

**ANNEX 4: “MEDICAL WASTE MANAGEMENT PLAN (MWMP) FOR THE OPERATION OF HEALTH CENTER IN 4 VILLAGES (AL KHAZIFI, GEWIZRAT, ARAB AL KABEERA, AND AZIZ BALAD) VILLAGES**

**REPUBLIC OF IRAQ**

**MINISTRY OF PLANNING**

**Iraq “Social Fund for Development” Project  
(SFDP)**

**MEDICAL WASTE MANAGEMENT PLAN  
(MWMP)**

**FOR THE  
OPERATION  
OF**

**HEALTH CENTER IN 4 VILLAGES (AL KHAZIFI,  
GEWIZRAT, ARAB AL KABEERA, AND AZIZ BALAD)  
VILLAGES**

**IN  
SALAH AL-DIN GOVERNORATE**

**22<sup>nd</sup> January 2020**

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## **Executive Summary**

This executive summary reflects the main issues (subprojects description, baseline conditions, mitigation measures and monitoring arrangements) of the Medical Waste Management Plan (MWMP) prepared for the operation of four medical centers in Salah Al-Din governorate. The Environmental and Social Management Plan (ESMP) is prepared for these health centers in accordance to the ESMF requirements of the SFD project to mitigate the impacts in both construction and operation phase of these health centers. This MWMP is prepared in accordance to the ESMF requirements of the SFD project and WHO guide lines. The main objective of the MWMP is to prevent and/or mitigate the negative effects of medical waste on human health and the environment at operation phases, and to propose mitigation measures. The subprojects are expected to result in significant socio-economic benefits for the local communities and surrounding areas as it will improve the health and wellbeing of local residents and also to create a caring, secure environment so that all in health center feel a sense of worth.

### **1. Introduction**

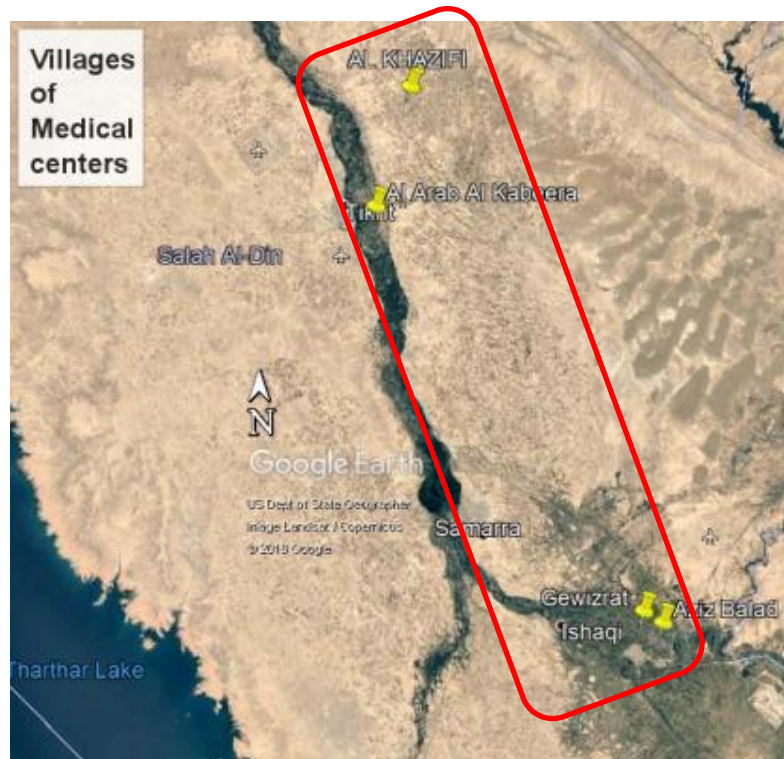
According to the Environmental and Social Management Framework (ESMF) which was prepared for the Social Fund for Development project (SFDP) and disclosed locally and on the WB website, a Medical Waste Management Plan (MWMP) should be prepared, cleared and publically consulted upon and disclosed prior to the commencement of any construction activities for the health centers.

The Medical Waste Management Plan's overall objective is to prevent and/or mitigate the negative effects of medical waste on human health and the environment. 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. 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.

## 2. Project Description

This subproject involves the construction of four health centers located in the Governorate of Salah Al-din northeast of Baghdad. These health centers serve Aziz Balad, Arab Al Kabeera, Al Khazifi and Gewizrat villages within Salah Al-Din governorate which are located about 102km, 7km, 25km and 108km from Tikrit respectively. Most of these villages have no health centers or destroyed ones during ISIS occupation as shown in the figure below. Each health center will include rooms for (doctor, dentist, pharmacy, basic test laboratory, dressing room, vaccination room, toilets and administration room)



Google map showing the location of the health centers in Aziz Balad, Arab Al Kabeera, Al Khazifi and Gewizrat villages in Salah Al-Din governorate

## 3. Baseline Data

The subproject is located in the governorate of Salah Al-Din that is situated in mid-north of Iraq, sharing internal boundaries with the governorates of Baghdad, Dyala, Kirkuk, Musel, Erbil, Sulaymaniyah and Ramadi.

This subproject involves the construction of four health centers located in the Governorate of Salah Al-din. These health centers serve Aziz Balad village, Arab Al Kabeera village, Al Khazifi village and Gewizrat village which are located about

102km, 7km, 25km and 108km from Tikrit respectively. Most of these villages have no health centers or destroyed ones during ISIS occupation.

Salah Al-Din governorate has a semi-desertic climate. The major rain, is about 177 mm yearly, falls during the period November through February, with a spread showering in March. The average annual temperature is 29.7 °C. The ambient air quality is within normal range. No protected areas or endangered species (there is no critical or high biodiversity values that might be affected) in the vicinity of the sites. The proposed location of these health centers will be in an open area where there is no river, or agricultural lands very close to this subproject. The population of these villages is shown in the table below:

No.	Village	Population
1	Aziz Balad	3665
2	Arab Al Kabeera	2882
3	Al Khazifi	3309
4	Gewizrat	1409
<b>Total</b>		<b>11265</b>

#### 4. Legal Framework & Institutional Arrangements

International and national legislation is the basis for improving health-care waste practices in any country. It establishes legal controls and permits the national agency responsible for the disposal of health-care waste. For this project, the following legal laws and regulatory guidelines apply:

##### **Iraqi National Laws**

- The Law for the Protection and Improvement of Environment No. 27, 2009;
- Forests and Woodlands Law No. 30 of 2009;
- Protection of Wild Animals and Birds No. 21 of 1979;
- Regulating Exploitation and Protection of Aquatic Life No. 46 of 1976;
- Ministry of Water Resources Law No. 50 of 2008;
- Public Health Law No. 89 of 1981, amended by Resolution No.54 of 2001;
- Iraqi Drinking Water Standard No. (417)-2001;
- Regulation for the Provision of Water Resources, No. 2, 2001;
- Regulation for the Protection of Rivers No. 25, 1967;
- Law No. 27 of 1999 concerning the establishment of the General Authority for Water and Sewage;
- Instructions No. 2 of 2014 on Environmental Protection from Municipal Waste;
- Directive No. (67) of 1986 Regulating the Debris Collection Areas;

- Clean Air Act No. 1 of 2004;
- Noise Prevention Law No. 21 of 1966;
- Directive No. 4 of 1993 concerning occupational health, protection of workers against vibration;
- Instructions No. 3/1985 Concerning Occupational Safety;
- Law No. 6 of 1988 concerning the National Commission for Occupational Hygiene and Safety;
- Instruction no.1 of 2015 (Management of medical waste)
- Instruction no.3 of 2015 (Management of Hazardous waste)

### **World Bank Safeguards Policies & Guidelines**

- OP. 4.01 on Environmental Assessment: The World Bank policy on Environmental Assessment –
- OP. 4.01 is triggered as the project involves the disposal of the vaccination kits, syringes and potentially other medical waste. The project is categorized as B because of the potential small-scale and site-specific impacts associated with the disposal of vaccinations kits. This waste management plan is prepared and will be implementation by the implementing agencies to fulfill the requirement of the OP. 4.01.
- Environmental, Health, and Safety Guidelines (accessible at [www.ifc.org/ehsguidelines](http://www.ifc.org/ehsguidelines)).

### **5. Medical Waste Management Plan (MWMP)**

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. The right investment of resources and commitment will result in a substantive reduction of disease burden and corresponding savings in health expenditures.

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.

It is important to mention that, the health local authority in the governorate will be responsible for the implementation of the measures that deal with the generated

medical wastes. In addition, the Environmental authority in the governorate will be responsible for the monitoring these measures.

### **5.1 Objective**

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 health centers.

### **5.2 Storage of Consumable Materials and Vaccinations**

Medical products need storage in an access-controlled environment. It is important to identify products that are at risk of theft or abuse or have the potential for addiction, and to provide increased security for those items. This includes products that are in high demand or have the potential for resale (black market value). As this this plan deals with medical waste, the focus on the following section will be on the handling and storage of vaccinations.

### **Vaccine Storage and Handling**

Exposure of vaccines to temperatures outside the recommended ranges can decrease their potency and reduce the effectiveness and protection they provide. Storage and handling errors can cost thousands of dollars in wasted vaccine and revaccination, and create medical waste. Vaccine management, including proper storage and handling procedures, is the basis on which good immunization practices are built. Vaccines must be stored properly from the time they are manufactured until they are administered. Assuring vaccine quality and maintaining the cold chain is a shared responsibility among manufacturers, distributors, public health staff, and health-care providers. A proper cold chain is a temperature-controlled supply chain that includes all equipment and procedures used in the transport and storage and handling of vaccines from the time of manufacture to administration of the vaccine. By following a few simple steps and implementing best storage and handling practices, providers can ensure that patients will get the full benefit of vaccines they receive.

### **Storage and Handling Plans**

Every facility should have detailed written protocols for routine and emergency vaccine storage and handling and they should be updated annually. These policies and procedures should be available in writing as a reference for all staff members and easily accessible. A routine storage and handling plan provides guidelines for daily activities, such as:

- Ordering and accepting vaccine deliveries



- Storing and handling vaccines
- Managing inventory
- Managing potentially compromised vaccines

Every facility should also have an emergency vaccine retrieval and storage plan. The plan should identify a back-up location where the vaccines can be stored. Considerations when choosing this site include appropriate storage units, temperature monitoring capability, and a back-up generator that can maintain power to the vaccine storage units. Potential back-up locations might include a local hospital, pharmacy, long-term care facility, or the Red Cross. There should be an adequate supply of packing materials and portable refrigerators and freezers or qualified containers and packouts on hand. Power outages or natural disasters are not the only events that can compromise vaccine. Forgotten vials of vaccine left out on the counter or doses of vaccine stored at improper temperatures due to a storage unit failure are other examples of how vaccines can be potentially compromised. Contact the local or state health department immunization program, vaccine manufacturer(s), or both for appropriate actions or guidelines that should be followed for all potentially compromised vaccines. Do not discard vaccines unless directed to by the immunization program and/or the manufacturer.

### **Measures to Prevent / Reduce Exposure to Infections / Diseases**

Health care providers and personnel may be exposed to general infections, 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 blood-borne pathogens;
- Provide staff members and visitors with information on infection control policies and procedures;
- Establish Universal / Standard Precautions to treat all blood and other potentially infectious materials with appropriate precautions, including:
  - Immunization for staff members as necessary (e.g.vaccination for hepatitis B virus).
  - Use of 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.
- 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.
  - 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.

### **5.3 MEDICAL WASTE MEDICAL WASTE MANAGEMENT PROCEDURES**

As highlighted by WHO recommendations, 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. 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.

#### **Waste Generation Estimation**

According to WHO guidelines, 85% of the total waste generated by health-care facilities is considered general non-hazardous waste. The remaining 15% is considered hazardous material that may be infectious, toxic, sharps or radioactive. The average hazardous waste generation rate for health care facilities is about 0.2 kg per patient per day. On the other hand, each health care facility under the project can serve maximum 40 patients daily. Therefore, the maximum hazardous waste generation rate for each health care facility is around 8 kg per day. This amount of waste will be stored temporarily in suitable containers before being shipped to their final treatment and disposal facilities.

The expected waste types from the four health centers are as the following list:

- **Infectious waste:** waste contaminated with blood and other bodily fluids, cultures and stocks of infectious agents from laboratory work (e.g. waste from autopsies and infected animals from laboratories), or waste from patients with infections;
- **Sharps waste:** syringes, needles, disposable scalpels and blades, etc.;
- **Chemical waste:** for example solvents and reagents used for laboratory preparations, disinfectants, sterilants and heavy metals contained in medical devices (e.g. mercury in broken thermometers) and batteries;
- **Pharmaceutical waste:** expired, unused and contaminated drugs and vaccines; and
- **Non-hazardous or general waste:** waste that does not pose any particular biological, chemical, radioactive or physical hazard.

### **Medical Waste Segregation, Collection, and Transport**

A programmed routine for hazardous 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. Health care workers are responsible for appropriately disposing of the waste within the health care facility. The number of places where patients and visitors can dispose of waste should be minimized (e.g. using designated containers in communal areas).

### **Waste Segregation Strategies**

At the point of generation, waste should be identified and segregated. Non-hazardous waste, such as food waste, paper and cardboard, glass, aluminum and plastic, should be collected and stored separately. 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;
- 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

### **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:
  - Hard, impermeable floor with drainage, and designed for cleaning / disinfection with available water supply
  - Secured by locks with restricted access
  - Designed for access and regular cleaning by authorized cleaning staff and vehicles
  - Protected from sun, and inaccessible to animals / rodents
  - Equipped with appropriate lighting and ventilation
  - Segregated from food supplies and preparation areas
  - 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:
  - Temperate climate: 72 hours in winter, 48 hours in summer
  - 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. If any

### **Waste Handling Safety Measures**

1. All personnel handling hazardous 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. 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).

### **Medical Waste Storage and Packaging**

1. A temporary waste storage area, should be set aside to store soft waste until it can be transported to treatment and disposal facilities.
2. Storage of medical waste should be for the minimum possible time, 24-48 hours.
3. Biomedical waste other than sharps and bulk liquids must be packaged in sealed in bags which are leak-proof and rip-resistant.
4. Sharps shall be placed in rigid leak and puncture resistant containers.
5. Bulk liquids to be transported off-site shall, in addition to the above requirements, be placed in rigid containers.
6. All medical waste must be stored in a secure area designated for this material.

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.

### **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 health center, and final destination;
- Transport vehicles should be dedicated to waste and the vehicle compartments carrying waste sealed.

### **Disposal of Hazardous Waste**

Collected Hazardous waste from these new health centers will be incinerated in the nearest existed health center that has available incinerator or in the central incinerator which is located in the main hospital in Salah Al-Din governorate. It is important to mention, that the ash resulted from the incineration process should be dumped in an authorized area. Incineration is a high-temperature process that reduces the volume and weight of waste.

### **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 2 shows the treatment and disposal methods for categories of health care waste.

## Waste Minimization, Reuse, and Recycling

Health centers 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;
  - 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)

## **Open Burning**

Open 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.

Annex 2 shows the treatment and disposal methods for categories of health care waste

## **Awareness Raising & Capacity Building**

Health care staff should be trained and aware of good practices and procedures of waste management under this plan. Such practices and procedures should be disseminated to the health centers 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 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.

## **6. 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 monitoring and evaluation on a continuous basis, at all institutional levels.

To ensure that objectives of the MWMP are achieved, the implementation of the plan has to be monitored to ensure proper waste management at health centers. It is important to mention that, the health local authority in the governorate will be responsible for the implementation of the measures that deal with the generated medical wastes. In addition, the Environmental authority in the governorate will be responsible for the monitoring these measures.

### **Monitoring Objectives**

The aim of the monitoring is to establish appropriate criteria to address potential negative impacts of medical waste 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.

### **Monitoring Arrangements**

The medical waste management plan will be monitored internally at local, governorate and national levels. At least one staff should be partially tasked with monitoring the plan in each health center. The reporting on the plan will be part of the regular reporting of the project activities at local, governorate and national levels.

### **Monitoring Indicators**

Considering the type of interventions implemented by this projects 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 & 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 center 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, treatment and disposal).
  - Disposal method - volume incinerated, volume treated and disposed.

### 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: Treatment and Disposal Methods For Categories Of Health Care Waste

Type of waste	Summary of treatment and disposal options / notes
<p><b>Infectious waste:</b> 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.</p>	<p><b>Waste Segregation Strategy:</b> Yellow or red colored bag / container, marked "infectious" with international infectious symbol. Strong, leak proof plastic bag, or container capable of being autoclaved.</p> <p><b>Treatment:</b> 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)<sup>e</sup></p> <ul style="list-style-type: none"> <li>Highly infectious waste, such as cultures from lab work, should be sterilized using wet thermal treatment, such as autoclaving.</li> <li><b>Anatomical waste</b> should be treated using Incineration (Rotary kiln; pyrolytic incinerator; single-chamber incinerator; drum or brick incinerator<sup>e</sup>).</li> </ul>
<p><b>Sharps:</b> Includes needles, scalpels, blades, knives, infusion sets, saws, broken glass, and nails etc.</p>	<p><b>Waste Segregation Strategy:</b> 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".</p> <p><b>Treatment:</b> 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)<sup>e</sup></p> <ul style="list-style-type: none"> <li>Following incineration, residues should be landfilled.</li> <li>Sharps disinfected with chlorinated solutions should not be incinerated due to risk of generating POPs.</li> <li>Needles and syringes should undergo mechanical mutilation (e.g. milling or crushing) prior to wet thermal treatment</li> </ul>
<p><b>Pharmaceutical waste:</b> 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.).</p>	<p><b>Waste Segregation Strategy:</b> Brown bag / container. Leak-proof plastic bag or container.</p> <p><b>Treatment:</b> Sanitary landfill<sup>a</sup>; Encapsulation<sup>a</sup>; Discharge to sewer<sup>a</sup>; Return expired drugs to supplier; Incineration (Rotary kiln; pyrolytic incinerator<sup>a</sup>); Safe burial on hospital premises<sup>a</sup> as a last resort.</p> <ul style="list-style-type: none"> <li><u>Small quantities:</u> 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.</li> <li><u>Large quantities:</u> Incineration at temperatures exceeding 1200 °C. Encapsulation in metal drums. Landfilling not recommended unless encapsulated in metal drums and groundwater contamination risk is minimal.</li> </ul>
<p><b>Genotoxic / cytotoxic waste:</b> 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.</p>	<p><b>Waste Segregation Strategy:</b> See above for "infectious waste". Cytotoxic waste should be labeled "Cytotoxic waste".</p> <p><b>Treatment:</b> Return expired drugs to supplier; Chemical degradation; Encapsulation<sup>a</sup>; Inertization; Incineration (Rotary kiln, pyrolytic incinerator);</p> <ul style="list-style-type: none"> <li>Cytotoxic waste should not be landfilled or discharged to sewer systems.</li> <li>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.</li> <li>Chemical degradation may be used for certain cytotoxic drugs – See Pruss et al. (1999) Annex 2 for details.</li> <li>Encapsulation and inertization should be a last resort waste disposal option.</li> </ul>

Type of waste	Summary of treatment and disposal options / notes
<p><b>Chemical waste:</b> 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<sup>d</sup>, organic chemicals for cleaning / disinfecting, and various inorganic chemicals (e.g. acids and alkalis).</p>	<p><b>Waste Segregation Strategy:</b> Brown bag / container. Leak-proof plastic bag or container resistant to chemical corrosion effects.</p> <p><b>Treatment:</b> Return unused chemicals to supplier; Encapsulation<sup>a</sup>; Safe burial on hospital premises<sup>a</sup>; Incineration (Pyrolytic incinerator<sup>a</sup>);</p> <ul style="list-style-type: none"> <li>• Facilities should have permits for disposal of general chemical waste (e.g. sugars, amino acids, salts) to sewer systems.</li> <li>• <u>Small hazardous quantities:</u> Pyrolytic incineration, encapsulation, or landfilling.</li> <li>• <u>Large hazardous quantities:</u> 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.</li> </ul>
<p><b>Radioactive waste:</b> 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.</p>	<p><b>Waste Segregation Strategy:</b> Lead box, labeled with the radioactive symbol.</p> <p><b>Treatment:</b> 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.</p>
<p><b>Waste with high content of heavy metals:</b> Batteries, broken thermometers, blood pressure gauges, (e.g. mercury and cadmium content).</p>	<p><b>Waste Segregation Strategy:</b> Waste containing heavy metals should be separated from general health care waste.</p> <p><b>Treatment:</b> Safe storage site designed for final disposal of hazardous waste.</p> <ul style="list-style-type: none"> <li>• Waste should not be burned, incinerated, or landfilled. Transport to specialized facilities for metal recovery.</li> </ul>
<p><b>Pressurized containers:</b> Includes containers / cartridges / cylinders for nitrous oxide, ethylene oxide, oxygen, nitrogen, carbon dioxide, compressed air and other gases.</p>	<p><b>Waste Segregation Strategy:</b> Pressurized containers should be separated from general health care waste.</p> <p><b>Treatment:</b> Recycling and reuse; Crushing followed by landfill</p> <ul style="list-style-type: none"> <li>• Incineration is not an option due to explosion risks</li> <li>• Halogenated agents in liquid form should be disposed of as chemical waste, as above.</li> </ul>
<p><b>General health care waste</b> (including food waste and paper, plastics, cardboard):</p> <p><b>Source:</b> Safe Management of Wastes from Health-Care Activities. International Labor Organization (ILO), Eds. Pruss, A. Giroult, and P. Rushbrook (1999)</p> <p><b>Notes:</b></p> <ol style="list-style-type: none"> <li>a. Small quantities only</li> <li>b. Low-level infectious waste only</li> <li>c. Low-level liquid waste only</li> <li>d. 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.</li> </ol> <p>e. Note on incinerators. Pyrolytic and rotary kiln incinerators should be used. Use of single-chamber and drum / brick</p>	<p><b>Waste Segregation Strategy:</b> 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).</p> <p><b>Treatment:</b> 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.</p>