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INJURED CITIZENS AFTER THE MAGNITUDE 7.8 EARTHQUAKE IN APRIL 2015. DOCTORS AND NURSES AT THE HOSPITAL TREATED APPROXIMATELY 700 PATIENTS AND PERFORMED 300 SURGERIES WITHIN THE FIRST 24 HOURS OF THE NATURAL DISASTER. PHOTO CREDIT: KASHISH DAS SHRESTHA, USAID

# SECTOR ENVIRONMENTAL GUIDELINE: HEALTHCARE WASTE

## Partial Update 2024 | Full Update 2019

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# ABOUT THIS DOCUMENT AND THE SECTOR ENVIRONMENTAL GUIDELINES

USAID has developed sector-specific environmental and social guidance to support activity design, pre-implementation environmental review (including the identification of potential impacts and the design of mitigation and monitoring measures), and the development of environmental mitigation and monitoring plans. **This document presents USAID's Sector Environmental Guidelines – Healthcare Waste.** The Sector Environmental Guidelines for all sectors are accessible at USAID's Sector Environmental Guidelines & Resources webpage.

**Purpose.** The purpose of the SEGs is to support environmentally and socially sound design and management of common USAID sectoral development activities by providing concise, plain-language information regarding:

- The typical, potential adverse impacts of activities in these sectors, including impacts related to environmental, social, and climate change;
- How to prevent or otherwise mitigate these impacts, both in the form of general activity design guidance and specific design, construction, and operating measures;
- How to minimize the vulnerability of activities to climate change, as well as the contributions of activities to climate change;
- How to minimize social impacts and maximize the benefits to beneficiaries and the local community in an equitable manner; and
- More detailed resources for further exploration of these issues

**Environmental Procedures.** USAID's mandatory environmental procedures, as described in Automated Directives System (ADS) 204, require that the potential adverse impacts of USAID-funded and managed activities be assessed prior to implementation via the Environmental Impact Assessment (EIA) process defined by 22 Code of Federal Regulations (CFR), Part 216 (Reg. 216)[1]. They also require that the environmental management/mitigation measures identified by this process be written into award documents, implemented over the life of projects, and monitored for compliance and sufficiency.

The procedures are USAID's principal mechanism to ensure environmentally sound design and management of USAID-funded activities and, thus, protect environmental resources, biodiversity, ecosystems, ecosystem services, and the health and livelihoods of beneficiaries and other affected groups. These procedures strengthen and sustain development outcomes and help safeguard the good name and reputation of USAID.

The Sector Environmental Guidelines (SEGs) directly support environmental compliance by providing the information that is essential to assessing the potential impacts of activities and helping identify and design appropriate mitigation and monitoring measures, as necessary and appropriate, based on capabilities.

However, they are not specific to USAID's environmental procedures. They are generally written and are intended to support the EIA of these activities by all actors, regardless of the specific

[1] USAID. 1980. Reg. 216 (22 CFR 216). https://www.usaid.gov/environmental-procedures/laws-regulations-policies/22-cfr-216.

environmental requirements, regulations, or processes that may apply.

**Limitations.** This document serves as an introductory tool for Agency staff and Implementing Partners dealing with healthcare waste within projects, programs, and activities. This document is not intended to act as a complete compendium of all potential impacts because contextual information is critical for determining those impacts. Furthermore, the SEGs are not a substitute for detailed sources of technical information or design manuals. Users are expected to refer to the accompanying list of resources and references for additional information, as well as other resources not included in this document. Related cross-cutting guidelines and resources may also be found in the following SEGs: *Construction*, *Small Healthcare Facilities*, *Solid Waste*, *Water Supply and Sanitation*, and *Livestock*.

**USAID Guidelines Superseded.** This Sector Environmental Guidelines replaces Sector Environmental Guidelines: Healthcare Waste SEG (2019).

**Comments and Corrections.** Each SEG is a work in progress. Comments, corrections, and suggested additions are welcome. Email: environmentalcompliancesupport@usaid.gov.

**Advisory.** The Sector Environmental Guidelines are advisory only. They are not official USAID regulatory guidance or policy. Following the practices and approaches outlined in the Sector Environmental Guidelines does not necessarily ensure compliance with USAID environmental procedures or host country environmental requirements.

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# LIST OF ACRONYMS

| | |
|---|---|
| ADS | Automated Directives System |
| AOR | Agreement Officer's Representative |
| BEO | Bureau Environmental Officer |
| CBOs | Community-Based Organizations |
| CDC | Centers for Disease Control and Prevention |
| CDR | Compulsory Displacement and Resettlement |
| CEMS | Continuous Emissions Monitoring System |
| CFR | Code of Federal Regulations |
| COR | Contracting Officer's Representative |
| CRM | Climate Risk Management |
| EA | Environmental Assessment |
| ECOS | Environmental Compliance Support |
| EIA | Environmental Impact Assessment |
| EIS | Environmental Impact Statement |
| EJ | Environmental Justice |
| EMMP | Environmental Mitigation and Monitoring Plan |
| EMMR | Environmental Mitigation and Monitoring Report |
| ESIA | Environmental and Social Impact Assessment |
| FEFO | First Expired, First Out |
| FPIC | Free, Prior and Informed Consent |
| FP/RH | Family Planning/Reproductive Health |
| GHG | Greenhouse Gas |
| GHS | Globally Harmonized System |
| GHSA | Global Health Security Agenda |
| GHSC | Global Health Supply Chain |
| HCV | Hepatitis C Virus |
| HCW | Healthcare Waste |
| HCWM | Healthcare Waste Management |
| HEPA | High-Efficiency Particulate Air [filter] |
| HIV/AIDS | Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome |
| IEE | Initial Environmental Examination |
| IFC | International Finance Corporation |
| ILO | International Labor Organization |
| IP | Implementing Partner |
| IPC | Infection Prevention and Control |
| IWMP | Integrated Waste Management Plan |
| LGBTQI+ | Lesbian, Gay, Bisexual, Transgender, Queer, and Intersex |
| MCH | Maternal and Child Health |
| MEL: | Monitoring, Evaluation, and Learning |
| MEOs | Mission Environmental Officers |
| NGO | Non-Governmental Organization |
| NTD | Neglected Tropical Diseases |
| OECD | Organization for Economic Cooperation and Development |
| PAD | Project Appraisal Document |
| PDCA | Plan-Do-Check-Act |
| PEPFAR | U.S. President's Emergency Plan for AIDS Relief |
| PMI | President's Malaria Initiative |
| POP | Persistent Organic Pollutant |
| PPE | Personal Protective Equipment |

| | |
|---|---|
| PRO-IP | Promoting the Rights of Indigenous Peoples |
| PVC | Polyvinyl Chloride |
| RCEs | Requests for Categorical Exclusion |
| RTK | Rapid Test Kit |
| SBCC | Social and Behavior Change Communication |
| SDS | Safety Data Sheet |
| SEG | Sector Environmental Guideline |
| SEP | Stakeholder Engagement Plan |
| SOPs | Standard Operating Procedures |
| TB | Tuberculosis |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| USAID | United States Agency for International Development |
| VMMC | Voluntary Medical Male Circumcision |
| WASH | Water, Sanitation, and Hygiene |
| WHO | World Health Organization |

# 1. USING THESE GUIDELINES

The primary intended audiences for this guideline are USAID Project Design Teams, Agreement Officer's Representatives/Contracting Officer's Representatives (AORs/CORs) and Implementing Partners (IPs). The secondary intended audience consists of other USAID staff with design, monitoring and evaluation, and environmental compliance responsibilities, as well as other actors involved in the design, implementation, and monitoring of development activities in the healthcare sector. Brief recommendations on the use of the guidelines for these user groups are provided below.

**AGENCY TECHNICAL OR PROGRAM OFFICE STAFF**, who are designing or providing technical expertise to colleagues and Missions on healthcare projects and activities, may find Sections 2 through 6 to be most useful. These sections establish the framework for healthcare waste management (HCWM) for USAID actions, including typical types of waste, potential negative environmental and social impacts, and climate change considerations. Staff may also benefit from using the annexes when supporting or evaluating healthcare interventions.

**PROJECT DESIGN TEAMS, AORs/CORs, AND ACTIVITY MANAGERS** must work together with their IPs to address healthcare waste management (HCWM) throughout the project life cycle—from project planning and procurement through disposal and closeout. They can use all sections of this SEG to help guide them through these processes and to ensure that HCWM systems are developed and implemented to suit the size, scope, and complexity of their programs. In particular, the discussion of the Integrated Waste Management Plan (IWMP) template in Section 7.1.3 can help guide these stakeholders in determining whether their IPs have adequately considered and prepared for HCW issues.

**IN-COUNTRY AND REGIONAL MISSION STAFF**, such as in-country Activity Managers, Mission Environmental Officers (MEOs), and Environmental Compliance Officers, will find Sections  through  useful for project and activity design, including key elements to address in Initial Environmental Examinations (IEEs). Section 7 and Annex 4 will be most useful for the oversight of IPs in planning, monitoring, and reporting on environmental mitigation measures during project implementation. These users may likely benefit from the IWMP template guidance in Section 7.1.3 in their oversight capacity as well.

**IPs** will benefit from the project and activity design guidance provided throughout the SEG, especially the mitigation and monitoring elements of Section 7, as well as the tools provided in the annexes. This guidance may be useful at various stages, including the development of work plans, activity planning, and/or the development of Environmental Mitigation and Monitoring Plans (EMMPs) and IWMPs. The References and Resources sections may also be useful for this group of users as they search for more assistance with specific issues or locations.

**IPs** submit the Environmental Mitigation and Monitoring Report (EMMR), which is an extremely important document. It is a key tool for evaluating the effectiveness of environmental mitigation measures implemented during a project and provides an overview of the project and its potential environmental impacts. The report provides details on the specific actions taken to minimize or avoid environmental harm caused by the project. It refers to the Environmental Mitigation and Monitoring Plan (EMMP) established beforehand. EMMRs are typically submitted regularly, often annually, to relevant authorities or funding agencies, such as USAID. These reports are vital tools for ensuring that projects comply with environmental regulations and that mitigation efforts are achieving their intended results.

This SEG is intended to describe the basic elements of sound HCWM to assist with the design and implementation of global health programs, while also providing a list of technical resources and references for further assistance. Developers of environmental documents, such as IEEs, for USAID projects or activities will benefit from referring to this SEG throughout the project life cycle to improve compliance with applicable environmental requirements. However, document developers should also consult with host country authorities to understand local laws, regulations, and capabilities related to HCWM.

During project planning and design, potential waste streams should be identified and evaluated to adequately consider treatment and disposal requirements and feasibility before conducting any activities, including procurement. Such considerations may effect a change in project design early on to help mitigate environmental impacts before they occur, including minimizing the amount of waste generated and, ultimately, encouraging more sustainable healthcare interventions worldwide. Examples of project and activity design elements related to healthcare programs, as well as how to safely and effectively mitigate potential impacts, are discussed in further detail in Section 6, Section 7, and Annex 4 .

# 2. THE POLICY CONTEXT AND USAID PROGRAMMING IN HEALTHCARE

USAID projects to improve healthcare are subject to the conditions stated in international, domestic, and Agency-specific agreements, guidelines, regulations, and policies in order to ensure that environmental impacts are minimized and projects are sustainable. Key examples are referenced below. Additional resources are available in the References and Resources sections.

## 1.1 INTERNATIONAL CONVENTIONS AND AGREEMENTS

- *Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal* – This international convention is aimed at protecting human health and the environment against the adverse effects of hazardous waste by controlling the movement of waste across national borders. Its scope covers a wide range of waste defined as "hazardous waste" based on their origin and/or composition and characteristics, as well as two types of waste defined as "other waste" (household waste and incinerator ash). Parties to the Convention may not import waste from, or export waste to, non-parties, except where a separate agreement exists to govern that transboundary movement. While the United States is not yet a party to the Basel Convention, it does participate in another legally binding agreement on the transboundary movement of waste termed the *Organization for Economic Cooperation and Development (OECD) Council Decision on the Control of Transboundary Movements of Wastes Destined for Recovery Operations*, which is discussed below.

- *OECD Council Decision on the Control of Transboundary Movements of Wastes* – The Council Decision established the OECD Control System, which aims to facilitate the environmentally sound and economically efficient trade of recyclables by establishing two types of control procedures using a risk- based approach. The **Green Control Procedure** does not establish any controls other than those normally applied in commercial transactions for waste representing a low risk for human health and the environment. The **Amber Control Procedure** establishes controls for waste presenting sufficient risk to justify their control. Regardless of whether waste is on the Green list or Amber list, it will not benefit from simplified control procedures if it is exported outside the OECD area.

- *Stockholm Convention on Persistent Organic Pollutants* – This global treaty is aimed at protecting human health and the environment from chemicals known as persistent organic pollutants (POPs). POPs remain intact in the environment for long periods, become widely distributed geographically, accumulate in the fatty tissue of humans and wildlife, and have harmful impacts on human health and the environment. Currently, the Stockholm Convention controls 22 POPs that fall into three general categories: certain pesticide-related substances, certain industrial chemicals (e.g., polychlorinated biphenyls), and certain unintentionally produced substances (e.g., dioxins and furans). Article 5 of the Convention requires parties to reduce or eliminate the release of unintentionally produced POPs, especially dioxins and furans, which are often produced and released into the air as a result of the use of healthcare waste (HCW) incinerators. While the United States is not yet a party to the Stockholm Convention, which entered into enforcement in 2004, it has signed other POP-related agreements and has supported initiatives for the reduction of POPs.

- *Minamata Convention on Mercury* – This multilateral environmental agreement is aimed at reducing global mercury pollution over time by controlling specific human activities that contribute to global mercury pollution. Such activities include conducting waste incineration, artisanal and small-scale gold mining, operating coal-fired power plants and coal-fired industrial boilers, the manufacturing of mercury-containing products (e.g., batteries, lights, cosmetics, medical devices, dental amalgams), and other manufacturing operations. The Minamata Convention became legally binding for all of its parties on August 16, 2017 after passing the 50-ratification milestone required for it to enter into force. The United States accepted the Minamata Convention on June 11, 2013. Of particular relevance to healthcare projects, Article 4 of the convention calls for the phasing out of mercury-containing products and antiseptics, as well as mercury sphygmomanometers and thermometers used in healthcare facilities.

## 1.2 U.S. GOVERNING FRAMEWORK

- *Foreign Assistance Act of 1961 as amended, Section 117—Environment and Natural Resources* – This section requires USAID to utilize an Environmental Impact Assessment (EIA) process to evaluate the potential impact of USAID's activities on the environment prior to implementation, and to "fully take into account" environmental sustainability in designing and carrying out its development programs. It states, "Special efforts shall be made to maintain, and where possible, restore the land, vegetation, water, wildlife, and other resources upon which depend economic growth and human well-being, especially that of the poor."

- *PEPFAR's Five-year Strategy Fulling America's Promise to End the HIV/AIDS Pandemic by 2030* – This strategy reaffirms the U.S. Government's leadership and commitment, through the U.S. President's Emergency Plan for AIDS Relief (PEPFAR), to support HIV/AIDS efforts in more than 50 countries, ensuring access to services by all populations, including the most vulnerable and at-risk groups.

- *USAID's Global Tuberculosis (TB) Strategy: 2023-2030* – This strategy lays out how the U.S. Government will direct and coordinate its investments in the global fight against TB between 2023 and 2030. Led by USAID and implemented by and involving several agencies, efforts focus on diagnosis, treatment, and control of TB (including multi-drug-resistant and extensively drug-resistant TB) and on research. The United States is also a donor to the Global Drug Facility of the Stop TB Partnership, which is a global network of public and private entities working to eliminate TB.

- *President's Malaria Initiative (PMI) Strategy (2026)* – The updated PMI strategy continues efforts begun in 2005 with the goal of malaria eradication. PMI programs, overseen by USAID's U.S. Global Malaria Coordinator and implemented by USAID and the Centers for Disease Control and Prevention (CDC), focus on expanding coverage of four key high-impact interventions: (1) artemisinin-based combination therapy, (2) intermittent preventive treatment in pregnancy, (3) indoor residual spraying with insecticides, and (4) insecticide-treated mosquito nets.

- *Global Health Security Agenda (GHSA)* – The GHSA was launched in February 2014 and endorsed by the Group of Seven (G7) to advance a world that is safe and secure from infectious disease threats; bring together nations from all over the world to make new, concrete commitments; and elevate global health security as a national leaders-

level priority. The United States contributes to the global effort through USAID, the U.S. Department of Health and Human Services, CDC, the U.S. Department of Defense, and others, working with ministries of health, agriculture, environment, and other key stakeholders to detect viruses with pandemic potential, improve laboratory capacity to support surveillance, strengthen national and local capacities to respond in an appropriate and timely manner, and provide education on ways to prevent exposure to dangerous pathogens.

### 2.3 USAID STRATEGY AND PROGRAMMING

- Agency Sustainability Plan – As part of this plan, USAID is committed to "pursuing waste management strategies that include reducing, reusing, and recycling." USAID's sustainability program also emphasizes the procurement of "energy-efficient and environmentally preferable electronic products and utilizing sound environmental practices when disposing of those products."

- *USAID Neglected Tropical Diseases (NTD) Program* – The NTD Program began in 2006, primarily focusing on seven diseases: lymphatic filariasis, blinding trachoma, onchocerciasis, schistosomiasis, and three soil-transmitted helminths that could be eliminated or controlled through community-wide administration of safe and effective medicines. The donation of pharmaceuticals by companies has enabled USAID to focus its support on distributing these medicines to communities around the world and evaluating progress toward the elimination of these diseases.

- *USAID Family Planning/Reproductive Health (FP/RH) Program* – FP/RH activities encompass a wide range of services with the objective of assisting countries in providing sustainable access to quality voluntary FP/RH services, commodities, and information that enhance efforts to reduce high-risk pregnancies; allow sufficient time between pregnancies; provide information, counseling, and access to condoms to prevent HIV transmission; reduce the number of abortions; support women's rights; and stabilize population growth.

- *USAID Maternal and Child Health (MCH) Program* – MCH activities aim to improve equal access to and use of services by vulnerable populations; bring to scale a range of high-impact interventions that mitigate maternal, newborn, and under-5 deaths; prevent and address the indirect causes of such deaths (such as HIV, TB, and malaria); strengthen the integration of maternal healthcare services with FP; and strengthen healthcare systems. Additionally, some water, sanitation, and hygiene (WASH) activities are part of the environmental health efforts within the USAID MCH Program.

- *22 Code of Federal Regulations (CFR) 216 (Reg. 216)* – Reg. 216 is a U.S. federal regulation that defines USAID's pre-implementation Environmental Impact Assessment (EIA) process for all its programs, projects, activities, and amendments. It was developed in response to a 1975 Court Order. The EIA process outlined by the regulation results in documentation such as Requests for Categorical Exclusion (RCEs), Initial Environmental Examinations (IEEs), and Environmental Assessments (EAs). The regulation is intended to implement the requirements of the National Environmental Policy Act of 1970. More information on the law can be found at https://ceq.doe.gov/index.html.

# 2. OVERVIEW OF THE HEALTHCARE WASTE SECTOR

Small-scale healthcare activities (e.g., rural health posts, immunization posts, reproductive health posts, mobile healthcare clinics, emergency healthcare programs, urban clinics, small hospitals) provide important and often critical healthcare services to individuals and communities that would otherwise have little or no access to such services. However, appropriate management of associated waste from these services and facilities is limited, especially in developing countries.

It is common practice to dispose of healthcare waste (HCW) along with general solid waste and to bury HCW without prior treatment. Some HCW generators may burn waste in dedicated on-site incinerators but often fail to operate them properly. Others use small-scale incinerators or less effective treatment options, such as open burn pits or burn barrels, resulting in toxic air, including greenhouse gas (GHG) emissions, and smoke. Unwanted/expired pharmaceuticals and chemicals may be commingled with general waste or improperly dumped, sometimes into local wastewater systems, including sewage collection systems, septic tanks, or latrines.

Improper management of HCW poses risks to both the environment and human health. These risks include the potential for disease transmission, physical injury, air pollution (including higher levels of GHG emissions), soil pollution, water pollution, and fish and wildlife impacts, as well as social impacts. Lack of resources, infrastructure, and training to properly manage HCW are common in developing countries. It is important for USAID and Implementing Partners (IPs) to take into consideration host country policies, laws, operational norms, and management constraints to integrate feasible waste management practices throughout the project life cycle.

To understand the nature of HCW management issues related to USAID projects and activities, it is important to understand the scope of the healthcare interventions conducted by USAID.

### CASE STUDY: SPREAD OF INFECTED HYPODERMIC NEEDLES IN INDIA THROUGH INFORMAL RECYCLING

In 2004, Ramaiah Medical College in Bangalore was considered the best HCW program operating in India. Despite this, it was reported that 9 out of 10 hypodermic needles packaged and sold in Indian drug stores and pharmacies for home use had trace elements of organic materials or chemicals from previous uses, resulting in potential health risks. The high demand for hypodermics at that time created a market for used hypodermics, and informal recyclers (or "waste scavengers") began combing waste dumps for them because they could be sold for a high price. This is one example of how uncontrolled disposal of HCW can create health risks.

Source: Iyengar, V., and M. R. Islam. 2017. "Biomedical, Sharps and General Waste Disposal in India: Potential for the Spread of Contagious Diseases and Serious Environmental Contamination." *Universal Journal of Public Health, 5*(5):271–274. DOI: 10.13189/ujph. 2017.050509. https://www.hrpub.org/download/20170830/UJPH9-17609703.pdf

These interventions typically include the following:

- Provision of public health commodities (e.g., pharmaceuticals, anti-retroviral medication, family planning supplies, medical supplies);
- Direct provision of healthcare service delivery (e.g., volunteering medical male circumcision, vaccinations, medical evaluations, maternal and child healthcare

services);

- Capacity building for healthcare providers (e.g., nurses, doctors) and healthcare education;
- Capacity building for healthcare institutions (e.g., non-governmental organizations [NGOs], clinics, hospitals);
- Capacity building for healthcare delivery and management systems above the facility level, which may engage host country government institutions and agencies at the district, regional, or national levels, as well as private, NGO, and faith-based healthcare networks; and
- Construction, expansion, rehabilitation, and/or upgrade of new or existing healthcare and healthcare supply chain facilities.

**SUPPLEMENTING THIS SEG**

Where appropriate, references and links are provided to the other SEGs that supplement the information covered in this SEG. In particular, the following:

- **Solid Waste SEG** provides an overview of the nonhazardous solid waste management sector, including systems for reducing, collecting, treating, and disposing of waste. It provides guidance on planning and implementing such systems.
- **Small Healthcare Facilities SEG** provides more information about waste generated as a result of the construction, rehabilitation, and operation of small-scale healthcare clinics or hospitals.
- **Construction SEG** provides guidance on managing waste generated as a result of the design, siting, building, maintenance, occupation, and use of infrastructure developed as part of USAID's construction portfolio. This includes the management of asbestos and lead waste.
- **Water Supply and Sanitation SEG** discusses the public health importance of potable water and sanitation projects, including the proper management of wastewater.
- **Livestock SEG** addresses veterinary or livestock waste issues.

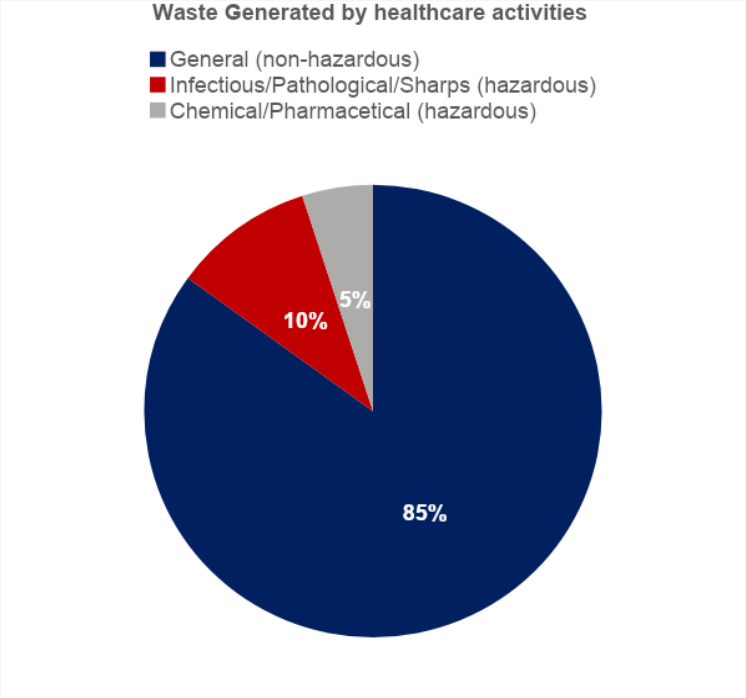
The  section of this SEG provides tools for the safe management of waste associated with vector control activities (e.g., empty pesticide containers from activities to combat the spread of malaria-spreading mosquitos) under the heading "Vector Control Waste Management."

These SEGs can be found at https://www.usaid.gov/environmental-procedures/sectoral-environmental-social-best-practices/sector-environmental-guidelines-resources.

## 2.1 TYPES OF HEALTHCARE WASTE

The World Health Organization's (WHO) Safe Management of Wastes from Health-Care Activities Handbook[2] reports that, regardless of the scope or scale, healthcare activities will typically generate waste that consists of approximately 75% to 90% "nonhazardous" or general waste (see Figure 1). Nonhazardous waste is waste that has not been in contact with infectious agents, hazardous chemicals, or radioactive substances, and, therefore, is considered safe for management with regular municipal solid waste and does not require special handling. HCW includes all waste generated within healthcare facilities, research centers, and laboratories. Of the waste produced by healthcare providers, 85% is considered nonhazardous (general waste). (i.e., the infectious/pathological/sharps and chemical/pharmaceutical indicated in Figure 1).

**FIGURE 1. TWO MAJOR CATEGORIES OF HEALTHCARE WASTE**




**Nonhazardous/General Waste.** Nonhazardous waste is waste that has not been in contact with infectious agents, hazardous chemicals, or radioactive substances. Nonhazardous HCW does not require special handling and includes items such as packaging, unwanted paper, and food.



**Hazardous Waste.** Hazardous waste is waste that has been in contact with infectious, sharps, pathological, and chemical waste and, therefore, must be specially managed to prevent adverse impacts on human health and the environment.

**Radioactive.** For information regarding each of these types of waste, including examples and suggested management methods, refer to .

## 2.2 WASTE MANAGEMENT HIERARCHY

Healthcare programs can achieve safe and effective management of their waste, both hazardous and nonhazardous, through a variety of methods. Some methods are preferable and are ranked in what is known as the "waste management hierarchy" (see Figure 2). Prevention and reduction of the amount of waste generated (i.e., waste minimization) typically sit at the top of this hierarchy, while treatment and disposal sit on the bottom. The basis for the hierarchy is

[2] WHO. 2014. "Safe management of wastes from health-care activities, Second edition." [Chartier, Y., J. Emmanuel, U. Pieper, A. Prüss, P. Rushbrook, R. Stringer, W. Townend, S. Wilburn and R. Zghondi (eds).] ISBN 978 92 4 154856 4. https://www.who.int/water_sanitation_health/publications/wastemanag/en/.

that decreasing the amount of waste that requires treatment and disposal helps avoid negative impacts on human health and the environment, such as respiratory illnesses due to air pollution or contamination of groundwater and surface water.

In the middle of the waste management hierarchy, there are reuse, recycling, and recovery options, which have varying degrees of benefit and feasibility in the development context. Additionally, certain types of waste, such as pathological waste or expired pharmaceuticals, cannot be reused or recycled. Refer to Section 6.5 of WHO's Safe Management of Wastes from Health-Care Activities Handbook for further information on these practices. Section 3 of the Solid Waste SEG provides additional discussion of the waste management hierarchy.

**FIGURE 2. WASTE MANAGEMENT HIERCHY**


### 3.2.1 WASTE MINIMIZATION

Waste minimization is the most preferable approach to reducing the negative impacts of HCW. Waste minimization may be performed "at the source" (i.e., where it is generated); however, it should also be implemented at the procurement stage, including considering green purchasing and adapting inventory management strategies. Table 1 presents examples of some waste minimization practices.

**TABLE 1. WASTE MINIMIZATION PRACTICES**

| EXAMPLES OF WASTE MINIMIZATION PRACTICES | DESCRIPTION OF PRACTICES |
|---|---|
| Hazardous Chemical Use Minimization | Implement management and control measures to promote the minimization of hazardous chemical usage (e.g., centralized purchasing of hazardous chemicals, use of chemical inventories and Safety Data Sheets (SDS)/Globally Harmonized System (GHS) classifications to monitor usage and disposal, switching to less hazardous chemicals or physical cleaning methods). |
| Inventory Management | Practice sound inventory management to reduce the generation of chemical and pharmaceutical waste due to expiration. Good practices include more frequent deliveries of smaller amounts of inventory rather than one-time, large deliveries; application of "first expired, first out" (FEFO) practices to use the oldest batches of products first to avoid expired stockpiles; and/or encouragement of beneficiaries to use all contents of medicine containers before discarding. |

### 3.2.2 WASTE TREATMENT AND DISPOSAL

Waste treatment and/or disposal should be considered after waste minimization, reuse, recycling, and recovery. There are a variety of treatment and disposal methods available for HCW, including mechanical processes (e.g., shredders); steam-based technologies (e.g., autoclaves); chemical, dry heat, or microwave treatments; encapsulation; incineration; and sanitary landfills.

The choice of HCW treatment and/or disposal technology depends on local conditions and other considerations, such as the following:

- Relevant host country regulations and requirements (e.g., a ban on incineration);
- Available resources, including technical expertise (e.g., the operation of some technologies requires a high degree of training/education);
- Waste characteristics and volume (e.g., hazardous versus nonhazardous, small versus large quantities);
- Safety and environmental factors (e.g., proximity to sensitive ecosystems); and
- Cost considerations (e.g., shipping fees, customs fees, operating and fuel expenses, transportation fees, decommissioning expenses).

Section 6 further discusses planning for HCW treatment and disposal, and presents an analysis of different treatment and disposal methods.

## 2.3 GENERAL PRINCIPLES FOR SUSTAINABLE HEALTHCARE WASTE MANAGEMENT

Sustainable HCWM interventions should be based on the size and complexity of a project or facility, as well as the resources available for waste management. Adopting just a few key practices can dramatically reduce risk; protect the environment; and improve the health and safety of healthcare workers, patients, and the local community. To successfully implement the

waste management hierarchy and ensure the effective long-term management of waste, generators of HCW should strive to follow these guiding principles:

1. Ensure that **waste minimization, recycling, and reuse opportunities** are considered during project planning. Refer to
2. **TABLE 1** for examples of waste minimization practices.
3. Ensure that **funding for waste management** is included in the project or facility's budget.
4. Develop and implement an effective **Integrated Waste Management Plan (IWMP) or comparable standard operating procedures (SOPs)** that cover waste management aspects, including waste minimization, classification, segregation, recycling, and treatment/disposal.
5. Define and communicate the **roles and responsibilities** of affected personnel within the waste management process, including healthcare providers.
6. Provide **training and capacity building for healthcare providers** on topics related to HCW management, including occupational health and safety, such as the following:

    a. **Personal hygiene**—Ensure that soap/water or hand sanitizer are readily available, and healthcare workers are appropriately trained on best practices.

    b. **Sharps handling**—Ensure that sharps boxes (or alternatives) are readily available and that healthcare workers are adequately trained to segregate waste and avoid the risks associated with needlestick injuries.

    c. **Personal Protective Equipment (PPE)**—Ensure that healthcare workers receive and are trained on using the required PPE for their respective jobs, such as thick gloves and aprons for staff who handle HCW.

    d. **Vaccinations**—Ensure that healthcare workers receive the required vaccinations, depending on their roles and responsibilities (e.g., Hepatitis B vaccinations for all healthcare workers at risk of exposure to blood).

    e. **Accident response**—Ensure healthcare workers understand accident reporting procedures and post-prophylaxis requirements for accidents, such as needlestick injuries. Develop and implement an accident mitigation procedure.

    f. **Provision of supplies**—Ensure that adequate supplies for waste collection, storage, treatment, and disposal are provided, as appropriate.

    g. **Environmental best practices**—Promote environmental best practices,

**MINIMUM CONSIDERATIONS FOR W MANAGEMENT BUDGETING**

- Sharps containers or safety boxes
- Bins and/or bags of different colors for hazardous and nonhazardous waste segregation
- Waste handling, PPE, and cleaning supplies
- Treatment and disposal processes
- Repairs and maintenance
- Healthcare workers (e.g., waste handlers, transporters)
- Program development and training

such as waste treatment technologies and the sustainable procurement of goods and supplies, where possible.

Refer to Annex 3 for a checklist template to assist with developing a sustainable HCW management program based on the guiding principles listed above.

In areas with scarce resources, such as remote or disaster-stricken locations, it may not be possible to strictly adhere to these guiding principles. In such cases, WHO recommends employing minimal approaches to HCWM; for example, pharmaceutical and chemical waste should be safely stored until an appropriate disposal method has been identified. Project teams should consult with their Bureau's or Mission's Environmental Officer (BEO or MEO) for assistance with identifying alternative options for managing waste. Section 6 of this SEG provides further discussion on adaptive management and provide treatment and disposal options for various types of HCW.

**HCWM IN EMERGENCY OR DISASTER RESPONSE SCENARIOS**

In emergency or disaster response scenarios, some USAID projects or activities may be exempt from the Initial Environmental Examination (IEE) process. However, these exemptions are typically reserved for exceptional circumstances that meet specific criteria defined under 22 CFR 216. Activities that do not meet these criteria must follow the IEE process, including planning for, mitigating, and monitoring adverse impacts from the generation of healthcare waste. Resources that are applicable to emergency or disaster response are provided in the Resources section under *Emergency or Disaster Response Scenarios*.

# 3. POTENTIAL ADVERSE IMPACTS OF IMPROPER HEALTHCARE WASTE MANAGEMENT (HCWM)

HCWM activities can directly affect the environment, human health, and local communities in a variety of ways. The potential adverse impacts of inadequate HCWM include disease transmission, physical injury, air pollution, soil pollution, water pollution, and social impacts. These impacts can result from the improper management and handling of healthcare waste (HCW) during generation, transportation, storage, treatment, and disposal. More information about these adverse impacts is presented below and in .

## 3.1 DISEASE TRANSMISSION

Hazardous HCW, including infectious, pathological, and sharps waste, may contain infectious agents that can transmit disease to those who encounter it. Infectious agents include bacteria (e.g., cholera, *E. coli*), viruses (e.g., Hepatitis B, HIV), and parasites (e.g., giardia, lice) that can cause disease transmission in humans or animals. Individuals exposed to these infectious agents can develop serious and even fatal illnesses. Healthcare workers and those handling and managing HCW are at the highest risk of exposure. Infectious agents can enter the body through punctures, breaks in the skin, inhalation, or ingestion. Providing awareness training to affected workers and using appropriate personal protective equipment (PPE) are important first steps for minimizing this risk. There are many documented cases of individuals handling HCW without appropriate PPE and then contracting serious illnesses, including Hepatitis B, HIV/AIDS, or heavy metal poisoning (e.g., due to exposure to mercury from broken thermometers).

If HCW is not stored, transported, treated, and/or disposed of properly, there is an increased risk of disease transmission for healthcare patients, visitors, healthcare workers, and the general public. Unsegregated, improperly stored, treated, and/or improperly disposed of infectious and sharps waste can spread disease through inadvertent contact made by healthcare workers, patients, or individuals in the local community (e.g., children playing near or in an unsecured HCW burial pit). Another common occurrence in many developing countries is people scavenging in unsecured landfills/burial pits for contaminated, used syringes in order to re-sell or re-use them.

Trash, including sharps waste, lays in an open landfill near a residential area. Photo credit: Adeel Saeed

Such people are at high risk for disease transmission. Similarly, foraging animals, both domesticated and feral, are at high risk for disease transmission when not inhibited from entering these sites and becoming exposed to infectious waste.

Another example of poor HCWM that can lead to disease transmission is improper treatment (e.g., incineration). When infectious waste is not incinerated at the proper temperature, or for an appropriate amount of time, this partial combustion may fail to eliminate the infectious agents present in the waste. In some cases, it may be safer to manage such waste using alternative means rather than through partial combustion. Waste handlers, or others who come in contact with partially combusted waste, may not know that the waste is still infectious and they are at risk of contracting diseases.

**CASE STUDY: SPREAD OF HEPATITIS C AMONG EGYPT'S WASTE COLLECTORS**

Mismanagement of healthcare waste in Egypt has led to increased disease transmission, especially the Hepatitis C virus (HCV), and threatens public health. Egypt produces almost 4 million tons of medical waste per year, and a lack of adequate incinerators and education/awareness of the importance of proper waste management has contributed to the spread of disease. In particular, Cairo's main informal garbage collection community, known as the Zabaleen, experiences high infection rates, especially HCV. According to WHO, "HCV kills an estimated 40,000 Egyptians a year, and at least 1 in 10 of the population aged 15 to 59 is infected." Local NGOs have launched grassroots initiatives, aiming to segregate waste on-site, direct waste to appropriate facilities, and provide medical help to individuals who have contracted diseases from improper healthcare waste management.

Source: El Dirini, A. Shorthand Social. 2017. *Medical Waste in Cairo: Impact and Health Problems.* #Cairo BioHazards. https://social.shorthand.com/AlaaDirini/nyRRut9223/medical-waste-in-cairo-impact-and-health-problems#:~:text=Medical%20waste%20has%20a%20daunting%20nature%20and%20poses,of%20these%20is%20the%20contraction%20of%20infectious%20diseases.

### 3.2 PHYSICAL INJURY

Physical injuries can occur when HCW is poorly managed. Individuals exposed to sharps, including needles, scalpels, razors, or broken glass, are at risk of puncture wounds, severe cuts, abrasions, and increased risk of exposure to pathogens. Examples of improper sharps management include overfilling or not using puncture-proof storage containers, not segregating sharps waste from other waste streams, or handling sharps without proper PPE.

Physical injuries can also occur when chemical waste is improperly handled. Depending on the type of chemical (e.g., corrosive, toxic, reactive), exposed individuals can experience chemical burns, headaches, and/or respiratory illness. One example of a common healthcare chemical is formaldehyde. Individuals handling formaldehyde waste without the appropriate PPE can be exposed through inhalation or skin contact. This exposure can cause individuals to experience respiratory irritation, skin irritation, and/or cancer, if exposed for longer periods.

Physical injury may also occur when HCW is improperly stored, treated, or disposed of. If waste containers are overfilled or become too heavy, individuals transporting or treating the waste may experience back or muscle strain. Workers responsible for the operation of treatment equipment, such as incinerators, compactors, or grinders, can experience physical injuries and respiratory complications if such equipment is not properly operated. Workers handling ash disposal from incinerators without appropriate PPE, for example, can be exposed to physical injuries due to exposure to heavy metals and other toxins contained in the ash.

### 3.3 AIR POLLUTION

Absent appropriate controls, air pollution may occur when hazardous HCW, including chemicals, pharmaceuticals, plastics, or heavy metals, are openly burned or incinerated, causing particulates, toxic gases, or other pollutants to be released into the air. The use of a continuous emissions monitoring system (CEMS), for example, can be used by incinerator operators (or remotely by regulatory agencies) to help ensure ongoing environmental compliance of air emissions with local laws and applicable permit requirements.[3] If HCW is landfilled, decomposing organic components can release GHGs such as methane and carbon dioxide, which are primary contributors to climate change. Incineration of HCW also releases GHGs, including carbon dioxide and nitrous oxide, and other toxic fumes. Air pollution, in the form of toxic fumes, can also occur when containers of certain chemical waste (e.g., solvents, formaldehyde, alcohols) are left open and the contents are allowed to evaporate into the air. Lack of awareness or training for the waste handlers who are managing these HCW streams can lead to improper waste segregation and, ultimately, these materials being left in open containers, burned, or incinerated improperly.

Individuals exposed to air pollutants from improper HCWM may have an increased risk of respiratory diseases, cardiovascular diseases, birth defects, and/or cancer. Toxic gases pose a significant health risk to individuals working or living near treatment sites. Air pollution and the associated health risks are greatly increased when incinerators used to treat HCW are poorly maintained or operated or when unsuitable materials, such as polyvinyl chloride (PVC) plastics, are burned.

Proper PPE is crucial for individuals handling waste and operating incinerators to reduce the associated risks, including physical injury or the inhalation of exhaust. Photo Credit: Scott Ackerson

### 3.4 SOIL POLLUTION

Soil pollution may occur when hazardous HCW, including chemicals, pharmaceuticals, incineration ash, or infectious waste, is disposed of in unlined landfills or pits, accidentally spilled, or stored on permeable ground surfaces. Soil pollution can also occur when smoke and ash from waste burning or treatment activities are not controlled and settle on surrounding areas. If waste is not properly segregated prior to incineration, incinerators are not operated properly, or waste is only partially combusted prior to final disposal, the risk of soil and water pollution is increased.

HCW can accumulate and contaminate the soil over a period of time, which can then contaminate crops or groundwater and increase the risk of disease transmission, inhibit the growth of plants, or contribute to the degradation of animal habitats. Decreased plant growth and diversity can also reduce biomass and the soil sequestration of carbon dioxide from the atmosphere, resulting in higher GHG emissions. Heavy metals, such as mercury, lead, or

[3] U.S. EPA. 2018. *Basic Information about Air Emissions Monitoring.* https://www.epa.gov/air-emissions-monitoring-knowledge-base/basic-information-about-air-emissions-monitoring.

cadmium, are commonly present in areas where soil has been contaminated from incinerator ash disposal or other HCW, such as medical devices (e.g., thermometers, catheters), batteries used in medical devices, and chemical reagents. Heavy metal contamination of soil can pose a risk of disease and neurological effects for individuals, especially children, who come in contact with the soil.

### 3.5 WATER POLLUTION

Water pollution may occur when untreated water containing hazardous HCW, including infectious waste and heavy metals, enters surface water or groundwater. Untreated or improperly treated hazardous HCW discharged to the sanitary sewer system (e.g., via sinks, toilets, floor drains or directly where no sewer systems exist) can ultimately enter surface waterbodies, storm drains, ditches, or other conveyances and affect natural surface waterbodies (e.g., streams, ponds). Illegal dumping of HCW in or near surface waterbodies can also contribute to water pollution. Additionally, the leachate from polluted soil can contaminate groundwater and surface water.

A waterway is visibly contaminated with waste. Photo Credit: USAID

When HCW is disposed of in low-lying areas, there is the chance of waste being leached into the soil and nearby waterbodies. The risk of infection increases when wastewater treatment systems and drinking water treatment systems are not equipped to adequately neutralize and remove HCW contaminants (e.g., pharmaceuticals, chemicals, infectious agents) from the effluent. Water contaminated by waste chemicals, pharmaceuticals, or heavy metals can inhibit plant growth and degrade the habitats of water fauna. Individuals exposed to polluted water are at an increased risk of disease transmission and epidemic outbreaks.

# 4. SOCIAL CONSIDERATIONS

The potential exists for adverse and unintended negative social impacts as a result of projects that generate healthcare waste (HCW). USAID is committed to integrating stakeholders' voices, concerns, perspectives, and values as a form of acquiring feedback and input on a proposed project to identify potential social impacts early on and make sound decisions during the design and planning phase. As indicated in the adjacent textbox, per ADS 201, USAID requires an initial screen of potential social impacts.

**SOCIAL IMPACT RISK INITIAL SCREENING (SIRS) TOOL**

Per the June 2024 update to ADS Chapter 201 Program Cycle Operational Policy, USAID design teams must conduct an initial screening of the social impact of their Activities and Programs using the Social Impact Risk Initial Screening and Diagnostic Tools (ADS 201mbf).[4] The Social Impact Risk Initial Screening (SIRS)[5] Tool is intended to help USAID design teams plan for, mitigate, and monitor potential adverse social impacts from USAID Activities and Programs. The Tool consists of 10 questions designed to kickstart mandatory analytical thinking about a variety of different potential adverse social impacts and help identify when additional social safeguarding is needed. Additional social safeguarding may include redesigning Activity/Program components or concepts, identifying social impact mitigation measures, or conducting additional analyses, such as a Social Impact Assessment. When filling out the Tool, design teams should only check "no" when they are highly certain that there is no potential for an adverse impact. The complexity of the process for completing the Tool will vary based on the severity of social impacts posed by the Activity/Program.

USAID's visions, policies, and strategies call for a participatory process that safeguards against doing harm to its beneficiaries. This process includes ensuring meaningful stakeholder engagement from government, communities, and individuals to assure that USAID's international development efforts benefit all members of society, particularly marginalized and underrepresented groups and/or people in vulnerable situations.

Stakeholder engagement is critical for ensuring that USAID maintains accountability to program participants by ensuring the active participation of local communities, developing mitigation measures that include participants' voices, as well as ensuring that affected individuals and communities can communicate their concerns through USAID's Accountability Mechanism.[6] Given the importance of stakeholder engagement for fostering a successful project, the project may benefit from sustaining this engagement throughout the entire project life.

Just as environmental compliance measures under 22 Code of Federal Regulations (CFR) 216[7] seeks to avoid, minimize, and mitigate impacts, including projects that generate HCW, social impacts should be assessed to determine whether there has been a change from baseline conditions for individuals and communities resulting from a USAID project. Furthermore, there may be pre-existing adverse conditions in a local community prior to a USAID-funded activity, which should be taken into consideration to maximize benefit sharing so that proposed USAID-funded activities minimize unintended social consequences, such as impacts on a person's

[4] USAID. 2024. "Social Impact Risk Initial Screening and Diagnostic Tools. A Mandatory Reference for ADS Chapter 201." https://www.usaid.gov/sites/default/files/2024-05/201mbf_051424.pdf.
[5] Ibid.
[6] The USAID Social, Economic, and Environmental Accountability Mechanism (SEE-AM) is expected to be formally launched in summer 2024. The SEE-AM offers communities and project participants to report adverse social, economic, or environmental impacts caused by USAID-funded activities. Complaints and questions can be submitted to disclosures@usaid.gov.
[7] USAID. 1980. Reg. 216 (22 CFR 216). https://www.usaid.gov/environmental-procedures/laws-regulations-policies/22-cfr-216.

livelihood, economic activities, traditional vocations, land or property rights, access to natural resources, culture and customs, and health and well-being.

### 4.1 KEY SOCIAL IMPACTS

This section is organized according to the principles presented in USAID's Voluntary Social Impacts Principles Framework.[8] The Voluntary Social Impact Principles Framework encompasses nine principles for considering and assessing potential social risks and social impacts across USAID programs, projects, and activities. Table 2 summarizes the nine principles. For additional information on the nine Principles, see the USAID Voluntary Social Impact Principles Framework. The subsequent sections present an illustrative list of potential social impacts pertaining to projects that generate HCW that Missions and/or Implementing Partners (IPs) should consider.

**TABLE 2: USAID SOCIAL IMPACT PRINCIPLES**

| | PRINCIPLE | DESCRIPTION |
|---|---|---|
| 1 | Indigenous Peoples | Indigenous Peoples are a distinct cultural, linguistic, and social group with historical continuity, collective attachment to surrounding natural resources, and/or commitment to maintaining ancestral systems. Specific actions are required of USAID programs involving Indigenous Peoples. |
| 2 | Cultural Heritage | Cultural heritage is part of every culture and is found all over the world. It includes archaeological sites, historic buildings, artifacts, and natural environments inherited from past generations as well as intangible knowledge and practices. Working in areas with cultural heritage or on cultural heritage projects can have consequences beyond just the destruction of an important resource and can also offer a potential means of positively engaging with communities. |
| 3 | Land Tenure, Displacement, and Resettlement | Land tenure is associated with acquiring and managing the rights to land. Land use change may lead to compulsory displacement, resettlement, and/or the loss of access to and/or use of land and natural resources, which should be avoided and minimized to reduce the social impacts on affected landholders, tenants, community members, and pastoralists, among other groups. Failure to account for and respect the land and resource rights of local community members can cause costly delays, work stoppages, protests, and, in some cases, violence. USAID may face legal actions and suffer financial, brand, or reputational harm. |
| 4 | Health, Well-Being, and Safety | Health, well-being, and safety is safeguarding against potential physical, psycho-social, and health impacts among project staff, program participants, and communities where USAID actions are implemented. Individual USAID actions must account for potential occupational health and safety risks, as well as potential uneven socioeconomic gains across affected communities/program participants, to avoid unintended consequences. |
| 5 | Working with Security Personnel | Cognizance of the unique challenges involved in engaging and working with security personnel prioritizes a rights-based approach to ensure respect for and the safety of individuals and local communities. Without |

[8] USAID. 2024. "Voluntary Social Impact Principles Framework."https://www.usaid.gov/environmental-procedures/environmental-compliance-esdm-program-cycle/social-impact-assessment.

| | | |
|---|---|---|
| | | transparent and accountable oversight of the rule of law, the risk of potential human rights violations increases. |
| 6 | Conflict Dynamics | Attentiveness to the operational context in relation to past and present conflicts as well as sensitivity around the role that a USAID action has in shaping the conflict landscape. Poor understanding of conflict dynamics increases the possibility of contributing to or exacerbating conflict. |
| 7 | Inclusive Development | Inclusive development is an equitable development approach built on the understanding that every individual and community, of all diverse identities and experiences, is instrumental in the transformation of their own societies, which means providing them with the opportunity to be included, express their voices, and exercise their rights in activities and public decisions that impact their lives. Inclusion is key to aid effectiveness. Nondiscrimination is the basic foundation of USAID's inclusive development approach. |
| 8 | Environmental Justice | Environmental Justice (EJ) is the fair treatment and meaningful engagement throughout the project life cycle of marginalized and underrepresented groups and/or people in vulnerable situations, with respect to environmental and/or health impacts and implementation and enforcement of environmental laws. It includes the protection of marginalized and underrepresented groups that may face enhanced vulnerability due to environmental harms caused by any action or activity. Marginalized and underrepresented groups and/or people in vulnerable situations may include (but are not limited to): Indigenous Peoples, LGBTQI+ persons, persons with disabilities, children and other youth, older persons, women, low-income populations, and all disadvantaged and marginalized communities across race, color, gender, or national origin. |
| 9 | Labor | The Labor principle focuses on advancing worker empowerment, rights, and labor standards through programming, policies, and partnerships to advance sustainable development outcomes. USAID recognizes the high risk of labor abuses that may result from programming, and, thus, USAID works to establish and strengthen labor protections (including social protections) that align with internationally recognized worker rights. This principle includes the promotion of safe and healthy work environments; respecting the principles of freedom of association and collective bargaining; the elimination of forced labor and the worst forms of child labor; and the protection from discrimination at work. |

### 5.1.1 INDIGENOUS PEOPLES

When a Mission /or IPs are identifying stakeholders, it is important to ascertain whether Indigenous Peoples are present in or nearby the project footprint. Indigenous Peoples may be unintentionally impacted and are particularly vulnerable to negative impacts of proposed projects. Several Agency guidelines, such the Voluntary Social Impact Principles Framework[9] can aid an Operating Unit in identifying whether a project may affect Indigenous Peoples. Furthermore, Missions or IPs should apply USAID's Policy on Promoting the Rights of

[9] USAID. 2024. "Voluntary Social Impact Principles Framework." https://www.usaid.gov/environmental-procedures/environmental-compliance-esdm-program-cycle/social-impact-assessment.

Indigenous Peoples (PRO-IP)[10] when Indigenous Peoples are identified. The PRO-IP should be followed to uphold protections for Indigenous Peoples, wherein opportunities should aim to address goals and issues identified by Indigenous Peoples and include actions to improve standard of living and increase long-term sustainability of the natural resources they use. The policy sets out criteria that should be used when identifying Indigenous Peoples, as well as ensuring that Free, Prior and Informed Consent (FPIC) is obtained related to project impacts and decisions that may affect their land, livelihoods, lives, resources, or territories. Additional resources are also provided in the footnote below.[11]

Impacts on Indigenous Peoples should be avoided as much as possible. In cases where social impacts from project activities are deemed to adversely impact on the lands, rights and livelihoods of individuals and communities, consider ending plans to implement the project. If/when the project is under implementation, consider stopping the project until adequate management measures have been designed and implemented to mitigate the identified impacts. Management measures must always be commensurate with the degree of the identified adverse social impacts.

### 5.1.2 CULTURAL HERITAGE

Cultural heritage is part of every culture and is found around the world. Working in areas with cultural heritage resources can have consequences beyond just the destruction of an important cultural site. It is important to assess cultural heritage projects that generate HCW as there may be unintended impacts. Cultural heritage refers to monuments (e.g., architecture, sculptures, elements, or structures of an archaeological nature), groups of buildings, and sites (e.g., archaeological sites, burial sites, areas of human-made and natural features) that are of outstanding universal value from a historical, artistic, scientific, aesthetic, ethnological, or anthropological point of view. Examples of this tangible type of cultural heritage also include moveable objects (including artifacts, paintings, coins, manuscripts, and sculpture), underwater resources or sites (including shipwrecks, ruins, and submerged landscapes), and paleontological remains. In addition to tangible resources, cultural heritage includes intangible resources, which may be aspects of culture, knowledge, history, customs, beliefs, and traditions that may be invisible or not apparent and are often unseen by people who are not of that culture. The United Nations Educational, Scientific and Cultural Organization (UNESCO) states that intangible heritage can include oral traditions and expressions, folklore, beliefs, language, knowledge, performing arts, social practices, rituals, festive events, and traditional craftsmanship.[12,13]

In order to ascertain whether a project that generates HCW may have unintended impacts on cultural heritage, USAID has released a resource on the potential positive and negative impacts

[10] USAID. 2020. "Policy on Promoting the Rights of Indigenous Peoples (PRO-IP)." USAID. https://www.usaid.gov/sites/default/files/2022-05/USAID-IndigenousPeoples-Policy-mar-2020.pdf.
[11] USAID. 2021. "Optional Toolkit for Identifying Indigenous Peoples." USAID. https://www.usaid.gov/sites/default/files/2022-05/Optional-Toolkit-for-Identifying-Indigenous-Peoples.pdf.; USAID. 2021. "Concise Guide to USAID's Toolkit for Monitoring Engagement and Verifying Free Prior, and Informed Consent (FPIC)." USAID. https://www.usaid.gov/sites/default/files/2022-05/Guide-to-Monitoring-FPIC-Toolkit.pdf.; USAID. 2021. "USAID Guidance on Monitoring Free, Prior, and Informed Consent (FPIC)." USAID. https://www.usaid.gov/sites/default/files/2022-05/Guidance-on-Monitoring-FPIC.pdf.; and USAID. n.d. *FPIC 360 Monitoring Tool*. Accessed 2024 at https://www.usaid.gov/document/fpic-360-monitoring-tool.
[12] UNESCO. n.d. "What is Intangible Cultural Heritage?" https://ich.unesco.org/en/what-is-intangible-heritage-00003.
[13] UNESCO. 1972. *Convention Concerning the Protection of the World Cultural and Natural Heritage.* https://whc.unesco.org/en/conventiontext/.

for cultural heritage resources as the result of USAID programming.[14] In addition, several resources are available from the U.S. National Park Service, the International Council on Monuments and Sites, UNESCO, and the International Finance Corporation (IFC) (see footnote).[15] Furthermore, prior to project implementation, it is important to consider undertaking a Social Impact Assessment that is commensurate with the impacts and includes broad and in-depth stakeholder consultations to increase awareness of the existence of the cultural resources in or nearby the proposed project site.

### 5.1.3 LAND TENURE, DISPLACEMENT AND RESETTLEMENT

While projects that generate HCW will likely not necessitate large stretches of land to undertake a large-scale project, it is nevertheless important to be cognizant of the social implications that may come about due to land use change. In particular, land use change may have repercussions for land use access, access to land resources, and implications on land tenure and resource claims and rights, due to the siting or placement of projects. Consequently, land use change and the associated repercussions should be assessed early on during the design phase when a project is being proposed. For example, a large-scale project in reference to system-wide solid waste management, which refers to the entire process of collecting, treating, and disposing of solid waste[16] can have large-scale social impacts. A project that generates HCW can also have social impacts due to the siting of a project which may affect land tenure and the loss of land being used based on customary practices.

Land tenure is associated with acquiring and managing rights to land. Loss of access to land and/or resources, changes to the use of land and resources, and/or CDR is to be avoided or minimized to reduce the risk of impoverishment of the affected landholders, tenants, local community, and pastoralists. Failure to account for the land and resource rights of local people can cause costly delays, work stoppages, protests, and, in some cases, violent conflict.

Land tenure is the relationship that individuals and groups of people hold with respect to land and related resources. Land tenure rules define the ways in which property rights to land are allocated, transferred, used, or managed in a particular society. Land tenure issues can be complicated in areas that may not have a formal system of land ownership or of documentation of land ownership. Traditional rights of use (e.g., for hunting and/or gathering) may be allocated at the local level without a legal registration system. These alternate forms of land tenure and land use when assessing impacts, designing mitigation measures, and determining compensation, must be considered. Projects that generate HCW should be assessed for the risk of the impingement of use rights.

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[14] McCoy and Lassell. 2023. *Guide to Encountering and Working with Cultural Heritage.* USAID, ICF. https://www.usaid.gov/environmental-procedures/sectoral-environmental-social-best-practices/cultural-heritage-guide-2023-09.

[15] National Park Service. 2019. "National Heritage Area Feasibility Study Guidelines." https://www.nps.gov/subjects/heritageareas/upload/NHA-Feasibility-Study-Guidelines_FINAL-Revisions-2019_508-compliant.pdf.; ICOMOS. 2011. *Guidance on Heritage Impact Assessments for Cultural World Heritage Properties.* Paris: International Council on Monuments and Sites. https://www.iccrom.org/sites/default/files/2018-07/icomos_guidance_on_heritage_impact_assessments_for_cultural_world_heritage_properties.pdf.; UNESCO. 2024. "List of World Heritage in Danger." https://whc.unesco.org/en/danger/.; and IFC. 2012. "Performance Standard 5: Land Acquisition and Involuntary Resettlement." https://www.ifc.org/en/insights-reports/2012/ifc-performance-standard-5.

[16] For additional guidance on solid waste management, see the Solid Waste SEG, accessible at https://www.usaid.gov/environmental-procedures/sectoral-environmental-social-best-practices/sector-environmental-guidelines-resources.

Land tenure issues may lead to CDR. In the context of projects that generate HCW, there may be a potential social impact of economic displacement, rather than physical displacement or involuntary resettlement due to the smaller footprint of the project that generates HCW; however, economic displacement may affect local community members. Economic displacement is an impact that should be avoided, minimized, or mitigated.

Economic displacement may occur when a business moves from a valuable location, a worker must travel a greater distance to get to his or her place of employment, or an individual or business loses access to natural resources that provide an economic or survival benefit. Displacement can also have social implications by disrupting or dispersing communities, fracturing social networks, or reducing access to important cultural heritage resources and sites. Resettlement to alternative sites can have negative social impacts on both the resettled population and the established community at the new site, with one or both groups subject to discrimination, prejudice, social conflicts, and/or violence.

There may also be physical displacement. When there is the potential for partial or total physical displacement, economic displacement, or resettlement, the social impacts must be assessed and addressed in an Environmental and Social Impact Assessment (ESIA). USAID's Environmental Compliance Procedures (22 CFR 216) identify resettlement as a class of action with a "significant effect" on the environment and therefore requires, as appropriate, either an EA or Environmental Impact Statement (EIS).

USAID has implemented guidelines that cover CDR[17] that may result from USAID programs. Given the importance of stakeholder engagement, an important first step is to review the Agency's social assessment-related resources, including the Environmental Compliance Factsheet: Stakeholder Engagement in the Environmental and Social Impact Assessment Process.[18] Specific guidelines that USAID[19] and its partners should follow to avoid, minimize, and mitigate CDR risks include the following:

- Understand the legal and institutional contexts;
- Identify all legitimate landholders and relevant risks;
- Develop a Resettlement Action Plan and a Livelihood Action Plan (LAP) if physical displacement is unavoidable;
- Promote informed and meaningful engagement;
- Improve livelihoods and living standards; and
- Provide additional protections for marginalized and underrepresented groups and/or people in vulnerable situations, especially women and Indigenous Peoples.

The USAID CDR guidelines[20] are consistent with leading international standards on land and

[17] USAID. 2016. "Guidelines on Compulsory Displacement and Resettlement in USAID Programming." https://www.land-links.org/wp-content/uploads/2016/09/USAID_Land_Tenure_Guidelines_CDR.pdf.
[18] USAID. 2016. "Environmental Compliance Factsheet: Stakeholder Engagement in the Environmental and Social Impact Assessment (ESIA) Process." https://www.usaid.gov/sites/default/files/2022-05/Stakeholder_Engagement_052016.pdf.
[19] USAID. 2024. "Voluntary Social Impact Principles Framework." https://www.usaid.gov/environmental-procedures/environmental-compliance-esdm-program-cycle/social-impact-assessment.
[20] USAID. n.d. "Securing Land Tenure and Property Rights for Stability and Prosperity." https://www.usaid.gov/land-tenure.; USAID. 2016. "Why Land Rights Matter." https://2017-2020.usaid.gov/sites/default/files/documents/1865/USAID_Land_Tenure_Infographic_October-2016b.pdf; and

resource tenure, including IFC Performance Standard 5, Land Acquisition and Involuntary Resettlement,[21] and Environmental and Social Standard 5 in the World Bank Environmental and Social Framework.[22]

Resettlement must consider not only the impacts on displaced people but also the impacts on the communities to which the displaced people are resettled. Failure to address the issues of all stakeholders can lead to many challenges, including adverse impacts on project-affected groups and individuals, delays in project implementation, possible cancellation of the project, protests, conflict, and/or violence.

### 5.1.4 HEALTH, WELL-BEING, AND SAFETY

Specific choices around project design and implementation invariably have the potential to influence health, well-being, and safety. Assessing and managing the potential social impacts related to health, well-being, and safety requires a careful and sustained effort. For example, community members may contract an illness from the emissions from burn pits and incinerators. In many developing countries, healthcare facilities burn HCW. However, incineration releases pollutants into the air, including dioxins and furans. Such substances are human carcinogens and may lead to unintended consequences for the local community. Failing to invest in incineration methods that minimize pollution results in greater adverse community impacts.[23]

### 5.1.5 CONFLICT DYNAMICS

USAID's projects are often implemented in fragile or conflict-affected environments. USAID's work encompasses investments in conflict prevention and mitigation, stabilization, and peace building, parallel to investments in other sectors, for example, projects that generate HCW. Understanding conflict dynamics and how a project in this sector can affect or is being affected by these dynamics is an essential component of being conflict aware and conflict sensitive.[24] For example, local communities may have a heightened awareness of the distribution of resources, as well as the roles and responsibilities of the people involved in the distribution of those resources, and a proposed project may exacerbate the underlying conflict dynamics. There may be historical grievances that come to light due to proposing a project that generates HCW due to siting and placement of the project, which may negatively affect one group over another, thus exacerbating local tensions. Therefore, conflict dynamics at the site level should be understood during the design phase by means of engaging stakeholders in a participatory approach and assessing conflict dynamics. Additional resources and guidance on conflict dynamics may be found in the footnotes.[25]

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USAID. 2016. "Guidelines on Compulsory Displacement and Resettlement in USAID Programming." https://www.land-links.org/wp-content/uploads/2016/09/USAID_Land_Tenure_Guidelines_CDR.pdf.

[21] IFC. 2012. "Performance Standard 5: Land Acquisition and Involuntary Resettlement." https://www.ifc.org/en/insights-reports/2012/ifc-performance-standard-5.

[22] World Bank. 2017. "The World Bank Environmental and Social Framework." IBRD/The World Bank. Washington, D.C. https://thedocs.worldbank.org/en/doc/837721522762050108-0290022018/original/ESFFramework.pdf.

[23] WHO. 2018. Health-care Waste. https://www.who.int/news-room/fact-sheets/detail/health-care-waste#:~:text=Health%20risks,health%20facilities%20into%20the%20environment.

[24] USAID. 2024. *"Voluntary Social Impact Principles Framework*." https://www.usaid.gov/environmental-procedures/environmental-compliance-esdm-program-cycle/social-impact-assessment.

[25] USAID. n.d. *Technical Publications on Conflict Management and Mitigation.* https://www.usaid.gov/conflict-violence-prevention/technical-publications; USAID. 2024. "Voluntary Social Impact Principles Framework." https://www.usaid.gov/environmental-procedures/environmental-compliance-esdm-program-cycle/social-impact-assessment.

### 5.1.6 ENVIRONMENTAL JUSTICE

Environmental justice (EJ) is the fair treatment and meaningful stakeholder engagement throughout the project life cycle of all project-affected persons, particularly marginalized and underrepresented groups and/or people in vulnerable situations with respect to environmental and/or health impacts, and implementation and enforcement of environmental laws. It includes the protection of potentially marginalized and underrepresented groups that may face enhanced vulnerability due to environmental harms caused by any action or activity. It also includes equitable access to environmental benefits and/or ecosystem services that a project may enhance. Marginalized and underrepresented groups and/or people in vulnerable situations may include (but are not limited to): Indigenous Peoples, LGBTQI+ persons, persons with disabilities, children and other youth, older persons, women, low-income populations, and all disadvantaged and marginalized communities across race, color, gender, or national origin.[27]

**Meaningful stakeholder engagement entails:**

- People from diverse social groups are provided with an opportunity to participate in decisions about activities that may affect their environment, livelihoods, well-being, and/or health;
- The public's contribution can influence the agency's decision;
- Community views, perspectives, and concerns will be considered in the decision-making process; and
- Decision makers will seek out and facilitate the stakeholder engagement process with potentially affected people[26]

Further guidance on EJ is available in the USAID Voluntary Social Impact Principles Framework (see footnote below)[28] to help assess adverse environmental and social impacts of USAID programs on marginalized and underrepresented groups and/or people in vulnerable situations and to provide guidance to USAID staff and IPs on identifying and stakeholder engagement with marginalized and underrepresented groups and/or people in vulnerable situations.

### 5.1.7 LABOR

Specific choices around project design and implementation invariably have the potential to influence labor practices and working conditions.

Projects that generate HCW may involve workers. Each project implementer should be aware of the International Labor Organization's (ILO) conventions[29] that the host country has signed. Adherence to ILO's core labor standards is essential. The ILO core labor standards address freedom of association, collective bargaining, abolition of forced labor and the worst forms of child labor, minimum age, equal remuneration, discrimination, and the protection of children and

[26] USAID. 2024. *"Voluntary Social Impact Principles Framework*." https://www.usaid.gov/environmental-procedures/environmental-compliance-esdm-program-cycle/social-impact-assessment.
[27] Ibid.
[28] Ibid.
[29] As per IFC Performance Standard 2, this Performances Standard recognizes that "the pursuit of economic growth through employment creation and income generation should be accompanied by protection of the fundamental rights of workers and must respect several International Labor Organization (ILO) Conventions, including ILO Convention 87 on Freedom of Association and Protection of the Right to Organize; ILO Convention 98 on the Right to Organize and Collective Bargaining; ILO Convention 29 on Forced Labor; ILO Convention 105 on the Abolition of Forced Labor; ILO Convention 138 on Minimum Age (of Employment); ILO Convention 182 on the Worst Forms of Child Labor; ILO Convention 100 on Equal Remuneration; ILO Convention 111 on Discrimination (Employment and Occupation); UN Convention on the Rights of the Child, Article 32.1; and the UN Convention on the Protection of the Rights of all Migrant Workers and Members of their Families" (IFC. 2012. "Performance Standard 3: Resource Efficiency and Pollution Prevention." https://www.ifc.org/content/dam/ifc/doc/2010/2012-ifc-performance-standard-3-en.pdf.)

young persons. Even for countries that do not adopt one or more standards, they are fundamental to the protection of the workforce. USAID's Agency-Wide Counter-Trafficking in Persons Code of Conduct has the goal of prohibiting USAID contractors, subcontractors, grantees, and sub-grantees from engaging in trafficking in persons, procuring commercial sex acts, or using forced labor. Please refer to the guidance in the footnote.[30]

Furthermore, workers in projects that generate HCW may be exposed to many occupational hazards, including toxic or radioactive materials and the emission of dioxins, furans, and particulate matter from open burning and incineration.[31]

Consequently, labor practices and working conditions in individual projects should be assessed early on in order to avoid, minimize, and/or mitigate the potential impacts. See the footnote for further resources.[32]

## 4.2 OTHER SOCIAL CONSIDERATIONS

### 5.2.1 THE ROLE OF STAKEHOLDER ENGAGEMENT

Stakeholder engagement provides a systematic approach to Missions and Implementing Partners to acquire stakeholders' input, information, feedback, local and traditional knowledge, local perspectives, and concerns early on, during the design and planning phase, well before the assessment of the social impacts phase, as well as should be sustained throughout the entire project life cycle[33]. Stakeholders may be groups or individuals from the private or public sector, as well as individuals who may be considered an affected party along with those who may have interests in a project or the ability to influence its outcome, either positively or negatively. Members of civil society organizations may also be considered such as youth groups, church groups, or women's clubs. Special attention should be paid to marginalized and

[30] Alliance 8.7. n.d. Ending Forced Labour, Modern Slavery, Human Trafficking and Child Labour. https://www.alliance87.org/.; U.S. Department of Labor. n.d. "Comply Chain: Business Tools for Labor Compliance in Global Supply Chains." https://www.dol.gov/general/apps/ilab-comply-chain.; ILO. 2011. "Convention 189: Domestic Workers Convention." https://normlex.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_ILO_CODE:C189.; Rainforest Action Network. 2017. "Workers' Rights and Environment Justice."https://www.ran.org/issue/workers-rights-and-environmental-justice/.; Responsible Sourcing Tool. n.d. "Is Forced Labor Hidden in Your Global Supply Chain." https://www.responsiblesourcingtool.org/.; The White House. 2023. "Memorandum on Advancing Worker Empowerment, Rights, and High Labor Standards Globally." https://www.whitehouse.gov/briefing-room/presidential-actions/2023/11/16/memorandum-on-advancing-worker-empowerment-rights-and-high-labor-standards-globally/.; United Nations. 2023. "Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all." https://sdgs.un.org/goals/goal8.; USAID. 2023. "ADS Chapter 225: Program Principles for Trade and Investment Activities and the "Impact on U.S. Jobs" and "Workers' Rights"." https://www.usaid.gov/about-us/agency-policy/series-200/225.

[31] WHO. 2018. Health-care Waste. https://www.who.int/news-room/fact-sheets/detail/health-care-waste#:~:text=Health%20risks,health%20facilities%20into%20the%20environment and ILO. 1981. "Protocol 155 - Protocol of 2022 to the Occupational Safety and Health Convention." https://normlex.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_INSTRUMENT_ID:312338.

[32] The World Bank. 2018. "Guidance Note for Borrowers: ESS2: Labor and Working Conditions." https://documents1.worldbank.org/curated/en/149761530216793411/pdf/ESF-Guidance-Note-2-Labor-and-Working-Conditions-English.pdf; ILO. n.d. "Introduction to International Labour Standards." https://www.ilo.org/global/standards/introduction-to-international-labour-standards/lang--en/index.htm.; and ILO. 1981. "Protocol 155 - Protocol of 2022 to the Occupational Safety and Health Convention." https://normlex.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_INSTRUMENT_ID:312338.

[33] USAID. 2022. "Community Engagement Guide." https://www.climatelinks.org/sites/default/files/asset/document/2022-04/5a.%201_Community%20Engagement%20Reference%20Guide_30Mar22_508.pdf.

underrepresented groups and/or people in vulnerable situations because they may be inequitably affected by a project.

Stakeholder mapping, engagement, and consultation are key steps in the planning process of projects that generate HCW and will also be crucial in identifying opportunities for the inclusion of marginalized and underrepresented groups and/or people in vulnerable situations.[34] Stakeholder engagement should be a broad, inclusive, and continuous process. The benefit of beginning the stakeholder engagement process early on and sustaining it throughout the entire project life cycle is that it may allow for the co-creation[35] of positive benefits, for example identifying mitigation measures regarding the social impacts based on traditional knowledge from local community members, through adaptive management. Information on best practices for stakeholder engagement is available in the USAID document entitled Environmental Compliance Factsheet: Stakeholder Engagement in the Environmental and Social Impact Assessment (ESIA) Process. [36]

### 5.2.2 LOCAL COMMUNITY

When planning and designing projects that generate HCW, the local community in which the project will be embedded should be assessed. This assessment may be addressed prior to assessing potential social impacts by means of undertaking a desktop review of the characteristics of the community, such as demographics; socioeconomic composition; and political, institutional, and legal frameworks, as well as through field visits and stakeholder engagement. Although the particulars of identifying social impacts for projects that generate HCW depends on the site location, and local context, undertaking stakeholder engagement early on is necessary to improve the understanding of how the proposed project may affect the local community. If stakeholders in a local community voice concerns regarding potential negative social impacts due to a proposed project, the social impacts may be assessed, and mitigation and monitoring measures designed. Management measures should be commensurate with the degree of the identified adverse social impacts. In cases where social impacts from project activities are deemed to adversely affect the lands, rights, and livelihoods of individuals and communities, implementation of the project should be reconsidered (i.e., potentially ended). If/when the project is under implementation, the local community is adversely impacted, implementation of the project may need to be curtailed until adequate management measures have been designed and implemented to mitigate the identified impacts.

### 5.2.3 GENDER EQUALITY

Many social impacts are gender differentiated and can affect men and women in different ways. USAID seeks to support gender equality with the following goals: (1) improve the lives of people by advancing gender equality; (2) empower women and girls to participate fully in, and equally benefit from, the development of their societies on the same basis as men; and (3) secure equal

[34] USAID. 2016. "Environmental Compliance Factsheet: Stakeholder Engagement in the Environmental and Social Impact Assessment (ESIA) Process." https://www.usaid.gov/sites/default/files/2022-05/Stakeholder_Engagement_052016.pdf.
[35] USAID defines co-creation as a process that "brings people together to collectively design solutions to specific development challenges. Time limited and participatory, partners, potential implementers, and end-users define a problem collaboratively, identify new and existing solutions, build consensus around action, and refine plans to move forward with program and projects." For additional information see https://www.usaid.gov/co-creation-usaid.
[36] USAID. 2016. "Environmental Compliance Factsheet: Stakeholder Engagement in the Environmental and Social Impact Assessment (ESIA) Process." https://www.usaid.gov/sites/default/files/2022-05/Stakeholder_Engagement_052016.pdf.

economic, social, cultural, civil, and political rights regardless of gender. USAID policy requires that a Gender Analysis "be integrated in strategic planning, project design and approval, procurement processes, and measurement and evaluation" as part of ADS 205: Integrating Gender Equality and Women's Empowerment in USAID's Program Cycle, which seeks to integrate gender and equality into the program cycle.[37]

Special attention must be paid to how projects that generate HCW projects may affect women and girls. Gender Analysis[38] "is a systematic analytical process used to identify, understand, and describe gender differences and the relevance of gender roles and power dynamics in a specific context." Such analysis[39] typically involves examining the differential impact of development policies and programs on women and men and may include the collection of sex-disaggregated or gender-sensitive data. Gender Analysis examines the "different roles, rights, and opportunities of men and women and relations between them. It also identifies disparities, examines why such disparities exist, determines whether they are a potential impediment to achieving results, and looks at how they can be addressed."[40] Furthermore, there may be gender divisions in the decision-making process that may influence how the placement of the project may be proposed.

Disparate gender impacts on projects that generate HCW may involve imbalances in stakeholder input, decision making, employment opportunities, and monetary compensation for project impacts. A Gender Analysis helps to identify gender disparities in the community early on. Because USAID projects require stakeholder engagement and consultation as part of the process of identifying, avoiding, and mitigating adverse social impacts, it is increasingly important to be aware of gender-based barriers to public participation. In these cases, stakeholder engagement and consultations may need to occur in a gender sensitive manner, for instance by having separate venues for men and women. To acquire input and feedback from women, a combination of methods may be undertaken (such as interviews and focus groups). For, instance semi-structured interviews or women-only focus groups may be conducted with women in a safe space such as an individuals' home or place of worship. Providing a space in which to obtain women's perspectives may shed light on a potential gender division in decision making and consultation, and in turn could impact siting and benefit sharing.

Table 3 below provides an overview of the potential social impacts associated with projects that generate HCW. For each potential social impact listed, recommended mitigation and monitoring measures are provided. The impacts and measures are for illustrative purposes only and do not provide an exhaustive list because the social impacts identified for a particular project that generates HCW depend upon the proposed site location, the local context, and the specificities of the project, among other factors.

[37] USAID. 2023. "ADS Chapter 205: Integrating Gender Equality and Women's Empowerment in USAID's Program Cycle." https://www.usaid.gov/about-us/agency-policy/series-200/205#:~:text=USAID%20has%20adopted%20several%20comprehensive,fully%20exercise%20their%20rights%2C%20determine.
[38] USAID. 2023. "2023 Gender Equality and Women's Empowerment Policy." https://www.usaid.gov/document/2023-gender-equality-and-womens-empowerment-policy.
[39] USAID. 2011. "Tips for Conducting a Gender Analysis at the Activity or Project Level." https://pdf.usaid.gov/pdf_docs/PDACX964.pdf.
[40] USAID. 2023. "2023 Gender Equality and Women's Empowerment Policy." https://www.usaid.gov/document/2023-gender-equality-and-womens-empowerment-policy.

**TABLE 3: SUMMARY OF POTENTIAL SOCIAL IMPACTS, MITIGATION MEASURES AND MONITORING MEASURES.**

| SOCIAL IMPACT | MITIGATION MEASURES | MONITORING MEASURES |
|---|---|---|
| **Labor**<br><br>Healthcare facility workers are exposed to several health and safety hazards when burning HCW. They may experience exposure to hazardous chemicals and pollution that may affect their health. The use of burn pits and incinerators by healthcare workers puts them at risk for diseases, such as cancer, if the proper precautions are not followed.<br><br>Biohazardous HCW may affect healthcare workers if not handled properly. Risks include toxic exposure to pharmaceuticals and needlestick injuries.<br><br>Unsafe labor practices and working conditions are causing work-related incidents and accidents, which are on the rise, in a local clinic, due to weak national host country laws and regulations. | ● Draft a Stakeholder Engagement Plan (SEP) early on in the project life cycle and sustain throughout the project<br>● Follow guidance as per ILO 155[41]<br>● Address occupational safety in the pre-implementation Environmental and Social Impact Assessment process (e.g., USAID Initial Environmental Examinations (IEEs) and Environmental Assessments (EAs)). The process should specifically address the labor safety and health risks presented by using burn pits and incinerators to manage HCW.<br>● Conduct safety trainings on waste management for workers on a periodic basis.<br>● Educate healthcare workers on the various risks and hazards that are presented when using burn pits and incinerators.<br>● Provide proper personal protective equipment (PPE) for hospital workers and train them on the importance of the use of PPE.<br>● Identify and enforce host country laws and regulations and/or international laws/regulations regarding labor safety and implement a Zero Accidents policy. | ● Review the SEP on a periodic basis.<br>● Institute procedures for documenting and reporting illnesses from HCWM.<br>● Keep records of trainings on labor safety.<br>● Conduct monthly reviews to monitor occupational health and safety precautions.<br>● Keep records of the trainings and the number of participants with regard to waste management for workers.<br>● Keep records of the trainings and the number of participants who build awareness on the various risks and hazards regarding the use of burn pits and incinerators.<br>● Keep a log of the number of incidents with regard to the Zero Accidents policy. |
| **Health, Well-Being, and Safety**<br>Improper HCWM may pose negative health impacts on the | ● Establish a Stakeholder Engagement Plan (SEP) early on during the project and continue to engage in | ● Review the SEP periodically throughout the project life cycle. |

[41] ILO. 1981. "Protocol 155 - Protocol of 2022 to the Occupational Safety and Health Convention." https://normlex.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:12100:0::NO::P12100_INSTRUMENT_ID:312338.

| SOCIAL IMPACT | MITIGATION MEASURES | MONITORING MEASURES |
|---|---|---|
| local community, for example, on women. Impacts include the following:<br>● Disposal of untreated HCW in landfills may contaminate drinking water.<br>● Chemical substances used to treat HCW may be released into drinking water.<br>● Poor HCW incineration may lead to the release of pollutants into the air, which may be carcinogenic.<br>● Occupational health and safety incidents regarding HCW are on the rise due to weak national occupational health and safety standards and lack of enforcement of the use of PPE for hospital workers. | stakeholder engagement and consultations throughout the project life cycle.<br>● Conduct a Gender Analysis, per the USAID Gender Equality and Women's Empowerment Policy, and integrate the results into the SEP.<br>● Promote practices that reduce the volume of waste produced.<br>● Ensure proper waste segregation.<br>● Select burn pit and incinerator sites that are away from homes.<br>● Educate community members on how to prevent contracting illnesses associated with HCW contamination.<br>● Build capacity for community health education.<br>● Conduct trainings on measures to prevent nosocomial infection. | ● Institute procedures for documenting and reporting HCW-related illnesses.<br>● Keep records on the health, well-being, and safety of community members affected by HCW-related illnesses.<br>● Keep a log of all trainings for local community members regarding how to prevent contracting illnesses associated with HCW contamination.<br>● Keep a log of all trainings and the number of participants regarding the importance of the use of PPE. |
| **Environmental Justice**<br>Marginalized and underrepresented groups and/or people in vulnerable situations may experience disproportionately high levels of pollution from the burn pits and incinerators from healthcare facilities. Burn pits and incinerators used for burning HCW can emit pollution that can lead to increased health risks for those living nearby. Environmental injustice can occur due to the placement of the burn pits and incinerators. Environmental injustice can also occur due to the placement of the waste itself. Marginalized and underrepresented groups and/or people in vulnerable situations, such as women and children, who may be living | ● Establish a Stakeholder Engagement Plan (SEP) and conduct stakeholder engagement at the beginning of the project life cycle and ensure that protections for marginalized and underrepresented groups and/or people in vulnerable situations are upheld in order to ensure environmental justice.<br>● Conduct a Gender Analysis, per the USAID Gender Equality and Women's Empowerment Policy, and integrate the results into the SEP.<br>● Further evaluate demographic and geographic data to ensure that the project is sited such that other marginalized and | ● Review the SEP periodically.<br>● Apply spot auditing, where feasible.<br>● Review demographic and geographic data, such as land use patterns and population statistics, for significant changes in community composition.<br>● Review integrated waste management plans and HCW procedures periodically.<br>● Report cases of illnesses contracted from the pollution from burn bits and incinerators.<br>● Review public health data. |

| SOCIAL IMPACT | MITIGATION MEASURES | MONITORING MEASURES |
|---|---|---|
| near waste sites, may be disproportionately affected. | underrepresented groups and/or people in vulnerable situations, such as ethnic minority groups, are not exposed to pollution.<br>● During the project design phase, evaluate the placement of waste sites to ensure that they are not in close proximity to homes.<br>● Procurement provisions requiring incinerators and burn pits should be placed at a safe distance away from nearby homes and proper waste management procedures should be followed.<br>● Explore safer waste management procedures that cause less pollution. | |
| **Conflict Dynamics**<br>Siting a proposed in a geographical area that is near a community and comprises marginalized and underrepresented groups and/or people in vulnerable situations may lead to social conflict. | ● Establish a Stakeholder Engagement Plan (SEP) early on during the project cycle.<br>● Undertake stakeholder engagement at the beginning of the project life cycle and sustain throughout.<br>● Consult with community leaders who represent the vulnerable community by integrating a mixed-methods approach (e.g., focus groups, village meetings, community surveys, semi-structured interviews and town halls), as well as engaging and consulting with government officials, members of civil society, women's groups, church groups, and NGOs and community-based organizations (CBOs), among others, to understand existing conflicts and tensions and integrate the findings into the SEP.<br>● Ensure social inclusion, especially for marginalized | ● Review the SEP periodically.<br>● Conduct stakeholder engagement on an ongoing basis.<br>● Keep a record of all attendees who have participated in awareness building and conflict resolution workshops and trainings.<br>● Review and address grievances in a timely manner. |

| SOCIAL IMPACT | MITIGATION MEASURES | MONITORING MEASURES |
|---|---|---|
| | and underrepresented groups and/or people in vulnerable situations.<br>● Assess the local dynamics at the project level and integrate the results into the SEP.<br>● Undertake workshops that build awareness and develop strategies on conflict resolution.<br>● Conduct a Gender Analysis, per the USAID Gender Equality and Women's Empowerment Policy, and integrate the results into the SEP.<br>● Set up a grievance and redress mechanism. | |

### 4.3 SUMMARY OF POTENTIAL IMPACTS

Inadequate or poor management of HCW can have short- and long-term adverse environmental, human health, and social impacts, which may be further exacerbated by climate change. The implementation of a proper waste management program with appropriate mitigation measures and monitoring activities is important for preventing disease transmission, injury, pollution, and other impacts on communities.

provides more detailed information on potential adverse impacts associated with improper HCWM and lists recommended mitigation measures and monitoring indicators for those impacts.

# 5. CLIMATE CHANGE CONSIDERATIONS

Changing climate conditions, such as increasing temperatures and changes in the frequency, intensity, and duration of extreme events, such as floods, high winds, and tropical storms, may affect the management of HCW.[42] Climate change should be a key part of planning any activity that includes HCW, including the consideration of opportunities to reduce or avoid any potential GHG emissions that could contribute to climate change.

When seeking to address climate change challenges, it is useful to take a broad perspective considering options for reducing emissions and building resilience. These actions can be supplemented with measures to mobilize financing for climate-related investments; efforts to strengthen policies and market signals that enable low-emissions development; and engagement with Indigenous Peoples, local communities, and women, youth, and marginalized groups to foster buy-in and direct engagement in the construction, operation, and maintenance of infrastructure.

This subsection also references the key principles of locally led development, equity and inclusion, private sector engagement, nature-based solutions, and the use of evidence and innovation.

## 5.1 BUILDING RESILIENCE AND ADAPTING TO CLIMATE CHANGE

By making projects more resilient and reducing vulnerability to the effects of climate change, USAID can increase the sustainability of its investments and improve the likelihood of their long-term success. To plan for a changing climate, USAID and its IPs should identify and assess potential climate change risks relevant to their projects, programs, and operations, and develop ways to manage such risks through avoidance or adaptation. USAID provides guidance for climate risk management in ADS Reference 201mal, Climate Risk Management for USAID Projects and Activities.

### 6.1.1 CLIMATE RISK MANAGEMENT

Climate Risk Management (CRM) is the process of assessing, addressing, and adaptively managing climate risks at all stages in the program cycle. With few exceptions, USAID's Project and Activity Design Teams are required to identify and assess relevant climate risks, implement measures to mitigate significant risks, and monitor and evaluate the effectiveness of adopted measures in accordance with ADS Reference 201mal. The CRM process involves identifying climate risks, risk ratings, how risks are addressed, opportunities, and any further analysis needed. These elements and results of the CRM should be documented in environmental compliance analyses (e.g., the Initial Environmental Examination (IEE)). It is also important to consider GHG emissions and emissions reductions throughout the program cycle, including during design, planning, and implementation.[43] Table 4 includes examples of potential climate risks which could be associated with HCW management and operations.

[42] Paterson, Jaclyn, Peter Berry, Kristie Ebi, and Linda Varangu. "Health care facilities resilient to climate change impacts." International journal of environmental research and public health 11, no. 12 (2014): 13097-13116.
[43] USAID. 2022. "Climate Risk Management for USAID Projects and Activities: A Mandatory Reference for ADS Chapter 201." https://www.usaid.gov/sites/default/files/documents/1868/201mal_042817.pdf.

**TABLE 4. CLIMATE RISKS IN THE HEALTHCARE WASTE MANAGEMENT SECTOR**

| CLIMATE STRESSORS | CLIMATE RISKS |
|---|---|
| Increasing average air temperatures and incidence and/or severity of heat waves<br>Increasing incidences and/or severity of drought | ● Increased risk of fires at landfills, waste storage areas, and dumpsites<br>● Altered chemical composition of contaminants below the surface, and changes in evaporation rates affecting land disposal<br>● Proliferation of disease vectors (insects, vermin) at waste storage areas and disposal sites<br>● Overheating of collection vehicles and sorting equipment<br>● Reduced storage times for organic waste<br>● Odor around storage areas and facilities<br>● Mobilization of dust and volatile organics, leading to deterioration in air quality<br>● In cold climates, thawing permafrost or soils disrupting drainage and surface water flow around landfill sites or burial/placenta pits<br>● Increased HCW generation due to adverse health and nutrition impacts on communities, as well as healthcare and sanitation workers (e.g., due to increases in heat stroke, vector-borne disease, nutritional deficiencies), resulting in increased volumes of patients; this can strain HCWM systems |
| Increasing the incidence and/or intensity of storms (high rainfall and high wind events), including floods and storm surges | ● Saturated soils and decreased stability of slopes and landfill linings at waste management sites<br>● Flooding of waste sites, leading to groundwater, soil, and surface water contamination, and unintended mobilization of hazardous materials<br>● Disruptions in the waste management supply chain, including the removal and transport of waste, as well as waste management materials (e.g., bins, bin liners, sharp boxes)<br>● Damage to incinerators, burial pits, municipal dumps, sanitary landfills, and/or placenta pits<br>● Increased need to manage debris following storms or flooding<br>● Inundation of waste sites releasing contaminants to waterways, land, and occupied areas<br>● Potential formation of pools of standing contaminated water, which promote waterborne and vector-borne diseases<br>● Floating waste resulting from flooded sewage systems or washing up on shore due to storm surges<br>● Increased power outages from extreme weather events, resulting in a diminished energy supply for waste operations (e.g., fuel required for operating incinerators, burning chambers, rotary kilns, autoclaves, fuel for waste transport from remote healthcare facilities to healthcare facilities with appropriate waste disposal capacity)<br>● Increased injuries and/or illnesses, resulting in increased volumes of patients and, therefore, increased HCW generation, which strains HCWM systems |

| CLIMATE STRESSORS | CLIMATE RISKS |
|---|---|
| Sea-level rise | ● Increased inundation of HCWM sites and facilities in coastal areas<br>● Contamination of groundwater, aquifers, waterways, and water supplies due to the impact of rising water tables on the hydrology around landfills in coastal areas<br>● Increased flooding and inundation risks to incinerators, burial pits, municipal dumps, sanitary landfills, and/or placenta pits<br>● Incremental risks and impacts on coastal docking and transfer facilities<br>● Permanent inundation of collection, processing, and disposal infrastructure in coastal areas<br>● Increased risk of disruption in the waste management supply chain, including removal and transport of waste, as well as waste management materials (e.g., bins, bin liners, sharp boxes) |

### 6.1.2 ASSESSING CLIMATE CHANGE RISKS

Assessing climate change risks associated with a project or activity involves (1) assessing potential climate change trends and related climate stressors, (2) evaluating the project's or activity's level of exposure to impacts from that stressor and its vulnerability (i.e., ability to cope with impacts) to determine the potential severity of the impacts, and (3) evaluating the likelihood that impacts will occur. Project designers should also consider the potential effects from the project or the activity itself on the vulnerability of communities and physical assets to climate change impacts and adaptability.

Project Design Teams should assess the likely extent of variability and extreme climate-related events, drawing from available historical records, current trends, and future projections. The timeframe of projects should reflect the type of investment being made. Planned actions associated with the project or activity should then be evaluated against historical and projected trends to identify potential climate change risks. Procedural aspects of identifying climate change impacts associated with a project or activity are set out in 22 CFR 216 (USAID's Regulation 216).

Tools are increasingly available to help decision-makers and project designers pragmatically assess potential climate risks in the face of uncertainty by first screening for climate vulnerabilities through the use of a "decision tree." Further or deeper analysis is performed only as needed, allowing decision-makers to allocate scarce project resources that are proportional to the project's needs.[44]

Climate change risks and impacts will be distinctive to the specific location, timing, and characteristics of the project or activity. Examples of potential risks, which could be associated with HCW management and operations, are listed in Table 4 and are discussed in the paragraphs below.

[44] Ray, Patrick A., and Casey M. Brown. 2015. Confronting Climate Uncertainty in Water Resources Planning and Project Design: The Decision Tree Framework. Washington, DC: World Bank. https://documents1.worldbank.org/curated/en/516801467986326382/pdf/99180-PUB-Box393189B-PUBLIC-PUBDATE-8-19-15-DOI-10-1596-978-1-4648-0477-9-EPI-210477.pdf.

Once risks and potential impacts have been identified and described, project designers should determine their overall significance, which involves assessing the severity of the impacts and the likelihood that they will occur.

The key determinants of the severity of climate impacts are exposure (the degree to which a system is exposed to significant climate variations) and vulnerability. HCW disposal sites, particularly burial and placenta pits, municipal dumps, and sanitary landfills, can be vulnerable to flooding or rising groundwater, potentially spreading contaminants from untreated waste into soil, groundwater, and surface water, or undermining their structural integrity. Increasing temperatures and drought can lead to a higher frequency of fires at waste sites, as well as increasing incidence of odor, vermin/vectors, and dust, which may require a higher collection frequency and improved HCWM controls. Increased climate risks in the HCW sector can also affect healthcare staff and sanitation/waste workers, increasing the exposure to contaminants among waste industry workers and the general public, resulting in adverse health outcomes. Additionally, as climate change threatens the structural integrity of HCW infrastructure (e.g., incinerators, waste storage areas, landfills), this may exacerbate dangerous conditions and the health risks noted here, as well as potentially disrupt livelihoods and income for those reliant on the waste processing sector.

In many developing countries, HCWM systems can be inadequate, leading to the accumulation of waste in areas affected by flooding, which can affect water runoff or flood control along drains, sewers, channels, and waterways. These conditions can lead to increased vulnerability to flooding from intense precipitation, storm surges, and even moderate rainfall. Such impacts can be pronounced in urban areas, particularly in informal settlements, which often lack formal infrastructure or are on marginal lands (e.g., hillsides, marshland, floodplains). Flooding can increase exposure to contaminated water and water/vector-borne diseases, landslides, and damage to property and livelihoods.

Vulnerability to climate change impacts can be compounded in some developing countries due to a limited ability to provide planned and coordinated debris clean-up and management following storms and flooding. Much of the debris left behind after storms and flooding represent a danger to human health and safety, particularly for chemical, infectious, or radioactive HCW, and can be a barrier to rescue and relief operations and post-disaster recovery.

The magnitude, timing, and geographic variability of climate change impacts cannot be predicted with certainty. However, it is widely accepted that without significant reductions in global GHG emissions, climate change will continue to worsen in the coming years, and extreme climate events are also likely to increase in frequency and severity. From a risk management perspective, depending on the project, it is appropriate to take a precautionary approach that seeks to reduce risk in the face of such uncertainty. Governments, businesses, and local households and communities in developing countries may not be able to absorb the full cost of the damages or risk the loss of services, so planning for risk management as far in advance as possible can be important.

### 6.1.3 ADDRESSING CLIMATE CHANGE RISKS[45]

USAID Project Design Teams who are considering including HCW activities in new activities should consider the potential risks and impacts of climate change and ensure that procurement documents and contracts or agreements include the requirements to conduct appropriate

[45] See Annex 5 for additional information on managing the climate risks noted above.

architectural and engineering design (as relevant) and risk management procedures that incorporate climate risk considerations.

The overall objective is to create projects or activities that are resilient to the effects of climate change. Climate resilience is the capacity of a system to absorb the stresses imposed by climate change, respond to them, and evolve into more sustainable and robust systems. Embedding climate resilience in the design of HCWM activities will contribute to minimizing the future losses and damage (and the associated costs) associated with extreme climate events and help them to rebound swiftly.

If healthcare facilities are sited in coastal areas, waste management strategies should account for potential changes in daily sea level variations, sea level rise, and storm surges, and appropriate waste storage and management plans should be developed based on these considerations. The same principle applies to healthcare facilities near floodplains, rivers, and wetlands. HCWM decisions should be informed by accurate data on geology, groundwater, surface water, flooding hazards, and proximity to vulnerable populations. Adapting design, operations, and maintenance of HCWM to climate change risks involves ensuring that structures and systems can withstand climate stressors, such as increasing temperatures and increasing frequency and/or intensity of extreme climate-related events (e.g., floods, wildfires, high-wind storms), to protect occupants and maintain the uninterrupted provision of services.

Reducing the amount of HCW stored in waste disposal sites is one of the easiest ways to reduce climate vulnerability. For example, one important adaptation strategy is ensuring adequate capacity to treat HCW more frequently (e.g., within 24 hours of generation) due to higher decomposition rates and pest activity from elevated temperatures in locations where local temperatures are likely to increase. This may require altering waste collection schedules, ensuring transportation, and increasing the use of disposal equipment. These measures may increase the cost of HCWM. However, from a risk management perspective, it is less costly to design for the potential direct and indirect impacts of climate change on HCWM systems than it is to risk major losses or damage (e.g., damaging sophisticated disposal equipment, such as an autoclave) or for staff, patients, or communities to face the risk of exposure to infectious diseases. Flood-related risks to HCW can be mitigated through the improvement of HCWM practices by updating design standards for waste treatment and disposal sites and waste storage facilities. This can be accomplished by considering climate risks in site location, ensuring that proper drainage systems are in place, and elevating sites to prevent inundation. These can be taken as preventative measures in advance of anticipated flood risks.

In municipal HCW collection systems, the accumulation of waste and informal disposal should be minimized, and adequate collection and storage and containment systems should be in place to reduce the spread of contamination and litter from flooding. However, many governments and municipal authorities in developing countries face a variety of challenges when implementing effective HCWM systems, including struggling to finance minimal HCW operations.

Improved HCWM practices can themselves serve as a measure to bolster climate resilience. For example, preventing waste blockages in a drainage system can significantly improve stormwater and wastewater management, particularly under increasing high-intensity rainfall events. Improving waste management can reduce the impacts of increasingly severe and/or frequent heat waves, storms, drought, and sea level rise, increasing a community’s climate resilience.

The ability of HCWM operations to provide continuous service during extreme climate events is also a key factor in establishing resilient projects and activities. Adaptation includes integrating, where economically feasible, back-up systems to provide services (e.g., power, water, communications) in the event of sudden or intermittent failures due to weather events. Debris management following these events is also important to protect human health, comply with regulations, conserve disposal capacity, reduce injuries, and prevent or minimize environmental impacts.

Climate risk management and adaptation measures also could inadvertently result in increased vulnerability to climate impacts for certain individuals or communities, particularly for those who are already marginalized. This is sometimes called *maladaptation*. For example, a community that is displaced to accommodate the construction of a new HCWM structure that aims to improve climate resilience could potentially suffer economically and lose cultural or knowledge-based connections with the land, ultimately leaving that community less resilient to climate stressors.

Addressing the points listed below will help develop more effective HCWM strategies that are both climate-resilient and equitable. This will facilitate ensuring that the health and well-being of all communities are protected in the face of climate change.

**Importance of Localization and Climate Equity**

- **Local Knowledge:** Building the capacity of the local community and staff knowledge is vital for effective HCWM in a changing climate.
- **Empowerment and Sustainability:** Empowering local leaders fosters ownership and ensures that solutions are tailored to the specific context, leading to more sustainable practices.

**Climate Risks and Vulnerable Populations**

- **Disproportionate Impact:** Marginalized communities often bear the brunt of climate impacts and compromised HCWM, which can put their health at further risk.

**Exploring Further**

- **Specific Climate Risks:** What are some of the most common climate risks that could affect HCWM in different regions (e.g., extreme heat, flooding)?
- **Vulnerable Populations and HCW:** How can HCWM strategies be specifically designed to protect vulnerable populations from climate-related risks?
- **Capacity Building for Local Actors:** What training or resources could be provided to local healthcare staff and communities to empower them in managing HCW in a changing climate?

See Annex 5 for additional information on mitigating the climate risks discussed above.

## 5.2 REDUCING GREENHOUSE GAS EMISSIONS

Waste treatment and disposal practices may generate GHGs either directly (e.g., via waste combustion or burning) or indirectly (e.g., via consumption of electricity or transport of waste). The overall climate impact depends on net GHGs. Properly maintained and operated waste management systems can reduce downstream, indirect GHG emissions through increased recycling and decreased energy and fossil fuel use. Project Design Teams should assess a proposed project's contribution to increasing GHG emissions and select implementation strategies and activities that will minimize these emissions in the most cost-effective manner. These implementation strategies and activities should be incorporated into activity planning and implementation documentation, such as the work plans; monitoring, evaluation, and learning (MEL) plans; Initial Environmental Examinations (IEEs) and Environmental Mitigation and Monitoring Plans (EMMPs); and other documents.

### CASE STUDY: LOW-CARBON WASTE MANAGEMENT

Nepal's Bir Hospital in Kathmandu installed 248 solar panels with the support of the World Bank, providing 60 kilovolt-amperes of electricity for critical care units. Bir Hospital also received international recognition for its waste reduction efforts, which are considered as much a humanitarian feat as an environmental one. The hospital cut its medical waste in half and now recycles 55% of all waste, which provides income to the hospital. Bir Hospital uses autoclaves to treat its infectious waste, including sharps, reducing emissions from small-scale incinerators. The hospital is experimenting with new methods to reduce waste further, including vermicomposting and a biogas system that turns food waste into biogas, with the potential to generate 1 kilowatt of electricity for cooking in the hospital kitchen.

Source:
Bouley,Timothy; Roschnik, Sonia; Karliner, Josh; Wilburn, Susan; Slotterback, Scott; Guenther, Robin; Orris, Peter; Kasper, Toby; Platzer,Barbara Louise; Torgeson, Kris.
*Climate-smart healthcare: low-carbon and resilience strategies for the health sector (English).* Investing in climate change and health series Washington, DC: World Bank Group. http://documents.worldbank.org/curated/en/322251495434571418/Climate-smart-healthcare-low-carbon-and-resilience-strategies-for-the-health-sector

A holistic approach to healthcare waste management (HCWM) may also help reduce or avoid GHG emissions. HCW treatment and disposal methods vary in terms of emissions. Some options have higher fuel consumption rates or higher emissions than others. These factors are all important to consider during project and activity design. Waste segregation and minimization strategies can help reduce GHG emissions from HCWM activities. Encouraging waste minimization, as described in Section 2, can aid IPs in reaching project objectives while reducing GHG emissions by, for example, minimizing the commodities purchased and, therefore, reducing transportation, treatment, and disposal needs. The segregation and recovery of nonhazardous paper and organic waste from hazardous HCW (e.g., to recycle paper, recover pharmaceutical packaging, compost organics), as well as the associated reduction in the amount of hazardous healthcare waste (HCW) to manage and treat, can reduce fossil fuel use and avoid increased air emissions. Additionally, in low-resource or energy-poor settings, powering healthcare with renewable energy sources, such as solar and wind, can enhance access to healthcare services for the community.

### 6.2.1 GLOBAL HEALTH SUPPLY CHAIN (GHSC) GHG ASSESSMENTS AND RECOMMENDATIONS

USAID's Global Health Supply Chain (GHSC) GHG Assessments completed in 2024 estimate transportation-related GHG emissions from USAID custody to in-country port-of-entry. The

assessments provide recommendations and opportunities for improvement in estimating these GHG emissions that can be applied to healthcare waste emissions assessments. Better understanding and quantification of GHG emissions can identify areas for reducing or avoiding GHG emissions. Establishing consistent metrics across country data, increasing consistency in data collection, and using specific location information can help to improve the data used in GHG emissions estimates. More specifically, the assessments recommend investigating actual shipment distances rather than distance estimates developed with origin and destination data, to monitor developments that increase transparency around the shipping industry's carbon footprint, and to standardize required reporting for in-country shipments to gather data. These improvements reduce assumptions and uncertainty in country-level emission estimates.

Assessing emissions across the entire USAID value chain can help to identify areas to reduce or avoid GHG emissions. For example, transitioning air shipments to sea shipments, optimizing shipping routes, and consolidating shipments can reduce GHG emissions from shipping. Furthermore, reviewing individual healthcare products for opportunities to reduce packaging can also help USAID reduce emissions from shipping.

# 6. PROJECT AND ACTIVITY DESIGN—SPECIFIC ENVIRONMENTAL GUIDANCE

Most USAID healthcare projects and activities are designed to improve health outcomes and save lives, while building sustainable and resilient healthcare systems in the poorest regions of the world. Project Design Teams must begin identifying proposed actions and their potential adverse impacts, as described in Sections 3, 4, and 5, as well as selecting appropriate mitigation measures. Where these impacts cannot be avoided, they will be further analyzed as the IEE documentation is developed and, subsequently, in more depth in the EMMP. Mitigation and monitoring requirements must also be included in procurement documents to ensure that issues are addressed during project implementation (see Section 7).

This section focuses on best management practices and design criteria that can help prevent the adverse environmental impacts associated with HCWM and support achieving compliance with the requirements of host country laws, 22 CFR 216, and ADS 204.

## 6.1 BEST PRACTICES FOR HEALTHCARE WASTE MANAGEMENT (HCWM)

The primary objective of HCWM is to do it properly to protect the environment and human health and ensure the sustainability of projects and activities. In order to achieve this objective, projects and activities must be designed and implemented with waste management needs and capabilities in mind. Therefore, proper planning for HCWM during the strategy, project, and activity stages is crucial to the success and sustainability of USAID healthcare programs.

Proper planning typically requires the development of a system to ensure proper management of HCW, as well as an IWMP or comparable SOPs to ensure the effective implementation of the HCWM system. In some cases, waste management may be part of a broader set of procedures, such as Infection Prevention and Control (IPC) programs. HCWM considerations must also be incorporated into solicitation and award documents in order to ensure that they are given due consideration, including budgeting and planning. The following sections discuss the importance of such systems and how to ensure adequate management of HCW.

### 7.1.1 EVALUATING HEALTHCARE WASTE MANAGEMENT (HCWM) SYSTEMS

Whether developing a new system for managing HCW or strengthening an existing one, a good place to start is evaluating the current situation. This evaluation includes understanding the existing HCWM system or IPC program (if any), the expected waste types and quantities, and the available infrastructure and workforce to manage the HCW. The Waste Management Program checklist and Waste Inventory Sheet templates in  can assist project teams with this process.

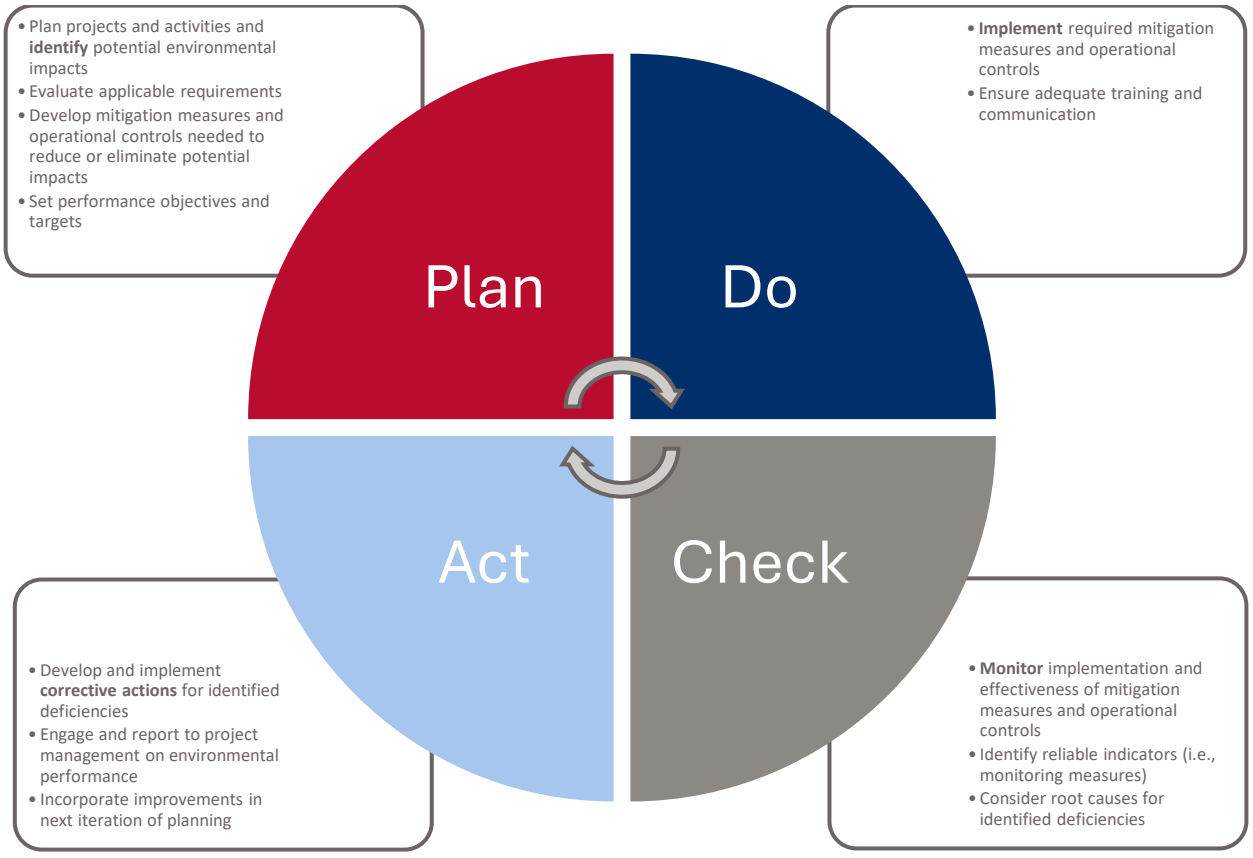
For teams wishing to conduct assessments of HCWM systems on the national level, WHO has developed a detailed rapid assessment tool that may be downloaded in English and French. See WHO. 2011. *Health-care waste management rapid assessment tool*. https://www.who.int/publications/m/item/health-care-waste-management-rapid-assessment-tool.

### 7.1.2 ADAPTIVE HEALTHCARE WASTE MANAGEMENT

The development of an HCWM system for the safe and effective management of HCW is an important best practice. However, such systems must be adaptive in order to remain successful. ADS 201 defines the term *adaptive management* as "an intentional approach to making decisions and adjustments in response to new information and changes in context." There are various tools that can help with adaptively managing projects through continuous learning, including the Plan-Do-Check-Act (PDCA) cycle (see Figure 3). PDCA is an iterative process used to achieve continual improvement by helping ensure that:

- Environmental impacts are identified;
- Adequate controls are implemented;
- Monitoring is performed; and
- Corrective actions are taken, when needed, to improve compliance.

**FIGURE 3. THE PLAN-DO-CHECK-ACT CYCLE**




Once improvements are identified and made through the PDCA cycle, they can be incorporated into the next iteration of planning, thereby improving the HCWM system moving forward.

### 7.1.3 INTEGRATED WASTE MANAGEMENT PLANS

The development and use of an IWMP or comparable SOPs is the recommended approach for successfully implementing an HCWM system. USAID has developed a recommended IWMP template, which can serve as a starting point for project teams preparing for HCWM.[46]

The USAID IWMP template provides the framework for creating a plan that takes a holistic view of the risks and impacts associated with waste generated from a project or activity. It also promotes the use of best practices and formal procedures in addressing those risks and impacts. The IWMP will vary in terms of length, content, and approach, depending on the scope, scale, and location of the project or activity.

**Key Elements of an IWMP**

- Introduction—Purpose, Scope, and Objective of the IWMP
- Roles and Responsibilities
- Waste Stream Identification
- Applicable Laws and Regulations
- Waste Management Procedures
- Waste Minimization
- Health and Safety Practices
- Implementation Strategy
- Employee Training Program
- Performance Monitoring and Reporting
- Plan Review Cycle

Regardless of its title or format, a Waste Management Plan or comparable SOPs should address the different types of waste that the team expects the project or activity to generate, as well as the associated handling, treatment, and disposal. It should also provide for monitoring and oversight, including monitoring operations, maintaining written records, and conducting periodic reviews of the plan itself. Therefore, multiple stakeholders with a variety of areas of expertise should be engaged during the planning stage. For example, the in-country Activity Manager may be an expert on applicable host country laws and regulations and project implementation strategy. However, it is important for the team to also have an HCW specialist, who can develop specific Integrated Waste Management Plan elements regarding waste management procedures and health and safety practices.

By working together, the project team can ensure that HCWM practices are organized, effective, and sustainable. Moreover, increased involvement during the planning stage typically results in stronger ownership and, therefore, increased commitment to ensuring the success of the plan.

The USAID IWMP template encompasses the key elements of an IWMP and includes 11 sections:

1. **Introduction**—A clearly defined purpose and scope (i.e., what activities and/or waste are covered). A clear scope and simple objectives can help avoid confusion.
2. **Roles and Responsibilities**—Typically consists of four layers of responsible parties: those designing it, those affected by it, those implementing it, and those monitoring its implementation. The plan should identify those persons and their designated roles and

[46] To download the template, with explanatory guidance text, see USAID. 2019. Integrated Waste Management Plan (IWMP). https://www.usaid.gov/environmental-procedures/environmental-compliance-esdm-program-cycle/environmental-documentation/iwmp.

responsibilities.

3. **Waste Stream Identification**—In order to plan appropriately, a waste management team must understand the sources, types, and quantities of waste generated, or expected to be generated, by a project or activity. Using an inventory, such as the template provided in Annex 3, can assist with this process. Annex 1 provides definitions and examples of the different types of HCW expected for USAID healthcare projects and activities.
4. **Applicable Laws and Regulations**—Once waste types have been identified, it is important to understand the laws or regulations that may apply. Often, generating hazardous waste will involve special requirements for additional controls. These requirements may include, but are not limited to, international standards and treaties, USAID or other U.S. Government policies or procedures, and host country laws and standards.
5. **Waste Management Procedures**—Project teams should develop procedures that address the full life cycle of waste management, ranging from on-site activities (e.g., waste segregation, containment, storage) to off-site activities (e.g., transportation, treatment/disposal, associated documentation and recordkeeping). Annex 1 provides guidance related to storing, handling, and treating/disposing of different types of HCW. Annex 2 provides more detailed guidance on the different types of treatment and disposal methods available for HCW.
6. **Waste Minimization**—As discussed in Section 2, waste minimization is the most preferable approach to reducing the negative impacts of HCW. Therefore, it is important for project teams to consider options and develop performance targets for minimizing waste generation. This section of the IWMP template also calls on project teams to consider and document reuse, recycling, and recovery options.
7. **Health and Safety Practices**—Beyond the potential adverse environmental impacts and health implications for neighboring communities, HCWM must also address the potential impacts on the health and safety of affected workers. Addressing these impacts may include practices such as mandatory vaccinations or the provision of PPE for certain jobs involved in handling HCW.
8. **Implementation Strategy**—In addition to developing a waste management system, teams must also plan how it will be implemented. For example, implementation plans should include the estimated cost (including the cost of personnel; occupational health and safety; waste collection, storage, treatment, and disposal; and/or training and capacity building), source of funding, and training needs, especially for individuals affected by waste management procedures (e.g., healthcare workers, waste handlers).
9. **Employee Training Program**—New employees will require training and existing employees will require refresher trainings at various intervals. A training plan and schedule should be developed and incorporated into the IWMP in order to ensure safe handling, storage, treatment, and disposal of waste.
10. **Performance Monitoring and Reporting**—An effective waste management system should also delineate procedures for ensuring compliance with the system and applicable requirements, as well as procedures for monitoring and reporting on the effectiveness of the system. Performance monitoring and reporting should enable teams to identify problems or issues in order to remedy them via corrective actions. A process for corrective actions

should be incorporated into the plan.

11. **Plan Review Cycle**—At regular intervals, the plan should undergo review to ensure that it remains current and effective.

### 6.2 USAID RESPONSIBILITY FOR HEALTHCARE WASTE MANAGEMENT (HCWM)

Understanding that an effective HCWM system is crucial to the success of USAID projects and activities, the question then arises: **Who is responsible for developing and implementing the HCWM system?**

At USAID, this responsibility is often established based on the IEE process and the resulting *Threshold Determinations*, which reflect the level of expected environmental impacts of activities and the degree to which such impacts can be mitigated, as well as the degree of USAID control over those activities.

**MOST COMMON THRESHOLD DETERMINATIONS FOR USAID PROJECTS/ACTIVITIES**

**Categorical Exclusion**—Little or no environmental impacts

**Negative Determination**—Some environmental impacts, which may be reduced or eliminated with mitigation measures and monitoring (i.e., conditions included with the determination)

**Positive Determination**—Significant, foreseeable environmental impacts requiring further evaluation, design considerations, and mitigation

Typically, the negative impacts associated with USAID healthcare activities receiving a *Negative Determination* stem from the increased generation of HCW at discrete locations. Larger scale activities that may have a significant impact on the environment or human health typically receive a *Positive Determination* and require more thorough assessment of potential impacts. For both *Negative* and *Positive Determinations*, potential impacts can be mitigated according to the IEE document's conditions, which provide for appropriate management and monitoring of the waste streams as part of the project or activity. The EMMP required by the IEE document will operationalize these conditions into actions required by the IP. Also, activities providing capacity-building and/or technical support for healthcare facilities or supporting broader institutions or systems affecting healthcare operations should generally attempt to develop or strengthen systems for appropriate HCWM.

Where USAID and other donors are directly delivering healthcare services or healthcare training that generates HCW, USAID, through its IPs, generally must take responsibility for managing the resulting waste streams. This responsibility includes the effective development and implementation of an appropriate HCWM system. Where USAID provides partial, or non-controlling, support to an institution, facility, system, or activity that is delivering healthcare services and generating waste, the question becomes more complicated. Careful consideration of the degree of donor responsibility for, and involvement in, the HCWM system is required on a case-by-case basis prior to implementation of the activity.

Table 5 presents various scenarios in which USAID may have different levels of responsibility for HCWM, as well as recommended approaches. It is critically important that the roles and responsibilities related to waste management be properly defined in project documents during

both the planning and design phase and the implementation phase (i.e., in the Project Appraisal Document (PAD)/Activity Action Memo, IEE, Work Plan, EMMP, IWMP, and/or SOPs).

**TABLE 5. RECOMMENDED LEVELS OF USAID RESPONSIBILITY AND/OR BEST PRACTICES FOR HEALTHCARE WASTE MANAGEMENT (HCWM)**

| PROJECT CATEGORY | ILLUSTRATIVE ACTIVITY | RECOMMENDED USAID APPROACH |
|---|---|---|
| Direct delivery of healthcare trainings that do not generate waste requiring management | Classroom training on waste management without demonstrations or similar activities that would generate HCW<br>*Potential Threshold Determination:*<br>Categorical Exclusion | ● Avoid indirect impacts. |
| Direct delivery of healthcare services or healthcare trainings that generate waste requiring management | Operating 12 mobile clinics<br>*Potential Threshold Determination:*<br>Negative Determination with Conditions | ● Ensure the proper management of waste throughout the project life cycle.<br>● At a minimum, provide support and guidance to existing facilities and organizations in-country to encourage improvements on the macro level. Recommended actions may include the following:<br>– Encourage public-private partnerships or corporate social responsibility initiatives to build HCWM capabilities, such as sponsoring mobile incinerators or other suitable waste treatment and disposal options.<br>– Work with host country environmental and healthcare authorities to ensure that proper HCWM guidelines are followed.<br>– Coordinate with other donors to share responsibility for the disposing of the HCW generated.<br>– Provide supplies (e.g., PPE for healthcare staff, color-coded waste bins and liners).<br>● Provide social and behavior change communication (SBCC) tools (e.g., informational posters in the local language or with visual depiction of proper waste disposal). |
| Distribution of personal use products | Distribution of home test kits, personal repellents, or similar personal products<br>*Potential Threshold Determination:*<br>Negative Determination with Conditions | ● Conduct collection campaigns, if possible.<br>● Provide instructions for safe use, handling, and disposal.<br>● Conduct SBCC campaigns (e.g., instructions for the safe disposal of empty personal repellent containers). |

| PROJECT CATEGORY | ILLUSTRATIVE ACTIVITY | RECOMMENDED USAID APPROACH |
|---|---|---|
| Support to an institution, system, or activity that is delivering healthcare services and is generating waste | Supporting healthcare activities at the local Ministry of Health facility with no control by USAID IPs over the facility<br>*Potential Threshold Determination:*<br>Negative Determination with Conditions | ● At a minimum, provide support and guidance to existing facilities and organizations in-country to encourage improvements on the macro level. Recommended actions may include the following:<br>– Encourage public-private partnerships or corporate social responsibility initiatives to build HCWM capabilities, such as sponsoring mobile incinerators or other suitable waste treatment and disposal options.<br>– Work with host country environmental and healthcare authorities to ensure that proper HCWM guidelines are followed.<br>– Coordinate with other donors to share responsibility in disposing of the HCW generated.<br>– Provide supplies (e.g., PPE for healthcare staff and/or color-coded waste bins and liners).<br>● Provide SBCC tools (e.g., informational posters in the local language or visual depiction of the safe administration of vaccinations). |
| On-site/direct management of a healthcare facility or activity | USAID program conducting vaccination programs in hundreds of clinics operated by USAID<br>*Potential Threshold Determination:*<br>Negative Determination with Conditions (possibly Positive Determination, depending on the circumstances) | ● Assess existing host country/local systems capacity (e.g., existing infrastructure, suitable waste treatment and disposal options, applicable laws/regulations).<br>● If the host country/local system's capacity is inadequate or does not exist, consider alternative solutions in advance of project implementation (e.g., exportation of waste and/or building waste management capacity as part of the project).<br>● Begin following best practices during the design and procurement stages (e.g., ensuring the procurement of approved commodities, planning for waste minimization, budgeting for sustainable waste management). |
| Construction or rehabilitation of healthcare facilities | Renovation of a hospital ward<br>*Potential Threshold Determination:*<br>Negative Determination with Conditions (possibly Positive Determination, depending on the circumstances) | ● See the Construction SEG and the Small Healthcare Facilities SEG for more information, available at USAID's Environmental Procedures Hub (https://www.usaid.gov/environmental-procedures/sectoral-environmental-social-best-practices/sector-environmental-guidelines-resources). |

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# 7. IMPACT MITIGATION, ENHANCEMENT, AND MONITORING

## 7.1 MITIGATION AND IMPLEMENTATION HIERARCHY

Where impacts are identified, it is necessary to work through possible mitigation and improvement measures to manage those impacts. Mitigation is the identification and application of measures to avoid, minimize, or remedy impacts. Potential adverse impacts and mitigation measures should be discussed during the planning and design phase, as well as during the development of project documents. The Initial Environmental Examination (IEE) and Environmental Mitigation and Monitoring Plan (EMMP) are project document examples. The CRM Screening (included in the IEE) is used to plan for the mitigation of climate risks.[47] Mitigation can be implemented at all stages of the project cycle. However, the earlier that impacts are identified and considered, the more likely they can be avoided. The term *mitigation* is defined under the U.S. National Environmental Policy Act as any activity that includes the following:

- Avoiding the impact all together by not taking a certain action or part of an action.
- Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment.
- Reducing or eliminating the impact over time by conducting preservation and maintenance operations during the life of the action.
- Compensating for the impact by replacing or providing substitute resources or environments.

Those responsible for designing or implementing projects or activities should prioritize mitigation measures in line with the mitigation hierarchy described above.

## 7.2 BEST MANAGEMENT PRACTICES IN PLANNING AND DESIGN

As Section 6 illustrates, USAID-funded projects and activities should be planned and designed to maintain or improve environmental, health, or sociopolitical systems, as well as minimize negative impacts. Projects should be designed to meet international industry best practices and should follow the steps outlined in 22 CFR 216. Typically, such plans and designs are incorporated into EMMPs, which are required for most USAID-funded projects. EMMPs describe the required mitigation measures to avoid or minimize negative impacts and assign corresponding monitoring activities to ensure that mitigation measures are sufficient and appropriate.

## 7.3 OPERATIONAL STAGE MITIGATION AND MONITORING

It is essential that project managers engage specialists with expertise in the management of environmental and socioeconomic impacts to assist in identifying opportunities to avoid or minimize potential impacts. In countries where project infrastructure for supporting good environmental and social management is lacking, it is important that Mission leaders, including Mission Front Office and Activity Managers, take a proactive role in determining locally adapted

[47] See Annex 5: Mitigation of Climate Risks for information on managing climate risks.

solutions that achieve the best practices set out in the *Sector Environmental Guidelines* and nationally or internationally accepted standards.

As noted in previous sections, potential adverse impacts and mitigation measures must be identified, documented, and addressed throughout the project life cycle, including during procurement and implementation. During implementation, impacts and mitigation measures are typically further analyzed as EMMPs are developed. Once approved, EMMPs set out monitoring requirements to ensure that mitigation measures are sufficient and appropriate. USAID personnel oversee mitigation and monitoring to ensure effective implementation and oversight by the IP, as well as appropriate reporting of monitoring, issue identification, and issue resolution. Where serious deviations are noted, USAID personnel may need to intercede. For example, a Contracting Officer's Representative may need to take direct action, and an Agreement Officer may need to issue a stop work order.

Table 8 in Annex 4 identifies the potential adverse environmental impacts associated with HCWM activities and the mitigation measures that can be implemented to reduce or eliminate these impacts. The table includes activities that may generate HCW (e.g., procurement, storage, distribution/use of commodities), as well as activities directly involving the HCW (e.g., waste storage, transportation, treatment/disposal). The monitoring indicators described in the table include procedures, plans, or other documentation used to monitor the implementation of mitigation measures and continually improve HCWM practices. However, the Annex 4 information only provides general guidance. Project-specific characteristics should be considered before applying such guidance.

USAID experts, including Mission Environmental Officers (MEOs), Regional Environmental Advisors (REAs), and Bureau Environmental Officers (BEOs), should be consulted for assistance.

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# ANNEX 1: HEALTHCARE WASTE TYPES

Healthcare waste (HCW) includes a variety of separate waste streams, or types, which may require different handling, storage, treatment, and disposal considerations. Proper segregation of these waste streams is important to ensure proper treatment and disposal, as well as aid in potential waste minimization, reuse, and recycling strategies. Table 6 below provides detailed information on the types of HCW streams that may be generated by USAID projects and activities. It also contains guidance on the recommended handling, storage, labeling, treatment, and disposal for these waste streams. The treatment and disposal methods presented in this Annex are recommended, although some may not be feasible or available in some locations. Technologies that are not recommended have not been included in Table 6. However,  explores additional information on a range of treatment and disposal options.

**A note on color-coding:** The primary goal of color-coding waste containers is to allow individuals to be able to easily identify the types of waste contained in them for treatment and disposal. Recommendations provided in Table 6 regarding the color-coding of waste containers are based on the WHO-recommended segregation scheme in Table 7.1 of the Safe Management of Wastes from Health-Care Activities Handbook. However, certain countries may follow different color-coding schemes. Refer to the applicable host country regulations and guidance on HCWM.

**TABLE 6. TYPES OF HEALTHCARE WASTE AND DISPOSAL/TREATMENT CONSIDERATIONS**

| TYPE OF WASTE[48] | DESCRIPTION AND EXAMPLES | SPECIAL HANDLING CONSIDERATIONS | STORAGE AND LABELING CONSIDERATIONS | RECOMMENDED TREATMENT/ DISPOSAL METHODS[49] |
|---|---|---|---|---|
| **NONHAZARDOUS WASTE** | | | | |
| Nonhazardous/General Waste | Waste that has not been in contact with infectious waste, hazardous chemicals, or radioactive substances. Waste includes paper, cardboard, plastics, textiles, food, and packaging. This waste type makes up most of the waste generated at healthcare facilities. | ● Waste should be segregated from other waste streams.<br>● Waste should be stored in a manner that prevents harboring or infestation of vectors or other pests. | ● General waste should be stored in black plastic bags.<br>● Waste bags should be adequately sized to contain all waste and prevent fly-aways or spillage. | ● Recycling (e.g., cardboard, glass, metal).<br>● Mechanical processes (e.g., compactors, shredders, grinders) may be used to reduce the volume of waste.<br>● Composting may be used for food waste and organic materials.<br>● Incineration with proper pollution control (for materials not reused, recycled, or composted).<br>● Sanitary landfill. |
| **HAZARDOUS WASTE** | | | | |

[48] The Construction SEG and the Small Healthcare Facilities SEG provide information about waste management, including asbestos and lead, for hospitals under construction or rehabilitation. The Solid Waste SEG provides additional broader level waste management information. For all USAID *Sector Environmental Guidelines*, see USAID. 2019. *Sector Environmental Guidelines & Resources*. https://www.usaid.gov/environmental- procedures/sectoral-environmental-social-best-practices/sector-environmental-guidelines-resources

[49] More details are provided in Annex 2: Treatment And Disposal Options For Waste From Small-Scale Healthcare Activities.

| TYPE OF WASTE[48] | DESCRIPTION AND EXAMPLES | SPECIAL HANDLING CONSIDERATIONS | STORAGE AND LABELING CONSIDERATIONS | RECOMMENDED TREATMENT/ DISPOSAL METHODS[49] |
|---|---|---|---|---|
| Sharps Waste | Items that could cause cuts, punctures, or tears to an individual's skin. Examples of this type of waste include needles, scalpels, razors, glass, saws, and knives. | Sharps waste should be handled in a manner that minimizes healthcare worker contact with the waste to prevent needlestick injuries (e.g., no recapping or manipulation of needles after use). | ● Sharps waste should be stored in clearly labeled, hard plastic, metal, or cardboard, leak-proof containers. It is preferable if the containers are single-use, self-locking, and tamper-proof.<br>● Sharps disposal containers should not be overfilled.<br>● Sharps containers should be yellow, marked "SHARPS," and marked with a biohazard symbol. | ● Advanced autoclave system.<br>● Autoclaving.<br>● Microwave treatment.<br>● Dry heat technology.<br>● Incineration with proper pollution control.<br>● May include the use of mechanical processes (e.g., compactors, shredders, grinders) to reduce the volume of waste.<br>● Encapsulation and sanitary landfill (after shredding, mixing, incineration, or autoclaving). |

| TYPE OF WASTE[48] | DESCRIPTION AND EXAMPLES | SPECIAL HANDLING CONSIDERATIONS | STORAGE AND LABELING CONSIDERATIONS | RECOMMENDED TREATMENT/ DISPOSAL METHODS[49] |
|---|---|---|---|---|
| Rapid Test Kits (RTKs) and Other Disposables | RTKs and other disposables are self-testing kits, where an individual collects his or her own specimen (e.g., blood or saliva), interprets the results in a private setting (e.g., at home), and disposes of the materials.<br>Sometimes, tests may be administered by a healthcare provider, adding the RTKs to the facility's waste stream.<br>Other disposables may include voluntary medical male circumcision (VMMC) kits, which are used in areas with limited staff or sterilization facilities. | ● Oral fluid (or saliva) tests may generate significantly less biohazardous waste than other test types. Blood tests pose a greater risk due to the need for used sharps disposal.<br>● RTKs provided for home testing should be accompanied by disposal instructions.<br>● RTKs administered at a healthcare facility should be segregated and stored according to the facility's IWMP. | ● Used RTKs and VMMC kits should be handled according to the manufacturer's instructions.<br>● For blood tests, see "Sharps Waste" row above. | ● Used RTKs should be disposed of according to the manufacturer's instructions.<br>● Where the manufacturer's instructions are not available or feasible, disposal of RTKs should be included with infectious or sharps waste, as appropriate.<br>● For blood tests, see "Sharps Waste" row above. |

| TYPE OF WASTE[48] | DESCRIPTION AND EXAMPLES | SPECIAL HANDLING CONSIDERATIONS | STORAGE AND LABELING CONSIDERATIONS | RECOMMENDED TREATMENT/ DISPOSAL METHODS[49] |
|---|---|---|---|---|
| Infectious Waste | Waste that is suspected to contain pathogens (e.g., bacteria, viruses, parasites, fungi) in sufficient quantity or concentration to cause disease. Examples include items contaminated with blood and/or body fluids, laboratory cultures or stocks, and waste from the treatment of a known infectious patient. | ● Infectious waste should be segregated from other waste and handled in a manner that minimizes healthcare worker contact with the waste.<br>● Highly infectious waste should be collected separately and autoclaved at the point of generation. Once disinfected, it can be stored and transported in an infectious waste container. | ● Infectious waste should be stored in leak-proof containers or bags.<br>● Infectious waste containers should be yellow with a biohazard symbol. | ● Advanced autoclave system.<br>● Autoclaving.<br>● Microwave treatment.<br>● Dry heat technology.<br>● Incineration with proper pollution control. |
| Pathological Waste | Pathological waste includes human tissue, organs, placentas, or body parts.<br>Pathological waste could also include blood and body fluids from surgery, autopsy waste, or test tubes containing specimens. | ● Pathological waste should be segregated from other waste and handled in a manner that minimizes healthcare worker contact with the waste. | ● Pathological waste should be stored in leak-proof containers or bags.<br>● Pathological waste containers should be yellow with the biohazard symbol. | ● Maceration with chemical disinfection.<br>● Incineration with proper pollution control.<br>● Placenta burial pits. |

| TYPE OF WASTE[48] | DESCRIPTION AND EXAMPLES | SPECIAL HANDLING CONSIDERATIONS | STORAGE AND LABELING CONSIDERATIONS | RECOMMENDED TREATMENT/ DISPOSAL METHODS[49] |
|---|---|---|---|---|
| Pharmaceutical Waste | Pharmaceuticals that are expired, unused, spilt, or contaminated. Examples include vaccines, antibiotics, sera, or other prescribed drugs. | ● Pharmaceutical waste should be segregated from other waste streams. | ● Pharmaceutical waste should be stored in plastic bags or rigid containers.<br>● Pharmaceutical waste containers should be brown and labeled with an appropriate hazard symbol (e.g., corrosive, highly flammable, toxic). | ● Return to the supplier, if possible. Check with suppliers to determine the feasibility of and process for returns.<br>● Incineration with proper pollution control (requires temperatures of >1200°C for proper treatment).<br>● Encapsulation. |
| Cytotoxic (Antineoplastic) Waste | Cytotoxic waste includes outdated or excess pharmaceuticals used for chemotherapy or cancer treatment. These drugs can cause birth defects, mutations, or cancer. This waste stream also includes contaminated materials from drug preparation and administration or body fluids from treated patients. | ● Waste should be segregated from other waste streams.<br>● Due to the toxic nature of this waste, staff should wear chemo-resistant PPE when handling this waste type. | ● Waste should be stored in leak-proof containers and bags that are clearly labeled as cytotoxic waste, including the appropriate symbol. | ● Incineration with proper pollution control (requires temperatures of >1200°C for proper treatment).<br>● Encapsulation. |

| TYPE OF WASTE[48] | DESCRIPTION AND EXAMPLES | SPECIAL HANDLING CONSIDERATIONS | STORAGE AND LABELING CONSIDERATIONS | RECOMMENDED TREATMENT/ DISPOSAL METHODS[49] |
|---|---|---|---|---|
| Chemical Waste | Waste includes discarded or expired solid, liquid, or gaseous chemicals. Examples include cleaning and maintenance chemicals or diagnostic laboratory reagents. These chemicals have toxic, corrosive, flammable, oxidative, or reactive properties. | ● Chemical waste should be segregated according to compatibility (e.g., acids should be stored away from bases) into clearly labeled containers. | ● Chemical waste containers should be brown and labeled with an appropriate hazard symbol (e.g., corrosive, highly flammable, toxic).<br>● Containers should be compatible with the contents. | ● Chemical treatment/neutralization (only for certain chemicals).<br>● Encapsulation.<br>● Sanitary landfill. |
| Radioactive Waste | Waste materials contaminated with radionuclides. These materials are generated during patient treatment with radionuclides, imaging procedures, or laboratory activities. | ● Waste should be stored in containers that prevent the dispersion of radiation and stored behind lead shielding. | ● Recommended container is a lead box.<br>● Containers should be labeled with a radiation symbol. | ● Decay in storage.<br>● Encapsulation. |

The Construction SEG and the Small Healthcare Facilities SEG provide information about waste management, including asbestos and lead, for hospitals under construction or rehabilitation. The Solid Waste SEG provides additional broader level waste management information. For all USAID *Sector Environmental Guidelines*, see USAID. 2019. *Sector Environmental Guidelines & Resources*. https://www.usaid.gov/environmental- procedures/sectoral-environmental-social-best-practices/sector-environmental-guidelines-resources

# ANNEX 2: TREATMENT AND DISPOSAL OPTIONS FOR WASTE FROM SMALL-SCALE HEALTHCARE ACTIVITIES

A strong waste segregation system (i.e., sorting and separating different waste streams) is extremely important for reducing the volume of waste that requires special treatment and/or disposal. According to the World Health Organization, separating infectious waste from general waste reduces the amount of waste requiring pre-disposal treatment by approximately 75% to 90%. In addition, separating sharps from other infectious waste helps reduce the dangers associated with sharps waste, such as needlestick injuries. Other waste streams (e.g., PVC plastics, materials containing heavy metals) can also be segregated for separate treatment and disposal.

Table 7 below provides information regarding various healthcare waste (HCW) treatment and disposal methods (including advantages and disadvantages) and the types of waste for which they are best-suited. The methods have been categorized as follows:

1. **GREEN TIER:** Environmentally preferable methods that are typically available and/or feasible in developing countries.
2. **YELLOW TIER:** Environmentally preferable methods that may not be available and/or feasible in developing countries (e.g., due to cost and/or the availability of technology) or that are emerging technologies.
3. **RED TIER:** Non-environmentally preferable methods that should only be used if more environmentally preferable options are unavailable.

Table 7 is not intended to be an exhaustive list of options that are available or well-suited for every project or activity, nor an endorsement of one method over another by USAID. The inclusion of a treatment or disposal method in the table does not guarantee its effectiveness or appropriateness for specific cases. The costs and consequences of treatment and disposal methods should be considered when conducting environmental analyses and designing healthcare activities. Technologies should also be carefully evaluated before their selection in order to determine their viability. Beyond treatment and disposal technologies, it is also important to consider waste minimization strategies, as well as reuse and recycling, when and where appropriate.

With regard to incineration, Stockholm Convention guidance states that if HCW is incinerated under conditions that do not constitute best available techniques or best environmental practices, there is a potential for the release of polychlorinated dibenzodioxins and polychlorinated dibenzofurans (commonly referred to as “dioxins and furans”) in relatively high concentrations. Dioxins and furans are highly toxic air pollutants that are known to cause serious health issues. WHO states that small-scale healthcare incinerators often encounter significant problems and, therefore, concludes that “small-scale incineration is viewed as a transitional means of disposal for healthcare waste.” WHO also advises using caution before selecting developing and emerging technologies (e.g., plasma pyrolysis, superheated steam, ozone) for routine use because most do not have a demonstrable track record in HCW applications. See World Health Organization (WHO). 2014. *Safe management of wastes from health-care activities, Second edition.* [Chartier, Y., J. Emmanuel, U. Pieper, A. Prüss, P. Rushbrook, R. Stringer, W. Townend, S. Wilburn, and R. Zghondi (eds)]. ISBN 978 92 4 154856 4. Pages 117 and 126. https://www.who.int/publications/i/item/9789241548564.

**TABLE 7. HEALTHCARE WASTE TREATMENT AND DISPOSAL METHODS**

| TREATMENT/ DISPOSAL METHOD | DESCRIPTION | ADVANTAGES | DISADVANTAGES | FEASIBILITY OF METHOD* |
|---|---|---|---|---|
| **GREEN TIER: ENVIRONMENTALLY PREFERABLE TREATMENT/DISPOSAL METHODS THAT ARE TYPICALLY AVAILABLE AND/OR FEASIBLE FOR SMALL-SCALE HEALTHCARE WASTE MANAGEMENT** | | | | |
| Autoclave (Low- Heat Thermal Process) | Steam treatment of waste at high temperature (93°C–177°C) and pressure for enough time for sterilization. The exact temperature, pressure, and time of exposure needed for disinfection is dependent on the composition of the waste. This method is commonly used for sterilizing reusable medical equipment. | • Efficient at disinfecting.<br>• Can be used for infectious and sharps waste.<br>• Pre-vacuum autoclaves are the most efficient type of autoclave.<br>• If properly operated and maintained and if waste is properly segregated, has no significant adverse environmental impacts.<br>• This technology is widely available with established operating parameters. | • Requires trained/qualified operators.<br>• Waste must be placed into autoclave-appropriate (i.e., steam-permeable) bags.<br>• Cannot be used on pathological, pharmaceutical, radioactive, or chemical waste.<br>• Waste treatment autoclaves must include controls to ensure that there is no release of pathological aerosols (i.e., HEPA filters).<br>• Treated waste retains its physical appearance and volume.<br>• Insufficient ventilation can lead to odors. | • This technology is widely available.<br>• Capital costs are lower when compared with other waste treatment technologies. |

| TREATMENT/ DISPOSAL METHOD | DESCRIPTION | ADVANTAGES | DISADVANTAGES | FEASIBILITY OF METHOD* |
|---|---|---|---|---|
| Integrated Autoclave Systems (Advanced Autoclaves) | Functions as an autoclave but also includes a mechanical process, such as internal shredding or compacting, for volume reduction to make the waste unrecognizable and to improve heat transfer and distribution. | • Efficient at disinfecting.<br>• Has no significant environmental adverse impacts if properly operated and maintained and if waste is properly segregated.<br>• Highly automated and computer-controlled; reduced reliance on the operator.<br>• Reduced disinfection time.<br>• Can be used for pathological waste.<br>• Reduces waste volume by 85%–90%. | • Cannot be used on pharmaceutical or chemical waste.<br>• Waste must be placed in autoclave-appropriate (steam-permeable) bags. | • This technology is widely available.<br>• Capital costs can vary in price depending on the size and type of the mechanical process incorporated into the system.<br>• Higher capital cost than regular autoclaving. |

| TREATMENT/ DISPOSAL METHOD | DESCRIPTION | ADVANTAGES | DISADVANTAGES | FEASIBILITY OF METHOD* |
|---|---|---|---|---|
| Microwave Treatment (Low- Heat Thermal Process) | Waste is treated by steam generated when water contained in or added to the waste is heated by microwave energy. These systems often have a mechanical process (shredder or compactor) included. | • Efficient at disinfecting.<br>• Has no significant environmental adverse impacts if properly operated and maintained and if waste is properly segregated.<br>• Reduced disinfection time.<br>• Simple to understand and generally requires only a single operator.<br>• Lower operational costs (energy) when compared with autoclaves. | • Requires trained/qualified operators.<br>• Waste must be placed in appropriate, steam-permeable bags.<br>• Microwave treatment is most efficient when waste is shredded or in small batches.<br>• Treated waste would retain its physical appearance and volume if a mechanical process is not used.<br>• Cannot be used on pathological, pharmaceutical, radioactive, or chemical waste.<br>• System must include controls to ensure that there is no release of pathological aerosols (i.e., HEPA filters). | • Capital costs are higher when compared with other technologies. |

| TREATMENT/ DISPOSAL METHOD | DESCRIPTION | ADVANTAGES | DISADVANTAGES | FEASIBILITY OF METHOD* |
|---|---|---|---|---|
| Dry Heat Technology | Heat is applied to the waste without adding steam or water. Heat is created through conduction, convection, or thermal radiation. | • Has no significant environmental adverse impacts if properly operated and maintained and if waste is properly segregated.<br>• Treatment of infectious, sharps, and pathological waste is feasible with this technology.<br>• Treated waste is dry and generally unrecognizable.<br>• Generally, an easier installation and simpler operation requirements when compared with other waste treatment technologies. | • Best for small volumes of waste.<br>• Requires higher temperatures and longer exposure times than other methods.<br>• Should not be used for pharmaceutical, radioactive, or chemical waste.<br>• Some organisms may not be destroyed because there is no moisture.<br>• Bacillus atrophaeus spores are resistant. | • Capital costs can vary based on size but are generally lower when compared with other technologies.<br>• While there are companies that offer this technology, they are not as widely available as autoclaves. |
| Encapsulation | The addition of immobilizing material (e.g., sand, clay, foam) to a waste container and sealing it off prior to burial or storage. | • Used for pharmaceutical, chemical, or heavy metal waste.<br>• Allows for the safe transport of hazardous waste. | • Medical waste is not sterilized or disinfected.<br>• Increases the volume of waste that is to be disposed.<br>• Long-term adverse environmental effects are possible. | • Encapsulation costs are generally low.<br>• Encapsulated waste would typically be transported to a sanitary landfill or buried on-site in a lined pit. |

| TREATMENT/ DISPOSAL METHOD | DESCRIPTION | ADVANTAGES | DISADVANTAGES | FEASIBILITY OF METHOD* |
|---|---|---|---|---|
| In-Country Landfill Disposal | HCW streams are segregated and shipped to a landfill disposal facility. Examples of final disposal options in developing countries include the less likely sanitary landfill (with environmental protection components such as a liner, leachate management, GHG management, and/or daily cover) and a controlled landfill (with less protection components). | • Various waste types and volumes can be accommodated.<br>• More likely that adequate operational controls, including waste segregation and routine maintenance, are in place.<br>• More likely that qualified operators are used.<br>• More likely that pollutants are adequately controlled. | • Additional responsibility to properly store and transport waste.<br>• Additional cost to properly store and transport waste.<br>• Disposal costs are dependent on the availability and location of consolidated disposal facilities. | • Feasibility is dependent on the availability of consolidated disposal operations and their willingness to accept HCW.<br>• Requires large, secured storage area on-site until waste can be transported off-site. |
| Waste Exportation | Transport of waste to adequate facilities in other countries for treatment and/or final disposal. The waste generator receives a receipt of proof of waste treatment and/or disposal in an environmentally sound manner in the state of importation (e.g., certificate of destruction).<br>Refer to Section 2 of this SEG for information on the Basel Convention. | • No on-site treatment and/or disposal systems are needed.<br>• Does not require training, treatment, and/or disposal operators.<br>• Provides access to treatment and disposal sites when no comparable alternatives are available locally. | • Highly regulated or, in some countries, prohibited.<br>• Requires proper vetting of the transportation contractor to ensure proper qualifications and certifications, including of treatment and/or the final disposal site.<br>• Certain waste is prohibited from import/export. | • Can be extremely costly due to specialized requirements for packing, labeling, shipping, treatment, and/or disposal.<br>• Relatively high risk if handled by an unqualified contractor.<br>• Requires a large, secured storage area on-site until waste can be transported off-site. |

| TREATMENT/ DISPOSAL METHOD | DESCRIPTION | ADVANTAGES | DISADVANTAGES | FEASIBILITY OF METHOD* |
|---|---|---|---|---|
| Double-chamber (Pyrolytic/ Starved Air) Incineration | A furnace of masonry/concrete, refractory materials, and metal. Waste thermally decomposes in the first, oxygen-poor (pyrolytic) chamber, which operates at 800°C–900°C. In the second chamber, the gases produced in the primary chamber are burned at a high temperature (1100°C–1600°C). If the temperature drops below 1100°C (the minimum requirement specified in the European Union's Waste Incineration Directive 2000/76/EC), additional energy should be provided by a gas or fuel burner. | • Disinfects very effectively.<br>• Fewer toxic emissions, odor, and smoke than single-chamber and drum incinerators (but still should not be used to incinerate PVC).<br>• Reduces waste volume by ~95%.<br>• Some mobile and containerized options are available, along with varying sizes and options for add-on controls.<br>• Potential for energy recovery through combustion. | • Effective performance requires qualified operators and regular maintenance.<br>• Sharps in ashes will still pose a physical hazard.<br>• Without proper maintenance and operations practices, air pollution can occur, including emission such as fly ash, acid gases, and some toxins. | • Capital costs are higher when compared with other types of incinerators or disposal options. |
| Single-Chamber Incineration | A simple furnace of solid construction (e.g., concrete or brick). Waste is placed on a fixed grate. Burning is maintained by the natural flow of air. Operating temperature reaches <300°C. May need to add kerosene or similar fuel to maintain combustion. | • Disinfects effectively.<br>• Reduces waste volume by ~80%.<br>• Burning efficiency of 90%–95%.<br>• Potential for energy recovery through combustion. | • Without proper maintenance and operations practices, air pollution can occur, including emissions such as fly ash, acid gases, and some toxins.<br>• May produce odors (can be limited by not burning PVC plastics; avoiding PVCs will prevent the worst toxin and odor problems).<br>• Sharps in ashes will still pose physical hazards.<br>• Not appropriate for | • Capital costs are lower when compared with other types of incinerators or waste disposal options. |

| TREATMENT/ DISPOSAL METHOD | DESCRIPTION | ADVANTAGES | DISADVANTAGES | FEASIBILITY OF METHOD* |
|---|---|---|---|---|
| | | | most pharmaceutical or chemical waste. | |
| Rotary Kilns | Comprises a rotating oven and a post-combustion chamber, allowing for the incineration of infectious waste (including sharps), pathological waste, and chemical and pharmaceutical waste (including cytotoxic waste). A rotating oven is typically inclined 3%–5% of slope, rotates 2–5 times a minute, and is loaded with waste at the top. Available incineration capacities of rotary kilns range from 0.5 to 3 metric tons per hour. | • Incineration temperature between 1200°C and 1600°C allows decomposition of very persistent chemicals, such as polychlorobiphenyls and genotoxic substances.<br>• May operate continuously and can be adapted to a wide range of loading devices. | • Treatment of radioactive waste does not affect the radioactive properties and may disperse radiation.<br>• Likely requires exhaust gas cleaning and ash treatment equipment if used to incinerate chemical waste, which produces exhaust gases and ashes potentially loaded with toxic chemicals. | • Frequent repair or replacement of the kiln refractory lining is required due to the highly corrosive nature of the waste and incineration byproducts.<br>• Requires well-trained operators. |
| Return to Supplier | Unused and/or expired products are returned to the product supplier or manufacturer for proper reuse, treatment, and/or disposal. | • Has no significant environmental impact.<br>• Good method to use for expired or unused pharmaceuticals, chemicals, or other medical supplies. | • Most efficient when the facility has good inventory control processes. | • Few suppliers have programs that allow facilities to return unused or expired products.<br>• Products must be stored in a manner that keeps them in a condition that would allow them to be returned. |

| TREATMENT/ DISPOSAL METHOD | DESCRIPTION | ADVANTAGES | DISADVANTAGES | FEASIBILITY OF METHOD* |
|---|---|---|---|---|
| Mechanical Processing | Mechanical processing is used to reduce the volume of waste or break it down into smaller pieces. These methods are often combined with autoclaving or chemical disinfection to make the waste treatment and/or disposal process more efficient.<br>Mechanical processing includes grinding, shredding, compacting, maceration, and needle cutters. | • Reduces bulky waste volume and mass, including product packaging and other general solid waste.<br>• Prepares infectious waste for further treatment, including autoclaving or chemical disinfection.<br>• Has no significant environmental adverse impacts if properly operated and maintained. | • Does not sterilize or disinfect waste.<br>• May require qualified operators and continuous maintenance.<br>• Not for use on infectious or biological waste unless combined with another treatment technology. | • These systems are almost always combined with other treatment technologies to reduce waste volume or increase efficiency. |
| Composting/ Biological Processing | Microorganisms are added to the waste and break down the organic matter. | • Primarily used for kitchen and yard waste.<br>• Has no significant environmental impact.<br>• Compost enriches soil with nutrients and can improve plant growth. | • Cannot be used for infectious or medical waste.<br>• Composting can be a time-consuming process. | • This technology is very common and is widely available for the treatment of organic waste. |
| **YELLOW TIER: ENVIRONMENTALLY PREFERABLE TREATMENT/DISPOSAL METHODS THAT ARE NOT TYPICALLY AVAILABLE AND/OR FEASIBLE FOR SMALL-SCALE HEALTHCARE WASTE MANAGEMENT** | | | | |
| Solar Incineration | High-temperature, refractory-lined metal incinerator that includes both primary and secondary chamber, similar in process to double-chamber incineration. Temperature range: 800°C–1320°C. | • Reported by manufacturers.<br>• Less non-renewable energy use and low fuel consumption, thus controlling operating costs and minimizing GHG emissions.<br>• Can disinfect effectively.<br>• Reduces waste volume. | • Smaller units, less residence time, less emissions control likely compared with larger incinerators at consolidated treatment facilities. | • Capital costs are higher when compared with other incinerators or waste disposal options.<br>• Newer technology is still unavailable in many markets. |
| Plasma Pyrolysis (High-Heat Thermal | HCW is exposed to intense heat (1650°C) generated by plasma arc in an oxygen- | • Has no significant environmental impacts if properly operated | • Requires trained/qualified operators. | • There is the potential for energy recovery |

| TREATMENT/ DISPOSAL METHOD | DESCRIPTION | ADVANTAGES | DISADVANTAGES | FEASIBILITY OF METHOD* |
|---|---|---|---|---|
| Process) | free environment. Waste is pyrolyzed into CO, $H_2$, and hydrocarbon gas. | and maintained.<br>• Reduces the volume and mass of waste.<br>• Chlorinated and other hazardous waste does not have to be segregated except for mercury waste.<br>• The gases produced by this process may be used for energy recovery. | • The potential to emit dioxins with these systems is still possible and should be monitored.<br>• Very high-temperature process with a temperature reaching upward of 1500°C.<br>• These systems are generally complex, require high-energy consumption, and have significant installation requirements. | with these systems; however, studies have shown that sites would need to treat 300 pounds of waste daily to be cost-effective.<br>• These systems are still in the development process for small-scale HCW treatment and have very high capital costs. |
| Irradiation | Waste is exposed to gamma rays (through a cobalt or other source) to kill bacteria or other pathogens. | • Waste can remain in bags during treatment.<br>• Has no significant environmental adverse impacts if properly operated and maintained.<br>• Reduced disinfection time. | • Irradiation is most efficient when waste is shredded or in small batches. This ensures more adequate exposure to the radiation source.<br>• Treated waste retains its physical appearance and volume unless mechanical processing is used.<br>• Staff operating this technology should be protected and monitored for radiation exposure.<br>• Should not be used for pharmaceutical, radioactive, or chemical waste. | • Capital costs are higher when compared with other waste treatment or disposal options.<br>• Many worker protections would need to be in place for operation. |

| TREATMENT/ DISPOSAL METHOD | DESCRIPTION | ADVANTAGES | DISADVANTAGES | FEASIBILITY OF METHOD* |
|---|---|---|---|---|
| Alkaline Hydrolysis (Chemical Treatment) | A high pH alkali solution is added under high heat and converts body parts and tissue into a decontaminated aqueous solution. This solution can be disposed of in the sanitary sewer. | • Has no significant environmental adverse impacts if properly operated and maintained.<br>• Can be used to treat prion waste.<br>• Can be used for the treatment of pathological waste.<br>• Can be used for some pharmaceutical, cytotoxic, chemical, and radioactive waste.<br>• Reduces total waste volume. | • Requires trained/qualified operators.<br>• Can take more time (4–8 hours) for digestion to occur.<br>• Best for small quantities of waste. | • Newer technology, with limited availability.<br>• Capital costs are higher when compared with other waste treatment or disposal options. |
| Ozone (Chemical Treatment) | Waste is exposed to ozone in a controlled chamber for a set period. Waste is sterilized and then can be disposed of as regular solid waste. | • Has no significant environmental adverse impacts if properly operated and maintained.<br>• Systems are usually fully enclosed and automated, and require limited waste handling.<br>• Chemical-free treatment because ozone can be generated on-site.<br>• Reduced treatment times. | • Requires shredding or mixing to be fully effective. | • Newer technology, with limited availability.<br>• Capital costs vary based on the size and scope when compared with other waste treatment or disposal technologies. |
| Sanitary Landfill | HCW is transported off-site to a sanitary landfill, where waste is isolated and degraded biologically, chemically, or physically. | • Can be used for many types of solid waste as permitted by the receiving landfill.<br>• Potential for energy recovery through gas recovery. | • If not constructed appropriately (e.g., with a liner and/or leachate management), a sanitary landfill can cause significant environmental | • Waste would need appropriate and reliable transportation to the available sanitary landfill.<br>• Costs would be dependent on the |

| TREATMENT/ DISPOSAL METHOD | DESCRIPTION | ADVANTAGES | DISADVANTAGES | FEASIBILITY OF METHOD* |
|---|---|---|---|---|
| | | | hazards, including soil and groundwater contamination.<br>• Waste may need to be disinfected prior to being sent to the sanitary landfill. | availability of sanitary landfills in the area. |
| **RED TIER: NON-ENVIRONMENTALLY PREFERABLE TREATMENT/DISPOSAL METHODS DUE TO POTENTIAL ENVIRONMENTAL AND HEALTH IMPACTS. INCLUDED FOR INFORMATIONAL PURPOSES.** | | | | |
| Open-Air Burning | Waste is burned in an area where smoke and other potentially hazardous emissions do not pass through a chimney or stack. | • Readily available and cost-effective. | • Releases hazardous air pollutants.<br>• If the burning is not controlled, it can lead to a larger, uncontrolled fire.<br>• Poses many physical and health risks for employees tasked with managing the process. | • Burn areas are generally low cost and easy to establish on-site. |
| Burying | Waste is placed in a pit lined with clay or other impermeable material and covered with soil or lime. Pits should be located away from water sources and have security measures to keep unauthorized individuals away. | • Can be used for many types of solid waste, including pathological waste. Hazardous waste may be secured in a separate area (e.g., fenced in) from nonhazardous waste for additional safety. | • Not an effective method for disposing of chemical or other liquid waste.<br>• Medical waste is not disinfected or sterilized during the process.<br>• Improperly lined pits could lead to soil and groundwater contamination. | • Cost-effective if done on-site.<br>• Requires a larger area of land. |
| Drum or Brick Incinerator | A simple furnace with less mass and insulating value than a single-chamber incinerator. Constructed out of an empty oil drum or a short chimney | • Disinfects reasonably well, destroying 99% of microorganisms.<br>• 80%–90% burning efficiency. | • Emits black smoke, fly ash, acid gases, and some toxins. May produce odors (can be limited by not burning PVC plastics). | • Cost-effective if done on-site.<br>• Requires distance from residential areas. |

| TREATMENT/ DISPOSAL METHOD | DESCRIPTION | ADVANTAGES | DISADVANTAGES | FEASIBILITY OF METHOD* |
|---|---|---|---|---|
| | of bricks placed over a metal grate and covered with a fine screen. Operating temperature is <200°C. May need to add kerosene or similar fuel to maintain combustion. | | Avoiding PVCs will prevent the worst toxin and odor problems.<br>• Sharps in ashes will still pose a physical hazard.<br>• Not good for most pharmaceutical or chemical waste. | |
| Gas Sterilization | HCW is placed in an airtight chamber and exposed to a sterilizing gas (ethylene oxide or formaldehyde) to kill pathogens. This technology is generally used for the sterilization of reusable medical equipment. | • Efficient at disinfecting.<br>• Has no significant environmental adverse impacts if properly operated and maintained. | • Requires trained/qualified operators.<br>• Ethylene oxide and formaldehyde are highly toxic to humans.<br>• Cannot be used on pathological, pharmaceutical, radioactive, or chemical waste.<br>• Treated waste retains its physical appearance and volume. | • Because of the high toxicity of ethylene oxide and formaldehyde, these treatment technologies are not very feasible due to the increased risk to operators.<br>• These technologies are no longer as available or as frequently used as they have been in the past. |
| Chlorine-Based Chemical Treatment | Waste is exposed to chemical agents (e.g., sodium hypochlorite and/or chlorine dioxide) in a controlled environment and for a set contact time to disinfect. | • Most suitable for liquid waste and, in many cases, the liquids can then be safely disposed of into the sewer system.<br>• No combustion byproducts.<br>• Cost-effective. | • Requires trained/qualified operators.<br>• Increased chemical risk for staff.<br>• Solid waste disinfection may require shredding or a stronger disinfectant.<br>• Chemically disinfected waste may still require specialized disposal. | • These systems are common and are well established.<br>• Capital costs are average when compared with other available waste technologies. |

| TREATMENT/ DISPOSAL METHOD | DESCRIPTION | ADVANTAGES | DISADVANTAGES | FEASIBILITY OF METHOD* |
|---|---|---|---|---|
| | | | • Microbial resistance to certain types of chemicals.<br>• Cytotoxic waste, pharmaceuticals, and other hazardous waste should not be treated with this technology.<br>• Best for small quantities of waste. | |

* The term *capital costs* is used here in accordance with the WHO definition: "The purchase price for resource items with a lifetime above one year. Capital costs don't include shipment and customs costs, installation or eventual construction requirements to shelter the equipment." WHO provides methods for calculating the costs associated with setting up an HCW management system.[50]

[50] WHO. 2019. *HealthCare Waste Management Costing estimation/calculation methods*. https://www.who.int/teams/health-systems-governance-and-financing/economic-analysis/costing-and-technical-efficiency/quantities-and-unit-prices-(cost-inputs)/econometric-estimation-of-who-choice-country-specific-costs-for-inpatient-and-outpatient-health-service-delivery.

# ANNEX 3: HEALTHCARE WASTE PROGRAM CHECKLIST AND INVENTORY TEMPLATES

Waste Management Program Checklist

Checklist Completion Date: _____

| WASTE MANAGEMENT PROGRAM ELEMENT | IN PLACE? (Y/N) | ACTION PLAN (IF NOT IN PLACE) | ESTIMATED COMPLETION DATE | POINT OF CONTACT |
|---|---|---|---|---|
| **WRITTEN PLANS AND PROCEDURES** | | | | |
| **1. Written Integrated Waste Management Plan**<br>The plan should include information for the handling, storing, treating, and disposing of waste generated at the facility. Training, vaccination, and other requirements for workers, such as personal protective equipment (PPE), should also be included. | | | | |
| **2. Internal Waste Management Procedures**<br>Procedures should include step-by-step processes for internal waste handling, storage, treatment, and disposal. They should clearly assign roles and responsibilities. Procedures may also include waste minimization, reuse, and recycling activities. | | | | |
| **3. Periodic Review**<br>Periodic review of all plans and procedures are established and followed to determine effectiveness and appropriateness. Plans and procedures that are found to be inadequate or ineffective are revised. | | | | |
| **STAFF TRAINING AND PROTECTION** | | | | |
| **4. Waste Management Training**<br>Staff should receive routine and periodic training on the proper handing, storage, treatment, and disposal of all waste generated at the facility. Training should include all elements of the facility's Integrated Waste Management Plan (IWMP), staff responsibilities, and inventory management. | | | | |
| **5. Personal Protective Equipment**<br>Staff who handle waste have access to the appropriate PPE, such as clothes, masks, gloves, and/or aprons. Staff can demonstrate the proper use of PPE. | | | | |

| WASTE MANAGEMENT PROGRAM ELEMENT | IN PLACE? (Y/N) | ACTION PLAN (IF NOT IN PLACE) | ESTIMATED COMPLETION DATE | POINT OF CONTACT |
|---|---|---|---|---|
| **6. Occupational Health and Safety**<br>Staff are vaccinated and practice good hygiene (e.g., handwashing with soap and, ideally, warm water), as appropriate for their roles. Waste handlers, for example, should be vaccinated against Hepatitis B and tetanus. | | | | |
| **WASTE MANAGEMENT PRACTICES** | | | | |
| **7. Waste Minimization**<br>Staff follow good waste minimization practices per the facility IWMP. Waste minimization may include good inventory management (e.g., using oldest batches first), reuse, or recycling practices. | | | | |
| **8. Waste Segregation**<br>Staff follow good waste segregation practices per the facility IWMP. Waste segregation includes separating HCW according to the waste type and ensuring that waste is stored in the appropriate containers. | | | | |
| **9. Waste Storage and Labeling**<br>The facility has adequate waste containers for collection and designated long-term storage locations on-site. Containers should be appropriately labeled, covered, leak-proof, and puncture-resistant. Storage location should be an indoor, secured area located away from facility staff, patients, water sources, and food. | | | | |
| **10. Waste Collection**<br>Waste is collected daily or at a frequency that is appropriate for the generation rate, waste type, climate, and/or season. | | | | |
| **WASTE TREATMENT AND DISPOSAL** | | | | |
| **11. On-Site Treatment**<br>Waste is treated in accordance with the IWMP and the best management practices available at the facility. These waste management treatment options may include autoclaving, microwaving, incineration, or staging for transportation to appropriate off-site treatment facilities. | | | | |

| WASTE MANAGEMENT PROGRAM ELEMENT | IN PLACE? (Y/N) | ACTION PLAN (IF NOT IN PLACE) | ESTIMATED COMPLETION DATE | POINT OF CONTACT |
|---|---|---|---|---|
| **12. Off-Site Treatment and/or Disposal**<br>If necessary, waste is safely transported off-site for final treatment and/or landfill disposal. Off-site transport typically requires appropriately licensed waste transporters, approved vehicles, and certified treatment and disposal facilities. The waste generator should ensure that he or she receives a waste receipt, which documents safe final treatment and/or disposal of the waste. | | | | |

Prepared by: _____

Waste Inventory Sheet (Daily)

Month: _____ Waste Inventory Point of Contact: _____

| WASTE TYPES (kilograms) / DATE | NONHAZARDOUS/ GENERAL WASTE | SHARPS WASTE | RAPID TEST KITS (RTKs)/ OTHER DISPOSABLES | INFECTIOUS WASTE | PATHOLOGICAL WASTE | PHARMACEUTICAL WASTE | CYTOTOXIC (ANTINEOPLASTIC) WASTE | CHEMICAL WASTE | RADIOACTIVE WASTE | OTHER WASTE | INITIALS | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Example: 2/01/2019 | 20 kg | | | 5 kg | | | | 2 kg | | | RF | Waste was placed in the main storage area. |
| | | | | | | | | | | | | |
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| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| | | | | | | | | | | | | |
| Add rows as needed … | | | | | | | | | | | | |
| **MONTHLY TOTALS (kilograms)*** | | | | | | | | | | | | |

* Waste types should be totaled monthly and added to the Monthly Waste Inventory Sheet.

Waste Inventory Sheet (Monthly)

Review Date: _____ Waste Inventory Point of Contact: _____

| ON-SITE INFORMATION | | | | | | | OFF-SITE INFORMATION | | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|
| WASTE DESCRIPTION | WASTE TYPE* | HAZARDOUS OR NONHAZARDOUS | MONTHLY QUANTITY | GENERATING ACTIVITY OR AREA | STORAGE LOCATION | SDS** | TRANSPORT | RECYCLE TREATMENT/ DISPOSAL | |
| Example:<br>Packaging (cardboard) | General | Nonhazardous | 10 kg | Storage room, admin office, etc. | Recycling bin behind the admin office | N/A | Call WeRecycle for pickup when the bin is nearly full. | Paid service with WeRecycle for the recycling of materials | Can we ask for less packaging on procured materials? |
| | | | | | | | | | |
| | | | | | | | | | |
| Add rows as needed … | | | | | | | | | |
| Total Monthly Hazardous Waste: _____<br>Total Monthly Nonhazardous Waste: _____ | | | | | | | | | |

* Waste Types: Nonhazardous/General, Sharps, Rapid Test Kits/Other Disposables, Infectious, Pathological, Pharmaceutical, Cytotoxic (Antineoplastic), Chemical, and Radioactive.

** Terminology according to the United Nations Globally Harmonized System. Some countries may still refer to these documents as Safety Data Sheets.

# ANNEX 4: MITIGATION AND MONITORING OF ENVIRONMENTAL, SOCIAL, AND CLIMATE IMPACTS ON PROJECT AND ACTIVITY IMPLEMENTATION

Table 8 identifies the potential adverse environmental and social impacts associated with healthcare waste management (HCWM) activities and the measures that can be implemented to mitigate these impacts. The table includes activities that may generate HCW (e.g., procurement, storage, distribution/use, treatment/disposal of commodities), as well as activities that directly involve HCW (e.g., waste storage, transportation, treatment/disposal). The scope of treatment/disposal activities covered by this table is limited to those that would typically be elements of USAID healthcare projects (e.g., incinerators) and does not include discussions of systems for the broader management of waste (e.g., municipal landfills). For guidance related to those systems, refer to the Solid Waste SEG at https://www.usaid.gov/environmental-procedures/sectoral-environmental-social-best-practices/sector-environmental-guidelines-resources.

Monitoring indicators described in Table 8 include procedures, plans, or other records used to monitor the implementation of mitigation measures and continually improve HCWM practices. These indicators, along with the associated mitigation measures, are intended as suggested examples and do not represent an exhaustive list of considerations.

**TABLE 8. POTENTIAL ADVERSE ENVIRONMENTAL AND SOCIAL IMPACTS ASSOCIATED WITH HEALTHCARE WASTE MANAGEMENT ACTIVITIES**

| POTENTIAL ADVERSE IMPACTS | MITIGATION MEASURES | MONITORING INDICATORS |
|---|---|---|
| **PROCUREMENT ACTIVITIES THAT MAY GENERATE HEALTHCARE WASTE** | | |
| **Disease Transmission**<br>● Procurement of syringes without retractable needles (smart syringes) enables unauthorized reuse (or resale by scavengers), thus increasing the risk of disease transmission.<br>● Procurement or inadvertent acceptance of healthcare commodities (e.g., vaccines) that are defective, expired, or counterfeit may render them ineffective and, therefore, allow disease transmission to continue.<br>**Physical Injury**<br>● Procurement of needles that are not single-use smart syringes increases the risk of needlestick injuries.<br>● Procurement or acceptance of healthcare commodities that are defective, expired, or counterfeit may cause illness or physical injury from the use of defective items and indirectly generate more HCW.<br>**Air Pollution (including GHG Emissions)**<br>● Procuring an oversupply of or defective/expired/counterfeit healthcare commodities increases the probability of expiration on the shelf and the need for treatment and/or disposal, which increases the potential for air pollution, including GHG emissions (e.g., due to incineration and/or transport for disposal).<br>**Soil Pollution**<br>● Procuring an oversupply of or defective/expired/counterfeit healthcare commodities increases the probability of expiration on the shelf and the need for disposal, which increases the potential for soil pollution (e.g., due to increased volume of waste requiring sanitary landfilling or lined pit burial).<br>**Water Pollution**<br>● Procuring an oversupply of or defective/expired/counterfeit healthcare commodities | ● Conduct quantification analysis to determine supply needs and develop a supply plan.<br>● Coordinate forecasting and supply planning activities with the quantification team (e.g., host country officials and/or program staff) to meet current needs and minimize the risk of stockouts or a surplus of healthcare commodities.<br>● Procure healthcare commodities that consider the ratio of commodities to the target population, existing supply of commodities, and supply of commodities from non-USAID sources (e.g., other donors).<br>● Manage the inventory of stock to minimize the potential for the diversion in commodity distribution.<br>● Procure healthcare commodities that comply with host country and international regulatory, shipping, and packaging requirements to ensure that only appropriate products enter the supply system.<br>● Negotiate manufacturer take-back clauses and sustainability criteria, including minimal, recyclable packaging and environmentally preferred transportation in healthcare commodity procurements, if possible.<br>● Develop and implement an inspection and quality assurance process for assessing and | ● Supply plan<br>● Supply forecast<br>● Inventory control system<br>● Product specifications<br>● Procurement records<br>● Treatment records<br>● Disposal records<br>● Site visits (announced and unannounced) to verify that mitigation measures are being implemented correctly and are effective<br>● Review the SEP periodically |

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| increases the probability of expiration on the shelf and the need for disposal, which increases the potential for water pollution (e.g., due to leakage and/or spills).<br>**Social Impacts**<br>● Poor procurement processes can impede the delivery of healthcare services, especially at the small-scale clinic level, which may further exacerbate socioeconomic inequities in access to critical healthcare services among marginalized and underrepresented groups and/or people in vulnerable situations (e.g., older persons, women, youth). | monitoring product quality.<br>● Maintain copies of procurement records (e.g., manufacturing records, chain of custody manifests, certificate of analysis, test data, regulatory certificates) and copies of quality documentation on file.<br>● Establish a Stakeholder Engagement Plan (SEP) at the beginning of the project life cycle and maintain stakeholder engagement throughout.<br>● Integrate the results from the gender-based analysis into the SEP.<br>● Follow guidance from USAID, such as the Gender Equality and Female Empowerment Policy and the Youth in Development Policy.[51] | |
| **CONSTRUCTION OR REHABILITATION ACTIVITIES THAT MAY GENERATE HEALTHCARE WASTE** | | |
| Refer to the Construction SEG and the Small Healthcare Facilities SEG for information regarding waste management for hospitals or facilities under construction or rehabilitation, including the management of waste containing asbestos, lead, and other hazardous materials. All USAID Sector Environmental Guidelines may be found on USAID's Sector Environmental Guidelines & Resources webpage, accessible at https://www.usaid.gov/environmental-procedures/sectoral-environmental-social-best-practices/sector-environmental-guidelines-resources. | | |
| **WATER, SANITATION, AND HYGIENE ACTIVITIES THAT MAY GENERATE WASTEWATER** | | |
| Refer to the Water Supply and Sanitation SEG for information regarding waste management related to public health improvement projects conducting potable water, sanitation, and hygiene activities. All USAID Sector Environmental Guidelines may be found on USAID's Sector Environmental Guidelines & Resources webpage, accessible at https://www.usaid.gov/environmental-procedures/sectoral-environmental-social-best-practices/sector-environmental-guidelines-resources. | | |
| **STORAGE OF HEALTHCARE WASTE/STORAGE ACTIVITIES THAT MAY GENERATE HEALTHCARE WASTE** | | |
| **Disease Transmission**<br>● Improper storage (e.g., not using puncture-proof containers, not segregating, overfilling containers, not color-coding bins) of HCW can increase the risk of disease transmission through contamination, exposure to infectious materials, and potential needlestick injuries.<br>**Physical Injury** | ● Refer to  for detailed guidance on handling, storing, and labeling various types of HCW.<br>● Develop and implement standard operating procedures (SOPs) for the safe and effective storage of healthcare commodities to reduce damage or early expiration. | ● IWMPs/SOPs, including waste collection and storage plans<br>● Training program records<br>● Photographs<br>● Records/manifests of generation/transport<br>● Site visits (announced and |

[51] USAID. 2012. "Gender Equality and Female Empowerment Policy." https://www.usaid.gov/sites/default/files/2022-05/GenderEqualityPolicy_2.pdf. and USAID. 2012. "Youth in Development Policy: Realizing the Demographic Opportunity." https://www.usaid.gov/sites/default/files/2022-12/Youth_in_Development_Policy_0.pdf.

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| ● Improper storage of HCW can increase the risk of physical injury when waste containers are overfilled, unlined, left open, or not labeled.<br>**Air Pollution (including GHG emissions)**<br>● Improper storage of healthcare commodities can result in damage to the commodity, increasing the quantity of HCW requiring treatment and/or disposal and the potential for air pollution, including GHG emissions (e.g., due to incineration and/or HCW transport disposal)<br>● Improper storage of healthcare commodities or HCW that contain hazardous chemicals can lead to the release of toxic air pollutants.<br>**Soil Pollution**<br>● Improper storage of healthcare commodities can result in damage to the commodity, increasing the need for disposal, which increases the potential for soil pollution (e.g., due to the increased volume of waste requiring sanitary landfilling or lined pit burial).<br>● Improper storage of healthcare commodities or HCW that contain hazardous chemicals can lead to leaks and spills that can ultimately cause soil pollution.<br>**Water Pollution**<br>● Improper storage of healthcare commodities can result in damage to the commodity, increasing the quantity of HCW requiring disposal, which increases the potential for water pollution (e.g., due to leakage and/or spills).<br>● Improper storage of healthcare commodities or HCW that contain hazardous chemicals can lead to leaks and spills that can ultimately cause water pollution.<br>**Social Impacts**<br>● Improper storage of healthcare commodities can impede the delivery of healthcare services, especially at the small-scale clinic level, which may further exacerbate socioeconomic inequities in access to critical healthcare services among marginalized and underrepresented groups and/or people in vulnerable situations (e.g., older persons, women, youth).<br>● Workers engaged in HCW-related activities are particularly at risk from poor HCW storage practices, | ● Develop and implement an Integrated Waste Management Plan (IWMP) or comparable SOPs for the safe storage of HCW to reduce the potential for disease transmission and physical injury.<br>● Provide training to workers on the IWMP/SOPs developed for the safe and effective storage of healthcare commodities and HCW.<br>● Conduct site inspections to determine that IWMP/SOPs and training programs are implemented and effective. | unannounced) to verify that mitigation measures are being implemented correctly and are effective |

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| especially if worker welfare provisions are not in place (e.g., mandatory vaccination of certain workers, incident response procedures). | | |
| **COMMODITY DISTRIBUTION AND IMPLEMENTATION ACTIVITIES THAT MAY GENERATE HEALTHCARE WASTE** | | |
| **Disease Transmission**<br>● Improper distribution or use of healthcare commodities may render them ineffective and, therefore, allow disease transmission to continue.<br>**Physical Injury**<br>● Improper distribution and use of needles, razors, scalpels, or other sharps increases the risk of needlestick injuries.<br>**Air Pollution**<br>● Improper distribution and use of healthcare commodities can result in a reduction in quality through inadequate temperature or humidity controls and damaged or defective supplies that increase the need for treatment and/or disposal and the potential for air pollution (e.g., due to incineration and/or transport for disposal).<br>**Soil Pollution**<br>● Improper distribution and implementation of healthcare commodities can result in a reduction in quality through inadequate temperature or humidity controls and damaged or defective supplies that increase the need for disposal and increase the potential for soil pollution (e.g., due to an increased volume of waste requiring sanitary landfilling or lined pit burial).<br>**Water Pollution**<br>● Improper transport of healthcare commodities can result in a reduction in quality through inadequate temperature or humidity controls and damaged or defective supplies that increase the need for disposal and increase the potential for water pollution (e.g., due to leakage and/or spills).<br>**Social Impacts**<br>● Improper commodity distribution and implementation activities can impede the delivery of healthcare services, especially at the small-scale clinic level, which may further exacerbate socioeconomic inequities in access to critical healthcare services among marginalized and underrepresented groups | ● Develop and implement SOPs, including those in the IWMP, for the safe distribution and use of healthcare commodities.<br>● Provide training to workers and drivers on the distribution and implementation of healthcare commodities, including inventory and cold chain management during transport.<br>● Include supplies for clean-up in the event of an accident during distribution.<br>● Conduct site visits to verify that workers and drivers are trained and are following the IWMP/SOPs.<br>● Where possible, encourage energy-efficient modes for commodity distribution/transportation.<br>● Encourage distributors to reduce vehicle idling.<br>● Optimize routes to decrease the overall distance traveled in order to save energy and reduce transportation-related GHG emissions.<br>● Monitor worker welfare to ensure that adequate protections are in place and inequalities are addressed. | ● IWMPs/SOPs, including commodity distribution plans<br>● Clean-up supplies<br>● Training program records<br>● Photographs<br>● Site visits (announced and unannounced) to verify that mitigation measures are being implemented correctly and are effective<br>● Worker welfare monitoring carried out via qualitative interviews, anonymous reporting, a grievance mechanism, and independent audits |

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| and/or people in vulnerable situations (e.g., older persons, women, children).<br>● Activities may exacerbate issues with workers' welfare and rights, which may not be prioritized by certain employers and governments, or which may not be adequately protected for marginalized and underrepresented groups and/or people in vulnerable situations (e.g., women and children). This may, in turn, increase their risk of developing health problems or becoming victims of crime or exploitation. | | |
| **TREATMENT AND DISPOSAL OF SOLID WASTE (GENERALLY)** | | |
| Refer to the Solid Waste SEG for information regarding planning and implementation of systems for the reduction, collection, treatment, and disposal of waste. USAID interventions targeting the solid waste management sector help public authorities and communities in the developing world to improve the capacity, systems, and infrastructure needed to manage solid waste (e.g., landfills) through financial and technical assistance and partnerships. This focus differs from that of the HCW SEG, which aims to guide healthcare project managers, implementers, and workers in properly managing waste generated by their projects. All USAID *Sector Environmental Guidelines* may be found at USAID. 2019. *Sector Environmental Guidelines & Resources.* https://www.usaid.gov/environmental-procedures/sectoral-environmental-social-best-practices/sector-environmental- guidelines-resources. | | |
| **TREATMENT AND DISPOSAL OF HEALTHCARE WASTE (SPECIFICALLY)** | | |
| **Disease Transmission**<br>● Workers and others handling HCW without using the appropriate personal protective equipment (PPE) may come in direct contact with hazardous HCW, including infectious or sharps waste, which could lead to disease transmission.<br>● Unsecured or improperly managed landfills/dumpsites/intermediate or satellite storage areas may allow scavengers to collect disposed healthcare commodities and reuse or circulate them in the community, which could result in disease transmission.<br>● Infectious waste that is not treated properly could enter the water supply and increase the potential for disease transmission.<br>● Poor incineration practices (e.g., incineration of unsuitable materials, improper operation, lack of maintenance) can result in the release of pollutants (e.g., particulate matter, heavy metals, dioxins, furans) into the air or fail to kill infectious agents, which can lead to diseases in people, animals, and plants in the surrounding areas. | ● Refer to  for detailed guidance on handling, storing, and labeling various types of HCW.<br>● Refer to  for detailed guidance on various HCW treatment and disposal methods.<br>● Develop and implement an IWMP/SOPs that provide procedures for disposing of HCWs in conformance with international best practices and host country requirements. Management considerations include, but are not limited to, waste minimization procedures, proper handling of waste, storage of waste (including PPE), containers and labeling, safe treatment and disposal practices and procedures (including fire safety), inspection protocols and frequency, and documentation requirements (including waste manifests). | ● IWMPs/SOPs, including waste treatment and disposal plans<br>● Training program records<br>● Contractor licenses and SOPs<br>● Transportation and disposal documents/records<br>● Site visits (announced and unannounced) to verify that mitigation measures are being implemented correctly and are effective<br>● Worker welfare monitoring carried out via qualitative interviews, anonymous reporting, a grievance mechanism, and independent audits<br>● Systematic monitoring and evaluation efforts showing documented improvements related to human rights protection<br>● Traffic monitoring—via direct |

| | | |
|---|---|---|
| **Physical Injury**<br>• Workers and others handling HCW, such as waste disposal contractors, may come in direct contact with sharps or chemical waste during disposal activities, which could lead to physical injury, such as burns or needlestick injuries.<br>**Air Pollution (including GHG Emissions)**<br>• Improper waste segregation allows materials that are unsuitable for burning (e.g., chemicals or PVC plastics) to be incinerated, potentially releasing toxic air pollutants, as well as GHG emissions.<br>• The use of vehicles to transport waste (e.g., fuel operations and/or maintenance) can release toxic air pollutants, as well as GHG emissions.<br>• Open burning or improper operations and maintenance of incinerators can release toxic air pollutants, as well as GHGs.<br>**Soil Pollution**<br>• Disposal of HCW in unlined landfills/pits/dumpsites may lead to the leaching of hazardous waste into the soil.<br>• Improper operations and maintenance of incinerator or open burning can release toxic particles, smoke, and ash that can settle and create soil pollution.<br>**Water Pollution**<br>• Disposal of HCW in unlined landfills/pits/dumpsites may lead to the leaching of hazardous waste into the surrounding water sources.<br>• Disposal of HCW (e.g., chemicals or pharmaceuticals) into sanitary wastewater systems or into natural waterways can lead to water pollution.[52]<br>**Social Impacts**<br>• Poorly managed HCW treatment/disposal activities may lead to quality-of-life impacts on neighboring communities (e.g., air quality degradation, increased noise levels, foul odors) and further exacerbate | • Provide training to workers on the IWMP/SOPs developed for properly handling, segregating, storing, and treating/disposing of HCW.<br>• Conduct site visits to document that workers are trained on and are following the IWMP/SOPs.<br>• Ensure that waste disposal contractors have SOPs established for properly transporting, treating, and disposing of HCW off-site in conformance with host country requirements and international best practices.<br>• Conduct site visits to verify that the waste treatment and/or disposal contractor is following SOPs and that appropriate documents and records are being collected/maintained.<br>• Encourage the use of environmentally preferred technologies, if possible.<br>• Cover HCW in landfills/pits/dumpsites with earthen material (U.S. EPA recommends 6 inches) on a daily basis to control disease transmission, pests, odors, scavengers, or other impacts.<br>• Install access controls (e.g., fences and/or warning signs) at HCW activity locations (e.g., incinerators or landfills/pits) to limit improper access to such areas, especially if contamination exists. | observation surveys, GPS tracking, and complaints monitoring—and review of the waste collection plan |

[52] The Construction SEG provides more information about waste management for hospitals and clinics under construction or rehabilitation. The Small Healthcare Facilities SEG provides guidance on operating hospitals and clinics. The Water Supply and Sanitation SEG discusses considerations for potable water and sanitation. For all USAID *Sector Environmental Guidelines*, see USAID. 2019. *Sector Environmental Guidelines & Resources*. https://www.usaid.gov/environmental-procedures/sectoral-environmental-social-best-practices/sector-environmental-guidelines-resources.

| | | |
|---|---|---|
| socioeconomic inequities among marginalized and underrepresented groups and/or people in vulnerable situations (e.g., older people, women, children).<br>• Activities may exacerbate issues with workers' welfare and rights, which may not be prioritized by certain employers and governments, or which may not be adequately protected for marginalized and underrepresented groups and/or people in vulnerable situations (e.g., women, children). This may, in turn, increase their risk of developing health problems or becoming victims of crime or exploitation.<br>• Off-site transportation of HCW for treatment/disposal can increase accidents and traffic flow through certain communities, causing disturbance to community members. | ● Monitor worker welfare to ensure that adequate protections are in place and inequalities are addressed.<br>● Screen the visual/odor/noise impacts of HCW treatment and disposal activities through tree plantings, solid fencing/walls, or other screening methods. Incorporate community art and/or architectural features, where possible.<br>● Develop and implement a waste collection plan designed to minimize the traffic impacts associated with off-site HCW transportation, including the appropriate timing of vehicle movement, efficient routing, and appropriate vehicle selection. | |

# ANNEX 5: MITIGATION OF CLIMATE RISKS

## TABLE 9. MITIGATING CLIMATE RISKS TO HEALTHCARE WASTE MANAGEMENT

| CLIMATE STRESSORS | RISK MITIGATION MEASURES | MONITORING EXAMPLES |
|---|---|---|
| Increasing average air temperatures and the incidence and/or severity of heat waves | • In site selection, consider the likelihood of climate risk impacts on the specific location in question, with consideration of both historical and projected climate conditions.<br>• Promote integrated watershed management and rainfall capture/water efficiency practices to build resilience to decreased water availability and drought.<br>• Incorporate heat stress in the Health and Safety Guidelines.<br>• Provide healthcare and sanitation workers with a work schedule that allows for breaks and water consumption at regular intervals.<br>• Decentralize waste transfer and processing stations to reduce transport distances.<br>• Install temperature controls in waste storage areas, noting that extreme weather events may result in power failure.<br>• Adapt collection schedules to reduce storage time during heat waves. | • Indicate the consideration of high temperature risk in site selection, materials selection, and the design/construction of waste facilities.<br>• Document local capacity strengthening on various hazards of waste streams and emergency preparedness and response.<br>• Identify and document available early warning systems and their use.<br>• Document the availability of waste management emergency plans.<br>• Implementation plan documents the process of providing work breaks in order to avoid heat stress.<br>• Document the regular inspection of building stability/deterioration to proactively address causes.<br>• Document the use of decentralized waste transfer and collection schedules to reduce storage and transport times.<br>• Document the use of temperature controls in waste storage areas. |
| Increasing the incidence and/or severity of drought | • In site selection (or relocation), consider the likelihood of climate risk impacts on the specific location in question, with consideration of both historical and projected climate conditions.<br>• Promote integrated watershed management and rainfall capture/water efficiency practices to build resiliency to decreased water availability and/or drought.<br>• Divert organic waste from landfills through segregated organics collection, if possible, in order to prevent landfill fire outbursts.<br>• Use reusable and/or energy-efficient devices and equipment, where feasible, and ensure back-up plans for emergency energy needs. | • Indicate the consideration of increasing incidences and/or severity of drought in site selection, materials selection, and the design/construction of waste facilities.<br>• Document local capacity strengthening on various hazards in waste streams and emergency preparedness and response.<br>• Document the availability of planned alternative routes to minimize disruption from extreme events.<br>• Identify and document available early warning systems and their use.<br>• Document that waste management emergency plans are available.<br>• Document the use of integrated watershed management and rainfall capture/water efficiency. |

| CLIMATE STRESSORS | RISK MITIGATION MEASURES | MONITORING EXAMPLES |
|---|---|---|
| | | • Document the availability/use of reusable and/or energy-efficient devices and equipment and back-up plans for emergency energy use. |
| Increasing the incidence and/or intensity of storms (high rainfall and high wind events) | • In site selection (or relocation), consider the likelihood of climate risk impacts on the specific location in question, with consideration of both historical and projected climate conditions.<br>• Properly site incinerators, burial/placenta pits, and other HCW storage and management areas away from floodplains, wetlands, and areas with high water tables.<br>• Design/maintain water catchment systems that can keep pace with projected rainfall patterns.<br>• Update design standards for waste treatment sites (e.g., incinerators, chemical treatment pits, placenta pits), waste disposal sites (e.g., on-site burial pits, sanitary landfills), and waste storage facilities (including temporary storage containers) by ensuring proper drainage, extra clearance between subsurface constructions and the water table, and/or elevate to prevent inundation from flood waters.<br>• Use early warning systems for storm events to allow for proactive preparation.<br>• Schedule more frequent HCW collection in response to weather forecasts to avoid impacts on waste from flooding and/or high wind.<br>• Cover collection trucks to prevent waste blowing away in high winds.<br>• Use reusable and/or energy-efficient devices and equipment, where feasible, and ensure back-up plans for emergency energy needs.<br>• Ensure that a variety of waste disposal technologies are available, as feasible, to safely disinfect, neutralize, and contain waste (such as autoclaving) should certain options become compromised.<br>• Train the healthcare workforce on waste stream hazards (including chemical safety) for better management and monitoring during climate-related extreme weather events. | • Indicate the consideration of storm risk in site selection, materials selection, and the design/construction of waste facilities in coastal areas.<br>• Document local capacity strengthening on various hazards in waste streams and emergency preparedness and response.<br>• Document the availability of planned alternative routes to minimize disruptions from extreme events.<br>• Identify and document available early warning systems and their use.<br>• Document that waste management emergency plans are available.<br>• Document the regular inspection of building stability/deterioration to proactively address causes.<br>• Document the use of adapted collection schedules to reduce storage times.<br>• Document the availability/use of reusable and/or energy-efficient devices and equipment and back-up plans for emergency energy use.<br>• Document the use of covered collection trucks.<br>• Document the use of varied waste disposal options. |

| CLIMATE STRESSORS | RISK MITIGATION MEASURES | MONITORING EXAMPLES |
|---|---|---|
| Increasing the incidence and/or intensity of storm surges | • Site selection (or relocation) needs to consider the likelihood of climate risk impacts on the specific location in question, with consideration of both historical and projected climate conditions.<br>• Update design standards for waste treatment sites (e.g., incinerators, chemical treatment pits, placenta pits), waste disposal sites (e.g., on-site burial pits, sanitary landfills), and waste storage facilities (including temporary storage containers) by ensuring proper drainage, extra clearance between subsurface construction and the water table, and/or elevate to prevent inundation from flood waters.<br>• Use reusable and/or energy-efficient devices and equipment, where feasible, and ensure back-up plans for emergency energy needs. | • Indicate the consideration of sea level rise risk in site selection, materials selection, and the design/construction in coastal areas.<br>• Document local capacity strengthening on various hazards in waste streams and emergency preparedness and response.<br>• Document the availability of planned alternative routes to minimize disruptions from extreme events.<br>• Identify and document available early warning systems and their use.<br>• Document the regular inspection of building stability/deterioration to proactively address causes.<br>• Document the availability/use of reusable and/or energy-efficient devices and equipment and back-up plans for emergency energy use. |
| Sea-level rise | • Site selection (or relocation) needs to consider the likelihood of climate risk impacts on the specific location in question, with consideration of both historical and projected climate conditions.<br>• Update design standards for waste treatment sites (e.g., incinerators, chemical treatment pits, placenta pits), waste disposal sites (e.g., on-site burial pits, sanitary landfills), and waste storage facilities (including temporary storage containers) by ensuring proper drainage, extra clearance between subsurface construction and the water table, and/or elevate to prevent inundation from flood waters.<br>• Identify alternative routes for waste delivery and processing.<br>• Use early warning systems for storm events to allow for proactive preparation for storm surge.<br>• Establish natural buffer zones on coasts.<br>• Use reusable and/or energy-efficient devices and equipment, where feasible, and ensure back-up plans for emergency energy needs. | • Consider the risk of sea level rise in site selection, materials selection, and the design/construction in coastal areas.<br>• Document local capacity strengthening on various hazards in waste streams and emergency preparedness and response.<br>• Document the availability of planned alternative routes to minimize disruptions from extreme events.<br>• Identify and document available early warning systems and their use.<br>• Document that waste management emergency plans are available.<br>• Document the regular inspection of building stability/deterioration to proactively address causes.<br>• Document the availability/use of reusable and/or energy-efficient devices and equipment and back-up plans for emergency energy use.<br>• Document the use of natural buffer zones. |

# ANNEX 6: MEASURING GHG EMISSIONS

## TABLE 10. MITIGATING GHG EMISSIONS FROM HEALTHCARE WASTE

| GHG EMISSIONS SOURCES | EMISSIONS MITIGATION OPTIONS | ESTIMATION TOOLS |
|---|---|---|
| **PROCUREMENT ACTIVITIES** | | |
| ● GHG emissions from the incineration of waste<br>● GHG emissions associated with fuel combustion to transport waste to disposal sites<br>● Methane emissions from landfill waste<br>● GHG emissions associated with the energy used to recycle waste materials<br>● Nitrous oxide and fluorinated gas emissions from anesthetics | ● Use electric vehicles, where possible, for waste transport to reduce emissions.<br>● Generate and recover biogas through anaerobic digestion or landfill gas capture, which can be used for electricity, heat generation, as transport fuel, or sold as a fuel.<br>● Design energy-efficient waste management facilities.<br>● Flare landfill gases to prevent methane release.<br>● Adopt waste anesthetic capture systems to reduce emissions from anesthesia use. | ● USAID's Clean Energy Emission Reduction (CLEER) Tool can be used to estimate emissions that would be avoided as a result of renewable energy projects, including projected avoided emissions to 2050 (see https://www.cleertool.org/).<br>● The GHG Protocol's GHG Emission Calculation Tool can be used to estimate potential emissions (and avoided emissions) resulting from the use of vehicles, refrigeration and air conditioning equipment, and other emissions sources (see https://ghgprotocol.org/calculation-tools-and-guidance).<br>● U.S. EPA's Simplified GHG Emissions Calculator is an additional resource for considering GHG emissions from stationary combustion, vehicles, refrigeration and air conditioning, fire suppression, electricity use, waste, and other emissions sources, although it was developed for U.S. domestic use (see https://www.epa.gov/climateleadership/simplified-ghg-emissions-calculator).<br>● The 2019 Refinement to the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories, Volume 5: Waste, Chapter 3: |
| **STORAGE OF HEALTHCARE WASTE** | | |
| ● GHG emissions from the incineration of defective/expired/counterfeit healthcare commodities<br>● GHG emissions associated with the transportation of these commodities for disposal | ● Use electric vehicles for waste transportation to reduce emissions.<br>● Generate and recover biogas through anaerobic digestion or landfill gas capture, which can be used for electricity, heat generation, as transport fuel, or sold as a fuel.<br>● Design energy-efficient waste management facilities. | |
| **COMMODITY DISTRIBUTION AND IMPLEMENTATION ACTIVITIES** | | |
| ● GHG emissions from the improper distribution and use of healthcare commodities, which can result in an increased need for treatment and/or disposal (incineration and/or transport for disposal) | ● Design energy-efficient waste management facilities.<br>● Through the reuse-reduce-recycle programs, encourage the reuse of materials, reduce consumption, adopt recycling, and encourage sustainable consumer practices via education and awareness programs.<br>● Recover recyclable materials through separate collection and recovery facilities.<br>● Encourage manufacturers to use materials that are recyclable or have recycled content.<br>● Emissions reductions from sorting and recycling waste to reduce the amount of waste that goes into landfills. | |
| **TREATMENT AND DISPOSAL OF SOLID WASTE** | | |
| ● GHG emissions from improper waste | ● Adopt energy recovery from incineration (with | |

| GHG EMISSIONS SOURCES | EMISSIONS MITIGATION OPTIONS | ESTIMATION TOOLS |
|---|---|---|
| segregation, which allows materials that are unsuitable for burning (e.g., chemicals or PVC plastics) to be incinerated<br>● GHG emissions from the use of vehicles to transport waste (e.g., fuel operation, maintenance)<br>● GHG emissions from open burning or improper operations and maintenance of incinerators | strict pollution control technology).<br>● Restrict open burning practices.<br>● Design energy-efficient waste management facilities.<br>● If energy generation at landfills is not viable, flare landfill gases to prevent methane release.<br>● If feasible, consider promoting advanced energy generation technologies in energy from waste projects, such as fuel cells.<br>● Use electric vehicles, where available, for waste transportation to reduce emissions.<br>● Schedule and route trips to dispose of waste in a manner that minimizes emissions. | Solid Waste Disposal can be used to estimate emissions from HCW (https://www.ipcc-nggip.iges.or.jp/public/2019rf/pdf/5_Volume5/19R_V5_3_Ch03_SWDS.pdf). |