FEDERAL GOVERNMENT OF NIGERIA

NATIONAL HEALTH CARE WASTE MANAGEMENT PLAN (NHCWMP) FOR THE REGIONAL DISEASE SURVEILLANCE SYSTEM ENHANCEMENT (REDISSE) PROGRAM

DRAFT FINAL REPORT

April 2016

NATIONAL HEALTH CARE WASTE MANAGEMENT PLAN (NHCWMP)

FOR

THE

REGIONAL DISEASE SURVEILLANCE SYSTEM ENHANCEMENT (REDISSE) PROJECT

DRAFT FINAL REPORT

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ABBREVIATIONS AND ACRONYMS

AAT	African Animal Trypanosomiasis
ACE	African Center of Excellence
ACGF	Africa Catalytic Growth Fund
AHI	Avian and Human Influenza
AI	Avian Influenza
AMR	Antimicrobial Resistance
ASF	African Swine Fever
AU	African Union
AU-IBAR	Inter-African Bureau for Animal Resources of the African Union
BMGF	Bill and Melinda Gates Foundation
BP	Bank Procedure
CBA	Cost benefit Analysis
CBPP	Contagious Bovine pleuropneumonia
CDC	Center for Disease Control and Prevention
CDs	Communicable Diseases
CHAMPS	Child Health and Mortality Prevention Surveillance
CORDS	Connecting Organizations for Regional Disease Surveillance
CPS	Country Partnership Strategy
CRSA	*Centre Régional de Santé Animale* (Regional Animal Health Center)
CSO	Civil Society Organization
DAGE	Directorate for Financial Management of the Ministry of Health
DGS	*Direction Générale de la Santé*
DSR	Disease Surveillance and Response
EA	Environmental Assessment
EAC	East Africa Community
EAPHLN	East Africa Public Health and Laboratory Networking Project
ECOWAS	Economic Community of West-African States
ECOWAS-RAHC	Regional Animal Health Center of the Economic Community of West-African States
ECTAD	FAO Emergency Centre for Transboundary Animal Diseases
EIDS	Emerging Infectious Diseases
EISMV	*(École Inter-États des Sciences et Médecine Vétérinaires de Dakar)* Dakar Inter-State School of Sciences and Veterinary Medicine
EOC	Emergency Operations Center
EPT	Emerging Pandemic Threat
ESMF	Environment and Social Management Framework
ESMP	Environmental and Social Management Plan
ESSAF	Environmental and Social Screening and Assessment Framework
EVD	Ebola Virus Disease
FAO	Food and Agriculture Organization of the United Nations
FELTP	Field Epidemiology and Laboratory Training Program
FETP	Field Epidemiology Training Program
FMD	Foot and Mouth Disease
GDP	Gross Domestic Product
GF-TAD	FAO/OIE Global Framework for the Progressive Control of Transboundary Animal Diseases
GGE	Gross Government Expenditure
GHSA	Global Health Security Agenda
GIS	Geographic Information System
GPAI	Global Program for Avian Influenza Control and Human Pandemic Preparedness and Response
GPN	General Procurement Notice

GRM	Grievance Redress Mechanism
H5N1	Avian Influenza Strain H5N1
HMIS	Health Management Information Systems
HPAI	Highly Pathogenic Avian Influenza
HRH	Human Resources for Health
ICB	International Competitive Bidding
ICT	Information and Communication Technology
IDA	International Development Agency
IDSR	International Disease Surveillance and Response
IEG	Independent Evaluation Group
IHPAU	Integrated Health Project Administration Unit
IHR	International Health Regulations
ILRI	International Livestock Research Institute
IMC	International Medical Corporation
INAP	Integrated National Action Plan
IPC	Infection Prevention and Control
IPF	Investment Project Financing
IPMP	Integrated Pest and Vector Management Plan
IRCM	Integrated Regional Coordination Mechanisms for the Control of TADs and Zoonoses
JEE	Joint External Evaluation
JICA	Japan International Cooperation Agency
LSU	Livestock Unit
M&E	Monitoring and Evaluation
MAER	Ministry of Agriculture and Rural Equipment
MAFFS	Ministry of Agriculture Forestry and Food Security
MCMC	Markov Chain Monte Carlo
MDBS	Mekong Basin Disease Surveillance
MDTF	Multi-Donor Trust Fund
MECIDS	Middle East Consortium for Infectious Disease Surveillance
MEDD	Ministry of Environment and Sustainable Development
MEPA	Ministry of Livestock and Animal Production
MERS	Middle East Respiratory Syndrome
MERS-CoV	Middle East Respiratory Syndrome Coronavirus
MFDP	Ministry of Finance and Development Planning (Liberia)
MITS	Minimally Invasive Autopsy Tissue Sample
MOA	Ministry of Agriculture
MOH	Ministry of Health
MOHS	Ministry of Health and Sanitation (Sierra Leone)
MOHSW	Ministry of Health and Social Welfare (Liberia)
MOU	Memorandum of Understanding
MRRT	Multidisciplinary Rapid Response Team
MRU	Mano River Union
MWMP	Medical Waste Management Plan
NCB	National Competitive Bidding
NCDC	Nigeria Centre for Disease Control
NGO	Non-Governmental Organization
N-PCU	National Project Coordination Unit
NPHCDA	National Primary Health Care Development Agency (Nigeria)
NSC	National Steering Committee
OIE	World Organization for Animal Health
OP	Operations Policy
PACE	Pan-African Program for the Control of Epizootics
PCU	Project Coordination Unit
PDO	Project Development Objective
PHEIC	Public Health Emergency of International Concern
PIM	Project Implementation Manual

PIU	Project Implementation Unit
PPR	*Peste des Petits Ruminants* (small ruminants plague)
PRAPS	Regional Sahel Pastoral Support Project
PVS	Performance of Veterinary Services
RAP	Resettlement Action Plan
RCDC	Regional Center for Disease Control and Prevention (of ECOWAS)
RDSR	Regional Disease Surveillance and Response
REDISSE	Regional Disease Surveillance Systems Enhancement Project
REOI	Request for Expression of Interest
RESEPI	Regional Network of National Epidemio surveillance Systems for HPAI and other Priority Animal Diseases in West-Africa
RESOLAB	Veterinary Laboratory Network for Avian Influenza and other Transboundary Animal Diseases in West-Africa
RF	Results Framework
RHAC	Recovery Health Access Center
RIAS	Regional Integration Assistance Strategy
R-PCU	REDISSE Project Coordination Unit
RPF	Resettlement Policy Framework
RRT	Rapid Response Team
RSC	Regional Steering Committee
RVF	Rift Valley Fever
SACIDS	South African Center for Infectious Disease Surveillance
SARS	Severe Acute Respiratory Syndrome
SDGs	Sustainable Development Goals
SOP	Series of Projects
SPN	Specific Procurement Notice
SWOT	Strengths, Weaknesses, Opportunities and Threat
TAD	Transboundary Animal Disease
TB	Tuberculosis
ToR	Terms of Reference
UHC	Universal Health Coverage
UN	United Nations
UNDB	United Nations Development Business
UNDG	United Nations Development Group
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
US	United States
US CDC	United States Centers for Disease Control and Prevention
USAID	United States Agency for International Development
V-FETP	Veterinarian Field Epidemiology Training Program
WAEMU	West African Economic and Monetary Union
WAHO	West-Africa Health Organization
WANIDS	West-African Network of Infectious Diseases Surveillance
WARDS	West-Africa Regional Disease Surveillance Project
WB	World Bank
WBG	World Bank Group
WHO	World Health Organization
WHO/IST/WA	World Health Organization – Inter-Country Support Team for West-Africa
WHO-AFRO	World Health Organization – Africa Region

EXECUTIVE SUMMARY

The World Bank and its key partners have been working on the Global Pandemic Emergency Facility (PEF) which aims to provide immediate support to countries experiencing any infectious disease outbreak that meets predefined triggers, either defined as a public health emergency of international concern (PHEIC) or a certain (Disease outbreak notification) DON event, through both an insurance funding mechanism and a public funding mechanism. PEF initially targets seventy seven IDA countries and aims to get the funds to a country within a maximum of one to two days. The REDISSE project complements the PEF in the following ways: By focussing on capacity for disease surveillance and epidemic preparedness countries will be better able to contain outbreaks before they develop into PFEIC or DON events and trigger the PEF.

The REDISSE is linked to the commitment that the global community has made to the countries of West Africa in light of the huge human and economic costs of Ebola, to strengthen weak human health, animal health, and disaster response systems to improve the preparedness of the region to handle future epidemics, and thereby minimize the national, regional, and potential global effects of such disease outbreaks. The project design incorporates a shift from a paradigm grounded in crisis response to one that embraces a disaster risk reduction approach and better risk management. It does so by building support for the animal health and human health systems, and the required linkages at country and regional level to manage infectious disease threats.

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

The REDISSE Project has five components as follows:

Component 1: Surveillance and Information Systems:

- support the enhancement of national surveillance and reporting systems and their interoperability at the different tiers of the health systems.
- 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 2: Strengthening Laboratory Capacity:

- establish networks of efficient, high quality, accessible public health, veterinary and private laboratories for the diagnosis of infectious human and animal diseases, and
- establish a regional networking platform to improve collaboration for laboratory investigation.
- address critical laboratory system weakness systems weaknesses across countries, fostering cross-country and cross-sectoral (at national and regional levels) collaboration.

Component 3: Preparedness and Emergency Response:

- support national and regional efforts to enhance infectious disease outbreak preparedness and response capacity.
- support (i) updating and/or development of cross-sectoral emergency preparedness and response plans (national and regional) for priority diseases, and ensuring their integration into the broader national all-hazards disaster risk management framework; (ii) regular testing, assessment, and improvements of plans; (iii) expansion of the health system surge capacity including the allocation and utilization of existing pre-identified structures and resources (at the national and regional level) for emergency response, infection prevention and control.

Component 4Human resource management for effective disease surveillance and epidemic preparedness:

- Cross-cutting given that animal and human health workers form the backbone of Disease Surveillance (Component 1), Laboratories (Component 2) and Preparedness and Response (Component 3) ensure effective human resource

management aims at bringing the right people with the right skills to the right place at the right time.

Component 5: Institutional Capacity Building, Project Management, Coordination and Advocacy:

- focus on project management which includes fiduciary aspects (financial management and procurement), M&E, knowledge generation and management, communication, and management (capacity building, monitoring and evaluation) of social and environmental safeguard mitigation measures.

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The proposed REDISSE project activities shall include, essentially, the rehabilitation of existing building structures and laboratory investigations, and thus is seen as triggering two World Bank safeguards policies dealing with Environmental Assessment (OP/BP 4.01) and Pest management (OP/BP 4.09) respectively. Hence this project which has been categorized as B prepared three safeguards instruments which shall be, consulted upon and disclosed in-country and at World Bank Info Shop The three safeguard instrument include: (i) Medical waste Management Plan; (ii) Integrated Pest Management Plan; and (iii) Environment and Social Management Framework.

These three documents are complimentary though prepared as standalone. **Other** *participating West African countries also have prepared these documents taking into consideration their local situations.*

This document (your are reading) represents the Medical (Healthcare) Waste Management Plan for Nigeria (HCWMP)**.**

This HCWMP was originally prepared for the Polio Eradication Management Project and now updated to accommodate the REDISSE project. The update involved project description of the REDISSE project and inclusion of vital specific issues of REDISSE concerns and activities and waste components into the existing medical waste management plan

The objective of the HCWMP is to provide processes and plans that the implementing agencies (Federal, States, Local Government Authorities, and Healthcare Facilities Managements) will follow to ensure the protection of healthcare workers, wastes handlers, animals and the community at large from the harmful impacts of hazardous healthcare wastes and infectious and/or communicable diseases (both zoonotic and non-zoonotic), impacting veterinary and public health, trade, rural development and livelihoods

The HCWMP also provides a description of the activities, impacts/hazards, mitigation measures, costs and institutional responsibilities for implementing the Healthcare Waste Management Plan (HCWMP).

The table below shows an indicative budget breakdown and responsibility of the cost for implementing the HCWMP. The cost is estimated at **Five Hundred and Ninety Six Thousand Seven Hundred and Fifty US Dollars only ($596,750)**

Item	Responsibility	Cost Estimate in Us Dollars (US$)
Mitigation/Management	SIOs, Program Officers from LGAs (LIOs), FMEnv/SEPAs, HCFs	336,000
Capacity Building	SIOs, Program Officers from LGAs (LIOs), Immunization managers, HCWs	14,500
Monitoring	NPHCDA/SPHCDA, SIOs, LIOs, FMEnv/SEPAs	110,000
Public Awareness	NPHCDA/SPHCDA, FMEnv/SEPAs, States, LGAs, HCFs	82,000

Sub- Total	542,500
Contingency (10%)	54,250
Total	**596,750**

Following the clearance of the final document by GoN, the Bank will disclose the revised regulations and assist Nigeria with country-wide dissemination if so desired.

1. INTRODUCTION

1.1 Project Context:

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 The 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 Régional 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 WB 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 zoonoses.

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

The REDISSEE project's development objective (PDO) is to strengthen national and regional cross-sectoral capacity for collaborative disease surveillance and epidemic preparedness in West Africa. 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 Zoonoses (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 multisectoral 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

1.4 Project location

REDISSE will be implemented in five counties: Guinea, Liberia, Nigeria, Senegal and Sierra Leone. This ESMF covers Nigeria only.

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 zoonoses 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 analyse 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 analyse 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 WB 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 Purpose of the Health Care Waste Management Plan (HCWMP)

Currently, improper and unsafe health care waste management (HCWM) practices put at risk healthcare workers, patients, and communities at large who are exposed both within Health Facilities (HFs) and the surrounding communities.

Although a well-defined Environmental Assessment legal system (EIA Act, Cap EI2LFN2004) for safeguarding the environmental aspect of the project exists as well as the recently approved National Strategic Healthcare Waste Management Policy, including National Strategic Healthcare Waste Management Plan and Guideline for 2013 -2017 by the GoN, the operators, especially at facility levels do not seem to be aware of these hence inadequate health care waste management and thus poor implementation or utilization of the instruments.

The potential risks are considered to be small in scope, site specific, and easy to avoid, prevent, and manage as well as remediate to acceptable levels. Experience has proven that when healthcare wastes are properly managed, generally they pose no greater risks than that of properly treated municipal or industrial wastes. Thus the risks are manageable and can be mitigated through development and implementation of the approved National Health Care Waste Management Plan.

The project will (a) apply the necessary safeguard requirements at primary care facility level; (b) draw upon the National Healthcare Waste Management Strategic Plan and other already prepared HCWM plans of other World Bank health projects in Nigeria such as the Nigeria HIV/AIDS project and NSHPIC to prepare a HCWM plan in order to provide guidance on processes that the implementing agencies (Federal, States, Local Government Authorities, and Healthcare Facilities Managements) and to ensure the protection of healthcare workers, wastes handlers, and the community from the harmful impacts of hazardous healthcare wastes and to maximize project compliance with international and national environmental regulations and best practices. Following the clearance of the final document by GoN, the Bank will disclose the revised regulations and assist Nigeria with country-wide dissemination if so desired.

1.7 Approach and Methodology

This HCWMP was originally prepared for the Polio Eradication Management Project, cleared and disclosed and now updated to accommodate the REDISSE project. The update involved project description of the REDISSE project and inclusion of vital specific issues of REDISSE concerns and activities and waste components into the existing medical waste management plan

Overall the preparation of the original document followed the approach below:

1.7.1 Technical Approach for the study

The indicative work plan, desktop study, scoping activities to understand the projects field of influence, review of the existing state laws and polices currently in place at each level of government as well as relevant World Bank policies and processes, stakeholder consultation constituted activities in preparing the HCWMP.

Below is a brief description of activities performed in the implementation process of the methodology.

- Initial meetings with the NPHCDA: This meeting offered the opportunity to clarify relevant issues in the terms of reference and to agree on deliverables and timelines. The outcome of this meeting included the collection of the existing National Health Care Waste Management Plan and National Health Care Waste Management Policy and guidelines and other relevant documents.

- Review of relevant literature and documents, Analysis of current HCWM practices: This is integral to the development of recommendations to guide the development of the action plan; and the Operational Policy guideline

- Consultation with the Nigeria Polio Eradication Support Project Officersfor the selected states.

1.7.2 Literature Review

Project specific background documents would be collected and reviewed, such as

- Project Paper;
- Integrated Safeguards Date Sheet (ISDS)
- Project Information Document (PID);
- National Health Care Waste Management Policy (2013)
- National Health Care Waste Management Guidelines (2013)
- National Health Care Waste Management Strategic Plan (2013-2017);
- National Healthcare Waste Management Plan for Polio Eradication Management Project
- Health care Waste Management Plan for Control of Avian Influenza in Nigeria
- World Bank Health projects in Nigeria such as the Nigeria HIV/AIDS project and Nigeria State Health Programmatic Investment Credit (NSHPIC);
- WHO HCWM Rapid Assessment Toolkit

1.7.3 Stakeholder Consultation

A stakeholder consultation was carried out on 3rd March 2015. It included representatives of MDAs such as the National Primary Health Care Development Agency (NPHCDA) and other relevant government institutions.

2.0 BASELINE DATA OF STUDY AREAS

Nigeria is situated in the western portion of Africa, and lies between latitudes 40 00' N and 140 00' N, and longitudes 20 50' E and 140 45' E. Nigeria is bordered by Chad to the northeast, Cameroon to the east , Benin Republic to the west, Niger to the northwest and the Atlantic Ocean to the south. The country's total area is 923,768 sq km, of which 910,768 sq km is land and 13,000 sq km is water.

Nigeria was created by the merging of the northern and southern protectorate by the British Colonial Government in 1914. The country gained independence on October 1st, 1960 and was declared a republic in 1963. The country is divided into 36 states and a federal territory.

Figure 1.0: Administrative Map of Nigeria

With a population of over 140 million (2006 National Census figure), Nigeria is the most populous country in Africa. Among the major contributors to the disease burden of the country are malaria, tuberculosis (TB) and HIV/AIDS. Unlike most of Sub-Saharan Africa, rural areas in Nigeria have a higher HIV/AIDS prevalence than urban areas (UNAIDS 2004)1. About 25% of the population lives in urban and 75% in rural areas. There are wide variations in health status and access to care among the six geo-political zones of the country, with indicators generally worse in the North than in the South (MDG Report 2004)2. Nigeria is made up of 36 States and the Federal Capital Territory (FCT), which have been grouped into six geopolitical zones and include 774 Local Government Areas (LGAs).

2.1 Structure of Health Services in Nigeria

Health service provision in Nigeria includes a wide range of providers in both the public and private sectors, such as public facilities managed by Federal, State, and Local governments, private for-

profit providers, NGOs, community-based and faith-based organizations, religious and traditional care givers (WHO 2002).

Nigeria is a federation with three tiers of Government: Federal, State and Local. Responsibility for health service provision in the public sector is based on these three tiers. The Federal Government owns and runs tertiary healthcare facilities (HCFs) across the country. Each State health system runs a programme that suits the peculiar needs of the State. There is synergy and co-operation between the Federal and State institutions to meet the national needs. The levels of care in the public sector are:

Primary: Facilities at this level form the entry point of the community into the healthcare system. They include health centres and clinics, dispensaries, and health posts, providing general preventive, curative and pre-referral care. Primary facilities are typically staffed by nurses, community health officers (CHOs), community health extension workers (CHEWs), junior CHEWs, and environmental health officers. Local Government Areas (LGAs) are mandated by the constitution to finance and manage primary healthcare.

Secondary: Secondary care facilities include general hospitals, providing general medical and laboratory services, as well as specialized health services, such as surgery, paediatrics, obstetrics and gynaecology. General hospitals are typically staffed by specialist doctors, medical officers, nurses, midwives, medical laboratory scientists, pharmacists, community health officers etc. Secondary level facilities serve as referral points for primary healthcare facilities. Each LGA is expected to have at least one secondary healthcare facility.

Tertiary: Tertiary level facilities form the highest level of healthcare in the country and include Specialty and Teaching Hospitals and Federal Medical Centres (FMCs). They provide specialist care for patients referred from the secondary level. Other functions include teaching and research.

Table 2.2 Health Care Facilities by State in Nigeria

s/n	State	Tertiary	Secondary	Primary	Private	Public	Total Beds	Doctors	Nurse
1	Abia	2	80	656	473	265	4,420	790	5,530
2	Abuja	2	17	243	225	37	3,540	298	2,280
3	Adamawa	1	12	650	51	612	4,680	268	3,976
4	AkwaIbom	2	188	345	151	384	4,980	482	2,422
5	Anambra	1	576	282	661	198	5,896	1021	7,147
6	Bauchi	1	21	1063	120	965	5,059	328	3,982
7	Bayelsa	1	15	151	6	161	3,210	372	2,548
8	Benue	2	102	1228	534	798	4,185	586	4,488
9	Borno	2	38	440	44	436	6,655	368	3,738
10	CrossRiver	2	51	488	117	424	6,908	640	4,480
11	Delta	1	57	480	244	294	8,520	624	4,368
12	Ebonyi	2	127	560	276	413	6,440	580	4,980
13	Edo	3	282	385	375	295	9,880	1,420	8,484
14	Ekiti	1	31	247	114	165	4,980	822	5,516
15	Enugu	3	178	539	520	200	6,400	866	6,420
16	Gombe	1	16	297	52	262	6,845	268	2,420
17	Imo	3	179	712	667	226	6,840	860	6,020
18	Jigawa	1	58	440	72	427	5,826	438	3,828
19	Kaduna	2	15	1137	333	821	10,280	1,680	7,680
20	Kano	2	42	604	27	621	12,860	1,420	8,400
21	Katsina	1	7	754	5	757	4,400	488	3,820
22	Kebbi	1	23	488	22	490	5,870	680	5,760
23	Kogi	1	62	839	97	805	7,650	1380	8,400

24	Kwara	1	491	73	195	370	8,640	1,340	9,380
25	Lagos	4	1,002	1680	2,220	466	19,892	3,541	23,820
26	Nasarawa	1	26	683	372	338	5,680	438	3,820
27	Niger	1	54	848	180	723	3,580	786	6,320
28	Ogun	3	842	437	790	492	6,850	1,684	11,760
29	Ondo	1	164	611	290	486	4,845	1,453	10,156
30	Osun		164	611	290	487	6,580	832	5,460
31	Oyo	2	43	1240	765	520	9,580	1,620	11,340
32	Plateau	2	38	906	459	486	5,820	1,760	10,846
33	Rivers	1	40	631	381	291	9,860	1,842	11,242
34	Sokoto	1	15	385	29	372	5,480	368	3,980
35	Taraba	1	3	586	189	401	4,320	540	3,890
36	Yobe	1	10	253	0	264	2,680	368	3,182
37	Zamfara	1	28	300	10	319	3,310	302	2,980
	Total	**58**	**5,097**	**22,272**	**11,356**	**16,071**	**243,463**	**33,853**	**234,765**

Source: HIV/AIDS Medical Waste Management Plan; Second HIV/AIDS Program Development Project (HPDP2)

Table 2.2 above clearly shows the distribution of HCFs in the 36 states and the F.C.T Abuja. In analyzing the distribution regionally, the South West (26%) has the largest proportion of beds in Nigeria, followed by the North Central (20%), North West (16%), South East (14%) ; North East (12%) and the least number in the South South with 11%. The south West with the largest number f beds is mainly due the large population in Lagos and Ibadan. An evaluation of the bed capacity data of health care institutions shows the distribution as follows: South West (22%); North West. In terms of the hospital type, the southern part of the country has 73% of private and 36% of public HCFs compared to 27% private and 64% of public HCFs in the Northern part of Nigeria.

3.0 MEDICAL (OR HEALTH CARE) WASTES AND LEGAL PROVISIONS

3.1 Definitions of Health Care Waste in Nigeria

According to the Basel Convention: "Environmentally sound management of hazardous waste or other wastes" means taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a way which will protect human health and the environment against the adverse effects which may result from such wastes.

Hazardous healthcare waste is of primary concern, due to its potential to cause disease or injury. Precise definitions of types of healthcare waste (HCW) must take into account the associated hazards and should be incorporated into Nigeria healthcare waste management (HCWM) legal, regulatory, technical, and information documents.

The hazardous nature of HCW may be due to the following properties:

- It contains infectious agents
- It contains sharps
- It is cytotoxic or genotoxic
- It contains toxic or hazardous chemicals or pharmaceuticals
- It is radioactive

Healthcare Waste (HCW) is all waste generated by health-care establishments (human or veterinary), including research facilities and laboratories. It can include waste generated in the course of healthcare in homes. HCW includes:

(1) Non-risk (General) healthcare waste: includes all waste that has not been contaminated with infectious materials or other hazardous materials. UNEP recommendations include in this category all items such as gloves, gauze, dressings, and swabs that have been used for medical care but are visually not contaminated with blood or body fluids of the patient. This waste category is considered domestic waste and can be managed by municipal waste services.

(2) Hazardous healthcare waste:

a) **Infectious waste:** comprises all healthcare waste known or clinically assessed by a medical practitioner, Public health officer or Environmental health officer to have the potential of transmitting infectious agents to humans or animals.

b) Pathological Waste: includes all organs (including recognizable body parts and placentas), tissues as well as blood and body fluids.

c) **Chemical waste, waste with high contents of heavy metals and pressurized containers:** includes gaseous, liquid and solid chemicals, waste with a high content of heavy metals such as pressurized containers, photographic fixing and developing solutions, halogenated or non-halogenated solvent.

d) **Pharmaceutical Waste:** includes medicines, expired, adulterated/fake drugs and vaccines. Not all the pharmaceutical wastes are hazardous. Because the Federal Ministry of Health has initiated specific measures to reduce the wastage of drugs, healthcare facilities should only need to dispose of small quantities of pharmaceutical waste.

e) **Mercury Waste: includes** wastes from mercury containing devices such as batteries, dental amalgam, thermometers, blood-pressure gauges and fluorescent tubes.

(3) Highly hazardous healthcare waste:

a) **Sharps** are all objects and materials that pose a potential risk of injury and infection due to their puncture or cutting properties. Sharps are considered as one of the most hazardous categories of waste generated during medical activities and must be managed with the utmost care.

b) **Highly infectious waste:** includes all viable biological and pathological agents artificially cultivated in significant elevated numbers. Cultures and stocks, dishes and devices used to transfer, inoculate and mix cultures of infectious agents belong to this category of waste.

c) **Radioactive Waste:** includes liquids, gas and solids contaminated with radionuclide whose ionizing radiations have genotoxic effects.

Table 3.1 below illustrates the major categories of medical wastes.

Table 3.1: Major Categories of Medical Waste

Waste type	Description
1.Infectious waste	Infectious wastes are susceptible to contain pathogens (or their toxins) in sufficient concentration to cause diseases to a potential host. Examples include discarded materials or equipment, used for the diagnosis, treatment and prevention of disease that has been in contact with body fluids (dressings, swabs, nappies, blood bags etc). It also includes liquid waste such as faeces, urine, blood or other body secretions.
2.Pathological and anatomical waste	Pathological waste consists of organs, tissues, body parts or fluids such as blood. Anatomical waste consists in recognizable human body parts, whether they may be infected or not.
3. Hazardous pharmaceutical waste	Pharmaceutical waste includes expired, unused and contaminated pharmaceutical products, drugs and vaccines. This category also includes discarded items used in the handling of pharmaceuticals like bottles, vials and connecting tubing.
4. Hazardous chemical waste	Chemical waste consists of discarded chemicals (solid, liquid or gaseous) that are generated during disinfecting procedures. They may be hazardous (toxic, corrosive, flammable or reactive) and must be used and disposed of according to the specification formulated on each container.
5. Waste with a high content of heavy metals	Waste with high contents of heavy metals and derivatives are highly toxic (e.g. cadmium or mercury from thermometers or manometers).
6. Pressurized containers	Pressurized containers consist of full or emptied containers or aerosol cans with pressurized liquids, gas or powdered materials
7. Sharps	Sharps are items that can cause cuts or puncture wounds (e.g. needle stick injuries). They are highly dangerous and potentially infectious waste. They must be segregated, packed and handled specifically within the HCF to ensure the safety of the medical and ancillary staff.
8. Highly infectious waste	This includes microbial cultures and stocks of highly infectious agents from medical laboratories. They also include body fluids of patients with highly infectious diseases.
9. Genotoxic/cytotoxic waste	Genotoxic waste includes all the drugs and equipment used for mixing and administration of cytotoxic drugs. Cytotoxic drugs or genotoxic drugs are drugs that have the ability to reduce the growth of certain living cells and are used in chemotherapy for cancer.
10. Radioactive waste	Radioactive waste includes liquids, gas and solids contaminated with radio nuclides whose ionizing radiations have genotoxic effects. These include x- and g-rays as well as a- and b- particles.

Source: Safe Management of Wastes from Health-Care Activities, WHO 1999

3.2 Present State of HCWM Practices in Nigeria

In general, HCW is poorly managed in Nigeria. Normally, it is estimated that between 10% and 25% of healthcare waste generated by medical institutions are hazardous in nature. However, this is much higher in Nigeria due to the poor HCWM practices (poor segregation at source of generation, poor transportation mechanisms, poor storage). In a Medical Waste Management survey conducted by Aliyu, 2006in sampled health institutions in the Federal Capital Territory (FCT), it was found that 26.5% of the healthcare waste to be hazardous. This figure is expected to be much higher in the states and local governments.

The study results also indicated that 18% of healthcare institutions incinerate their solid wastes in locally built brick incinerators without adequate protection to the environment; 36.3% of the institutions simply dispose of their medical wastes into the Abuja municipal dumpsite. These health care wastes were found not to be treated before dumping into the dustbin at the dumpsite; 9.1% buried their solid wastes; while another 36.3% had their waste burnt off in open pits. Liquid medical wastes were disposed directly into the municipal sewer system by all the institutions surveyed. Waste segregation and non-thermal waste disposal techniques such as autoclaving were not used for HCWM by any of the selected healthcare institutions surveyed.

A cross-sectional survey of injection safety and HCWM practices in Nigeria (FMoH and MMIS, 2004) detected equally weak HCWM systems in healthcare facilities at all levels. Safety boxes were not used in 63% of facilities and there were no sharps boxes in 69% of all injections delivery points. Only 29% of providers placed the needle and syringe in a closed container immediately after injection. After vaccinations, 63% of providers placed used injection equipment in over-flowing, pierced or open containers. Injection equipment was found in containers other than safety boxes or in open or overflowing containers in 83% of all survey sites. Used sharps were found on the grounds of 65% of all healthcare facilities visited. Unsupervised open dumping was found in 22% of facilities. Burning in a pit or an enclosure was found in 14% of HCFs and; open burning on the ground was performed in 12% of HCFs visited during this assessment.

3.3 Risks associated with health care waste

Health care waste management is an integral part of hygiene and infection control within a health care facility and safe HCWM will help control infections and occupational hazards. All individuals exposed to HCW are potentially at risk of being injured or infected. These individuals include:

- Medical staff: doctors, nurses, pharmacists, laboratory scientists, etc;
- In- and out-patients and their visitors;
- Workers in support services such as laundries, waste handling, maintenance personnel, cleaning staff, and transportation staff;
- Workers in waste disposal facilities, including scavengers;
- General public, including children playing with hazardous items that they find in the waste outside the health care facilities (HCF) when it is made accessible through improper HCWM.

The general public can be infected by HCW either directly or indirectly through several routes of contamination. Dumping HCW in open areas is a practice that can have major adverse effects on the population. Reuse of improperly disposed injection equipment is another route of infection by HCW. WHO estimates that over 20 million infections of hepatitis B, C and HIV occur yearly due to unsafe injection practices (reuse of syringes and needles in the absence of sterilization). Furthermore, there is a risk for public health as regards the sale of recovered drugs in the informal sector and the lack of controls.

The dumping of HCW in uncontrolled areas can have a direct environmental effect by contaminating soils and underground waters. During improper burning or incineration of HCW, air can also be polluted causing illnesses to the nearby populations. This has to be taken into consideration when choosing a treatment or a disposal method.

3.4 The Healthcare Waste Management Process

Below are some critical steps that must be considered when managing healthcare waste.

Table 3.2: Steps in managing health care wastes

Waste Management Component	**Key Elements for Safe and Effective HCWM**
Generation	• Identification & classification of HCW material • Segregation of HCW at source based on categories (general wastes, sharps, infectious wastes, highly infectious wastes, pharmaceuticals) • Cleaning & Disinfection of personnel and surfaces that have come in contact with hazardous HCW
Collection	• Handling and Storage based on Colour Coding
In-Facility Storage	• Separate storage facility • Appropriate storage temperature • Waste not to be stored for more than 48 hours • Documentation and Assessment of the waste quantity • Packaging and Labelling • Monitoring
Transport	• Monitoring during Transportation • Documentation
Off-Facility Storage	• Separate Storage Facility • Documentation and Assessment of waste quantity • Monitoring
Treatment and Disposal	• Appropriate treatment using appropriate and affordable technology option

A schematic representation of the ideal situation is shown below.

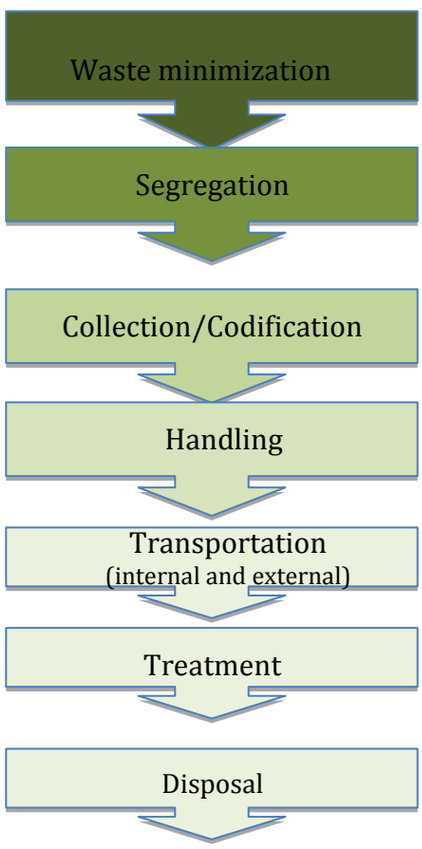


Figure 2.0: Schematic representation of health care waste management

3.5 Legal and Regulatory Framework

This section reviews the current legal provisions for HCWM in Nigeria. There are a number of relevant Government Policies at Federal and State levels that are related to giving direction towards a safe and healthy environment which depends largely on the effective management of healthcare waste in the country. However, they are scattered and there is no particular legislation specifically dealing with healthcare waste management in Nigeria as of today.

Although currently there is no specific legislation, regulations or bye-laws for the Health Care Waste Management in Nigeria, there are relevant laws and regulations pertaining to the protection of the environment and health:

- **Decree no 58** of 1988 establishes the Federal Environmental Protection Agency with:
  - the responsibility to monitor and help enforce environmental protection measures;
  - the duty to co-operate with Federal and State Ministries, Local Government
  - Councils and Research Agencies on matters and facilities relating to environmental protection;
  - the powers to establish standards, inspect, search, seize and arrest offenders.

- **Decree no 42** of 1988 Harmful Waste (Special Criminal Provisions, etc) prohibits the carrying, depositing and dumping of harmful wastes (injurious, poisonous, toxic or noxious substance) and prescribes penalties for those found guilty of improper practices.

- **Decree no 86** of 1992 sets out the procedures and methods for Environmental Impact Assessments on both public and private projects and states that the "construction of incineration plants" requires an environmental assessment.

- **Act no 11** of 31st July 2007 sets up National Environmental Standards and Regulation and Enforcement Agency to enforce compliance laws, guidelines, policies and standards on environmental matters in the country.

These regulations dealing with environmental issues have been identified including:

- **S.I. 8 National Effluent Limitation** of 1991 which makes it mandatory for industrial facilities to install anti-pollution equipment and make provision for effluent treatment. It also prescribes maximum limits of effluent parameters allowed for discharge.

- **S.I. 9 National Pollution Abatement in industries and facilities generating wastes** of 1991 imposes restrictions on the release of toxic substances and stipulates **requirements** for monitoring of pollution to ensure that permissible limits are notexceeded.

- **S.I. 15 Management of Solid and Hazardous Wastes Regulation** of 1991 deals with facilities that generate solid and hazardous waste. It also covers hazardous waste treatment and disposal facilities and indicates requirements for such facilities including contingency planning, emergency procedures etc. Part 12 of this regulation provides for the tracking of wastes from their point of generation to the final disposal with specific details regarding HCW.

- **National Environmental Health practice Regulations 2007** issued by the Federal Ministry of Environment

- **National Guidelines on Environmental health practice in Nigeria 2007,** issued by the Environmental Health Officers' Registration Council of Nigeria

Nigeria's National Policy on Environment was first published in 1989 and revised in 1999. It describes strategies for achieving the policy goal of sustainable development. Sanitation and waste management as well as toxic and hazardous substances are presented. No specific mention is made of HCW, although a number of points can be applied to hazardous substances.

There are several Legislation policies, guidelines, plans and blueprints that are applicable to HCWM in Nigeria. They are as follows:

	National Health-Care Waste Management Policy	**2013**
Summary.	This document presents the national policy on waste management in Nigeria taking into account three (3) sections-(i) General consideration and institutional mechanism in policy implementation at national level, (ii) Requirements for management of HCW in the medical institutions including regulation and definition of institutional Health Care Waste Management Plans.	
Definition.	The policy stipulates that HCW generated by both public and private medical institutions in Nigeria must be safely handled and disposed of by these medical institutions.	
Comments.	This document contains specific formulated policies presently been used as well as a laid down framework of lines of responsibilities for all parties involved.	
Suggestions.	There would certainly be the need for these policies to be formulated in the context of the present situation thus giving for a realistic implementation and adherence by all medical institutions involved to obtain effective results.	

	National Health-Care Waste Management Guidelines	**2013**
Summary	This comprehensive document presents guidelines and strategies for the sustainable management of HCW taking into account waste generation, waste types and waste treatment technologies. Also highlighting a number of critical areas and possible solutions.	
Definition	Hazardous HCW is of primary concern in Nigeria, due to its potential to cause diseases and/or injuries. Hazards associated with HCW should be incorporated into Nigeria's HCWM legal, regulatory, technical and informational documents.	
Comments	HCWM is constitutionally the responsibility of the FMEnv and SEPAs, with necessary input and support from the health ministries. Formulation and implementation of HCWM policies and regulations rest with the FMEnv in collaboration with FMoH.	
Suggestion.	There is certainly the need for HCWM planning, formulating and implementing bodies to take into consideration the challenges procuring pragmatic and affordable HCWM disposal technologies.	

	National Health-Care Waste Management Plan	**2013**
Summary.	This document presents strategies for the management of HCW taking into account the technical, financial and legal aspects, as well as public awareness, discussing also responsibility of the different levels of government (Local, State and Federal) and furthermore highlighting critical areas and possible solutions.	
Definition.	A NHCWM plan looks at practical steps to ensure that hazardous and non-hazardous medical wastes are managed properly to protect humans and the environment against the adverse effects which may occur as a result of indiscriminate handling of such wastes.	
Comments.	This document provide basic information about the development and implementation of HCWM plans as well as HCW types, treatment and disposal methods, also thus defining duties and responsibilities of staffs for different categories of HCFs in Nigeria.	

	Blueprint on Municipal Solid Waste Management in Nigeria	**2000**
Summary	This comprehensive document presents strategies for the sustainable management of municipal waste which take into account technical, legal and financial as well as public awareness issues. It discusses the responsibilities of the different levels of authority (Local Government, State and Federal, pp. 14-16) and highlights a number of critical areas and proffers possible solutions.	
Definition	An integrated municipal solid waste management strategy is advocated. It is made up of a series of steps that comprise, source reduction, recycling, incineration and land filling.	
Comment	Solid Waste Management is constitutionally the responsibility of the Local Government Councils which in many instances do not have the means of enforcing current regulations. This situation will have to be addressed.	
Suggestions	There will most certainly be the need for harmonizing laws/bylaws or existing regulations within each state and ideally at national level so as to avoid potential inter-state movements of certain wastes.	

	Blueprint: Handbook on Hazardous Waste Management	**2000**
Summary	This document provides a number of definitions and strategies regarding hazardous waste management as well as a categorization scheme based on the Basel Convention on Control of the Trans-boundary Movements of Hazardous Waste and their Disposal, signed and ratified by Nigeria.	
Definition	see handbook for details	
Comment	A few examples of industries which have adopted environmentally cleaner production practices are given, demonstrating that an ecological approach can also be economically interesting.	

	Blueprint on Environmental Enforcement, a Citizen's Guide	**2000**
Summary	This document aims at defining who the enforcers are (FMEnv, SEPA, LGA); how compliance, monitoring and inspections are conducted as well as types of enforcement actions and tools available. Citizens are encouraged to play an active role both by complying with environmental laws/rules at home and on the job as well as signalling any suspect activities they may notice.	
Definition	No specific definitions in relation with HCWM issues provided	
Comment	Suggests informing the general public about their duties and rights regarding environmental issues. To get the message across, it will nevertheless be necessary to conduct information campaigns within schools and with the use of the media.	

	Blueprint on compliance monitoring inspections	**2000**
Summary	This guide provides some basic information about the different types of inspections and how to carry them out.	
Definition	No specific definitions in relation with HCWM issues provided	

3.6 Review of Hospital Health Care Waste Regulations

The proper management of HCW depends to a large extent on strong HCFs administration and organisation. HCFs should have well organized HCWM procedures with explicit HCWM rules. These resources must be made readily available as a written document to all personnel of the facility. HCWM regulations for hospitals must demand that financial and material resources are made available so that HCWM procedures can be safely and routinely practiced. Nigeria now has a National Waste Management Plan. This will be used in addition to this project-specific Medical Waste Management Plan (MWMP).

3.7 Need for Regulation and Plan for Handling of Wastes from Vaccination and Routine Immunization for Polio Management

Although a well-defined Environmental Assessment legal system (EIA Act, Cap EI2LFN2004) for safeguarding the environmental aspect of the project exists as well as the recently approved National Strategic Healthcare Waste Management policy, including National Strategic Healthcare Waste Management Plan and Guideline for 2013 -2017 by the GoN, the operators, especially at facility levels do not seem to be aware of these hence inadequate health care waste management and thus poor implementation or utilization of the instruments.

Considering the potential risks posed by wastes generated by vaccination and routine immunization that generate healthcare waste such as expired vaccines and sharps there is an urgent need for a regulation and plan on handling wastes emanating from vaccination and routine immunization for Polio management.

3.8 Applicable International Agreements

At an international level, Nigeria has ratified the *Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal* (1992). It is also party tothe *Stockholm Convention on Persistent Organic Pollutants* (2002) and RotterdamConvention on prior informed consent on certain industrial chemicals and pesticides international trade.

3.9 World Bank Safeguard Policies

The World Bank has 10 + 2 Safeguard Policies to reduce or eliminate the negative environmental and social impacts of potential projects, and improve decision making. Details of the safeguard policies can be seen in Annex 1. These World Bank safeguard operational policies are:

- OP/BP 4.01: Environmental Assessment
- OP/BP 4.04: Natural Habitats
- OP 4.09: Pest Management
- OP/BP 4.12: Involuntary Resettlement
- OP 4.10: Indigenous Peoples
- OP 4.11: Physical Cultural Resources
- OP 4.36: Forests
- OP/BP 4.37: Safety of Dams
- OP/BP 7.50: Projects on International Waters
- OP/BP 7.60: Projects in Disputed Areas

Plus 2

- OP/BP 4.00: Use of Country System
- OP/BP 17.50: Public Disclosure

OP 4.01 Environmental Assessment

The objective of OP 4.01 is to ensure that projects financed by the Bank are environmentally and socially sustainable, and that the decision making process is improved through an appropriate analysis of the actions including their potential environmental impacts. Environmental Assessment (EA) is a process whose breadth, depth, and type of analysis depend on the nature, scale, and potential environmental impact of the proposed project.

The proposed AF is not envisaged to involve any civil works including construction and rehabilitation of existing buildings. Operational Policy (OP) 4.01 on Environmental Assessment will be triggered given the potential environmental concerns around the handling of Health care waste resulting from project related activities such as the Vaccination and Routine Immunization that generate healthcare waste such as expired vaccines and sharps.

The environmental risks and the environmental category for the additional financing would be categorized as B. The volume of health care waste from wasted vaccine vials is small and because they are sterilized vaccines which do not present a public health or environmental risk.

The overall social impacts of the project are likely to be positive with main issue being utilization of services. No land requirements or restriction of access to sources of livelihoods or involuntary resettlement of any kind under the project.

3.10 Review of Nigeria's National Healthcare Waste Management Plan, Guideline and Policy

Nigeria has demonstrated its commitment to mitigating adverse social and environmental impacts in the implementation of a range of World Bank projects. There are adequate legal and institutional frameworks in the country to ensure compliance with World Bank safeguards policies.

On September 4, 2013, the Nigerian Federal Executive Council (FEC) approved a new National Strategic Healthcare Waste Management policy, including National Strategic Healthcare Waste Management Plan and Guideline for the country. However, the prayer of the joint task group that prepared the reports was for the Government of Nigeria to pass the Health Care Waste Management Bill into law to establish legal controls and permit the regulatory bodies responsible for the safe disposal of healthcare waste to apply pressure for their implementation. Since 2013, the Bill has been with the National Assembly and yet to receive their assent. In terms of inter-sectoral commitment and cooperation, the fact that Ministers of Environment and Health jointly presented the memo seeking Council's approval for the adoption of the National Healthcare Waste Management policy, underscores the high level of the commitment of the Government toward improving the situation of the sector.

Generally, Nigeria is considered to have a fairly complete set of regulations and legal instruments. Passage into law of the proposed HealthCare Waste Management Bill is critical to implementation and enforcement of standards that improve medical waste management.

4.0 ANALYSIS OF MEDICAL WASTE MANAGEMENT

An analysis of the current situation across Nigeria with respect to medical waste generation segregation, collection, transportation, and disposal was reviewed. Medical wastes includes infectious wastes such as; swabs, syringes, blades, gloves are mostly mixed with municipal waste and disposed in open dumps where they are either burnt or left to decay.

Existing waste management facilities differ among hospitals, it consists mostly of**:**

- Incinerators built with primary and secondary burners, and in some cases, drum incinerators, which do not have air pollution abatement facilities;
- Autoclaving;
- Chemical disinfection;
- Microwave irradiation;
- Open ditches; sanitary landfills;
- Pit latrines and soak-away;
- Transportation of medical waste to off-site disposal sites; and
- Use of public drainage for infectious liquid disposal.

In urban areas, unregulated practices by both public, private hospitals and private waste collectors has resulted in dumping of medical waste (infectious and sharps) at municipal dump sites. Scavenging at these disposal sites pose severe public health risks. Possibilities of infections are very high considering the fact that scavengers do not wear any form of personal protection.

4.1 Medical Waste Composition

The average distribution on types of medical waste for purposes of waste management planning is approximately as follows:

- 80% general domestic waste;
- 15% infectious and biological (or pathological) waste;
- 3% chemical or pharmaceutical waste;
- 1% sharps; and
- Less than 1% special waste, such as radioactive, cytotoxic, photographic wastes, pressurized containers, broken thermometers, used batteries, etc.

The quantity of these wastes generated varies greatly between the different categories and location of HCFs. Variations in the composition of waste raises serious issues at the local level which require different approaches with respect to necessary medical waste management procedures to be applied in order to achieve sustainability. The variations may be due to several factors among which are differences in HCF specialization, numbers of qualified health care personnel available, medical waste management practices prevailing as well as recycling and reuse.

4.2 Medical Waste Handling Practices

Medical waste handling is critical in minimizing health care associated risks to human health and the environment. The most significant risk occurs during transportation, this highlights the need for regulations and control measures to control segregation.

However, the disposal practise for sharps and used medical supplies are incinerated, disposed in pits or in the open, collected by specialized firms, mixed with general waste with the risk of infections at community level, exposure of garbage workers to infection

In this respect, the following are necessary:

- ***Segregation of MedicalWaste***

Segregation of wastes (infectious, non-infectious, sharps, anatomical parts) generated within hospitals helps in identifying the categories of waste and significantly reduces the risk associated with waste handling. At some teaching hospitals, wastes are segregated into various components.

- Sharps are systematically stored in separate sharp containers;
- Infectious wastes are stored in yellow coloured containers,
- Anatomical wastes are stored in red coloured containers
- Other medical wastes are collected together into a variety of labelled waste bins and covered.

This practice is however not followed in some other health care institutions where all wastes are dumped in the same waste bin.

- ***Injection Safety***

The disposal of sharps is unsatisfactory in many public HCFs. This poses significant risk to patients, health workers and the surrounding communities. Safe disposal of injection is a major cause of concern with respect to the spread of communicable diseases like hepatitis B and HIV/AIDS.

- ***Waste Collection***

Few hospitals have treatment facilities (about 15%) for the health care wastes generated; hence most of the facilities transport waste off-site for disposal. Where there are disposal sites, the wastes are not removed on schedule and are not properly transported to the disposal site. At some private hospitals, collection of waste is limited to once a day when the cleaner comes in the morning to clean the entire facility. Storage and collection was observed to be most organized at general and teaching hospitals.

- ***Waste Transportation***

Some facilities gather the wastes in bags and cartons and then transported off-site in secure trucks. In the rural areas, the wastes are often buried or burnt within the facility. In some urban areas, sharps and other wastes are transported to a private landfill for burial while anatomical and pathological wastes are buried.

- ***Waste Disposal***

Current disposal practices varied depending on the category of the facilities, and type of disposal facilities available. All categories of infectious wastes are usually burnt except placenta and other anatomical wastes that are buried.

The scenario is different at some of the secondary, primary and private health centers. At the private clinics located in the semi-urban and rural areas, there are no significant differences in the way the medical waste and sharps are disposed. All waste are either buried or transported and dumped at the public dumpsite.

4.3 Responsibility for Medical Waste Management

Responsibilities for waste management are not well defined in most HCFs except in tertiary and secondary HCFs. Most institutions do not have Environmental Health Officers and have delegated this duty to administrative staff.

In tertiary and secondary HCFs, Medical Waste Management Committees should be constituted and should include:

- Chief Medical Officer;
- Head of Hospital Departments;
- Chief Pharmacists;
- Radiation Officer;
- Financial Controllers;
- Senior Nursing Officer/ Head Matron; and
- Hospital Administrator.

In Primary HCFs (Rural and Urban), Medical Waste Management Committees should be constituted and should include:

- Senior Nursing Officer/Matron
- Hospital Administrator
- Nurses

Employers have a number of legal responsibilities which include:

- developing and maintaining a safe work environment and safe work practices;
- ensuring that hospital activities complies to state and national environmental standards; and
- providing staff training and education for the safe handling of health care waste.

Employees also have responsibilities which include:

- complying with safety instructions and the use of safe work practices for their own protection and for the protection of other staff and the public;
- actively supporting environmental initiatives introduced by the waste management committee; and
- comply with the requirements for the handling of chemical substances according to Material Safety Data Sheets (MSDS).

5.0 HEALTHCARE WASTE MANAGEMENT PLAN FOR SMALL HEALTHCARE FACILITIES

In Nigeria, the smallest unit of healthcare facilities is the primary healthcare facility. Primary health care facilities usually function as a dispensary for drugs, immunization posts, reproductive health care centre, and maternal homes for childbirth. The facilities usually have less than 15 beds in most cases and refer patients to Secondary facilities for specialized cases.

5.1 Basic steps in HCWM at Primary (small) healthcare facilities

5.1.0 Raise awareness at the management level and develop an integrated waste management plan

There is need to enlighten the head of the facility on the importance of good healthcare waste management. The head should also form a committee in the facility with responsibility of overseeing healthcare waste management. The committee should consist of the head of the healthcare facility, nurses and waste collectors.

5.1.1 Train healthcare workers in proper HCW procedures

The entire staff in the facilities should all be aware of the healthcare waste management plan and should have proper training in HCW procedures. The trainings should include:

- Basic information about HCW and the risks of bad management of HCW;
- Basic information on the facility's waste management plan;
- Each employee's responsibility and role in healthcare waste management; and
- Technical instruction on application of the practices described in the health care waste management plan.

The healthcare waste management plan should be presented in a simple and easy to understand format (with diagrams) and displayed at all points of health care waste generation. Health Care Waste handlers for the facilities should be educated on the appropriate health and environmental working conditions for waste management. This should include the use of PPE and specialized equipment to ensure worker safety as well as safety for the general public.

5.1.2 Ensure segregation of special HCW from other waste generated at the facility

Segregation of the waste at source of generation must be implemented in the facilities. The first priority should be segregating sharps and pathological waste from all other waste. Sharps must be put into safety boxes which should be available at the health worker's workplace at all times. Pathological waste should be put into non-transparent plastic heavy-duty bags. When these are three-quarters full, the containers and bags should be disposed of safely. Pharmaceuticals should also be separated from regular solid waste materials, and disposed of properly.

5.1.3 Develop and implement a healthcare waste management plan

It is necessary for every healthcare facility to develop a health care waste management plan. The health care waste management plan should include daily routines for collection, handling, segregation, and packaging of the different types of waste. The head of the facility should ensure that this plan is in place, with adequate budget and personnel to implement it. Implementation of the healthcare waste management plan and routine monitoring should be carried out in parallel with the information/training program described below.

5.1.4 Determine the most appropriate treatment and disposal site for the facility's waste

Decisions regarding treatment technology should be made at hospital level; however, responsible personnel for health care waste management in the hospital should be in close contact with the regulatory/supervisory authority.

- All non-hazardous HCW not designated for recycling should be collected and managed with the general municipal waste.
- Burying HCW in specially constructed pits (lined with impermeable materials such as clay) is for the present moment probably the most affordable and acceptable options for Primary HC facilities in Nigeria.

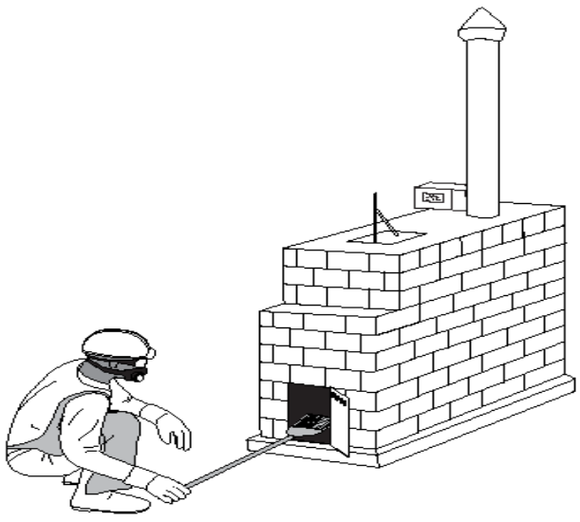
For the Nigeria Polio Eradication Support project, burning in low temperature (600°C-800°C) incinerators {preferably a well designed and constructed **De-Montfort Waste Disposal Unit (DWDUs)**} is the option recommended whenever this can be made available for primary healthcare facilities. However, this option is not satisfactory environmentally, and should only be considered a short-term solution to HCW treatment.

Figure 3.0: A De-Montfort Waste Disposal Unit

A DWDU comprises of:

- **A De-Montfort Incinerator** - The incinerator comprises primary and secondary combustion chambers. The burning zone of the primary chamber is accessible through a door at the front which lets in air and allows the operator to light the fire and remove the ash.

  The medical waste is dropped in through a loading door above the primary chamber. The secondary chamber, which is inaccessible to the operator, is separated from the primary chamber by a brick column with an opening at the bottom to induce a cross-draft during operation. Additional air is drawn into the secondary chamber through a small opening in the lower section of the rear wall of the secondary chamber.



  This air mixes with the partially burnt flue gas from the primary chamber and causes secondary combustion. A self-adjusting draught control for regulating heat output and burn time is mounted at the base of the chimney and controls the flue gases in the chimney. A stove pipe thermometer mounted at the neck of the chimney indicates when the medical

waste should be loaded. A four-meter high chimney mounted above the secondary combustion chamber releases the flue gases into the atmosphere.

- **Ash pit** – *where ash and other residues from the incineration process are disposed off. It is considered the final disposal point of HCW. The ash pit should be lined to prevent contamination of underground water. It should also be covered and secured with a lock to prevent access to unauthorized persons and avoid accidents.*

- **Storage area** – *storage space is provided for safety boxes awaiting incineration. The area should be secured to prevent unauthorized access and covered to keep the safety boxes dry. Storage should also be provided for tools, records, personal protective equipment and fuel (both kerosene and firewood).*

- **A shelter –**
    - *an enclosure with a lockable door to prevent access by children and unauthorized persons, as well as scavenging animals and birds.*
    - *provides protection from the weather, particularly rain, for the incinerator, the operator, and the waste to be incinerated. The shelter will also protect the fuel, the operator's tools, protective clothing, and records.*

6.0 HEALTHCARE WASTE MANAGEMENT PLAN FOR SECONDARY HEALTHCARE FACILITIES

A secondary healthcare facility can be classed as facilities with more than 15 beds. Wastes generated in this type of facility include general, anatomical, infectious, highly infectious, pharmaceutical, chemical waste, radioactive waste etc.

6.1 Basic Steps in HCW Management at Secondary Healthcare Facilities

The following steps indicated below are the basic elements expected to be in place to achieve a good healthcare waste management at a secondary healthcare facilities in Nigeria.

6.1.0 Raise awareness at the management level and develop an integrated waste management plan

The Chief Medical Officer for the healthcare facility should raise awareness of the importance of proper HCW management and designate a committee with responsibility for overseeing the HCW situation.

6.1.1 Ensure that special healthcare waste is segregated from other waste for disposal.

The wastes generated in the facilities must be segregated into various components. This will ensure the safe handling of special HCW and minimizes the amount of special waste requiring special treatment or disposal techniques. Sharps must be separated from all other waste at source and stored in safety boxes until filled.

6.1.2 Determine appropriate treatment technology

Some decisions regarding treatment technology are made at the healthcare facility level and others are made at the national or regional level. The satisfactory destruction of special healthcare waste is a major problem facing health services in Nigeria. Research and development are still needed to find acceptable treatment options for the destruction of special healthcare waste, which meets the technology capacity of the country and the financial resources available.

Dual chamber (preferably rotary kiln) Incinerators with good emissions management system in place, in the size range of 150 kg/hr – 500 kg/hr would be appropriate for this size of facility, and should be used as a central hub for the treatment of special healthcare waste from smaller healthcare facilities in the area. These incinerators operate at temperatures of over 800°C in the primary chamber, and 1000°C in the secondary chamber, and if operated appropriately and maintained adequately, pose minimal risks to human health and the environment.

Managing wastes from many facilities could be achieved by utilizing specialized private HCW managers/contractors for collection and transport of wastes from other healthcare facilities to the central HCWM-hub in the secondary healthcare facility; the operations of the HCW managers should be supervised by the relevant environmental regulatory authorities in the L.G.A./State.

Fig 4.0 Rotary Kiln Incinerator

6.1.3 Ensure proper colour coding system

A colour coding system is required and must be in line with the system as stipulated in the National Healthcare waste management Guidelines. Colour-coding is an effective method of achieving an effective segregation of waste as the waste can be sorted into and stored in containers or bags, of which different colours represent different categories of waste. The method of colour-coding for HCWM in Nigeria must remain simple and be applied uniformly in all HCFs. The National Health-Care Waste Management Guidelines has colour codes that must be followed in order to achieve effective national colour coding and waste segregation system. They include:

- Colour coding for the plastic bags should correspond or match whenever possible with the waste containers both at the internal and external storage sites;
- After use, all health care waste containers must be sealed to prevent spilling during handling and transportation;
- Before collection, health care waste should be appropriately labelled;
- Bags and containers for infectious waste should be marked with the international infectious substance symbol;
- All waste bags or containers should be labelled with basic information in English and the local language of the area where the HCF is located;
- Basic label information should include type of waste in the container; and
- Name of the ward/facility, date of collection and, warning of hazardous nature.

6.1.4 Ensure safe transportation of special healthcare waste on public roads

If the waste treatment and/or disposal facility is located off-site (probably a centralized treatment facility), the vehicle that transports special HCW should be used exclusively for this purpose. The vehicle should also be able to accommodate the secondary transportation packaging in a safe and controlled manner.

6.1.5 Develop a HCW management plan for the facility

The facilities should develop a health care waste management plan that includes daily routines for collection, handling, segregation, and packaging of the different categories of waste. The Chief Medical Officer for the facility should ensure that the plan is in place, with adequate budget and personnel to implement it. A committee should be formed in the facility and will include the head of the facility, physicians, nurses, procurement personnel or accountant, and waste collectors.

6.1.6 Train healthcare workers in HCW management procedures

All healthcare staff should be aware of the facility's basic healthcare waste management plan and their role in the plan. This includes management and regulatory staff, medical doctors, nurses and nursing assistants, cleaners, waste handlers, and visitors to the facility.

Training programs should be organized and conducted on a regular basis, and should include proper instruction on the use of personnel protective equipment, cleaning and disinfection agents, and specialized equipment, to ensure the safety of both the HCW worker and the general public.

Table 6.0: Healthcare Waste Management Plan (HCWMP) For Primary and Secondary Healthcare Facilities

S/N	ACTIVITY	IMPACT/HAZARD	MITIGATION MEASURES	COSTS (USD)	INSTITUTIONAL RESPONSIBILITY
	Primary Healthcare Facilities				
1.	Raise awareness at the management level and develop an integrated waste management plan **Sub-activities** i) Implement standardized waste management leadership responsibilities training for Chief Health Officers in charge ii) Conduct a detailed Healthcare waste assessment of primary healthcare facilities in MSS clusters within the Nigeria Polio Eradication Support project states	No negative impact No negative impact	No mitigation required No mitigation required	10,000 10,000	NPHCDA and Partners NPHCDA and Partners
2.	Train healthcare workers (nurses nurses, orderlies, CHEWs, Waste Officers, Units)in proper HCW procedures	No negative impact	No mitigation required	12,000	NPHCDA, SPHCDA, SIO,LIO, HCWM Consultant
3.	Ensure segregation of vials and used syringes from other waste generated at the facility. **Sub-activities** i) Immediate "at source segregation of healthcare wastes (sharps, infectious wastes, highly infectious wastes, pharmaceutical wastes, e.t.c	Needle-stick injuries from used needles and syringes; Unsafe disposal can spread some of the very same diseases that we are trying to prevent; Leaving used syringes and	Puncture resistant safety boxes; Impermeable containers for the safe disposal of used syringes and needles and other contaminated sharps	15,000	SIO,LIO, SEPA

		needles in the open puts the community at risk; Possible infection of personnel by infectious or highly infectious wastes,	Immunization Post Exposure Prophylaxis; Appropriate PPE for specific health risks;		
	ii) Waste collection iii) Waste storage	Exposure to radioactive compounds/wastes Spillage or droppings due to breaking of waste collection bags/bins	Good house keeping Vaccinators should place all used needles and syringes in a safety box immediately after administering the vaccine, without recapping them, tape the nearly (i.e. not more than 3/4) full box securely shut and store the box in a safe place until it can be properly disposed; Ensure containment is air-tight and leakage proof; Locate storage facility away from healthcare delivery areas within facilities	25,000	SIO,LIO, SEPA
4.	Develop and implement a healthcare waste management plan	No negative impact	No mitigation required	10,000	NPHCDA, FMEnv, SPHCDA, SIO,LIO, HCWM Consultant
5.	Determination and procurement of appropriate treatment technology(s) **Sub-activities**				

	i) Selection of type of incinerator facility to be installed. ii) Construction of hard-standing and incinerator house iii) Transport of incinerators to designated secondary healthcare facility. iv) Installation of incinerators	No negative impact Dust, noise and (air and noise pollution), medium to moderate loss of vegetation and fauna Medium to moderate disruption of local traffic Collapse of incinerator during off-loading, Musculoskeletal disorders of heavy duty personnel.	No mitigation required Conduct ESIA Conduct ESIA Develop and implement safe-work procedures; provide haulage and heavy duty equipment for installation of incinerator; implement training and Standard Operating Procedures for Incinerator installation.	 50,000 20,000	 NPHCDA, FMEnv, SEPAs, SPHCDA, ESIA Consultant NPHCDA, SPHCDA, Contractor
S/N	**ACTIVITY**	**IMPACT/HAZARD**	**MITIGATION MEASURES**	**COSTS**	**INSTITUTIONAL RESPONSIBILITY**
	Secondary Healthcare Facilities				
1.	Raise awareness at the management level and develop an integrated waste management plan **Sub-activities** i) Implement standardized waste management leadership responsibilities training for Federal, state, local and secondary healthcare facilities management.	No negative impact	No mitigation required	7,000	NPHCDA and Partners

	ii) Conduct a detailed Healthcare waste assessment of secondary healthcare facilities in MSS clusters within the Nigeria Polio Eradication Support project states	No negative impact	No mitigation required	10,000	NPHCDA and Partners
2.	Ensure that special healthcare waste is segregated from other waste for disposal**.** **Sub-activities** i) Immediate "at source segregation of healthcare wastes (sharps, infectious wastes, highly infectious wastes, pharmaceutical wastes, radioactive wastes e.t.c.	Needle-stick injuries from used needles and syringes; Unsafe disposal can spread some of the very same diseases that we are trying to prevent; Leaving used syringes and needles in the open puts the community at risk; Possible infection of personnel by infectious or highly infectious wastes,	Puncture resistant safety boxes/Impermeable containers for the safe disposal of used syringes and needles and other contaminated sharps; Immunization Post Exposure Prophylaxis; Appropriate PPE for specific health risks;	15,000	SIO,LIO, SEPA
	ii) Waste collection	Spillage or droppings due to breaking of waste collection bags/bins	Provision of high quality sharps boxes, waste bags and bins	13,000	SIO,LIO, SEPA
	iii) Waste storage	Foul Odour, leaching	Vaccinators should place all used needles and syringes in a safety box immediately after administering the vaccine, without recapping them, tape the nearly (i.e. not more than	12,000	SIO,LIO, SEPA

			3/4) full box securely shut and store the box in a safe place until it can be properly disposed; Ensure containment is air-tight and leakage proof; Locate storage facility away from healthcare delivery areas within facilities		
3.	Determination and procurement of appropriate treatment technology(s) **Sub-activities** i) Selection of type of incinerator facility to be installed. ii) Construction of hard-standing and incinerator house iii) Transport of incinerators to designated secondary healthcare facility. iv) Installation of incinerators	 No negative impact Dust, noise and (air and noise pollution), medium to moderate loss of vegetation and fauna Medium to moderate disruption of local traffic	 No mitigation required Conduct ESIA Conduct ESIA	 50,000	 NPHCDA, FMEnv, SEPAs, SPHCDA, Incinerator workers,
	iv) Healthcare waste treatment	Collapse of incinerator during off-loading, Musculoskeletal disorders of heavy duty personnel	Develop and implement safe-work procedures; provide haulage and heavy duty equipment for installation of incinerator; implement training and Standard	20,000	NPHCDA, SPHCDA, Contractor

			Operating Procedures for Incinerator installation		
		Emissions releases	Install emissions control systems; procure incinerators with emissions control systems.	10,000	NPHCDA, , FMEnv, SEPAs, SPHCDA, Contractor
4.	Ensure safe transportation of special healthcare waste on public roads **Sub-activities** i) Transport of HCW within the facility. ii) Transport of HCW off the facility. incinerator house	Containment ruptures or breaks; Spillages, possibly infection of personnel and contamination of clothing. En-route leakages	Provision of high quality waste bags and bins, double-bag wastes; Use PPEs. Provision of high quality waste bags and bins	25,000	Incinerator workers, SPHCDA, SEPAs, Contractor
5.	Develop a HCW management plan for the facility	No negative impact	No mitigation required	10,000	SPHCDA, HCWM Consultant
6.	Train healthcare workers (nurses, orderlies, CHEWs, Waste Officers, Units), in HCW management procedures	No negative impact	No mitigation required	12,000	NPHCDA, SPHCDA, SIO,LIO, HCWM Consultant
	Total			**336,000**	

7.0 MONITORING AND EVALUATION

Monitoring is required to follow-up on decisions made to intervene in various activities of health care waste management in order to protect human health and the environment. This can be achieved through periodic internal and external processes of monitoring and evaluation on a continuous basis, at all institutional levels. In this way management will be able to assess compliance with regulatory requirements at national, state and local levels.

To ensure that objectives of the Additional Financing for the Nigeria Polio Eradication Support Project HCWMP are achieved, the implementation of the plan has to be monitored by both internal and external bodies including the Federal and State Ministries of Health and Environment as well as the National and State Primary Health Care Development Agencies. These MDAs will determine their respective monitoring tools and will work jointly within the monitoring and evaluation mechanism of the proposed project.

7.1 Monitoring and Evaluation Objectives

The aim of the M&E is to establish appropriate criteria to address potential negative impacts of HCWMP and to ensure that unforeseen impacts are detected and the mitigation measures implemented at an early stage. Specific objectives of the monitoring plan are to:

- ensure that any additional impacts are addressed appropriately;
- check the effectiveness of recommended action plans and mitigation measures;
- ensure that the proposed mitigation measures are appropriate;
- demonstrate that health care waste management is being implemented according to plan and existing regulatory procedures; and
- provide feedback to implementing agencies in order to make modifications to the operational activities where necessary.

7.2 Monitoring Indicators

The following will be used to monitor progress in implementing the health care waste management plan:

- Enactment of necessary legislation governing, regulating and creating community awareness campaigns addressing health care waste concerns;
- Development of relevant institutional arrangements to plan and implement policies for addressing health care waste concerns;
- Development of human resource capacity in all health care facilities;
- Development of an Management Information System (MIS) on health care waste generation;
- Development of collaborative mechanisms with private sectors and development partners to finance health care waste treatment/disposal facilities; and
- Development of database for inventorying the types of waste and volume generated by health-care institutions nationwide.

The monitoring of environmental effects is necessary to ensure that predicted impacts are addressed effectively and efficiently through the mitigate measures indicated. Specific monitoring indicators for consideration include the following:

Internal Packaging and Storage

- Separation of waste (at point of generation)
- Storage bins / bags
- Frequency of removal

External Packaging and Storage

- Segregation of waste
- Storage area
- Frequency of waste removal
- Amount of waste generated per day

Transportation

- Identification of waste management contractor (accredited or certified)
- Conditions for transportation
- Equipment/vehicles (to prevent scattering, spillage, odour nuisance and leakage).

Treatment and Disposal

- Incineration
- Sterilisation by Heat
- Disinfection by steam
- Chemical disinfection
- Sanitary Landfill

Administration

- Establishment / functioning of a Waste Management Committee
- Availability of waste management plans
- Collection and Analysis of data

7.3 Monitoring Plan

An effective control of health care waste and monitoring of facilities should be carried out regularly, in order to maintain and improve management of the waste. Measures should be adopted to ensure that problems and risks involved are identified while enhancing safety and preventing the development of future problems.

Compliance and enforcement with legislation shall be ensured through co-coordinating and regulatory bodies. These bodies should include NPHCDA, FMEnv, SEPAs, and SPHCDAs. They shall undertake regular monitoring of these facilities, with the aim of establishing long-term sustainability in health care waste management. The bodies shall ensure compliance with the following:

- Segregation i.e. sharps, pathological, hazardous and radioactive waste from other waste. Picture stickers shall be used in rural areas for identification;
- Collection routines including packaging and labelling;
- On-site treatment procedures like sterilisation, disinfection and incineration. It should be ensured that the incinerator plant continually burns its materials at a temperature of 1200°C and above to eliminate the release of dioxins.

- Storage into appropriate, labelled and adequate containers for both internal and external storage.
- Transportation i.e. needs and conditions including certification.
- Worker safety measures
- Disposal at sanitary landfills, cemetery or crematorium.

To ensure effective record keeping, each health institutions shall keep records on:

- The type and volume or weight of health care waste generated
- The means of transportation, type and volume transported
- Commissioned waste contractor (company name, type of license, treatment and disposal.
- Disposal method - volume incinerated, volume treated and disposed

Table 7.0 below describes the summary monitoring plan with indicative costs.

Table 7.0: Summary of the Monitoring Plan

	What is being monitored	**Why**	**When**	**How**	**Institution responsible**	**Cost (USD)**
1.	HCWM Monitoring and Evaluation program	To check effectiveness and compliance	Quarterly	Verification of monitoring and evaluation program reports	NPHCDA/SPHCDA/LGAs World Bank	20,000
2.	HCWMP implementation i) Trainings ii) Use of SOPs iii) Civil works iv) incinerator installations and operations v) Treatment, transport and disposal of healthcare wastes	To verify if HCWMP is being implemented, and to check implementation progress.	Every 6months	Organized supervisory missions; stakeholder conference meetings	NPHCDA/SPHCDA, /LGAs World Bank, contractors and consultants.	50,000
4.	Compliancy to World Bank Environmental Safeguards	To establish that triggered safeguard (s) is being complied with.	During and after the commencement of civil works	Environmental Safeguards Audit	World Bank, ESIA consultant	20,000
5.	Social accountability and community perceptions	To ascertain social accountability.	Quarterly	Organized supervisory missions;	World Bank, ESIA consultant	20,000
	Total					**110,000**

8.0 INSTITUTIONAL ARRANGEMENTS AND IMPLEMENTATION RESPONSIBILITIES

REDISSE project will be implemented at a regional and national level. At the Regional level, project implementation will be led by WAHO of ECOWAS, which will host the regional secretariat of the project. Under this regional coordination, Governments of the five participating countries will implement country-level tasks as per their respective country implementation arrangements. WAHO will also provide support to countries both directly and through service agreements and Memoranda of Understanding (MOU) with technical organizations such as WHO and OIE. This proposed arrangement is fully in line with IEG's recommendations on regional projects[1].

Regional coordination will be managed through a Regional Steering Committee (RSC), whose secretariat will be run by WAHO. More generally, WAHO will be responsible for the technical coordination at regional level. WAHO and RAHC, the latter supported by OIE[2], will also be responsible for the execution of identified regional activities (e.g. regional harmonization of surveillance protocol and reporting; of health workers curricula) and of supporting countries regarding specific issues. The RSC will include representatives of involved Ministries from all the five countries and will meet twice a year.

Nationally, the project will be implemented under the structures of the Federal Ministry of Health and Ministry of Agriculture. A National Steering committee and a National Technical Committee, made up of members from Ministries of Health, Agriculture and Rural Development, Environment and information will be constituted. The National Steering Committee will be responsible for reviewing and approving annual work plans and ensure coordination and linkages across relevant agencies and international partners. Fully staffed project management units at all levels will be a condition for project implementation. The project will be coordinated as follows;

a. A National Technical Coordinator designated as agreed by Ministers of Health and Agriculture and domiciled in the Federal Ministry of Health and selected through a process satisfactory to the Bank will report directly to the Ministers

Two Component Coordinators: (i) Human Health Component Coordinator and (ii) Animal Health Component Coordinator. In addition, each component will have a separate domiciliary account with a project accountant for ease of fund management. A unified procurement unit will handle the procurement activities of both Animal and Human health

Capacity building in health care waste management issues is very essential during project implementation.

8.1 Training Needs Assessment

Correct attitudes for effective health care waste management result from knowledge and awareness regarding the potential risk of health-care and administrative procedures for handling the waste. Apart from a general understanding of the requirements of health care waste management, each category of personnel (doctors, nurses, ward attendants, cleaners, administrative staff, waste transporters, dumpsites, hospitals etc.) needs to be trained. For the training to be successful and to lead to the desired objective, participants must become aware of the risks linked to medical waste management.

The principal groups involved in waste generation and management are:

- Primary group: (i) management and administrative staff; (ii) medical and laboratory staff; (iii) ward attendants, caretakers, ground workers and other support staff; and

- Secondary group: patients, visitors, scavengers and the local communities, waste collectors/transporters, disposal site operators etc.

The training needs identified based on interview of the categories of actors involved are presented below:

Health Care Staff
Administrative staff

- Information on potential risks and advice about health and security;
- Basic knowledge of procedures of medical waste collection, storage, transportation, treatment and final disposal including the management of risks;
- Use of protection and security equipment;
- Medical waste management guidelines; and
- Financial resources to be allocated to waste management.

Doctors, nurses, midwives, etc.
- Information on the risks; advice about health and security;
- Basic knowledge about procedures of HCWM waste collection, storage, transportation, treatment and final disposal including the management of risks;
- Use of protection and security equipment (protective clothes);
- Strategies to control and ensure that used disposable equipment/materials are placed in appropriate disposal and collection facilities and to ensure that all patients are safe from injury or hazards resulting from health care waste;
- HCW segregation at source;
- Staff orientation on the guidelines for health care waste management; and
- Good practices on health care waste

Cleaners, ward attendants, grounds attendants, other personnel in touch with health care waste, etc.
- Information on the risks; advice about health and security;
- Basic knowledge about procedures of medical waste collection, storage, transportation, treatment and final disposal including the management of risks;
- Collection and transportation of waste containers;
- Use of protection and security equipment (protective clothes); and
- Good practices on health care waste

Waste Management Company Personnel
Waste Management Operators
- Information on the risks; advice about health and security;
- Basic knowledge about procedures of wastes handling, including risk management;
- Use of protection and security equipment;

Waste Transportation Staff
- Risks linked with waste transportation;
- Procedures for waste handling: loading and unloading;
- Equipment such as vehicles for health care waste transportation;
- Protection equipment.

Treatment Systems Operators
- Treatment and operating process guidelines;
- Health and security related to the operating system;
- Procedures in emergency cases and help;
- Technical and maintenance procedures;

- Control of health care waste production;

Disposal Managers
- Information about health and security
- Control of scavenging activities and recycling of used instruments;
- Protection equipment and personal hygiene;
- Secure procedures for the management of wastes at the disposal site;
- Measures concerning emergency cases and help.

Others
Patients and visitors
- Advice on basic health care waste management; and
- Proper use of health care waste containers

8.2 Training Strategy and Plan

The training strategy shall operationalize the HCWMP in all health-care facilities by promoting the emergence of professionals in health care waste management; raising the sense of responsibility of healthcare personnel; and safeguarding health and security of health staff and waste handlers. Table 8.0 belowgives indicative training courses for Mid-Level Management (MLM) training and personnel needed.

The training plan shall be structured around the following principles:
- Train-the-trainers: this involves training the senior Public Health Officers at the states who in turn will roll out training courses in their states.
- Training health-care staffs: already trained senior Public Health Officers will train other HCFs staff. These training sessions will be held in each local government area (LGA);and
- Training medical waste management supporting staffs in health centers (Cleaners, transporters, incinerator operators and waste handlers. These training sessions will be held in every healthcare facility and will be conducted by already trained hospital staff.

Table 8.0: Training and Schedule for Staff and Support Staff of Health Care Facilities

Capacity Needs	Content	Target Participant	Duration	Resource Person	Estimated Cost (USD)
Basic knowledge about medical waste	Waste categories Hazardous potential of certain waste categories Transmission of hospital acquired infection Health risk for health care personnel	State Immunization Officers (SIO); Program officers (Local Immunization Officers-LIO) etc	8 hours	NPHCDA and partners	2000
Proper behaviour of waste generators	Environmentally sound handling of residues; Waste avoidance and reduction possibilities; Identification of waste categories; Separation of waste categories; Knowledge about appropriate waste containers	State Immunization Officers (SIO); Program officers (Local Immunization Officers-LIO) etc	7 hours	NPHCDA and partners	2500

Proper handling of health care waste	Adequate waste removal frequency; Safe transport containers and procedures; Recycling and re-use of waste components; Safe storage of wastes; Cleaning and maintaining of collection, transportation and storage facilities; Cleaning and maintenance of sanitation facilities, drains and piping.; Handling of infectious laundry; Handling of chemical and radioactive waste, outdated drugs; Maintenance of septic tanks and other sewage treatment facilities; Maintenance and operation if incinerator for infectious wastes; Maintenance and operation of waste pits and landfill site; Safety regulation in waste management, protective clothing.; Emergency regulation in waste management	State Immunization Officers (SIO); Program officers (Local Immunization Officers-LIO) etc	7 hours	NPHCDA and partners	5000

Establishment of a health care waste management system	Establishment and implementation of a waste management plan.; Sampling of waste quantities, monitoring, and date collection.; Monitoring and supervision of waste management practices; Cost monitoring of waste management; Establishment of a chain of responsibilities; Set-up of occupational safety and emergency regulations; Interaction with city assemblies or private sector waste handling structures; Public relation and interaction with local community.	State Immunization Officers (SIO); Program officers (Local Immunization Officers-LIO) etc	7 hours	NPHCDA and partners	5000
Total					**14,500**

Category of Target Groups

- State and Local Immunization Officers
- Management & administrative staff;
- Medical laboratory staff;
- Ward attendants, caretakers, ground workers and other support staff;
- Patients and visitor;
- Waste management facility operator;
- Waste collection and transportation staff;
- Treatment system operators; and
- Disposal managers.

9.0 PUBLIC AWARENESS AND CONSULTATION

To ensure the successful implementation of this plan, the, NPHCDA, and SPHCDAs as well as the SIOs and LIOs have responsibilities to effectively engage stakeholders in achieving its objectives for the benefit of all. The implementation of the plan depends on the meaningful participation of all stakeholders for success. The public awareness process will be focused on informing the general public and scavengers about potential dangers associated with health care waste handling.

The scope of this Public Awareness Plan includes the entire participating states of the proposed project where the plan will be implemented. It describes the avenues that will be used to convey the plan implementation information to the public.

9.1 Objectives

This public awareness/consultation plan provides a framework for achieving effective stakeholder involvement and promoting greater awareness and understanding of issues so that the plan can be effectively implemented on-time to the satisfaction of all concerned.

To ensure effective implementation of this plan, the NPHCDA/SPHCDAs, SIOs/LIOs shall be committed to the following principles:

- promoting openness and communication;
- ensuring effective stakeholder involvement in the development of the project;
- increasing public knowledge and understanding of the project implementation process;
- using all strategies and techniques which provide appropriate, timely and adequate opportunities for all concerned parties to participate; and
- evaluating the effectiveness of the engagement plan in accordance with the expected outcomes.
-

9.2 Potential Stakeholders

The potential stakeholders in the implementation of this plan include the following:

- Patients and visitors;
- Government Agencies e.g. Federal and State Ministries of Health, Environment and Information;
- National and State Primary Health Care Development Agency;
- Medical and Paramedical Professionals;
- Educational Institutions e.g. Medical Schools, Teaching Hospitals;
- Planning Authorities e.g. Town Planning;
- Federal and State Waste Management Authorities; and
- Other Regulatory bodies e.g. Nigerian Medical Association etc.

9.3 Consultation Strategies

The focus of this public involvement program/plan is to inform the public and invite input relating to the plan and its implementation. As elements of the plan proceed from planning into execution, the NPHCDA objective will be to maintain the public awareness and understanding of the plan. The implementing agencies shall execute a program comprising seven strategic elements to accomplish the public awareness objective. A comprehensive public awareness program will include the following:

- Develop and distribute a project newsletter;
- Develop presentations and organize seminars and workshops;
- Develop and maintain a project web site;
- Develop radio and television adverts;
- Establish and maintain a project telephone information line;
- Prepare project press releases; and
- Prepare posters and erect billboards.

The objective of the public awareness program is to convey information to the public and interested groups. By utilizing a multi-faceted approach to convey information, the success of the effort is optimized. The Public Awareness Plan describes the general approach and specific benefits of each element of the program.

- *Newsletters*

Newsletters will be written in all major Nigerian languages to include project progress and information, calendars of events, telephone numbers, and information about the web site, location maps, and photographs of ongoing efforts. The newsletters will be printed and distributed quarterly throughout the implementation period. Newsletters differ from press releases in that a newsletter will have a smaller audience, greater depth of reporting, and more issues presented than a press release. Each newsletter will explain how to provide input into the plan. Newsletter shall be distributed through the 36 states and the federal capital in hospitals and other HCFs.

Newsletter distribution points will be identified on the project web site, and via press releases distributed to the local media. Although the primary method of distribution will be at established distribution points, newsletters will be mailed out upon specific request.

- *Seminars and Workshops*

Seminars and workshops will offer the public an opportunity to listen to the experts on different aspects of the plan. These meetings will be broadcasted on local television and radio stations. This will offer the public a convenient opportunity to take advantage of this information.

Newsletters, website, and press releases will advertise the schedule of seminars and workshops. Workshops shall be conducted annually throughout the period of the plan implementation. Other presentations will also be made throughout the plan implementation period on as need basis but will be limited to a reasonable number.

- *Radio and Television Adverts*

Radio jingles and TV adverts/announcements shall be developed and aired in all the states of the federation in all major languages. Pertinent information will be offered at intervals to maintain viewers' interest on the topic. Two radio jingles and two TV announcements shall be broadcasted in English and the major languages every month.

- *Posters and Billboards*

Posters and billboards shall be pasted and installed in strategic places to make them accessible to the general public. The public awareness plan would be effective since several medium would be used as part of a coordinated program. Although some strategies may be more effective than other elements, combining several techniques and different media in conveying plan/project information to the public would create an optimal approach.

The indicative cost for the Health Care Waste Management Public Awareness as seen in Table 9.1 is estimated as **Eighty Two Thousand Dollars (US $ 82,000).**

Table 9.1: Indicative cost for the Health Care Waste Management Public Awareness

Media	**Frequency per annum**	**No of Messages**	**Tertiary HCF Cost per Annum ($)**	**Secondary HCF Cost per Annum ($)**	**Primary HCF (Urban) Cost per Annum ($)**	**Primary HCF (Rural) Cost per Annum ($)**
Radio and TV	2 per month	All major Languages in the state	2,000	2,000	2,000	2,000

IEC/BCC	2 per month	All the Languages in the states	12,000	12,000	12,000	12,000
Newsletter	2 per month	3 (Hausa, Yoruba and Igbo) languages	6500	6500	6500	6500
Total Cost for Public Awareness						**82,000**

9.4 Stakeholder Consultation and issues raised

The concerns raised by the stakeholders during the stakeholder consultation, responses provided by the proponent and the consultant have been summarized and presented in table 9.2 below.

The meeting started with self-introduction and the objective of the HCWMP. The consultant took the responsibility in revising the project components and implementation arrangement. An overview of the operational safeguard policy triggered was discussed and the consultant offered that the Project Paper, Integrated Safeguards Data Sheet (ISDS) and the Project Information Document (PID) be consulted. The consultant also stated that the project will draw upon the National Healthcare Waste Management Strategic Plan and other already prepared HCWM plans of other World Bank health projects in Nigeria such as the Nigeria HIV/AIDS project and NSHPIC to prepare a HCWM plan in order to provide guidance on processes that the implementing agencies (Federal, States, Local Government Authorities, and Healthcare Facilities Managements) and to ensure the protection of healthcare workers, wastes handlers, and the community from the harmful impacts of hazardous healthcare wastes and to maximize project compliance with international and national environmental regulations and best practices. The stakeholders present were also given opportunity of expression and contribution. The meetings held on 4th March 2015 in the National Primary Health Care Development Agency (NPHCDA) complex.

Audience	Comments	Concerns/Remarks
Dr. Bassey Okposen; CMO/Head RI +ESS NPHCDA	▪ The Consultant made an opening remark and gave an overview on the HCWMP. ▪ Dr Bassey mentioned that the oral immunization system would soon be phased out and the Inactivated Polio Vaccine (IPV) introduced in Routine Immunizations; ▪ He stated that the Agency had developed a National Routine Immunization Strategic Plan 2013-2105 with a section on waste management. There is work in progress i.e about seventy percent complete in developing the 2016-2020 revised multi year plan with a waste management component which would be ready for submission in May 2015. ▪ He noted that from this revised plan a yearly annual plan approved by the ICC is developed. ▪ Through the Global Alliance for Vaccine Immunization (GAVI) Phase 1 support, regular HSS and	▪ The major concern mentioned was on the training of incinerator workers on the installation and maintenance of incinerators across the country. ▪ Dr. Bassey noted that there is also need for training of health workers at the LGA level to manage and coordinate vaccinations and Health Care Wastes (HCW); ▪ He further said that the last training for state managers was ten years ago and none had never been conducted for local level staff. ▪ He offered that a Mid-level Management Training (MLM) would be appropriate in the safe handling of HCW. ▪ He raised concerns about the lack of funds in the state offices (SPHCDA) making the agencies unsatisfactorily functional in their operations. ▪ He noted that with the revision of Health Act, the state agencies would be strengthened and all 36 states would house a SPHCDA. ▪ Also in terms of monitoring i.e through

	support on regular calls for yellow fever and meningitis, arrangements for the procurement of incinerators are done on a yearly basis. Incinerators are procured in states with HCW disposal gaps. ▪ He mentioned that 43 incinerators have been installed across the country to dispose immunization wastes. ▪ Since 2011 NPHCDA has been bridging the gaps within the states that have HCW issues. ▪ Dr. Bassey also stated that implementation of the Polio Eradication Support Project- AF would be by the state and local governments and that HCW are usually paid by these Governments. The role of the National Agency is to provide vaccines free for safety. ▪ NPHCDA do not manage HCW but support the state and LGA in managing these wastes. ▪ NPHCDA has six zonal offices with about 40 zonal officers per zone and 3-6 staff in 27 state offices nationwide.	the supportive supervisory visits made by the Federal Agency he stated that monitoring activities would need more strengthening.. ▪ He finally remarked that the Agencies' priority is getting vaccines for immunization to the children.

10.0 SUMMARY & RECOMMENDATIONS

10.1 HCWM minimization

To reduce the amount of hazardous HCW generated at Primary and Secondary healthcare facilities in Nigeria;

- The use of recyclable materials and products should be encouraged;
- Encourage a preference for oral alternatives in place of injections in treatment when appropriate;
- ensure good management and control practices especially in the purchase and use of pharmaceuticals; and,
- enforce a rigorous and careful segregation of HCW at source.

Segregation

Correct waste segregation is the fundamental first step for efficiently and effectively managing HCW. Proper segregation of waste at source will also reduce the quantity of waste requiring treatment prior to final disposal.

Courtesy: JSI/MMIS

Infectious and other hazardous waste must be segregated at source and put in appropriate colour – coded containers/bags as recommended by the National HCWM Guidelines. In particular, sharps must be segregated from other HCW at their point of generation.

Important elements specific to the segregation of sharps include:

- Sharps boxes, should be used strictly for sharps. Where there is a difficulty in getting sharps boxes, the use of recycled cardboard boxes is acceptable if it is puncture resistant, securely in place, easy to insert sharps, contains sharps without risk of spillage, and is well labelled.
- No healthcare waste other than sharps should be deposited in sharps containers. When a disposable syringe is used, the packaging should be placed in the general waste bin and the used syringe in the sharps container.
- Syringes and needles must be discarded of immediately following use without needles being removed from syringe, recapped, bent or broken before disposal (except where the healthcare facility has appropriate needle cutters/removers in place).
- The whole combination must be inserted into the safety box directly after use. If removal of the needle is required, special care must be taken.

Colour Coding

The colour coding system for HCW as recommended by the Nigeria National Healthcare Wastes Management Guidelines document is black, yellow and red in primary healthcare facilities, and black, yellow, red, and brown in secondary and tertiary healthcare facilities, and is one of the efficient ways of achieving segregation of waste and for sorting out items such as paper, plastic, glass and metal for recycling.

- Colour coding for plastic bags should correspond or match whenever possible the waste containers.

Recommended segregation and colour coding system in Nigeria

It is essential that clinical and related wastes are properly segregated, packaged, labelled, handled and transported to minimise risk to waste handlers and the community, such as needle stick injuries and transmission of infectious diseases.

Recommended colour coding system for primary HCFs in Nigeria

Black	**Yellow**
✓ non-risk waste of category	✓ infectious waste and highly infectious waste ✓ sharps collected in yellow, puncture-proof containers

Recommended colour coding system for secondary HCF in Nigeria

Black	**Yellow**	**Red**	**Brown**

Class	**Labelling**	**International symbols**
2	« Danger! Hazardous infectious waste »	
3	« Danger! Contaminated sharps, do not open »	
4	« Danger! Anatomical waste, to be incinerated or deeply buried »	
5	« Danger! To be discarded by authorized staff only »	
6	« Danger! Highly infectious waste, to be pre-treated »	
7	« Danger! Radioactive waste »	

✓ non-risk(domestic) waste	✓ infectious waste ✓ sharps collected in yellow, puncture-proof containers	✓ highly infectious waste	✓ pharmaceutical waste, some chemical waste, heavy metal wastes

Courtesy: Draft National Healthcare Waste Management Guidelines for Nigeria

- All waste bags or containers should be labelled with basic information in English and the local language of the area where the HCF is located. Basic label information should include type of waste in the container; name of the ward/facility, date of collection and, warning of hazardous nature.
- Provide Colour-coded refuse bags & bins (Black, yellow and red for the primary healthcare facilities) and (black, yellow, brown and red for the General Hospitals.

- Ensure the provision of Sharps boxes to the healthcare facilities, and these must be available at the points of wastes generation.
- Introduce segregation code of practice to be followed in each hospital.

- Training - Continuous training of staff.
- Reinforce on-job training and supervision.

10.2 HCW Collection

After proper segregation is performed, it is important that routine collection of waste is conducted. Health care waste collection must be performed on a regular schedule by designated personnel and carried out along well-defined routes within the HCF.

- When full, all health care waste containers must be sealed to prevent spilling during handling and transportation
- Bins/boxes and collection receptacles must not be overfilled and must be transported in carts well fitted to prevent spillages.

Courtesy: JSI/MMIS

- Sanitary staff and cleaners should always wear Personal Protective Equipment (PPE) including, as a minimum, overalls or industrial aprons, nose mask, heavy duty gloves, and safety boots.
- Regulations and supervisory arrangements must be set in-place to ensure that personnel utilize PPE when on duty.
- No bags should be removed unless they are labelled with their point of production (hospital and ward or department) and contents.
- The bags or containers should be replaced immediately with new ones of the same type.
- A supply of fresh collection bags or containers should be readily available at all locations where waste is produced.
- Containers for waste collection should meet the following requirements:

    a. Non-transparent;
    b. Impervious to moisture;
    c. Sufficient strength to prevent easy damage during handling or use;
    d. Leak resistant;
    e. Close-fitted lids;
    f. Fitted with handles for easy manipulation;
    g. Light weight and convenient;
    h. Designed to minimize physical contact.

- Nursing and other clinical staff should ensure that waste bags are tightly sealed when three-quarters full by tying the neck or sealing tag. Bags should not be closed by stapling.
- Sealed sharps containers should be placed in a labelled, yellow infectious health-care waste bag before removal from the hospital ward or department.
- Wastes should not be allowed to accumulate at the point of production.

- Routine programmes for waste collection should be established as part of the hospital's waste management plan (daily or as frequently as is necessary) and should be transported to a central storage site or treatment site.
- Collection carts should be easy to load and unload, have no sharp edges that could damage waste bags or containers, and be easy to clean.
- Water and hand-wash materials must be readily available for healthcare waste handlers to wash their hands after handling HCW.

10.3 HCW Waste Storage

Storage is the time lapse between the productions of the waste until collection for final disposal. Consideration for storage must be based on the classification or type of waste being dealt with and the potential risk of infection to health-care workers, waste disposal staff, and the public.

The following rules should be observed for proper storage of HCW in Nigeria:

- Initial packaging should take place where HCW is generated.
- Non-risk HCW should always be stored in a separate location from the infectious / hazardous HCW in order to avoid cross-contamination.

The Nigeria National Guidelines for HCWM recommends the under-listed characteristics for infectious and hazardous waste storage facilities for health-care waste:

- Impermeable, hard-standing floor with good drainage;
- easy to clean and disinfect, with a water supply;
- easy access for staff in charge of handling the waste;
- locked to prevent access by unauthorized persons;
- easy access for waste-collection vehicles;
- protected from the sun;
- for storage periods more than 24 hours, temperature must not exceed +10 degrees Celsius. (The storage of biological waste might require much lower temperatures);
- inaccessible for animals, insects, and birds;
- good lighting and at least passive ventilation;
- outside the proximity of fresh food stores or food preparation areas; and,
- Convenient to a supply of cleaning equipment, protective clothing, and waste bags or containers.
- Provide secured storage with adequate chambers for infectious, non-infectious, and food waste

10.4 HCW Waste Handling/Internal Transport

Health-care waste should be transported by the quickest possible route, which should be planned before the journey begins.

- Every effort should be made to avoid unnecessary handling of HCW;
- Hazardous HCW must be packaged in a closed yellow or red bag, tied and placed into sturdy container
- Waste that has the potential to leak must be double bagged
- all waste bags should be in-place and intact at the end of transportation;
- Provide dedicated trolleys/ trolley bins for on-site transport.
- Personnel handling/transporting HCW must wear PPE (i.e. gloves, lab coat, etc.)
- Have spill clean-up material available or, at minimum, know where it is (i.e. absorbent pads, bleach solution, etc.)

Off-site Transport

When transporting waste off-site, it is important that:

- Vehicles should be kept locked at all times, except when loading or unloading;
- when transporting hazardous waste, vehicles and containers must be cleaned and disinfected daily with an appropriate disinfectant;
- waste bags should be placed in containers (e.g. cardboard boxes or wheeled, rigid, lidded plastic or galvanized bins), before being placed directly into the transportation vehicle;
- any vehicle used to transport health care waste should fulfil the following design criteria:
    a) Suitable size for the amount of waste;
    b) designed such that the load is retained even if the vehicle is involved in a collision;
    c) include a system for securing the load during transport;
    d) possess a separate compartment in the vehicle for spare plastic bags, suitable protective clothing, cleaning equipment, tools, disinfectant, and "spill," and,
    e) able to be easily cleaned and have no sharp edges to damage waste containers.
- Provide securely designed transport vessel for off-site transport

10.5 HCW Waste Treatment

Proper treatment and disposal of healthcare waste is necessary to ensure that its impact on the environment and human health is minimized or eliminated. Unfortunately, environmental-friendly, safe and affordable options for treatment and disposal are not readily available for every situation in Nigeria.

The first step in HCWM is to ensure that all non-risk (general) waste is safely sent to the municipal waste management system. The remaining fraction of hazardous and highly hazardous health care waste should be treated and disposed appropriately to meet the following objectives:

- destruction of viable infectious organisms
- destruction/transformation of used or expired pharmaceuticals and chemicals
- destruction of sharps and other materials capable of causing physical injuries
- decomposition of radioactive waste materials
- final disposal / destruction of body parts, tissues, blood and other organic material
- avoidance or minimisation of secondary impacts from the disposal system

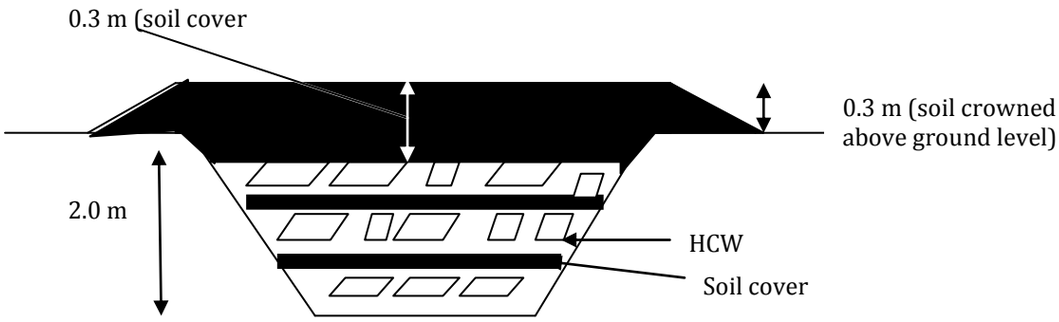
Decisions regarding treatment technology should be made at hospital level; however responsible personnel for waste management in the hospital should be in close contact with the regulatory/supervisory authority.

- All non-hazardous HCW not designated for recycling should be collected and managed with the general *municipal waste*.
- Burning in low temperature incinerators, preferably a well designed, constructed and managed-**Montfort Waste Disposal Unit (DWDU)** –is satisfactory whenever this can be made available for a primary health centre and even for some secondary healthcare facilities. However, this option is not satisfactory environmentally, and should only be considered a short-term solution to HCW treatment.

A De-Montfort Waste Disposal Unit

Disposal in Burial Pit

- *Burying HCW in spec*ially constructed pits (lined with impermeable materials such as clay) is for the present moment probably the most affordable and acceptable options for Primary HC facilities. This option has the advantage that it can be made available immediately, is cheap to provide, and the personnel can be easily trained on how to manage it in an environmentally sound manner. Of course it has its drawbacks – pollution of air, soil and water; spread of diseases by rodents and insect vectors (when soil-cover is not appropriately utilised); trespass by human beings and animals. A guideline on the safe construction and operation of a HCW burial pit (as designed by the consultant) has been added as an appendix to this HCWM plan document.



Centralized Incineration

- Treatment in a centralized Rotary Kiln Incinerator with good emissions management system, situate in a Tertiary or big secondary healthcare facility (or run by a private waste management firm/Public-Private partnership arrangement) in the region; with HCW collection by a HCWM contractor or public collection system in the opinion of the Consultant, would be the ideal option for the management of HCW from primary and secondary healthcare facilities in Nigeria. This approach would reduce health and environmental pollution risks that would arise from several inefficiently managed and run incinerators or burning pits/burials pits. The major drawback of this approach is that it will take some time to put in place, is expensive to set-up, and will require a transportation infrastructure that is well organized. But once the initial problems associated with setting up the system are overcome, it should run smoothly, especially if a public-private arrangement for the management of the incinerator is achieved

Waste Treatment in Secondary Healthcare Facilities:
Treatment in a Centralized Incinerator

- As with primary healthcare facilities above, sending the HCW from a secondary healthcare facility for treatment in a centralized dual chamber, semi-pyrolytic (preferably a rotary kiln) incinerator, operating at temperatures above 1000°C in the primary chamber and 1200°C in the secondary chamber and incorporating a good emissions management system, situate in a Tertiary or big secondary healthcare facility (or run by a private waste management firm/Public-Private partnership arrangement) in the region would be the ideal option.

The advantages in choosing off-site centralized HCW treatment solutions are:

- **financial:** greater cost-effectiveness can be achieved in larger units unless the running costs for waste collection and transportation remain too expensive;
- **technical:** efficient operation and maintenance of units is easier to ensure in a centralized facility than in several plants where financial and human resources may not be readily available;
- **legal compliance:** conformance to environmental norms are easier to achieve, thanks to the use of more sophisticated/ expensive technology and by the reduced number of facilities that need to be monitored by environmental surveillance authorities.

Treatment in an On-site Incinerator

- Waste treatment in an on-site, high temperature, dual chamber, semi-pyrolytic incinerator– (which operate at temperatures of over 800°C in the primary chamber, and 1000°C in the secondary chamber), with a good emissions management system is recommended for lager secondary healthcare facilities that is in a region where there is no secondary or tertiary healthcare facility with a good quality incinerator installed. This incinerator should be used to manage HCW from other healthcare facilities in the region, especially by utilizing specialized private HCW managers for waste collection, and whose standards of operation would be supervised by the relevant environmental regulatory authorities.

  Note: An Environmental & Social Impact Assessment (ESIA) would be carried out prior to the installation of incinerators in line with the existing laws in Nigeria and World Bank safeguards Policies.

Treatment in a De-Montfort WDU

- As with the primary healthcare facilities, burning in low temperature incinerators, such as a well designed, constructed and managed-**Montfort Waste Disposal Unit (DWDU)** –would be satisfactory. However, as noted above, this option is not satisfactory environmentally, and should only be considered a short-term solution to HCW treatment in a secondary healthcare facility.

Treatment in a Burial Pit

- Burying of the HCW in *spec*ially constructed pits (lined with impermeable materials such as clay) as described above for treatment of HCW in primary healthcare facilities would be acceptable for use in secondary healthcare facilities where incinerators are unavailable.

10.6 Final Disposal of HCW

To fulfil Best Environmental Practices (BEP), an Environmental and Social Impact Assessment (ESIA) will precede commencement of any civil works aimed at installation of incinerators in both primary and secondary healthcare facilities.

10.7 Disposal Procedural Steps

- Provide secured appropriately lined pits for final disposal of incineration ash.
- Transportation of incineration ash and non-hazardous and treated hazardous waste (that has been rendered non-infectious) to engineered designated (sanitary) land fill sites.

10.8 Resources & Human Capacity Development

- Ensuring mandatory budgeting for HCWM by Healthcare Facilities
- Development of the capacity of healthcare personnel, HCW waste handlers, and HCW waste treatment personnel to appropriately manage HCWM
- Regular trainings and re-trainings of personnel on HCWM techniques
- Provision of awareness materials on HCWM in healthcare facilities and ensuring that they are put in strategic locations in the healthcare facility, and at the points of HCW generation.
- Ensuring that HCWM Committees are setup in healthcare facilities and that they carry out their functions effectively (the Chief Medical Officer of the facility must be the leader of this committee)
- Ensuring that all healthcare facilities appoint/designate a specific officer to be in-charge of HCWM
- Development of supervisory capacity and monitoring mechanism for the implementation of a well developed HCWM Plan for healthcare facilities (including records keeping mechanisms)
- Awareness creation and capacity development in the communities on the dangers associated with improper HCW handling and disposal
- Support and development of mechanisms for private institutions to be involved in HCW collection, transport, treatment and disposal process
- Standardization of transport facilities for the management of HCW

10.9 Recordkeeping

- The HCWM Officer must have a fully completed internal HCW manifest ready before transporting the waste to the designated disposal location.
- All details (type, weight, quantity, etc) of the HCW must be filled prior to movement of the wastes for disposal
- A copy of the HCW manifest must be kept at the HCF a copy by the HCW Officer.

10.10 Recordkeeping

Spills should be cleaned-up if:

- The supplies to absorb and bag the spilled material is available
- Use Bleach, diluted to 1:10 with water: to decontaminate the spill area and to clean/decontaminate equipment used in spill response. Cover the spilled area with absorbent pad or paper towels and then pour diluted bleach over the towels; let to stand for 30 minutes and the clean-off
- To reduce the number of employees at risk of exposure: Restrict access to the area of the spill; Provide warnings of hazards and advice about special requirements
- Proper PPE must be worn whilst cleaning spills

Procedures for Reporting and Tracking Spillages

- Inform the immediate supervisor of the unit if any personnel are involved in a spill or cleanup.
- The supervisor must immediately maintain restriction to the area of the accident.
- Information of the spill should be passed to all personnel in a calm and organized manner.
- Personnel of the unit in which the accident occurred should implement appropriate clean-up. It is recommended that health care facilities be provided with US EPA Mercury Clean-up Kits (one of the most effective mercury clean-up kits; containing procedures for best handling of spills and environmentally sound disposal of broken chemical containers).
- The incident should be finally communicated to the records department of the health facility for documentation and lessons learned.

Note: If it is a larger chemical or non-chemical spill there will be a required increase in personnel assistance for clean-up and a more organized clean-up approach.

Prevention of Spillage

Containers and items should be placed in secure areas and marked "breakable handle with care" behavioural patterns are a factor of good or ineffective safety practices. Personnel need hospital chemical safety trainings and educated on the use of material safety data sheets (MSDS) for the identification of chemical in their facilities.

This guideline is applicable for both primary and secondary healthcare facilities.

10.11 Post Exposure Prophylaxis Guidelines for Occupational Exposure

Definition of an occupational exposure

An occupational exposure that may place a worker at risk of HIV infection is a percutaneous injury, contact of mucous membrane or contact of skin (Especially when the skin is chapped, abraded or afflicted with dermatitis or the contact is prolonged or involving an extensive area) with blood, tissue or other body fluids to which universal precaution apply.

Occupational exposure to viral pathogens

- needle stick injuries
- cuts from other sharps
- contact of eye, nose, mouth or skin with blood or body fluids

Factors affecting transmission

- amount of blood in the exposure
- amount of virus in patient's blood
- whether P.E.P. taken or not

Average risk of HIV infection after an occupational exposure
Risk increases if patient has high viral load as in patients with acute HIV
Infection or patient near death prevention of occupational exposure

Standard precautions (universal work precautions) and safe practices

- Wash hand after patient contact, removing gloves.
- Wash hands immediately if hands contaminated with body fluids.
- Wear gloves when contamination of hands with body substances anticipated
- Protective eyewear and masks should be worn when splashing with body substance is
- anticipated
- All health care workers should take precautions to prevent injuries during procedures and when cleaning or during disposal of needles and other sharp instruments.
- Needle should not be recapped
- Needles should not be purposely bent or broken by hand
- Not removed from disposable syringe nor manipulated by hand
- After use disposable syringes and needles, scalpel blades and other sharp items should be placed in a puncture resistant container.
- Health care workers who have exudative lesions or dermatitis should refrain from direct patient care and from handling equipment
- All needle stick injuries should be reported to infection control officer.
- Handle and dispose of sharps safely
- Clean & disinfect blood / body substances spills with appropriate agents
- Adhere to disinfection and sterilization standards
- Regard all waste soiled with blood/body substance as contaminated and dispose of according to relevant standards
- Vaccinate all clinical and laboratory workers against hepatitis B
- Other measures double gloving changing surgical techniques to avoid "exposure prone" procedures use of needle-less systems and other safe devices.

Body fluids to which universal precautions apply

- Blood
- Other body fluids containing visible blood
- Semen
- Vaginal secretions
- Cerebrospinal fluid (CSF)
- Synovial fluid
- Pleural fluid
- Peritoneal fluid
- Pericardial fluid
- Amniotic fluid

Body fluids to which universal precautions do not apply

The risk of HIV transmission is extremely low or negligible

Use of protective barriers

- Protective barriers reduce the risk of exposure of the HCWs skin or mucus membrane to
- potentially infective materials

These Include:

- Nasal secretions
- Sputum
- Sweat
- Tears
- Urine
- Vomits
- Saliva

Protective barriers include gloves gowns, masks, protective eye wears.
Selection of protective barriers

- The use of double gloves is not recommended. Heavy duty rubber gloves should be worn for cleanings instruments, handling soiled linen or when dealing with spills

What to do on exposure to HIV infected blood?
Prompt measures

- Do not Panic
- Do not put cut / pricked finger into your mouth

Post-HIV exposure management / prophylaxis (PEP)
It is necessary to determine the status of the exposure and the HIV status of the exposure source before starting post-exposure prophylaxis (PEP)

Immediate measures:

- wash with soap and water
- no added advantage with antiseptic/bleach

Next step:

- prompt reporting
- post-exposure treatment should begin as soon as possible
- preferably within two hours
- not recommended after seventy -two hours
- late PEP? may be yes
- Is PEP needed for all types of exposures? NO

Type of exposure Examples Protective barriers
Low Risk

- contact with skin with no visible blood
- injections
- Minor wound dressing

Protective Gear

- Gloves helpful but not essential

Medium Risk
-probable contact with blood
-splash unlikely

- vaginal examination,
- insertion or removal of intravenous canual
- handling of laboratory specimens
- large open wounds dressing
- venepuncture ,spills of blood

Protective Gear

- Gloves

- Gowns and
- Aprons may be necessary

High Risk
-probable contact with blood, splashing, uncontrolled bleeding, major surgical procedures, particularly in orthopaedic surgery and oral surgery; vaginal delivery

Protective Gear
- Gloves
- Water proof
- Gown or Apron
- Eye wear
- Mask

OTHER INFORMATION
1. Post exposure Prophylaxis:

The decision to start PEP is made on the basis of degree of exposure to HIV and the HIV status of the source from whom the exposure/infection has occurred.

2. Determination of the Exposure Rate (ER)

3. Exposure Code (EC)

4. Determination of PEP Recommendation

5. Testing and Counselling

The health care provider should be tested for HIV as per the following schedule

i) Base-line HIV test - at time of exposure
ii) Repeat HIV test - at six weeks following exposure
iii) 2nd repeat HIV test - at twelve weeks following exposure

On all three occasions, healthcare workers/personnel must be provided with a pre-test and post-test counselling. HIV testing should be carried out on three ERS (Elisa/ Rapid/ Simple) test kits or antigen preparations. The healthcare worker/personnel should be advised to refrain from donating blood, semen or organs/tissues and abstain from sexual intercourse. In case sexual intercourse is undertaken a latex condom should be used consistently. In addition, female healthcare worker/personnel should not breast -feed their infants

This guideline is applicable for both primary and secondary healthcare facilities.

10.12 Handling of Liquid Wastes Streams form Healthcare Facilities

All liquid wastes must be adequately treated for safe, permitted discharge to public sewers. Pharmaceuticals should not be discharged to the sewer system but collected for separate treatment or sent to the National Agency for Food and Drug Administration and Control (NAFDAC) to be treated and disposed of in the agencies laboratories or to the National Institute for Pharmaceutical Research and Development (NIPRD) under a formal Memorandum of Understanding (MoU).

Cleaning wastewater and storm water from storage rooms and loading docks where waste is handled between transportation modes is to be regarded as health care wastewater and managed as such.

Wastewater pre-treatment
Wastewater from laboratories must be neutralized, detoxified and undergo removal of heavy metals as appropriate. Wastewater from X-ray development shall be neutralized and treated for removal of silver. Kitchens must be equipped with grease traps and main laundry facilities shall have lint traps/fine screens. Wastewater from wet treatment of incineration flue gas shall be treated for neutralization and removal of heavy metals.

Discharge for off-site treatment.
Wastewater from health care facilities may be discharged to off-site sewerage and the associated treatment system if the owner and operator approve such a discharge in writing. The accepting entity must confirm in writing that the systems (sewerage and treatment) have adequate capacity and provide quantitative documentation demonstrating permitted performance. The treatment works must be capable of ensuring continuous compliance with national liquid effluents standards as described by the National Environmental Standards and Regulations Enforcement Agency (NESREA). Health care facilities discharging wastewater for offsite treatment must further ensure that external handling and treatment can be managed without compromising the health and safety of workers responsible for operating and maintaining the sewer system and treatment facility. Pre-discharge disinfection of health care facility wastewater and a separate sewer to the treatment plant may be required.

Note: Certain Genotoxic pharmaceuticals may only be destructed by incineration at a temperature of 1200 °C.

Discharge to surface waters
Wastewater discharged directly to surface waters shall have undergone treatment and disinfection and complies with the limits in the table on the page following.

Table 10.1: Liquid effluent concentration limits for health care facilities

Parameter	Unit	Limit
ph		6-9
Biochemical oxygen demand (BOD5)	mg/l	50
Chemical oxygen demand (COD)	mg/l	250
Oil and Grease		
Total suspended solids (TSS)	mg/l	20
Cadmium (Cd)	mg/l	0.1
Chromium (Cr)	mg/l	0.5
Lead (Pb)	mg/l	0.1
Mercury (Hg	mg/l	0.01
Chlorine, total residual	mg/l	0.2
Phenols	mg/l	0.5
Fecal Coliform MPN/100	mg/l	400
Dioxins and furans	mg/l	0.3

This is applicable primarily to secondary and tertiary healthcare facilities who have the capacity to implement the above. Management personnel of primary healthcare facilities are to safely store collected pharmaceutical wastes which should be sent to secondary healthcare facilities alongside other wastes. Other liquid wastes generated in primary healthcare facilities can be disposed of in-facility, provided sewage pipe line networks, soak-away and septic tanks are constructed.

10.13 Assignment of Responsibilities

The proper management of health-care waste in the course of the implementation of the Nigeria Polio Eradication Project will be achieved if it is ensured that there is good administration and organization in the HCFs participating in the program. Adequate financing for HCWM, as well as active participation by trained and informed staff must be guaranteed by the NPHCDA.

The Head of the institution should form a **health care waste management team** (HCWMT) to develop a health care waste management plan.

A **Waste Management Officer** – Each healthcare facility should have an Environmental Health Officer with the overall responsibilities for the development of the hospital waste management plan and for the subsequent day-to-day operation and monitoring of the waste disposal system.

Development of a waste management plan
The waste management plan should be developed in close consultation with all members of the Waste Management Team. The plan should analyse existing practices in the HCF and its development should be based on the National HCWM guidelines. It should as a minimum consider the following:

- Quantities of waste generated;
- Possibilities for waste minimization, reuse, and recycling;
- Waste segregation, on-site handling, transport, and storage practices;
- Identification and evaluation of waste treatment and disposal options (on- and off-site);
- Training;
- Estimation of costs relating to waste management (actual situation and proposed options);
- Strategy for the implementation of the plan

Implementation of the waste management plan
Implementation of the WMP is the responsibility of the Chief Health Officer in each HCF. It involves the following steps:

- Interim measures, to be introduced as a precursor to complete implementation of a waste management system should be developed by the Waste Management Officer (WMO), in collaboration with the Waste Management Team (WMT), and be appended to the plan;
- The Head of Hospital appoints personnel to the posts with responsibility for waste management. Notices of these appointments should be widely circulated and updates should be issued when changes occur;
- The Infection Control Officer should **organize and supervise training programmes** for all staff, in collaboration with the WMO and other members of the WMT. Initial training sessions should be attended by key staff members, including medical staff, who should be urged to be vigilant in monitoring the performance of waste disposal duties by non-medical staff;
- The WMT should review the WMP annually and initiate changes necessary to upgrade the system

Table 10.2: Resource requirements for the Implementation of the HCWM plan of the Nigeria Polio Eradication Project- Additional Financing

S/N	**Activity**	**Human Resources**	**Institution Responsible**	**Costs (US$)**	**Source of funding**
1.	Provide appropriate collection, storage and segregation containers at all medical facilities	waste management and procurement specialist	NPHCDA, SPHCDA	150,000	NG Polio Eradication Support Project – – through Facilities
2.	Facilitate the procurement of medical waste treatment facilities in hospitals (incinerators, disinfectants, autoclaves)	procurement and financial management specialists	NPHCDA, SPHCDA,	1,500,000	Link with NSHPIC
3.	Develop monitoring and supervisory framework, develop standardized reporting format for use in the HCF	consultants, monitoring and evaluation specialists	NPHCDA, SPHCDA	10,000	NG Polio Eradication Support Project – – through Federal State and LGAs
4	Assist with design and construction of pilot environmentally sound HCW Disposal Pits in selected HCFs	Consultant/Contractor	NPHCDA; SPHCDA;	100,000	NG Polio Eradication Support Project – – through Federal State and LGAs
5.	Conduct comprehensive waste audit of all hospitals	Consultants - HCWM Expert	NPHCDA	50,000	NG Polio Eradication Support Project – – through Federal State and LGAs
6.	Conduct trainings and workshops on HCWM (National, State, L.G.A., Healthcare Facilities)	NPHCDA, SPHCDA, Consultants - (HCWM Expert Etc)	NPHCDA, SPHCDA	200,000	NG Polio Eradication Support Project – through Federal State and LGAs
7.	Develop and produce public awareness materials e.g. posters	Printing Contractor	NPHCDA, SPHCDA	10,000	Link with NSHPIC
8.	Supply/provision of PPEs for HCFs (coveralls, goggles, nose guards, gloves, face masks, fixtures e.t.c)	Contractor	NPHCDA, SPHCDA	300,000	Link with NSHPIC
9	Prophylactic immunization for HBV in HCFs	NPHCDA, SPHCDA, Consultants	NPHCDA, SPHCDA	90,000	Link with NSHPIC

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APPENDIX 1: SUMMARY OF WORLD BANK ENVIRONMENTAL AND SOCIAL SAFEGUARD POLICIES

- ***Environmental Assessment (OP 4.01).*** Outlines Bank policy and procedure for the environmental assessment of Bank lending operations. The Bank undertakes environmental screening of each proposed project to determine the appropriate extent and type of EA process. This environmental process will apply to the Nigeria Polio Eradication Support Project-Additional Financing.
- ***Natural Habitats (OP 4.04).*** The conservation of natural habitats, like other measures that protect and enhance the environment, is essential for long-term sustainable development. The Bank does not support projects involving the significant conversion of natural habitats unless there are no feasible alternatives for the project and its siting, and comprehensive analysis demonstrates that overall benefits from the project substantially outweigh the environmental costs. If the environmental assessment indicates that a project would significantly convert or degrade natural habitats, the project includes mitigation measures acceptable to the Bank. Such mitigation measures include, as appropriate, minimizing habitat loss (e.g. strategic habitat retention and post-development restoration) and establishing and maintaining an ecologically similar protected area. The Bank accepts other forms of mitigation measures only when they are technically justified. Should the sub-project-specific ESMPs indicate that natural habitats might be affected negatively by the proposed sub-project activities with suitable mitigation measures, such sub-projects will not be funded under Nigeria Polio Eradication Support Project-Additional Financing
- ***Pest Management (OP 4.09).*** The policy supports safe, affective, and environmentally sound pest management. It promotes the use of biological and environmental control methods. An assessment is made of the capacity of the country's regulatory framework and institutions to promote and support safe, effective, and environmentally sound pest management. This policy does not apply to the Nigeria Polio Eradication Support Project- Additional Financing.
- ***Involuntary Resettlement (OP 4.12).*** This policy covers direct economic and social impacts that both result from Bank-assisted investment projects, and are caused by (a) the involuntary taking of land resulting in (i) relocation or loss of shelter; (ii) loss of assets or access to assets, or (iii) loss of income sources or means of livelihood, whether or not the affected persons must move to another location; or (b) the involuntary restriction of access to legally designated parks and protected areas resulting in adverse impacts on the livelihoods of the displaced persons. This policy does not apply to the Nigeria Polio Eradication Support Project- Additional Financing.
- ***Indigenous Peoples (OP 4.10).*** This directive provides guidance to ensure that indigenous peoples benefit from development projects, and to avoid or mitigate adverse effects of Bank-financed development projects on indigenous peoples. Measures to address issues pertaining to indigenous peoples must be based on the informed participation of the indigenous people themselves. Sub-projects that would have negative impacts on indigenous people will not be funded under Nigeria Polio Eradication Support Project- Additional Financing.
- ***Forests (OP 4.36).*** This policy applies to the following types of Bank-financed investment projects: (a) projects that have or may have impacts on the health and quality of forests; (b) projects that affect the rights and welfare of people and their level of dependence upon or interaction with forests; and (c) projects that aim to bring about changes in the management, protection, or utilization of natural forests or plantations, whether they are publicly, privately, or communally owned. The Bank does not finance projects that, in its opinion, would involve significant conversion or degradation of critical forest areas or related critical habitats. If a project involves the significant conversion or degradation of natural forests or related natural habitats that the Bank determines are not critical, and the Bank determines that there are no feasible alternatives to the project and its siting, and comprehensive analysis demonstrates that overall benefits from the project substantially outweigh the environmental costs, the Bank may finance the project provided that it incorporates appropriate mitigation measures. Sub-projects that is likely to have negative impacts on forests will not be funded under Nigeria Polio Eradication Support Project- Additional Financing.
- ***Physical Cultural Resources (OP 4.11).*** The term "cultural property" includes sites having archaeological (prehistoric), paleontological, historical, religious, and unique natural values. The Bank's general policy regarding cultural property is to assist in their preservation, and to seek to

avoid their elimination. Specifically, the Bank (i) normally declines to finance projects that will significantly damage non-replicable cultural property, and will assist only those projects that are sited or designed so as to prevent such damage; and (ii) will assist in the protection and enhancement of cultural properties encountered in Bank-financed projects, rather than leaving that protection to chance. The management of cultural property of a country is the responsibility of the government. The government's attention should be drawn specifically to what is known about the cultural property aspects of the proposed project site and appropriate agencies, NGOs, or university departments should be consulted; if there are any questions concerning cultural property in the area, a brief reconnaissance survey should be undertaken in the field by a specialist. This policy does not apply to the Nigeria Polio Eradication Support Project-Additional Financing.

- ***Safety of Dams (OP 4.37).*** For the life of any dam, the owner is responsible for ensuring that appropriate measures are taken and sufficient resources provided for the safety to the dam, irrespective of its funding sources or construction status. The Bank distinguishes between small and large dams. Small dams are normally less than 15 m in height; this category includes, for example, farm ponds, local silt retention dams, and low embankment tanks. For small dams, generic dam safety measures designed by qualified engineers are usually adequate. This policy does not apply to the Nigeria Polio Eradication Support Project- Additional Financing.
- ***Projects on International Waterways (OP 7.50).*** The Bank recognizes that the cooperation and good will of riparians is essential for the efficient utilization and protection of international waterways and attaches great importance to riparian's making appropriate agreements or arrangement for the entire waterway or any part thereof. Projects that trigger this policy include hydroelectric, irrigation, flood control, navigation, drainage, water and sewerage, industrial, and similar projects that involve the use or potential pollution of international waterways. This policy does not apply to the Nigeria Polio Eradication Support Project- Additional Financing.
- ***Disputed Areas (OP/BP/GP 7.60)***. Project in disputed areas may occur the Bank and its member countries as well as between the borrower and one or more neighboring countries. Any dispute over an area in which a proposed project is located requires formal procedures at the earliest possible stage. The Bank attempts to acquire assurance that it may proceed with a project in a disputed area if the governments concerned agree that, pending the settlement of the dispute, the project proposed can go forward without prejudice to the claims of the country having a dispute. This policy is not expected to be triggered by sub-projects. This policy does not apply to the Nigeria Polio Eradication Support Project- Additional Financing.

APPENDIX 2: REQUIRED PERSONAL PROTECTIVE EQUIPMENT (PPE) FOR SAFE HCW MANAGEMENT

Waste Handlers and Incinerator operators should always have adequate personal protective equipment (PPE). PPE must be worn at all times when working with health care waste. It is important that the PPE is properly maintained and kept clean; it should not be taken home; and must remain at the health facility to avoid possible spread of infection to the community.

Standard PPE generally includes:

- **Gloves:** Always wear gloves when handling health care waste. Puncture-resistant gloves should be used when handling sharps containers or bags with unknown contents. Heat-resistant gloves should be worn when operating an incinerator
- **Boots:** Safety boots or leather shoes provide extra protection to the feet from injury by sharps or heavy items that may accidentally fall. Boots must be kept clean.
- **Overalls:** Overalls should be worn at all times.
- **Goggles:** Clear, heat-resistant goggles can protect the eyes from accidental splashes or other injury.
- **Mouth respirators**
- **Helmet (for incinerator operators):** Helmets protect the head from injury and should be worn at all times during the incineration process.

Health Worker Safety Measures

Hand hygiene

Running Water and soap should be available to ensure clean hands after handling HCW. Hand washing is one of the oldest, most well known methods of preventing disease transmission. HCW handlers and incinerator operators should always wash their hands after handling HCW.

Medical examinations

Healthcare waste handlers and incinerator operators should be medically examined prior to initial employment and undergo regular medical examinations every 6 months. They should also be immunized for Tetanus and Hepatitis B Virus.

APPENDIX 3: GUIDELINES FOR THE DISPOSAL OF HEALTH CARE WASTE BY PIT BURIAL

Introduction

The recommended method for HCW disposal in the primary and secondary healthcare facilities at present is the use of burial pits. This option has been chosen because of the need to act quickly in managing the critical negative impacts which the very poor management of HCW in Nigeria is having on the environment and the human population. To wait till other technology options that are more environmentally sound are available would delay the implementation of the project, and needlessly expose the HCW workers to deleterious health impacts.

NOTE:

If HCW are not buried properly, wild animals, dogs, or birds could exhume them and help spread diseases. Partially decayed HCW are unsightly, attract rodents, smell and are a breeding spot for flies.

- All healthcare facilities generate some quantity of hazardous wastes which need to be treated in an environmentally sound manner.
- It is important to note that adequate expertise is required for proper disposal of such wastes with consideration to mitigate to the lowest levels the negative environmental and possible human impacts.
- Necessary standard operating procedures for pit burial of HCW are described below, with the aim of giving HCWM personnel a hands-on approach to safe disposal of hazardous healthcare wastes.

Factors to consider

A) Ground Water Contamination Concerns

Burial of hazardous HCW in areas susceptible to ground water contamination could result in adverse effects in nearby wells, boreholes and streams. The potential for ground water contamination and subsequent water contamination of other sources is a function of the soil type, bedrock depth, and ground water depth

Soil Type

- Coarse soils may increase ground water contamination risks because they allow rapid movement of liquids away from the burial site with minimal filtration or treatment.

Bedrock Depth

- Open fractures in bedrock permit rapid movement of contaminated water with minimal filtration or treatment. Shallow bedrock is therefore a concern.

Ground Water Depth

- The zone above the ground water table up to the soil surface is effective in destroying some biological contaminants. However, this zone is minimal in areas where the water table is high. Depending on the combination of these three features, the ground water contamination potential could change.
- A specified method of determining the potential for ground water contamination at the burial site area will be adopted. It indicates how to determine if the ground water contamination potential is:

    1) High
    2) Low
    3) Moderate
    4) Very Low

Note: Avoid areas of thin soil cover over a bedrock layer.

B) Surface Water Contamination Concerns

Improper burial of hazardous HCW can also result in surface water contamination, affecting the water quality draining into watercourses, open-top catch basins and ponds. Some land, have a higher potential for surface water contamination because of the topography and soil type.

Topography

Hilly land is of more concern than flat land, since it promotes more rapid surface water runoff during spring runoff or heavy rainfall.

Soil Type

Since they promote more rapid runoff, heavier soils such as clay are of more concern than lighter soils such as sand. Unfortunately, the best soil condition to reduce ground contamination (a fine-grained, heavy soil like clay) also helps promote rapid runoff that can contribute to surface water contamination. In most cases, the optimum burial site is one that is relatively level.

Site Selection

Important considerations for burial site selection include the following.

- **Access**: Access is needed for the equipment to dig the burial pit There should be sufficient space for the temporary storage of overburden.

- **Environment**: Selection should take into account;

    1) Distance to watercourses, boreholes and wells.
    2) The height of the water table.
    3) Proximity to buildings, especially houses and surrounding farms.
    4) Proximity to neighbours or public lands, including roads.
    5) The slope of the land and drainage to and from the pit.
    6) The permeability of the soil.
    7) The direction of the prevailing wind (to manage odour).

    Consideration may need to be given to the lining of pits and the treatment of leachate and gas, depending on soil type, location, and volume of material to be buried.

- **Construction.** Soils should be stable enough to withstand the weight of equipment used to construct and fill the pit. If necessary, surface run-off should be prevented from entering the pit by the construction of diversion banks. Similar banks should be constructed to prevent any liquids escaping from the burial site.
- Fencing: It is very necessary to fence-in the burial pit to exclude animals and people.

Land suitability for Burial of HCW

- To check the suitability of land for the burial of HCW, consult soil and topographic maps, and dig test holes in the area to see how close the ground water is to the soil surface. Soil auger probes are available in extendable lengths that allow simple depth investigations up to 3 m (10ft.).
- Do not bury HCW on hilly land, because the soil covering the HCW could wash out during rainstorms, and surface water could become contaminated. Keep burial sites on relatively flat land.

Sizing the Burial pit

A) Burial Depth and Cover

Dig the burial hole to a depth of about 1.2-2.0 m deep (4 - 6.5 ft.) below the original ground level. Width of the pit should be determined by the quantity of wastes generated by the facility.

Note : Deeper holes are more difficult to dig, particularly if the inside slopes are quite steep; shallower holes would not permit at least 0.6 m (2 ft.) of soil cover; and wider and longer holes could take an unacceptably long time to fill before moving on to another site.

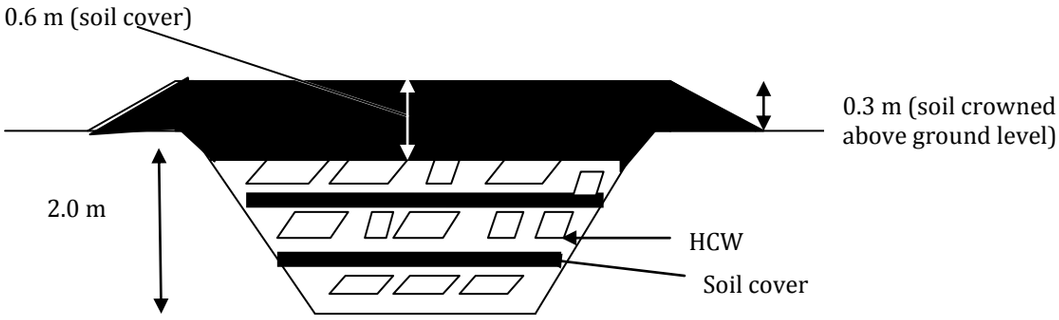
Place HCW in pit and cover completely with soil cover. When the pit is filled to a depth of about 1ft to the surface it should be covered with a minimum of 0.6 m (2 ft.) of soil, [including soil crowned up over the hole about 0.3 m (1 ft.)]. This mounding helps prevent scavenging animals from exhuming the HCW, allows for settling and helps shed surface water.

Note: Several small burial sites that are spread out are better than fewer, larger sites.

B) Distances from Burial Sites to Water Sources

- Maintain the separation distances from burial sites to open-top catch-basins, or natural watercourses to at least 50 m (165 ft.), provided the burial sites are on relatively flat land under.
- Keep burial sites at least 15 m (50 ft.) from ground drainage systems and gutters.
- As a guideline, don't bury HCW any closer than about 15 m (50 ft.) from all property lines, and 100 m (330 ft.) from neighbouring homes. Keep HCW and burial sites out of view, if possible.

C) Digging a Proper HCW Burial pit



Note: To overcome the Health and Safety issues associated with vertically or straight-sided pits(such as collapsing walls), and environmental concerns about uncontained leachate, it is good practice to use pits with outwardly sloping sides(as shown above) to prevent collapse and allow for impervious liners to contain leachate. There must also be enough cover to prevent waste from surfacing.

Pit Management Guidelines

To prevent problems,

- cover the HCW with 0.12 m (4 in.) of soil between burial intervals, then cap the hole with a 13 mm (1/2 in.) thick 1.2 x 2.4 m (4 ft. x 8 ft.) piece of plywood, or equivalent, that is secured on the top edges with soil.
- Install a bright flag warning of the pit location.
- Problems with pit burial include rainwater accumulating in the pit between burials, and safety concerns with slumping inside slopes since they are usually steep.

Record Keeping

Keep records of the burial sites to avoid digging the same location again too soon
Important information to record for each site is:

- exact location in relation to some fixed point
- date of pit usage and closure

Essential Considerations

Personnel Safety

Safety of personnel is an overriding consideration. Aspects to consider include;

- The hygiene of the personnel working on the site (especially the availability of hand-wash materials).
- Suitable Personal Protective Equipment (PPE) especially for coverall, boots, gloves and dust protection.

Before the use construction and operation of the Burial Pits, personnel should be properly trained and briefed.

Leachate production

- Leachate is the liquid that is released during the decomposition of wastes. This can be managed by the use of an impervious layer to cover the base and sides of the pit during construction. Impervious materials could be clay soil or plastic material lining.

Site inspection and monitoring

- Regular inspection of the burial pit site after closure is recommended so that appropriate action can be taken in the event of seepage or other problems. The objective is to return the site to its original condition.
- Advice for an ongoing environmental monitoring program of burial sites and the water table will need to be obtained from the Environmental Management Plan (EMP) consultant.

APPENDIX 4: BEST PRACTICES IN USING THE WASTE DISPOSAL UNIT (INCORPORATING THE DE MONTFORT INCINERATOR)

1. Introducing the waste disposal unit

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WASTE DISPOSAL UNIT (INCORPORATING THE DE MONTFORT INCINERATOR)

1.1 The waste disposal unit and its components

The WDU has been designed to enable trained operators to safely process and dispose of infectious waste. It is made up of several elements, housed within a sheltered enclosure. These elements are:

- A **De Montfort incinerator** to burn and reduce waste. The incinerator destroys 6-7 kg per hour if used correctly (i.e. approximately six safety boxes per hour).
- An **ash pit** where residual ash, glass and metallic parts – including needles - are safely deposited ***after*** incineration. The ash pit is large enough to store incinerated residues for at least 10 years without being emptied. Residue from one incineration session weighs approximately 0.5 kg. A pit of 3.25 cubic metres stores ash from the burning of approximately 300 safety boxes per month, over a period of 12 years. The ash pit has access trap doors to allow the pile of ash to be redistributed from time-to-time.
- A **waste store** to securely accumulate waste that is to be incinerated. The store has the capacity to stock at least 200 neatly-stacked safety boxes.
- A **fuel store** to stock the fuel, such as agro residues or wood, required to preheat the incinerator. The fuel store has enough capacity to stock fuel for at least five incineration sessions, both for pre-heating and supplementing medical waste.
- A s**torage box** to keep tools, protective clothing and records.
- An **enclosure** with a lockable door to prevent access by children and unauthorized persons, as well as scavenging animals and birds.
- A **shelter** to provide protection from the weather, particularly rain, for the incinerator, the operator and the waste to be incinerated. The shelter alsoprotects the fuel, the operator's tools, protective clothing and records. The shelter supports a 4- metre high chimney.
- An **access hatch** through the wire-mesh wall of the WDU to allow waste to be deposited when the WDU is locked and the operator is not present. This hatch opens into a **safety-box deposit** which provides a protected area where the safety boxes (and containers from needle-cutters) can be deposited temporarily.

1.2 How the De Montfort incinerator works

The incinerator is made of firebricks and prefabricated metal components which can either be manufactured locally or imported.

The structure is assembled and built at the site using Portland or refractory cement. No specialized tools are required.

The incinerator comprises primary and secondary combustion chambers. The burning zone of the primary chamber is accessible through a door at the front. This door lets in air, allows the operator to light the fire and also to remove the ash. The medical waste is dropped in through a loading door above the primary chamber. The secondary chamber, which is inaccessible to the operator, is physically separated from the primary chamber by a small distance.

A metallic tunnel placed between the primary and secondary chamber interconnects these two chambers at the bottom to induce across draught during operation. Additional air is drawn into the tunnel through small openings provided at centre on both sides of the tunnel. This air mixes with the partially-burnt flue gas from the primary chamber and causes secondary combustion. A self-adjusting draught control for regulating heat output and burn time is mounted in the lower section of the chimney and controls the flue gases in the chimney. A stove-pipe thermocouple mounted at the neck of the chimney indicates when the medical waste should be loaded. A 4- metre high chimney, mounted above the secondary combustion chamber, releases the flue gases into the atmosphere.

2. Safety:

The safety of the WDU operator is assured by following the instructions below:
1) Wear the protective clothing provided to all operators.
2) Wash hands regularly.
3) Be vaccinated against Hepatitis B virus (HBV).
4) Have regular medical checkups (every six months).

3. Operator's tasks and responsibilities

1) Adhere to the instructions in the Operator Manual.
2) Establish a regular routine to burn waste.
3) Minimize personal risk, as well as risk to other health workers and the local community.
4) Report achievements and problems to the supervisor.

4. Receiving health-care waste at the WDU

4.1 When operator is present at the WDU

When waste is deposited at the WDU, the operator will:
1) Receive the waste and record the required details in the ***Waste-Deposit Record***.
2) Verify that any waste received is appropriately packaged - that is:
• Sharps in safety boxes,
• Other waste in plastic bags,
• Needles in needle-cutter containers.
3) If the waste is not packaged correctly, report this to the supervisor.

4.2 When the operator is not present at the WDU

If the operator is not present at the WDU, the person delivering the waste at the WDU should:

1) Make sure that the safety boxes and plastic bags are properly closed.
2) Deposit the safety boxes and plastic bags through the access hatch that is clearly labelled and designed for this purpose. The waste deposited here drops into the safety box deposit that is accessible only to authorized persons.
3) At locations where a needle-cutter is used, deposit the needle containers through the access hatch that is used for the safety boxes and plastic bags.

On returning to the WDU, the operator will arrange the safety boxes or plastic bags of waste which have been deposited through the waste store access hatch in the waste store. The operator will also complete the ***Waste-Deposit Record*** for the newly arrived waste.

5. Conditions for incinerating waste

Use the incinerator to burn waste only if:
1) Six or more safety boxes of waste have been deposited at the WDU for disposal.
2) The wind is not blowing towards the health facility, other buildings near the incinerator, or across cultivated agricultural land.
3) No large groups of people are present in the immediate area.

4) The wind is not strong and likely to cause a fire.
5) The safety precautions are adequate *(as defined below).*
6) The incinerator is in good working order *(as defined below).*

For *safety precautions* to be termed *adequate,* the following conditions must be met:

• Tools and protective clothing are available and in good condition.

• A container full of sand is available at the WDU.

• The appropriate tools are available to operate the incinerator.

For the *incinerator to* be considered in *good working condition,* the following conditions must be met:

• The ash door and the loading door close correctly, i.e. they must not be broken.

• The strainer cables to the chimney should be tight, and there should be no risk that the chimney will fall down.

• The metal parts (front door, loading door, spigot, chimney, etc.) should not be badly corroded and/or likely to break.

• The masonry should not be badly cracked and/or likely to cause injury.

6. Preparation
Prior to start-up:

1) Make sure that more than 10 kg of renewable fuels (wood, coconut shells or other combustible agro waste) and 1 litre of kerosene is available at the WDU.
2) Make sure that the medical waste stored in the WDU is dry. If it is wet, place it in a well ventilated spot inside the WDU to dry.
3) Ensure that all tools and equipment are in working order.
4) Wear protective clothes (gloves, goggles, overalls and masks).
5) Remove the ash from the incinerator and place it in the ash pit.
6) Clean the area around the WDU.
7) Weigh the medical waste to be incinerated and count the boxes and/or packages. Record these quantities in the ***Waste-Disposal Record***.

6. Getting started

7.1 Lighting and warm-up
To light the incinerator and achieve the temperature required to load medical waste, follow the procedure outlined below.
1) Fully open the ash door and keep the loading door closed.
2) Place paper, kindling wood (approximately 1.5 kg) or other readily burnable (non-polluting) materials on the grate. Pour a small quantity of kerosene or diesel over the materials if necessary.
3) Light the fire through the ash door. Use a taper of burning paper rather than a match or cigarette lighter.
Avoid looking directly into the grate when lighting the fire in case any explosive or volatile gas remains in the primary combustion chamber.
4) After steady burn is achieved (approximately 5 minutes), add approximately 1–2 kg of combustible material (not medical waste) to the burning fire through the ash door.
5) Observe the temperature gauge mounted on the chimney until the temperature stabilizes (approximately 5 minutes).
6) Place additional fuel on the fire (approximately 2 kg).
7) Repeat this procedure until the temperature gauge displays a temperature of, at least, 600° C and then close the ash door.

8. Loading and destroying medical waste
1) Prior to loading the packaged waste for burning, store it temporarily in the designated waste store.
2) Load the safety boxes and the plastic bags for burning through the loading door at the top of the incinerator.

3) If the needle-cutter containers are disposable, deposit them in the needle chute; if the needle cutter containers are not disposable, empty the needles into the needle chute and save the containers for re-use.

8.1 Rate of loading waste and fuel

"Rate of loading" is a key factor in reducing smoke levels. Loading one full safety box approximately every 8–10 minutes gives the cleanest burn. However, this rate of loading cannot be maintained too precisely because the amount of waste in the safety boxes varies. The best "rate of loading" is determined by observing the temperature gauge.

8.2 Operating without a temperature gauge

Some incinerators are not fitted with a temperature gauge so the operator has to judge the adequate operating temperatures, based on experience. Inexperienced operators should not be assigned to operate incinerators that do not have a working temperature gauge fitted.

A good visual guide is to look through the secondary air inlet and check the colour of the smoke from the chimney.

Visual guide to judging temperature:

- If a good strong flame is visible through the secondary air hole, the temperature should be more than 600°C at this point.
- If the smoke is dense white, grey or black, poor combustion is occurring because the temperature is either above or below what is required.
- If temperatures are too high, the chimney glows red.

8.3 Loading

1) Load only waste that has been weighed and recorded in the operator's record.
2) Load through the loading door on the top and not through the ash door at the front.
3) Open the loading door just prior to depositing medical waste and close it immediately afterwards in order to avoid being exposed to toxic gases.
4) Load *safety boxes* only when the temperature on the gauge is above 600°C but below 900°C.
5) Load *bags of waste* only when the temperature on the gauge is above 700°C.
6) If the temperature drops below 600°C, only load fuel (wood, coconut husks, etc.) and not health-care waste.

8.4 Mixtures and proportions of waste to be loaded

1) Do not load very wet safety boxes or bags of waste. Place them in a dry, well-ventilated, warm place to dry (e.g. on the concrete slab next to the top of the incinerator).
2) Fuels with high heating values (e.g. plastics, paper, card and dry textiles) are useful in maintaining the correct temperatures for burning bags of healthcare waste.
3) Burn a mixture of safety boxes and bags of non-sharps waste if both types of waste are available (sorting and labelling the waste in separate bags must be done at the place where the waste is generated).
4) As a general rule: burn safety boxes in order to *increase temperatures* in the incinerator, and bags of other waste in order to *reduce temperatures* in the incinerator.

9. Burn down/cool down

When all the health-care waste has been burned and the temperature indicated on the temperature gauge falls below 600°C, proceed to *burn down/cool down*. After the waste has burned down, leave sufficient time for the fire to die down and the embers to cool. This allows the "fixed carbon" in the waste bed to burn, reducing toxic emissions and ensuring that all the waste is totally destroyed.

9.1 Procedure

1) Add 1-2 kg of fuel (wood, coconut shell, or other combustible agro waste) when the temperature falls below 600°C.
2) Do not leave the WDU until the temperature on the gauge falls below 400°C (if there is no temperature gauge, wait until the fire is reduced to a bed of red embers) to avoid any possible accidents.
3) Allow the incinerator to cool down for at least three hours after use before removing the ash.

9.2 Cleaning – including ash removal

When burning is complete a residue is left. This residue is a mixture of ash from the fuels used to pre-heat the incinerator, ash from the safety boxes of syringes and non-burnable materials such as needles, scalpels, etc. and glass from vials. It is important to dispose of this ash carefully since it is toxic and it contains sharp objects.
If the load of health-care waste has been burned in accordance with "best practices", needles are sterilized and annealed. There is, therefore, no risk of infection from needle-stick. Observe the instructions below:
1) Always wear gloves and a face mask when removing the ash.
2) Never handle the ash or other solids with bare hands. Always wear protective clothing, including gloves. Use the rake provided as part of the WDU tool kit to rake the ash and other non-burnable waste directly into the ash pit.
3) If the incinerator is operated every day, remove the ashes and other non-burnable waste the following day, prior to operating the incinerator again.
4) If the incinerator is not used every day, remove all the ash on the same day after several hours or remove it the following morning. Do not leave ash in the incinerator for long periods of time.
5) Carefully sweep the area around the incinerator to ensure that all the needles and non-combustible waste are placed in the ash pit.
6) Always replace the trap door of the ash pit to avoid accidents.
7) Two additional trap doors are provided in the concrete slabs at ground level on either side of the incinerator. Open these from time-to-time and distribute the ash evenly within the pit.

10. Record-keeping and reporting

WDU activities are recorded on three different forms:

1) The **Waste-Deposit Record** shows the amount and type of waste deposited at the WDU when the operator is present, and provides a monthly record of the waste to be burnt *(see Table 1).*
2) The **Waste-Disposal Record** shows the amount of waste destroyed at each burn session
3) The **Tools and Equipment Record** lists the equipment available and its condition, as well as problems and defects encountered with any of the elements of the WDU.
The operator is responsible for maintaining these records in accordance with the steps below:
1) Submit each record monthly to the waste-management supervisor.
2) Keep a carbon copy of all records at the WDU. These records must always be available for inspection at the site.
3) Prepare monthly/quarterly reports of the waste-management activity on the basis of the information in the daily records.

10.1 Record of waste deposited

The purpose of the ***Waste-Deposit Record*** is to trace the quantities and origins of waste deposited. This record does not provide complete information since the waste deposited during the operator's absence is not recorded.
Table 1 shows how this form should be completed.
1) Complete the ***Waste-Deposit Record*** for every delivery of waste deposited at the WDU.
2) Get the signature of the person who deposits the waste for the record.

Table 1: Example of waste deposit record						
Health Facility: PIMS						
Type of Incinerator: Small scale De Mont fort Incinerator						
Day of the Month	Waste Deposited		Origin of waste		Name of Person depositing waste	Signature of Person depositing waste
	Sharps (kg)	Other (kg)	Means of transport	Service or Place		

10.2 Record of waste destroyed

1) Complete this record for every burn session.
2) Sign in the last column for each entry.

Table 2 shows how to complete a ***Waste-disposal Record.***

Table 2: Example of incineration/waste-disposal record						
Health facility:			Month/Year:			
Type of incinerator: De Mont fort			Name of Incinerator operator:			
Day of the month	Waste Incinerated		Auxiliary fuel		Time spent at WDU	Operator's Signature
	Sharps (kg)	Other (kg)	Type	Kg/ltrs		

10.3 Record of tools and equipment, reported problems and WDU defects

1) Complete the ***Record of tools and equipment, reported problems and WDU defects*** every month.
2) Include in this record a note of any absence of basic consumable supplies (e.g. fuel, soap, etc.). Submit requests for supplies of such items according to the standard operating procedures of the primary health facility.
3) Submit the ***Record of tools and equipment*** at the end of each month to the waste-management supervisor.

The ***Record of tools and equipment, reported problems and WDU defects*** documents:

- the presence/lack and condition of tools, equipment and protective clothing;
- any breakages or problems in the WDU;
- improper waste segregation; and
- incorrect waste-management practices of incoming waste.

11. Operator's maintenance responsibilities

1) Maintenance of the WDU:

• Keep the area around the WDU clean; do not allow it to become littered.
• Store safety boxes and other medical waste in an orderly manner in the WDU waste store.
• Store fuel stocks in the WDU fuel store.
• Keep the concrete slabs on either side of the incinerator clean; do not use them as permanent storage zones. Space on the concrete slabs at the top of the incinerator may, however, be used temporarily to store waste that is being dried prior to burning.
• Keep tools, records and protective clothing in the storage box provided in the WDU.

2) Handle tools and protective clothing carefully and keep them clean
3) Immediately report to the waste-management supervisor any damage to the WDU that affects operation or performance.
4) Perform simple repairs but avoid makeshift solutions.
5) Systematically complete and submit monthly reports for all three records.

12. Security of the WDU

The operator will be held responsible if an accident occurs.
1) Keep the WDU locked at all times.
2) Do not allow unauthorized persons to enter the WDU area during periods of incineration.
3) Ensure that the waste-management supervisor has a key to the WDU.

4) Immediately report any vandalism, theft or unauthorized entry to the waste management supervisor.

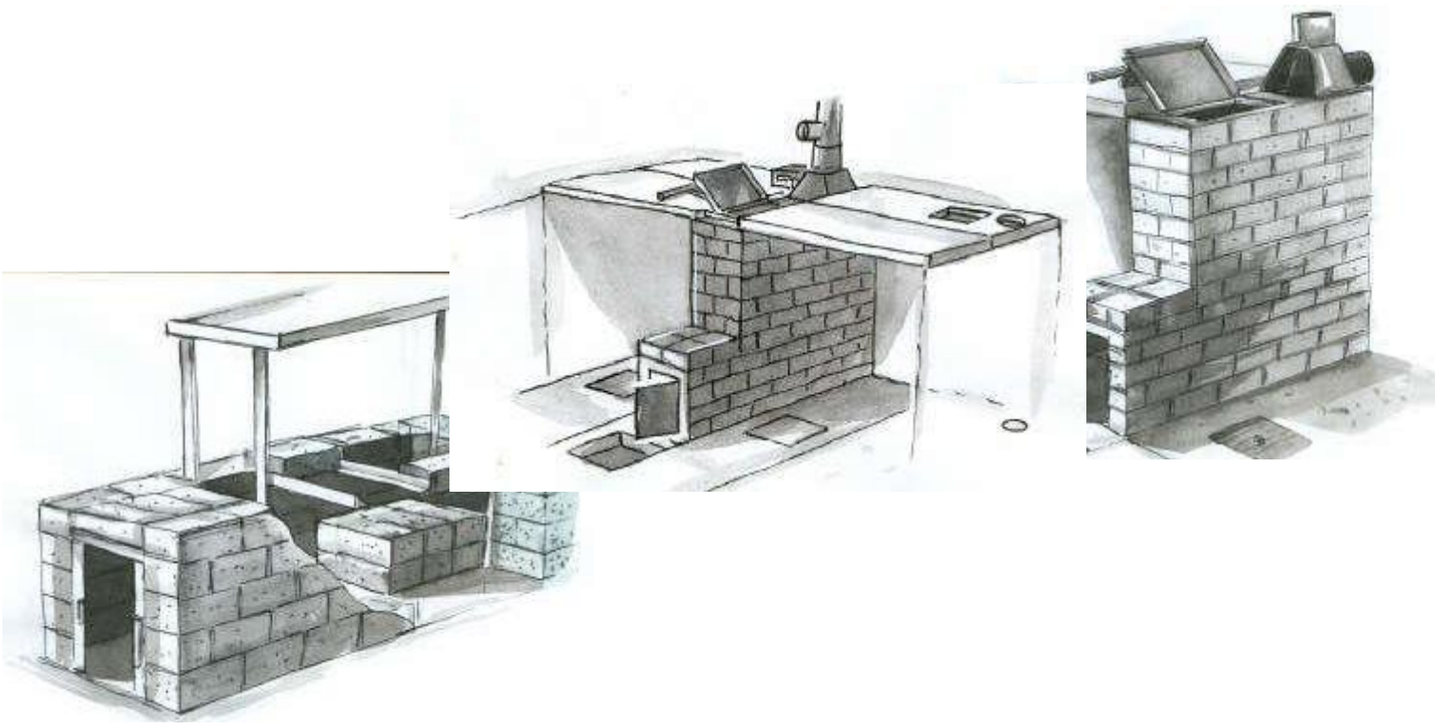

Figure 5: Stages in the construction of a De Mont fort incinerator

APPENDIX 5: GUIDELINES FOR EA FOR INSTALLATION OR UPGRADE OF AN INCINERATOR

1.0 Introduction – *The Incineration Process*

An incineration facility will typically be comprised of the following units and processes which are briefly described below.

Waste Registration and Control

Facility should be equipped with system for declaring waste, weighing and registration after entry of incinerator site premises for monitoring and control purposes

Size reduction, sorting and inspection of waste (optional)

This will include reduction of size of bulky waste, sorting and inspection of the waste.

Waste unloading and storage system

Waste is unloaded into bunker or hopper system from where it is fed into the furnace. The size of the hopper system should be adequate to allow for variations in waste quantities.

Feeding system
The prepared waste is fed from the hopper into the furnace. Appropriate system of doing this in a safe and efficient manner should be employed.

Furnace
The waste is burnt in a series of combustion zones. Flue gases are completely burned out in a post-combustion chamber.

Energy recovery system
The flue gases carrying the energy released in the furnace must be cooled before entering the air pollution control system. Depending on the intentions of the facility owners and local energy market, energy is recovered as power, heat, or steam or a combination thereof.

Ash and clinker removal system
This includes a system of conveying the ash to collect it for final disposal.

Air Pollution Control (APC) system
Depending on the desired level of cleaning the APC may consist of devices for physical removal of particulate matter; additional flue gas scrubbing systems; and additional NO_x or dioxin removal.

Stack
The treated flue gas is finally emitted via the stack. The stack height depends on local topography and prevailing site conditions.

2.0 Key Issues for EA
The key issues for consideration of environmental impacts of incinerator facilities are described below and form the basis for the checklist that follows. **The checklist is intended for guidance only and is not exhaustive. It should be used in conjunction with the discussions in this paper.**

2.1 Siting
- The facility should be located far from human dwellings or centers of human activity to protect against air pollution or odor nuisances, and noise from fans/ventilators used in cooling systems.
- The stack of the incinerator should be located at most remote area from area of human activity, and downstream of sites of human activity in the prevalent wind direction.
- The facility should be sited.

Access

- The area where the facility is located should be fenced off/separated from areas of general use by a lockable physical barrier.
- Access to the area should be strictly controlled and limited to essential personnel e.g persons operating the facility, persons responsible for maintenance or repair activities on the facility.

Signage

- A sign stating the use of the site should be placed at a visible/conspicuous location e.g entry to the site and written in clear, legible letters. The information on the signboard should indicate the purpose of the facility, state access limitations, provide a contact details e.g phone number or contact name in case of emergencies or enquiries.
- At important locations throughout the site, signs should be adequately placed accordingly, such as 'danger', 'hazardous material', 'no entry', 'authorized personnel only' etc, consistent with the high level of caution that is required in such facilities.

2.2 Technical

Waste Identification and segregation

- Wastes to be incinerated should be contained in easily identifiable, coded containers; ensuring appropriate procedures for pharmaceutical, cytotoxic, chemical and radioactive wastes.

Combustion

The facility should be operated under conditions to achieve complete combustion or over 99.9% destruction to avoid generation of pollutants, especially NO_x, and persistent organics such as dioxins; by ensuring adequate retention time and temperatures, use of a mixing and agitation mechanism, optimal supply of combustion air etc.

- The facility should possess adequate system to maintain the required temperatures in the primary and secondary combustion chambers to avoid post-combustion recombination. Temperature and duration of retention should comply with available international standards for combustion of medical waste.

Energy Recovery

The energy recovery system must be capable of cooling the flue gases from the furnace before flue gas treatment in the APC.

- Available international/national standards for operation of energy recovery systems should apply.

Air Pollution Control

Monitoring system for flue gas quality (before entering the APC from the furnace) provided and monitoring should be mandatory.

- The facility should be adequately equipped with appropriate air pollution control devices including gas cooling and acid gas cleaning systems; and should be capable of controlling air pollution by precipitating, adsorbing, absorbing or transforming (or a combination of these) pollutants.
- The Air Pollution Control device should be capable of achieving national/international requirements for emission limits or standards.
- The height of the stack should comply with national/international standards for air pollution reduction.

Residues from the incineration process

There are two sources of residues from the incineration process, namely the APC system and the incineration furnace. In both cases, adequate provision should be made for storage of the ash to

prevent generation of dust before final disposal e.g by spraying with water, and transportation in covered containers.

Residues from the APC system:

- The APC system produces residues either directly or by the subsequent treatment of spent scrubbing liquids, depending on the method used to clean the flue gases.
- Appropriate methods should be in place for handling any solid or liquid waste streams from the APC process in an environmentally safe and sound manner and should comply with national standards e.g discharge of liquid streams should comply with national wastewater standards; discharge of solid residues by a proven technology such as controlled landfill.

Residues from the incineration furnace:

- A process for characterization of the ash from the furnace should be in place using international standard methods for ash characterization.
- Ash should be disposed by a proven technology such as controlled landfill.

2.3 Plant Operation and Maintenance

2.3.1 Staffing and Training

- The facility should be adequately staffed with suitably trained and skilled personnel to ensure effective/optimal operation and maintenance of the facility.
- Plant operators should be trained before start up of the facility and refresher courses given during operational life of facility.

2.3.2 Codes of Practice and Occupational Safety

- Codes of practice or documented work procedures should be prepared for all key activities in plant operation and maintenance to instruct staff how to operate the equipment.
- Contingency plans be developed in case of accidents or equipment failure
- The Equipment supplier should be required to submit work procedures as part of the contract.
- Staff be provided with appropriate safety and protective gear.

Incinerator Checklist

PARAMETER	**OPTIONS**
Institutional	
▪ Regulations	Effective regulations exist with regard to collection and disposal of medical wastes and in particular to incineration.
▪ Organization of waste treatment	Incineration preceded by reduction at source, and adequate segregation procedures.
▪ Incineration organizational position	The medical waste incinerator is part of an integrated system of hospital waste management.
▪ Incinerator ownership	Owned by hospital/ Ministry of Health?
▪ Medical waste incinerator rights	Incinerator is granted the right to receive combustible medical waste and obliged to ensure the necessary capacity.
Siting	
▪ Air quality impact	Facility located far from and downstream of dwellings or centres of human activity, in direction of prevalent wind.
▪ Zoning of facility locality	
▪ Distance to residential areas/zones	Incinerator stack located at most remote area, downstream of human activity, in direction of

▪ Access to site of facility	prevalent wind. Facility should be located in an area that is fenced off/separated from areas of general use by a lockable physical barrier. The site should be adequately posted with signs consistent with the high level of caution that is required in such facilities.
Incineration Technology	
▪ Flue gas burnout	Flue gas is completely burnt out resulting in emissions compliant with national/international emission standards or targets.
▪ Energy Recovery system	Capable of achieving adequate temperature to allow for energy recovery and gas cleaning.
Incineration Residues	
▪ Characterization	System for characterization of residues according to international standard methods in place.
▪ Storage	Stored in covered containers, prevent dust by moistening.
▪ Final disposal	Solid residues disposed of in controlled landfill or similar proven technology. Liquid residues must be treated to comply with national/international standards for discharge of wastewater.

PARAMETER	**OPTIONS**
Operation and Maintenance	
▪ Staff	Adequate number of suitably qualified staff with provision for backup
▪ Operation and Maintenance Manuals, Training of staff, Plant monitoring	Supplier should provide instruction manual for facility. Staff training undertaken before operation of facility and provision of refresher training during operational life of facility
Environmental Issues	
▪ Environmental standards	Emission standards for medical waste incineration exist and are available
▪ Environmental administration	Responsibility person/entity for necessary environmental permits, supervision and enforcement clearly identified
▪ Flue gas treatment	Flue gas treatment meets national emission standards/targets.
▪ Flue gas emission	Stack is sufficiently high to avoid exceeding national air ambient standards
▪ Odor emission	The facility is constructed and operated so that odor nuisance does not arise
▪ Wastewater discharge	Wastewater discharge meets national standards

▪ Noise emissions	Noise emission is adequately mitigated to avoid nuisance
▪ Monitoring	Monitoring system for all relevant environmental parameters is established.
Occupational Health Issues	
▪ Site layout	Separation between permanently staffed spaces/offices and operational areas; Showers and changing rooms for staff; Adequate emergency access/exits; Adequate ventilation of work and non-work stations.
▪ Manual of Operation and Safety	Well articulated manual developed and made available to operators, including procedures for operation and maintenance, contingency plans, plans for accidents and equipment failure.
▪ Worker Safety	All operators of facility provided with adequate safety and protective gear.

APPENDIX 6: PRIMARY HEALTHCARE FACILITY HCWM ASSESSMENT CHECKLIST

The information for the checklist is adapted from the WHO Rapid Assessment Toolkit.

General facility information

Healthcare facility (HCF)

- Which category is it (are they)? Small or large
- Which type is it? Private or Public
- How many beds do you have in total?
- How many outpatients come each day on average?

Staff

- Is there a staff responsible for HCWM, identified and operational?

HCWM regulations (code of conduct; management plan, policy…)

- national HCWM regulations (HCF) are available and enforced
- national HCWM regulations (does their application cause any problems ?)
- HCF HCWM regulations
- Internal guidelines and SOP are available and used

Policy and budget

- budget allocation for HCWM is available and used
- budget allocation for HCWM (budget per bed and year)
- annual report of activities(can you obtain a copy of your annual report(s) regarding HCWM?)

Wastewater

- waste water drainsto what (is the waste water system connected?)
- sewer connection(where does the sewerage system lead to)

- Which kind of waste is generated in the healthcare facility?[1] general, [2] recyclables, [3] radioactive, [4] infectious, [5] sharps; [6] chemicals (liquid and solid); [7] pharmaceutical waste; [8] anatomic waste;
    - quantity produced/day (estimated, in kg)
    - quantity prod/day (in kg or number of sharps boxes)
    - quantity produced/day (estimated, in kg)
    - quantity produced/day (estimated, in kg)

- quantity produced/day (estimated, in kg)
- quantity produced/day (estimated, in litres)
- quantity produced/day (estimated, in kg)

- Into which categories are HCW separated? [0] no segregation, [1] general, [2] recyclables, [3] radioactive, [4] infectious, [5] sharps; [6] chemicals (liquid and solid); [7] pharmaceutical waste; [8] anatomic
- Proper segregation of waste is:[0] non-existent; [1] bad (low); [2] insufficient; [3] satisfactory; [4] good; [5] excellent (high)
- Safe handling of waste is:[0] non-existent; [1] bad (low); [2] insufficient; [3] satisfactory; [4] good; [5] excellent (high)
- What kind of specific containers do you use ? [0] no specific container; [1] plastic; [2] metallic; [3]cardboard; [4] bag; [5] box; [6] other
- What kind of specific containers do you use ?[0] no specific container; [1] puncture-proofed single use; [2] puncture-proofed multiple use, [3] not puncture-proof single use; [4] not puncture-proof multiple use
- For what reasons are there shortages, if any ?[0] no shortages; [1] budget; [2] logistical; [3] other (specify)
- Do you have a specific colour coding system?
- Infectious waste containers are lidded? Yes/No
- Sufficient equipment for proper chum is available and properly used? [0] not available; [1] partly available; [2] widely available; [3] available and properly used
- Do you have a specific area for HCW?
- Is the area only accessible for authorised pers.
- Are different kinds of waste stored in separated storage areas?
- Is hazardous and non-hazardous waste collected and transported separately?
- What kind of means do you use?
- Do you think current practices offer enough security?
- Is there any transport documents used?
- Who generally transports the HCW?
- Which kind of system is used?

- C
- B
- B
- C
- C

- [0] open device; [1] closed device; [2] other (specify)
-
- [0] none; [1] transport form; [2] other (specify)
- [0] the HCF; [1] municipal service; [2] private company (name ?)
- [0] none; [1] open fire; [2] incinerator; [3]

			chem. disinf.; [4] other
What is the current capacity of the system(s)?	N		in kg/day and how often treatment is done per week
Any operation problems; if so for what reasons?	C		[0] none; [1] money; [2] maintenance; [3] spare-parts; [4] other
What do you do when it doesn't function?	T		
Is it treated onsite or offsite?	C		[0] no treatment; [1] on-site; [2] off-site (which treatment technology is used)
Is it treated onsite or offsite?	C		[0] no treatment; [1] on-site; [2] off-site (which treatment technology is used)
Is it treated onsite or offsite?	C		[0] no treatment; [1] on-site; [2] off-site (which treatment technology is used)
Is it treated onsite or offsite?	C		[0] no treatment; [1] on-site; [2] off-site (which treatment technology is used)
Is it treated onsite or offsite?	C		[0] no treatment; [1] on-site; [2] off-site (which treatment technology is used)
Is it treated onsite or offsite?	C		[0] no treatment; [1] on-site; [2] off-site (which treatment technology is used)
How is the quality of treatment technology	N		[0] non-existent; [1] bad (low); [2] insufficient; [3] satisfactory; [4] good; [5] excellent (high)
How is the maintenance status of the technology	N		[0] non-existent; [1] bad (low); [2] insufficient; [3] satisfactory; [4] good; [5] excellent (high)
Is it treated onsite or offsite?	C		[0] no treatment; [1] on-site; [2] off-site (which treatment technology is used)
Is it on or off-site?	C		[0] on-site; [1] off-site
Which kind of disposal site is used for the HCW?	C		[0] none, [1] open dump; [2] sanitary landfill; [3] small burial pit; [4] other
Is the area secured?	B		
Where is it disposed of?	C		[0] at the chef [1] off site: open dump; [2] off site: sanitary landfill; [3] other

STAFF

• Hepatitis B and tetanus	Do you vaccinate your personnel against them?	C	[0] none; [1] only tetanus; [2] only HBV; [3] both

HCW GENERATION

• Number of injections performed	How many are done in average per day?	N

HCW SEGREGATION & HANDLING

• Needle stick injuries	How many cases reported in the past 12 months (average)?	N	
• Type of syringes used	What type of syringes do you use?	C	[0] Disposable; [1] sterilisable; [2] auto-disable; [3] safety syringe
• Protective equipment	Sufficient personal protective equipment for the handling of waste is available	B	

PERSONAL OPINION

• Personal opinion	What kind of short-comings, weak points regarding HCWM in your country can you point out	T
• Personal opinion	Do you think sufficient funds are allocated to HCWM?	Q
• Personal opinion	Do you think HCWM is safely managed?	Q
• Personal opinion	Do you think HCWM is environmental friendly managed?	Q

STAFF

Medical staff training	Is training of med. Staff available regarding HCWM?	B	If yes, what kind of training is given ? How often is trained?
Training responsible of HCWM	What kind of training has this person followed?	T	
Staff for HCW awareness	Awareness of risks of person(s) handling HCW?	Q	
Medical staff training	Is the participation in the trainings documented?	B	Please provide participation sheets
Staff training on monitoring	Staff is trained on monitoring and supervising of chum	B	

HCWM REGULATIONS (CODE OF CONDUCT; MANAGEMENT PLAN, MONITORING…)

National monitoring regulations	Are monitoring regulations available?	B	If yes, could i obtain the legal document and checklists?
Monitoring regulations	Is a monitoring system stipulated and established?	B	

APPENDIX 7: SUGGESTED OPTIONS FOR TREATMENT OF "SHARPS" HCW FOR THE NIGERIA POLIO ERADICATION PROJECT

Disinfection of syringes with bleach

Household bleach can be used to disinfect sharps and other wastes at an appropriate concentration (0.5% chlorine solution). Disinfection is aimed at reducing the pathogenicity of infectious health-care wastes. Disinfecting procedures must be followed carefully to be effective. Disinfection only serves to reduce the risk from accidental exposure to sharps prior to treatment or disposal and can serve as a pre-treatment prior to employing subsequent treatment technologies, e.g. sending to a centralized incinerator or burial in pits.

Needle remover

The used needle is inserted into a device, which cuts or pulls the needle off from the syringe. Various designs available are shown in the figure below. The devices are inexpensive and can be made locally. Removal of needles from used syringes with needle removers can render them unfit for reuse and safe for disposal after disinfection. Subsequently the plastic syringes can be disinfected and sent to a centralized incinerator for further actions.

Encapsulation

Encapsulation involves filling containers with waste, adding an immobilizing material (plastic foam, bituminous sand, cement mortar, or clay)and sealing the containers. After the medium has dried, the containers are sealed and disposed of in a landfill.

The main advantage of the process is that it is very effective in reducing the risk of scavengers gaining access to the hazardous health-care waste. Encapsulation of sharps however, be envisaged in temporary settings, such as camps, or mass campaign, and provided that raw materials are available. Encapsulation of used sharps is generally not practiced and not a long-term solution. The sharps can then be incinerated at the centralized pit.

Procedure for "Sharps" Disposal

The recommended methods of managing HCW in primary and secondary health facilities have been presented in the main body of this report.

The following technology options are recommended for the disposal of "Sharps":

Use of Centralized Incineration

Incineration presents a good option for good disposal and destruction of sharps-wastes. However, concerns such as availability of technical knowhow, maintenance, environmental pollution, etc should be considered. Incineration has the potential for toxic emissions, particularly if the waste stream is not regulated, as is usually the case if the equipment is not properly operated and maintained, and if the emissions management system is inadequate. Large-scale incinerators tend to pollute less than small-scale incinerators because the combustion temperature is higher and combustion efficiency (gas residence time) is better.

Rather than having an incinerator in several facilities, a centralized, large-scale health care waste incineration plant should be located in a tertiary or secondary healthcare facility in a region. Sharps wastes from healthcare facilities in the region are then transported to the incinerator site for incineration. The sharps should be transported in sharps boxes.

2. Pit Burial for Sharps

Pits for sharps can be constructed in the facilities. The sides of the pits should be covered with a low permeability material, and fenced. The pit should be sealed with cement once it is three-quarters full or at least the last 50cm should be filled with compacted soil and the area identified with a red coloured flag. This approach is simple and adequate for health facilities that generate small amount of waste.

3. Cemented sharp pit

Pit-well covered with a narrow access for sharps should be filled with cement once full.

APPENDIX 8: SAMPLE WASTE DEPOSIT RECORD

		Health facility:		Month/Year:
		Location & Type of Waste Disposal Facility:		Name of Healthcare Waste Management Officer:

Day of the month	Waste deposited				Origin of waste (Ward/Dept., etc)		Name & Sign. of person depositing waste	Name & Sign of person Receiving Waste
	Sharps (kg)	Infectious (kg)	Highly Infectious	Other (kg) (State)	Means of transport to Disposal Site	Type of Disposal Facility and Address		