Disposal and Management of Solid Waste in Damaturu, Yobe State, Nigeria: Challenges and Implications

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ABSTRACT

This study assesses the challenges of solid waste management and their implications in Damaturu, Yobe State, Nigeria. The data were generated through primary and secondary sources. A total of 50 copies of questionnaire were administered to households, civil servants, and Yobe State Environmental Protection Agency staff. Direct survey and interview were conducted. The findings of the study reveal that majority of the respondents have been living in Damaturu for more than 2 years. The type of soil wastes generated mostly were organic which are biodegradable, and the solid waste is dispose in open land by the inhabitants. Most of the respondents reveal that YOSEPA is managing their waste to some extent. Majority of the respondents dispose their waste on daily basis. Based on the findings, wastes in the environment have some implications to human health and aesthetic nature of the environment. Inadequate financing, low workforce and lack of adequate machinery are the major factors hindering the performance of the agency. Refuse collection containers preferably plastic bag should be provided to individual households at closer intervals in markets, shopping areas, streets and other commercial centers.

***Keywords**: Solid waste, Disposal, Management, Agency, Environment, Damaturu*

INTRODUCTION

According to United Nations Environmental Protection Agency (UNEP), wastes are substances or objects, which are disposed of or are intended to be disposed of or are required to be disposed of by the provision of national law (Basel Convention, 1989). However, the words "trash", "garbage", "refuse" and "rubbish", are used to refer to some forms of solid waste. The problem of solid waste is one of the most critical environmental problems facing Nigerian urban centers. A feature of urban scene in Nigeria in recent years is gradually taken over of virtually every available open space by solid waste. One event that acted partly to create, or at least worsen the waste problem situation in our urban centers is the rapid rate of population growth, the need for a baseline study to identify the major problems have been a challenge to the government and other members of the public. One of the most important achievements of the federal government of Nigeria in environmental management is the establishment of the Federal Environmental Protection Agency (FEPA) under Act No. 39 of 1988, and the subsequent creation of State Environmental Protection Agencies (SEPAs). The Yobe State Environmental Protection

Agency was established under 3[1] sub-section of Yobe State Edict No. 12 of 1991, which under the name shall be a body corporate with perpetual succession and a common seal, and may sue and be sued in its corporate name. The agency has the following functions:

1. Collection and disposal of both wet and dry refuse including human wastes
2. Street cleaning and maintenance
3. Enforcement of all the provision of its edicts
4. Control and abatement of nuisance
5. Industrial and premises hygiene
6. Burial of paupers
7. Market sanitation
8. Installation of refuse collection devices at appropriate points in the town.
9. In consultation with FEPA, ensure implementation and enforcement of FEPA's regulation in the State.
10. Co-operate with federal and state ministries, LGAs statutory bodies, research and educational institutes on matters relating to environmental protection.
11. Establishment of programmes on protection of the State environment.

However, 20 years after the creation of FEPA and SEPAs and their transformation into Federal ministries of environment, the problem is still remaining an eyesore to the society. Therefore, the survey focuses on the disposal and management of solid waste in Damaturu, Yobe State. Nigeria. The aim is to investigate what the problems and implications are.

MATERIALS AND METHOD

This study adopts the survey research design to assess the challenges of solid waste management and their implications in Damaturu, Yobe State, Nigeria. Systematic sampling technique was used to select four wards in Damaturu. Fifty copies of structured questionnaire were administered in four different wards (Nayi-Nawa, Ajari, Gwange and Tsohuwar, Kasuwa) selected randomly across the metropolis; ten for each ward. The remaining ten were distributed unbiased among YOSEPA staff. Direct survey and oral interview were conducted with residents and some of the staff of the agency. Information were also collected from gazette, reports, publications, journals, newspapers and other records of the agency. Data were collected from the final disposal site at Gashu'a road to assess its type, activities of the crew, working hours, health risk, methods used, etc. The data collected were analysed using simple percentage and frequency distribution tables.

RESULTS AND DISCUSSION

This study observes that solid waste should be collected at least once in a week; more frequent collection is often desirable for densely populated communities. During the warm months in general the amount of solid waste collected per stop receiving twice a week will be greater than the total amount of solid waste receiving once a week collection (YOSEPA Gazette, 2008). The number of men in a collection crew depends on the system, equipment

and type of services offered. In general, cost saving and high services level can be realized by using a minimum size crew except for the driver, the crew member time is normally non-productive during disposal trips. YOSEPA has various waste collection centers/depots at different wards for individual households; it is the responsibility of the agency to collect from the demarcated areas to final disposal site located along Gashu'a Road, Damaturu. Collection is not regular; it depends on the time available for the agency, with only 4 tippers carrying 5 tons of solid waste each. 1 tipper × 25 tons per month, the waste collected is disposed using crud tipping. The budget allocation of the agency is not enough to meet its services (< N50 million) but not regularly according to the Director Environment health unit, which is less than required when compared to other states.

Based on the 1975 industrial directory published by the federal government of Nigeria, industrial waste constitutes over 90% of the local wastes generated in the country (FEPA, 1998). Establishments generating these wastes include the mining and quarrying, wood and wood products including furniture, paper, rubber and plastic products (tyres and tube industries), fabricated metal products, equipment and repair services (for motor vehicle and motorcycles repairs). According to Oyinlola (2001), the average per capita waste generation in Nigeria was estimated as 0.45kg/capita/day. The rate also varies by ecological zones with the highest value of 0.49 kg/capita/day in the tropical rain forest and lowest value of 0.37kg/capita/day in the mangrove .The corresponding rates for guinea and sudan savannas are 0.41kg/capita/day and 0.48kg/capita/day respectively. These results show that the rates of both mangrove swamp and the guinea savanna are lower than the national average of 0.45kg/capita/day. The explanation for such variation may be adduced to the prevalence of primary agricultural by-products in the household wastes and most importantly due to dietary habits of the communities.

Challenges of Solid Wastes Management in Nigeria: No towns in Nigeria especially the urban and semi urban centers of high population density can boast of having found a lasting solution to the problem of filth and huge piles of solid waste, rather the problem continues to assume monstrous dimensions (Mba, 2003). To urban and city dwellers, public hygiene starts and ends in their immediate surrounding and indeed the city would take care of itself. The situation has so deteriorated that today the problem of solid waste has become one of the nation's most serious environmental problem.

In the late 70s in an attempt to solve the problems of waste disposal, Lagos State Government contracted a firm, Claudius Peters and Marini SPA of Italy, to construct three incinerators at the cost of N45 million (Akingbade, 1991). The plants installed could not operate because they could only target garbage containing less than 20% water, but most garbage in Nigeria contains 30-40% liquid. A break down in organizational and management structure has hampered garbage disposal (Withers, 1987). Household waste is not really disposed of in Nigeria, but is transferred from one location to another where its nuisance effect is thought to be less, therefore the problem of garbage disposal or management is yet to be solved (Withers, 1987). Resources-trucks and the technical know-how for removal of garbage are insufficient and inadequate; also the responsibility of waste disposal

in Nigeria (between State and Local Government) is not clearly defined in terms of full control of fund in order to enhance accountability and efficiency (NEST, 1995). Solid waste management is the most pressing environmental challenge faced by urban and rural areas of Nigeria. Nigeria, with population exceeding 170 million, is one of the largest producers of solid waste in Africa. Despite a host of policies and regulations, solid waste management in the country is assuming alarming proportions with each passing day. Reckless disposal of Municipal Solid Waste (MSW) has led to blockage of sewers and 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 litters the immediate surroundings. Improper collection and disposal of municipal wastes is leading to an environmental catastrophe as the country currently lacks adequate budgetary provisions for the implementation of integrated waste management programmes across the states. According to the United Nations Habitat Watch, African city populations will more than triple over the next 40 years. African cities are already inundated with slums; a phenomenon that could triple urban populations and spell disaster, unless urgent actions are initiated. Out of the 36 States and a federal capital in the country, only a few have shown a considerable level of resolve to take proactive steps in fighting this scourge, while the rest have merely paid lip services to issues of waste management indicating a huge lack of interest to develop the waste sector. It has been recognized that improper disposal of solid waste has a lot of health hazards and other negative consequences on the people and the environment, open waste dumps in most urban areas have become breeding grounds for mosquitoes, flies, rats and other disease vectors. This renders the populace exposed to various forms of diseases (Kagu, 1996).

Some of the Major Implications of Solid Waste in Nigeria

Environmental Degradation: The disposal and accumulation of toxic waste on land and water can affect the natural quality of these vital resources. On land, these wastes can alter the soil structure especially the non-biodegradable wastes such as polythene bags, plastics and others. Land which can be cultivated are used as refuse dumps. This affects the intended use of the resource. A solid waste littered around alters the beauty of the environment thereby making it uncomfortable for man (Oyediran, 1995).

Pollution: Solid waste in the presence of moisture can foul the environment, releasing toxic materials into the air. This contaminates and reduces the quality of air we breathe. Hazardous wastes pollutants from solid waste disposal sites may enter the environment in these forms; methane, ammonia, hydrogen sulphide, hydrogen, nitrogen gas, heavy metals such as Argon (Ar), Cadmium (Cd), Copper (Cu), Iron (Fe), Lead (Pb), Zinc (Zn), Aluminium (Al) and so on, soluble materials such as chlorine, nitrite and sulphate may pass through the soil to the ground water system, overland run off may pick up leachate and transport it into streams and rivers, some plants (including crops) may take up heavy metals and other toxic materials to be passed up the food chain (bioaccumulation) (Walker and Colwell, 1974).

Health consequences: Flies breeding will always be encouraged by uncovered piles of rotting refuse and the flies may play a role in the mechanical transmission of faeces and thus of feces-oral diseases. Pile of refuse will also contain mosquito breeding sites where pools of rainwater forms cans, car tyres etc., they will breed under these conditions and may transmit yellow fever and other arboreal infections. They may promote or transmit a variety of other diseases including plague, rat bite fever, Lassa fever and many others. Flies also spread amoebic dysentery, diarrhea (Barina, 2003).

Resource depletion: According to a recent World Bank report, cost of water contamination from improper waste disposal to this county is about N10 billion/year and the lives of about 40 million people are at risk (NEST, 1995). Some damages of improper waste disposal may not be compensated with money for example microorganisms that are destroyed in the spoil lives, destroyed form exposure to toxic waste (Oyediran, 1995). Adefolatu (1983) observes that a typical waste in Nigeria consist of leaves and its components, paper components, food left over, tin and metal waste ,polythene and plastic materials among others. Wastes may be classified according to properties .The following classes of wastes can be identified as well as on the point of source:

Household Solid Waste (HSW): These are the by-products of household activities. They include fuel residues, wrapping leaves, empty tins and containers, residues of various food items, broken utensils, garden wastes, ashes from fire, among others (NEST 1991; 1995; Anyakoha and Egboeli; 1993). The fraction produced from the preparation and consumption of food is sometimes known as the putricible or consumable components. This is the most common type of solid wastes.

Organic Waste: These are solid wastes that are biodegradable in nature, that is, they are easily taken care off by nature. Included in this group are leaves, vegetables, fruits, food scraps, carcass, wood, yard waste and many others. They are important components of sludge (NEST, 1991).

Plastic Waste: These are characterized by either semi-biodegradable or non-biodegradable. Recently, large amount of plastic wastes are found to be the cause of environmental nuisance since they are not degradable by biological activities or nature such as polythene bags, package water bags, plastic products, used tyres, old electrical appliances and many others (NEST, 1991; Botkin and Keller, 1997).

Metal Waste: Metal and metallic products are non-biodegradable and some are toxic and hazardous in nature because during corrosion, they can leach toxic chemicals into the environment. These include disposed metallic buckets, spoons, plates, pots, pans, sinks, water pipes, junked cars, refrigerators, generators, air conditioners, generators, empty tins and all other metal scraps (NEST, 1991; Botkin and Keller, 1997).

Bottles and Broken Glasses: These are made up of broken bottles or intact bottles, broken car screen, plates, empty bottles of drugs, chemicals, drinks, other broken glass materials and so on. They are also non-biodegradable and some percentage of household solid wastes. Their presence in the environment can also be of harmful effects (Botkin and Keller, 1997; NEST 1991).

Industrial, Clinical and Mining Solid Waste: Industrial and mining activities generate some forms of solid waste in the course of manufacturing or mining process; they include metal scraps, chips and grits from machine shops, saw dust, wastes paper, junked machines, and some health facilities like bandages, sharp objects including syringes, needles, and items contaminated with fluids including blood. It is important to separate the hazardous and non-hazardous fraction of such wastes to reduce risk to health and population (Shehu, 1997).

Agricultural Solid Waste: These are generated during the course of agricultural activities such as harvesting, for instance corn stalks, uprooted waste, fruits, shafts, broken tools or damaged implements and other farm residues (Barina and Gisbart 2001: NEST, 1995).

Commercial Solid Waste: These are products of commercial activities by hawkers, traders, restaurants, offices, shops, photocopying and printing centers and a host of others. The solid wastes generated include polythene bags, damaged vegetables and fruits, papers, metals and plastic containers, food residues and so on (Shwartz and Miller, 1991).

SOLID WASTE MANAGEMENT

Solid waste management includes all activities that seek to minimize the health, environmental and aesthetic impacts of solid wastes, this involves the collection, transport, storage, treatment and disposal of wastes including the after care of the disposal site (Botkin and Keller, 1997). Storing solid waste prior to collection prevents attraction of vectors, and excessive odour. Storage devices should be convenient for the user and facilitate safety, efficient collection, processing and disposal. The most commonly used devices include:

i. Metal or plastic containers
ii. Plastic/Polythene bags
iii. Drop boxes
iv. Underground pit

There are several methods of disposing/treating solid wastes which include:

***Sanitary landfilling*:** This is the most common and probably account for more than 90% of the nation's municipal refuse system, even though landfills have been proven to contaminate drinking water in certain areas (Botkin and Keller, 1997). It is the most cost effective method of waste disposal. The collection and transportation account for 75% of the total cost. In the modern landfills, refuse is spread with compacted layers covered by a layer of soil in the site not subject to flood or high ground water levels. The best soil for landfill is the clay, because it is less permeable than other types of soils. Materials disposed of in a landfill can be further secured from leakage by solidifying them in materials such as cement, fly ash from power plants, asphalts or organic polymers (Pepper and Gerba, 1996).

***Incineration*:** Refuse is also burned in incinerators, it is more expensive but safer method of disposal than landfills (Luke, 2000). Modern incinerators are designed to destroy at 99% of the organic wastes materials. Incinerators reduce combustible wastes of inert (lifeless or sluggish) residue at very high temperature of about 760°C (1400°F). Numerous processes such as pyrolysis recover energy from the wastes. Pyrolysis is a process of

chemical decomposition which produces a variety of gasses and inert ash. Garbage burned in incinerators has poisoned air, soil and water.Communities near incinerators have objected to them because of fear of possible emissions (Luke, 2000).

Composting*:* Organic materials that have little or no heavy metals can be broken down or detoxified biologically, composting and land farming in which materials are spread out over a large area of land so that microbes can decompose them are example of biological treatment of hazardous wastes. If the materials are not detoxified before they percolate into the groundwater, then obvious repercussion may occur. Yearly, the industries produce a total of over 1.375 billion tons of solid wastes (Revelle and Charles, 1984). Environmental products and technologies corporation, a company focused on solving environmental problems which enhances the productivity of farming operation in the United State has come with a system to remedy the amount of livestock wastes generated. Their close-loop wastes management system converts animal wastes into commercial quantities of the pathogenic free nutrient rich, soil building materials. Systems like this one are good examples of the direction Nigeria should follow when dealing with the wastes we generate (Revelle and Charles 1984; Pepper and Gerba, 1996).

Open dumping: This is the oldest and most common method of waste disposal. In this method, dump sites are located at various points, and waste are allowed to pile or levelled at times. Most urban centers in Nigeria are resorting to this method of disposal. However, the method is unsatisfactory and has adverse effects on the urban environment, it creates nuisance and health hazards (Kagu, 1996).

Recycling: Today, recyclable materials are recovered from municipals refuse number of methods including shredding, magnetic separation of metals, screening, washing etc. Increasingly, municipalities require those who generate solid waste to keep recyclable items from other waste. It takes time, energy, labour and money to make new products from recycled ones (Luke, 2000). Currently, it is easier or cheaper for manufacturers to use virgin raw materials rather than recycled materials to make things (Luke, 2000).

Table 1: Analysis of the Staff

S/No.	Staff	Number	%
1.	Technical (professional)	52	17
2.	Laborers	200	65
3.	Supervisors	15	5
4.	Laboratory attendants	3	1
5.	Others	39	12
	Total	**309**	**100**

Source: YOSEPA, 2008.

Table 2: Facilities of the Agency

S/No.	Facilities	Number
1.	Refuse bunkers	25
2.	Pay loaders	1
3.	Hauled containers	120
4.	Procuring compactors	-
5.	Tippers	4

Source: YOSEPA, 2008

Table 3: Sex of Respondents

Gender	Frequency	%
M	41	82
F	09	18

Source: Survey, 2012

Table 4: Size of Households

S/No.	No. of individuals/household	Frequency	%
1.	1-5	33	66
2.	6-10	17	34
3.	11-15	0	0
4.	>15	0	0

Source : Survey, 2012

Table 5: Types of Solid Waste

S/No.	Type	Frequency	%
1.	Plastic	18	36
2.	Metals	0	0
3.	Bottles/Glasses	0	0
4.	Organic	6	60
5.	Other	2	4

Source: Survey, 2012

Table 6*:* Frequency of Waste Disposal

S/No.	Time	Frequency	%
1.	Daily	37	74
2.	Once in 2 days	10	20
3.	Weekly	2	4
4.	Monthly	1	2

Source : Survey, 2012

Table 7: Mode of getting rid of waste from immediate environment

S/No.	Method	Frequency	%
1.	Burning	8	16
2.	Burial	1	2
3.	Taking to disposal point	4182	

Source: Survey, 2012

Table 8*:* Management organization

S/No.	Organization	Frequency	%
1.	Confer Cleaning Service	11	22
2.	YOSEPA	34	68
3.	Other	5	10

Source: Survey, 2012

Table 9: Ranking the performance of YOSEPA

S/No.	Rank	Frequency	%
1.	Excellent	5	10
2.	Good	20	40
3.	Fair	12	24
4.	Poor	13	26

Source: Survey, 2012

CONCLUSION AND RECOMMENDATIONS

Yobe State has not done much in waste management; transportation of waste has been identified as one of the major problems affecting solid waste management in the study area which hinders the operations of YOSEPA, the only four tippers with little crew size is not enough to cover the whole Damaturu metropolis. Yearly allocation of fund from the State government is not enough to meet their demand. The following recommendations therefore are drawn for consideration:

1. Refuse collection containers preferably plastic bag should be provided to individual households at closer intervals in markets, shopping areas, streets and other commercial centers.
2. To facilitate the transportation, the Yobe State government should procure more facilities and grounded vehicles should be overhauled.
3. The problem of discarded vehicles disposal should also be considered.
4. Health survey should be conducted by health personnel to study the possible effects of garbage deposits on the public health.
5. More man-power should be employed to improve the services of the YOSEPA.
6. The waste should be treated before final disposal.
7. House to house inspection should be conducted on routine bases.
8. Further study on the characteristics and quality of refuse used in the metropolis which will assist in designing a better system of disposal and possible recoveries should be carried out by researchers.

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