



Waste disposal in developing countries

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Waste disposal is a neglected area in many low income countries, and a major environmental health hazard. Increasing quantities of waste and their changing composition are a major challenge for municipal governments. The cost of disposal of large quantities of waste is often beyond their financial capacity. There is also poor institutional capacity and political will to address the problem. The Millennium Development Goals set targets for Environmental Sustainability and Access to Environmental Sanitation, but safe disposal of solid waste still seems beyond the capacity of many countries. This fact sheet presents some basic issues and solutions on municipal waste disposal.

Introduction

The Millennium Declaration in September 2000 leads to the 8 MDGs that provide the framework for a new international commitment to address poverty eradication. The goal most relevant to this fact sheet is Goal 7, “Ensure environmental sustainability” and in particular Target 9, “Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources”. In addition, the World Summit on Sustainable Development (WSSD) 2002 set the targets for access to water and environmental sanitation. Proper solid waste disposal is an important component of environmental sanitation and sustainability. A sustainable environment and improved waste management offer opportunities for income generation, health improvements and reduced vulnerability.

Waste quantities are increasing at an alarming rate. By the year 2010 the 7 billion people in the world will be producing more than 2.5 billion tonnes of waste annually. Low income countries will be contributing more than 50% of this, but their share will increase with economic growth. Countries with rapid economic growth and large cities such as China and India are already struggling with the proper disposal of large quantities of solid waste. Currently, the major expenditure is on collection and transportation but with more mechanisation and with the need for proper disposal the share of disposal cost will rise. Many low income countries lack the facilities for safe disposal. The current practice in most of the low income countries is uncontrolled dumping and it might take more than 20 years to provide sanitary disposal of municipal solid waste. With the growth of trade and industries the proportion of hazardous industrial waste and its impact will also increase.

This fact sheet discusses some of the issues of waste disposal and provides basic knowledge on improved disposal practices.

Stages in SWM

Municipal solid waste management comprises various stages from the generation of waste to its final disposal. Planning for proper management must consider all these stages. For a complete system of solid waste, all the stages need to be in place. The group of stakeholders around each

of these stages could differ. For example, at the stage of generation and household storage the households and community groups are more important as compared to final disposal where municipal agencies and local authorities are the key players.

Final disposal is the last stage in the waste management stream. This is the stage when all the collected waste requires a safe disposal. Despite all the efforts to reduce, recycle and reuse the waste, there are always certain quantities of waste requiring final disposal. At the final disposal stage we need to deal with the larger and accumulated quantities of waste. For example, for a city of 5 million people with a collection rate of 70%, the quantity of waste requiring final disposal could be 3000 tonnes/day. This is equivalent to 500 truck loads of waste. The environmental impact of such a large quantity of waste could be very significant. Some common methods of final disposal of waste are landfilling, incineration and composting of the organic portion.

There are many reasons why safe disposal is rarely practised in low income countries; Box 1 identifies some of the key issues. Improvements to waste disposal practices depend largely on overcoming these constraints gradually.

Box 1. Key issues in solid waste disposal

Municipal capacity

The scale of the task can be enormous. Most municipalities have no experience of controlled disposal. They may identify disposal sites but few actively manage them. Contracting out waste services has been suggested as a solution to low municipal capacity, but there are many uncertainties surrounding the issue: in what manner should the service be privatised? Should a large or small contractor be used? Does the municipality have the required capacity to adequately regulate the contract?

Political commitment

Solid waste management is much more than a technical issue; it has implications for local taxation, employment, regulation, and any changes need political support to be effective. Unfortunately, it is rarely a priority for political leaders unless there is strong and active public interest. Thus there is little incentive to invest in disposal or to control unofficial practices.

Many people rely on waste picking for their income and a controlled disposal operation could be seriously disrupted if the practice were allowed to continue. Banning picking, however, requires strong management and political commitment.

There are many unofficial practices (such as fuel theft) which would be threatened by the introduction of a controlled operation, making staff unwilling to co-operate.

Finance and cost recovery

Development of a sanitary landfill site represents a major investment and it may be difficult to give it priority over other resource demands.

The need for funding can make municipalities dependent on donors or loan agencies that apply pressure to reach high, possibly unachievable, standards of disposal.

Finance may be available in the short term for establishment of a disposal site, but reliable revenue is needed for long-term recurrent costs. This is very hard to provide if residents are unwilling to pay taxes for waste disposal.

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Technical guidelines

Standards from high income countries may be inappropriate in low income countries due to differences in climate, resources, institutions etc. However, relatively little appropriate guidance is available for low income countries.

A lack of accurate data – or the means of getting it - compounds planning problems. For example, it may not be possible to undertake a geophysical survey of a disposal site or even make an accurate estimate of the total daily generation of domestic waste.

Due to these uncertainties, officials find themselves ill-equipped to plan a disposal operation which is both achievable and avoids unacceptable environmental hazards. They may try to adopt unsuitable, highly expensive imported designs or ignore the issue altogether, perhaps fearing prohibitive costs.

Institutional roles and responsibilities

A disposal site may be located outside the boundary of the town it serves and may serve more than one municipality. This necessitates the co-ordination of all authorities concerned and may involve departments that are accustomed to acting independently. Within authorities, the roles and responsibilities of different departments need to be clearly defined and accepted by all concerned. Some smaller towns may not have staff with specific responsibility for providing a solid waste management service.

Location

The accessibility of a disposal site – especially its distance from town – is an important factor in site selection, especially when staff and the public do not have a strong incentive to use it when compared with indiscriminate dumping.

What could be done?

Final disposal of solid waste must be an inseparable part for the planning of integrated waste management. This must go hand in hand with recycling strategies to minimise the quantities of waste requiring final disposal. The estimates of quantities of waste requiring final disposal needs to be based not on how much waste is produced but on the estimates of quantities left, requiring disposal. Municipalities could gradually develop safe disposal practices. Some of the common options for final disposal of solid waste are given in Box 2.

As low income countries are making progress in their socio economic status, they need proper disposal of waste. With the expected increase in trade, employment and literacy, there is an urgent necessity to improve the final disposal of solid waste. In order to achieve the full benefits of the millennium development goals on poverty and environment, solid waste disposal must be considered as one of the key elements of infrastructure and services. A number of organisations collect and disseminate information on good practice in solid waste management.

Box 2. Summary of waste treatment and disposal options

Disposal option	Description	Application for low income countries
Uncontrolled dumping	Waste is dumped at a designated site without any environmental control measures	This is not a disposal option but a common practice in low income countries. It has high environmental health risks.
Sanitary landfilling	Controlled burial of waste. The site is engineered and managed to meet certain standards.	Comparatively low cost and simple technology solution when land is available. Presents some risks in certain circumstances.
Composting	Biological decomposition of organic matter in waste under controlled conditions.	Requires sufficient proportion of bio-degradable material in the waste. Not a complete disposal system; if there is no market for compost a further disposal option will still be needed. Large mechanised schemes have not been successful.
Incineration	The controlled burning of waste at high temperature to reduce its volume. Plant is designed to recover the energy released by combustion.	High capital costs, requires highly skilled operation and control. The waste must have a high calorific value, which is unlikely in low and middle income countries. Cost-effective only if landfill sites are not available.
Gasification	Biological decomposition of organic matter in waste under controlled conditions to obtain methane and other gases.	High cost and technologically complicated for developing countries.
Refuse derived fuel	Separation of combustible materials from solid waste for fuel purposes.	Depends on the presence of combustible material in the waste. Expensive and therefore of limited use in developing countries.
Pyrolysis	High temperature conversion of organic materials in the absence of oxygen to obtain combustible by-products.	Capital intensive with high running costs. Technically complex; the full operational and cost issues are not widely known.

The following are key contacts.

Other sources of information:

Ali S. M. (2000), *'Down to Earth: Waste Disposal Practices in Developing Countries'*. Loughborough University.

<http://www.ciwm.co.uk/> <http://www.sandec.ch/> <http://www.waste.nl/>

<http://www.worldbank.org/urban/uswm/> <http://www.awma.org/>

Regional annex: Solid waste disposal in Ghana

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This fact sheet seeks to assess the solid waste disposal (SWD) situation in Ghana and to identify prospects for improvement focusing on remediation of dumpsites and sanitary landfills. The key problems with solid waste disposal in Ghana principally relate to:

- *Problems with indiscriminate dumping;*
- *Increasing difficulties with acquiring suitable disposal sites;*
- *Difficulties with conveyance of solid waste by road due to worsening traffic problems and the lack of alternative transport options; and*
- *The weak demand for composting as an option for waste treatment and disposal.*

Generally the poor state of waste management is clearly not only an engineering problem. Rapid urbanization, poor financing capacity of local authorities, low technical capacity for planning and management of solid waste, weak enforcement of environmental regulations - which allow local authorities to flout environmental regulations without any sanctions - have all contributed to compound the problem. The Ghanaian experience shows that within the existing socio-economic context, manual systems are appropriate. The challenge therefore is to develop and promote disposal systems that require a minimum level of mechanical equipment.

The magnitude of the problem

The disposal of solid waste has always been an intractable problem throughout Ghana. Landfills in Ghana are primarily open dumps without leachate or gas recovery systems. Several are located in ecological or hydrologically sensitive areas. They are generally operated below the recommended standards of sanitary practice. Municipal budgetary allocations for operation and maintenance are inadequate. The result is substandard and unsafe facilities which pose public health risks and aesthetic burdens to the citizens they are meant to serve. It is estimated that throughout the country only about 10% of solid wastes generated are properly disposed of.

In the last few years problems with solid waste disposal have assumed increased prominence as a political issue especially in urban areas. The dismissal of a mayor of the capital city (Accra) in 2002, was largely attributed to his inability to deal with the problems of waste management.

Based on an estimated population of 18 million and an average daily waste generation per capita of 0.45 kg, Ghana generates annually about 3.0 million tons of solid waste. Accra, the capital, and Kumasi, the second city, with a combined population of about 4 million and a floating population of about 2.5 million generate over 3,000 tons of solid waste daily. Almost all the collected quantities of wastes in Ghana depend on the "waste sink" function of the environment for assimilation.

Overview of current situation

In recent years several large foreign loans have been secured to help tackle the problems of environmental sanitation. Ghana's first sanitary landfill facilities were recently commissioned in the 4 largest towns in the country – Accra, Kumasi, Sekondi-Takoradi and Tamale - between 2003 and 2004. In smaller towns and rural areas the issue of solid waste disposal has never really been a priority issue. Few districts are known to invest in the development of solid waste disposal sites.

Generally conditions of waste disposal in Ghana are similar to those in many developing countries within the tropical climates. The overwhelming majority of landfills in Ghana are open dumps even though these are strongly discouraged in the national sanitation policy. The problems associated with open dumping are briefly described below. The most feasible options for SWD are:

- Controlled dumping,
- Sanitary land filling,
- Composting, and
- Incineration

Complex systems for waste disposal that are coupled with energy recovery such as gasification and *pyrolysis* are not considered to be financially and technically sustainable in Ghana and are thus not considered.

Uncontrolled dumping of refuse

Open refuse dumps are most commonly located at the perimeter of major urban centres in open lots, wetland areas, or next to surface water sources. Open dumps are generally sited based on considerations of access for collection vehicles rather than hydrological or public health considerations. In rural areas and small towns, there are often no vehicles for collection hence uncontrolled dumping occurs within the built up areas - with all its attendant health hazards and negative environmental impact.

The recent proliferation of plastic bags for packaging has seriously aggravated the negative impact of uncontrolled dumping creating very unsightly conditions.

Generally, the widespread prevalence of uncontrolled dumping reflects the weak capacity of districts and municipalities, and given the lack of resources for dealing with the problem, it is likely that for hundreds of small towns and villages, this option will continue as the only option for SWD in the medium to long-term. The key challenge for local authorities therefore relates to how to upgrade the numerous uncontrolled dumping grounds in order to ensure some semblance of order and hygiene in uncontrolled dumpsites using manual labour.

Controlled dumping

The sanitation policy recommends controlled dumping with cover as the preferred option for all small towns and rural areas. In practice however, there are few good examples. In most communities controlled dumping sites are located on river banks and in depressed areas such as in borrow pits, surface mining areas, ravines, old quarries and valleys. Generally the standard of operation and maintenance on these landfills is inadequate. There is often no mechanical

equipment for spreading and compaction of waste which means little reduction in waste volumes. Fly and rodent control are often neglected and there are serious problems with littering. Few district assemblies (DAs) can afford to haul the required inert cover materials to disposal sites. Various trials have been made with use of industrial wastes such as shavings from timber sawmills (which are abundant in most urban areas) for this purpose but research in this area is still scanty and the extent of suitability is not well documented. With low central government budgets and weak capacity for internally generating funds, most DAs find sustained operation of controlled landfill sites a real burden. However, there is a real need for improvement in current levels of operations and in the design and siting of new facilities to ameliorate current levels of environmental degradation.

Sanitary landfilling

This option is the recommended choice for solid waste disposal for the metropolitan and municipal areas (comprising about 10 cities with populations over 200,000). Landfilling is considered the most feasible option from the point of view of costs and level of environmental impact. However experiences with landfill sites that meet engineering requirements in Ghana are few. Indeed, the first set of landfill projects have only been recently commissioned in 4 key metropolitan areas. These projects were mostly sponsored by external donors including the World Bank and DFID. All the new landfill sites were designed and developed with technical assistance from foreign consultants. Generally the trend has been to develop solid waste disposal sites alongside waste stabilization pond based treatment systems for liquid wastes. However none of the recently completed sites has operated for long. It remains to be seen whether the beneficiary cash-strapped Metropolitan

Composting

Generally conditions in Ghana are very conducive for composting in terms of the waste composition and weather conditions. However composting has never flourished as an option for refuse treatment and disposal. Most local authorities feel, based on local experience, that the running costs of composting plants are excessive and unjustifiable.

Box 3. The experience of a local NGO

The Ghana Organic Agriculture Network (GOAN) has promoted compost as an option for solid waste management. The experience of GOAN has shown that: technically, there are good prospects for sustainable operation of compost plants. The plant designs involve simple screening and maturing - that can be operated by community groups or private sector. Though a growing horticulture industry has generated some demand for compost the operations of GOAN confirm the long held view that there is low demand for compost and financial sustainability for composting is difficult to attain. The problems with financial sustainability are attributed to: (i) lack of awareness about the soil-enriching benefits of compost which means there is little demand for compost, and (ii) lack of support from the key agencies who could do most to promote it, ie The Ministry of Local Government (who are responsible for waste management) and the Ministry of Food and Agriculture (MOFA).

The only known large composting plant in the country was built with external donor support and commissioned in the early 1980s. During its early years of operation the plant was useful in helping reduce the volume of waste. However high maintenance costs adversely affected its sustainability. In the last few years most of the mechanical components have been decommissioned and the plant currently operates only for demonstration purposes.

Incineration

The national policy recommends small scale incineration plants for the treatment and disposal of health care and hazardous wastes. In most towns with health facilities small incinerators have been built as part of the health provision infrastructure. These facilities involve simple designs with lateritic bricks, cement blocks and metal. Local firewood is the most common energy source and the facilities are easily operated and maintained by environmental health staff of the District Assemblies. These simple incinerators have provided several years of service in dealing with relatively small quantities of hazardous hospital wastes. However in reality many of such facilities have no environmental controls and often comprise nothing more than combustion of medical and chemical waste in an oven or open pit.

Key knowledge gaps

Generally, the level of research and documentation of experience is very low. The analysis of the current situation reveals the following key knowledge gaps :

- Feasibility of options (preferably labour intensive) for upgrading waste dumping sites and landfill management
- Experiences with resource mobilization for solid waste management within local authorities.
- Experiences with monitoring and control of waste disposal by local authorities. Specific examples are required for questions like "How do other countries build capacity to ensure that local authorities do not flout environmental requirements for landfill based disposal sites?"
- Experiences with sustainable composting systems and success stories on strategies for promoting composting as a waste management option.

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