

CHAPTER 21

TOWARDS EFFECTIVE WASTE DISPOSAL IN DEVELOPING COUNTRIES

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Introduction

Waste can be disposed of effectively only after usable resources have been reclaimed from it and once it has no adverse effects on the environment. Discarding waste involves use of transportation from the collection site to the disposal location. Developing countries, in general, hardly ever have special sites designed for disposing of different waste types, as such solid and hazardous wastes are all dumped in a common location. Hazardous wastes primarily originate from more developed countries, and reach less developed countries as imports and through technology transfer. Less developed countries (LDC) have different waste disposal practices which may be determined by environmental awareness and availability of resources.

In rural areas waste is dumped in pits dug on household backyards, or at dumpsites designated by local authorities. **In larger towns and cities** there may be sanitary landfills where wastes are disposed of. Other than disposal on land, waste also undergoes incineration, which is practised mainly on medical waste. It is clear that *LDCs are confronted with dilemmas between providing basic needs such as shelter and food supply for their countries and handling the responsibility of ensuring that wastes are disposed of efficiently.*

In this chapter suggestions are made on the use of disposal methods appropriate to the conditions in developing countries. Most developing countries are in arid environments; therefore their climates differ from those in wet areas of UK or USA. The climatic effects on wastes should be studied and relevant disposal methods applied in developing countries. An example can be the use of constructed wetlands to treat wastewater from septic tanks or other primary treatment processes.

Overview

The effective disposal of wastes may be attained after waste has been sorted for resource recovery; the remaining matter then is discarded. For waste to be efficiently disposed of, it should have no negative impacts on the environment. Waste disposal comes as a final step in the processes of waste management; that is, after attempts have been made to apply the “3Rs”, namely, *reduce, reuse and recycle*. Solid wastes that have been generated may be sorted for resource recovery prior to disposal. Hazardous wastes on the other hand hardly ever require any sorting; they usually undergo treatment and disposal.

This chapter will *focus on modes of transporting solid wastes to the disposal sites; it will assess the disposal practices that are in use and their effectiveness in developing countries*. Methods used to dispose of hazardous wastes will also be scrutinised. Suggestions will be given on how to effectively dispose of wastes in developing countries. Solid wastes may be transported for disposal by means of ordinary trucks or compactor collector vehicles. The waste must be well contained to avoid spills or falling off of loose material along the way.

In more developed countries (MDCs) wastes are transferred from collector trucks to larger forms of transportation to the landfills. These may be huge trucks, trailers, or rail carriages (Economopoulos, 1992). This transfer is prompted by the distant location of landfills in most developed countries. *The situation differs in most developing countries where the collecting trucks transport wastes to the disposal area.*

Ideally solid and hazardous wastes are discarded at different landfills; this is the case in most developed countries where numerous quantities of hazardous waste are generated. *Developing countries generally do not have separate disposal systems for solid and hazardous wastes; all wastes tend to be dumped into single dumping location.* Recently Botswana introduced guidelines for waste disposal using landfills. These contain procedures for handling solid and hazardous wastes separately (National Conservation Strategy Agency, German Technical Co-operation, 1995).

Developing countries still lag behind when it comes to handling hazardous waste, especially because these wastes reach these countries as some form of imports. Most African countries, for example, do not manufacture hazardous products. In some of these countries imports of such substances were introduced during the colonial period. One example relates to Mauritius, where European colonialists introduced pesticides, and since then Mauritius became an internationally known importer of agro-chemicals (Government of Mauritius, 1992).

Developing countries seem to have difficulties when it comes to handling wastewater: this type of waste seems to be the most threatening to handle in the developing world. For instance Harare is recorded to have experienced heavy pollution from effluents to the extent that there have been fish kills reported in the receiving reservoirs such as Lake Chivero. The fish kills are suspected to have been due to domestic wastewater pollution in the lake (Zava, 1996).

Transportation of Wastes

Trucks usually transport solid wastes from the point of collection to the

disposal site. The nature of the waste and the availability of the resources determine the means of transportation. For instance, paper waste is transported in open trucks that have wire mesh surrounding the truck, this just keeps the loose materials from falling off. Compactor trucks also collect waste materials that can be compacted easily. Individuals transport solid wastes such as rubble on privately owned trucks, tractors or other vehicles.

In rural areas there are more means of transporting wastes than through trucks, the use of horse or donkey carts is quite convenient especially when trucks are not easily available. As rural communities develop awareness for sanitary management of waste, novel methods of transporting wastes also mushroom. This is quite an appropriate method for LDCs since there is no need to worry about costs of purchasing vehicles and paying for fuel. The method also protects the environment from atmospheric pollution caused by fuel combustion when vehicles are used. These carts have a few limitations though. Horse carts cannot carry all waste categories; for instance hazardous waste cannot be transported in such a cart. The carts are not designed such that compaction of waste may be possible. Governments in developing countries should encourage and improve these means of transporting wastes.

The effectiveness of waste transfer to disposal areas is determined by the availability of resources as, for example, the mode of transportation for collection and disposal. *Developing countries are confronted with the pressure of maintaining a habitable environment. On the other hand they struggle to meet the basic needs in their countries i.e. shelter, clothing, food supply.* Basic human requirements must be given priority over environmental management and other secondary factors. As such this creates a dilemma for poorer countries.

Hazardous wastes including wastes from medical centres may require special equipment for transfer to disposal sites. Plastic bags may be used for transporting swabs and other similar wastes. More rigid plastic containers and boxes are used for other wastes, for example, human tissue, sharps and so forth. It is recommended that these wastes be pre-treated prior to disposal. *Developing countries are shifting towards managing their wastes effectively. Historically there has been misinformation about hazardous waste handling and disposal.* Since such wastes were mostly generated in more developed countries (MDCs), they would be transferred directly for dumping in developing countries or indirectly through technology transfer. When one considers disastrous effects such material has had on developing countries, such instances as when the French tested their nuclear weapons on the Sahara desert, the radiation from the waste generated had severe health impacts on the communities in Nigeria and neighbouring countries.

Disposal of Solid and Hazardous Wastes

Municipal solid waste is usually dumped in pits, local dumpsites or landfills. Individual households in rural areas dig pits in their backyards to dispose of wastes generated in the homes. Dumpsites are typical open spaces designated by local authorities for waste disposal. These do not necessarily follow sanitary means of managing waste; they are, nevertheless, useful for dumping inert wastes. An example of a typical local dumpsite in Botswana can be observed in Ramotswa village, in Southeast Botswana. At such dumpsites sorting of recyclable matter remains a necessary undertaking.

Disposing of hazardous wastes tends to be more complicated due to the nature of the waste. In countries like Botswana these wastes are incinerated or eliminated by open burning. In some areas they are just dumped at local dumpsites without pre-treatment. Open burning proves to be quite ineffective for certain types of hazardous wastes as the temperature cannot be controlled (NCSA, GTZ, 1996). *Simplified incinerators exist in developing countries. These may be constructed using bricks or metal.* There are also Type II incinerators (Low Technology Manufactured Incinerators). These are used in major hospitals and certain clinics in Botswana. Type II incinerator reach up to 900 degrees Celsius. The multi-hearth surface is another type of incinerators, functionally useful for hydrated industrial wastes and for sewage sludge. *The use of sanitary landfills for discarding wastes is a new technique being adopted by developing countries.* The Botswana government, for example, undertook pilot studies to assess ways of introducing sanitary landfills in the country. This resulted in guidelines and recommendations of appropriate disposal of wastes in the local environment. Wastes can be sorted at the landfill or at source of generation. For instance, the Gaborone landfill has sorting centres for tyres, metal scrap, construction waste (or rubble). Construction waste is crushed and reused as cover material for wastes. A separate area is routinely demarcated nearer to the domestic and other food waste disposal cells, for sorting and storage of beverage cans to be recycled.

Disposal of Liquid Wastes

The complications related to the disposal of liquid wastes seem to threaten the developing countries. That may be due to the arid conditions of most LDCs, which then experience less pollution from leachate emanating from dumpsites or landfills. A typical situation exists where oil wastes and wastewater appear impossible to handle in an environmentally safe manner.

Used Oils are stored in various size containers and in underground storage containers for resource recovery. These waste oils cannot be dumped anyhow, so they accumulate in storage containers, from which minimal amounts are

collected for reuse and recycling (Central Transport Organisation, 1998). No alternative method of handling or recycling these oils has been attained, but there are small-scale reuse practices that can still be expanded further. Used oils have tended to be stored in a way that helps little to combat damage to the environment: their result spills and flows into neighbouring streams. It is recommended that containers of used oils, particularly customary 200 litre drums containing oil should be stored in a place with a concrete slab, and an impenetrable wall that can safely prevent spillages or leakages.

Wastewater also becomes disposed of not in landfills but in other ways. Sludge from wastewater treatment plants sometimes ends up in landfills or dumpsites. The understanding of the effects this has on the soil, air or groundwater is not much known. There may be contamination from methane gas due to high organic content of such wastes. Contribution to groundwater contamination may only be confirmed through research or field studies carried on in affected areas. The disposal of wastewater usually follows a different system from that of solid wastes. The effluents discharged into the environment must not in any way deteriorate the quality of that receiving stream. As such developing countries, such as Botswana, carry out routine monitoring of treated effluent to control pollution of receiving waters and of the environment.

Treated effluents usually flow into existing channels or are disposed of in open environment. Effective disposal of wastewater implies treatment to compliance levels prior to disposal. It may also imply reusing such wastewater in an environmentally safe method. At present wastewater from Gaborone, Botswana, for example, undergoes treatment in the activated sludge treatment plant, which commenced operating late 1997. Whether this is an effective method of waste disposal is debatable. It depends on whether the method is the best suitable for the environment of Botswana and whether it is economically viable not only to operate the plant but to maintain it as well. However the plant is operating well and discharges effluents within the required quality.

Suggestions for Achieving Effective Waste Disposal

There is yet more that LDCs ought to do to attain the goal of effectively discarding or eliminating wastes. The common practices of indiscriminately dumping wastes in the open environment, though fading away, results in serious health and pollution problems in developing countries. As LDCs aim for efficiency in handling and disposal of wastes, efforts should be made by local authorities and policy makers to develop appropriate methods and techniques for these wastes. One of the problems with the current methods of treatment/disposal through open burning is that the process does not proceed to completion. Similar and even worse problems result from open dumpsites. The process of digging pits in back yards may only temporarily solve the waste

problem, but in areas where topography and hydrological conditions are unfavourable, pollution may result.

The author wishes to suggest to developing countries to avoid re-inventing the wheel. MDCs have already encountered complications that result from indiscriminate dumping of wastes. LDCs may learn their methods of handling wastes but not adopt them as raw as they are. It will be prudent for developing countries to assess their waste situations and develop methods which are applicable to their country circumstances in the handling and discarding of wastes. For instance innovation centres, such as the Rural Industries Innovation Centre (RIIC) in Botswana, can be encouraged and supported for developing waste handling techniques as well as waste containers applicable to a sub-region. Developing countries should promote waste disposal methods which suit their environments, and which they can efficiently run without resource limitations. Taking advantage of warm temperatures and climates, biological methods of wastewater treatment using reed-beds in constructed wetlands to treat sewage may be widely practised, can be novel and innovative.

References

Economopoulos A. P., (1992). *Assessment of Sources of Air, Water and Land Pollution*. Holland.

Government of Mauritius, (1991). *State of the Environment in Mauritius: Report*. Port Louis.

National Conservation Strategy Agency, German Technological Co-operation (NCS/GTZ), (1995). *Guidelines for the Disposal of Wastes by Landfill*. Draft Report. Gaborone.

NCS/GTZ, (1996). *Study on the Management of Oil Containing Wastes*. NCS, Gaborone.