Composting of Organic Materials and Recycling

This Technical Brief looks what can be recycled and composted, and how to go about it.

Introduction

Recycling and composting are waste management options, which should be considered as part of an overall waste management solution. However, during the early stages of an emergency these are unlikely to be appropriate and emphasis will on removing waste from areas where people are highly concentrated to avoid potential health and safety problems. After the immediate emergency period is over, an integrated and more sustainable approach to waste management should be considered. This is likely to include options for recycling and composting, which also has the benefit of creating livelihood opportunities for those affected by the emergency situation.

Public health engineers and public health promoters can start thinking about recycling and composting options early on. Discussion with communities and local authority representatives can start to ascertain whether any recycling markets previously existed and also whether there are recycling opportunities within the communities as they currently exist, e.g. recycling of bricks and timber to build new shelters.

Case Study – Banda Aceh, Indonesia

Following the Asian tsunami in December 2004 solid waste management was a highly important issue, not only in terms of keeping camp waste managed but also in clearing areas deluged by tsunami waste such as destroyed buildings, vegetation, etc. Once the initial emergency phase drew to an end, it was clear that there was significant opportunity both from a livelihoods and recycling point for recycling of various constituents of waste in particular, building materials, glass, various metals, etc. Oxfam set up a pilot recycling project in Lampaya, south Banda Aceh, which collected and utilised recycling markets, which existed prior to the tsunami. This included a "shop" which provided a market place for recyclable materials not be collected and sold elsewhere. An Information Officer was employed to facilitate communications between Oxfam and the local community, tools and supplies to lend in individual reconstruction efforts were also available.

Figure 1: Lampaya Oxfam recycling "shop" (courtesy of Mindy Wiemer)

Waste Hierarchy

There is a hierarchy of approaches to solid waste management that should be considered. However, effective solid waste management requires a balanced approach, which takes into account the specific context and the circumstances of those affected by the emergency.

Under normal circumstances recycling and composting options should be considered after exploring options for waste reduction and reuse. Both recycling and composting are likely to be part of an integrated solution to waste management problems.

The waste hierarchy

Waste Reduction & Minimisation

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Waste Reuse / Repair

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Recycling / Composting

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Landfill / Burial / Incineration

Fractions (Characteristics) of waste in emergencies

Waste from settlements and refugee camps will vary widely in composition and quantity, according to the amount and type of economic activity, the staple foods consumed and local practices of recycling and/or waste disposal. Typical constituents of solid waste may include the following:

- Packaging from emergency supplies, e.g. plastic water bottles, cardboard boxes, cans
- Waste containing excreta material, for example the flying latrine following the tsunami in Indonesia where faecal material was disposed of in plastic bags
- Organic waste and food waste
- Non-organic wastes, such as metals, glass and plastics
- Hazardous wastes such as asbestos (including asbestos roof sheeting), chemicals, hydrocarbons, medicals wastes (including additional medical wastes associated with emergency supplies), etc.
- Wastes generated from the disaster itself, such as sludges, debris, bodies, etc (disaster waste is dealt with a separate Technical Briefing Note (TBN 17))

Community Issues

In identifying and developing recycling and composting options it is important to involve communities from the earliest possible stage. This can assist with identifying those who have previously been involved in the waste sector and have knowledge of existing recycling markets and also in identifying whether recycling and composting that is something that people have been involved with previously. As with all activities where community groups are consulted it will be important to obtain the views of different sections of the community who will have different needs. Men, women, children, those with particular or special needs should be consulted and considered separately.

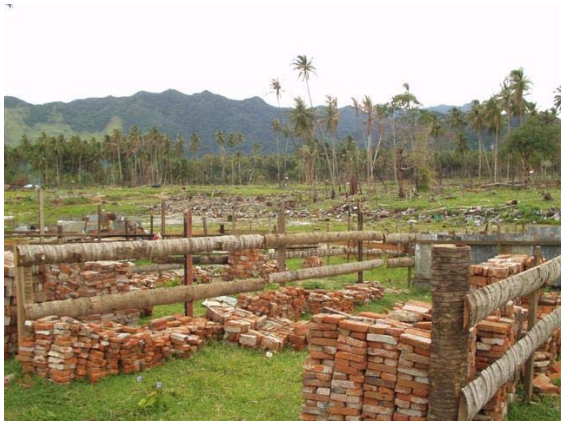
In undertaking recycling and composting activities, separation of waste at source will be important to success. Source separation involves waste being separated by those who generated it and is advantageous over separating later, as it avoids double handling and unnecessary transportation.

Options for separation at source may include:

- a central location where people can bring their recyclable materials to sell which are then sold on to commercial recyclers; or
- recycling points on a camp by camp basis where people separate the waste at their camps and this is taken away by a central co-ordinator and sold to commercial recyclers.

Determining the most appropriate option will be dependant on what people are familiar with doing, and whether there are already formal or informal recycling markets existing, and how accessible they are to the local population.

Figure 2: Recycled Bricks Collected by the Local Community following the Asian tsunami in Banda Aceh, Indonesia.



To enable recycling and composting to take place successfully, communities will need understanding why it is important to separate waste and how they can do this in a practical way. The role of the public health promotion team will be crucial in understanding current practices, and in raising awareness of new issues related to better waste management practices. The roles of men, women and children in any potential recycling and composting activities should also be analysed, as these are likely to have a big impact on potential outputs.

Identifying individuals to champion recycling and composting within the communities can assist with presenting messages and also linking the management of waste to broader health messages.

Waste pickers

In many communities individuals are involved in waste picking and selecting out waste items, which can be recycled and have a resale value. There may also be other individuals who have previously been involved in existing waste recycling markets. It will be important to identify these individuals and include them in any discussions and development of recycling options.

Waste picking in some countries is only undertaken by certain groups in society and are likely to be part of marginalised groups. It may therefore be necessary to consult with this group separately to ensure that their voice is heard and represented in any decisions being made. It is important that any existing salvaging and waste picking is protected and an integral part of any new waste management system.

Case Example – Bangalore, India
(courtesy of WEDC, Synthesis Note on Recognising livelihoods from urban waste)

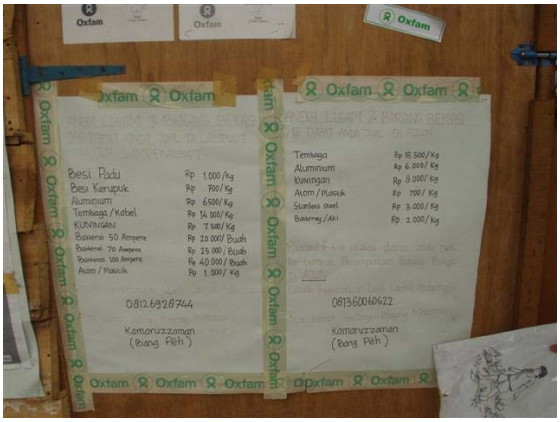
In Bangalore, India, there are a number of NGOs, which have worked with waste pickers over a long period. They have tried to incorporate pickers into neighbourhood-based primary collection schemes and have worked with the city corporation to developed integrated approaches to solid waste management. For example, a Rag Pickers Education Scheme was set up which worked with waste picker street children and also picker families to take responsibility for and reap the benefits from collecting and selling waste from prescribed residential and commercial areas, by helping them negotiate and protect their interests and livelihoods.

Recycling

What can be recycled?

What can be recycled will depend on local recycling markets. Investigation will need to be undertaken of local recycling markets and commercial recyclers. This may have changed as a result of the emergency situation. In investigating the markets, it may be necessary to ascertain if certain markets are regional rather than local, in which case transportation and costs will need to be considered. Likely materials that can be recycled might include: glass, paper, textiles, bricks, aluminium, steel, and certain types of plastics, such as plastic bags, etc.

Figure 3: Local Prices for Recycled Materials in Banda Aceh, Indonesia.



Waste separation should be undertaken to facilitate recycling. Minimum separation should be into three categories: inorganic, organics and non-recyclables. The inorganics can then be further separated and sold onto commercial recyclers or informal waste purchasers. The organics can be composted. The remaining waste, which cannot be recycled or composted, should be dealt with either through landfilling or incineration (refer to Technical Reference Briefing Note (TBN 15)).

Case Example – prices of recycled materials in Banda Aceh in 2005 following the Asian tsunami

Market Buying Price of 1 kg of Used Material

Material	Buying Price (Rupiah)
Plastic –mix (i.e. drink bottles)	1,000
Soft Aluminium (i.e. soda can)	6,000
Aluminium –hard (i.e. roofing)	8,000
Iron	800
Batteries	2,000
Stainless steel	5,000
Plastic pipe (broken o.k.)	600
Cable (copper) and/or Brass	12,000

Processing of recyclables prior to selling on

Some form of processing of recyclables may be necessary prior to transportation or selling on the recyclables. This may include the following activities:

- Crushing: for aluminium, steel cans, etc.
- Shredding: of papers, cardboard, tyres, etc.
- Bailing of fibrous materials such as fabrics, cardboard, etc.

Depending upon the facilities and technologies available all or some of these processing options will be viable. The processing of recyclables increases the density of the materials involved making them more efficient and economic to transport and resell.

Case Example – Livelihoods from waste *(courtesy of WEDC, Synthesis Note on Recognising livelihoods from urban waste)*

A number of livelihoods are derived from waste in low-income countries, which can be reinvigorated following an emergency situation. Dealers in waste materials are common everywhere, whether it is the second-hand merchant or scrap metal dealer.

The two most common groups involved in these activities; waste pickers and street sweepers. Waste pickers separate re-saleable materials, such as paper, plastics, glass, to sell on in the recycling chain. Sweepers are involved with street cleaning and primary waste collection.

It is possible to include and involve waste pickers and sweepers formally in waste collection and recycling activities. However, it needs to be recognised that these systems of waste collection depend on them remaining informal. In such circumstances an arm's length relationship might be better than a full integration into a formal system.

Composting

What can be composted?

Composting is the biological decomposition and stabilisation of organic material, such as vegetable scraps, under aerobic conditions (in the presence of oxygen). Under the correct conditions of moisture and aeration, biological heat is generated and composting takes place. The composting period is followed by a period of stabilisation to produce a final product suitable for application to the land without adverse environmental effects.

Any organic material can potentially be composted. However, woody materials such as woodchips and paper take much longer to compost than fleshy materials such as vegetables and vegetable peelings. It will however, be useful to get a good balance between woody materials and fleshy organic material. Woody materials, such as woodchips, are important for keeping the structure of the compost open and allow air in; keeping the composting process aerobic, which speeds the process and keeps odours to a minimum. The flashy organic material will be the main matter to be composted. As wood chips don't compost quickly these can sieved and reused for future composting if required.

Faecal materials can be composted but this should not be considered in an emergency or post emergency environment due to the risk to health and safety, even if the process can be well managed. Even under controlled conditions, faecal material should be excluded from composting processes.

Types of composting

There are a number of different composting systems ranging from relatively low technology and low cost bin composters and windrows, to medium cost aerated static piles (ASPs), to highly technical, high cost reactor systems.

Case Example – post emergency composting, Montserrat, West Indies

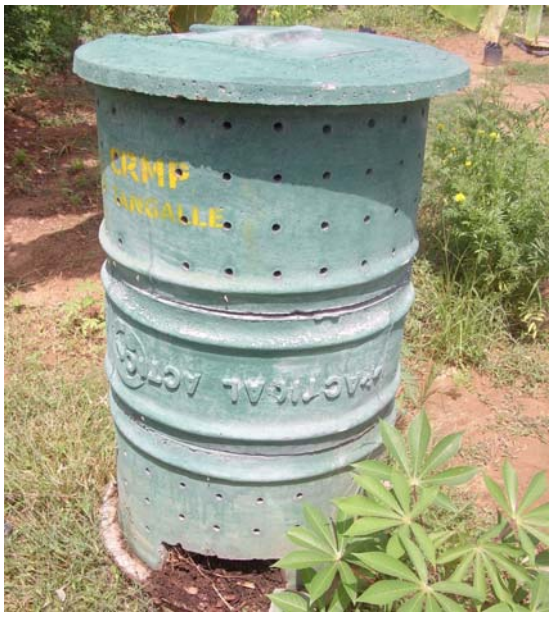
Following the volcanic emergency in Montserrat, there were significant problems associated with lack of fertility of land for growing vegetables and other plants. A pilot-composting project was set up using a basic windrow composting. A double composter was built utilising waste timber from wooden crates used to transportation of emergency/post emergency supplies. One half of the composter was used to add new organic material (organic kitchen waste, vegetable scraps, plant prunings where available, etc.) which was turned on a regular basis, whilst the other half of the composter contained maturing compost which was then added to the ground as soil improver where plants and vegetables were to be grown.

Bin composters –
Compost bins are most suitable for use at a household or camp level to compost kitchen vegetable waste and garden cuttings. They may also be suitable for use in small communal environments, for example for composting communal kitchen vegetable waste.

Compost bin can be bought purpose built or can be easily constructed utilising an ordinary household bin with holes penetrating the sides to enable air to circulate within the contained compost (Figure 1). A box compost container can also be constructed utilising wood planks to form a slatted box container.

Vegetable peelings and kitchen waste are added to the compost bin and left to "compost". Woody and fibrous materials can be added, which assists with maintaining airflow through the compost but these materials will take longer to break down.

Figure 1: Post tsunami compost bins, Sri Lanka (courtesy of Practical Action)



One of the main problems with compost bins is that it can take a considerable period of time for the composting to take place (up to a year). Also restrictions in the amount of air in the system can lead to anaerobic conditions, which can create bad odours and attract flies and vermin. The most appropriate way of dealing with this is to turn the compost on a regular basis – initially twice a week to start with, but if the composting is drying out - less frequently. If the compost becomes smelly, – then turn more frequently. It may be more practical to cover fresh waste with a lid, which will reduce access to the compost by vermin as well as keeping out excessive rainwater, especially in a tropical climate. In an arid environment, a lid will help to stop the compost drying out.

Wherever possible, a twin composting system is recommended. This involves utilising two compost bins: one compost bin which is in use and being filled with new vegetable waste; and another compost bin containing older "composting" waste is no longer being added to. This system has the advantage that the bin containing the composting material can be turned without new un-composted matter being further added and slowing down the overall composting process.

Windrow (batch) composting –
Windrow or Batch composting offers a relatively low technology, low cost composting option. If undertaken on a large scale windrow composting can however be relatively land intensive.

Typically, organic wastes with high water content (e.g. vegetable waste) are blended with a drier material such as straw, woodchips, and recycled mature compost. Doing this opens up the compost encouraging air movement and enables the compost to be maintained in trapezoidal or triangular section windrows around 1.5m in height (no greater than the average height of a compost worker).

Aerobic conditions are maintained by turning on regularly. When turning material from the outer portions of the pile should if possible be placed in the centre of the pile when it is reconstructed. The frequency of turning will be dependant maintaining aerobic conditions and the moisture content of the pile. As an initial guide, turning of once a day or once every second day should be sufficient for most composting operations. This should however be reduced if the compost is becoming too dry (water can also be added during the turning process if the pile becomes too dry). Usually after 30days of composting turning can be reduced to once a week.

Piles should be kept small so that turning can be undertaken using a shovel.

Windrow composting should be undertaken in batches connected to one another with care taken to ensure that batches are not mixed, which will slow the overall composting process.

A maturing period is generally necessary following composting (depending on the use of the final compost). The compost should be stockpiled for 4-8 weeks to ensure that the final compost is stable and does not further degrade when added to soil.

Figure 2: An Example of Windrow Composting in UK

Consideration should be given to the surface upon which the composting takes place. Ideally composting should take place on a concrete base and cut-off drains around edges to capture leachate/run-off (from rain) to avoid environmental degradation of the surrounding area, watercourses and ground water. Leachate can be captured and re-added to compost during the turning process to add moisture to the pile if drying is an issue.

The Aerated Static Pile (ASP) system - Aerobic static pile composting requires airs being pumped into piles of compost, utilising compressors and pumps. This system is unlikely to be a short-term or an emergency option as it requires significant capital investment and energy requirements.

Health and Safety

As with handling any waste material workers must be provided with appropriate protective clothing such as waterproof, durable gloves and boots and overalls. Facemasks should be used particularly when handling composts to avoid exposure to fungi and other potential aerosols.

Care should be taken in lifting activities, with appropriate tools provided and loads carried by people should not exceed 25kgs.

For further information on health and safety refer to the Oxfam public health cd.

Further information

- Guidance for Solid Waste Management, prepared by the Sanitation Task Force, March 2006
- Emergency Sanitation – Assessment and Programme Design by Peter Harvey, Sohrab Baghri and Bob Reed, WEDC, Loughborough University, UK, 2002
- WEDC Synthesis Notes on solid waste management:
  1. Vehicles for primary collection of solid waste
  2. The role of community-base organisation (CBOs) in solid waste management
  3. Recognising livelihoods from urban waste
  4. Gender issues in the management of urban waste

Additional Support / Expert Advice

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