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## **Selection of Equipment for Use in Participating Hospitals or Clinics**

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### **Activity 1.8 Obtain data to be used in the selection of equipment that will potentially be purchased with Project funds for use in participating hospitals or clinics**

Why do we need this Activity?

One of the activities under Component 1 of the Full Project is the deployment and use of appropriate waste treatment approaches. This could involve the purchase and installation of an alternative treatment technology that does not produce dioxins. The purpose of this activity is to obtain information to help the Global Project Team, in consultation with the National Consultant and others, to specify the technology appropriate for each country.

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#### **I. What overall approach will we use for the activity?**

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Each country will be asked to provide information related to the following:

- a. Treatment system approach
- b. Co-financing options
- c. Data for selecting general type of technology
- d. Data for sizing and selecting a specific technology
- e. Data for cost estimation

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#### **II. Data Gathering**

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##### **1. Treatment system approach**

In order to demonstrate a cradle-to-grave waste management approach that eliminates POPs, the tail end of the system would require a treatment technology and disposal method that does not generate dioxins while protecting public health and the environment. The National Consultant, in consultation with the National Working Group, National Steering Committee, and the Global Project Team, should recommend the overall treatment system approach consistent with the objective of developing model facilities.

Several treatment system options are possible:

- o On-site treatment technology at the model facility
- o On-site treatment technology at the model hospital but also used as a centralized treatment facility by nearby hospitals
- o Mobile treatment system traveling to hospitals in a region and providing on-site treatment
- o Centralized treatment technology at a regional facility
- o Centralized treatment technology at a landfill

The table below discusses some of the pros and cons of each treatment system approach. Keep in mind that the more complex and bigger the scope of the treatment system, the larger the number and/or size of technology, which would mean a higher capital expense and fewer funds available for other activities of the Full Project.

TREATMENT SYSTEM APPROACH	DESCRIPTION	ADVANTAGES	DISADVANTAGES
On-site treatment at the model facility	Equipment is installed at the hospital or clinic, the waste is treated on site, and the treated waste is then sent to a landfill	<ul style="list-style-type: none"> <li>• Avoids the problem of transporting untreated waste</li> <li>• Treated waste can be sent to the landfill with regular municipal solid waste</li> <li>• Technologies using steam can use the model facility's central steam</li> <li>• Lower cost of a smaller technology allows more funds to be used for other aspects of the project</li> <li>• Technology is under closer supervision by managers of the model facility</li> <li>• Microbial inactivation tests can be done at the model facility</li> <li>• Visitors* can observe treatment at the model facility</li> </ul>	<ul style="list-style-type: none"> <li>• Requires space which is often limited at health-care facilities</li> <li>• Ventilation may be needed to avoid odor problems from the treatment unit</li> </ul>
On-site technology at a model hospital used as a central facility	Wastes from nearby health-care institutions are transported to the model facility to be treated along with waste from the model hospital itself. The treated waste is sent to a landfill	<ul style="list-style-type: none"> <li>• On-site technology serves a large base</li> <li>• Treated waste can be transported to the landfill with regular municipal solid waste</li> <li>• Technologies using steam can use model facility's central steam</li> <li>• Technology is under closer supervision by managers of the model facility</li> <li>• Microbial inactivation tests can be done at the model facility</li> <li>• Visitors* can observe treatment at the site itself</li> </ul>	<ul style="list-style-type: none"> <li>• Requires space which is often limited at health-care facilities</li> <li>• Ventilation may be needed to avoid odor problems from the treatment unit</li> <li>• A large technology requires a high capital cost</li> <li>• Increased traffic of waste from other facilities may impede traffic at the model facility</li> </ul>
Mobile treatment system	The treatment system is mounted on a truck or special vehicle which travels to different hospitals. After waste is treated on site, the mobile system moves to the next hospital. Treated waste is sent to a landfill.	<ul style="list-style-type: none"> <li>• Avoids the problem of transporting untreated waste</li> <li>• Treated waste can be sent to the landfill with regular municipal solid waste</li> <li>• Technologies can use the facility's central steam or use a steam generator</li> <li>• Avoids the need for siting, permanent installation, and commissioning</li> <li>• Lower cost of a medium-size technology allows more funds to be used for other aspects of the project</li> <li>• Microbial inactivation tests can</li> </ul>	<ul style="list-style-type: none"> <li>• Costs would include capital cost of a special vehicle, as well as fuel, insurance, maintenance, labor, and other operating costs associated with transport</li> <li>• The technology is exposed to the risk of damage from traffic accidents, poor road conditions, weather, etc.</li> <li>• Requires good coordination to ensure timely treatment of waste and avoid long storage times</li> <li>• Visitors* would have to schedule their visits at the right time to see the technology</li> </ul>

		<p>be done at the model facility</p> <ul style="list-style-type: none"> <li>• Sharing capital and operating costs with other facilities could be cost-effective</li> <li>• The vehicle can be placed in a way that minimizes use of space at the facility</li> <li>• A mobile technology could serve a large base</li> </ul>	
Centralized treatment at a regional facility	Wastes from the model facility and from many other health-care institutions in the region are transported and treated at a central site; treated waste is then sent to the landfill	<ul style="list-style-type: none"> <li>• Centralized technology serves a very large base</li> <li>• Treated waste can be transported to the landfill with regular municipal solid waste</li> <li>• A central facility allows more space for safe movement of waste</li> <li>• Odor problems can be ameliorated if the site location is well chosen</li> </ul>	<ul style="list-style-type: none"> <li>• Requires installation of steam and electrical sources</li> <li>• A very large technology requires a higher capital cost</li> <li>• A system of safe transport of untreated waste has to be put in place</li> <li>• Visitors have to travel to the regional facility to observe the treatment process</li> </ul>
Centralized treatment at a landfill	Similar to a centralized treatment facility except that the treatment is done at or adjacent to the landfill	<ul style="list-style-type: none"> <li>• Centralized technology serves a very large base</li> <li>• Treated waste can be immediately disposed at the landfill</li> <li>• Visitors* can see final disposal immediately after treatment</li> </ul>	<ul style="list-style-type: none"> <li>• Requires installation of steam and electrical sources</li> <li>• A very large technology requires a higher capital cost</li> <li>• A system of safe transport of untreated waste has to be put in place</li> <li>• Visitors* have to travel to the landfill to observe the treatment process</li> </ul>

\* Visitors refer to individuals or groups from around the country or region that wish to learn about the model facility.

If alternative technologies are already available in the country, the model facility may wish to contract with an existing system for the treatment of their waste. This will allow more funds to be used for other aspects of the Full Project. If so, skip sections 3 and 4 below. Alternatively, the country may decide to bring in a technology for dealing with a difficult waste stream only, such as pathological waste.

After consultation with stakeholders and the National Steering Committee, the National Consultant should propose an appropriate treatment system approach for the country and inform the project coordinator, Firuzeh Mahmoudi <Firuzehm@unopsmail.org>.

## 2. Co-financing options

The deployment of a treatment technology raises many possibilities for co-financing including but not limited to:

- Provision of space, electrical and other utilities, drainage, shelter, ventilation, ancillary equipment (such as carts, cleaning equipment, etc.), safety equipment, and other installation requirements by the model facility operating the equipment
- Provision of personnel and their training by the model facility operating the equipment
- Provision of land by the government, private sector, or landfill operator for the installation of the equipment as a centralized facility
- Provision of a transport vehicle by the government, private sector, or group of hospitals, for use in a mobile treatment system

- If no new technology is deployed, the model facility can arrange a service contract with an existing commercial system to treat their medical waste
- Design and construction of a physical plant including electrical and other utilities, drainage, ventilation, docking and storage areas, ancillary equipment (such as carts, cleaning equipment, etc.), safety equipment, and other installation requirements by the government, a private firm, or landfill owner willing to operate the equipment as a centralized facility
- Provision of personnel by the government, a private firm, or landfill owner willing to operate the equipment as a centralized facility
- Matching funds by the private sector and/or government towards the capital cost of the equipment
- Coverage of operating expenses by the model facility, government, private firm, or landfill owner for the lifetime of the equipment
- Provision of special vehicles, personnel, and services related to transport of treated or untreated waste by the government, a private firm, or municipal waste hauling service
- Provision of microbial inactivation testing equipment and services by the model facility, private firm, or government laboratory
- Provision of waste transport and treatment services by the model facility, private firm, government, or landfill owner at a discounted price for a certain period during and after the Full Project

Each country should explore these and other co-financing options related to the technology. Provide information on co-financing arrangements (see Guidance 1.9) to the project coordinator, Firuzeh Mahmoudi <Firuzehm@unopmail.org>.

### **3. Data for selecting general type of technology**

When selecting the type of technology to be deployed, priority consideration should be given to locally manufactured equipment.

- i. Describe existing local manufacturers of commercially available alternative treatment technologies:
  - a. For each manufacturer, provide name of company, contact person, address, phone, fax, email, website, description of the locally manufactured treatment system, capital cost including cost of installation, estimated operating cost

If alternative treatment technologies have been imported from other countries and already operate in the country or region where the model facility is located, as much as possible consideration should be given to a different type of technology to demonstrate a different type of treatment system.

- ii. Describe imported alternative treatment technologies operating in your country
  - a. For each operator, provide name of company or facility operating the equipment, address, phone, description of the alternative treatment system, name of the vendor of the original equipment, contact information (address, phone, fax, email, website) of the vendor

### **4. Data for sizing and selecting a specific technology**

The following information is needed to size and select a specific technology:

- Describe any laws or regulations that may restrict the type of technology to be deployed.
- Estimate the amount (kilograms per day) that will be treated by the technology. Provide details on how this estimate was obtained. (The estimates should take into consideration waste minimization at the model facility.)
- Describe the types and approximate composition of waste that needs to be treated: what percent of the waste is sharps, materials contaminated with blood or body fluids, cultures and stocks, pathological (anatomical) waste, etc.?

- How many hours per day will the equipment be operated?
- Describe the space available for the technology, including the shape of the space, area (square meters), height (meters), and current use of the space.
- Describe the utilities currently available or to be made available at the site: specify electrical voltage, frequency, power and phase; steam pressure if any; water pressure; drainage and type of wastewater treatment available; phone connection.
- Describe existing ventilation system at the site. Is the site fully enclosed or open to the atmosphere? If it is an enclosed site, is there a heating or air-conditioning system? If it is open to the atmosphere, describe the range of weather conditions (temperatures, frequency of rain, snow, etc.) at the location.
- Describe the level of education of workers available to operate the equipment.
- Describe the surrounding: how close is the space to the nearest building, or to residential or commercial areas?
- If the technology will be used at a central facility, provide the range of distances from the treatment site to the different health-care facilities to be served by the technology. Describe the types of roads from the treatment site to the health-care facilities and to the landfill.
- Describe the landfill for the final disposal of the treated waste:
  - Open dumpsite
  - Controlled dumpsite (restricted access, managed working area)
  - Engineered landfill (restricted access, designed to prevent entry of surface water, clay liner, daily soil cover, collection of leachate in lagoons, compaction of waste, some training of the workforce)
  - Sanitary landfill (restricted access, designed to prevent entry of surface water, one or more clay or geomembrane liners, daily soil cover, collection and treatment of leachate, compaction of waste, control of landfill gas, monitoring of air and groundwater, trained workforce, record-keeping)

## 5. Data for cost estimation

The following information is needed to estimate siting, installation and operating costs unless the cost is covered by co-financing and reported under Guidance 1.9.

- Provide investment cost of ancillary equipment that may be required for proper functioning of the installation such as steam generator, external waste shredder, waste compactor, waste cart, etc.
- Estimate cost of site preparation in US dollars (including any demolition and disposal, building construction or renovation, foundation, installation of electrical service and other utilities, drainage, etc.)
- When calculating the cost of waste treatment, please include depreciation rate of the installation if required by the national regulation.
- Provide the cost of electricity (\$ per kilowatt-hour).
- Provide the cost of water (\$ per unit volume)
- Provide the cost of installation efficiency tests (\$ per test)
- Estimate the cost of installation maintenance service (\$ per service)
- Estimate the cost of labor for the equipment operator (\$ per hour)
- Estimate the cost of ancillary equipment (cleaning supplies, personal protective equipment for workers such as gloves and coveralls, safety equipment such as fire extinguishers and eye wash stations, etc.)
- Estimate the cost of disposable sharp boxes, waste bins and bags.
- Estimate the cost of transport of waste (\$ per kilometer)
- Provide the cost of landfill disposal (\$ per ton)
- Estimate other indirect costs (administrative overhead, insurance fees, regulatory fees, taxes, etc.)
- If no new technology will be deployed, provide the cost of a service contract with an existing commercial plant to treat the waste.
- Provide the cost of personnel training.

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**III. Timeline for Activity 1.8**

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The above information should be collected and submitted to the project coordinator, Firuzeh Mahmoudi <Firuzehm@unopsmail.org> by September 2005.