



Voluntary medical male circumcision

A guide to safer health care waste management practices

Program Management Guide

Published in 2016

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About SCMS

The Supply Chain Management System (SCMS) was established to enable the unprecedented scale-up of HIV/AIDS prevention, care and treatment programs in the developing world. SCMS procures and distributes essential medicines and health supplies, works to strengthen existing supply chains in the field, and facilitates collaboration and the exchange of information among key donors and other service providers. SCMS is an international team of 13 organizations funded by the US President's Emergency Plan for AIDS Relief (PEPFAR). The project is managed by the US Agency for International Development.

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Abbreviations and acronyms

EMMP	Environmental mitigation and monitoring plan
HCW	Health care waste
HCWM	Health care waste management
IP	Implementing partner
PEPFAR	President's Emergency Plan for AIDS Relief
PIEE	Programmatic initial environmental examination
PPE	Personal protective equipment
QMS	Quality management system
SCMS	Supply chain management system
SOP	Standard operating procedure
USAID	United States Agency for International Development
WM	Waste management

Introduction

Purpose

Health care waste management is an integral component of any VMMC program. It is essential for any VMMC project/program to develop a phased approach to support the VMMC project lifecycle, spanning situational analysis to system evaluation of hazardous waste management. To support the analysis and evaluation methods, SCMS developed assessment tools to collect data for design, development, and implementation of a comprehensive VMMC program. These tools can be used to provide policy makers with a better understanding of what is required to manage hazardous waste appropriately.

To further formalize the waste management approach, an environmental mitigation and monitoring plan (EMMP) must be submitted to USAID eliminate, reduce, or offset adverse impacts on the environment and human health attributable to actions of SCMS.

To comply with USAID, US environmental laws, regulations, executive orders, and procedures to protect the environment, VMMC project/program must prepare the following standards to support USAID implementing partners in the design, implementation, and monitoring of VMMC campaigns and programs. Effectively implementing these procedures will help ensure not only economic sustainability, but also the protection of the environment.

These standards aim to inform USAID implementing partners (IPs) on proper procedures to ensure that waste is handled and managed in such a way to minimize adverse effects on human health or the environment. The specific objectives of this plan are to:

- Protect human health by reducing exposure of employees, patients, visitors, and/or entire communities to waste
- Protect the environment from hazardous materials arising from waste products generated
- Improve regulatory compliance and avoid liability

Methodology

Waste management model

To help ensure that the environment and community are safe, and that the waste products are not mismanaged or misused at any point in the process, key stakeholders, in collaboration with implementing partners develop measures to confirm that the flow of resources between the point of origin and the point of disposal is orderly and meets national requirements.

A project should follow best practices in procurement, point of generation, storage, transport, treatment, and disposal. To support the goals set forth in any project, a quality management system (QMS) is developed and implemented to guide the practices. The QMS provides a framework through which key stakeholders can monitor and continuously improve all aspects of the project. The waste management model is shown in Figure 1.

Figure 1. Waste management model



Waste management quality management system

This section describes the organizational structure, responsibilities, procedures, processes, and management resources needed to implement a HCWM quality management system/program as part of a VMMC. Each site must be able to implement and maintain acceptable HCWM standards and practices for the duration of a campaign. To do so, each individual campaign administrator and site staff member must be empowered and equipped to monitor the performance of their HCWM system, identify priority areas for attention and improvement, and be able to take action to address any adverse issues.

It is important to establish tools, which are described in the toolkit, to support the creation of quality management (QM) processes that, when correctly implemented, will help campaigns maintain sound HCWM practices across the board.

Monitoring and evaluation¹

Information is needed to assess program strategies; guide policies; ensure effective operations; meet internal and external reporting requirements; and inform current program decisions, as well as future campaigns. Monitoring and evaluation (M&E) provides a framework through which implementing partners and other stakeholders can determine how well their VMMC HCWM system is functioning, and identify and address weak points. While monitoring and evaluation are often viewed as a single process, they are actually two distinct processes. Monitoring involves the systematic collection and analysis of information as a project progresses. Evaluation analyzes why intended results were or were not achieved. An effective M&E system requires well-articulated monitoring structures, trained staff, a functioning information network, and appropriate reporting formats and procedures. Monitoring should be established from the beginning of a program or campaign as part of planned HCWM activities.

¹Janet Shapiro. *CIVICUS Monitoring and Evaluation Toolkit*, <http://www.civicus.org/view/media/Monitoring%20and%20Evaluation.pdf> (April 2011). Jody Zall Kusek and Rist, Ray C. *The World Bank. A Handbook for Development Practitioners: Ten Steps to a Results-Based Monitoring & Evaluation System*, <http://www.oecd.org/derec/worldbank/35281194.pdf> (2004).

Internal auditing

While similar to monitoring, auditing is a more systematic and structured approach to examining how well campaign sites are executing established HCWM standards and practices. Monitoring can indicate the need for a more detailed audit. Auditing allows implementing partners to address critical HCWM risks and compliance issues. Oversight and direction of audit activities is the responsibility of campaign administrators and implementing partners, and should be factored into the VMMC HCWM plan.

Incident management

An incident management system is used for internal and continuous process improvement at the site level. The system does not replace existing emergency response or problem resolution mechanisms. Rather, it provides a means for avoiding potential problems by identifying weaknesses and planning improvements. The system also offers a mechanism through which existing problems can be analyzed to determine the root cause of the problem and identify corrective actions. Incident management as part of HCWM is not intended to be a stand-alone system. Should your campaign already have a robust incident reporting system in place, you need only integrate HCWM activities into it.

Monitoring, auditing, and incident management are separate processes that can be implemented independent of each other. When fully and correctly implemented, these tools enable campaigns to assess the effectiveness of their HCWM system. Campaigns considering the use of these tools should ensure that each reflects relevant key performance indicators, and suits their program context and objectives prior to implementation. In addition, careful thought should be given to how information collected by the VMMC HCWM monitoring tool, VMMC HCWM audit tools, and incident management tools will flow through the organization and be applied at the various levels of the campaign.

Overview of HCWM quality management processes & tools in the VMMC toolkit

Table 1: Overview of HCWM quality management processes & tools in the VMMC toolkit

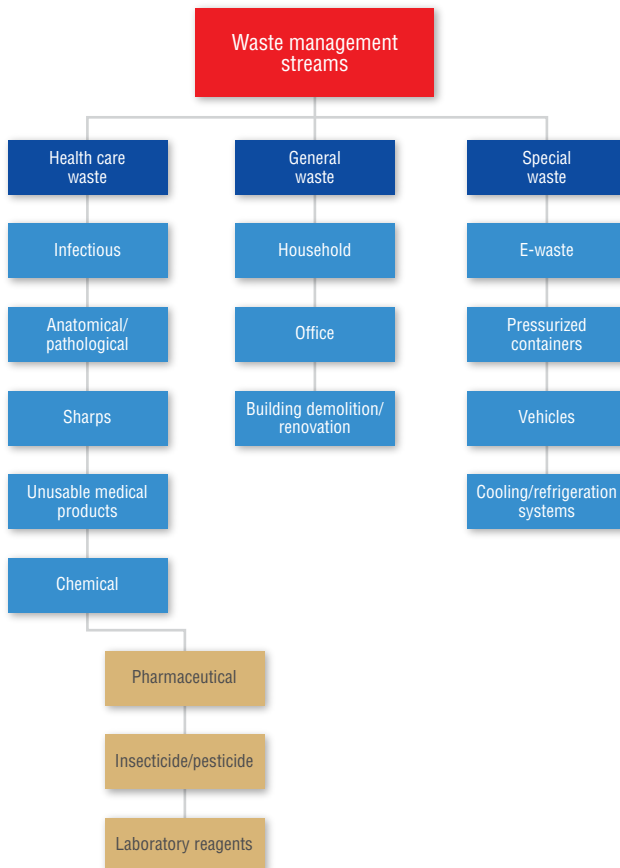
QM process & definition	Resource/tool	Intended users	Target audience	Recommended frequency
<p>MONITORING Systematic collection and analysis of information as a project, program, or campaign progresses</p>	✓VMMC HCWM monitoring tool	✓ Campaign administrators	✓ Campaign sites (health care facility)	✓ Monthly reporting
<p>AUDITING A systematic examination of how well standards and practices are being executed, allowing risks and compliance issues to be addressed.</p>	<ul style="list-style-type: none"> ✓ Site level audit tool ✓ Off-site transport audit tool ✓ Laundry services audit tool (not provided) ✓ Treatment/ destruction audit tool (not provided) ✓ Final disposal audit tool (not provided) 	✓ Campaign administrators	<ul style="list-style-type: none"> ✓ Campaign sites (HCF) ✓ Off-site transport companies ✓ Outsourced laundry services providers ✓ Outsourced treatment/ destruction providers ✓ Outsourced final disposal providers 	<ul style="list-style-type: none"> ✓ Depends on the duration of the campaign ✓ At a minimum, administer at the beginning, mid-point, and near the end-point of the campaign. ✓ For outsourced services, administration may be more frequent and should be informed by initial audit results
<p>INCIDENT MANAGEMENT Activities to identify, analyze, and correct problems and hazards.</p>	<ul style="list-style-type: none"> ✓ Incident report ✓ Incident management tracker log ✓ Incident investigation report (template) 	<ul style="list-style-type: none"> ✓ All site staff ✓ Site managers, infection prevention & control officers, and directors of clinical services 	✓ All site staff	✓ Ongoing/ routine adoption
<p>EVALUATION Analysis of why intended results were or were not achieved.</p>	✓ Results from all QMS tools	✓ Campaign administrators	<ul style="list-style-type: none"> ✓ Implementing partners ✓ Donor community ✓ National governments 	<ul style="list-style-type: none"> ✓ Periodic analysis ✓ If possible, conduct mid-point and end-point evaluations

Waste management defined

Waste management (WM) is a term used to encompass the range of technical initiatives and capacity-building activities aimed at strengthening controls and infrastructure for properly managing different waste streams.

WM includes all streams of waste generated from the VMMC site and special household-/office-related activities that pose a significant risk to the environment, or are vulnerable to misuse or abuse if in the wrong hands. It also includes general waste. Waste management is further subdivided into categories based on the nature of the waste, the risk it poses, and the unique packaging, handling, and treatment/disposal requirements warranted. This document focuses on providing sound solutions for properly managing the waste streams defined below into the three categories: health care waste, special waste, and general waste.

Figure 2. Waste management streams



General waste

This waste is comparable to domestic/municipal/household waste; this type of waste does not pose special handling problems or hazards to human health or to the environment. It comes mostly from the administrative and housekeeping functions at the facility and may also include, but not be limited to, packaging materials, kitchen waste, office waste, and building demolition/renovation waste. General waste will be dealt with by the local municipal waste disposal system (city council) or disposed of in a sanitary landfill/engineered landfill, and/or government-authorized landfill.

Note: When health care waste (HCW) is mixed with general waste, all the waste is considered health care risk waste, as the general waste will be contaminated and therefore rendered hazardous.

Health care waste

Health care waste includes all the streams of waste generated from all health care facilities or health care-related activities that pose a significant risk and are not general waste. Health care waste is further subdivided into categories based on the nature of the waste, the risk posed, and the unique packaging requirements warranted:

Infectious waste (excluding sharps)

This type of waste is assumed to contain pathogens (bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts. It can be human or animal waste.

Anatomical/pathological waste

Anatomical waste (also often referred to as pathological waste) consists of tissues, organs, body parts, blood, and bodily fluids from patients, as well as human fetuses. This category will be considered a subcategory of infectious waste, even though it may also include healthy body parts. Anatomical waste is characteristically wet and heavy, which is why it is separated from other infectious waste.

Sharps waste

Sharps include needles, syringes, scalpels, saws, blades, broken glass, infusion sets, knives, and any other items that can cause cuts or puncture wounds. Sharps waste is characteristically dry, light, and sharp.

Unusable medical products

Unusable medical products include expired, damaged, contaminated, altered, obsolete, or outdated products. They may contain chemicals or other materials which may be vulnerable to misuse or abuse.

Chemical waste

Chemical waste consists of discarded solid, liquid, and gaseous products that contain dangerous or polluting chemicals.

Chemical waste is dealt with in different ways, depending on the chemical in question. Some chemicals can be returned to the manufacturer, while some can be rendered inert or encapsulated. Other chemicals can be diluted and disposed of through a suitably equipped sewage system. Most chemicals can be destroyed in a specialized, high-temperature incinerator with appropriate controls to limit air pollution. For most chemical waste disposal activities, it is recommended to use high-temperature incineration with air emission controls.

Pharmaceutical waste

This subcategory of chemical waste includes expired, unused, spilt, and/or contaminated pharmaceutical products, along with drugs, vaccines, and sera that are no longer usable as medication and need to be disposed of appropriately. This category also includes discarded items used in handling pharmaceuticals, such as bottles or boxes with residues, gloves, masks, connecting tubing, and drug vials.

Insecticide/pesticide waste

This subcategory of chemical waste includes any chemical used to prevent, destroy, or repel pests.

Laboratory reagents

This subcategory of chemical waste is defined as any substance used in laboratories for determinations.

Special waste

Special waste is hazardous and nonhazardous waste that has physical and/or chemical characteristics that are different from infectious, anatomical/pathological, chemical, and general waste and that requires special packaging and/or handling. This section covers extraordinary

items that don't fit into mainstream packaging, and "grey area" waste streams as well. Although special wastes are often a small part of the total quantity of wastes disposed of, they represent an endless variety.

Electronic waste

Electronic waste (also known as e-waste or waste electrical and electronic equipment) describes discarded electronic and electrical devices. Some electronic scrap components, such as cathode ray tubes, may contain contaminants such as lead, cadmium, beryllium, or brominated flame-retardants, and informal processing or incineration of electronic waste can cause major health and pollution problems. Electronic waste is collected where it is routed for specialized recovery, disposal, and/or recycling.

Pressurized containers

Many gasses are stored in pressurized cylinders, cartridges, and/or aerosol cans. Many of these are reusable, but once empty (even those of no further use) may still contain residues. Certain types, notably aerosol cans, must be handled and disposed of with care, for gases in pressurized containers, whether inert or potentially harmful, may cause them to explode if incinerated or accidentally punctured.

Vehicles

Vehicles include cars, trucks, motorcycles, etc. in addition to parts such as tires and batteries, and fluids such as oil. The array of products poses significant challenges to disposal, and licensed agents should be tasked with handling these disposals.

Leachate

Leachate is the liquid that drains or "leaches" from a landfill. It varies widely in composition regarding the age of the landfill and the type of waste that it contains. It usually contains both dissolved and suspended material.

Health care risk waste management best practice

Persons at risk

All individuals exposed to waste are potentially at risk, including those within the health care institutions/facilities/programs that generate health care and special waste, and those outside these sources who either handle such waste or are exposed to it as a consequence of careless waste management. The main groups of people who are at risk of exposure to health hazards associated with waste include, but are not limited to:

- Primary health care practitioners responsible for the VMMC procedures, e.g., doctors, nurses, and assistants
- Warehousing, picking and packing, and maintenance staff
- Visitors to and occupants of the health care facility
- Staff and workers providing support services to and allied with health care facilities, such as pharmacists
- Persons handling and transporting HCW
- Workers and operators of waste treatment and disposal facilities, such as sanitary landfills
- Waste pickers/scavengers
- General public

Exposure to health care waste

Hazards from infectious waste and sharps

Infectious waste may contain any of a great variety of pathogenic organisms. Pathogens in infectious waste may enter the human body by a number of routes, including:

- A puncture, abrasion, or cut in the skin (needle-stick or scratch)
- The mucous membrane (splash)
- Inhalation
- Ingestion

Hazards from chemical

Chemical products may cause poisoning either by acute or by chronic exposure, and injuries such as burns. Poisoning can result from absorption of a chemical or pharmaceutical substance through the skin or the mucous membranes, or from inhalation or ingestion. Injuries to the skin, eyes, or mucous membranes of the airways can be caused

by contact with flammable, corrosive, or reactive chemicals (e.g., formaldehyde and other volatile substances). The most common injuries are burns. Disinfectants such as chlorine and sodium hypochlorite are particularly important members of this group; they are used in large quantities and are corrosive and cause irritation. Reactive chemicals might form highly toxic secondary compounds.

Cytotoxic and radioactive drugs and tracers pose special challenges. Cytotoxic drugs must either be incinerated at high temperatures or mixed with cement and inertized. All radioactive products must be mixed with cement and inertized or be encapsulated.

Hazards from special waste categories

Corrosive materials destroy metal surfaces and living tissues. They can chemically react with whatever they contact. Corrosive substances are acidic (pH less than or equal to 2) or caustic (pH greater than or equal to 12.5).

Reactive materials are very unstable and may react with the substances around them. They may be explosive and may create toxic fumes. Flammable materials will burst into flames if they come into contact with sparks or flames at certain temperatures. The temperature at which this happens is referred to as the flash point. Flammable liquids have a flash point of 140° Fahrenheit. Toxic materials cause immediate or long term negative health problems including injury, illness, or death.

Impacts of waste to public health and the environment

Apart from the risk to staff and others, waste may impact the general public and the environment. The major risks are possible pollution of the air, water, and soil, as well as aesthetic damage. Minimizing risks to public health and the environment requires ensuring sound waste management principles to address waste within all facilities and warehouses. The waste water should all be treated with hypochlorite, which renders it non-infectious and it could then be drained anywhere because the excess hypochlorite decomposes fairly rapidly, especially when exposed to soil.

Chemicals used in facilities are a potential source of water pollution through the sewer system. A chemical waste survey is a prerequisite for developing an effective waste management program. Any hazardous chemical waste generated will be dealt with by a proper chemical waste management system. Substituting chemicals with less noxious, more environmentally friendly alternatives is a recommended practice.

Waste handling, collection, storage, and transport

The practical management of waste involves several key steps:

- Identification of relevant categories/streams
- Segregation and/or color-coding and packaging/containerization
- Storage
- Transportation
- Treatment/destruction
- Final disposal

Table 2. Waste handling flow chart

Step	Location	Waste stream	Key points
0		Waste minimization	Purchasing policy, stock management, and recycling of certain types of waste
1	Inside facility	Generation	
2		Segregation and/or color-coded packaging/containerization	One of the most important steps to reduce risks and amount of hazardous waste
3		Collection	Protective equipment, sealed containers, and specific easy-to-wash trolley
4		Storage	Adequate and lockable, easy-to-clean storage room
5		Treatment/disposal	Disposal of waste per approved treatment and disposal method
6	Outside facility	Off-site transportation	Appropriate vehicle and consignment note; facility is informed about final destination
7		Off-site treatment/disposal	Appropriate vehicle and consignment note to ensure proper handling and transport

Waste segregation and storage

Effective HCW management requires waste minimization, proper identification, and waste segregation. In the past, no incentives were offered to separate, recycle, or reduce waste. Appropriate handling, treatment, and disposal of waste by category results in cost savings and helps protect public health. Segregation at the source remains the responsibility of the waste producer. Segregation should take place as close as possible to where the waste is generated, and the waste should be handled, stored, packaged/containerized, and transported correctly and carefully along its journey from cradle to grave.

Segregation is the process of separating different categories of waste at the point of generation, keeping them isolated from each other for specific reasons and in suitably designed, labeled, and/or color-coded containers/packaging for visual identification. Appropriate resource recovery and recycling techniques can be applied to each separate waste stream. Proper segregation will minimize or reduce the amount of health care waste that needs to be treated, thereby prolonging the operational life of the treatment and disposal facility and conserving resources.

HCW will be placed in clearly marked containers that are appropriately labeled to the country requirements and/or World Health Organization (WHO) standards, and which are suitably designed for the type, nature of, and weight of the waste. Except for sharps and fluids, infectious waste is generally put in good-quality red plastic bags.

Collection and transportation of waste

Proper collection and transport is an important step in waste management. It requires the direct involvement of the facility's core staff (i.e., maintenance services, housekeeping services, and motor pool service staff, as well as the cooperation of all health care staff).

Waste collection practices will be designed to achieve efficient movement of waste from points of generation to storage and/or treatment while minimizing the risk to all staff and the general public.

On-site collection

Waste should not be allowed to accumulate at the point of generation. A program should be established for waste collection and transportation as part of the facility's waste management plan.

The following are recommendations that will be followed by health care staff directly involved in waste handling and collection:

- Waste will be collected frequently and transported to the designated storage site or waste transfer station.
- No bag or container will be removed unless it is closed off correctly (and not overfilled), correctly labeled with the point of generation identified as well as the contents.
- Bags or containers will be replaced immediately with new ones of the same type. Replacement packaging/container stock will be readily available at all locations where waste is produced.

On-site transport

Transportation of waste within the facility may involve different methods depending on the nature of the waste. Workers transporting the waste will be issued appropriate personal protective equipment (PPE), which could include heavy-duty gloves, coveralls, and thick-soled, steel-tipped safety boots/shoes, and will be suitably trained in how to use their PPE.

Off-site transportation of health care waste

The HCW and special waste generator is responsible for the safe packaging and correct labeling of waste to be transported off-site for treatment and disposal. Packaging and labeling will comply with the national regulation governing the transport of special wastes and/or international requirements and must present no danger to the public during transportation. Likewise, waste generators are ultimately responsible for ensuring that their wastes are properly treated and disposed of in an approved and fully compliant treatment/disposal facility.

Transboundary transportation

Hazardous waste, including HCW and special waste, may occasionally need to be transported to another country for treatment and disposal due to lack of appropriate compliant facilities in the home country.

This is permissible provided the receiving country has compliant facilities to deal with the waste in question and there is documentation to demonstrate that the receiving country is willing to receive it.

For more information and guidance, refer to the Basel Convention:

<http://www.basel.int/Portals/4/Basel%20Convention/docs/text/BaselConventionText-e.pdf>

Requirements for packaging and labeling for off-site collection

Waste will be packaged in correctly sealed bags or containers so that waste categories can be visually identified and to prevent spillage

during handling and transportation. Bags or containers will be sufficiently robust to hold their contents safely (e.g., puncture-proof for sharps, resistant to chemicals, etc.) and to endure normal conditions of handling and transportation, such as vibration or changes in temperature, humidity, or atmospheric pressure.

Requirements for off-site collection vehicles

Collection vehicles used to transport waste will not be used for any other materials that could be seriously affected by contamination, such as food, livestock, people, or retail goods. The vehicle will have an enclosed leak-proof body, separate from the cab where the driver and/or load assistant sit, that can be locked to secure the waste. Waste can be loaded directly into a specially designed vehicle, but it is safer first to place the waste in the appropriate container and then to load those into the vehicle.

All waste must be bagged in appropriate colored-coded bags or other special containers when transported. Each package will be marked or coded for easy identification. Containers will be leak-proof and fitted with self-sealing lids, where applicable, to prevent spillage. The design of the collection vehicle will conform to the following:

- The body of the vehicle will be of a size commensurate with the design of the vehicle and the waste that will be carried in the required packaging materials.
- The vehicle will be completely enclosed and secured (open-bed trucks are not allowed), with the driver's seat separated from the waste/goods compartment to prevent coming into contact with waste in a collision/accident.
- A suitable system will be in place for securing the load during transport to prevent toppling and subsequent breakages or spills.
- The vehicle will be easy to clean and the internal surface of the body will be smooth enough for steam cleaning, with all corners/angles rounded. The vehicle will be cleaned at the end of each working day and after any spillage.
- The vehicle will be marked with the name and address of the waste carrier, as well as at least two emergency contact numbers, guaranteed to be answered when called.
- The international biohazard sign will be displayed on the vehicle or container.
- A spill kit and first aid kit will be carried on board in a separate compartment in the vehicle.

Routing

Waste will be transported through the quickest or shortest possible route, which will be planned before the trip begins. After departure from the source, every effort will be made to avoid further handling of the waste. If handling cannot be avoided, it will be pre-arranged and take place in authorized and adequately designed premises. Handling requirements may be specified in the contract established between the waste generator and the transporter.

An efficient and effective collection system route will consider the following:

- Collection schedule either by route or zone
- Assignment of staff responsible for the zone or area
- Logical planning of the route (avoid congested areas)
- Transport scheduled during off-peak hours wherever practical

Waste minimization

Waste minimization is a method that helps facilities reduce the bulk or amount of waste while reducing costs for operating the waste management system and for final treatment/disposal.

Principles of waste minimization

Waste minimization is a management issue rather than a technical one. It depends completely on the commitment of administrative and political authorities and each facility's staff.

Management or administration needs to keep records of waste generated and ensure the availability of data on waste management in facilities/warehouses/projects with written/documented policies to guide waste minimization and the proper training of employees in waste minimization. In keeping with these goals, the waste hierarchy will be used as a guiding principle.

Figure 3. Waste minimization



Reduction at source

Waste generation can be managed or reduced at the source by carefully controlling the procurement of supplies and waste receptacles (green procurement) with a focus on opportunities to minimize waste as well as increase waste awareness of staff.

Reduction at the source focuses on eliminating the use of material with bulk waste so as to result in fewer waste-generating products. An example includes working with suppliers to reduce the use of waste-generating materials such as product packaging.

Reuse

Reusable items should be selected over disposable items whenever it is appropriate, environmentally sound, and practical.

Recycling

Recycling means collecting waste and processing it into something new. Many items in facilities can be recycled. Facilities will critically examine current waste streams and determine what products can be separated at the point of generation for effective recycling. Recycling of nonhazardous paper, metal, glass, and plastics can result in savings for facilities either through reduced disposal costs or payments made by a recycling company.

Segregation

Segregation is the process of separating different wastes at the point of generation/source and keeping them apart during handling, accumulation, intermediate storage, and transportation. Waste should be segregated for several reasons. This process:

- Minimizes the amount of waste that needs to be managed as infectious or hazardous waste (since mixing general waste with infectious or hazardous waste renders the combined amount as infectious or hazardous).
- Facilitates waste minimization by generating a solid waste stream, which can be easily, safely, and cost effectively managed through recycling or composting.
- Reduces the amount of toxic substances released into the environment in the disposal of general waste (e.g., removing mercury from general waste).

- Makes it easier to assess the quantity and composition of different waste streams, thereby allowing health care facilities to obtain baseline data, identify options, determine waste management costs, and assess the effectiveness of waste minimization strategies.

Composting

Composting is another important strategy to minimize waste streams such as food discards, kitchen waste, cardboard, and yard waste. Sufficient land space is required for on-site composting, located far from patient care and public access.

Food scraps can provide most of the nitrogen for the compost, while bulk agents commonly found in hospitals, such as cardboard and wood chips, can provide carbon. Composting techniques range from simple unaerated static piles to vermicomposting. The resulting rich compost can be sold or donated to local farmers and gardeners or used for plants around the health care facility grounds.

Waste treatment technology

Factors in selecting treatment technology

Factors to consider when selecting treatment technology include:

- Treatment efficiency
- Occupational, health and safety, and environmental considerations (quality, safety, health, & environment)
- Volume and mass reduction
- Types and quantity of waste for treatment and disposal/capacity of the system
- Infrastructure and space requirements (investment and operational costs)
- Locally available treatment options for final disposal
- Training requirements for operation of the method (availability of skills)
- Operation and maintenance considerations
- Location of the treatment site and disposal facility
- Social and political acceptability
- Regulatory requirements

Technologies/processes of waste treatment

Types of treatment technology

Treatment technologies are wide-ranging. They include:

- Thermal
- Chemical
- Irradiation
- Biological processes
- Encapsulation
- Inertization
- Pulverization
- Shredding
- Compaction/baling

Definitions of technologies applicable to the VMMC project

The following definitions include information specific to local contexts where VMMC project/program operates, including affordability and availability in local markets, as well as each method's advantages and disadvantages.

Thermal (incineration)

High-temperature incineration with air emission control

High-temperature incineration with air emission control is a method of combusting waste in a multiple-chamber device that has mechanisms for closely monitoring and controlling the combustion parameters (temperatures between 800°C and 1200°C, air emission control equipment, and capacity).

Low-temperature incineration

Low-temperature incineration is a method of combusting waste in a single- or multiple-chamber device that controls burning of solid, liquid, or gaseous combustible wastes to produce gases and residues containing little or no remaining combustible materials.

Autoclaving

Using steam sterilization to render infectious waste harmless is an efficient wet thermal process. This technique has been used for many years in hospitals for sterilizing reusable medical equipment. Autoclaves come in a wide range of sizes. A typical autoclave designed for infectious waste treats about 100 kg per cycle per hour. Autoclaves used in centralized treatment facilities can handle as much as 3,000 kg per cycle.

Chemical disinfection

Chemical disinfection may include physical maceration (shredding and grinding) and is a suitable treatment for small amounts of clinical and related waste. This treatment usually involves the grinding and shredding of waste, which is then soaked in a liquid disinfectant. Agents used include sodium hypochlorite solutions, formaldehyde, chlorine compounds, phenolic compounds, and lime. Chemical disinfection is most suitable in treating blood, urine, stools, and sewage. Care is needed in the use of chemicals, as they pose an occupational hazard (e.g., formaldehyde is a suspected carcinogen and sodium hypochlorite solutions are highly corrosive).

Encapsulation

Encapsulation involves filling containers with waste, adding an immobilizing material, and sealing the containers. The process uses either cubic boxes made of high-density polyethylene or metallic drums. In both cases, 75 percent of the container is filled with HCW and then topped up with a medium, such as plastic foam, bituminous sand, or cement mortar. After the medium has dried, containers are sealed and disposed of in a special landfill site. The process is particularly appropriate for the disposal of sharps and chemical residues. The main advantage of this process is that it is highly effective in reducing the risk of scavengers gaining access to HCW.

Microwave

This technology typically incorporates some type of size reduction device. Waste is being shredded either before or after disinfection. In this process, waste is exposed to microwaves that raise the temperature to 95–100°C (212.0°F) for at least 30 minutes. Microorganisms are destroyed by moist heat, which irreversibly coagulates and denatures enzymes and structural proteins.

The efficiency of microwave disinfection must be checked routinely through bacteriological tests using bacterial spores. The microwave process is widely used in several countries and is becoming more popular.

Biological processes

Biological processes use an enzyme mixture to decontaminate HCW, and the resulting byproduct is put through an extruder to remove water for sewage disposal. The technology is suited for large applications and is also being developed for temperature, pH, enzyme levels, and other variables.

Radiation technology

Ionizing radiation technologies are available to treat certain HCRW. Attention must be given to the type of radiation and to protective measures to mitigate exposing workers to the radioactive source. Consideration must also be given to the disposal of radioactive material.

Inertization

Inertization involves mixing waste with cement and other substances before disposal to minimize the risk of toxic substances contained in the waste migrating into surface water or groundwater. It is especially

suitable for pharmaceuticals and for incineration ashes with a high metal content (in this case, the process is also called “stabilization”).

For inertization of pharmaceutical waste, the packaging is removed, the pharmaceuticals ground, and a mixture of water, lime, and cement added. A homogeneous mass is formed, and cubes (20 kg) or pellets are produced on-site that can then be transported to a suitable storage site. Alternatively, the homogeneous mixture can be transported in a liquid state to a landfill and poured into municipal waste. The following are typical proportions for the mixture:

- 65 percent pharmaceutical waste
- 15 percent lime
- 15 percent cement
- 5 percent water

The process is reasonably inexpensive and can be performed using relatively unsophisticated equipment. Other than staff, the main requirements are a grinder or road roller to crush the pharmaceuticals, a concrete mixer, and supplies of cement, lime, and water.

Inactivation

Inactivation is the process of rendering a VMMC single-use instrument unrecognizable and unusable for its original purpose before disposal (observe health and safety best practices at all times).

Waste disposal systems

Sanitary landfill/engineered landfill

A sanitary landfill is engineered to keep waste isolated from the environment. Appropriate engineering preparations must be completed before the site is allowed to accept waste. Trained staff will be present on-site to control operations and organize deposits and daily coverage of waste. Some essential elements for designing and operating a sanitary landfill are:

- Location away from human habitants (residents), appropriate soil type, and adequate distance away from water sources
- Waste delivery and site vehicle access to the site and its working areas
- Presence of on-site staff capable of effectively controlling daily operations
- Division of the site into manageable phases, appropriately prepared, before the landfill starts
- Adequate sealing of the base and sides of the site to minimize the movement of wastewater (leachate)
- Adequate mechanisms for leachate collection and treatment systems
- Organized deposit of waste in a small area, allowing wastes to be spread, compacted, and covered daily
- Surface water collection trenches around site boundaries
- Construction of final cover to minimize rainwater infiltration when each phase of the landfill is completed

Disposing of treated, unusable medical products, inertized products, encapsulated products, and ash from incinerated products is acceptable. Even sanitary/engineered landfills are not designed to treat hazardous waste. Some types of hazardous wastes can destroy the synthetic liner, making it ineffective. Leachate contaminated with hazardous waste cannot be completely cleaned at the wastewater treatment facilities to which it is sent. Leachate, contaminated by hazardous waste, can potentially enter the water cycle. For this reason, it is recommended to use high-temperature incineration with air emission and ash controls for hazardous waste disposal.

Government-authorized landfill

A government-authorized landfill is a planned land disposal site that incorporates covering waste with sand, soil, or any other convenient materials, with no burning, but with access control, basic record-keeping, and control of waste picking/scavengers. Disposing of untreated, unusable medical products is prohibited. Disposing of medical products through inertization or encapsulation, or disposing of incinerator ash, is acceptable in this instance.

Open, uncontrolled, nonengineered landfill

An open, uncontrolled, nonengineered landfill is an unplanned land disposal site that doesn't provide environmental or public protections for the safe disposal of waste. This does not protect the local environment and therefore should not be used.

Salvage yard/junkyard

A salvage yard/junkyard is a place where unusable vehicles or other machinery is salvaged and processed for resale.

Smelting

Smelting is the process of heating and melting metal for reuse. This method should only be used for the disposal of VMMC stainless steel scrap metal instruments at a government-licensed facility.

Waste categorization, handling, treatment, and disposal processes

Table 3. Waste categorization, handling, treatment, and disposal processes

Waste category	Waste subcategory	Color – coding ^(a)	Label/symbol ^(a)	Container/ packaging	Treatment	Disposal
Health care waste	Infectious waste	Yellow	Biohazard symbol (see section 13.1)	Heavy-duty, leak-proof yellow plastic bag	<ul style="list-style-type: none"> High-temperature incineration with air emission control Low-temperature incineration Chemical disinfection Steam sterilization Microwave radiation 	Waste MUST be treated (ash only): <ul style="list-style-type: none"> Sanitary landfill/engineered landfill Government-authorized landfill
	Anatomical/pathological waste (a)	Red	Biohazard symbol (see section 13.1)	Heavy-duty, leak-proof red plastic bag, UN-certified lined fiber-board box, or red, leak-proof, rigid plastic container	<ul style="list-style-type: none"> High-temperature incineration with air emission control Low-temperature incineration 	Waste MUST be treated (ash only): <ul style="list-style-type: none"> Sanitary landfill / engineered landfill Government-authorized landfill
	Sharps	No color specified (WHO: yellow/white/red /clear)	Biohazard symbol (see section 13.1)	Puncture-proof lined fiber box or rigid plastic container, sealable	<ul style="list-style-type: none"> High-temperature incineration with air emission control Low-temperature incineration Chemical disinfection Steam sterilization Microwave radiation 	Waste MUST be treated (ash only): <ul style="list-style-type: none"> Sanitary landfill/engineered landfill Government-authorized landfill
Unusable medical products	VMMC single-use instrument stainless steel scrap metal	None	Caution symbol (see section 13.1)	Sealable, puncture-proof, UN-certified rigid plastic container or lined fiber box	Step 1: Scrap metal MUST be disinfected Step 2: To meet landfill requirements for option 1: <ul style="list-style-type: none"> Inactivation Encapsulation Option 2: No treatment required; proceed to disposal option 2	Scrap metal MUST be treated before Option 1 disposal: <ul style="list-style-type: none"> Sanitary landfill/engineered landfill Government-authorized landfill
	Unused VMMC single-use consumables (nonsharps)	None	None	Sealable, puncture-proof, UN-certified rigid plastic container or lined fiber box	<ul style="list-style-type: none"> High-temperature incineration with air emission controls Low-temperature incineration Inactivation 	Option 2 disposal: <ul style="list-style-type: none"> Smelting

Waste category	Waste subcategory	Color – coding ^(d)	Label/symbol ^(e)	Container/ packaging	Treatment	Disposal
Unusable medical products (cont.)	Unused VMMC single-use consumables (sharps)	None	Caution symbol (see section 13.1)	Sealable, puncture-proof, UN-certified rigid plastic container or lined fiber box	None	Waste MUST be inactivated before: <ul style="list-style-type: none"> Sanitary landfill/engineered landfill Government-authorized landfill
	Rapid diagnostic test kits	None	Caution symbol (see section 13.1)	Sealable, puncture-proof, UN-certified rigid plastic container or lined fiber box	<ul style="list-style-type: none"> High-temperature incineration with air emission controls 	<ul style="list-style-type: none"> Sanitary landfill/engineered landfill Government-authorized landfill Recycling Smelting
Chemical waste	Pharmaceutical	Brown	Use appropriate hazard label (see section 13.1)	Sealable, puncture-proof, UN-certified rigid plastic container or lined fiber box	<ul style="list-style-type: none"> High-temperature incineration with air emission controls Encapsulation Inertization 	Waste MUST be treated before: <ul style="list-style-type: none"> Sanitary landfill/engineered landfill Government-authorized landfill
	Insecticide/pesticide	Brown	Use appropriate hazard label (see section 13.1)	Sealable, puncture-proof, UN-certified rigid plastic container or lined fiber box	<ul style="list-style-type: none"> High-temperature incineration with air emission controls 	Waste MUST be treated (ash only): <ul style="list-style-type: none"> Government-authorized landfill Sanitary landfill/engineered landfill
	Laboratory reagents	Brown	Use appropriate hazard label (see section 13.1)	Sealable, puncture-proof, UN-certified rigid plastic container or lined fiber box	<ul style="list-style-type: none"> High-temperature incineration with air emission controls 	Waste MUST be treated (ash only): <ul style="list-style-type: none"> Government-authorized landfill Sanitary landfill/engineered landfill
General waste	Household	Black or transparent	None (b)	Good-quality black or transparent bag (c)	None	Waste DOES NOT need to be treated before: <ul style="list-style-type: none"> Sanitary landfill /engineered landfill Government-authorized landfill
	Office	None	Use appropriate hazard label (see section 13.1)	Put into boxes/containers sealed and labeled accordingly	None	Waste DOES NOT need to be treated before: <ul style="list-style-type: none"> Sanitary landfill/engineered landfill Government-authorized landfill

Waste category	Waste subcategory	Color – coding ^(a)	Label/symbol ^(a)	Container/ packaging	Treatment	Disposal
General waste (cont.)	Building demolition/renovation	None	Use appropriate hazard label (see section 13.1)	Put into boxes/containers sealed and labeled accordingly	Before:	Waste DOES NOT need to be treated before: <ul style="list-style-type: none"> Sanitary landfill/engineered landfill Government-authorized landfill
	Electronic waste	None	Labeled e-waste	Put into boxes/containers, sealed and labeled accordingly	None	e-waste CANNOT be landfilled Source a suitable collection facility for recovery, recycling, and/or specialized disposal
Special waste	Pressurized containers	None	Use appropriate hazard label (see section 13.1)	Good-quality bag, container, etc., labeled “waste pressurized containers” or “waste aerosol dispensers”	Treatment NOT required or: <ul style="list-style-type: none"> Encapsulation 	Transport to specialized recovery/hazardous waste landfill
	Vehicles	None	None	None	None	Salvage yard/junkyard
	Cooling/refrigeration systems	None	Use appropriate hazard label (see section 13.1)	None	None	Source a suitable collection facility for recovery, recycling, and/or specialized disposal

(a) Chemical or radioactive solutions containing human or animal anatomical and infectious wastes are considered to be chemical or radioactive waste, respectively.

(b) Black, white, or transparent packaging can be used.

(c) Transparent bag is recommended so that if hazardous waste slips into the general waste stream, it can be easily identified by visual assessment before handling.

(d) Preferred color if no country requirements or policies; color coding is based on WHO guidelines.

(e) Project suggested packaging/containerization.

Developing a waste management plan

Developing a holistic health care waste management (HCWM) plan is critical to implementing a successful voluntary medical male circumcision (VMMC) campaign. The purpose of this section of the guide is to outline six processes for the HCWM activity team in developing a thorough HCWM plan that is customized and integrated into the country's overall VMMC campaign strategy. Each of the following six sections will outline the purpose of each process and the activities needed to complete it.

HCWM activity contexts can vary significantly from country to country. The initial assessment will help determine the full country context. Outputs from the initial assessment will become inputs into many sections of the HCWM plan developed through this guide (see Table 4). These processes should be adapted to fit the unique country and HCWM context. For example, it is likely that HCWM activities already have a budget developed as part of a VMMC campaign proposal. If so, it is perfectly acceptable to use this budget to manage the HCWM activities instead of developing an entirely new budget. However, there might be instances where a budget submitted as part of a proposal does not provide enough detail to manage the HCWM activities effectively.

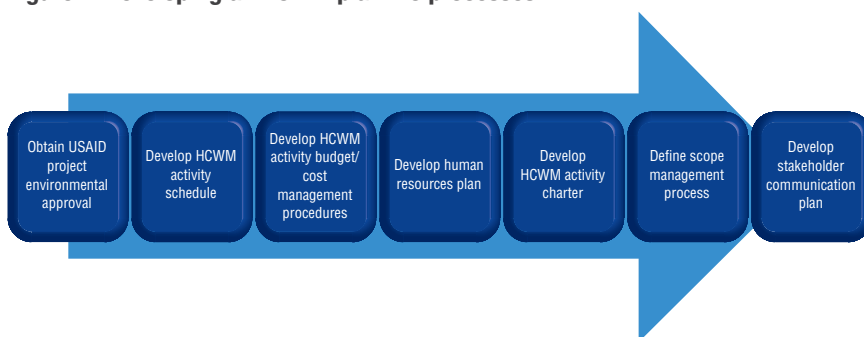
Table 4. Translating results from the initial assessment tool into your HCWM plan

Aspects to be assessed	Reference assessment questionnaires*	Relevance to HCWM plan
1. Sites minimum infrastructure requirements for the use of VMCC reusable MC kits: <ul style="list-style-type: none"> • Public utility requirements • Physical requirements • Supplies / products requirements • Human capacity requirements • Controls 	Infrastructure requirements for reusable MC kits	Provides the design, infrastructure, procurement, and operational qualifications for the use of single or multiple use MC kits
2. Regulatory environment and monitoring requirements related to: <ul style="list-style-type: none"> • HCWM (cradle to grave) guidelines, policies, and standards • Infection control • Labor and occupational health and safety • Procurement of health commodities/equipment • Third-party accreditation or licensing requirements 	Tool A – National level (e.g., Ministry of Health (MoH)) Tool B – Regional/provincial authorities	Backbone to any HCWM plan; compiles existing (by-laws for analysis and ensures HCWM program meets country standards/requirements
3. Non-financial resources available to campaign, including: <ul style="list-style-type: none"> • Staff training mechanisms/certifications • Emergency services (e.g., Post-exposure prophylaxis, fire response, civil police) • Transfer stations • Recycling facilities 	Tool A – National level (e.g., MoH) Tool B – Regional/provincial authorities	Provides campaign management and implementing partners with a sense of the breadth and quality of non-financial resources available and how to access these resources; important for establishing terms of reference with government counterparts and budgeting process
4. Prevailing HCWM practices and infrastructure at potential integrated sites (i.e., health care facility (HCF)): <ul style="list-style-type: none"> • Maturity of HCF management and HCWM policies/processes • Prevailing HCWM and infection control practices • Physical infrastructure conditions (e.g., security/ fencing, temporary storage requirements, power and water supply) • Laundry management practices 	Tool C1 – HCF management and policy Tool C2 – HCF infrastructure and security Tool C3 – HCF occupational health and safety Tool C4 – HCF monitoring and training Tool C5 – HCF HCWM practices and equipment Tool C6 – HCF on-site laundry management	Critical for integrated campaign site selection; used to evaluate and prioritize training needs for HCF staff; pivotal to proper budgeting (e.g., pinpoints what infrastructure needs to be repaired or established); informs choice of treatment/destruction and final disposal technologies; highlights key strengths and weaknesses of HCF HCWM system and practices and its potential for progress
5. Suitability of available service providers, namely: <ul style="list-style-type: none"> • Off-site transport company • Off-site treatment/destruction services • Off-site final disposal services • Off-site laundry services 	Tool D – Off-site transport company Tool E – Off-site treatment/destruction company Tool F – Off-site final disposal company Tool G – Off-site laundry service	Indispensable for service provider selection; in countries where third-party services are limited to none, analyzing the existing market will help the campaign determine the level of investment and trade-offs associated with either strengthening a particular service provider or starting one up

*Referenced tools are available in the *Health care waste management - initial assessment tool*

The HCWM activity manager (the person chosen to oversee implementation of the HCWM plan, who could be the National Clinical Director or other designee) and the rest of the team should always remember that, while they can and should learn from previous HCWM plans in other countries, flexibility is encouraged where differences exist. It is of no value to anyone to complete HCWM activities on time and within budget if the activities do not meet the overall objectives of the HCWM plan. The plan developed through the processes shown in Figure 4 should integrate into the national HCWM context and strategy.

Figure 4. Developing an HCWM plan – 6 processes



Obtain USAID environmental approvals

The purpose of this section is to ensure the project has considered all international, national, and USAID environmental compliance factors.

Obtaining environmental approval consists of the following key steps in a single document, submitted to the USAID Mission and USAID Washington for approval and monitoring. This document includes the following components:

- Environmental monitoring and evaluation plan
- Implementation plan

Environmental mitigation and monitoring plan

To ensure a project's environmental requirements are observed, an EMMP has three major objectives:

- Specify the actions required to meet the environmental requirements of 22 CFR 216 for the project

- Outline indicators or criteria that will be used to monitor whether the mitigation actions are effective and sufficient
- Identify the parties responsible for each action and the schedule for execution

Implementation plan

An implementation plan identifies the critical steps in developing and starting a project. It is a guide or map that helps program staff be proactive rather than reactive in developing their program and identifying any challenges along the way. The implementation plan consists of the following key steps.

- Scope of work
- Project work plan
- Disposal verifications
- Operating licenses
- Health and safety requirements
- Waste inventory list
- Monitoring plan

Developing an HCWM activity schedule

A HCWM activity schedule lays out all activities and milestones for the entire length of the HCWM activities while outlining the dependencies and durations for each activity. With a schedule of activities, dependencies, and durations, the HCWM team can use all resources more effectively by understanding who and what can be used and when and where these resources can be leveraged. An activity schedule also helps the team to demonstrate to key stakeholders its ability to meet and manage deadlines. Also at this stage in the process, the team develops the HCWM activity's site map, illustrating all areas where waste is generated, stored, etc. (e.g., blood-drawing area, operating theater, testing area, or recovery area). The map should be created before starting the two activities for this process described below.

Activities

This process involves two steps: HCWM activity breakdown and schedule management process development. Each step will enable the HCWM activity team to build and manage the HCWM activity schedule.

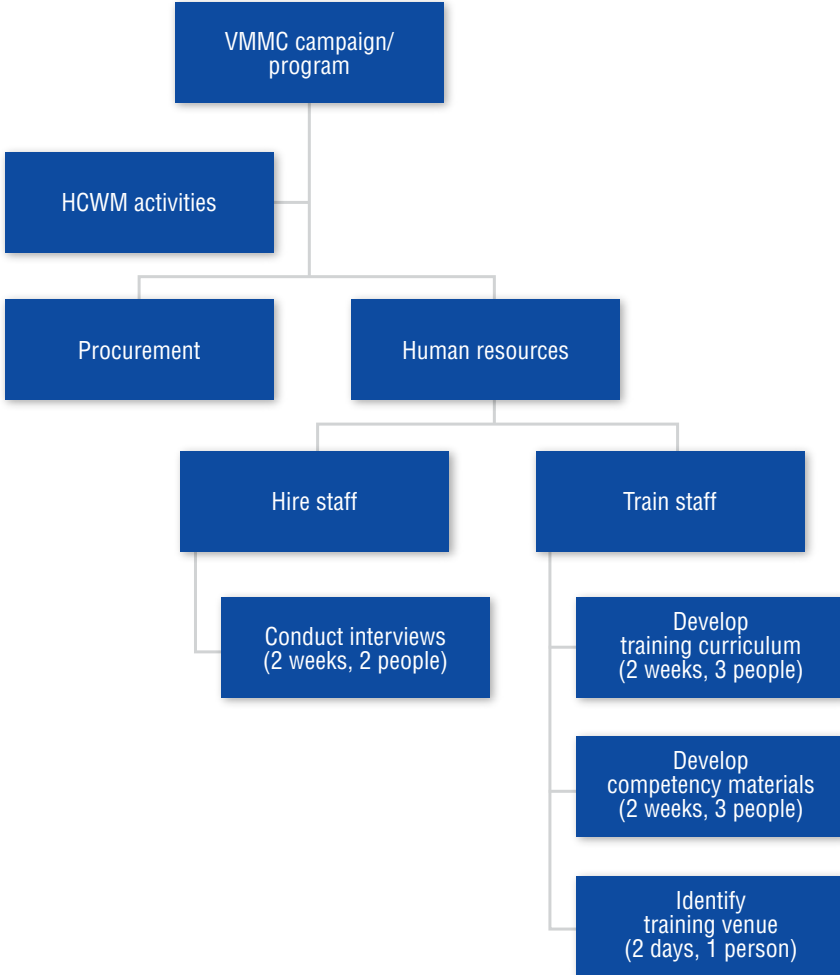
HCWM activity breakdown

This step involves creating a breakdown of each activity and how it relates to other activities (see Figure 4). Each activity should define the following key characteristics:

- Number of people needed to complete the activity
- Activity duration
- Other resources needed to complete the activity
- When an activity should take place
- Estimated cost to complete the activity
- Dependencies of this activity in relation to other HCWM activities (i.e., whether other activities are dependent on an activity ending before they can begin, or vice versa).

This information can be organized in a list, a chart similar to an organogram, or a workflow (see Figure 4 for a sample schedule completed in a list format). This breakdown can best be done first by the HCWM activity manager and then validated with the activity team, which includes the HCWM activity manager and HCWM staff.

Figure 5. Sample HCWM activity breakdown



Once the characteristics of each activity are defined, the HCWM activity manager can develop the activity schedule. To create this schedule, he or she uses the activity characteristics for sequencing the activities into an HCWM activity schedule. The schedule should define start and end dates and key milestones for each HCWM activity, as well as overall start and end dates, and can be created from any level of the HCWM activity breakdown. For example, in the schedule below, only the three high-level activities for staff hiring and staff training are listed, but the workflow clearly outlines more than just these activities. See Annex 2 to build your own activity schedule.

Figure 5. Sample HCWM activity schedule

Activity	Timeline		Calendar											Estimated cost	
	Start date	End date	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	July	Aug		Sep
Procure HCWM commodities	Dec 2015	Sept 2016													\$250,000
Hire HCWM staff	Oct 2015	Jun 2016													\$10,000
Conduct HCWM staff training	Nov 2015	Jul 2016													\$5,600

Schedule management process development

Similar to the scope management process outlined in the section below, the schedule management process gives the HCWM activity manager the ability to effectively control the schedule of HCWM activities and avoid surprises that negatively impact the cost and schedule. Should situations arise that impact the schedule, having a process in place will enable the HCWM activity manager to adjust the schedule accordingly in order to meet HCWM activity target end dates and goals.

The process usually directly involves only the HCWM activity manager, who is responsible for regularly monitoring the schedule. Monitoring can take many forms, the most common being regular reports from staff on the progress of their activities. The manager should regularly follow up with staff members to ensure that they are on track to complete their activities within the allotted timeframe. For example, should the manager become aware that an activity will not be completed on schedule, or will be completed ahead of schedule, the manager should investigate how this situation will impact the rest of the activities remaining on the schedule.

Two questions are key when investigating these situations:

1. Are any other activities dependent on this activity finishing before they can begin?
2. Can resources from another activity be added to the off-schedule activity in order to help complete this activity within the scheduled timeframe?

Once the manager understands the answers, and their consequences, he or she can adjust the schedule accordingly. If the late activity does not have any impact on the overall schedule, then the manager may choose to simply accept late completion of the activity. If it does have an impact, then the manager can possibly use resources from another activity to complete the late activity on time. Regardless of the decision made in this example, the key result is that the team has a process in place for dealing with any schedule changes.

Developing a budget and cost management procedures

With a budget in place for HCWM activities, the HCWM activity manager can better manage costs and ensure that the activities have enough

funds available at all points, from start to finish. Managing according to a defined budget is one of the most important functions of the HCWM activity manager. If the team is managed according to defined budgets, the HCWM activity team is validated in the eyes of stakeholders.

Activities

This process includes two steps, including developing the 1) HCWM activities budget and 2) cost management procedures.

HCWM activities budget

This step involves using each activity's defined characteristics, which were identified during development of the HCWM activity schedule, and combining them into an overall budget. The HCWM activity manager usually performs this task. If it is achieved with careful and thoughtful planning, the budget can serve as a useful tool for the manager to track overall activity status.

Most teams will already have developed a budget due to a funding request, or are given a budget through a national government. In this instance, it may be useful for the team to simply transfer this budget into a format that aligns with the activities. However, it is also possible that this type of direct transfer is not possible and, in these instances, the HCWM activity manager and team should decide the extent to which they will recreate the budget to align with defined activities. Should the manager and team decide that too much work is involved in transferring the budget in this way, it is acceptable to use the budget that is already developed for HCWM activities.

Cost management procedures

Cost management procedures are similar to the schedule management process outlined previously in the HCWM schedule management process section. Ensuring that the HCWM portion of the overall VMMC campaign is operating within its defined budget can be done in several ways. The simplest way is to project the HCWM costs by combining the anticipated future activity costs with the actual activity costs to date and comparing these figures to the total defined HCWM activity budget.

Using this information, the HCWM activity manager will need to manage the activities accordingly.

If the HCWM activity manager finds that the activities are projected to overrun the defined budget, then he or she must take action to ensure that this does not happen. The HCWM activity manager can do this in

multiple ways, such as by eliminating non-essential activities that do not affect quality overall, by seeking more funds, or by eliminating non-essential resources on activities. These are not the only ways a HCWM activity manager can act to ensure the activities operate within budget, but they are commonly used approaches. Each HCWM activity's budget management procedures will likely be different from others', but each team needs to define its own budget management procedures before the start of the HCWM activities.

Developing a human resources plan

The human resources (HR) plan enables the HCWM activity team to determine the appropriate number of staff, ensure that staff members are trained according to HCWM activity standards, ensure that appropriate incentives are in place for activity staff to perform their duties, and delineate the HCWM activity organogram. Developing the HR plan ensures that the resources needed for implementing a successful HCWM plan are in place at the appropriate points during the HCWM activity. Figure 6 provides a sample HCWM activity organogram in which the Director of Clinical Services is serving as the HCWM activity manager. If the country's HCWM team includes different titles, then this process should be customized to match the country and HCWM activity context.

Activities

The HR plan includes four main parts, the HCWM activity 1) hiring plan, 2) training plan, 3) organogram, and 4) HR schedule. Each is described below.

Hiring plan

Once the team has developed the HCWM activity schedule and activity breakdown, the manager will know how many staff members need to be hired, what competency levels are required for each, and when to hire them. Knowing the overall schedule and activities will give the HCWM activity manager a baseline for determining the number of staff members needed during the HCWM activities. This baseline can then be combined with the overall scale of the HCWM activities (i.e., how many sites are involved in the overall HCWM activity), duration of the activities, and any other performance targets to determine the final number of staff to hire for the relevant activities. Using this information, the manager develops a plan to ensure that the team has enough staff for each activity at the appropriate time and place.

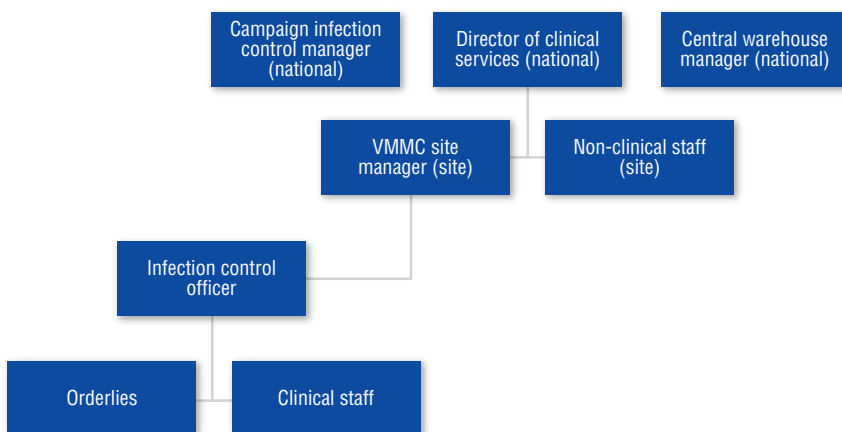
Training plan

The HCWM activity manager develops a plan of when each position in the team will be trained on the appropriate materials referenced elsewhere in this toolkit. Note that not all activity staff need to be trained in every aspect of HCWM. The training plan should take this into account when scheduled training sessions occur and in session content. The training curriculum developed as part of the VMMC HCWM toolkit should serve as a guide for HCWM training activities.

Organogram

The HCWM activity organogram visually illustrates the reporting relationships of each role within the team. Figure 6 provides a sample. While this example pertains to national HCWM activity management, site-specific organograms should also be constructed as part of managing HCWM activities for the entire VMMC campaign.

Figure 6. Sample HCWM activity organogram



HR schedule

Similar to the HCWM activity schedule (see Figure 5), the HR plan shows when each HCWM activity staff member is scheduled for each activity. This schedule is developed in similar fashion to the HCWM activity schedule. The HCWM activity manager uses the activity characteristics that define the number of people needed to complete each activity, the duration of each activity and its dependencies, to sequence each staff member's responsibilities throughout that activity.

Developing an HCWM activity charter

The activity charter formally authorizes the beginning of the HCWM activity by the HCWM sponsor. With this document in hand, the HCWM activity team is assured that it has the backing of its key stakeholders. Furthermore, the activity charter defines the scope of the HCWM activity: who is involved, who is responsible for determining the success of the HCWM activity, and the high-level milestones and schedule for the activity. Figure 7 provides an example of an HCWM activity charter.

Figure 7. Sample HCWM activity charter

1. HCWM activity sponsor	
Name: Joe Johnson	Signature:
2. HCWM activity team	
Name: John Madden Steve Johns Marcus Custis	Role: HCWM activity manager HCWM site manager Orderly
3. HCWM activity description and scope	
The HCWM activities will encompass only the seven sites in the Eastern Cape province funded by USAID. It will not include the other nine sites funded by the Global Fund.	
4. HCWM activity schedule and milestones	
Start Date: August 1, 2015 Midpoint: June 5, 2016 Endpoint: December 12, 2016	
5. High-level HCWM activity budget	
<i>HCWM budget: \$450,000</i>	

As Figure 7 indicates, a HCWM activity charter needs several elements in order to accomplish the charter's purposes:

- **HCWM activity sponsor:** A HCWM activity sponsor is the person(s) who formally authorizes the start and completion of the HCWM activity. With the sponsor's signature, the activity team can formally document the start and finish of its work.
- **HCWM activity team:** This section documents the permanent members of the HCWM activity team and their respective roles.

- **HCWM activity description and scope:** Here, the team can outline clearly the purpose and scope of the HCWM activity. Outlining what is not in the scope of the HCWM activity is just as important as outlining what is in the scope. Scope can be defined in terms of target population, sites, or other criteria the HCWM activity team, sponsor, and stakeholders feel are important.
- **HCWM activity schedule and milestones:** Using the schedule that the HCWM activity team developed previously, the charter provides an overview of key schedule dates (start, midpoint, completion) and any milestones associated with the HCWM activity schedule.
- **High-level HCWM activity budget:** The minimum for this section would be to include the total overall operating budget for the HCWM activity. The budget can also be explained in greater detail in this section. The HCWM activity manager should work with the sponsor to determine appropriate level of detail.

Activities

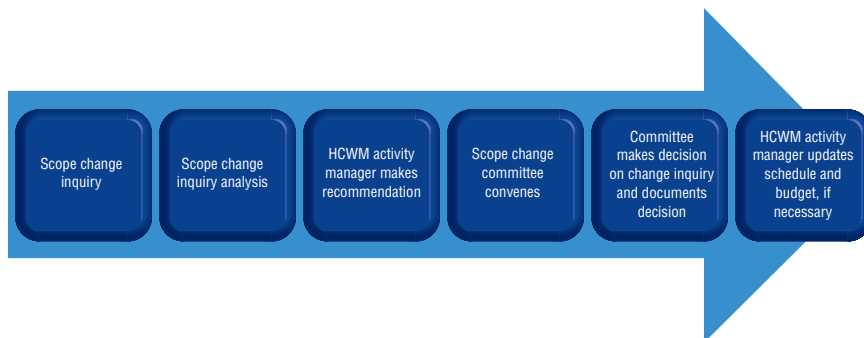
Developing the HCWM activity charter (See Annex 3) is a process involving the HCWM activity manager(s), HCWM activity sponsor(s), and other key stakeholders. This activity can be accomplished in one formal meeting where the HCWM activity manager facilitates a review of the content of the HCWM activity charter that has been prepared beforehand. The HCWM activity manager should focus the meeting and the group, securing consensus on the scope, cost, and schedule of the HCWM activity or activities. Once consensus is achieved, the project sponsor and HCWM activity manager can formally sign the HCWM activity charter. This marks the official start of the HCWM activity.

Developing an HCWM activity scope management process

Using the project charter as a guide, the team develops a process for ensuring that the scope of the HCWM activity is maintained or the expansion/contraction of the scope is managed appropriately. Any defined set of activities always poses the possibility that, if not correctly managed, the scope of the activity can increase or decrease. Increases or decreases in scope will impact all other areas of the plan. For example, the addition of five unplanned VMMC sites to the campaign will likely increase the duration, cost, and number of people involved in the HCWM activity portion. A decrease in the number of planned VMMC sites would have the opposite effect. Because of these impacts, the

team must develop a process to manage any scope changes efficiently. Typically, the HCWM activity manager is responsible for developing and managing this process. Figure 8 provides an example of a scope management process for a HCWM plan.

Figure 8. Sample HCWM activity scope management process



A key part of the scope management process is the scope change committee, who ultimately determines all scope changes. The committee should balance the impact of scope changes according to cost and schedule, keeping in mind the overall mission and goals of the HCWM activity.

Activities

The only activity for the HCWM activity team here is to decide on the process for managing any scope changes that arise during the project. Once this process is in place, the HCWM activity manager can implement the process whenever a scope change is requested and/or noticed.

Developing a stakeholder communication plan

Ensuring active, positive, and productive engagement with stakeholders enables the HCWM activity to manage stakeholder expectations, articulate HCWM activity successes, and directly engage negative publicity concerning the HCWM activities as and when they unfold. Without a plan in place to engage stakeholders, the team will find it difficult to communicate its successes. With a plan in place, the team is assured that internal and external perceptions of HCWM activities are exactly what the team wants them to be, with full buy-in from relevant stakeholders.

Activities

Developing a stakeholder registry matrix uses the data from the initial assessment to identify key HCWM activity stakeholders and determines how and when to communicate with these stakeholders. Table 5 provides a sample HCWM plan stakeholder registry matrix. As the figure indicates, each stakeholder is registered based on level of engagement and level of influence. With this matrix, the HCWM activity manager can tailor specific communication activities to specific stakeholders. For example, a stakeholder with a low level of engagement, but high levels of influence should be engaged differently and with different actions than a stakeholder with a high level of engagement but low influence. See Annex 4 to build your own stakeholder registry matrix.

Table 5. Sample HCWM plan stakeholder registry matrix

Name	Organization	Internal / external	Contact information	Level of engagement	Level of influence	Engagement plan
Joe Bishop	Congress	External	E-mail: Phone: Address:	High	Low	Provide daily reports
Susan Dresser	USAID	Internal	E-mail: Phone: Address:	Low	Mid	Invite to monthly briefing
Manoff Springer	Centers for Disease Control and Prevention	External	E-mail: Phone: Address:	Low	Low	Respond to questions

Wrap-up

Developing a successful health care waste management plan is key to achieving proper HCWM activities. By completing each of the previous processes, the HCWM activity team has a clear roadmap to carry out the activities needed. Ideally, the plan developed with the help of this guide should be integrated into the broader country HCWM activity context and strategy. Plan integration will enable a smoother transition and greater uptake by in-country organizations, as well as higher levels of long-term sustainability.

Figure 8 revisits the process first presented in the introduction of this document. Now that the six processes have been explained, it is easy to see how each process builds on the process before it until the end result is a holistic and wholly integrated HCWM plan, one that enables the VMCM campaign to effectively implement its HCWM activities. However, the process of developing a HCWM plan does not guarantee activity

success. Success requires diligently implementing and managing HCWM activities in accordance with the developed plan. What plan development does guarantee is a proactive rather than reactive approach, ensuring that the team working on HCWM activities has a clear and structured process in place for successfully completing activities.

Health and safety practices

Policy

The health and safety policy will be:

- Specific to the organization/project and the nature of the health risks identified
- Available in a written format, signed by the employer/contractor, and displayed
- Inclusive of commitments to protecting employee health
- Compliant with legislation and other organizational requirements
- Communicated to all employees and interested and affected parties
- Reviewed regularly to ensure relevance

Elements of a proper health and safety program

Risk assessment

A risk assessment needs to be conducted at least every six months. The assessment needs to follow the following basic steps:

1. Identify hazards
2. Assess exposure: who might be harmed and how
3. Assess dose response: evaluate the risk and determine proper precautions
4. Characterize risk: create or review and update the assessment, as needed

Medical surveillance program

A medical surveillance program is the systematic approach for protecting employees/contractors exposed or potentially exposed to occupational hazards. This program monitors individuals for adverse health effects (pre- and post-employment) and determines the effectiveness of exposure prevention strategies. A medical surveillance program includes the analysis of individual and aggregate surveillance data over time, with the goal of reducing and ultimately preventing occupational illness and injury.

The primary purpose of the medical surveillance program is to identify conditions that could lead to occupational disease. The

program also provides compliance with country regulations that require medical monitoring.

For this program to be in place, three stages need to be followed when setting it up:

1. Baseline/replacement medical examination
 - Helps in selecting the right person for the right job
 - Protects the company against future compensation claims
 - Provides important medical baseline data for any future treatment of the employee
2. Periodic medical examination

A periodic medical examination provides valuable information on the health status of the employee that can be evaluated against his/her baseline medical examination. It is recommended that staff be offered counseling and immunization for certain diseases (e.g., hepatitis B and tetanus). Counseling and treatment will also be offered to staff after occupational exposure to blood-borne pathogens (e.g., HIV). It is furthermore recommended that employees who decline immunization, or who do not seroconvert, be advised in writing about the occupational risk associated within their unique work environment.

3. Exit medical examination

This examination will be conducted before a person leaves his or her current job, for whatever reason, so that health status is profiled at the time of departure.

Training

Training should include orientation (induction) of new employees and employees redeployed to other departments, as well as staff training in waste management.

Personal protection program

This program encourages involvement in the selection of personal protective equipment. Equipment maintenance is to be clearly defined and the wearers must be trained.

The waste management program requires that the following PPE be made available to all health care staff who collect and handle waste. This is not an exhaustive list, and the necessity for the items below will depend on the nature of the operation/program:

- Hard hats with or without a visor
- Face masks/shields
- Eye protection/safety goggles if face shields are not offered
- Respirators or dust masks
- Gloves (hand protection)
- Fire-fighting equipment (refer to the legislation)
- Protection against radioactive waste
- Appropriate uniform/work clothes
- Closed protective shoes/footwear

Response to injuries

All staff must be trained to deal with occupational injuries and exposure. A program prescribing the actions to be taken in an incident, injury, or exposure includes (but is not limited to) the following:

- Immediate first aid measures
- An immediate report of the incident to a designated responsible person
- Retention, if possible, of the item involved in the incident, with details of its source for identifying possible infection
- Additional medical attention in an accident and emergency or occupational health department as soon as possible
- Medical surveillance
- Blood or other test if indicated
- Recording of the incident
- Investigation of the incident, and identification and implementation of remedial action to prevent a similar incident in the future

Reporting accidents and incidents

Accidents and incidents, including near-misses, spillage, damaged containers, inappropriate segregation, and any incidents involving sharps must be reported. The report will include the following details:

- The nature of the accident or incident
- The place and time of the accident

- The staff who were directly involved
- Any other relevant circumstances

The responsible person will investigate the cause of the accident or incident, and also take all possible action to prevent recurrence.

Training

Adequate training is a critical step in the process of implementing the VMMC toolkit for health care waste management and achieving an efficient, safe HCWM system. The training program should bring staff at all levels of a VMMC campaign or program to a critical level of competency when it comes to HCWM. The training program should be appropriate for all types of VMMC sites and includes: proper identification; segregation, packaging/containerization and labeling; on-site transport; temporary storage; off-site transport; treatment/ destruction and disposal of HCW.

Training should be conducted before the start of a campaign/program to orient staff in HCWM best practices. All staff members, from clinicians to managers, should attend the comprehensive training program. Even those with previous HCWM experience should participate to ensure that they adopt the latest best practices and understand the standards that will be observed by the campaign/program.

Ultimately, the training curriculum should not only be designed to teach the various components, but also to open dialogue about HCWM between stakeholders and staff, to garner ownership, and to instill commitment to the campaign/program's responsibility for HCWM.

VMMC health care waste management toolkit components

The VMMC toolkit was created to provide guidance on implementing HCWM and environmental hygiene best practices for MC campaigns/programs. Each component of the toolkit is based on SCMS's experience, as well as WHO and South African standards (SANS 10248, in particular), and other international best practices.

The authors strongly believe that standardizing practices is essential for achieving quality services, and for allowing campaigns/programs to learn from each other through knowledge sharing and comparative analysis. At the same time, there are certain aspects of HCWM that require customization, depending on country-specific laws and regulations.

This VMMC HCWM toolkit is designed for staff members and partners of PEPFAR-funded organizations that are planning, implementing, or evaluating VMMC HCWM campaigns.

Tools:

Assessment

- Infrastructure requirements for reusable MC kit
- Initial national and site health care waste management assessment tool

Procurement

- Health care waste management product specifications and requirements

Treatment and disposal

- Disposal of unusable medical products in voluntary medical male circumcision and health intervention campaigns management guide

Quality management system

- Incident management
 - Incident management form
 - Incident management tracker form
 - Investigation form

Monitoring and evaluation





- Audit tool
- Site monitoring tool





Information, education, and communication materials





- Posters
 - Hand washing with liquid soap and clean water
 - How to use alcohol hand rub
 - Hand hygiene
 - Personal protective equipment for waste handlers
 - Personal protective equipment for incinerator operators
 - Injection safety and sharps safety
 - Waste segregation
 - Making chlorine solution from liquid bleach
 - Making chlorine solution from powders
 - Decontaminating reusable metal instruments
 - Wrapping of reusable metal instruments
 - Decontaminating single use instruments
- Environmental health hygiene staff pocket guide
- Health management for voluntary medical male circumcision services training guide
- Environmental health management for voluntary medical male circumcision services site management guide





Annexes

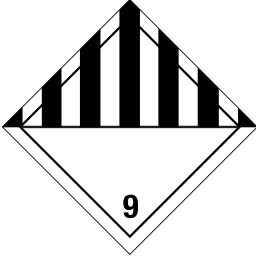
Annex 1: Hazard symbols

Class, division or subsidiary risk	Description	Hazard label
1.1, 1.2, or 1.3	Explosives	
1.4		
1.5		
1.6		
2.1	Flammable gases	
2.2	Non-flammable non-toxic gases	
2.3	Toxic gases	

Class, Division or Subsidiary Risk	Description	Hazard Label
3	<p>Flammable Liquids</p> <p>This class comprises liquids with a closed-cup flash point not exceeding 60.5°C.</p>	
4.1	Flammable Solids	
4.2	Substances liable to spontaneous combustion	
4.3	Substances that, on contact with water, emit flammable gases.	

Class, Division or Subsidiary Risk	Description	Hazard Label
5.1	Oxidizing substances	 <p>A yellow diamond-shaped hazard label with a black border. It features a black flame symbol above the word "OXIDIZER" in bold black capital letters.</p>
5.2	Organic Peroxides	 <p>A yellow diamond-shaped hazard label with a black border. It features a black flame symbol above the words "ORGANIC PEROXIDE" in bold black capital letters.</p>
6.1	Toxic Substances	 <p>A white diamond-shaped hazard label with a black border. It features a black skull and crossbones symbol above the word "TOXIC" in bold black capital letters. Below "TOXIC" is the number "6" in bold black font.</p>
6.2	Infectious Substances	 <p>A white diamond-shaped hazard label with a black border. It features a black biohazard symbol above the words "INFECTIOUS SUBSTANCE" in bold black capital letters. Below this, in smaller black capital letters, is the text "IN CASE OF DAMAGE OR LEAKAGE IMMEDIATELY NOTIFY PUBLIC HEALTH AUTHORITY". At the bottom is the number "6" in bold black font.</p>

Class, Division or Subsidiary Risk	Description	Hazard Label
7	Radioactive Material. This class comprises materials that spontaneously emit ionizing radiation.	
7		
7		
8	Corrosives. This class comprises substances that, by chemical action, cause damage to living tissue, to commonly used metals or to other packaging.	

Class, Division or Subsidiary Risk	Description	Hazard Label
9	<p>Miscellaneous dangerous substances.</p> <p>This class comprises any substance not covered by all the other classes, but that has been or could be shown by experience to be of such dangerous character that the provisions of this class should apply to it.</p>	

Annex 3: HCWM activity charter

1. Campaign Sponsor	
Name:	Signature:
2. Campaign Team	
Name:	Role:
3. Campaign Description and Scope	
4. Campaign Schedule and Milestones	
5. High-level Campaign Budget	

Annex 4: HCWM plan stakeholder registry matrix

Name	Organization	Internal / external	Contact information	Level of engagement	Level of influence	Engagement plan
			E-mail: Phone: Address:			
			E-mail: Phone: Address:			
			E-mail: Phone: Address:			
			E-mail: Phone: Address:			
			E-mail: Phone: Address:			
			E-mail: Phone: Address:			
			E-mail: Phone: Address:			

Terms and definitions

Anatomical waste/ pathological waste: Human tissues, organs or fluids, body parts, and contaminated animal carcasses.

Autoclaving: The method of sterilizing items, e.g., surgical instruments or laboratory waste, using steam under pressure.

Capacity: Refers to the optimal quantity of waste that can be processed in a given time under specified conditions, usually expressed in terms of mass per 24 hours.

Chemical waste: Chemical waste from health care may be hazardous or nonhazardous. It may consist of discarded solid, liquid, and gaseous products that contain dangerous or polluting chemicals (e.g., from diagnostic and experimental work and from cleaning, housekeeping, and disinfecting procedures.) *Examples: pharmaceutical waste, laboratory regents, and pesticides*

Color-coding system: A system for relating the contents of packaging/containers by using different colors.

Containerization: Often used interchangeably with the word “packaging.” Refers to the materials used to wrap and safely contain the relevant waste streams to prevent exposure during transport. *Examples: rigid plastic containers, flexible plastic bags, lined fiber-board box sets, etc.*

Contaminated: State of having been actually or potentially in contact with a contaminant. *Examples: pollutant, radioactivity, chemical, blood, etc.*

Contingency plan: A process of planning ahead to effectively respond to an emergency or unforeseen circumstance.

Disposal: The process of getting rid of or removing something especially by systematic destruction.

Engineered/sanitary landfill: A waste facility in which an engineered method of disposing of solid waste is applied on land in a manner that protects the environment. This is done by spreading the waste in thin layers, compacting it to the smallest practical volume, and covering it with soil by the end of each working day, constructing barriers to collect infiltration, and evacuate the gases produced.

General/non-hazardous waste: Waste that does not pose any particular biological, chemical, radioactive, or physical hazard.

Government-authorized landfill: A planned land disposal site that incorporates covering waste with sand, soil, or any other convenient materials. This site doesn't allow for burning of waste; is access controlled; has basic record-keeping; and has measures in place for waste picking/scavengers. Disposal of untreated, unusable medical commodities and medical products is prohibited. Disposal of inertized or encapsulated materials, or ash from incinerated commodities and products, is acceptable.

Hazard: A danger or risk that has the potential to cause harm.

Hazardous waste: Waste that may have a significant adverse effect on public health and/or the environment by circumstances of use, quantity, concentration, or inherent physical, biological, chemical, or toxicological characteristics.

Hazchem: Hazardous chemical information system used so that in an accident the emergency services will be aware of the correct action to take to minimize risk to people or property.

Health care facility: Place or site where health services are provided to patients. *Examples: laboratory, hospital, clinic, free-standing operating theatre, mobile clinic, and health center.*

Health care waste: All waste generated by health care facilities, including hazardous waste and general waste. Waste that is generated during health care delivery (e.g., during treatment, diagnostics, immunization, or operation) and from patients and visitors.

Identification: The process of visually recognizing relevant health care waste streams at the point of generation.

Implementing partner: A government or nongovernment agency that carries out the work of a larger organization or agency. For the purposes of this PIEE, PFSCM is the implementing partner.

Infectious waste: Waste contaminated with blood and other bodily fluids (e.g., from discarded diagnostic samples), cultures and stocks of infectious agents from laboratory work (e.g., waste from autopsies and infected animals from laboratories), or waste from patients in isolation wards and equipment (e.g., swabs, bandages, and disposable medical devices).

Legacy waste: Waste generated by past activities that is inherited by the party taking responsibility for and action to dispose of it.

Monitoring: Data collection and evaluation for the purpose of environmental assessment.

Municipal waste: Waste that includes goods, containers and packaging, food and garden waste, yard trimmings, and miscellaneous inorganic wastes produced from activities within local government units, which include a combination of domestic, commercial, institutional, and industrial locations.

Packaging: Often used interchangeably with the word “containerization.” Refers to wrapping and safely containing relevant waste streams to prevent exposure during transport (e.g., rigid plastic containers, flexible plastic bags, or lined fiberboard box sets).

Personal protective equipment (PPE): Specialized clothing or equipment worn by employees for protection against hazards (e.g., head protection, goggles/glasses, masks, aprons, gloves, and footwear). This clothing must be taken off and disinfected or disposed of when work with waste is completed.

Pharmaceutical warehouse: Secured, vermin-free, and temperature-controlled storage area able to ensure continued product quality.

Pharmaceutical waste: Waste containing unusable pharmaceuticals.

Recovery: The controlled extraction or retrieval of energy from waste.

Recycle: To separate and process materials from waste for further use as new products or resources.

Re-use: To use articles from the waste stream again for a similar or different purpose without changing the form or properties of the articles.

Segregation: Systematic separation of different wastes into designated categories at the point of generation for subsequent containment, transportation, treatment, and disposal.

Service provider: An institution, agency, or company that has been awarded a contract to provide services.

Sharps waste: Waste that poses a potential risk of injury and infection due to its puncture or cutting properties (e.g., needles, blades, or broken glass). For this reason, sharps are considered one of the most hazardous categories of waste generated during medical activities and must be managed with the utmost care.

Special waste: Hazardous and nonhazardous waste, which has physical characteristics that are different from anatomical/pathological, chemical, and general waste that requires special packaging and/or handling. *Examples: lead, batteries, mercury, pressured containers, and electronic waste.*

Subcontractor: A business or person that carries out work for a company as part of a larger project.

Treatment: Any method, technique, or process designed to change the physical, biological, or chemical character or composition of waste. Also includes any method used to remove, separate, concentrate, or recover hazardous, toxic, or infectious components of waste to reduce the toxicity or infectiousness of the waste and minimize the impact on the environment.

Open, uncontrolled nonengineered landfill: This category of land disposal is probably the most common method used in developing countries. Untreated waste is discharged into an open, uncontrolled, nonengineered pit that does not protect the local environment and therefore cannot be used.

Waste: Unwanted materials.

Waste management: Measures needed to prevent, minimize, or treat and dispose of waste to reduce risk posed by the waste to public health and/or the environment. These measures span the source of waste generation to the final waste disposal (cradle to grave).

Waste treatment facility: Any facility that treats and/or destroys waste.

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