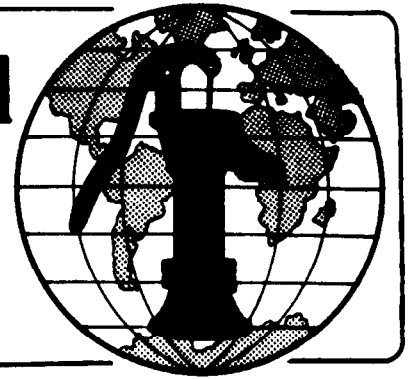


Water for the World



Planning Solid Waste Management Systems Technical Note No. SAN. 3.P

Solid waste management systems may be needed where quantities of garbage, rubbish, or animal manure are found near a dwelling, school, marketplace, slaughterhouse, refinery, or other public building. Managing solid wastes is important because wastes are a breeding place for rats, flies, and mosquitoes which can transmit disease to humans. See "Means of Disease Transmission," DIS.1.M.1. In addition, unmanaged solid wastes can be physically hazardous, odorous, and unsightly. The purpose of planning a solid waste management system is to determine its suitability and specific nature.

Planning solid waste management systems involves setting goals, then establishing step-by-step procedures toward those goals. There are eight major actions involved in project development for which planning is important. It is necessary to: (1) recognize the problem, (2) organize community support and set objectives, (3) collect data, (4) formulate alternatives, (5) select the most suitable method, (6) establish the system, (7) operate and maintain the system, and (8) evaluate the system.

This technical note discusses planning and implementation of these eight activities. Read the entire technical note before beginning the planning process. Worksheet A may be adapted for use in cataloging information collected as planning proceeds.

1. Recognize the Problem

This is done by gathering information from national and regional governments, questioning villagers and village leaders, and observing actual conditions in the field. Decide if

solid wastes pose a health hazard to people in the community. In general, the community should consider planning solid waste management systems if the answer is "yes" to any of the following questions.

Yes/No	Is there garbage, including agricultural wastes, near the dwelling?
Yes/No	Is there animal manure near the dwelling?
Yes/No	Is there garbage in or near the marketplace?
Yes/No	Is there garbage or rubbish near a public building, school, clinic, sugar cane refinery, slaughterhouse, or shops?
Yes/No	Are there bothersome numbers of flies, rats, mosquitoes or cockroaches?

When the problem has been identified and there is improper or non-existent management of solid wastes, then objectives can be set to solve the problem.

2. Organize Community Support and Set Objectives

The main objective is to establish an effective system of solid waste management. This is a major step toward improving the health of the people in the community and establishes a pattern of greater cleanliness for the community.

The most important step is organizing community support. See "Community Participation in Implementing Water Supply and Sanitation Programs," HR.2.I. Establish close working relations with

community leaders and organizers. Actively solicit their ideas and suggestions. The people in the community should be actively involved from the start of the project, because they must understand and accept all stages of the project.

Another step is setting secondary objectives, such as a time span for establishing the system, for example, three months or one year. Secondary objectives should be set with the participation and agreement of the community leaders. Be realistic when setting objectives. Consider local customs and resources such as money, material, and talent. Do not set objectives that may be impossible for the community to reach. Set objectives that are definite and can be measured, so the people will know when they have reached them. For example: establish on-site composting systems for ten families within three months; or, provide an effective solid waste management system for the community's marketplace within one year.

Your objectives must: (1) clearly state what the project will accomplish, (2) state the methods that will be used, and (3) specify when these accomplishments will be made. At the end of the specified length of time, it should be possible to determine whether your objectives have been met.

When the objectives have been set, proceed with the next step in planning: data collection.

3. Collect Data

To plan the system you must have correct information and data. The data can be divided roughly into six categories: (A) environmental conditions in the village, (B) nature of the solid waste, (C) present methods of solid waste management, (D) attitude of the people, (E) resources, and (F) geography. Collecting data will be an ongoing process; some of it will be used now, some later.

Make written records of all data collected. Some data will be specific (for example: quantity of garbage generated daily by the community marketplace). Other data will be more

general (for example: villagers' attitudes toward new methods of solid waste management). Use the following checklist to help organize data collection.

A. Environmental Conditions in the Village

1. Determine the incidence of disease associated with poor sanitation (see "Means of Disease Transmission," DIS.1.M.1) by personal observation, questioning villagers and village leaders, and checking health records which may be available from local health clinics.

2. Observe and record evidence of garbage or rubbish in or near the village.

3. Determine whether solid waste is being disposed of in or near sources of drinking water. Do this by questioning villagers and by personal observation.

4. Determine whether there are bothersome numbers of rats, flies, mosquitoes or cockroaches.

5. Determine whether there are foul odors.

B. Nature of Solid Waste

1. Observe and record the sources of solid waste generation such as dwellings and marketplaces.

2. Observe and record the type of waste from each source such as animal manure, garbage, and rubbish.

3. Observe and record approximate daily or weekly quantities of each type of waste generated from each source.

C. Present Methods of Solid Waste Management

1. Record evidence of salvage and reuse of solid waste.

Worksheet A. Planning a Solid Waste Management Project

1. Problems indicating a need for action are:

- (1) _____
- (2) _____
- (3) _____

2. Community support will be organized and directed by (name and position):

- (1) _____
- (2) _____
- (3) _____

2a. Major objectives of the program are:

- (1) _____
- (2) _____
- (3) _____

3. Data which will influence decisions are:

- (1) Need: _____
- (2) Present Methods: _____
- (3) Community Acceptance: _____
- (4) Resources: _____
- (5) Geography: _____

4. Alternatives to be considered are:

- (1) _____
- (2) _____
- (3) _____

5. The method(s) selected is (are):

- (1) _____
- (2) _____
- (3) _____

6. The system will be established by:

- (1) Ensuring public acceptance by building demonstration models or by: _____
- (2) Submitting plans to (government or lending agency): _____
- (3) Obtaining financing from (government, lending agency, or other): _____
- (4) Planning the construction within _____ weeks.
- (5) Constructing the system within _____ months.

7. The operation and maintenance of the system will be supervised by (name and position):

- (1) _____
- (2) _____
- (3) _____

8. The system will be evaluated during (month and year) _____, by (name and position):

- (1) _____
- (2) _____
- (3) _____

2. Record evidence of compost systems.

3. Record evidence of garbage used as animal feed.

4. Record evidence of salvage and reuse of bottles, cans, lumber and metal.

5. Determine and record how solid waste is presently transported from source of generation to area of reuse or disposal.

D. Attitude of the People

1. Question villagers and village leaders about their attitudes toward solid waste management in general.

2. Question villagers and village leaders about their preferences concerning specific methods of solid waste management.

3. Identify local customs and taboos.

E. Resources

1. List sources of money, such as government grants, taxes, general funds, and so on, and amounts available.

2. List types and quantities of available materials, tools, equipment, and vehicles.

3. List the names and special skills of available skilled workers.

4. List the names of available unskilled workers.

F. Geography

1. Record the type, number and location of all drinking water supplies, such as wells, springs, streams, and piped systems.

2. Determine and record ground water levels for the wettest season.

3. Obtain or produce a map of the village and surrounding area, including all roads, lots, dwellings, buildings, agricultural fields, unused land, streams, and ponds.

4. Determine the direction of prevailing winds.

4. Formulate Alternatives

Use the collected data and the information in "Methods of Solid Waste Management," SAN.3.M, to formulate alternative systems that will solve the problem of solid waste management. Each system may be a single method or a combination of several methods. When formulating alternatives, use only those methods which may be appropriate or practical for your particular community and which are basically acceptable to the members of the community. Reject those methods which for any reason are inappropriate, impractical, or unacceptable.

The remaining alternatives are possible solutions to the problem. To determine the best method for your situation, proceed to the next step: selecting a method.

5. Select a Method

When selecting a method of solid waste management, study the features of each alternative carefully and analyze the collected data thoroughly. The decision on which method to select should be based on the following considerations:

Need. Are present methods of solid waste management inadequate? Do people in the community suffer from diseases caused by poor sanitation? Are large quantities of solid waste being generated? Are the roads, paths and yards unsightly? Are there flies, mosquitoes, cockroaches or rats breeding?

Social acceptability. This is a most important consideration, for if the system is unacceptable to the people, it will surely fail. Will the method of solid waste management violate local customs, taboos, or preferences? Is the method likely to be continually operated and maintained? Have the people indicated that they prefer this system, or at least are willing to try it?

Resources. Can the desired method be put into operation considering available money, materials, vehicles, and workers?

Possibility for re-use. Is there a use for animal feed, compost, or biogas?

Use the comparison chart in "Methods of Solid Waste Management," SAN.3.M, and Table 1 to help in your selection of a method of solid waste management. The decision table is not meant to be followed strictly; it is merely an aid in selecting a system. If you need more specific information on the features of any method, consult the technical notes dealing with that particular method.

6. Establish the System

There are three steps in establishing the system: involving the public, submitting your plan for approval, and planning for construction and operation.

Involving the Public. The first step in establishing the system is gaining public acceptance. Set up community meetings to fully explain the proposed system. This is especially important for those systems, such as collection of garbage from a marketplace, which requires continued community cooperation and participation in order to succeed. It may be worthwhile to operate small-scale or individual solid waste management

methods for demonstration. These demonstration models can serve to educate members of the community and serve as a final test of community acceptance before larger scale operations are attempted.

Submitting Plan for Approval. The second step in establishing the system is submitting your plan to the regional or national government or lending agency. Since you may need approval of the entire plan before you can proceed, your submission should include: (a) the proposed technical system, (b) costs, (c) sources of finance, and (d) an implementation schedule.

a. Proposed system. Submit design drawings of the method or methods selected. Decide how many methods will be operated and where they will be located. Show them on a detailed map of the village and surrounding area. Bring village leaders, or others who speak for the community, to help explain the need for the project.

b. Costs. Determine how much money will be needed to pay for workers, materials, equipment, and vehicles. Make every effort to use locally available resources. Estimate how much money will be required to operate the system for one year.

c. Sources of finance. Funds may be available locally, nationally, or internationally. Your government can explain how to get national or international funds which may be in the form of grants or loans. Local funds can come from taxes, user fees, or a general fund. Local funds may take the form of a cooperative effort rather than money. For example, instead of paying a worker to haul rubbish and garbage to a disposal site, members of the village could haul their own solid waste to the designated site and cover it with soil.

d. Implementaiton schedule. Assign specific and reasonable time spans to each stage of the project. Allow time to collect data, formulate alternatives, select a method, establish the system, and train workers to operate and maintain the system. To help visualize an entire project and establish timetables for it, draw a chart similar to Figure 1, which indicates the month number across the top

Table 1. Decision Table for Selecting a Method of Solid Waste Management

If	And	And	Then
Solid waste consists of garbage and is a problem	Hogs are kept		Feed to hogs
	No hogs are kept	A use for compost	Compost
		No use for compost	Landfill
Solid waste consists of animal manure and is a problem	A use for compost		Compost
	No use for compost	A use for biogas and availability of needed materials and equipment	Biogas
		No use or equipment	Landfill
Solid waste consists of rubbish and is a problem	Able to reuse		Salvage
	Not able to reuse		Landfill

and the specific tasks on the left side. Figure 1 includes tasks performed from the start of the project-- recognizing problems, consulting with villagers, and early collection of data.

Planning for Construction and Operation. The third step in establishing the system is planning for construction and operation. Only biogas systems require difficult construction. Landfills and composting require preparing sites.

Determine which components of the system can be constructed in the community, perhaps the biogas digester, and which components will have to be purchased from outside the community, perhaps the pipes and valves. Determine who will perform the construction, how much they will be paid, and which tools, equipment, and materials they will need. Organize the construction. That is, be prepared to assign specific duties, set up time schedules, and hire a foreman to oversee the work.

How To Use the Decision Table

1. Find the statement in the "If" column that best describes your situation. More than one statement may apply.
2. Follow the arrows to the adjacent boxes in the first "And" column and select the statement that best fits your situation.
3. Follow the arrows to the adjacent boxes in the second "And" column and select the statement that best fits your situation.
4. Follow the arrow to the adjacent box in the "Then" column to find the recommended method of solid waste management.

Determine if the system will be operated by individual owners, for example, on-lot compost or biogas systems, by the community as a whole, for example, a community landfill, or

Scheduling a Solid Waste Management Project

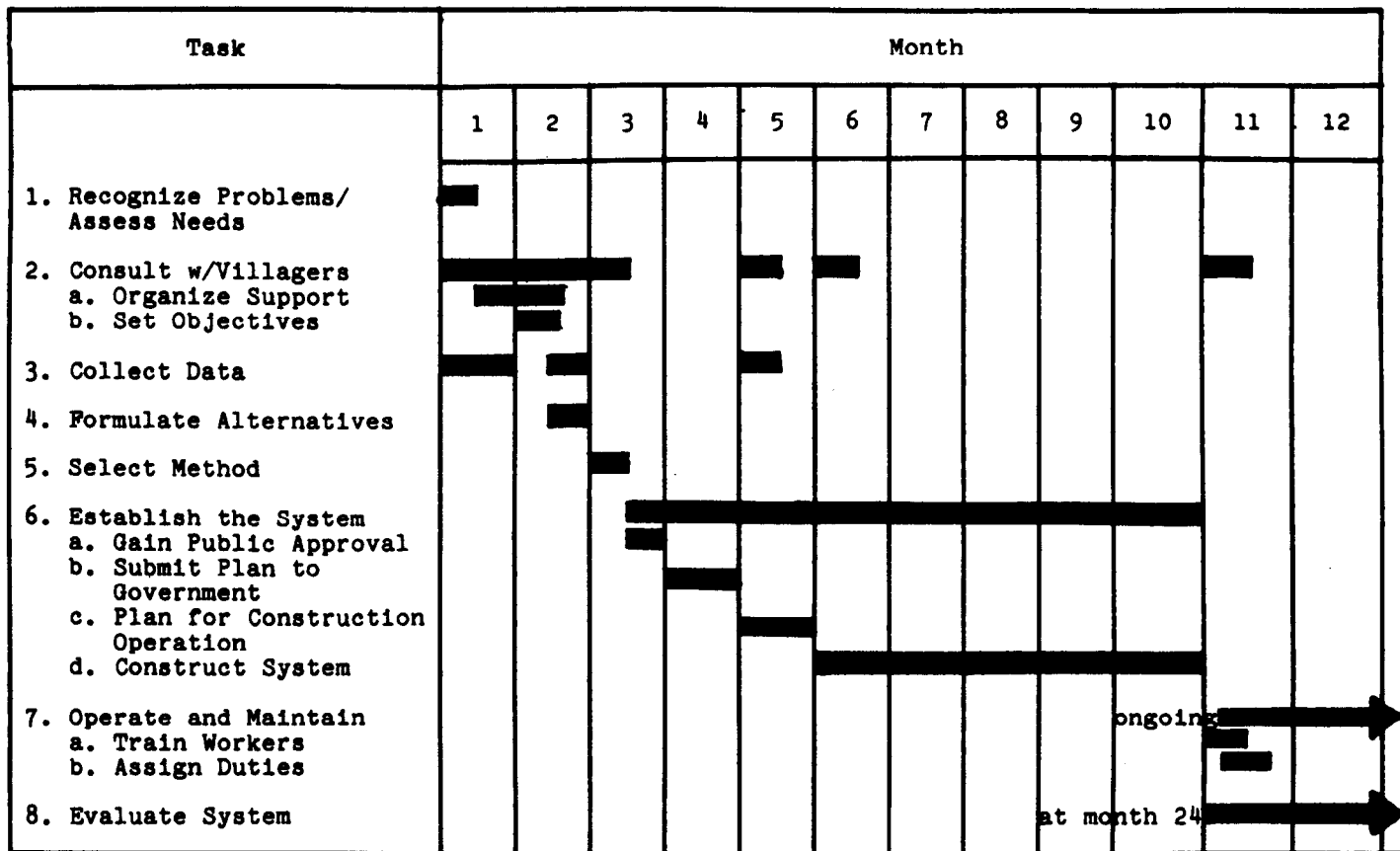


Figure 1. Sample Time Chart

by paid workers, for example, collection and disposal of solid wastes from a marketplace or factory. Determine which tools, equipment, and vehicles are necessary for operation and be prepared to assemble them. Organize the operation by assigning specific duties, setting up time schedules, and, if necessary, hiring a foreman to oversee the work. For a public collection system, a route and frequency plan must be devised. It can be modified as experience dictates.

7. Operate and Maintain the System

Plan for the continued use of the systems after they are initially put into operation. This includes using compost, maintaining soil cover at landfills, and inspecting and repairing biogas systems.

Establish a system of routine inspections of the solid waste management systems, and of cleaning and repairing tools, equipment, and vehicles. If these systems are not

continually maintained, they will fail to operate.

8. Evaluate the System

Evaluate the project one year after completion to determine whether project objectives have been achieved. Determine the success of the project by: (1) questioning villagers about their use or neglect of the systems; (2) comparing before and after health aspects; (3) comparing conditions in the community with conditions existing before the project began. Determine if the old problems have been eliminated, and decide if any new problems have arisen. Perhaps the community now needs and can afford a more advanced system of solid waste management such as collection and disposal of solid wastes by paid workers rather than community volunteers.

Sanitary improvements in rural villages are usually made one step at a time. Therefore, your evaluation of this project should be the first step in planning the next sanitation improvement.