

AN OVERVIEW OF THE MANAGEMENT PRACTICES AT SOLID WASTE DISPOSAL SITES IN AFRICAN CITIES AND TOWNS

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ABSTRACT

Operations at solid waste dumpsites in sub-Saharan Africa were explored by reviewing work done by scholars in different parts of Africa. It was established that engineered landfills were found mainly in South Africa, Botswana and Zimbabwe, while most countries use the open dumping method. Some landfills have been downgraded and now function as open dumps because municipalities do not have the financial capacity to maintain them. In most cases no environmental impact assessment was done, and municipalities took advantage of borrow pits and were recovering these by filling them with waste. The management of the dumpsites is very poor and they are a serious threat to the environment. However, even with their limited resources municipalities in Africa could improve conditions at current sites by instituting integrated waste management, improving awareness amongst their citizens, and encouraging reuse and recycling of waste materials.

Keywords: Sub-Saharan Africa, Solid Waste Disposal Sites, Open Dumps

INTRODUCTION

Land filling has been the most common method of solid waste disposal generated by different communities for many years (Komilis, Ham, & Stegmann, 1999). Three types of landfills are an integral part of most solid waste systems. These are the open dump, the semi-controlled landfill, and the sanitary landfill. The majority of urban centers in the developing world (including Africa) use open dumping as their principal disposal method (Rushbrook, 1999). Agunwamba (1998) contends that in 1998 there were only two landfills in Nigeria. By 2007, the situation had not changed as Abuja, the capital city of Nigeria, did not have sanitary landfills for waste disposal, and all solid waste from formal collection in the various districts were transported to a single site at Mpape (Imam, Mohammed, Wilson, & Cheeseman, 2008). Botswana has over 175 waste disposal sites throughout the country, only two of which are properly engineered landfills, but one has been reduced to an ordinary waste dump due to poor management and maintenance (Simon and Phatshwe in Gwebu, 2003). This picture is typical for the rest of Africa. This presents a host of problems as the open dumps expose people, animals, and the environment to serious risks. Most local authorities seem not to pay adequate attention to the dumps, because they do not know better systems and what happens there is out of their sights. It is important to operate them as efficiently as possible to mitigate any health and environmental disasters that may result from the neglect of waste dumps.

CONCEPTUAL FRAMEWORK

Open dumps are the preferred method of disposing of solid waste as an alternative of landfills in most African countries. In open dumps refuse is simply dumped in low lying areas on open land. Open dumps are characterized by an absence of engineered measures, no leachate management or consideration of landfill gas management, and few if any operational measures, such as registration of users, control of the number of tipping fronts, or compaction of waste (Zerbock, 2003). Waste is tipped haphazardly. This method is neither hygienic nor safe. However, African countries have very little choice but to hang on to this method. Local governments think that uncontrolled waste disposal is the best that is possible, because of financial and institutional constraints. Most local governments are weak, underfunded, and are faced with growing populations; hence they cannot raise enough funds to construct properly engineered landfills.

In some developing countries semi-controlled or operated landfills are used. For these, waste is dumped at a designated site and the dumped refuse is compacted, then a topsoil cover is provided daily to prevent nuisance. All kinds whether municipal, industrial, or clinical/hospital waste is dumped without segregation. The dumpsite is not engineered to manage the leachate discharge and emissions of landfill gases.

Sanitary landfills are properly engineered and found in developed countries. They have facilities for the interception of leachate generation and its treatment using a series of ponds, and they have arrangements for the control of gases from waste decomposition. These are costly to construct and most developing countries cannot afford them unless they get external funding (Oyaro, 2003). This is the desired method, but due to the high costs involved in establishing them, they remain a pipe dream.

The word landfill is widely misused owing to the fact that there is no rigid definition; hence the operational aspects of the word remain unclear. It is used loosely to refer to any form of dumpsite, yet in essence this refers to an engineered waste disposal site, which has very little environmental impact. Some prefer to call the open dumps disposal sites. The term open dump will be used to refer to uncontrolled disposal sites which are at the center of this discussion.

Leachate is a liquid associated mainly with open dumps. Leachate is produced when rainwater percolates through waste dumped in a disposal site. This water collects at the base of the dump. Leachate is usually composed of inorganic ions and organic constituents that were present in the original waste and organic products resulting from microbial activity. Trace metal such as lead, iron, copper, zinc, and manganese. are found in leachates, and leachates contaminate groundwater. Dumps also contaminate water as allochthonous organic matter enters the water by surface runoff, which carries leachates from disposal sites.

SITING OF OPEN DUMPSITES

Siting a sanitary landfill requires an extensive evaluation process in order to identify the best available disposal location. This location must comply with the requirements of government regulations, and at the same time must minimize economic, environmental, health, and social costs (Siddiqui, Everett, & Viewx, 1996). In assessing a site as a possible location for solid waste land filling many factors need to be considered, and these are categorized as topography and geology, socio-economic effects, economy and safety, and natural resources (Savage, Diaz, & Golueke, 1998). Most of the open dumpsites in Africa

were arbitrarily located. Very little or no consideration of environmental impacts were paid in the selection of the dumpsites. Under normal circumstances, an environmental impact assessment is a prerequisite when siting a new dumpsite. However, in most cases convenience takes priority. There has been a tendency by local authorities to locate dumpsites near collection areas.

The dump must not be located too far away from residential areas as this would deter people from carrying their wastes to these sites. It turns out that borrow pits and quarries are often selected as a reclamation strategy. Love, Zingoni, Ravengai, and Owen (2006) assert that the Golden Quarry landfill site in Harare, Zimbabwe, is an abandoned gold mine which started operating as a landfill in 1985 to reclaim the land by filling the shafts and pits. Rotich, Zhao, & Dong (2006) contend that in Eldoret, Kenya, an abandoned sand quarry at Mwendeni was used for the disposal of municipal solid waste, yet it was clear that the site was a water catchment area for small streams that drain into the Sosiani River. The Dandora municipal dumping site in Nairobi, Kenya, is an old quarry which had to be refilled using garbage. It has turned out to be a health hazard to the people living close to its environs (Environmental News Service, 2007).

PRACTICES AT THE DUMPSITES

Generally, the practices at municipal dumpsites are not effective. Dumping is unrestricted and industrial, agricultural, domestic, and medical wastes end up in one site. Dumpsites are not always fenced off as in some cases the perimeter fence has been stolen or vandalized. This allows easy access to the site at any time of the day. Mangizvo (2008) observed that the perimeter fence at Mucheke Municipal dumpsite had been removed and the place was not guarded, enabling the dumping of restricted materials, such as car batteries and metals. Scavengers had free access to the dump, and they mixed up the waste as they dug into it to salvage any valuable material. As a result of poor control, medical and hazardous wastes end up at municipal dumpsites even though they have their own special dumping areas. In Dar es Salaam City, industrialists and hospital owners take their waste to the Vingunguti dumpsite (Mato & Kaseva, 1999). In Ibadan, Nigeria, pathological wastes and sharps from the city's hospitals are dumped in an unregulated and haphazard manner in open dumpsites at Aba-Eku, Aperin-Oniyere, and Ajakanga. Maintenance of the open dumps is also an issue; there is no compaction and covering of waste (Agunwamba, 1998). As a result waste is easily blown away by the wind, making it an eyesore as plastics litter the area around the dump. Most local authorities resort to burning the waste to curb the nuisance produced by flying litter. Scavengers and workers at the dump run the risk of contracting respiratory diseases as they inhale the smoke. The lack of soil cover enables rainwater to infiltrate refuse and produce leachate that contaminates ground water reserves.

THREATS POSED BY SOLID WASTE DUMPSITES

The uncontrolled manner in which solid waste is disposed of at most open dumpsites creates serious health problems to humans, animals, and environmental degradation. This inadequate waste disposal translates into economic and other welfare losses (Zurbrugg, 2002). The environment is degraded in a number of ways. Soil is contaminated by being in contact with solid waste and leachate. In a study on a dumpsite in Kariba in Zimbabwe, trace metal concentrations were determined in soil samples collected from the area during 1996 and 1997. Accumulation of copper (Cu), lead (Pb), iron (Fe), and zinc (Zn) were found within the disposal site (Chifamba, 2007). Concentration of Zn, Pb, and Cu were in surface soil samples up to 75

meters away from the disposal site. Leachates collected from Ibadan and Lagos dumpsites had appreciable levels of dissolved solids, chloride, ammonia, chemical oxygen demand (COD), lead, iron, copper, and manganese. This was most likely a result of rampant dumping of lead acid car batteries and metal scraps (Ikem, Osibanjo, Sridhar, & Sobande, 2002). In a study carried out at Dandora dumpsite, 42% of soil samples had ten times higher lead levels than normal (Oyaro, 2003). Leachates also contaminate both ground and surface water. During floods, water mixed with leachate may flow out of the dumpsites and get into nearby ponds, streams, and rivers. The Nairobi River for example, passes through the Dandora Municipal Dumping site, and some of the waste from the site finds its way into the river (Environmental News Service, 2007). This is a health risk to the communities near the dump and those downstream who may be using the water for various purposes. In Eldoret town, the operation of an open dumpsite near the Mwenderi River has greatly polluted the Sosiani River, because the dumpsite, formerly a sand quarry, has small streams draining into the Sosiani River (Rotich et al., 2006). The study at Kariba showed that water samples taken from the vicinity of the dumpsite had a high level of concentration of mercury (Hg) and Pb (Chifamba, 2007). Okonkwo and Mothiba (2004) found a high concentration of lead in the Madanzhe and Mvudi Rivers in Thohoyandou, South Africa, which was attributed to the effluent from a nearby sewage treatment plant and a waste dumping site, which leachate had contaminated with lead flowing into the rivers. The Golden Quarry landfill in Harare pollutes ground water in the area close to it. Levels of coliforms, cadmium, iron, lead, and nitrates were above the water quality guidelines throughout the nearby suburb of Westlea (Love, Zingoni, Ravengai, & Owen, 2006). Water in the suburb is not suitable for domestic use. Mangizvo (2008) identified in a study of the Mucheke Municipal dumpsite in Masvingo, Zimbabwe, that soils within a 50 meter radius had been contaminated by trace metals of lead, iron, copper, zinc, and phosphorus.

Rapid urbanization has resulted in existing dumping sites originally located at a safe distance outside the municipal boundaries are now being increasingly encircled by settlements and housing estates (Schertenleib & Meyer, 1992). This has caused the public to oppose their existence as they cause odor, dust, and other nuisances. People living close to dumpsites are in danger of contracting diseases associated with dumps. Oyaro (2003) notes that tests conducted on 328 children living near the Dandora dumpsite found that half of them had excess concentrations of lead in their blood. They were also disproportionately affected by anemia, skin infections, asthma, and other respiratory diseases. These conditions are associated with high levels of toxins at the dumpsite, which receives plastics, rubber, wood, metals, chemicals, and hospital waste (Environmental News Services, 2007; Oyaro, 2003)

Thousands of poverty stricken Africans make a living through salvaging recoverable materials from waste sites. Daily, women, the elderly, and children spend long hours at the open solid waste dumps sifting through the rubbish for valuable items. Wilson, Velis, and Cheeseman (2005) say these people use bare their hands and wear no protective clothing. This lack of protective clothing and equipment puts them in direct contact with hazardous waste such as broken glass, human and animal faecal matter, paper that may have become saturated with toxic materials, as well as containers with residues of chemical, pesticides, and solvents. They are also exposed to needles, bandages, and other refuse from hospitals, exposing them to diseases, such as HIV and AIDS, and hepatitis (Oyaro, 2003). This state of affairs was observed at the Dandora dumpsite in Nairobi, Kenya. Informal waste pickers are at high risk as basic principles of occupational health and safety are disregarded. As such scavenging in open dumps is considered one of the most detrimental activities to health. Some people

come to the dumps looking for food. They are not spared from the inhalation of bio-aerosols, and of smoke and fumes produced by open burning of waste, which can also cause health problems. Respiratory and dermatological problems, eye infections, and low life expectancy are common among these people.

WAY FORWARD

The open dumping in sub-Saharan Africa, even though detrimental to human health, will remain in use as most countries are not able to construct landfills. Most of them are currently pressed with other issues that need immediate attention, such as provision of food to starving poor people, as the result of recurrent droughts. But it is imperative to improve the open dumps so that they do not remain a health hazard. They could adopt some of the ideas suggested below:

- **Integrated waste management:** this includes waste reduction, recycling, composting, and reuse. Composting is an excellent way of recycling biodegradable waste from an ecological point of view (Zurbrugg, 2003). However, large and small composting schemes have failed because not enough attention was given to the marketing and the quality of the product. It is important to establish a market and a demand for compost product. Local authorities, before looking for markets, could use the composts in their own municipal flower beds, as well as municipal gardens.
- **Awareness and attitudes:** public awareness and attitudes to waste can affect the population's willingness to participate and cooperate in adequate waste management practices. The population needs to be reminded time and again of the importance of environmental awareness and the health risks associated with poor waste management practices. Residents and dumpsite users should realize the importance of paying for waste management services. Residents in municipal areas need to segregate waste to assist in the recycling process.
- **Education and awareness campaigns:** municipalities need to have campaigns on a regular basis in communities and schools.
- **Resource recovery and recycling activities:** in the developing world this activity is driven by the informal sector and in most cases it is done in an unsafe manner. Municipal authorities in some cases actually hinder such recovery activities. Attitudes towards informal waste recovery should be positive and supported from local authorities and companies who ultimately use the recovered materials. Companies need to improve payments for the waste they buy from scavengers.
- **The municipalities need to realize that open dumping remains the most viable option in solid waste disposal, due to its affordability. However, in its current forms of operation it is not sustainable and dumping should be regulated. There is an urgent need to improve the open dumping system. It may be necessary to upgrade it to semi controlled landfills. This means that, instead of having a proper lining at the base, the base must be compacted, to reduce infiltration of leachate to ground water. The waste should be covered with soil on a regular basis to prevent diseases vectors, such as flies, from getting to the waste. This will reduce the amount of odor that is released from dumpsites. The dumps should be fenced off and protected. The fence will hold some of the flying litter, as well as stopping animals from getting into the dump. At the site organic and inorganic wastes must be separated to allow for easier reclamation of recyclable materials.**

CONCLUSIONS

Open dumping will continue to be the way of disposing waste by municipalities in Africa as discussed above, due to their inability to construct engineered landfills. Most local authorities pay little attention to their management because either they do not have adequate resources or they do not know of better systems. Open dumps are a threat to the environment as litter is blown out of the site and poisonous leachates continue to contaminate groundwater. It is therefore important to ensure that the open dumps are improved upon and attention is given so that they do not become environmental hazards.

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