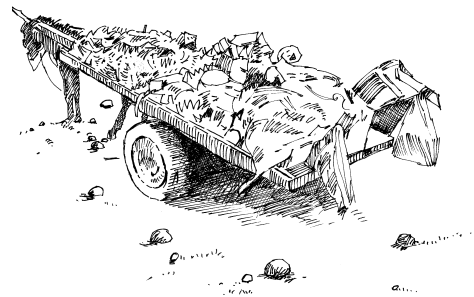


Solid waste management in emergencies



World Health Organization

This technical note outlines some of the key activities in dealing with solid waste in the immediate aftermath of a disaster. Solid waste refers here to all non-liquid wastes (e.g. rubbish or garbage). Sometimes solid waste may contain faeces. Solid waste can create significant health problems and a very unpleasant living environment if not disposed of safely and appropriately. It can provide breeding sites for insects and vermin (e.g. rats) which increase the likelihood of disease transmission, and can attract snakes and other pests. Unmanaged waste can also pollute water sources and the environment.

The process of planning solid waste management in an emergency is illustrated in Figure 1.

Initial assessment

The first stage in dealing with solid waste is to understand the emergency context and the nature of waste being generated. The following sections outline key questions for consideration.

The context

- What solid waste management systems/ equipment is already in place? How has it been affected? Is it possible to work with and learn from the existing systems?
- How many people are affected? Where are they? What are they doing with waste at present? Are there any pertinent cultural factors?

Waste generation, density and sources

Waste is produced by households, shops, markets, businesses, medical centres and distribution points.

Generation rates vary considerably according to seasons, diets (e.g. changes from fresh vegetable to packaged aid goods) and even the day of the week. An average of around 0.5kg/ capita/ day is common in low-income cities.

Waste densities also vary considerably. Densities for low-income cities are usually around 200-400 kg/m³.

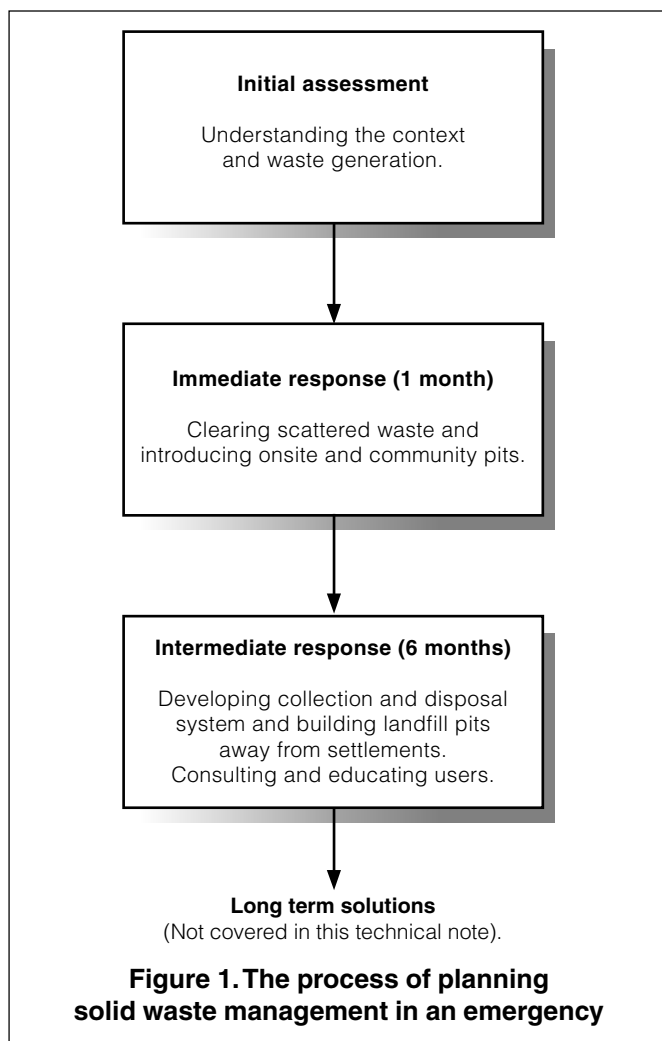
Where lots of packaging is used in emergency situations, densities are likely to decrease.

- What opportunities or restrictions does the environment present? Is it possible to dig pits? Where are surface water sources located? At what level does the water table lie? Where is land available?

The waste

- What waste is being generated (e.g. organic, hazardous, dry etc.)?
- Where is waste being generated? How accessible are waste generators?
- How much waste is being generated?

Please note: Medical and hazardous wastes are not discussed in this technical note.



Solid waste management

Immediate response

Activities should be prioritised according to present and future health hazards of different waste types and sources. Activities are likely to focus on clearing of existing scattered waste and managing waste from households and markets.

On-site household disposal

Suitable where space is not too limited and where waste has a high organic content (as it will decompose and reduce in volume). Also useful in areas where access is difficult.

Pits should be 1m deep and be frequently covered with ash/soil to prevent access to waste by insects and rats, and to reduce odours.

Note that on-site disposal is labour-intensive and requires advanced household cooperation.

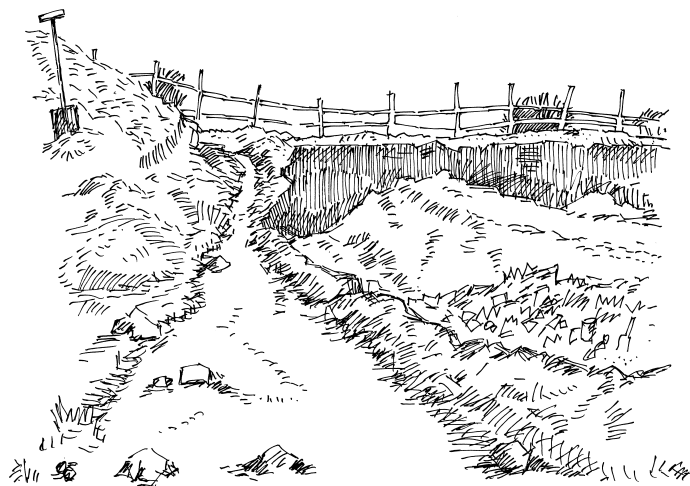


Community pits

Must be located within 100m walking distance of any household (SPHERE Guidelines).

As a rough guide, 50 people will fill 1m³ of a pit each month, depending on generation rates and density.

These are rapid to implement and requires little operation and maintenance. Note that some people may object to walking 100m to deposit waste.



Intermediate solutions

Community issues

Consultation. It is useful and important to consult potential users of a waste management system before and during design and implementation.

Education. It is important for participating communities to understand how good solid waste management can be achieved and can benefit their health.



Collection and storage

In some situations on-site, community pits may be a suitable medium-term solution, whilst in others it will be necessary to devise ways of removing and disposing of waste. This will usually involve the following:

- storage in the house;
- deposition at intermediate storage point; and
- collection and transport to final disposal.

In the home, plastic bags or a small container with a lid make suitable storage containers.



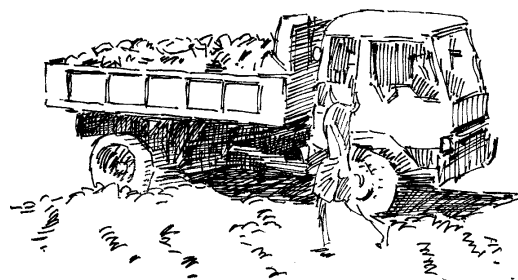
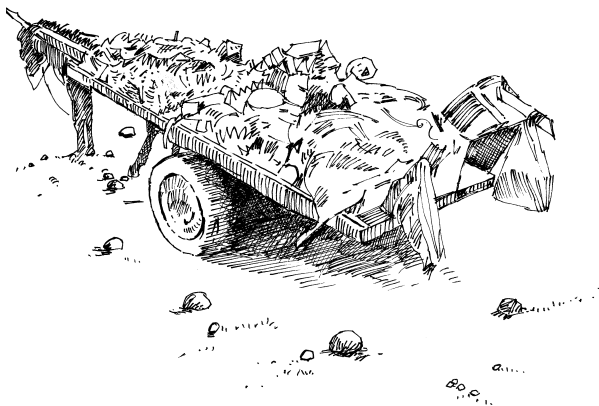
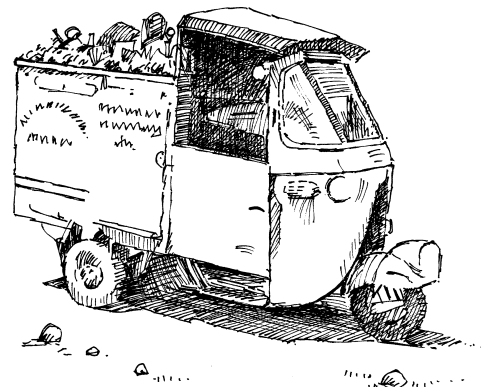
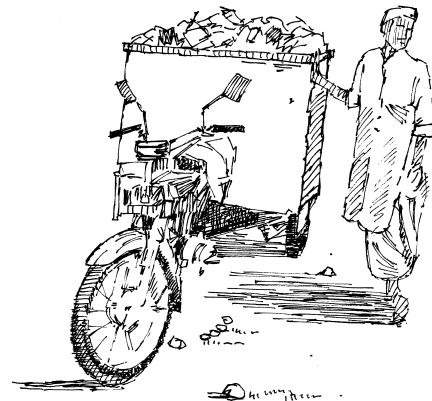
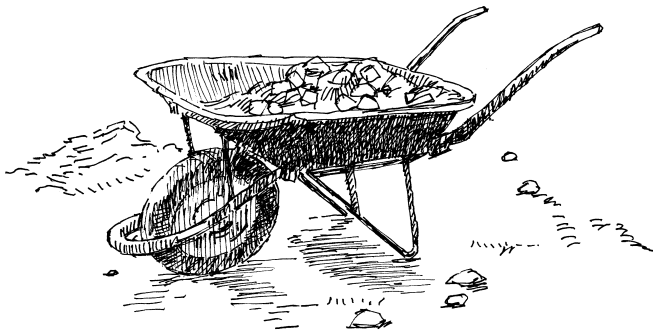
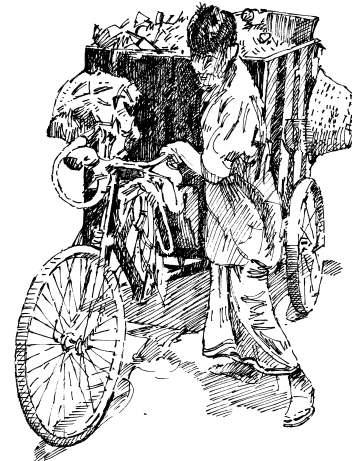
For intermediate storage points in communal areas bins of maximum 100 litre capacity are required (when full this will weigh around 40kg). Oil drums cut in half can be suitable. Ideally the bin will be arranged so that it can be emptied easily (e.g. hinged so it can tip into a handcart). A 100 litre bin is required for each 50 people or for a few market stalls. Bins require daily emptying, and this is labour-intensive.

Transport

When selecting suitable vehicles, waste generation rates and densities need to be considered along with:

- areas they need to access (e.g. narrow alleys or uneven paths); and
- distance between collection and disposal points.

For example, a wheelbarrow could collect waste from approximately 50 individuals before requiring emptying.



Solid waste management

Disposal

As a medium-term solution, larger-scale landfill pits can be constructed. Without leachate (liquid runoff) treatment these are not suitable for long-term use. They should be situated at least 1km downwind of settlements, at a location selected in consultation with the population. They should also be situated downhill of water sources and at least 50m from surface water sources. Carefully consider drainage where the pit is on sloping ground and erect fences to keep animals and scavengers out.

Staff

Approximately 2.5 workers are required for 1000 community members (WHO/ UNEP 1991). Protective clothing and equipment need to be considered (e.g. gloves, boots, visibility jackets).

Other important factors

Incineration

Incineration is not usually a favourable option for solid waste management as it requires a large capital input and care for operation and management to ensure non-polluting bone. Where burning is deemed necessary (e.g. to reduce waste volume), it must be done at least 1km downwind of settlements, and ashes should be covered with soil daily. On-site burning of household waste can be highly-polluting and can be a fire hazard.

Care of equipment

Waste can often be corrosive, so it is important to paint all metal waste management equipment and to wash it frequently. Such activity can significantly increase the life of equipment.

Emergency response waste

Packaging of emergency response provisions (e.g. food, water, medicine, shelter) can produce serious waste problems. Consider this in procurement and where possible manage packaging waste at point of distribution to prevent its widespread scattering.

Recycling and composting

In time it may be possible to work with local recycling industries to encourage entrepreneurs or waste collectors to gather recyclable items. This can provide a source of income as well as reducing the amount of waste requiring disposal. Home composting can also be an effective means by which to reduce the volume of waste requiring collection and disposal.

Management and implementation

It is important to consider management structures and implementation methods. At times in emergency situations, particularly early on, activities may have to be strongly enforced until more participating systems can be introduced.

Continuously review, monitor and respond to the nature of waste, prevailing conditions and levels of community participation.

Long-term waste management

In the long-term, capacity of landfill sites need to be increased, leachate needs to be contained and treated and the overall sustainability of waste management practices must be considered. Long-term solutions are beyond the scope of this technical note.

Further information

Harvey, P., Baghri, S and Reed, R. A. (2002)
Emergency Sanitation: Assessment and Programme Design. WEDC, Loughborough, UK

SPHERE Guidelines, The Sphere Project (2004)
Humanitarian Charter and Minimum Standards in Disaster Response,
The Sphere Project: Geneva,
Switzerland (Distributed worldwide by Oxfam GB)

<http://www.sphereproject.org/handbook/index.htm>



World Health Organization

WHO Headquarters
Avenue Appia 20
1211 Geneva 27
Switzerland

Telephone: (+ 41 22) 791 21 11
Facsimile: (+ 41 22) 791 3111
Telex: 415 416
Telegraph: UNISANTE GENEVA



This information has been prepared by WEDC

Author: Jonathan Rouse **Series Editor:** Bob Reed **Design:** Glenda McMahon **Illustrations:** Rod Shaw **Graphics:** Ken Chatterton
Water, Engineering and Development Centre, Loughborough University, Leicestershire, UK.
Phone: +44 1509 222885 Fax: +44 1509 211079 E-mail: WEDC@lboro.ac.uk Website: www.lboro.ac.uk/wedc