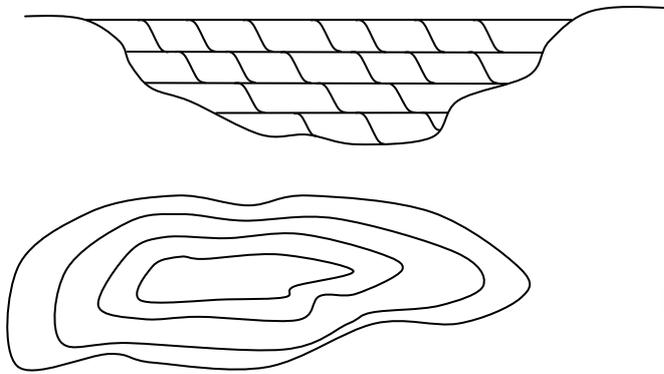


Making Waste Work: A Toolkit

How to design and operate a basic waste disposal site

A step-by-step guide



How-to guide 12

Part of
Making Waste Work: A Toolkit
for community waste
management in low and middle
income countries

Zoë Lenkiewicz and Mike Webster

Illustrated by Susan Hatfield

October 2017

wasteaid.org.uk/toolkit





WasteAid UK is a charity working to make an impact on the global waste emergency by:

- Partnering with local organisations to improve the health, environment and livelihoods of people without waste services.
- Building the skills of local people to deliver practical solutions to the waste management crisis in their own communities.
- Raising awareness of the benefits of proper waste management and campaigning for greater change.

www.wasteaid.org.uk



CIWM (Chartered Institution of Wastes Management) is the leading professional body for the resource and waste management sector, representing around 6,000 individuals in the UK, Ireland and overseas. It awards the title of Chartered Waste Manager to qualifying members.

The objectives of the CIWM are to advance the scientific, technical and practical aspects of wastes and resource management worldwide for the safeguarding of the natural environment, to promote education, training, and research in wastes and resource management, and the dissemination of knowledge of the topic; and to strive to achieve and maintain the highest standards of best practice, technical competence and conduct by all its members.

www.ciwm.co.uk

Creative Commons

Under this licence, our work may be shared freely. This provides the freedom to copy, distribute and transmit this work on to others, provided WasteAid UK and CIWM are credited as the authors, text and images are unaltered. This work must not be resold or used for commercial purposes. These conditions can be waived under certain circumstances with the written permission of WasteAid UK. For more information about this licence go to <http://creativecommons.org/licenses/by-nc-nd/3.0/>

Disclaimer

The information in this Toolkit and associated How-to guides is provided in good faith and is intended as an indicative guide to the processes and activities referred to only, based on information provided by currently active operators and practitioners. It should not be taken as a definitive guide to the activities referred to, and should not be used as a substitute for undertaking a full site-specific health and safety risk assessment. WasteAid and CIWM recommend always undertaking a full feasibility and environmental and health and safety risk assessment, based on the specific conditions applying to the community, waste, and site in question. WasteAid and CIWM do not accept any legal responsibility for any errors, omissions or misleading statements, or for any injury or loss resulting from the use of or reliance upon the processes outlined in this Toolkit and associated How-to guides. WasteAid and CIWM are not responsible for, and cannot guarantee the accuracy of, information on sites they do not manage, nor should the inclusion of a hyperlink be taken in itself to mean the endorsement of the site, the site owner or any specific content to which it points.

12 How to design and operate a basic waste disposal site

After reducing waste, recycling materials and recovering value, there will nearly always be some waste left. This remaining waste might include sanitary napkins, oily rags, some textiles and various other items. These need to be collected regularly and buried safely, preferably in a planned and managed landfill.

Summary: A waste disposal (landfill) site provides a safe place for unavoidable waste to be buried.

Waste materials: Only dispose of waste materials that cannot be reused or recycled.

Benefits: Safe waste disposal helps keep the air, water and land free of pollution, and helps prevent the spread of disease. Everyone should have their waste disposed of in a safe and well-managed waste disposal site, regardless of the size of their community.



Always follow the 3C's of safe waste disposal: Control – Contain – Cover

- **Control** – the community needs to agree on a single, suitable place to dispose of waste, and to stop burning and open dumping in communal areas and on common land. This means you need to organise as a community and agree rules.
- **Contain** – the disposal site should be used in an organised way, only using one area at a time. Agree which part of the site this is and ensure that there is good access to this area. Once one area is filled, cover it and move onto the next.
- **Cover** – waste in the site should always be covered with earth at the end of each day to control odour, prevent it blowing away with the wind, and ensure it is not eaten by livestock or vermin, nor used by flies and mosquitoes to breed in.



Be prepared! You never know what is in the waste.

Always wear strong covered footwear, good gloves and covered arms when working at or near a waste disposal site.

Make sure there is good access to the site for people delivering waste.

Make sure there are no fires at the site.

What is a landfill?

The type of burial site used for unavoidable and non-recyclable waste is called a landfill, and is often a natural depression, or manmade trench or pit¹. Waste is transported to the landfill site, where it is placed in a maximum of 1 to 2 metre high piles, compacted and covered daily in soil. The soil keeps away rats, flies and mosquitoes, prevents children from playing in the waste, prevents livestock from eating it, and eliminates odours and unsightliness.

If possible, it is better to place the waste on a level surface. If the site is on a slope then it is better to deposit the waste and push it up-slope (not down-slope). Deposit the waste each day in as small an area as possible so it is easier to contain and cover.

Locating a landfill

The site for a landfill should meet the following requirements:

1. **Size:** The required size of a landfill site is determined by how much waste will require disposal over at least the next 5 years. To calculate this, multiply the daily waste generation (in litres) by 365 days, multiply that by five (or more) years, and then divide by two (because the waste will be compacted and will shrink as it dries out). Finally, divide that answer by 1000 to convert from litres into cubic metres.

Example: A community marketplace disposes of approximately 400 litres of waste each day. Therefore the amount disposed of in 5 years = (400 litres x 365 days per year x 5 years x 0.5 (compaction rate)) / 1000 litres per metre³ = 365 metre³, so a landfill must be designed with at least this much capacity.

2. **Distance:** A landfill must be far enough from wells and streams to protect water supplies from contamination, far enough from dwellings to prevent causing a nuisance, and close enough to the source of the waste to avoid excessive transport. If you are making a landfill site for one house or compound, it should be at least 30 metres, preferably downhill, from wells and streams. A community landfill should be at least 200 metres, preferably downhill, from wells and streams and at least 200 metres from the nearest dwelling (see Figure 1).
3. **Geography:** A landfill should not be located on valuable land such as crop land. It should not be located on creviced rock because of the danger of groundwater contamination, or on marshy or wet ground because of the probable production of foul odours. Try to locate the landfill downwind from dwellings. It should be near a road for easy access.
4. **Groundwater:** The bottom of the landfill must be at least 1 metre above the highest groundwater levels. Information on groundwater levels may be available from residents, water well owners, or water well drillers. If not, a test hole 1 metre deeper than the bottom of the proposed landfill must be dug during the wettest season. If no groundwater is observed in the hole, the site is suitable.

¹ The advice and diagrams in this How-to guide are based on *Water for the World* (USAID, 1982), pp 385 – 464. Although it was published many years ago, the information is still valid. We recommend consulting this document for more detail. It is available freely online at http://pdf.usaid.gov/pdf_docs/PNAA484.pdf

- Cover soil:** The landfill must be located on or near ground which is easily excavated in order to provide adequate cover material. Loamy soils, sandy loams, and permeable clay mixtures are good. Heavy, non-permeable clays are hard to work and crack when dry surfaces are exposed.

When a suitable site has been located, draw a map like Figure 1 showing the site in relation to dwellings, water wells, streams, roads, and so on, and indicating ground slope and prevailing wind direction.

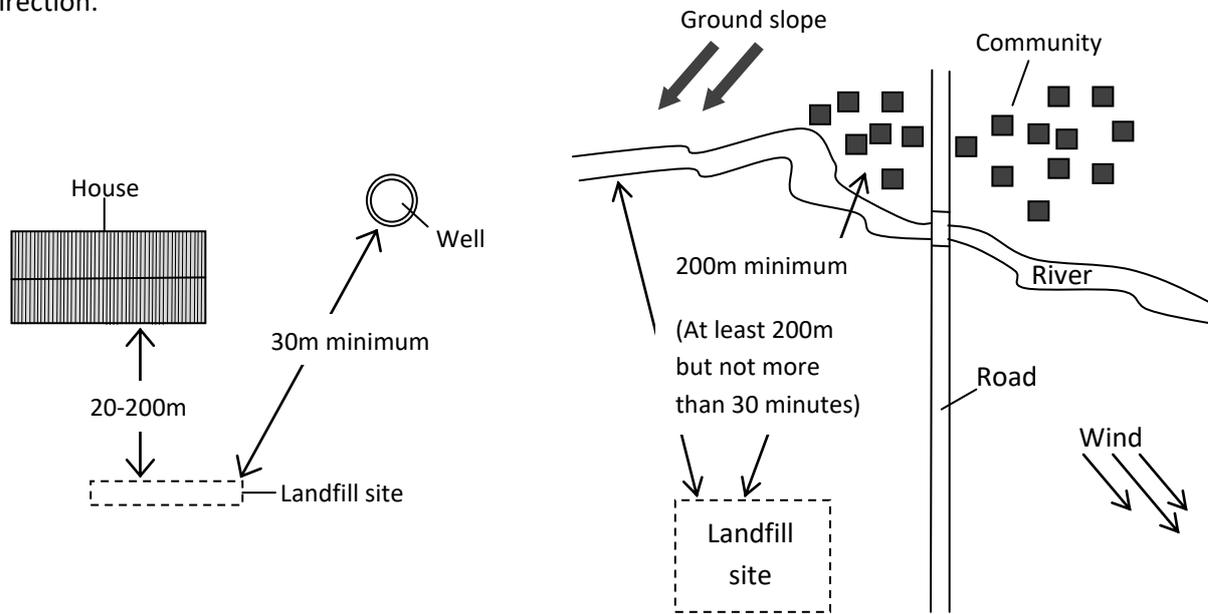


Figure 1: Landfill locations for household/compound (left) / community (right).

Selecting the method of landfilling

The three basic methods of landfilling are: (1) trench method, (2) area method, and (3) mound method.

- Trench method:** Dig a trench, place solid waste in the trench, compact the waste, and cover with the excavated soil. Generally, only a portion of the trench is dug and filled with waste each day or week. The size of the trench will vary depending on the amount of waste to be disposed of and the equipment used for excavation.

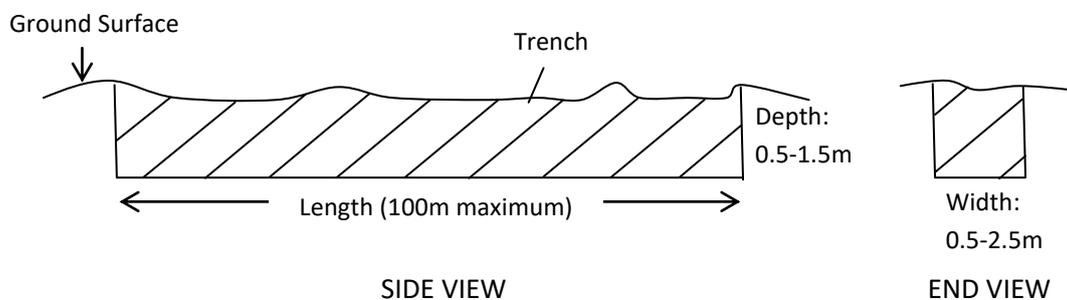


Figure 2: The trench method of landfill. Trenches are generally 0.5-2.5m wide 0.5-1.5m deep, and up to 100m long. The trench method is used where the ground is fairly flat or gently sloped and the soil on the site is easily excavated.

2. **Area method:** Raise a natural depression or low area by placing solid waste in the depression, compacting it, and covering it with soil. Cover soil can be hauled from off-site or scraped from the bottom of the depression before waste material is placed in it.

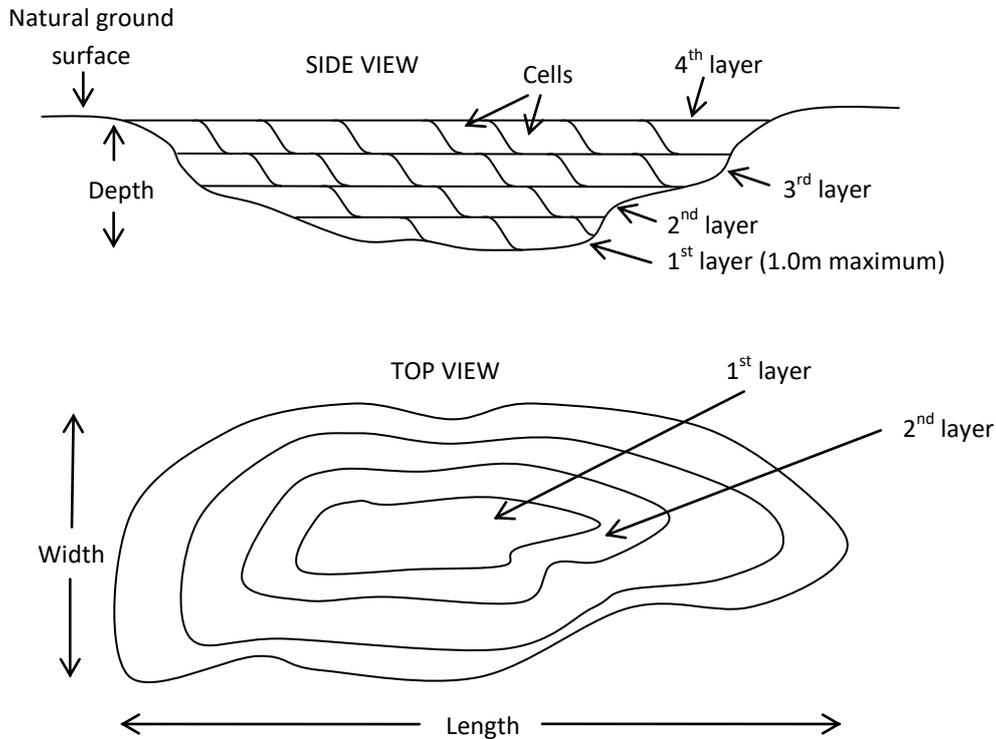


Figure 3: The area method of landfill. Although there are no design limitations to this type of landfill, waste is placed in strips of layers no higher than 1 metre. Each strip or layer may be composed of smaller sections called cells.

3. **Mound method:** Place solid waste in strips or layers no higher than 1 metre on top of relatively flat, hard ground and cover it with soil hauled from off-site. This method is generally used in areas difficult to excavate.

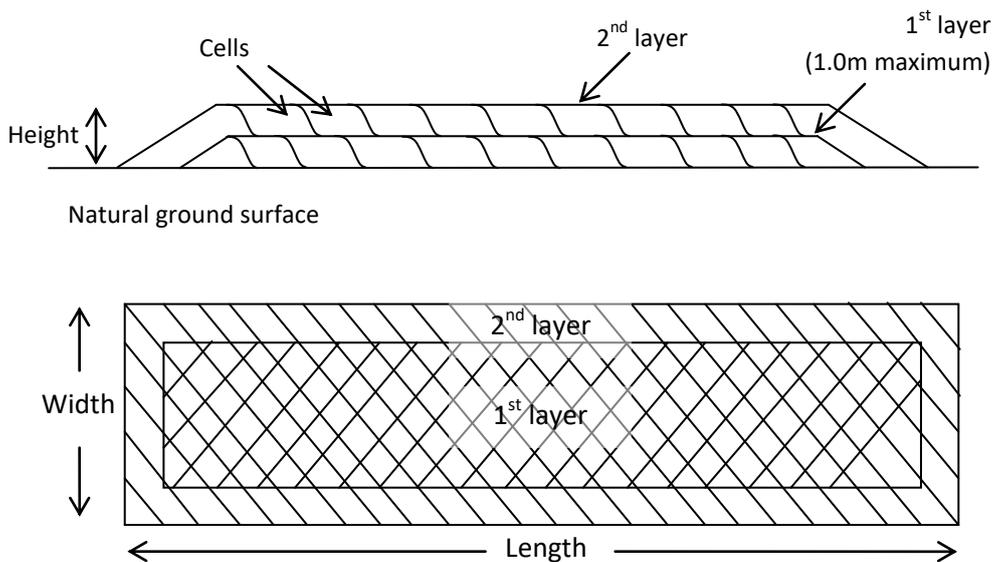


Figure 4: The mound method of landfill. There is no design limitation on landfill size.

How to restore and improve an uncontrolled dumpsite

There are several steps you can take to rehabilitate an existing poorly-managed or uncontrolled dumpsite²:

1. Find someone to be responsible for managing the site, so one person has charge for the place.
2. Inform the community of improvements to the site, including any waste pickers who scavenge for materials at the site.
3. Make sure you have the equipment to improve the site, and the control over vehicle access to it through a single-entry point.
4. Ensure there is a single working face in an area of the site that is not burning and establish a road suitable for traffic leading to it.
5. Control waste disposal: allocate and control where loads are disposed of and stop end-tipping – the pushing of waste over an extended slope, where the waste is un-compacted and can burn.
6. Spread the waste in layers of a maximum 1 metre and compact as best possible with the machinery available.
7. Extinguish fires in other parts of the site by exposing smouldering areas and smothering them with soil (not water).
8. Develop a draining system that prevents runoff water from entering the waste body.
9. Create an operating plan (as simple as possible) that progressively levels areas of the landfill (always using a single working phase and some degree of compaction).
10. Cover deposited waste as well as possible with incoming soil, rubble or quenched ash. Vegetate if possible.
11. Most important is to negotiate with the waste pickers throughout the process, if they work on the site. They will be most affected by the proposed rehabilitation and are able to cause major problems on site if they feel that their livelihood is threatened. Consequently, they must be made part of the solution. This is achieved by:
 - recognising the fact that they are on site and are there to stay;
 - formalising the right for the regular or career waste pickers to operate on-site in a controlled manner;
 - developing a working relationship that is agreed by the recognised leader of the waste pickers and the site manager.



Implementing a waste collection system (see How-to guide 11: How to collect waste safely and efficiently) and a safe waste disposal site are two of the most impactful activities that communities can undertake to protect their health and keep the neighbourhood clean.

² UN-Habitat (2010) *Solid Waste in the World's Cities*, Keysheet 8, Phasing out open dumps.