



Challenges of Solid Waste Disposal in Nigeria: A Review

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ABSTRACT

Solid waste management is the most pressing environmental challenge faced by urban and rural areas not only in Nigeria but in many developing countries. Therefore, it has been the centre of discussion for most of the environmentalists and also for the local governing bodies. Wastes are being generated mainly from municipal land uses. Efficient and effective waste management is best achieved at household levels. If every person gets involved, we can have a powerful effect on the environment in a positive way. By Reducing, Reusing other things like empty cans, Recycling the recyclables like paper and Rejecting unused items from the commercial like package of freezer instead of taking it home the amount of waste we generate in our environment can be minimize. Creating awareness on the strategies of waste management will go a long way in minimizing the problems of solid waste. Also the Government should strengthen the system for solid waste management i.e. by providing facilities such as waste bins at strategic places, human resources, vehicles, regular collection centres and use better disposal methods appropriately. Organic wastes can conveniently be composted. The remaining waste that can not fit into any of the above steps; reduce, reuse, recycle and composting can be disposed properly using the most convenient method. This paper discussed different methods of solid waste disposal practiced in both developed and developing countries and their problems which pose several negative impacts on humans and the environment in general.

Key words: Solid waste, Management, Disposal, Nigeria

1.0 INTRODUCTION

Solid waste can be almost anything, including food, leaves, newspapers, bottles, animal manure (dung), poultry droppings, dead plant or animal, disposable diapers, old cars, or radioactive materials (biodegradable and non-biodegradable). Reckless disposal of solid waste has led to blockage of sewers, drainage networks and choking of water bodies. Most of the wastes are generated by households and in some cases, by local industries, artisans and traders which litter the immediate surroundings. In Nigeria, Improper collection and disposal of wastes is leading to an environmental catastrophe as the country currently lack adequate budgetary provisions for the implementation of integrated waste management programmes across the States (Wale, 2016). The primary objective of waste management today, is to protect the public and the environment from potentially harmful effects of waste. Governments and industries are

constantly on the lookout for technologies that will allow for more efficient and cost-effective waste treatment option (Alvarez *et al.*, 2006).

Waste management is all the activities and actions required to manage waste from its inception to its final disposal (GES, 1997). This includes amongst other things, collection, transport, treatment and disposal of waste together with monitoring and regulation. As long as humans have been living in settled communities, solid waste, or garbage, has been an issue, and modern societies generate far more solid waste than early humans ever did (Mondal, 2014). These resulted as industry and technology have evolved and the human population has grown, waste management has become increasingly complex.

Solid waste management is the most pressing environmental challenge faced by urban and rural areas of Nigeria and other developing nations. Nigeria, with population exceeding 170 million,

is one of the largest producers of solid waste in Africa (Nigeria generates more than 32 million tons of solid waste annually, out of which only 20-30% is collected). The main components of these wastes are organic materials, paper, plastics/rubbers, textiles, and metals. These wastes are stored and transported in and through the society's living space and have a great potential of adversely affecting the health and hygiene of the people living in the areas concerned. It also has a potential for affecting the aesthetic of the environment.

General composition of refuse in most places in Nigeria constitutes about 70% organic materials and 30% non-organic materials (347 land fill recovery). Despite a host of policies and regulations, solid waste management in the country is assuming alarming proportions with each passing day (Wale, 2016). Piles of wastes are often found by roads, rivers and many other

open spaces in cities, and this is causing significant health and environmental problems. The urban population is growing at an alarming rate. While the Nigerian population is increasing by about 2.8% per annum, the rate of urban growth is as high as 5.5% per annum (UDBN, 1998). This is increasing the difficulties associated with providing an effective solid waste management system. As cities grow, land use becomes increasingly complex and the wastes generated increase in volume and variety (Omuta, 1987). And without adequate investment in collection, transport, treatment and disposal facilities.

These problems are further complicated by political, economic and social factors. The average waste generation rate in Abuja is 0.55–0.58kg per person per day (Solid Waste Audit Report, 2004).

Table : Typical Waste Generation of Some Urban Cities in Nigeria(Ogwueleka, 2009)

City	Population	Agency	Tonnage per Month	Density (kg/m ³)	Kg/capita/day
Lagos	8,029,20	Lagos State Management Authority	255,556	294	0.63
Kano	3,348,70	Kano State Environmental Protection Agency	156,676	290	0.56
Ibadan	307,840	Oyo State Environmental Protection Commission	135,391	330	0.51
Kaduna	1,458,90	Kaduna State Environmental Protection Agency	114,433	320	0.58
Port Harcourt	1,053,90	Rivers State Environmental Protection Agency	117,825	300	0.60
Makurdi	249,00	Urban Development Board	24,242	340	0.48
Onitsha	509,500	Anambra State Environmental Protection Agency	84,137	310	0.53
Nsukka	100,700	Enugu State Environmental Protection Agency	12,000	370	0.44
Abuja	159,900	Abuja Environmental Protection Agency	14,785	280	0.66

1.1 Statement of the Problem

Waste disposal remains a problematic issue especially in developing nations like ours, there is increasing accumulation of waste in the urban areas which pose a threat to human health and aesthetics. There is need to create awareness on its consequences on human and environment and also highlight on the better ways for people to practice.

1.2 Objective

The main objectives of the paper are as follows;

- To explore the various ways of managing solid waste
- To create awareness on the consequences of improper waste disposal
- To find out what pollution or environmental threat resulted from common waste disposal methods.
- To highlight and recommend improved ways of solid waste management.

2.0 METHODS OF SOLID WASTE DISPOSAL

The various methods of solid waste management could be classified as follows;

- a. Sanitary Landfill (garbage dump or dumping ground)
- b. Incineration: This process is also known as thermal treatment.
- c. Composting (biological waste treatment)
- d. Open burning
- e. And dumping in a sea or water passage. Etc

2.1 Sanitary Landfills

Generally, this term means a large piece of land away from living places where all the waste from a town is deposited. Proper landfill management involves sorting out all the waste (waste separation), and sending only the waste that cannot be recycled and composted to the site. Land fill is the oldest form of waste treatment (although the burial part is modern; historically, refuse was just left in piles or thrown into pits). Historically, landfills have been the most common method of organized waste disposal and remain so in many places around the world (Anon, 2013). Over 80% of municipal solid waste generated in China is land-filled. Land filling provides the cheapest and most convenient method of waste disposal today when operated efficiently (Krook, *et, al.*, 2012 and Morris and Barlaz, 2011). Several million tons of municipal solid waste (MSW) are disposed of in sanitary landfills (controlled landfill) and dump sites (uncontrolled landfills) daily around the world (EPA, 2005). Proper landfills are lined at the bottom to minimize the leakage of soil pollutants and other toxins from getting into the water table (Anon, 2015).

In places where there are no provisions for the landfills, it is a common sight to see the wastes being dumped at every place. The people tend to dispose of the wastes wherever they feel right. Most of the times, the nearby water body becomes the victim of such improper waste disposal (Henry, 2016).

Advantages:

1. The advantages of landfill is that; Land filled areas can be reclaimed and used for other purposes.
2. Natural resources are returned to soil and recycled (Gour, 2013).

3. Waste in landfills releases gases like methane and carbon dioxide when they get decomposed automatically, this gas is then used by the vast landfill plants to generate energy
4. The implementation of landfill gas energy (LFGE) projects reduces greenhouse gases and air pollutants, leading to improved local air quality and reduced possible health risks (CPE, 2010).
5. The gases evolved by the landfills are trapped in by the machinery of the power generation plants, where it provides electricity (Henry, 2016).

However, these benefits are still not fully taken advantage of in Nigeria (CPE, 2010). This is partly because the major issues that determine success of a LFGE have not been addressed in Nigeria. Landfills are the third largest anthropogenic (human influenced) emission source, Nigeria's estimated anthropogenic methane emissions ranked ninth in the world (EPA, 2005). Hence, Nigeria is a major contributor to the global methane emission.

Disadvantages:

1. Large area is required for land fill and away from the town,
2. Transportation costs are high, lead to bad odour and source of mosquitoes and flies if landfill is not properly managed.
3. Causes fire hazard due to formation of methane in wet weather (Gour, 2013).
4. Leachates is another potentially major source of pollution, which is the highly toxic liquid that can then seep into the top layer of soil and in fact even percolate down to affect the groundwater and other water bodies and hence harm the ecosystem in many ways (Henry, 2016).

2.2 Incineration:

This process is also known as thermal treatment where solid waste materials are converted by Incinerators into heat, gas, steam and ash. Incineration of solid waste is suitable if waste contains more hazardous material and organic content (combustible refuse). Incineration is practiced in countries where landfill space is no longer available, which includes Japan. It is expensive when compared to composting or land-filling (ANON, 2015). An incinerator is constructed of heavy, well-insulated materials, so that it does not give off extreme amounts of

external heat (Mondal, 2016). It also requires sorting out of the waste just like the land fill, to prevent including materials such as glass(non-combustible) (Mondal, 2016).

Advantages

1. Incineration reduces the volume of waste to only 20-25% of the original volume and it requires very little space
2. Cost of transportation is not high if the incinerator is located within city limits and reduces the stress on landfills.

Disadvantages

1. Its capital and operating cost is high,
2. Operation needs skilled personnel and ashes needs further disposal
3. Incineration method emits gaseous pollutants, dust and smoke (Gour, 2013).

2.3 Composting

This is another popular method practiced in many cities. In this method, bulk organic waste is converted into fertilizer by biological action (biological waste treatment). Separated compostable waste is dumped in underground trenches in layers. Minimizing waste generation and recycling have become the focus of governmental agencies in many countries to reduce human impacts on the environment. With this focus, composting has received a high ranking in the hierarchy of recycling methods and continues to gain importance throughout the world for the conversion of organic by-products to new resources. The waste is finally converted into humus that has a fertilizing value as it contains lots of Nitrogen, phosphates and other minerals which are needed for good growth of plant (Anon, 2016). Composting can be done in depth compost pit, composting on plain earth surface and anaerobic digestion in a bioreactor.

Advantages

1. A good quality nutrient rich and environmental friendly manure is formed which improves the soil conditions and fertility.
2. Composting ensures nutrients are recycled and returned to the soil.
3. It increases the soil's ability to retain water, nutrients and makes the soil easier to cultivate (Mondal, 2016).

Disadvantages

The problems that arise when making compost are few and the solutions are many, (such as odour, lack of water,). Non-compostables have to

be disposed separately; the technology has not caught-up with the farmers and hence does not have an assured market (Gour, 2013).

2.4 Gasification and Pyrolysis: These are two similar methods, both of which decompose organic waste materials by exposing waste to low amounts of oxygen and very high temperature. Pyrolysis uses absolutely no oxygen while gasification allows a very low amount of oxygen in the process. Gasification is more advantageous as it allows the burning process to recover energy without causing air pollution (Rick, 2016).

Past studies established that these disposal methods discussed above are commonly used in developed countries (Nwachukwu *et al.*, 2010 ; Alhassan and Mohammed, 2013 and Kumar and Nandini, 2013). There are other solid waste disposal methods mainly employed in developing nations (Afon, 2005; Afon, 2008; Nwachukwu *et al.*, 2010 and Njoroge *et al.*, 2013). These methods include the use of designated and incidental open spaces, dumping of waste into drainage during and after rainfall, on river banks, beside road, burning and burying. Others include the use of uncompleted building, vacant land, and collection by government refuse van, private waste managers, and cart pushers. These methods are considered both naive and dangerous, as they are environmentally unfriendly (Rushbrook and Pugh, 1999; Ayuba *et al.*, 2013; Mohapatra, 2013 and Vasanta and Priyasauni, 2013). Nigerian cities such as Lagos, Ibadan, Kano, Rivers, Jigawa and others practice these methods. Therefore, Piles of solid wastes are often found along roads, underneath bridges, in culverts and drainage channels and in other open spaces.

2.5 Open Burning: (thermal waste treatment that is environmentally harmful) it is not an ideal method in the present day context. Burning of municipal wastes is a common practice in Nigeria (Wale, 2016). It is referred to as uncontrolled incineration.

2.6 Dumping into the Sea: The mountainous heaps of solid wastes that deface Nigerian cities and the continuous discharge of industrial contaminants into the streams and rivers without treatment motivated the Federal government of Nigeria to enact the Decree 58 for the establishment of Federal Environmental Protection Agency (FEPA) on 30th Dec. 1988 (FMG, 1988). In spite of the formulation of FEPA and a national environmental Policy, the

environment has not been adequately protected (Agunwamba, 1998).

Similarly, according to a research conducted in Lagos as a form of social service and environmental management initiative provided by the Lagos State Government, 16.2%, 10.5%, and 27.2% of the residents in the high, medium, and low densities, respectively, indicated that they often disposed their solid waste in Lagos State Waste Management's (LAWMA) refuse facility. Despite the above findings, the study still established that indiscriminate waste disposal was prevalent in Lagos metropolis. This assertion is premised on the fact that (21.9%, 21.1%, and 22.7%) of the residents disposed solid waste on the road in the high, medium, and low densities, respectively: a proportion as high as 16.5% and 18% of the residents dumped waste in the drain during rainfall. Burning as a form of disposal practice accounted for 8.4% and 11.5% in the high and medium densities, respectively. The dumping of waste on open space was a practice found in all the three residential densities. It however accounted for 10.8%, 12.5%, and 11.3% of all the disposal methods in the high, medium, and low residential densities, respectively. The disposal of waste on vacant plots of land was common in places where landholders were yet to develop such land (Oluwole, 2014).

3.1 Challenges of solid waste disposal in Nigeria

1. **Irregular waste collection:** Waste collection is irregular and restricted to major cities. Improperly sited open dumps, deface several cities, thereby, endangering public health by encouraging the spread of odour and diseases, uncontrolled recycling of contaminated goods and pollution of water sources (Adegoke, 1989 and Singh, 1998).
2. **Methane:** As the wastes in landfills/dump sites break down, it produces methane which is a pungent-smelling gas that causes various disorders like headaches and nausea. In addition, methane is also flammable compound. Methane is lighter than air and can get accumulated in nearby buildings and houses. This can cause many problems for the people living in such areas and hence spread chronic disorders as well (Henry, 2016).
3. **Poorly run landfills:** This may become nuisances because of vectors such as rats and flies which can cause infectious diseases. The occurrence of such vectors can be

mitigated through the use of daily cover. There are no sanitary landfills in Nigerian cities and towns.

4. **Open burning:** Open burning being it the most common method of disposal in Nigeria have negative impact on the health and environment in general, a lot of harmful substances (such as carbon dioxide, sulphur dioxide, nitrogen oxides, hydrochloric acid, dioxin and furans) are released into the atmosphere which affects not only humans but other animals like birds, in the form of smoke, ash, slag and sludge. Particular concern has focused on some very persistent organic compounds such as dioxins and furans that are harmful to human beings. The most popular methods used to dispose wastes in Nigeria is through open dumping of waste and burning of waste in various cities in Nigeria such as Lagos, Abuja, Ibadan, Kano as reported by many researchers (Oluwole, 2014).
5. **Lack of awareness:** There is a general lack of public awareness or concern regarding waste issues, and wastes are currently taken to a single poorly engineered land disposal site. The existing system suffers from unfavourable economics and institutional, legislative, technical and operational constraints (Imam, 2007).
6. **Dumping in water:** Wastes that end up in water bodies as practiced in Nigeria negatively change the chemical composition of the water. Technically, this is called water pollution. This will affect all ecosystems existing in the water. It can also cause harm to animals that drink from such polluted water.
7. **Soil contamination:** Hazardous chemicals that get into the soil (contaminants) can harm plants when they take up the contamination through their roots. If humans eat plants and animals that have been in contact with such polluted soils, there can be negative impact on their health. In many towns, sorting is not done, and all the waste (paper, food, diapers, glass) is mixed up and deposited. That is a problem because, glass, and plastics take thousands of years to decompose (Anon, 2015).
8. In 1985, the Federal Government of Nigeria introduced a major initiative, the

Environmental Sanitation (clean-up campaign). Under this initiative, all Nigerian residents were mandated to conduct compulsory environmental clean-up every last Saturday of the month. This initiative was good, but it was not well implemented. For example, the garbage and wastes collected during the Clean-up exercises were dumped along roadsides instead of dump sites designated by the local governments for the purpose. The waste was left to decompose naturally, to be eaten by animals, picked by scavengers, or washed away by rainwater/floods.

9. While waste collection projects have been planned and conducted successfully in some parts of Nigeria both by the private and public sector, there is rarely any concrete plan for proper disposal of waste in Nigeria. This is probably why there are presently no engineered sanitary landfills in Nigeria (World Bank, 2005).

In general, the problems with solid waste management in Nigeria can be summarized as follows:

- (i) Policy: Government policy on solid waste management in Nigeria is not comprehensive.
- (ii) Recycling: There are no significant recycling programs. The limited recycling programs are where scavengers look for recyclables items such as cans, plastics, bottles, and papers for resale or reuse. Resource recovery and recycling; The average recyclable content of waste in Nigeria is estimated at 28% (UDBN, 1998).
- (iii) Disposal: There are no sanitary landfills and proper incineration is not practiced in Nigeria
- (iv) Funding: There are limited or no funding for solid waste management in Nigeria (CPE, 2010).

1.2 Conclusion and Recommendation

Accumulation and production of waste can never be avoided but it can be minimized through the various steps such as; reducing and reuse of solid waste materials, recycling and recovering of these waste materials (known as 4Rs). Solid waste is not something that should be discarded or disposed of with no regard for future use. It can be a valuable resource if handled appropriately. This method (Reduce, Reuse,

Recycle and Recover) helps save money, energy, raw materials and reduces pollution. Therefore, with rational and consistent waste management practices there is an opportunity to reap a range of benefits. The following recommendations are put forward;

- a) Laws on waste disposal should be enforced
- b) Government should provide waste collecting centres
- c) Drainages should be kept clean, to avoid attraction by household dump of waste
- d) Waste at collection centres should be collected regularly
- e) People should be encouraged to provide individual collection centres
- f) Four R's should be enlightened
- (g) Government/ Agencies should purchase recyclable waste constituents from households.

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