlet gases. The incinerators should be built at a convenient distance away from buildings. Such incinerators need to be heated with paper, wood or dry non-toxic waste (small quantities of kerosene may be added, if available) before adding infectious wastes.

ENCAPSULATION

Place sharps wastes or pharmaceutical wastes in hard containers, such as metal drums, and add an immobilizing material, such as cement, bituminous sand or clay. When dry, the drum or container can be sealed and buried in local landfill or a pit in a health-care facility.

DISPOSAL OF PHARMACEUTICALS AND EXPIRED DRUGS

During emergencies, large quantities of pharmaceuticals are often donated as part of humanitarian assistance. However, in some circumstances (e.g. when there is inadequate stock management, lack of space or unwanted quantities of pharmaceuticals), large quantities of pharmaceuticals may not be used and therefore should be disposed of safely.

Table: Summary of pharmaceutical disposal methods

Disposal method	Type of pharmaceutical	Comments
Return to donor or manufacturer, trans-frontier transfer for disposal.	All bulk waste pharmaceuticals, particularly antineoplastic.	Usually not practical – transfrontier procedures may be time consuming.
Highly engineered sanitary landfill.	Limited quantities of untreated solids, semi-solids and powders PVC plastics.	Immobilization of waste pharmaceuticals is preferable before disposal.
Engineered landfill Waste solids, semi	Solids and powders PVC plastics.	Engineered landfill Waste solids, semi
Open, uncontrolled, non-engineered dump	Untreated solids, untreated semi-solids and untreated powders.	Untreated solid Semisolids and powders must be covered immediately with municipal waste Immobilization is preferable before disposal Not for untreated controlled substances.
Immobilization: waste encapsulation or amortization.	Solids, semi-solids, powders, liquids, antineoplastic and controlled substances.	Immobilization – not applicable Chemical decompositions are not recommended unless special expertise and materials are available.
High-temperature incineration with temperature more than 1200C.	Solids, semi-solids, powders, antineoplastic and controlled substances.	Expensive, particularly for purpose-built incinerators Use of existing industrial plants may be more practical.
Medium-temperature incineration with two chamber incinerator, minimum temperature of 850C.	In the absence of high-temperature incinerators, solids, semi-solids, powders and controlled substances.	Antineoplastic best incinerated at high temperature.
Burning in open containers.	Packaging paper and cardboard.	As last resort not acceptable for PVC plastics or pharmaceuticals.
Sewer or fast-flowing watercourses.	Diluted liquids, syrups, intravenous fluids, small quantities of diluted disinfectants (supervised).	Not recommended for antineoplastic, undiluted disinfectants or antiseptics.
Chemical decomposition.	NA	Not recommended unless special expertise and materials are available Not practical for quantities of more than 50kg.