

HEALTH CARE WASTE MANAGEMENT PLAN (HCWMP)

FOR

**NIGERIAN POLIO ERADICATION SUPPORT PROJECT
ADDITIONAL FINANCING 3**

DRAFT REPORT

March 2018

TABLE OF CONTENTS	Error! Bookmark not defined.
LIST OF FIGURES	iii
EXECUTIVE SUMMARY	vi
ES 1 Background.....	vi
ES 2: Project Description.....	vi
ES 3 Major Activities.....	vii
ES 4: Legal and Regulatory Framework.....	viii
ES 5 Current State of HCWM in Nigeria.....	viii
ES 6 Institutional Responsibility.....	viii
ES 7 Capacity Building.....	ix
ES 8 Cost of Implementing the HCWMP.....	ix
CHAPTER ONE: INTRODUCTION	11
1.1 Background.....	11
1.2 Project Description.....	11
1.3 Project Development Objective.....	12
1.4 Purpose of the Health Care Waste Management Plan (HCWMP).....	12
1.5 Project Components.....	13
1.6 Major Activities of NPESP AF3 and Envisaged Impacts.....	13
1.7 Stakeholder Consultation.....	14
CHAPTER TWO: BASELINE DATA OF STUDY AREA	15
2.1 Description.....	15
2.2 Polio Eradication in Nigeria.....	16
2.3 Structure of Health Services in Nigeria.....	17
CHAPTER THREE: HEALTHCARE WASTE AND LEGAL PROVISIONS	19
3.1 Definition.....	19
3.2 Legal and Regulatory Framework.....	19
3.2.1 Acts Relevant to HCW in Nigeria.....	19
3.2.2 Regulations Relevant to HCW in Nigeria.....	20
3.3 National Healthcare Waste Management Policy, National Healthcare Waste Management Guidelines (NHCWMP) and National Healthcare Waste Management Plan (NHCWMP).....	21
3.4 Review of Hospital Health Care Waste Regulations.....	22
3.5 Need for Regulation and Plan for Handling of Wastes from Vaccination and Routine Immunization for Polio Management.....	22
CHAPTER FOUR: CURRENT STATE OF HEALTHCARE WASTE MANAGEMENT IN NIGERIA	23
4.1 Definitions of Health Care Waste in Nigeria.....	23
4.2 Medical Waste Composition.....	23
4.3 Classification of Healthcare Waste in Nigeria.....	23
4.4 Current State of HCWM Practices in Nigeria.....	2
4.4.1 Responsibility for Medical Waste Management.....	3
4.5 Healthcare Waste Management Constraints in Nigeria.....	4
4.6 Risks Associated with Healthcare Waste Generated in Nigeria.....	4
CHAPTER FIVE: BASIC PRINCIPLES FOR GOOD SUSTAINABLE HEALTHCARE WASTE MANAGEMENT	6
5.1 Waste Minimization.....	6

5.2 Waste Segregation	6
5.3 Colour Coding.....	7
5.4 Waste Collection.....	8
5.5 Waste Storage	9
5.6 Transportation.....	10
CHAPTER SIX: HEALTHCARE WASTE MANAGEMENT PLAN FOR HEALTHCARE FACILITIES.....	11
6.1 Basic Steps in HCWM for HCFs	11
6.1.1 Raise Awareness at the Management Level and Develop an Integrated Waste Management Plan.....	11
6.1.2 Train Healthcare Workers in Proper HCW Procedures.....	11
6.1.3 Develop and Implement a Healthcare Waste Management Plan.....	11
6.1.4 Ensure Segregation, Collection and Storage of HCW from Other Waste Generated at the Facility.....	13
6.1.5 Determining the Most Appropriate Treatment Technique and Disposal Site for the Facility’s Waste	13
6.2 Waste Treatment Options for HCF	14
6.3 Resource Requirements for the Implementation of the HCWMP	14
CHAPTER SEVEN: MONITORING AND EVALUATION	16
7.1 Monitoring and Evaluation Objectives.....	16
7.2 Monitoring Indicators	16
7.3 Monitoring Plan	17
7.4 National Health Care Waste Management Plan	18
CHAPTER EIGHT: INSTITUTIONAL RESPONSIBILITY AND CAPACITY BUILDING....	20
8.1 Institutional Responsibility	20
8.2 Training Needs Assessment	21
8.3 Training Targets.....	21
CHAPTER NINE: PUBLIC AWARENESS AND CONSULTATION.....	24
9.1 Objectives	24
9.2 Potential Stakeholders	24
9.3 Consultation Strategies.....	25
9.4 Stakeholder Consultation and issues raised	26
REFERENCES	28
APPENDIX 1: HCW TREATMENT OPTIONS	29
APPENDIX 2: REQUIRED PERSONAL PROTECTIVE EQUIPMENT (PPE) FOR SAFE HCW MANAGEMENT	40
APPENDIX 3: GUIDELINES FOR THE DISPOSAL OF HEALTH CARE WASTE BY PIT BURIAL	41
APPENDIX 4: SUGGESTED OPTIONS FOR TREATMENT OF “SHARPS” HCW FOR THE NIGERIA POLIO ERADICATION PROJECT	46

LIST OF FIGURES

Table 3.1: Relevant Nigerian Acts	19
Table 3.2: Relevant Nigerian Regulations	20
Table 3.3 Summary of the National Healthcare Waste Management Policy	21
Table 3.4 Summary of the National Healthcare Waste Management Guidelines	21
Table 3.5 Summary of the National Healthcare Waste Management Plan.....	22
Table 4.1: Healthcare Waste Categories, Examples and Classes	1
Table 5.1: Color Coding For Primary Healthcare Facilities.....	8
Table 5.2: Color Coding For Secondary Healthcare Facilities	8
Table 6.1: Resource requirements for the Implementation of the HCWMP for NPESP AF3	15
Table 7.1 Summary of monitoring plan with indicative costs	19
Table 8.1: Trainings and Schedule for Staff and Support Staff of HCF	23

LIST OF ABBREVIATIONS

AF3	Additional Financing 3
AFP	Acute Flaccid Paralysis
°C.	Celsius
BHC	Basic Health Centre
CHC	Comprehensive Health Centre
CHEWs	Community Health Extension Workers
CHOs	Community Health Officers
DPs	Development Partners
DWDUs	DWDUs
EA	Environmental Assessment
EIA	Environmental Impact Assessment
FEC	Federal Executive Council
FCT	Federal Capital Territory
FGON	Federal Government of Nigeria
FME _{env}	Federal Ministry of Environment
FMCs	Federal Medical Centres
GPEI	Global Polio Eradication Initiative
HBV	Hepatitis B Virus
HC	Health Centre
HCF	Health Care Facility
HCV	Hepatitis C Virus
HCW	Health Care Waste
HCWM	Health Care Waste Management
HF	Health Facility
HIV	Human Immunodeficiency Virus
in.	inches
IPDs	Immunization Plus Days
LIO	Local Immunization Officer
LGA	Local Government Area
MDG	Millennium Development Goals
MSDS	Material Safety Data Sheets
MIS	Management Information System
mm	millimetre
MSS	Midwife Sample Scheme
NPHCDA	National Primary Health Care Development Agency
NSHPIC	Nigeria State Health Programmatic Investment Credit
OP	Operational Policy
PHC	Primary Healthcare Centre

PPE	Personal Protective Equipment
RI	Routine Immunization
SIAs	Supplementary Immunization Activities
SIO	State Immunization Officer
SPHCDA	State National Primary Healthcare Development Agencies
UN	United Nations
UNICEF	United Nations Children Education Fund
WMP	Waste Management Plan
WHO	World Health Organization
WMO	Waste Management Officer
WMT	Waste Management Team
WPV	Wild Polio Virus

EXECUTIVE SUMMARY

ES 1 Background

On July 12, 2012 the World Bank approved the first Polio financing project for Nigeria for an amount US\$95 million, with a closing date of July 31, 2015. Subsequently, two other Additional Financing projects (AF) were approved - the first AF of US\$200 million was approved by the Board on April 10, 2015 with a closing date of July 31, 2017, and the second AF of US\$125 million was approved by the Board on June 7, 2016 with an original closing date of December 31, 2018.

On July 3, 2017, the FGN made a request to the Bank for the proposed Additional Financing (AF). The FGN made this request because

- It has already made large investments in Polio Eradication that has resulted in no new cases of polio in the last 16 months and would want to maintain the progress till total eradication; and
- It had proposed an additional component to address low routine immunization coverage in 12 states in the North of the country and extending the closing date.

In view of these, the WB through the AF3 will continue to assist the GoN in its polio eradication mission by providing financial support to the government's efforts in finally eradicating polio

ES 2: Project Description

Under this new NPESP Additional Financing (AF3), the Bank will support the strengthening of the cold chain and supply logistics for immunization by addressing the insufficient cold and dry storage capacity in Lagos State and cold chain storage capacity in Kano State. By supporting the cold chain and logistics system, every Nigerian child will have access to vaccines of assured quality, delivered at the right time through efficient logistics, proper vaccine management and a functioning cold chain. This will also help address wastage of vaccines resulting from poor cold chain supply and logistics.

ES 2.1 Objectives: The Project Development Objective (PDO) is "To assist the Recipient, as part of a global polio eradication effort, to achieve and sustain at least 80 percent coverage with oral polio vaccine immunization in every state in the Recipient's territory, and strengthen Routine Immunization in selected lagging states".

ES 2.2 Components: AF3 is designed similarly to AF1 and AF2 except for the addition of component 3. Thus AF3 has 3 components. The Components for NPESP AF3 are

- **Component 1: Polio Eradication Support (US\$65 million)**
 - Subcomponent 1a. Within this subcomponent, UNICEF will procure OPV (US\$50 million).
 - Subcomponent 1b: Polio Eradication Operations Support (US\$15 million)
- **Component 2: Routine Immunization Support (US\$69 million)**
- **Component 3: Health Systems Strengthening (newly introduced and proposed financing is US\$16 million)**
 - Component 3a. Expansion of two national Cold Chain hubs (in Lagos and Kano) the proposed AF will finance the expansion of the cold store in Lagos and renovate the Kano cold store (US\$8 million);
 - Component 3b. Supply Chain and Logistics Systems Strengthening – the proposed AF will finance the logistics strengthening (US\$3.5 million) including supply chain systems strengthening; and
 - Component 3c. Strengthening Management at national and sub-national levels (US\$4.5 million): To address the widely-perceived weaknesses in management of RI programs at national and sub-national levels, the AF will pilot a management strengthening approach and support the following activities in 12 poorly-performing states [Sokoto, Jigawa, Kebbi, Gombe, Adamawa, Zamfara, Kogi, Taraba, Nasarawa, Yobe, Bayelsa and Plateau].

ES 3 Major Activities

For the NPESP AF3, there will be construction and rehabilitation works (civil works) particularly under Component 3. These activities will include construction and expansion of cold stores in the Lagos State national hub and renovations of the Kano State hub. These subprojects to be carried out under Component 3 of the NPESP AF3 are subject to screening. There are also concerns over the management of healthcare waste associated with the NPESP AF3.

To address concerns of HCW, this Health Care Waste Management Plan (HCWMP) is prepared in compliance with the World Bank EA requirements on projects for World Bank financing to help ensure that they are environmentally sound and sustainable.

Healthcare Waste (HCW) in Nigeria can be defined as “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.”

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 objective of the HCWMP is to provide processes that

the implementing agencies (Federal, States, Local Government Authorities, and Healthcare Facilities Managements) will follow 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.

ES 4: Legal and Regulatory Framework

Nigeria has several Acts and Regulations related to HCWM in the country. In addition, the Federal Ministry of Health has three documents related to HCWMP in the Nigeria and these are

- National Healthcare Waste Management Policy;
- National Healthcare Waste Management Guidelines; and
- National Healthcare Waste Management Plan.

ES 5 Current State of HCWM in Nigeria

Major constraints with HCWM practices in Nigeria range from inadequate funding, availability of resources and inadequate infrastructure. There is also a low level of manpower training that currently exists for HCWM at all levels all across Nigeria.

The major short comings in the current HCWM in Nigeria are

- Absence of HCWM plans in most medical institutions;
- Weak coordination of HCWM system at all levels;
- Poor/lack of segregation of healthcare waste at health facility levels;
- Deficient/non-existent HCW colour-coding and labelling system;
- Poor hygiene practices in collection, storage, transportation, treatment and final disposal of healthcare waste;
- Waste handlers lack Personal protective equipment (PPE);
- Indiscriminate dumping of healthcare waste into public dumpsites;
- Use of locally built low temperature incinerators without adequate protection to the environment;
- Healthcare solid wastes are either buried or burnt at low temperature in open pits;
- High risks of injury and infection to healthcare waste handlers and scavengers;
- Absence of post exposure prophylaxis (PEP) to those who sustain needle stick injury, with increased risk of HIV, HBV & HCV infections; and
- Lack of healthcare waste management information system.

ES 6 Institutional Responsibility

Nationally, the project will be placed under the overall responsibility of the National Primary Health Care Development Agency (NPHCDA). The activities under NPESP AF3 build on a very strong network of development partners (DPs) that have helped Nigeria to improve immunization services. All of the funds under the AF will be coursed through WHO and

UNICEF who have a large and well-functioning presence on the ground. These are the arrangements that the FGoN itself has used and which have been successfully used during the original project.

NPHCDA’s role vis a vis the SPHCDA is to provide the overall national strategic direction within which states will tailor their activities based on the particular characteristics of polio eradication. NPHCDA will provide technical assistance to the States across the full-range of project activities.

ES 7 Capacity Building

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

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

ES 8 Cost of Implementing the HCWMP

The table below shows an indicative budget breakdown and responsibility of the cost for implementing the HCWMP for NPESP AF3. The cost is estimated at Three **Hundred and Forty Four Thousand Eight Hundred and Fifty US Dollars only (\$344,850)**

ITEM	RESPONSIBILITY	COST ESTIMATE (USD)
Resource requirements for the Implementation of HCWMP	NPHCDA, FME _{env} , SPHCDA, SIO,LIO, HCWM Consultant	300,000
Monitoring	NPHCDA/SPHCDA, /LGAs World Bank, contractors and consultants.	11,000
Capacity Building	NPHCDA/SPHCDA, /LGAs World Bank, contractors and consultants.	2,500
Sub- Total		313,500

Contingency (10%)		31,350
	Total	344,850

ES 10 Stakeholders Consultation

In brief the outcome of the stakeholders' consultation is presented below

- The stakeholders made it clear that there could be concerns as regards increased generation of HCW such as sharps and swabs once the project commences.
- All stakeholders were mainly about dealing with HCW. We, however identified two type of waste streams which included waste from the construction sites in Kano and Lagos and healthcare waste that would be generated during the operation of the project.
- There were slight concerns raised over the transportation of vaccines to the other 12 states to which rather than purchasing vehicles, it could be outsourced.

More details of the stakeholders' consultation are presented in Chapter Nine.

CHAPTER ONE: INTRODUCTION

1.1 Background

Nigeria is making significant progress on polio eradication - no cases since July 2014. The country has reduced the number of wild polio virus (WPV) cases from 122 cases in 2012 to 53 cases in 2013, and only 6 cases in 2014. As of February 24 2015, WPV has not been detected for 7 months – the last confirmed case was on July 24 2014. Once the country has been WPV-free for one year, it will have “interrupted transmission”– a key step on the path to formal polio eradication.

Maintaining Routine Immunization (RI) is important to complete polio eradication and improve child and maternal health. RI is a key pillar in interrupting the transmission of wild polio and in completing polio eradication. It is particularly intensively used in security-compromised areas and remaining hot-spots of polio such as Kano, Borno, and Yobe states and it is widely welcomed by community members. RI is also a critical aspect of improving child and maternal health. While Nigeria has made slow progress on improving immunization coverage, especially compared to other countries in West Africa, it would be disastrous for coverage to actually deteriorate. Such programs as immunization will generate HCW such as sharps, infectious wastes and there has to be in place a HCWMP to deal with such wastes.

Unfortunately, HCFs in Nigeria face several challenges in implementing health care waste management systems that will safely and adequately contain and eliminate infectious and hazardous wastes which they generate.

Health care waste management planning must take these challenges into consideration and propose pragmatic and affordable health care waste management (HCWM) plans and disposal technologies. The best way of rapidly improving the HCWM situation in Nigeria, is to define a comprehensive and realistic approach for all health institutions in Nigeria, including the often overlooked PHCs, which are so under-staffed, under-equipped and have no HCWMP in place.

1.2 Project Description

Under the NPESP AF3, the Bank will support the strengthening of the cold chain and supply logistics for immunization by addressing the insufficient cold and dry storage capacity in Lagos and cold chain storage capacity in Kano state. By supporting the cold chain and logistics system, we are well assured that every Nigerian child will have access to vaccines of assured quality, delivered at the right time through efficient logistics, proper

vaccine management and a functioning cold chain. This will also help reduce the wastage of vaccines resulting from poor cold chain supply and logistics.

All of the funds under the proposed AF3 will be channeled through the World Health Organization (WHO) and United Nations Children's Emergency Fund (UNICEF) which have a large and well-functioning presence on the ground including field level workers with access to communities in the North-Eastern States. These are the financing arrangements that the FGN itself uses and which have proven to be very successful.

The original project was approved on July 12, 2012, for an amount of US\$95 million, and has a closing date of July 31, 2015. The proposed additional financing would extend the closing date to July 31, 2017.

1.3 Project Development Objective

Project Development Objective is "to assist the recipient (FGN), as part of a global polio eradication effort, to achieve and sustain at least 80 percent coverage with oral polio vaccine (OPV) immunization in every state in the recipient's territory, and sustain national routine immunization coverage".

1.4 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 who are exposed both within Health Facilities (HFs) and the surrounding communities.

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), the project will

- apply the necessary safeguard requirements at primary care facility level;
- 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

This will 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.

1.5 Project Components

AF3 is designed similarly to AF1 and AF2 except for the addition of component 3. Thus AF3 has 3 components. The Components for NPESP AF3 are

- **Component 1: Polio Eradication Support (US\$65 million)**
 - Subcomponent 1a. Within this subcomponent, UNICEF will procure OPV (US\$50 million).
 - Subcomponent 1b: Polio Eradication Operations Support (US\$15 million)
- **Component 2: Routine Immunization Support (US\$69 million)**
- **Component 3: Health Systems Strengthening (newly introduced and proposed financing is US\$16 million)**
 - Component 3a. Expansion of two national Cold Chain hubs (in Lagos and Kano) the proposed AF will finance the expansion of the cold store in Lagos and renovate the Kano cold store (US\$8 million);
 - Component 3b. Supply Chain and Logistics Systems Strengthening – the proposed AF will finance the logistics strengthening (US\$3.5 million) including supply chain systems strengthening; and
 - Component 3c. Strengthening Management at national and sub-national levels (US\$4.5 million): To address the widely-perceived weaknesses in management of RI programs at national and sub-national levels, the AF will pilot a management strengthening approach and support the following activities in 12 poorly-performing states [Sokoto, Jigawa, Kebbi, Gombe, Adamawa, Zamfara, Kogi, Taraba, Nasarawa, Yobe, Bayelsa and Plateau].

Project Activities/Vaccination including RI (Waste Management): There is also an expected increase in the generation of HCW which will include expired vaccines, syringes, needles (sharps), blood clotted cotton wools (swabs) and drugs (pharmaceutical waste). All health care wastes expected to be generated as a result of the activities of the NPESP AF3 can be classified into Classes 2, 3, 5 and 6 in accordance with the National Healthcare Waste Policy of 2013. See Table 4.1.

1.6 Major Activities of NPESP AF3 and Envisaged Impacts

For the NPESP AF3, there will be construction, expansion and rehabilitation works (civil works) under Component 3 which will include construction and expansion of cold stores in the Lagos State national hub and renovations of the Kano State hub. There are also concerns over the management of healthcare waste associated with the NPESP AF3 as a result of immunization which will include management of medical wastes majorly swabs.

To address concerns of HCW, this Health Care Waste Management Plan (HCWMP) is prepared in compliance with the World Bank EA requirements on projects for World Bank financing to help ensure that they are environmentally sound and sustainable.

The objective of the HCWMP is to provide processes that the implementing agencies (Federal, States, Local Government Authorities, and Healthcare Facilities Managements) will follow to ensure the protection of healthcare workers, wastes handlers, and the community from the harmful impacts of infectious hazardous healthcare wastes and to maximize project compliance with international and national environmental regulations and best practices.

1.7 Stakeholder Consultation

During the preparation of this ESMF, consultations were carried out on the 5th of February 2018 in Abuja as well as follow up consultations with NPHCDA. Stakeholders present and consulted with include

- Federal Ministry of Health (FMoH);
- Federal Ministry of Environment (FMEnv);
- Federal Ministry of Finance (FMoF);
- National Primary Healthcare Development Agency (NPHCDA);
- World Health Organization (WHO);
- United Nations Childrens Fund (UNICEF);
- National Emergency Routine Immunization Coordination Centre (NERICC);
- Lagos State Primary Healthcare Board (LSPHCB); and
- Kano State Primary Healthcare Management Board (KSPHCMB).
- State Ministries of Health (SMoH) of Kano and Lagos States;
- State Primary Healthcare Development Agencies (SPHCDA) of Kano and Lagos States; and
- Staff of the Zonal Cold Stores of Kano and Lagos States.

Full details of all consultations are presented in Chapter Nine.

CHAPTER TWO: BASELINE DATA OF STUDY AREA

2.1 Description

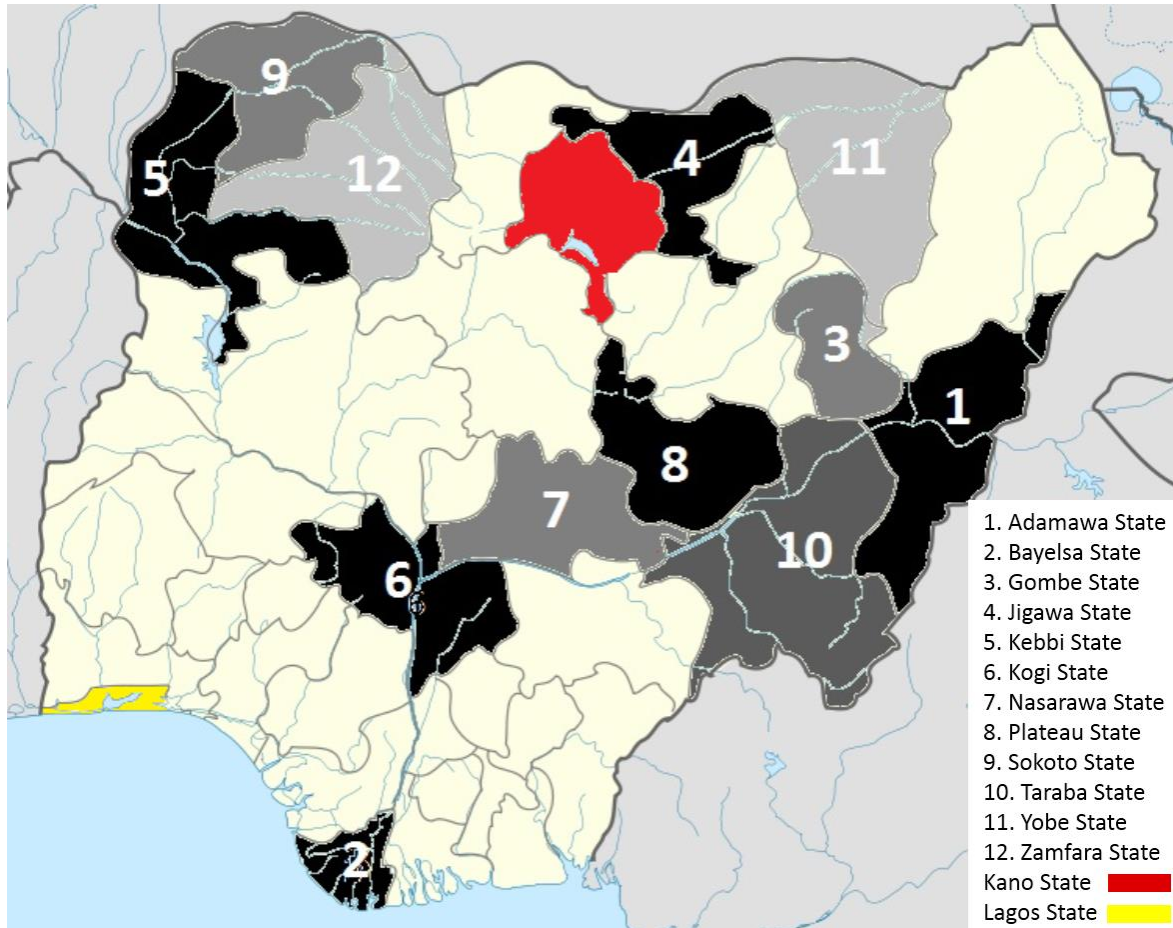


Figure 1.0: Map of Nigeria showing Kano and Lagos States as well as 12 States to support the strengthening of the cold chain and supply logistics for immunization)

Nigeria is situated in the western portion of Africa between latitude 9°4'N and longitude 7°29'E. It is bordered by the Republic of Benin in the west, Chad and Cameroon in the east, Niger in the north and the Atlantic Ocean in the south. It covers a geographical area of 923,768 square kilometres of which 13,000 square kilometres is covered by water.

Nigeria accounts for 47 percent of West Africa's population, and has one of the largest population of youths in the world. Its population is estimated to be 177.5 million inhabitants making it the most populous country in Africa and most populous black country in the world. By 2100, the UN has estimated that the Nigerian population will be between 505 million and 1.03 billion people.). Population is distributed between rural and urban centres at 51.7% and 48.3% respectively. However it has an average population density of 167.5 people per square kilometre.

The country gained independence on October 1st, 1960 and was subsequently declared a federal republic in 1963. Nigeria is divided into 36 States and the Federal Capital Territory (FCT), which have been grouped into six geopolitical zones and include 774 Local Government Areas (LGAs).

2.2 Polio Eradication in Nigeria

Although Nigeria has recorded some progress in Polio Eradication, it remains one of only three countries in the world with ongoing wild poliovirus transmission, alongside Afghanistan and Pakistan.

The Polio Emergency Operations Centre (EOC) has strengthened the management of polio in Nigeria through its reliance on routinely collected data (both pragmatic and surveillance). The Polio EOC has a huge capacity and all the knowledge about effective response in the country context for polio eradication. Programmatically, Nigeria is well equipped, monitoring the epidemic and developing innovative approaches to complete eradication of polio, despite the challenge of insecurity in polio high-risk states. To avoid cross-border transmission of polio, there is strong coordination with the Lake Chad countries. This involves the conduct of Immunization Plus Days (IPDs) in conjunction with the Lake Chad countries. This synergy of efforts has prevented the transmission of poliovirus across our borders.

In security compromised and poorly compliant LGAs, different innovative approaches to reaching children in these areas have been employed. These include:

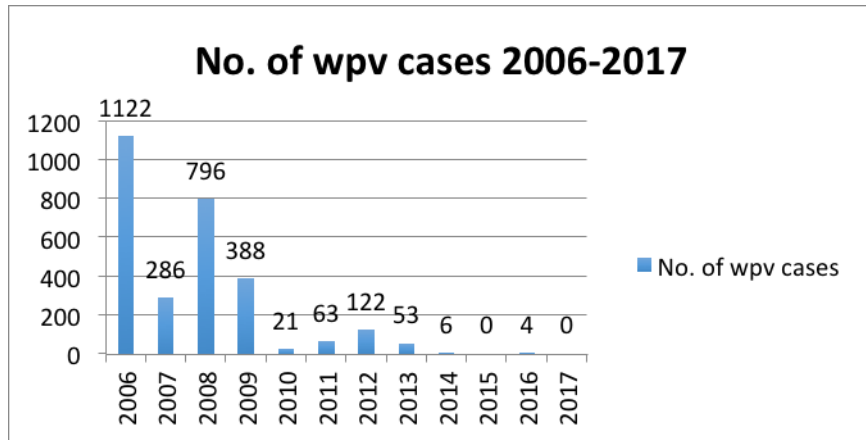
- Involvement of religious and traditional leaders;
- The use of performance approaches to incentivize and motivate vaccinators and immunization officers;
- Strategies like 'hit and run'; firewalling; transient health camps along borders, markets, motor parks; and house to house vaccination; and
- The use of military personnel and Joint Task Force (JTF) to serve as security escorts and vaccinators in inaccessible LGAs. These approaches have resulted in no recorded case of Wild Poliovirus (WPV) in the last 18 months.

There are challenges in the cold chain supply and logistics especially storage at the national hubs and inadequate storage capacity at the 3 national hubs in Lagos, Abuja and Kano - only 50% of required vaccine storage space available at the NSCS and 60% more storage space required for planned new vaccines. The Lagos cold store has inadequate cold rooms to accommodate the large volume of vaccines received from the NSCS and there is no dry store for vaccine devices.

The latest Multiple Indicator Cluster Survey (MICS) 2016 shows poor coverage for routine immunization with 33 percent coverage for the third dose of Pentavalent vaccine (Penta3). This represents a decline of 5 percentage points from the 2013 National Health and Demographic Survey (NDHS) and is almost the same as it was in 1990. One of the greatest threats to polio eradication is poor routine immunization coverage. More than a

quarter of states have less than 20% Penta3 coverage rates signifying the urgency of the challenge.

Figure 1: Trends in Wild Polio Virus in Nigeria – 2006-2017



Source: National Polio Emergency Operation Center (EOC)

Much of the resources provided under the AF will support vaccine procurement, as has been the case for the parent project and previous AFs. While this is input financing, it is justified for a few reasons:

- As described below the vaccine financing challenge is large at least partly due to the ambition to widely introduce new and potent vaccines such as Rotavirus and Pneumococcal vaccines;
- When Nigeria has experienced interruptions of stock outs in the past, vaccination coverage has suffered significantly (see Figure 2 below); and
- While routine coverage is low compared to other LMICs, it could get worse if vaccines are unavailable.

2.3 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, and the responsibility for health service provision in the public sector is based on these three tiers.

Each State health system runs a program 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.

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 Specialist Hospitals, Teaching Hospitals and Federal Medical Centres (FMCs). They provide specialist care for patients referred from the secondary level as well as from the primary level. Other functions include teaching and research.

By institutional arrangement and constitution, the Federal Government is responsible for managing all tertiary hospitals; the State caters for secondary healthcare facilities while the Local Government is expected to cater and funds the primary healthcare facilities.

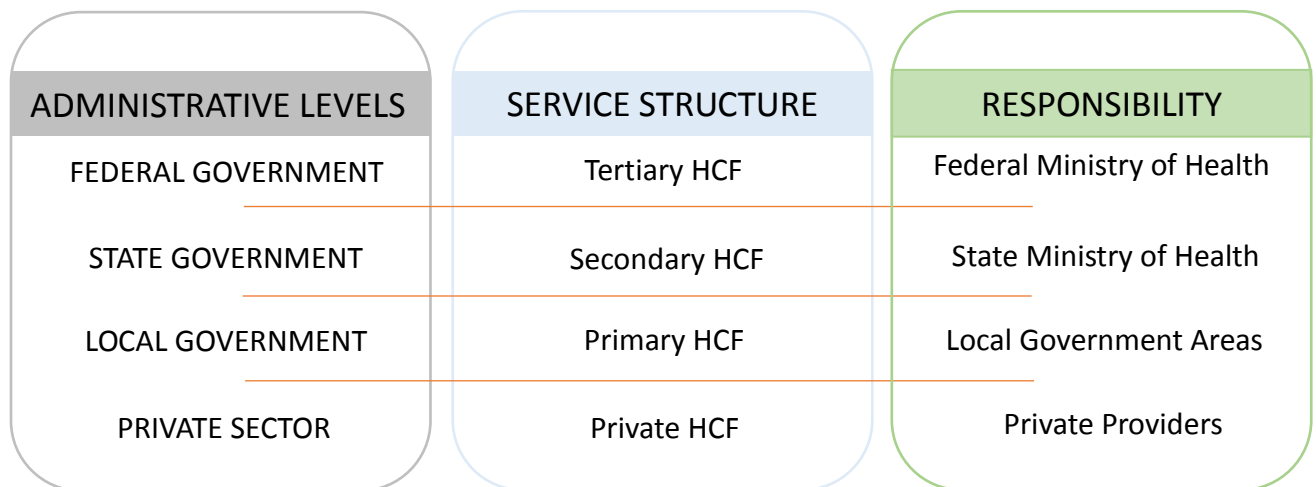


Figure 3.1 Organizational Structure of Nigeria Health Services

CHAPTER THREE: HEALTHCARE WASTE AND LEGAL PROVISIONS

3.1 Definition

Health Care wastes are by-products of health care that includes sharps, non-sharps, blood, body parts, chemicals, pharmaceuticals, medical devices and radioactive materials. Poor handling of HCW including those emanating from polio management exposes health care workers, waste handlers and the community to disease and injuries.

The activities surrounding the management and treatment of polio generate wastes and by-products that are hazardous to both human health and the environment. Wastes emanating from polio management HCW such as expired vaccines and sharps.

3.2 Legal and Regulatory Framework

This section reviews the current legal provisions for Health Care Waste Management (HCWM) in Nigeria. . Legal and institutional HCWM policies on HCWM constitute the essential backbone for safe management of Health Care Waste (HCW) since they will:

- Establish a National Health Care Waste Management Policy compatible with the technical, institutional and financial capacities of the HCFs in Nigeria.
- Support the National Health Care Waste Management Plan, National Health Care Waste Management Policy, and National Health Care Waste Management Guidelines.
- Define the duties and responsibilities of each actor involved in HCWM in Nigeria.
- Set-up legal regulation of HCWM systems within the HCFs.

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 HCW in the country. However, they are scattered and there is no particular legislation specifically dealing with HCWM in Nigeria as of today.

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.

3.2.1 Acts Relevant to HCW in Nigeria

Table 3.1: Relevant Nigerian Acts

S/N	ACTS	OBJECTIVES
1	Federal Environmental Protection Agency (FEPA) [Decree 58 of 1988 and 59 (amended) of 1992]	<ul style="list-style-type: none"> ▪ establishes the Federal Environmental Protection Agency with: a) the responsibility to monitor and help enforce environmental protection measures; b) the duty to co-operate with Federal and State Ministries, Local Governmental Councils and research agencies on matters

		and facilities relating to environmental protection; c) the powers to establish standards, inspect, search, seize and arrest offenders.
2	Harmful Waste (Special Criminal Provisions, etc.) Act 1988	<ul style="list-style-type: none"> 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.
3	Environmental Impact Assessment Act - CAP. E12 L.F.N. 2004	<ul style="list-style-type: none"> 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.

3.2.2 Regulations Relevant to HCW in Nigeria

Table 3.2: Relevant Nigerian Regulations

S/N	REGULATION	DESCRIPTION
1	National Environmental (Sanitation and Wastes Control) Regulations, 2009	The purpose of this Regulation is to provide the legal framework for the adoption of sustainable and environment friendly practices in environmental sanitation and waste management to minimize pollution.
2	National Effluent Limitation Regulations, 1991	This Regulation requires that every industry shall install anti-pollution equipment for the detoxification of effluent and chemical discharges emanating from the industry and specify selected waste water parameters for the industries in the First Schedule to these Regulations. The anti-pollution equipment shall be based on the Best Available Technology (BAT), the Best Practical Technology (BPT) or the Uniform Effluent Standard.
3	National Environment Protection (Pollution Abatement in Industries and Facilities Producing Waste) Regulations, 1991	By this regulation, no industry or facility shall release hazardous or toxic substances into the air, water or land of Nigeria's ecosystems beyond limits approved by the Federal Environmental Protection Agency. It imposes restrictions on the release of toxic substances and stipulates requirements for monitoring of pollution to ensure that permissible limits are not exceeded.
4	National Environmental Protection (Management of Solid and Hazardous Wastes) Regulations 1991	This Regulation regulates the handling and management of solid, radioactive and (infectious) hazardous waste. It defines objectives of the management of solid and hazardous waste, the functions of appropriate Governmental agencies and the obligations of industries/facilities that generate the wastes. It also classifies waste, makes provision for contingency plans, emergency procedures, groundwater protection, ground water monitoring requirements. 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.

3.3 National Healthcare Waste Management Policy, National Healthcare Waste Management Guidelines (NHCWVG) and National Healthcare Waste Management Plan (NHCWMP)

Nigeria has developed a trio of documents to tackle, regulate and provide guidelines for HCWM in the country. These three documents are

- National Healthcare Waste Management Policy (See Table 2.3)
- National Healthcare Waste Management Guidelines (See Table 2.4)
- National Healthcare Waste Management Plan (See Table 2.5)

Table 3.3 Summary of the National Healthcare Waste Management Policy

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.

Table 3.4 Summary of the National Healthcare Waste Management Guidelines

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.

Table 3.5 Summary of the National Healthcare Waste Management Plan

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.

3.4 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 clear HCWM rules. These resources must be made readily available as a written document to all personnel of the HCF. 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. In addition, the National healthcare Waste Management Guidelines will serve as a guide in developing a project-specific Healthcare Waste Management Plan (HCWMP) for the NPESP AF3.

3.5 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 E12LFN2004) 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.

CHAPTER FOUR: CURRENT STATE OF HEALTHCARE WASTE MANAGEMENT IN NIGERIA

4.1 Definitions of Health Care Waste in Nigeria

Hazardous healthcare waste is of primary concern, due to its potential to cause infections, 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.

Healthcare Waste (HCW) in Nigeria can be defined as “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.”

4.2 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.

4.3 Classification of Healthcare Waste in Nigeria

The Nigeria Healthcare Waste Management Guideline 2013 categorises HCW into 7 streams/ classes as follows

- Non Hazardous and general waste
- Hazardous healthcare waste which is subdivided into 5
 - Infectious waste
 - Pathological/ Anatomical Waste
 - Chemical wastes
 - Genotoxic
 - Mercury wastes

- Highly Hazardous waste which is subdivided into 3
 - Sharps
 - Highly infectious waste
 - Radioactive waste

Table 4.1 shows the categorization of healthcare waste in Nigeria with examples of each categorization

Table 4.1: Healthcare Waste Categories, Examples and Classes

S/N	CATEGORY OF WASTE	SUB CATEGORY OF WASTE TYPE	DESCRIPTION AND EXMAPLES	EXAMPLES OF WASTE	CLASS
A	Non-hazardous and general wastes		Waste that has not been contaminated with infectious materials or other hazardous materials.	Paper, cardboard, plastic, kitchen waste, ash, sawdust, pieces of wood segregated from hazardous waste	1
B	Hazardous Healthcare Waste	Infectious waste	Generated by both inpatients/out-patients or animals. It's likely to contain pathogenic micro-organisms and can be dangerous or infectious to both patients, health care workers and the public.	Laboratory waste, materials potentially infected blood, swabs, materials that have been in used in surgery or been in contact with patients	2
		Pathological/ Anatomical Waste	Amputations and other body tissues resulting from surgical operations, autopsy (post-mortem), or delivery. Requires special treatment for ethical and aesthetic reasons	Internal body organs, amputated limbs, placentas, foetus. Also includes urine and blood products	4
		Chemical waste	Wastes, including expired products, generated from the pharmacy, and from chemotherapy	Vials, connecting tubing, drugs, vaccines, pharmaceutical products, disinfection solutions, medicines, expired drugs, drugs, and vaccines	5
		Pharmaceutical Waste			
		Genotoxic			
Mercury Waste	Any mercury containing device	Wastes from mercury containing devices such as batteries, dental amalgam, thermometers, and blood-pressure gauges and fluorescent tubes	8		
C	Highly Hazardous Healthcare Waste	Sharps	These are sharp-edged wastes that can cause cuts or puncture wounds. They are highly hazardous whether or not they are contaminated with blood	Needles, syringes, surgical blades, scalpels, test tubes, ampoules, glass instruments, pipettes,	3
		Highly Infectious Waste	These highly infectious wastes required immediate treatment by chemical disinfectants or autoclaving before joining the hazardous HCW stream.	Sputum cultures of TB laboratories, contaminated blood clots and glassware, highly concentrated microbiological cultures carried out in medical analysis laboratories	6
		Radioactive Waste	Any solid, liquid, or pathological waste contaminated with radioactive isotopes of any kind	Radioactive papers, gloves, cotton swabs, needles (sharps), liquids, patient excretion, spent radiation sources radium needles.	7

4.4 Current State of HCWM Practices in Nigeria

Major constraints with HCWM practices in Nigeria range from inadequate funding, availability of resources and inadequate infrastructure. There is also a low level of manpower training that currently exists for HCWM at all levels all across Nigeria.

In general, HCW is poorly managed in Nigeria. 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 2006 Medical Waste Management survey in 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.

An analysis of the current situation was conducted with respect to Medical Waste generation segregation, collection, transportation, and disposal. 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.

4.4.1 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).

4.5 Healthcare Waste Management Constraints in Nigeria

It is estimated that an average of 20% of the waste generated by medical institutions are hazardous in nature. Studies show there is also a large lack of training in management of HCW and HCWMP in practice was almost non-existent.

The major short comings in the current HCWM in Nigeria are

- Absence of HCWM plans in most medical institutions;
- Weak coordination of HCWM system at all levels;
- Poor/lack of segregation of healthcare waste at health facility levels;
- Deficient/non-existent HCW colour-coding and labelling system;
- Poor hygiene practices in collection, storage, transportation, treatment and final disposal of healthcare waste;
- Waste handlers lack Personal protective equipment (PPE);
- Indiscriminate dumping of healthcare waste into public dumpsites;
- Use of locally built low temperature incinerators without adequate protection to the environment;
- Healthcare solid wastes are either buried or burnt at low temperature in open pits;
- High risks of injury and infection to healthcare waste handlers and scavengers;
- Absence of post exposure prophylaxis (PEP) to those who sustain needle stick injury, with increased risk of HIV, HBV & HCV infections; and
- Lack of healthcare waste management information system.

4.6 Risks Associated with Healthcare Waste Generated in Nigeria

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; and
- 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.

CHAPTER FIVE: BASIC PRINCIPLES FOR GOOD SUSTAINABLE HEALTHCARE WASTE MANAGEMENT

Generally, there are basic principles as regards HCWM. These principles are outlined in the National Healthcare Waste Management Guidelines 2013 and are discussed in brief in this chapter.

5.1 Waste Minimization

The best practice here is to ensure that all units in the HCF minimize their waste generation (all classes of wastes) to the barest minimum. This should be done at source. Appropriate plans, strategies and actions should be established to ensure adequate HCW minimization at source. Such strategies should be aimed towards

- Purchasing restrictions to ensure the selection of less wasteful materials;
- Encouraging the use of recyclable products;
- Reducing unnecessary injections and encouraging use of oral alternatives, when appropriate;
- Ensuring good management and control practices especially in the purchase and use of pharmaceuticals; and
- Enforcing a rigorous and careful segregation of the HCW at source.

5.2 Waste Segregation

Proper segregation of waste at source will reduce the quantity of waste requiring treatment prior to final disposal and ultimately reduce the cost of waste management. Segregation involves putting different classes of wastes into appropriate temporary containers such as bins, bags and boxes. For instance, sharps must be put into a separate container (preferably a cardboard box/ carton) from other hazardous wastes as well as non-hazardous wastes. Such temporary containers should be

- Clearly labelled (both in English and the local language) with the name of each waste class. Labelling should include the type of waste in the container, name of the ward/facility, date of collection and warning of hazardous nature;
- Should be leak-proof to avoid spillages;
- Should be puncture resistant;
- After use, waste containers should be sealed to prevent spilling during handling and transportation; and
- Should be kept in easily accessible to and secure place.

It is also important that only the same waste class be put into the same container. For example, no healthcare waste other than sharps should be deposited in sharps containers. All waste should be fully inserted into the container with no part sticking out.

Segregation must be done at the source of waste generation (at each medical unit). A homogenous segregation format must be practiced across all HCF in order to avoid mistakes during collection, storage, transportation and onward treatment. See Fig 5.1 below



Fig 5.1 Waste Segregation (Source JSI/MMIS)

5.3 Colour Coding

Colour coding is done by using colours to differentiate waste classes from one other. It is efficient and helps in the process of waste segregation at source. It is also simple, easy to use and thus can be understood by illiterate patients particularly at rural PHCs where illiteracy level is high. It is important that all HCF in Nigeria use the same colour coding scheme as this helps to minimize and avoid a waste class from mixing with other waste classes.

It is recommended that for PHC, a yellow and black colour coding scheme is used as shown in Table 5.1 below

Table 5.1: Color Coding For Primary Healthcare Facilities

COLOUR	WASTE DESCRIPTION - WASTE CLASS		EXAMPLES
Black	Non-hazardous waste	Non-hazardous general waste - Class 1	paper, ash, cardboard
Yellow	Hazardous Wastes:	Infectious waste -Class 2	Laboratory waste, materials potentially infected blood, swabs
		Highly infectious wastes - Class 6	Cultures of TB laboratories, contaminated blood clots and glassware
		Sharps - Class 3	Syringes with needles, blades

As expected, there will be a wider range of waste classes generated at secondary and tertiary healthcare facilities when compared to primary healthcare facilities. Thus is expected that the use of a broader colour scheme be applied at the former when compared to the latter. Colour coding here must be an expanded version from that used in the PHCs. It is recommended that for higher levels of HCF, the colour coding scheme shown in Table 5.2 below is used.

Table 5.2: Color Coding For Secondary Healthcare Facilities

COLOUR	WASTE DESCRIPTION - WASTE CLASS		EXAMPLES
BLACK	Non-hazardous waste	Non-hazardous general waste - Class 1	paper, ash, cardboard
YELLOW	Hazardous Wastes	Infectious waste -Class 2	Laboratory waste, materials potentially infected blood, swabs
		Sharps - Class 3	Syringes with needles, blades
RED	Hazardous Wastes	Highly infectious wastes and pathological waste Class 4 and 6	Cultures of TB laboratories, contaminated blood clots and glassware
BROWN	Hazardous Wastes	Chemical, Pharmaceutical Waste - Class 5	Vials, connecting tubing, drugs, vaccines, pharmaceutical products, disinfection solutions

5.4 Waste Collection

Collection of waste is extremely important to avoid over spilling of waste out of collection containers. Collection must be done promptly and routinely or as often as required. This will eliminate the occurrence of waste spilling out of containers and ultimately reduce the probability of contaminated wastes infecting the public. Collection of waste must be done by approved and trained personnel fully equipped with appropriate PPEs and conveying machinery such as trollies and carts.

Medical staff must be actively involved in collection of waste as should the waste handlers. They should ensure that their containers/bags are never more than three-quarter full before sealing them at their points of generation. They should also ensure that such collection containers are appropriately labelled.

The following should be adhered to when collecting waste

- Collection must be done routinely on a daily bases;
- Collection containers should be placed on leak-proof surfaces and in secured locations;
- Collection containers should never be allowed to overflow. This requires prompt and frequent collection;
- Collection containers should be tightly sealed when three-quarters full by tying the neck or sealing tag. Bags should not be closed by stapling;
- Waste collected must be moved directly to the central temporary storage area;
- Only containers and bags properly labelled should be collected from their points of generation;
- Collection containers must be replaced immediately after collection;
- All waste handlers should wear PPE at all times while on duty; and
- Collection trollies and carts should be designed to prevent and accommodate any form of spillages. They must also be easy to convey and clean.

5.5 Waste Storage

Storage refers to the time lapse of the entire process from time of waste generation to the point of collection for final disposal. Consideration for storage must be based on the classification or class 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 and storage should take place where HCW is generated.
- Storage of waste may then be moved to a temporary on-site storage location
- Non-risk HCW should always be stored in a separate location from the infectious/hazardous HCW in order to avoid cross-contamination

Every HCF must designate an area within its premises where waste can be temporarily stored until final collection for disposal and onward treatment. It is expected that each HCF must manage the HCW it generates. Such a general storage location should be located at the back of the facility and away from the view of the public. The following characteristics are recommended storage locations that deal with infectious and hazardous waste

- Their grounds should be hard, impermeable and with good drainage;
- They should be easy to clean and disinfect with easy access for waste handlers;
- They should be inaccessible to unauthorized persons;
- They should have easy access for waste-collection vehicles;

- They should be protected from the sun and inaccessible for animals, insects, and rodents;
- They should have good lighting and good ventilation; and
- They should not be in close proximity to fresh food stores or food preparation areas.

However in addition to these, it is also important to educate patients who patronise HCF on how to dispose of certain personal wastes. Patients should be encouraged to dispose of their waste in appropriate manners. For instance, when blood samples are taken, cotton wool is usually given to the patient to cover the puncture. Such cotton wool could be contaminated and it is important such a waste is disposed for properly. In this case, it should be disposed of in a yellow bag rather than in a black bag.

5.6 Transportation

This involves the conveying of waste from the point of generation to point of treatment or disposal. Transportation of HCW can be divided into two

- (a) **Transportation to On Site Storage Location:** This involves conveying of wastes from the various points of generation within a HCF to a temporary storage location also within the same HCF.
- (b) **Transportation to Off-Site Disposal/Treatment Location:** This involves conveying wastes both from the temporary on-site location within the HCF and a treatment facility (such as an incinerator) to an off-site location for final disposal.

The following should be adhered to when transporting wastes

- Every effort should be made to avoid unnecessary handling of HCW;
- All waste bags should in-place and intact at the end of transportation;
- carts, containers, or vehicles used for the transportation of health-care waste should not be used for the transportation of any other material;
- 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 that has the potential to leak must be double bagged;
- 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; and
- Vehicles must be easily cleaned and have no sharp edges to damage waste containers.

CHAPTER SIX: HEALTHCARE WASTE MANAGEMENT PLAN FOR HEALTHCARE FACILITIES

6.1 Basic Steps in HCWM for HCFs

6.1.1 Raise Awareness at the Management Level and Develop an Integrated Waste Management Plan

There is need to enlighten the head of each 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 (Chief Health Officer) of the healthcare facility who is responsible the HCWMP implementation. Also included in the committee should be nurses and waste collectors. Additionally, there is need to create awareness among the public and communities.

6.1.2 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 easily understandable format (with diagrams) and displayed at all departments/units of the HCFs. 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.

6.1.3 Develop and Implement a Healthcare Waste Management Plan

6.1.3.1 Development of a Waste Management Plan

It is necessary for every healthcare facility to develop a HWMP. The plan should include daily routines for collection, handling, segregation, and packaging of the different types of waste. It should also have clearly defined roles for medical personnel and staff. The head

of the facility should ensure that this plan is in place, with adequate budget and personnel to implement it.

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, evaluation of waste treatment and disposal options (on- and off-site);
- Training;
- Estimation of costs relating to waste management (actual situation and proposed options); and
- Strategy for the implementation of the plan.

6.1.3.2 Implementation of a Waste Management Plan

Implementation of the HCWMP and routine monitoring should be carried out in parallel with the information/training program. See Table 8.1. Implementation of the HCWMP 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;

6.1.4 Ensure Segregation, Collection and Storage of 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. In addition, segregated waste must be left separated until final treatment.

Waste collection should be done by handlers who are always equipped with PPE. They must limit their exposure to waste to the barest minimum. Collection and Storage of waste should be done in line with acceptable standards. See Section 5.4 and 5.5.

6.1.5 Determining the Most Appropriate Treatment Technique and Disposal Site for the Facility's Waste

Safe and affordable options for treatment and disposal are not always available/possible for every situation in Nigeria. 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. However, the treatment options chosen should be based on several criteria including

- Disinfection efficiency;
- Health and environmental considerations;
- Volume and mass reduction;
- Occupational health and safety considerations;
- Quantity of wastes for treatment and disposal capacity of the system;
- Types of waste for treatment and disposal;
- Infrastructure requirements;
- Locally available treatment options and technologies;
- Operation and maintenance considerations;
- Available space;
- Location and surroundings of the treatment site and disposal facility;
- Investment and operating cost;
- Public acceptability;
- Regulatory requirements; and
- Risk of toxic emissions.

6.2 Waste Treatment Options for HCF

Non Hazardous Waste (Class 1): These should be separated from other HCW and disposed of along with other MSW.

Infectious Waste (Class 2): These wastes should be burnt and buried in protected pits and fenced to prevent public access. See Annex 2 Guideline for disposal of healthcare waste by pit burial.

Sharps (Class 3): These waste should first be incinerated before being landfilled. In the alternative, they can be encapsulated and then landfilled

Pathological/Anatomical Wastes (Class 4): Anatomical wastes such as placentas can be buried at depths of over 1 metre inside the PHC. For pathological waste these should be preferably transported to central treatment centre as these wastes must not be burnt under low temperature.

Pharmaceutical Wastes (Class 5): These should be burnt in temperature around and exceeding 1200°C. If the PHC can afford to build a Cement Kilns, then they can be treated at the PHC, if not, these should be transported to a central treatment centre. These should never be disposed of in sewers or landfilled without appropriate treatment.

Highly Infectious Wastes (Class 6): These wastes should be treated in a concentrated solution of Sodium Hypochlorite (NaClO) before being disposed with other wastes.

Radioactive Wastes (Class 7): These wastes can be stored in designated rooms cordoned off from access and allowed to decay to background level. Once at background level, the non-infectious radioactive wastes can then be treated the same way as Class 1 HCW while the infectious radioactive waste should be treated the same way as Class 2 HCW.

Mercury Wastes (Class 8): This should be treated as a specialised kind of waste and should be collected and stored in a tin container at room temperature and transported to where it will be treated in an environmentally sound manner.

6.3 Resource Requirements for the Implementation of the HCWMP

Tables 6.1 shows resource requirement for implementing the HCWMP for the NPESP AF3

Table 6.1: Resource requirements for the Implementation of the HCWMP for NPESP AF3

S/ N	ACTIVITY	HUMAN RESOURCES	INSTITUTION RESPONSIBLE	COSTS (US\$)
1	Provision of appropriate collection, storage and segregation containers at all medical facilities	Waste management and procurement specialist	NPHCDA, SPHCDA	80,000
2	Procurement of medical waste treatment utilities in hospitals such as disinfectants, autoclaves	procurement and financial management specialists	NPHCDA, SPHCDA,	50,000
3	Assist with design and construction of pilot environmentally sound HCW Disposal Pits in selected HCFs	Consultant/Contractor	NPHCDA; SPHCDA;	100,000
4	Supply/provision of PPEs for HCFs (coveralls, goggles, nose guards, gloves, face masks, fixtures e.t.c)	Contractor	NPHCDA, SPHCDA	70,000
			TOTAL	300,000

CHAPTER SEVEN: 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 as well as 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.

Thus ensure that objectives of the HCWMP for NPESP AF3 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 NPHCDA. 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 suitable criteria for addressing potential negative impacts of HCW and to ensure that unforeseen impacts are detected and subsequently adequate mitigation measures are 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 monitoring of environmental effects is necessary to ensure that predicted impacts are addressed effectively and efficiently through the mitigation 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 HCW 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, FMEEnv, SEPAs, and SPHCDA. They shall undertake regular monitoring of these facilities, with the aim of establishing long-term sustainability in HCWM.

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;
- Storage into appropriate, labelled and adequate containers for both internal and external storage;

- 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;
- Transportation i.e. needs and conditions including certification;
- Worker safety measures; and
- Appropriate disposal techniques and approved disposal sites.

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; and
- Disposal method(s) - volume incinerated, volume treated and disposed.

7.4 National Health Care Waste Management Plan

There is a current National Health Care Waste Management (NMCWM) Plan which identifies the indicators to be tracked, specific tasks to be executed and assigns responsibility for waste collection to specific agencies.

For the national plan to be effectively implemented, all HCFs in the country need to develop standardized plans based on their existing needs. Such plans should focus on treatment, recycling, transportation and disposal options through safe and cost effective treatment and disposal methods.

The most critical needs for the implementation of the national plan are funding and skilled/well-trained manpower. The critical issues identified during the study include the following:

- Poor medical waste management practices in HCFs and government disposal sites with regard to handling and disposal
- Lack of waste generation data
- Inadequate waste treatment and disposal equipment
- Inadequate knowledge among those involved in medical waste management
- Lack of awareness on medical waste among health workers and the general public
- Poor management practices at hospitals and dumpsites
- Lack of code of conduct and technical guidelines for safety measures

This project - specific medical waste management plan will operate within the confines of the National Health Care Waste Management Plan and seek ways and means that it will operationalize the action plan.

Table 7.1 Summary of monitoring plan with indicative costs

S/N	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/SPHCD A/LGAs World Bank	2,000
2	HCWMP implementation i) Trainings ii) Use of SOPs iii) Transport and Disposal iv) Treatment of HCW	To verify if HCWMP is being implemented, and to check implementation progress.	Bi-annual	Organized supervisory missions; stakeholder conference meetings	NPHCDA/SPHCD A, /LGAs World Bank, contractors and consultants.	4,000
3	Compliance 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	3,000
4	Social accountability and community perceptions	To ascertain social accountability.	Quarterly	Organized supervisory missions;	World Bank, Consultant	2,000
Total						11,000

CHAPTER EIGHT: INSTITUTIONAL RESPONSIBILITY AND CAPACITY BUILDING

8.1 Institutional Responsibility

Nationally, the project will be placed under the overall responsibility of the National Primary Health Care Development Agency (NPHCDA). The activities under NPESP AF3 build on a very strong network of development partners (DPs) that have helped Nigeria to improve immunization services. All of the funds under the AF will be coursed through WHO and UNICEF who have a large and well-functioning presence on the ground. These are the arrangements that the FGoN itself has used and which have been successfully used during the original project.

Since immunization is a Federal responsibility the main implementing agency is the NPHCDA which has a Department for Disease Control and Immunization which also includes polio eradication.

NPHCDA's role vis a vis the SPHCDA is to provide the overall national strategic direction within which states will tailor their activities based on the particular characteristics of polio eradication. NPHCDA will provide technical assistance to the States across the full-range of project activities.

NPHCDA will organize the work planning exercises and review all state work plans and procurement plans before processing by the World Bank. It will also promote the sharing of best practice experiences and develop capacity-building activities to address needs at the State level.

At the state level, project activities will be managed by the State Primary Health Care Development Agencies (SPHCDA). The SPHCDA's are responsible for developing State priorities for action, as well as monitoring implementation in the state, and evaluating the performance of state implementing agencies.

With respect to the implementation of this Health Care Waste Management Plan (HCWMP), it is recommended that the program officers (SIO and LIO) as well as the SPHCDA recruits an environmental specialist on a part time basis that will be responsible for following up the recommendations of the HCWMP. Alternatively a consultant should be recruited to do same task and could provide information as and when necessary during World Bank supervision missions.

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

8.2 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 HCWM, 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.

8.3 Training Targets

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

- State and Local Immunization Officers
- Management & administrative staff;
- Medical laboratory staff;
- Ward attendants, caretakers, ground workers and other support staff;
- Patients and visitor and scavenger¹;
- Waste management facility operator;
- Waste collection and transportation staff;
- Treatment system operators; and
- Disposal managers

Table 8.1 below highlight suggested training courses needed for effective implementation and monitoring of a HCWMP

The training plan shall be structured around the following principles:

¹ Informal waste pickers is a person who collects either from the streets, dump sites or landfills, re-usable and recyclable material to sell or for personal consumption and to make personal income

- 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 8.1 shows training and schedule for staff and support staff of HCFs.

Table 8.1: Trainings and Schedule for Staff and Support Staff of HCF

CAPACITY NEEDS	TOPIC AND CONTENTS	TARGET PARTICIPANT	DURATION	RESOURCE PERSON	ESTIMATED COST (USD)
Basic knowledge about medical waste	<ul style="list-style-type: none"> ▪ Waste categories; ▪ Public relation and interaction with local community. ▪ Hazardous potential of certain waste categories; ▪ Transmission of hospital acquired infection; and ▪ Health risk for health care personnel. 	All categories of persons listed under Section 8.2	1 day	NPHCDA and partners and HCWM consultant	500
Proper behaviour of waste generators	<ul style="list-style-type: none"> ▪ Environmentally sound handling of residues; ▪ Waste avoidance and reduction possibilities; ▪ Identification of waste categories; ▪ Separation of waste categories; and ▪ Knowledge about appropriate waste containers. 	All categories of persons listed under Section 8.2	1 day	NPHCDA and partners and HCWM consultant	500
Proper handling of healthcare waste	<ul style="list-style-type: none"> ▪ Adequate waste removal frequency; ▪ Safe transport containers and procedures; ▪ Recycling and re-use of waste components; ▪ Safe storage of wastes; ▪ Handling of infectious laundry; ▪ Handling of chemical and radioactive waste, outdated drugs; ▪ Safety regulation in waste management, protective clothing; ▪ Emergency regulation in waste management. 	All categories of persons listed under Section 8.2	1 day	NPHCDA and partners and HCWM consultant	500
Establishing a healthcare waste management plan and system	<ul style="list-style-type: none"> ▪ Establishment and implementation of a waste management plan; ▪ Sampling of waste quantities, monitoring, and data 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. 	All categories of persons listed under Section 8.2 excluding Patients and visitor;	1 day	NPHCDA and partners and HCWM consultant	500
Establishing a healthcare waste maintenance plan	<ul style="list-style-type: none"> ▪ Cleaning and maintaining of collection, transportation and storage facilities; ▪ Maintenance and operation of incinerator for infectious wastes; ▪ Maintenance of septic tanks and other sewage treatment facilities; and ▪ Maintenance and operation of waste pits 	Management & administrative staff, waste management facility operator, waste collection and transportation staff, treatment system operators and disposal managers	1 day	NPHCDA and partners and HCWM consultant	500
				Total	2,500

CHAPTER NINE: PUBLIC AWARENESS AND CONSULTATION

To ensure the successful implementation of this plan, the, NPHCDA, and SPHCDA 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 every State 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 transparency and easy 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 benefits from 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, totaling 48 radio and TV messages in major languages per annum.

- **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.

9.4 Stakeholder Consultation and issues raised

ITEMS	DESCRIPTION
Date of Public consultation	5 February 2018
Name of Stakeholders (community)	FMoH, FMEnv, FMoF, NPHCDA, WHO, UNICEF, NERICC, LSPHCB, KSPHCMB
Language of communication	English
Introduction	The consultant explained to all stakeholders the World Bank Safeguards. After which discussions bothering around project implementation, environmental and health care waste management ensued.
Response and feedback from stakeholders about the project	<ul style="list-style-type: none"> ▪ They expressed good understanding of the proposed project and happiness the project was about to commence. ▪ Dr Bassey Okposen explained in depth the monitoring at the local government and state levels as well as the KPI which the Technical Assistants (TA) would be expected to meet.

<p>Concerns/Complaints</p>	<ul style="list-style-type: none"> ▪ The stakeholders made it clear that there could be concerns as regards increased generation of HCW such as sharps and swabs once the project commences. ▪ All stakeholders were mainly about dealing with HCW. We, however identified two type of waste streams which included waste from the construction sites in Kano and Lagos and healthcare waste that would be generated during the operation of the project. ▪ There were slight concerns raised over the transportation of vaccines to the other 12 states to which rather than purchasing vehicles, it could be outsourced.
<p>Remarks/Recommendations</p>	<p>A healthcare waste management plan can be adapted from NSHIP to cater for and manage HCW from the various PHCs.</p>

REFERENCES

- Environmental Assessment Sourcebook. Volume II: Sectoral Guidelines. World Bank Technical Paper No 140, Environmental Department, The World Bank. Washington, DC.
- Federal Government of Nigeria (2013), National Healthcare Waste Management Guideline
- Federal Government of Nigeria (2013), National Healthcare Waste Management Plan
- Federal Government of Nigeria (2013), National Healthcare Waste Management Policy
- Health-Care Waste Management: Rapid Assessment Tool for Country Level - World Health Organization, 2005.
- Pruss, A, E. Giroult, P. Rushbrook, editors (1999), Safe management of wastes from healthcare activities, WHO, Geneva, Switzerland.
- Suggested Guiding Principles and Practices for The Sound Management of Hazardous Hospital Wastes, World Health Organization, 1999.
- Vergara, W. and Niels, K.V. *Hazardous Waste Management Programs for Developing Countries: Prerequisites for Implementation.*
- World Bank Technical Guidance Note (1999). *Municipal Solid Waste Incineration.*
- World Health Organization (WHO) (2011), Health-care waste management Rapid Assessment Tool[online] Available at <toolhttp://www.who.int/water_sanitation_health/medicalwaste/hcwmtool/en/>
- World Health Organization (WHO), “Wastes from Healthcare Activities”, Fact Sheet No. 253, October 2000

APPENDIX 1: HCW TREATMENT OPTIONS

a) HCWM minimization







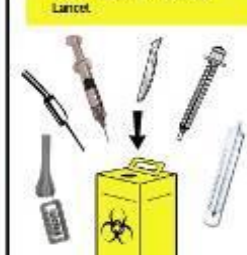


To reduce the amount of hazardous HCW generated at Primary and Secondary healthcare facilities in Nigeria;

- 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.

SEGREGATION OF MEDICAL WASTE

Non-Infectious Waste	Infectious Waste	Highly Infectious Waste	Sharp Waste
<ul style="list-style-type: none"> ▪ Paper/Packaging material ▪ Food  <div style="text-align: center; margin-top: 10px;">  <p>BLACK</p> </div>	<ul style="list-style-type: none"> Gauze/Dressing Blood/IV fluid lines Gloves  <div style="text-align: center; margin-top: 10px;">  <p>YELLOW</p> </div>	<ul style="list-style-type: none"> Anatomical Waste Teeth Placenta Pathological Waste Spulum container Test tubes containing specimens  <div style="text-align: center; margin-top: 10px;">  <p>RED</p> </div>	<ul style="list-style-type: none"> Intrusion sets Broken slides Broken vial Broken ampules Lancet Retractables Scalpels Blades Needles  <div style="text-align: center; margin-top: 10px;">  </div> <div style="border: 1px solid black; padding: 5px; margin-top: 10px; width: fit-content;"> <p style="font-size: 8px;">If using a needle remover, cut off needle and discard syringe in a safety box</p>  </div>

IT IS THE RESPONSIBILITY OF HEALTH PERSONNEL TO SEGREGATE WASTE IMMEDIATELY ACCORDING TO TYPE

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
<ul style="list-style-type: none"> ✓ non-risk waste of category 	<ul style="list-style-type: none"> ✓ 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
<ul style="list-style-type: none"> ✓ non-risk(domestic) waste 	<ul style="list-style-type: none"> ✓ infectious waste ✓ sharps collected in yellow, puncture-proof containers 	<ul style="list-style-type: none"> ✓ highly infectious waste 	<ul style="list-style-type: none"> ✓ pharmaceutical waste, some chemical waste, heavy metal wastes

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 »	

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.

b) 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:
 - Non-transparent;
 - Impervious to moisture;
 - Sufficient strength to prevent easy damage during handling or use;
 - Leak resistant;
 - Close-fitted lids;
 - Fitted with handles for easy manipulation;
 - Light weight and convenient;
 - 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.

c) *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

d) 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

e) 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.

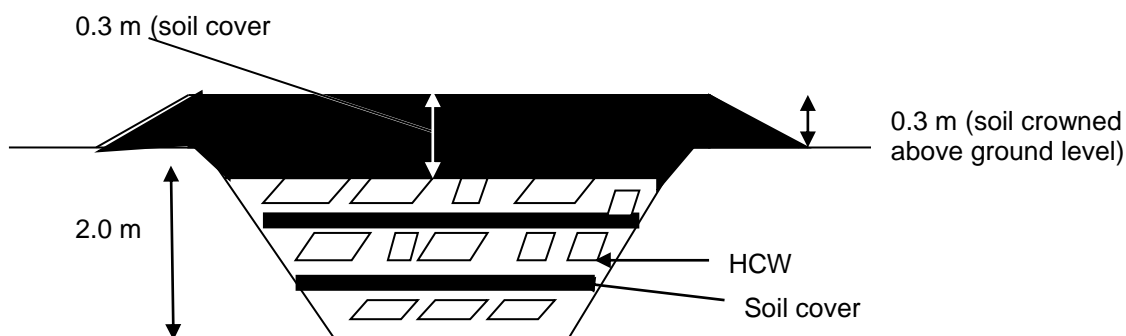


A De-Montfort Waste Disposal Unit

Disposal in Burial Pit

- *Burying HCW in 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. 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 larger 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 specially 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.

f) 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.

g) 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.

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:

High
Low
Moderate
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;

Distance to watercourses, boreholes and wells.
The height of the water table.

Proximity to buildings, especially houses and surrounding farms.

Proximity to neighbours or public lands, including roads.

The slope of the land and drainage to and from the pit.

The permeability of the soil.

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

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.

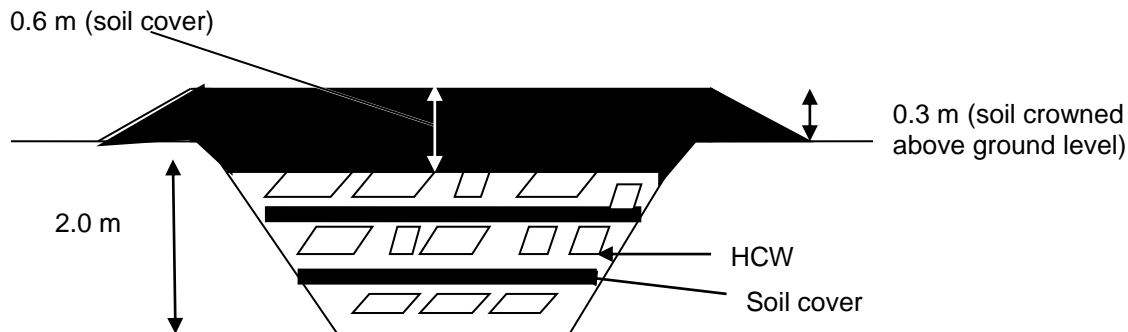
Note: Several small burial sites that are spread out are better than fewer, larger sites.

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.

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: 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.

