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INFECTION CONTROL AND MEDICAL WASTE MANAGEMENT PLAN

YEMEN COVID-19 RESPONSE PROJECT ADDITIONAL FINANCING

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1. Introduction

1.1 Project Context

The YEMEN COVID-19 Response Project has been established with support and finance from the World Bank and is implemented by World Health Organization (WHO) to prevent, detect and respond to the threat posed by COVID-19 and strengthen national systems for public health preparedness. The project aims to help Yemen immediately respond and mitigate the risks associated with the COVID-19 outbreak in Yemen. Based on the Yemen Preparedness and Response Plan, WHO will aim to fill critical gaps in technical areas to ensure adequate response and to reduce the expected potential impacts. Areas covered by the project include: points of entry interventions; national laboratories; infection prevention and control; case management and isolation; and operational support and logistics. These technical areas are identified to immediately strengthen the local capacity to respond and address the current COVID-19 potential challenges in timely manner, while working within the country's existing systems and providing technical assistance as needed for local entities. Emphasis will be placed on strengthening capacities at the district level through a model of decentralization.

In March 2021 Additional Financing AF to the existing Yemen COVID-19 Response Project YCRP has been negotiated/agreed between WHO and World Bank in coordination with the official authorities. The AF will mainly support the COVID-19 vaccine deployment in the Republic of Yemen.

WHO will implement material measures and actions so that the project is implemented in accordance with the World Bank Environmental and Social Standards (ESSs). The Environmental and Social Commitment Plan (ESCP) sets out material measures and actions, any specific documents or plans, as well as the timing for each of these. The Infection Control and Medical Waste Management Plan (ICMWMP) is one such document and its overall objective is to prevent and/or mitigate the negative effects of infection and medical waste on human health and the environment. The plan includes advocacy for good practices in infection control and medical waste management and is to be used by health, sanitary and cleaning workers who manage medical waste in mobile and fixed units, as well as health centers that are included in the project. All the health facilities and health services supported through the World Bank project are to have appropriate procedures and capacities in place to manage medical waste. The plan includes good practices and procedures for the waste packaging and storage, segregation, transportation, treatment and disposal.

A monitoring program has been developed including indicators to address potential negative impacts of the medical waste and to ensure that unforeseen impacts are detected and the mitigation measures implemented efficiently. The monitoring plan includes indicators for the storage, segregation, transportation and disposal of the medical waste. The plan will be implemented both internally as part of the project's overall monitoring and reporting process, and externally by the Third Party Monitoring (TPM) service which will be used under the project.

1.2 Project Components

The project components including the Additional Financing AF activities are as below:

Component 1: Emergency COVID-19 Response

The aim of this component is to prevent and limit the spread of COVID-19 through providing immediate support to enhance case detection, testing, case management, recording and reporting, as well as contact tracing and risk assessment.

More specifically, this component will finance the procurement of medical and non-medical supplies, medicines, vaccines and equipment as well as training and implementation expenses and limited rehabilitation and upgrading of the existing facilities as needed for activities outlined in the Yemen Preparedness and Response Plan such as:

(i) Rapid detection at the district level and at the POEs identified by assessing air, sea, and land movement/transportation.

(ii) Disease Surveillance, Emergency Operating Centers and Rapid Response Teams (RRT) to allow timely and adequate system of detecting, tracing, and reporting suspected cases.

(iii) Preparation and equipment of isolation and case management centers across the country to ensure adequate and trained clinical capacity to respond to any symptomatic cases.

(iv) Infection prevention and control at facility and community levels to ensure coordinated supply and demand side hygienic practices.

(v) Testing and laboratory capacity enhancement across the country for COVID-19 response.

(vi) The deployment of COVID-19 vaccines provided by COVID-19 Vaccines Global Access COVAX

The AF will provide additional support to ongoing activities under (ii) and (v), namely, strengthening disease surveillance, rapid response, and national laboratories as well as a new set of activities as (vi) the deployment of COVID-19 vaccines provided by COVID-19 Vaccines Global Access COVAX.

Component 2: Implementation Management and Monitoring and Evaluation

This component will support administration and monitoring and evaluation (M&E) activities to ensure smooth and satisfactory project implementation. The component will finance:

(i) General management support for WHO.

(ii) Hiring of Third-Party Monitoring TPM agents and auditors, with terms of reference TOR satisfactory to the World Bank.

(iii) Direct cost for staffing and project management.

(iv) Support for the Health Resources & Services Availability Monitoring System HeRAMS.

With the AF, the scope of this component is expanded to include (iv) support for the Health Resources & Services Availability Monitoring System HeRAMS, which provides core information on essential health resources and services to decision-makers at national, regional, and global levels and serves as a solid foundation to the country health information systems.

1.3 Administrative Organization of Health Care in Yemen

The Yemen Health system represents about 95% of the total health care and services provided to the citizen with a government finance to its prevention, medical and rehabilitation activities. Its structure is horizontally based on the health centers and units at the first touchline. Vertically, the health system depends on the prevention health programs and projects against epidemic and non-epidemic diseases.

With the start of the current crisis, a new set of challenges emerged that jeopardized the very core foundations of the Yemeni health system and its ability to meet the most basic health and nutrition needs of the population. Only 45 percent of HFs are fully functional and the availability of maternal and newborn health (MNH) services, as well as child health and nutrition services stand at 35 percent and 42 percent[1], respectively. Essential inputs to the health facilities (HFs) and outreach teams have become scarcer and, in many places, non-existent. This is most evident in: (a) severe shortages of essential medicines and medical supplies required at all levels of care with huge disruptions in procurement, transport and supply-chain capabilities; (b) diminished, and sometimes non-existing, safe potable water from the public domain and lack of essential fuel, power, maintenance, water pumps, among others; (c) insufficient operational and logistical resources for essential health and nutrition programs at first level referral centers, especially for emergency obstetric and maternal care as well as referral nutrition services, further risking the lives of hundreds of thousands. Consequently, the Expanded Program for Immunization (EPI) and national vaccination campaigns have been interrupted, threatening the re-emergence of some vaccine preventable diseases and risking the lives of millions of the Yemeni children. Also, pockets of new diseases that are usually associated with conflict-stricken countries (for example, cholera and trachoma) are emerging under a health system lacking adequate surveillance and rapid response systems for early detection and treatment.

1.4 Existing Medical Waste Management System/Practices

At present there is no proper management of hospital or health care waste anywhere in Yemen. Although some good basic groundwork has been carried out in an attempt to bring about improvements, the situation remains deplorable and represents a grave health risk, not only to medical staff but also to general public. Mixing most of the hospital waste with municipal solid waste worsens the problem. Most healthcare facilities have no common standards for source separation, collection bins, collection equipment for the disposal of medical waste. Disposable syringes, body organs, plastic bottles lay astray in the open dumps of the hospital wastes. Some hospitals and municipalities burn their wastes, which results in the production of large amount of highly toxic gases. The risk of injury and infection resulting from the improper management of the waste is very high. In particular, the dangers of the spread of disease PPEs, tubes, bags or plastic bottles are very serious indeed. 35 of the 63 healthcare facilities have a functional incinerator (56%), while 22% (14 HFs) don't have incinerator. The remaining 14 of 63 HFs (22%) not using incinerators despite having them and reasons include inappropriate location, fuel/energy requirements, poorly built, or non-compliance by HF staff.

[1] Health Resources Availability Mapping System June 2016

In other hand the parent Project is currently finalizing the installation arrangements of complete Waste Treatment Units including incinerators to properly dispose the generated hazardous waste within the isolation units' vicinity by the best applicable option that does not have significant adverse impact neither on personnel nor on Environment. The proposed Waste Treatment Units will include dual chamber incinerators in which the installation, operation, and maintenance is as per WHO guidance for safe management of wastes from health-care activities. Establishment of the Waste Treatment Units in the supported facilities followed the Project Environmental and Social Management Framework requirement in which the screening and safeguards instruments were addressed.

2. Infection Control and Medical Waste Management Plan ICMWMP

The safe and sustainable management of medical waste is a public health imperative and a responsibility of partners working in the health sector. Improper management of medical waste poses a significant risk to patients, health-care workers, the community and the environment. This problem can be solved. The right investment of resources and commitment will result in a substantive reduction of disease burden and corresponding savings in health expenditures.[2]

The effective management of medical waste is an integral part of a national health-care system, and as such needs to be integrated in this project. A holistic approach to medical waste management should include a clear delineation of responsibilities, occupational health and safety programs, waste minimization and segregation, the development and adoption of safe and environmentally-sound technologies, and capacity building.

Medical waste refers to the entirety of waste generated by health care and medical research facilities and laboratories. Though only 10-25% of medical waste is considered hazardous, posing various health and environmental risks, it is essential that a comprehensive plan be developed to prevent and mitigate these risks.[3]

Best practices for safely managing health-care waste should be followed in COVID-19 treatment units, which includes assigning responsibility and sufficient human and material resources to segregate and dispose of waste safely. There is no evidence yet that direct, unprotected human contact during the handling of health-care waste has resulted in the transmission of the COVID-19 virus. All health-care waste is considered to be infectious (infectious, sharps and pathological waste) which is produced during patient care, including those with confirmed COVID-19 infection, and should be collected safely in clearly marked lined containers and sharp safe boxes. This waste should be treated, preferably on-site, and then safely disposed. it is critical to know where and how this waste will be treated and safely disposed if its transported off-site[4]

Objective

[2] http://www.who.int/water_sanitation_health/facilities/waste/hcwprinciples.pdf?ua=1;

[3] Yves Chartier, Jorge Emmanuel, Ute Pieper, Annette Prüss, Philip Rushbrook, Ruth Stringer, William Townend, Susan Wilburn, Raki Zghondi, eds, *Safe management of wastes from health-care activities* (Malta: World Health Organization, 2014), page 3.

[4] https://www.who.int/publications/i/item/water-sanitation-hygiene-and-waste-management-for-the-covid-19-virus-interim-guidance

The plan's overall objective is to prevent and/or mitigate the negative effects of medical waste on human health and the environment. This must be managed in a safe manner to prevent the spread of infection and reduce the exposure of health workers, patients and the public to the risks from medical waste. The plan includes advocacy for good practices in medical waste management and is to be used by health, sanitary and cleaning workers who manage medical waste in mobile and fixed units, as well as health centers that are included in the project. All the health facilities and health services supported through the World Bank project are to have appropriate procedures and capacities in place to manage medical waste. Medical waste management is part of a set of measures to ensure patient safety and quality of medical services. In addition to the implementation of the ICMWMP, WHO will further develop and support the implementation of appropriate standards for patient safety, including for example Infection Prevention and Control measures, and adequate water, sanitation and hygiene standards.
Annex 4 therefore includes the infection control and medical waste management table for facilities involved in the implementation of Yemen COVID-19 response project.

2.1 Management Measures

Measures to Enhance Infection Prevention and Control in Isolation Centers and Prevent/Reduce Exposure to Infections or Diseases

Health care providers and personnel are exposed to infections particularly COVID-19 and other infections such as blood-borne pathogens, and other potential infectious materials (OPIM) during care and treatment, as well as during collection, handling, treatment, and disposal of health care waste. The following measures are recommended to reduce the risk of transferring infectious diseases to health care providers:

- Formulate an exposure control plan for COVID-19.
- Provide staff members and visitors with information on infection control policies and procedures.
- Establish Universal/Standard Precautions to treat all COVID-19 and other potentially infectious materials with appropriate precautions, including:
  - Use of standardized PPEs such as gloves, masks, and gowns
  - Adequate facilities for hand washing. Hand washing is the single most important procedure for preventing infections (e.g. nosocomial and community). Hand washing should involve use of soap / detergent, rubbing to cause friction, and placing hands under running water. Washings of hands should be undertaken before and after direct patient contacts and contact with patient blood, body fluids, secretions, excretions, or contact with equipment or articles contaminated by patients. Washing of hands should also be undertaken before and after work shifts; eating; smoking; use of personal protective equipment (PPE); and use of bathrooms. If hand washing is not possible, appropriate antiseptic hand cleanser and clean cloths / antiseptic towelettes should be provided. Hands should then be washed with soap and running water as soon as practical o Procedures and facilities for handling dirty linen and contaminated clothing, and preparing and handling food
  - Appropriate cleaning and waste disposal practices for the health care workplace

- Availability of disinfection and cleaning supplies

- The following recommendations should be implemented when using and handling of needles / sharps:
  - Use safer needle devices and needleless devices to decrease needle stick or other sharps exposures.
  - Do not bend, recap, or remove contaminated needles and other sharps unless such an act is required by a specific procedure or has no feasible alternative
  - Do not shear or break contaminated sharps
  - Have needle containers available near areas where needles may be found
  - Discard contaminated sharps immediately or as soon as feasible into appropriate containers
  - Used disposable razors should be considered contaminated waste and disposed of in appropriate sharps containers
- Establish policies to exclude animals from facility property.

2.2 Medical Waste Management Procedures

As highlighted by WHO recommendations[5], the first step in medical waste management is to minimize waste. To this end, a standardized assessment tool should be developed to identify gaps in the management process, including occupational health issues. Though all staff are responsible for managing waste, to ensure optimal waste management, it is recommended to establish a facility-based Waste Management Committee and designate a single waste management project lead. The project lead should coordinate the medical waste management system and be supported by the health facility management. In addition, the roles and responsibilities of key personnel engaged in waste management activities should be defined during all phases (i.e. generation, segregation, transportation and final disposal) and a waste-management committee should be established.

2.2.1 Medical Waste Segregation, Collection, and Transport

Waste generated in waiting areas of health-care facilities can be classified as non-hazardous and should be disposed in strong black bags and closed completely before collection and disposal. All those who handle health-care waste should wear appropriate PPE (boots, long-sleeved gown, heavy-duty gloves, mask, and goggles or a face shield) and perform hand hygiene after removing it. The volume of infectious waste during the COVID 19 outbreak is expected to increase, especially through the use of PPE. Therefore, it is important to increase capacity to handle and treat this health-care waste. Additional waste treatment capacity, preferably through alternative treatment technologies, such as autoclaving or high temperature burn incinerators, may need to be procured and systems may need to be put in place to ensure their sustained operation. A programmed routine for biomedical waste collection should be established as part of the medical waste management plan. Waste should be separated into categories and placed in designated containers (i.e., covered buckets) as soon as it is generated in the treatment room or department. Health care workers are responsible for appropriately disposing of the waste. The number

[5] http://apps.who.int/iris/bitstream/10665/85349/1/9789241548564_eng.pdf

of places where patients and visitors can dispose of waste should be minimized (e.g. using designated containers in communal areas). WHO recommends that small amounts of chemicals can be collected with infectious waste.

Large amounts of hazardous chemicals should be packed in chemical resistant containers and be sent to specialized treatment facilities (if available).

Waste buckets should be transported with their lids securely in place to prevent spillage. When many containers need to be transported, a cart or trolley should be used to prevent back injury.

Offsite transport of hazardous waste should be subject to national regulations. If there are none, then the 'Recommendations on the transport of dangerous goods' published by the UN may be referred to. Certain recommendations should be followed by the sanitary workers and cleaners:

1. Collection of medical waste should be from key sites (e.g. within nursing stations, mobile and fixed units), followed by transfer to the designated point(s) for segregation and/or treatment
2. Waste should be collected daily at the same time (or as frequently as required) and transported to the designated central storage/treatment site.
3. No bags should be removed unless they are labelled with their point of production (health unit/center) and contents.
4. Bags or containers should be replaced immediately with new ones of the same type.
5. There should be enough buckets provided to ensure an appropriate number of clean buckets in rotation. Buckets should be washed and disinfected before reuse.
6. The waste should be placed in rigid or semi-rigid and leak-proof containers.

2.2.2 Waste Segregation Strategies

At the point of generation, waste should be identified and segregated. Non-hazardous waste, such as paper and cardboard, glass, aluminum and plastic, should be collected separately and recycled. Food waste should be segregated and composted. Infectious and / or hazardous wastes should be identified and segregated according to its category using a color-coded system. If different types of waste are mixed accidentally, waste should be treated as hazardous. Other segregation considerations include the following:

- Avoid mixing general health care waste with hazardous health care waste to reduce disposal costs;
- Segregate waste containing mercury for special disposal.
- Management of mercury containing products and associated waste should be conducted as part of a plan involving specific personnel training in segregation and clean up procedures;
- Segregate waste with a high content of heavy metals (e.g. cadmium, thallium, arsenic, lead) to avoid entry into wastewater streams;
- Separate residual chemicals from containers and remove to proper disposal containers to reduce generation of contaminated wastewater. Different types of hazardous chemicals should not be mixed;
- Establish procedures and mechanisms to provide for separate collection of urine, feces, blood, vomits, and other wastes from patients treated with genotoxic drugs. Such wastes are hazardous and should

be treated accordingly

- Aerosol cans and other gas containers should be segregated to avoid disposal via incineration and related explosion hazard;
- Segregate health care products containing PVC to avoid disposal via incineration or in landfills

2.2.3 On-site Handling, Collection, Transport and Storage

- Seal and replace waste bags and containers when they are approximately three quarters
- Full bags and containers should be replaced immediately;
- Identify and label waste bags and containers properly prior to removal;
- Transport waste to storage areas on designated trolleys / carts, which should be cleaned and disinfected regularly;
- Waste storage areas should be located within the facility and sized to the quantities of waste generated, with the following design considerations:
    - o Hard, impermeable floor with drainage, and designed for cleaning / disinfection with available water supply
    - o Secured by locks with restricted access
    - o Designed for access and regular cleaning by authorized cleaning staff and vehicles
    - o Protected from sun, and inaccessible to animals / rodents
    - o Equipped with appropriate lighting and ventilation
    - o Segregated from food supplies and preparation areas
    - o Equipped with supplies of protective clothing, and spare bags / containers
- Unless refrigerated storage is possible, storage times between generation and treatment of waste should not exceed the following:
    - o Temperate climate: 72 hours in winter, 48 hours in summer
    - o Warm climate: 48 hours during cool season, 24 hours during hot season
- Store mercury separately in sealed and impermeable containers in a secure location;
- Store cytotoxic waste separately from other waste in a secure location;
- Store radioactive waste in containers to limit dispersion, and secure behind lead shields.

2.2.4 Waste Handling Safety Measures

1. All personnel handling infectious medical waste shall wear gloves and additional protective medical clothing and personal protective equipment (PPE) appropriate to the level of risk they encounter and shall remove any protective medical clothing used prior to leaving the work area and to place it in a designated area or container. When performing procedures where splashing is not expected, gloves are the minimum PPE that may be worn;
2. Protective medical clothing and PPE should not be submitted for laundering unless sterilized;
3. When performing procedures where splashing may occur or when infectious medical waste bags or containers may contact more than the worker's hands and wrists, the following medical

protective clothing and PPE is required in addition to gloves;

- Appropriate protective medical clothing should be of material that does not permit infectious medical waste from penetrating and reaching workers clothes or skin;
- Eye protection, surgical face masks, and face shields when personnel may reasonably anticipate facial exposure to infectious medical waste.
- Implement immunization for staff members, as necessary (e.g. vaccination for hepatitis B virus, tetanus immunization).

2.2.5 Medical Waste Storage and Packaging

1. A temporary waste storage area, inside the waste zone, should be set aside to store soft waste until it can be incinerated. Storage of medical waste should be for the minimum possible time, 24-48 hours in hot countries, 48-72 hours for cold countries (WHO).
2. Biomedical waste other than sharps and bulk liquids must be packaged in sealed in bags which are leak-proof and rip-resistant.
3. Sharps shall be placed in rigid leak and puncture resistant containers.
4. Bulk liquids to be transported off-site shall, in addition to the above requirements, be placed in rigid containers.
5. All medical waste must be stored in a secure area designated for this material.
6. Pathological waste stored anywhere for more than 24 hours must be refrigerated. Storage of biomedical wastes may need to be stored at the facility of origin until a large enough quantity is accumulated to warrant on-site treatment, or until transport to an offsite treatment facility is scheduled.

The following general guidelines apply to typical medical waste storage, transfer, and collection areas:

1. Store medical/infectious waste in a designated area located at or near the treatment site or the waste pickup point.
2. Areas used to store medical/infectious waste should be durable, easily cleanable, impermeable to liquids, and protected from vermin and other potential mechanisms that might spread infectious agents.
3. The manner of storage should maintain the integrity of the containers, prevent leakage of waste from the container, provide protection from the weather, and maintain the waste in a non-putrescent, odorless state (this may require refrigeration).
4. Storage areas should have adequate ventilation systems.
5. Access should be securely controlled and limited. Due to the hazardous nature of some medical wastes, appropriate methods of storing waste will help to prevent accidents and infections. Storage locations should be accessible, exclusive, secure, hygienic and sanitary, located as far as possible from patient treatment areas. Storage locations should be integrated with the physical and architectural infrastructure of the healthcare facility.

2.2.6 Transport to External Facilities

- Transport waste destined for off-site facilities according to the guidelines for transport of hazardous wastes / dangerous goods in the General EHS Guidelines;
- Transport packaging for infectious waste should include an inner, watertight layer of metal or plastic with a leak-proof seal. Outer packaging should be of adequate strength and capacity for the specific type and volume of waste;
- Packaging containers for sharps should be puncture-proof;
- Waste should be labeled appropriately, noting the substance class, packaging symbol (e.g. infectious waste, radioactive waste), waste category, mass / volume, place of origin within hospital, and final destination;
- Transport vehicles should be dedicated to waste and the vehicle compartments carrying waste sealed.

2.2.7 Disposal of Contaminated Waste

In facilities that have a waste zone, this is the final disposal site of the medical waste. A fully functional waste zone should have the following components:

1. An incinerator or burner for treatment of soft waste.
2. An ash pit for disposal of residues from the incinerator or burner and a covered pit with a hatch lid.
3. A sharps pit for disposal of sharps containers. A sealed, covered pit with a 1m length of pipe incorporated in the top to prevent access to the contents.
4. An organics pit for disposal of human tissue and other biological waste.
5. An infiltration facility or sewer for the disposal of liquids.

The waste zone should be kept locked at all times. The waste manager has the responsibility for its correct management. Kitchen waste and general waste from patients and visitors is not classified as medical waste.

Types of medical wastes are in Annex 1. A non-exhaustive list of activities to be undertaken by the waste management committee or the manager is outlined in the list below.

Table 1: Common medical waste and disposal methods

Waste Item*	**Waste Collection**	**Storage**	**Treatment/Disposal**
Needles, ampoules, scalpels, broken glass and vials	Closed sharps container	No	Sharps pit
Needle caps, syringes (w/o needles), masks, gloves, paper and dressings	Soft bucket	Temporary	Incinerator/ash Pit
Human body tissue, blood and fluids	Organics bucket	No	Organics pit
Wastewater	Bucket	No	Sewer/Infiltration facility

Domestic waste	Bin in communal area	No	Domestic waste pit

2.2.8 Best Practice for the Disposal of Liquid Contaminated Wastes

Liquid contaminated waste (e.g. human tissue, blood, feces, urine and other body fluids) requires special handling, as it may pose an infectious risk to healthcare workers with contact or handle the waste. Steps for the disposal of liquid contaminated wastes are the following:

- Wear PPE (utility gloves, protective eyewear and plastic apron)
- Carefully pour wastes down a utility sink drain or into a flushable toilet and rinse the toilet or sink carefully and thoroughly with water to remove residual wastes. Avoid splashing.
- If a sewage system doesn't exist, dispose of liquids in a deep, covered hole, not into open drains. This should be located at a safe distance from water sources.
- Decontaminate specimen containers by placing them in a 0.5% chlorine solution for 10 minutes before washing them.
- Remove utility gloves (wash daily or when visibly soiled and dry).
- Wash and dry hands or use an antiseptic hand rub as described above.

Acids and alkalis should be diluted; pH neutralized and disposed of to the sewer with water. Neutralization can be done with lime, which is cheap and effective.

In cases where wastewater is not discharged to sanitary sewage systems, HCF operators should ensure that wastewater receives on-site primary and secondary treatment, in addition to chlorine disinfection. Techniques for treating wastewater in this sector include source segregation and pretreatment for removal / recovery of specific contaminants such as radio isotopes, mercury, etc.; skimmers or oil water separators for separation of floatable solids; filtration for separation of filterable solids; flow and load equalization; sedimentation for suspended solids reduction using clarifiers; biological treatment, typically aerobic treatment, for reduction of soluble organic matter (BOD); biological or chemical nutrient removal for reduction in nitrogen and phosphorus; chlorination of effluent when disinfection is required; dewatering and disposal of residuals as hazardous medical / infectious waste.

Additional engineering controls may be required for (i) removal of active ingredients (antibiotics and miscellaneous pharmaceutical products, among other hazardous constituents), and (ii) containment and treatment of volatile constituents and aerosols stripped from various unit operations in the wastewater treatment system.

Wastewater generated from use of wet scrubbers to treat air emissions should be treated through chemical neutralization, flocculation, and sludge settling. Sludge should be considered hazardous, and may be treated off-site in a hazardous waste facility, or encapsulated in drums with mortar and landfilled. Sludge treatment should include anaerobic digestion to ensure destruction of helminthes and pathogens. Alternatively, it can be dried in drying beds before incineration with solid infectious wastes.

The most contaminated wastewater will come from the mortuary, showers, laundry, and kitchen washing area. Wastewater from this area must, therefore, be disposed of in soak pits possibly after first going through grease traps (so that the soak pit does not become clogged). Soak always must be located at least

30 meters from any groundwater source and the bottom of any soak away pit is at least 1.5 meters above the water tables.

2.2.9 Best Practice for the Disposal of Solid Contaminated Wastes

Solid contaminated waste (e.g. surgical specimens, used dressings and other items contaminated with blood and organic materials) may carry microorganisms. Remember:

- Never use hands to compress waste into containers
- Hold plastic bags at the top
- Keep bags from touching or brushing against the body while lifting or during transport

Steps for the disposal of solid contaminated wastes are:

- Wear heavy-duty or utility gloves when handling and transporting solid wastes.
- Wearing glasses if you are working with material that may splash into your face or eyes
- Dispose of solid wastes by placing them in a plastic or galvanized metal container with a tight-fitting cover. Never recap needles after use.
- Collect the waste containers on a regular basis and transport the burnable ones to the incinerator or area for burning.

If incineration is not available or waste is non burnable, bury it. Remove utility gloves (wash daily or when visibly soiled and dry).

- Wash and dry hands or use an antiseptic hand rub as described above.
- Disposing of waste into designated containers as soon as it is generated
- Wearing boots, overalls, glasses and gloves when disposing of waste
- Using adequate tools to avoid contact with waste (brush, shovel)

It should be mentioned that properly designed and operated sanitary landfills will protect against air and groundwater contamination. Disposal of waste into open dumps is not considered good practice and should be avoided. Pre-treatment of waste prior to land disposal may involve encapsulation (filling containers with waste and an immobilizing material and sealing the containers).

2.2.10 Incineration

Incineration is a high-temperature process that reduces the volume and weight of waste. This process is usually selected to treat waste that cannot be recycled, reused or disposed of in a sanitary landfill or dumpsite. Medical waste produced under this project will be incinerated at health facilities that are equipped with incinerators. In facilities with no incinerators, wastes will be properly collected and safely transported to bigger facilities with incinerators.

Types of Incinerators

Incinerators can range from extremely sophisticated, high-temperature ones to very basic units that operate at much lower temperatures. All types of incinerators, if operated properly, eliminate micro-

organisms from waste and reduce the waste to ashes. Four basic types of incinerators are used for treating waste:

a) Double-chamber, high-temperature incinerators are designed to burn infectious waste.
b) Single-chamber, high-temperature incinerators are less expensive and are used when double chamber incinerators are not affordable.
c) Rotary kilns operate at high temperatures and are used for destroying cytotoxic substances and heat-resistant chemicals.
d) Drum or brick (clay) incinerators operate at lower temperatures and are less effective but can be made locally using readily available materials.

Types of Waste That Should Not Be Incinerated

While it is possible to incinerate soft waste, the below items SHOULD NOT be incinerated:

1. Pressurized gas containers (aerosol cans)
2. Large amounts of reactive chemical waste
3. Silver salts and photographic or radiographic wastes
4. Plastic containing polyvinyl chloride (blood bags, IV tubing or disposable syringes)
5. Waste with high mercury or cadmium content, such as broken thermometers, used batteries and lead-lined wooden panels
6. Ampoules or vials, as molten glass will cause the grate to block up and vials can explode.
7. Bottles of chemicals and reagents due to risk of explosion and formation of toxic gases.
8. Needles due to the risk of needle stick injury from the metal ash.
9. Expired drugs.
10. Kitchen waste as this is wet, does not burn and will lower the efficiency.

Solid wastes that should not be incinerated will be packaged, transported to and disposed of in Government recognized landfill.

Annex 3 details the segregation, treatment and disposal principals for of healthcare waste categories as per the World Bank Environmental, Health, and Safety Guidelines for Health Care Facilities.

Waste Minimization, Reuse, and Recycling

Facilities should consider practices and procedures to minimize waste generation, without sacrificing patient hygiene and safety considerations, including:

- Source reduction measures:
- Consider options for product / material substitution to avoid products containing hazardous materials that require the product to be disposed as hazardous or special waste (e.g. mercury or aerosol cans), and preferring products with less packaging or products that weigh less than comparable products that perform the same function
- Use of physical rather than chemical cleaning practices (e.g. using microfiber mops and cloths), where such practices do not affect disinfection and meet relevant standards for hygiene and patient safety.
- Waste toxicity reduction measures:
- Consider options for product / material substitution for equipment containing mercury or other

hazardous chemicals; products that may become hazardous waste when disposed; products made of polyvinyl chloride (PVC6); halogenated compounds; products that off-gas volatile organic compounds (VOCs), or products that contain persistent, bio-accumulative and

- toxic (PBT) compounds; products that contain substances which are carcinogenic, mutagenic or reproductive toxins (CMR)
- Use of efficient stock management practices and monitoring (e.g. for chemical and pharmaceutical stocks), including:
- Small / frequent orders for products that spoil quickly and strict monitoring of expiry dates
- Complete use of old product before new stock is used

- Maximization of safe equipment reuse practices, including:
- Reuse of equipment following sterilization and disinfection (e.g. sharps containers)

How to Build and Use a Simple Drum Incinerator for Waste Disposal[6]

Simple drum incinerator is the best practice for biomedical waste treatment for healthcare facilities with limited resources and where high-temperature incinerators are not affordable, waste may be incinerated in a drum incinerator, a drum incinerator is the simplest form of single chamber incinerator. It can be made inexpensively and is better than open burning.

Steps for building and using simple drum incinerator are the following:

- Where possible, select a site downwind from the clinic.
- Build a simple incinerator using local materials (mud or stone) or a used oil drum (e.g. a 55-gallon drum). The size depends on the amount of daily waste collected.
- Collect all waste containers and locate them next to the incinerator for easy handing during operation**.**
- Make sure the incinerator has:
    a) Sufficient air inlets underneath for good combustion
    b) Loosely placed fire bars to allow for expansion
    c) An adequate opening for adding fresh refuse and for removal of ashes
    d) A long enough chimney to allow for a good draft and evacuation of smoke
- Place the drum on hardened earth or a concrete base.
- Burn all combustible waste, such as paper and cardboard, as well as used dressings and other contaminated wastes. If the waste or refuse is wet, add kerosene so that a hot fire burns all the waste. Ash from incinerated material can be treated as non-contaminated waste.
- Ashes should always be removed from the incinerator PRIOR to operation; otherwise the efficiency of combustion will be compromised.
- It is recommended to install an ashtray under the grate to catch the ashes.
- Pull out the ashtray and grate out and carefully clean with the brush and ash shovel.

[6] See also Guidelines on How to Construct, Use, and Maintain a Waste Disposal Unit. WHO, 2005, and De Montfort Medical Waste Incinerator at http://www.who.int/management/quality/Waste/en/index2.html

- Dispose of the ash directly to the ash pit.
- Any remaining ashes inside the chambers should be removed with a small, long handled brush and the ash shovel, transferred to a bucket and disposed of in the ash pit.

Open Burning

Open Burning is not recommended because it is dangerous, unsightly and the wind will scatter the waste. If open burning must be done, burn in a small, designated area, transport waste to the site just before burning and remain with the fire until it is out.

Burying Waste

Only contaminated and hazardous waste needs to be buried. In healthcare facilities with limited resources, safe burial of wastes on or near the facility may be the only option available for waste disposal. To limit health risks and environmental pollution, some basic rules are:

1. Access to the disposal site should be restricted (Build a fence around the site to keep animals and children away).
2. The burial site should be lined with a material of low permeability (e.g. clay), if available.
3. Select a site at least 50 meters (164 feet) away from any water source to prevent contamination of the water table. The site should have proper drainage, be located downhill from any wells, free of standing water and not in an area that flood.
4. Large quantities (over 1 kg) of chemical (liquid) wastes should not be buried at the same time; burial should be spread over several days. Safe on-site burial is practical for only limited periods of time (1–2 years), and for relatively small quantities of waste. During the interval, staff should continue to look for a better, permanent method for waste disposal.

Annex 3 details the segregation, treatment and disposal principals for of healthcare waste categories as per the World Bank Environmental, Health, and Safety Guidelines for Health Care Facilities.

Cost of Implementing the Medical Waste Management Plan

The cost associated with the implementation of the arrangements, practices and measures suggested in this plan is built in the overall cost of implementing the project. No special requirements are needed for implementing this plan.

Suggested incinerators at small scale health facilities

De Mont Fort mark 8-A incinerator model is considered as a suitable option of waste disposal. The incinerator is a double chambered refractory structure having metal components in the form of waste loading door, ash removal door, and chimney. The incinerator operates on burning of medical waste in specific temperature range from 600 C to 900C. The temperature range should be monitored by a high temperature digital thermometer mounted with the main structure. Close monitoring of the controlled burning reduces the emission of dioxin and furan which are the main objectionable environmental pollutants of incineration. Waste is loaded from waste loading door after preheating using kerosene oil as supplementary fuel. The temperature is maintained in the desired range by waste loading frequency. After

burning of infectious waste in the primary combustion chamber the toxic gases find passage in the secondary combustion chamber where further oxidation reduces the amount of dioxin and furans as a result atmosphere receive less polluting flue gases. This WDU will affectively get rid of approximately 6-7 kg of infectious waste per hour and can be operated for two hours daily five days a week following the best operation practices.

2.2.11 COVID-19 vaccine deployment waste management

In the COVID-19 vaccine deployment process waste disposal will be performed according to national guidelines and best practices and will be the responsibility of one of the National Deployment Vaccination Plan NDVP Subcommittees at the central level and the corresponding focal point at district level. It should be emphasized on the major limitation in the health system in the country, in specific, health facilities do not have a proper system to dispose of medical waste. At present except in a few larger facilities/ institutions, incinerators are not being used to dispose medical waste. In these other facilities, open burning of items in pits has been adopted. This is generally the widespread method of disposal of medical waste. All immunization centers collect used items in safety boxes which will be distributed to all the peripheral vaccination levels.

Existing staff is also adequately trained in the method of disposal of medical wastes. Every immunization center in the country has delegated this responsibility to identified health workers as a part of their routine duty. Given the availability of these resources, an extra effort would not be needed for collection and disposal of medical wastes during the vaccination process. If additional costs are needed, it will be estimated by the district team leaders and arrangements will be made to obtain the cost from local health budgets or local councils budgets. Duty rosters of relevant staff will be adjusted by relevant team leaders to include the quick disposal of extra load of waste during the vaccination. If any vaccine stocks are left unused due to cold chain issues or expiry, they will be disposed according to the system practiced within the National Expanded Program of Immunization EPI. Monitoring tools will be used by the health facilities and stock management to ensure the safe waste disposal as per WHO guidelines Annex 5. [7]

Infection, Prevention and Control and waste management will be an integral part of the micro plan. The immunization waste generated during outreach sessions will be segregated into sharps and no sharps container and will be handed over to the PHC/Hospitals for further disposal. Safety boxes will be used for the safe disposal of syringes (sharps wastes). Broken vials will be stored in leak proof containers. Training will be conducted at facility based on proper waste management and supervision committee will be notified for each facility with assigned responsibilities. Waste tracking system with inventory of equipment and stock monitoring will be developed. PPEs for the healthcare workers and sanitary workers will be provided. Final disposal of waste will be determined based on facilities available in respective governorates. Preference will be given to the on-site waste disposal systems available in the health

[7] https://apps.who.int/iris/bitstream/handle/10665/204415/WHO_SDE_WSH_04.11_eng.pdf;jsessionid=0DF836D25A31C55B66FB6161CF2167CB?sequence=1

facilities. If not available, safety boxes and containers (empty or expired vials) will be transported to the municipality landfill site following safe waste disposal protocols.

PPEs (gloves, masks) and hand sanitizers will be provided to health care workers involved in vaccination campaigns. Safe disposal of masks and gloves will be ensured through safe segregation, collection, transportation, and final disposal at the designated site.

3. Emergency Preparedness and Response

Emergency incidents occurring in a HF may include occupational exposure to infectious materials, accidental releases of infectious or hazardous substances to the environment, medical equipment failure, failure of solid waste and wastewater treatment facilities and fire. These emergency events are likely to seriously affect medical workers, communities, the HF's operation, and the environment. If serious incident or accident related to the project occurred, it shall be reported to the WHO Project Management Unit. World Bank then shall be notified within 24-48 hours after learning of the incident or accident.

Health-care waste management plans include provision or the continuous monitoring of workers health and safety to ensure that correct handling, treatment, storage, and disposal procedures are being followed. Healthcare worker's exposure risk assessment tool is being prepared and will be rolled out to all healthcare facilities for assessing the gaps and essential occupational health and safety measures include the following:

- proper training of workers;
- provision of equipment and clothing for personal protection;
- establishment of an effective occupational health programme that includes immunization, post exposure prophylactic treatment, and medical surveillance.

Training in health and safety is part of the capacity building program to ensure that workers know of and understand the potential risks associated with health-care waste and the importance of consistent use of personal protection equipment. Workers at risk include health-care providers, hospital cleaners, maintenance workers, operators of waste treatment equipment, and all operators involved in waste handling and disposal within and outside health-care establishments.

3.1 Emergency response

One person will be designated as responsible for the handling of emergencies, including coordination of actions, reporting to managers and regulators, and liaising with emergency services, and a deputy will be appointed to act in case of absence. In health-care establishments, spillage is probably the most common type of emergency involving infectious or other hazardous material or waste. Response procedures are essentially the same regardless of whether the spillage involves waste or material in use, and should ensure that:

- the waste management plan is respected;
- contaminated areas are cleaned and, if necessary, disinfected;

- exposure of workers is limited as much as possible during the clearing up operation;

The impact on patients, medical and other personnel, and the environment is as limited as possible. Health-care personnel are being trained for emergency response, and the necessary equipment will be provided to handle and readily available at all times to ensure that all required measures can be implemented safely and rapidly. Written procedures for the different types of emergencies were drawn up. For dangerous spills, the clean-up operation will be carried out by designated personnel specially trained for the purpose.

3.1.1 Response to injuries

A program of response will be established in all hospitals with COVID-19 treatment units that prescribes the actions to be taken in the event of injury or exposure to a hazardous substance. All staff who handle health-care waste will be trained to deal with injuries and exposures. The program includes the following elements:

- immediate first-aid measures, such as cleansing of wounds and skin, and irrigation (splashing) of eyes with clean water;
- an immediate report of the incident to a designated responsible person; retention, if possible, of the item involved in the incident; details of its source for identification of possible infection; additional medical attention in an accident and emergency or occupational health department, as soon as possible;
- medical surveillance;
- COVID-19 tests, blood or other tests if indicated;
- recording of the incident;
- investigation of the incident, and identification and implementation of remedial action to prevent similar incidents in the future.

In case of a needle stick injury, bleeding of the wound should be encouraged, and the area should be washed under clean running water. The remaining elements of the accident response plan should then be followed.

The purpose of incident reporting should not be seen as punitive; active support by managers should encourage prompt and accurate reporting.

3.1.2 General procedures in case of spillages

The actions listed below provide an example of typical measures that could/should be taken in case of accidental spillages of Healthcare waste.

- Evacuate the contaminated area.
- Decontaminate the eyes and skin of exposed personnel immediately.
- Inform the designated person who should coordinate the necessary actions.
- Determine the nature of the spill.
- Evacuate all the people not involved in cleaning up.

- Provide first aid and medical care to injured individuals.
- Secure the area to prevent exposure of additional individuals.
- Provide adequate protective clothing to personnel involved in cleaning-up.
- Limit the spread of the spill.
- Neutralize or disinfect the spilled or contaminated material if indicated.
- Collect all spilled and contaminated material. [Sharps should never be picked up by hand; brushes and pans or other suitable tools should be used]. Spilled material and disposable contaminated items used for cleaning should be placed in the appropriate waste bags or containers.
- Decontaminate or disinfect the area, wiping up with absorbent cloth. The cloth (or other absorbent material) should never be turned during this process, because this will spread the contamination. The decontamination should be carried out by working from the least to the most contaminated part, with a change of cloth at each stage. Dry cloths should be used in the case of liquid spillage; for spillages of solids, cloth impregnated with water (acidic, basic, or neutral as appropriate) should be used.
- Rinse the area, and wipe dry with absorbent cloths.
- Decontaminate or disinfect any tools that were used.
- Remove protective clothing and decontaminate or disinfect it if necessary.
- Seek medical attention if exposure to hazardous material has occurred during the operation.

3.1.3 Reporting accidents and incidents

All waste management staff will be trained in emergency response and made aware of the correct procedure for prompt reporting. Accidents or incidents, including near-misses, spillages, damaged containers, inappropriate segregation, and any incidents involving sharps will be reported to the Waste Management Officer (if waste is involved) or to another designated person. The report should include details of:

- the nature of the accident or incident;
- the place and time of the accident or incident;
- the staff who were directly involved;
- any other relevant circumstances like exposure to COVID-19 patients.

The cause of the accident or incident will be investigated by the Waste Management Officer (in case of waste) or other responsible Officer, who will also take all possible action to prevent recurrence. The records of the investigation and subsequent remedial measures will be kept.

4. Institutional Arrangements

Under the Yemen COVID-19 Response Project, WHO will be the grant recipient as well as the managing and implementing entity on an exceptional basis, where the organization is responsible for the respective activities based on the project design and the implementation experience under the Emergency Health and Nutrition Project (EHNP). WHO managed to set implementation mechanisms in place for the project,

through the existing local public system structures, to deliver various results on the ground during the ongoing conflict in Yemen. Since March 2015, WHO further strengthened and expanded its operational capacities and presence in the country to address the health issues at different levels.

WHO is a key leader of the Yemen Health Cluster, which is contributing to the Health Engagement Plan in Yemen and is also one of the main global and in-country players in addressing the current COVID-19 pandemic at both the technical and operational sides. Through its respective networks of providers, contractors, government health offices (GHOs), district health offices (DHOs), and international/local nongovernmental organizations (INGOs/LNGOs), the organization has existing institutional and implementation channels for the delivery of essential services and ensuring the availability of critical medicines nationwide. These implementation arrangements, which proved successful under the Health and Population Project and Schistosomiasis Project, are context specific and flexible based on the population needs and local capacity (DHOs or NGOs) to provide the identified package of healthcare services. Therefore, WHO will work with the existing local health system structures at the governorate, district and community levels to preserve the national capacity and maintain the core functions of the health system.

At the Secondary Care level, WHO will provide direct logistical, operational and capacity support to the teams working in public hospitals and various targeted isolation units. Contracting for the needed capacities to serve in deprived hospitals will be also provided for. WHO will also work closely with vendors and suppliers to maintain adequate flow of basic supplies (water and fuel) and essential medicines for all levels of care. WHO will also be responsible for operationalizing the sites under eDEWS (electronic disease early warning system) which are staffed by public health workers in terms of logistics and capacity readiness. Finally, WHO will oversee the logistical preparation and execution of the national targeted campaigns against various infectious agents by working closely with implementing teams following the same modalities.

Waste management / Infection control team of the hospital will be nominated by the in charge of the hospital. This will comprise of,

1. Director of the hospital
2. Infection control nurse,
3. Nursing Supervisor,
4. Senior Pharmacist,
5. Lab technician
6. Ward master,
7. Sanitary supervisor,
8. In charge Medical ICU,
9. Registrar Medicine / Surgery / Radiology / Gynecology and Obstetrics.

This team will be responsible for the efficient conduction of health care waste management activities and also deals with infection control issues at the facility. This team is also responsible for dealing with incidents and accidents occurring as a result of risk waste / nosocomial infections. If an incident / accident

occurs at a site, it will be immediately reported by the concerned person at the site i-e nurse / paramedical staff to the director of the hospital. Immediate consultations will be held among Waste management / Infection control team and steps are taken:

a) To limit the spread of accident,
b) To control the incident,
c) To evacuate the area,
d) To immediately clean the area,
e) To report incident to higher authorities in order to avoid unfortunate incident
the HFs do not have information management system in place to record amount of waste generated by each health facility. However, this is the ultimate objective to achieve for preparing a health care waste management plan for COVID-19 treatment units. Performance indicators on waste management and infection control will be monitored by the infection control committee being established at each health care facility.

Awareness Raising and Capacity Building

Health care staff should be trained and aware of good practices and procedures of waste management and infection control under this plan. Such practices and procedures should be disseminated to the health care units/facilities to be implemented as part of the project activities through the following options:

- Designating one of the members of the teams to train other health care staff, waste management workers and cleaners on the management of generated waste.
- Printing leaflets and booklets of good practices/procedures for waste management and disseminate these materials to the health units/facilities with medicine and vaccination.
- Recruiting staff/consultants whose task is to train health care staff on managing wastes generated from facilities and units supported under this project.
- Ensure that third-party waste management service providers should be provided with the relevant training as well.

The Project Stakeholders Engagement Plan SEP covers the engagement strategy and approach on the necessary infection prevention and waste management topics and relevant stakeholders. In other hand, awareness raising to patients and families could be achieved through the deployment of posters and leaflets on the infection prevention and waste management best practices.

5. Monitoring Plan

Monitoring is required to follow-up on decisions made to intervene in various activities of medical waste management in order to protect human health and the environment. This can be achieved through periodic internal and external processes of monitoring and evaluation on a continuous basis, at all institutional levels.

To ensure that objectives of the ICMWMP are achieved, the implementation of the plan has to be monitored by both internal and external bodies including the WHO, Government Health Offices (GHOs) and other implementing partners (NGOs) as well as Third Party Monitoring (TPM) agencies. These bodies

will use existing institutional arrangement as mentioned in Chapter 4 to ensure proper waste management at health units and facilities.

5.1 Monitoring Objectives

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

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

5.2 Monitoring Arrangements

The medical waste management plan will be monitored both internally and externally. Internally, the plan will be part of the project's overall monitoring and reporting. WHO will ensure that the staff hired at the unit/facility level will be monitoring the implementation of the Medical Waste Management Plan. At least one staff should be partially tasked with monitoring the plan in each health unit or facility. The reporting on the plan will be part of the regular reporting of the project components/activities at local, governorate and national levels. Externally, the project will use third party monitoring service for intervention and activities under each component of the project. To that end, a TOR has been prepared for the TPM service, including tasks on monitoring the implementation of the medical waste management plan. The TPM team will also be reporting on the implementation of the medical waste management plan. The cost of implementing the monitoring plan is included as part of the project's cost.

5.3 Monitoring Indicators

Considering the type of interventions implemented by this project which are anticipated to have limited, site specific impacts, the following will be used to monitor progress in implementing the medical waste management plan:

- Existence of human resource capacity in health care unites and facilities with basic knowledge to deal medical waste;
- Existence of records on waste generation; and
- Development of mechanisms for proper and safe medical waste management and disposal.

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

Internal Packaging and Storage

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

External Packaging and Storage

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

Transportation (if required)

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

Treatment and Disposal

- Incineration
- Sterilization by Heat
- Sanitary Landfill

Administration

- Ensure effective record keeping, each health institutions shall keep records on:
    - The type and volume or weight of waste generated
    - The means of transportation, type and volume transported
    - Commissioned waste contractor (company name, type of license, treatment and disposal).
    - Disposal method - volume incinerated, volume treated and disposed

Annex 2 includes a questionnaire for monitoring medical waste management in the supported facilities. The questionnaire will be filled by the project focal points in the governorates in coordination with the facilities representatives periodically and if any modification or expansion occurred. The survey will be used by Project team as reference to determine the needs and to prepare the required plans.

6. Budget

The budget for implementation the infection control and medical waste management within the supported facilities includes the cost of training, waste management materials, installation of incinerators and deployment of awareness messages as well as the cost of monitoring and visits.
The estimated budget under the parent Project and additional financing Project is as below:

ICMWMP Implementation Budget	USD
Training and Monitoring 1. Training on Infection Prevention and Control including Medical Waste Management to the project workers 2. Visits, Monitoring, and reporting	200,000
Supplies Procurement 1. Procurement of waste bins, bags, safety boxes 2. Procurement of PPE to the waste management workers	200,000
Waste Treatment Units Installation 1. Installation of Waste Treatment Units within the supported facilities	500,000
TOTAL USD	**900,000**

Annex 1: Major Categories of Medical Waste

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

8. Highly infectious waste	This includes microbial cultures and stocks of highly infectious agents from medical laboratories. They also include body fluids of patients with highly infectious diseases.
9. Genotoxic/cytotoxic waste	Genotoxic waste includes all the drugs and equipment used for mixing and administration of cytotoxic drugs. Cytotoxic drugs or genotoxic drugs are drugs that have the ability to reduce the growth of certain living cells and are used in chemotherapy for cancer.
10. Radioactive waste	Radioactive waste includes liquids, gas and solids contaminated with radio nuclides whose ionizing radiations have genotoxic effects. These include x- and g-rays as well as a- and b- particles.

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

Annex 2: Medical Waste Management Monitoring Questionnaire

Health Facility (name, location): _____

_____

_____

Type/Category of Health Facility (tick one):

☐ Tertiary: Specialist, National, Teaching Hospitals

☐ Secondary: Governorate Gen. Hospitals, Sub-HCF Hospital, Private Hospitals

☐ Primary; Health Centre, Dispensary

☐ Mobile health care unit

No. of inpatients: _____ /day

No. of outpatients: _____ /day

No. of beds (total): _____ /day

Type of solid waste produced and estimated quantity

(Consult classification and mark X where waste is produced)

Type	**Estimated Quantity**
Sharps	
Pathological waste	
Infectious waste	
Pharmaceutical waste	
Pressurized containers	

Waste segregation, collection, storage, and handling

Describe briefly what happens between segregation (if any) and final disposal of:

Sharps _____

Pathological waste _____

Infectious waste _____

Pharmaceutical waste _____

Pressurized containers _____

Waste segregation, collection, labelling, transport, and disposal

1. Handling of segregated waste	Sharps	Pathological waste	Infectious waste	Pharmaceutical waste	Pressurized containers
Indicate by X the type of waste (if any) that is segregated from general waste stream.					
Where is the segregation taking place (i.e. operating room, laboratory, among others)?					
What type of containers/bags (primary containment vessels) are used to segregate waste (bags, cardboard boxes, plastic containers, metal containers, among others)? describe accurately.					
What type of labelling, colour-coding (if any) is used for marking segregated waste? Describe					
i. Who handles (removes) the segregated waste (designation of the hospital staff member)? ii. Is the waste handler using any protective clothing (gloves, among others) during waste handling? Yes/No.					
What type of containers (plastic bins, bags, cardboard boxes, trolleys, wheelbarrows, safe boxes, metal containers, among others) are used for collection and internal transport of the waste? Describe.					
Where is the segregated waste stored while awaiting removal from the hospital for disposal? Describe.					

Describe briefly the final disposal of segregated waste (taken to municipal landfill, buried on hospital grounds, incinerated (external incinerator, own incinerator), open burned, removed from premises, among others)					
If removed from premises; who is responsible for removal? Health facility/self, private collector, State Environmental protection Agency					
If removed from premises; what form of transport is used? Enclosed waste track, open waste track, open pick-up, among others					
How often is the waste removed from site?					
Daily					
3 – 4 times per week					
1 – 2 times per week					
Once a week					
Every two weeks					
Once a month					
Less often					

Is safety clothing issued to staff involved in medical waste collection, i.e. gloves, aprons, among others? ☐ Yes ☐ No

If yes, please list the safety clothing/items issued to medical waste collectors and the frequency of issue:

Items issued	Daily	Weekly	Monthly	As Needed
Aprons				
Gloves				
Safety shoes				
Overhauls				
Others (specify)				

Which of these waste collection, handling, transport and disposal activities are undertaken by Health-care staff and which are outsourced? List the party responsible for that activity, where the activity is outsourced, and the start and end dates of the contract entered into:

ACTIVITY	RESPONSIBLE PARTY (self/facility, Environmental Protection Agency, Private collector, among others)	NAME OF THE RESPONSIBLE PARTY/PRIVATE COLLECTOR
Collection		
Handling		
Transport		
Incineration		
Disposal		

Personnel involved in the management of Health-care waste

1. (a) Designation of person(s) responsible for organization and management of waste collection, handling, storage, and disposal at the hospital administration level.

_____

_____

(c) Has he/she received any training on hospital waste management? Yes ☐ No ☐

If yes, what type of training and of what duration?

_____

_____

Annex 3: Treatment and Disposal Methods for Categories of Health Care Waste

Type of waste	Summary of treatment and disposal options / notes
Infectious waste: Includes waste suspected to contain pathogens (e.g. bacteria, viruses, parasites, or fungi) in sufficient concentration or quantity to cause disease in susceptible hosts. Includes pathological and anatomical material (e.g. tissues, organs, body parts, human fetuses, animal carcasses, blood, and other body fluids), clothes, dressings, equipment / instruments, and other items that may have come into contact with infectious materials.	**Waste Segregation Strategy**: Yellow or red colored bag / container, marked "infectious" with international infectious symbol. Strong, leak proof plastic bag, or container capable of being autoclaved. **Treatment**: Chemical disinfection; Wet thermal treatment; Microwave irradiation; Safe burial on hospital premises; Sanitary landfill; Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator)[e] Highly infectious waste, such as cultures from lab work, should be sterilized using wet thermal treatment, such as autoclaving. **Anatomical waste** should be treated using Incineration (Rotary kiln; pyrolytic incinerator; single-hamber incinerator; drum or brick incinerator).
Sharps: Includes needles, scalpels, blades, knives, infusion sets, saws, broken glass, and nails etc.	**Waste Segregation Strategy**: Yellow or red color code, marked "Sharps". Rigid, impermeable, puncture-proof container (e.g. steel or hard plastic) with cover. Sharps containers should be placed in a sealed, yellow bag labeled "infectious waste". **Treatment**: Chemical disinfection; Wet thermal treatment; Microwave irradiation; Encapsulation; Safe burial on hospital premises; Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator)[e] • Following incineration, residues should be landfilled. • Sharps disinfected with chlorinated solutions should not be incinerated due to risk of generating POPs. • Needles and syringes should undergo mechanical mutilation (e.g. milling or crushing) prior to wet thermal treatment
Pharmaceutical waste: Includes expired, unused, spoiled, and contaminated pharmaceutical products, drugs, vaccines, and sera that are no longer needed, including containers and other potentially contaminated materials (e.g. drug bottles vials, tubing etc.).	**Waste Segregation Strategy**: Brown bag / container. Leak-proof plastic bag or container. **Treatment**: Sanitary landfill[a]; Encapsulation[a]; Discharge to sewer [a]; Return expired drugs to supplier; Incineration (Rotary kiln; pyrolytic incinerator [a]); Safe burial on hospital premises[a] as a last resort. • Small quantities: Landfill disposal acceptable, however cytotoxic and narcotic drugs should not be landfilled. Discharge to sewer only for mild, liquid pharmaceuticals, not antibiotics

	or cytotoxic drugs, and into a large water flow. Incineration acceptable in pyrolytic or rotary kiln incinerators, provided pharmaceuticals do not exceed 1 percent of total waste to avoid hazardous air emissions. Intravenous fluids (e.g. salts, amino acids) should be landfilled or discharged to sewer. Ampoules should be crushed and disposed of with sharps. • Large quantities: Incineration at temperatures exceeding 1200 □C. Encapsulation in metal drums. Landfilling not recommended unless encapsulated in metal drums and groundwater contamination risk is minimal.
Genotoxic / cytotoxic waste: Genotoxic waste may have mutagenic, teratogenic, or carcinogenic properties, and typically arises from the feces, urine, and vomit of patients receiving cytostatic drugs, and from treatment with chemicals and radioactive materials. Cytotoxic drugs are commonly used in oncology and radiology departments as part of cancer treatments.	**Waste Segregation Strategy:** See above for "infectious waste". Cytotoxic waste should be labeled "Cytotoxic waste". **Treatment**: Return expired drugs to supplier; Chemical degradation; Encapsulation[a]; Inertization; Incineration (Rotary kiln, pyrolytic incinerator); • Cytotoxic waste should not be landfilled or discharged to sewer systems. • Incineration is preferred disposal option. Waste should be returned to supplier where incineration is not an option. Incineration should be undertaken at specific temperatures and time specifications for particular drugs. Most municipal or single chamber incinerators are not adequate for cytotoxic waste disposal. Open burning of waste is not acceptable. • Chemical degradation may be used for certain cytotoxic drugs – See Pruss et al. (1999) Annex 2 for details. • Encapsulation and inertization should be a last resort waste disposal option.

Type of waste	Summary of treatment and disposal options / notes
Chemical waste: Waste may be hazardous depending on the toxic, corrosive, flammable, reactive, and genotoxic properties. Chemical waste may be in solid, liquid, or gaseous form and is generated through use of chemicals during diagnostic / experimental work, cleaning, housekeeping, and disinfection. Chemicals typically include formaldehyde, photographic chemicals, halogenated and nonhalogenated solvents[d], organic chemicals for cleaning / disinfecting, and various inorganic chemicals (e.g. acids and alkalis).	**Waste Segregation Strategy**: Brown bag / container. Leak-proof plastic bag or container resistant to chemical corrosion effects. **Treatment**: Return unused chemicals to supplier; Encapsulation[a]; Safe burial on hospital premises[a]; Incineration (Pyrolytic incinerator[a]; Facilities should have permits for disposal of general chemical waste (e.g. sugars, amino acids, alts) to sewer systems. • Small hazardous quantities: Pyrolytic incineration, encapsulation, or landfilling. • Large hazardous quantities: Transported to appropriate facilities for disposal, or returned to the original supplier using shipping arrangements that abide by the Basel Convention. Large quantities of chemical waste should not be encapsulated or landfilled.
Radioactive waste: Includes solid, liquid, and gaseous materials that have been contaminated with radionuclides. Radioactive waste originates from activities such as organ imaging, tumor localization, radiotherapy, and research / clinical laboratory procedures, among others, and may include glassware, syringes, solutions, and excreta from treated patients.	**Waste Segregation Strategy**: Lead box, labeled with the radioactive symbol. **Treatment**: Radioactive waste should be managed according to national requirements and current guidelines from the International Atomic Energy Agency. IAEA (2003). Management of Waste from the Use of Radioactive Materials in Medicine, Industry and Research. IAEA Draft Safety Guide DS 160, 7 February 2003.
Waste with high content of heavy metals: Batteries, broken thermometers, blood pressure gauges, (e.g. mercury and cadmium content).	**Waste Segregation Strategy**: Waste containing heavy metals should be separated from general health care waste. **Treatment**: Safe storage site designed for final disposal of hazardous waste. • Waste should not be burned, incinerated, or landfilled. Transport to specialized facilities for metal recovery.

Pressurized containers: Includes containers / cartridges / cylinders for nitrous oxide, ethylene oxide, oxygen, nitrogen, carbon dioxide, compressed air and other gases.	**Waste Segregation Strategy:** Pressurized containers should be separated from general health care waste. **Treatment**: Recycling and reuse; Crushing followed by landfill • Incineration is not an option due to explosion risks • Halogenated agents in liquid form should be disposed of as chemical waste, as above.
General health care waste (including food waste and paper, plastics, cardboard	**Waste Segregation Strategy**: Black bag / container. Halogenated plastics such as PVC should be separated from general health care facility waste to avoid disposal through incineration and associated hazardous air emissions from exhaust gases (e.g. hydrochloric acids and dioxins). **Treatment**: Disposal as part of domestic waste. Food waste should be segregated and composted. Component wastes (e.g. paper, cardboard, recyclable plastics [PET, PE, PP], glass) should be segregated and sent for recycling.

Source: Safe Management of Wastes from Health-Care Activities. International Labor Organization (ILO), Eds. Pruss, A. Giroult, and P. Rushbrook (1999)

Notes:

a. Small quantities only Low-level infectious waste only
b. Low-level liquid waste only
c. Halogenated and nonhalogenated solvents (e.g. chloroform, TCE, acetone, methanol) are usually a laboratory-related waste stream for fixation and preservation of specimens in histology / pathology and for extractions in labs.
d. Note on incinerators. Pyrolytic and rotary kiln incinerators should be used. Use of single-chamber and drum / brick

Annex 4 Infection Control and Medical Waste Management Table

Activities	Potential E&S Issues and Risks	Proposed Mitigation Measures	Responsibilities	Timeline	Budget
General HCF operation – Environment	General wastes, wastewater and air emissions				
General HCF operation – OHS issues	- Physical hazards; - Electrical and explosive hazards; - Fire; - Chemical use; - Ergonomic hazard; - Radioactive hazard.				
HCF operation - Infection control and waste management plan					
Waste minimization, reuse and recycling					
Delivery and storage of specimen, samples, reagents, pharmaceuticals and medical supplies					
Storage and handling of specimen, samples, reagents, and infectious materials					
Waste segregation, packaging, color coding and labeling					
Onsite collection and transport					
Waste storage					
Onsite waste treatment and disposal					

Waste transportation to and disposal in offsite treatment and disposal facilities					
HCF operation – transboundary movement of specimen, samples, reagents, medical equipment, and infectious materials					
Emergency events	- Spillage; - Occupational exposure to infectious; - Exposure to radiation; - Accidental releases of infectious or hazardous substances to the environment; - Medical equipment failure; - Failure of solid waste and wastewater treatment facilities; - Fire; - Other emergent events	Emergency response plan			
Operation of acquired assets for holding potential COVID-19 patients					
To be expanded					

Annex 5 Stock management and waste control

Box 3 : Stock management and waste control at *focal centre*

This box helps you monitor your stocks on a daily basis by simple calculations. The daily control is an important task in order to track wastes in and out of the facility / mobile setting.

Name of facility			**Location**	
Name of person in charge				

[redacted]	**date**		**Name of recorder**		
Total number of syringes		**S**			
Total number of safety boxes		**B**	**safety box capacity**	**C**	**syringes / box**

[redacted]		**nb of injections performed**	**nb of sharp boxes used**	**approximate nb of syringes used**
Name of recorder	**date**			
		Id	Bd	Sd = Bd x C
	TOTAL	TI	TB	TS

[redacted]

1. Check *daily* that there is a good equivalence between :

Id	**and**	Sd

2. At the *end of the campaign*, check that there is a good equivalence between :

unused syringes	**+**	TS	**and**	S
unused boxes	**+**	TB	**and**	B