

Assessment of Disposal and Management of Solid Waste in Damaturu, Yobe State, Nigeria (A Case Study of YOSEPA)

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Abstract

This research assesses the solid waste management problems and implication in Damaturu, Yobe State, Nigeria; the data was generated through primary and secondary sources. 50 questionnaires were administered to households, civil servants, and YOSEPA staff. Direct survey and public interview were conducted. The finding of the study revealed the following: 41 (82%) of the respondents were male while only 9(18%) were female, of which 31 (62%) have been living in Damaturu for more than 2 years. The type of soil wastes generated mostly were organic 30(60%) which are biodegradable, and 35(70%) of the solid waste is dispose of in open land by the inhabitants. Most houses contained 1-5 people 33(66%) 34(68%) respondents revealed that YOSEPA is managing their waste to some extent, 11 (22%), 5(10%) by confer and other organizations respectively. With only 2(4%) of respondents sorted their waste before disposal (which is the first step in proper waste management). Most of the respondents dispose their waste on daily basis 37(74%). Based on the interview, 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. The results have provided baseline information on one of the major environmental problems of Yobe State, recommendations were forwarded for addressing the solid waste management problems in the study area and the state.

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

1.0. Introduction

According to United Nation 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 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 the members of the public.

One of the most important achievements of the federal government of Nigeria in environmental management was the establishment of the Federal Environmental Protection Agency (FEPA) under decree no.39 of 1988, and the subsequent creation of State Environmental Protection Agencies (SEPA).

However, 20 years after the creation of FEPA and SEPA and there transformation into Federal ministries of environment, the problem is still remaining an eyesore to the society.

2.0. Material and Methods

Fifty questionnaires 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 was also collected from gazette, reports, publications, journals, newspapers, and other records of the agency.

2.1. Study of the final destination site of solid waste collected

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.

Data analysis

The data collected was assessed using simple frequency and percentage tables.

3.0. Results

3.1. The Yobe State Environmental Protection Agency (YOSEPA)

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 sued in its corporate name.

Functions of the Agency

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-corporate 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.

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.	Other	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

Frequency of Collection

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, 2008).

Crew size

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.

Mode of Collection and Disposal

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.

Funding

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.

3.2. Data Analysis

Data analyzed on the primary aspects of the study were summarized on the tables below:

Table 3: Sex of respondents

Gender	frequency	%
M	41	82
F	09	18

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

Table 4: 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

Table 5: 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

Table 6: 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	41	82

Table 7: Management organization

S/No.	organization	frequency	%
1.	Confer cleaning service	11	22
2.	YOSEPA	34	68
3.	Other	5	10

Table 8: 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

4.0 Discussions

4.1. Waste generation in Nigeria

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. 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.

4.2. Problems of Solid Wastes Management in Nigeria

The government of Nigeria is aware of the effects of garbage or solid wastes on the people in Nigerian towns, wastes have not been removed for many months due to lack of removal trucks (Chukura *et al.*, 1993; Igbeoli, 1994). Instances of lack of equipment being the handicap are quoted by Chukura (1993), Oji-Okoro and Okunbawo (1993).

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 value 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).

4.3. Effects of Solid Waste on Urban Environment

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 effects of solid waste include the following:

1. *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 waste such as polythene bags, plastics etc. land which can be cultivated are used as refuse dumps which affects the intended use of resources. A solid waste littered around alters the beauty of the environment thereby making it uncomfortable for man (Oyediran, 1995).
2. *Pollution*:-solid waste in the presence of moisture can foul the environment, releasing bad odor that 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 e.g. Ar, Cd, Cu, Fe, Pb, Zn, Al etc. ,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, 1974).
3. *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 a cans, 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 etc. Flies also spread amoebic dysentery, diarrhea (Barina, 2003).
4. *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).

4.4. Components of Solid Wastes

Adefolala (1983) observed 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 and others.

Classification/Types of Solid Wastes

Wastes may be classified according to properties. The following classes of wastes can be identified as well as on the point of source include the following:

1. *Household Solid Waste (HSW)*
These are the by-products of housekeeping activities and consumption, includes fuel residues, wrapping leaves, empty tins and containers, residues of various food items, broken utensils, garden wastes, ashes from fire, etc., (NEST 1991; 1995; Anyakoha and Igboeli; 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.
2. *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 from residues wrapping papers and leaves, vegetables, fruits, food scraps, carcass, wood ,yard waste etc. they are important component of sludge (NEST,1991).
3. *Plastic Waste*
Plastic wastes 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 etc. (NEST,1991; Botkin and Keller,1997).
4. *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,waterpipes,junkedcars,refrigerators,generators, air conditioners ,generators, empty tins and all other metal scraps (NEST, 1991; Botkin and Keller).
5. *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 etc. 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).
6. *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; Schwartz and Miller, 1991).
7. *Agricultural Solid Waste*
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: NEST ,1995).
8. *Commercial Solid Waste*
These are products of commercial activities by hawkers, traders, restaurants, offices, shops, photocopying and printing centers etc. The solid wastes generated include polythene bags, damaged vegetables, and fruits, papers, metals and plastic containers, food residues etc. (Shwartz and Miller, 1991).

4.5. 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).

Storage of solid waste

Storing solid waste prior to collection prevent attraction of vectors, 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. *Others include underground pit*

4.6. Methods of Disposal and Treatment of Solid Wastes

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

1. *Sanitary landfilling*:- this is the most common and probably account for more than 90% of the nation's municipal refuse, even though landfills have been proven contaminated drinking water in certain areas(Daniel,1993). It is the most cost effective method of disposal of with collection and transportation account for 75% of the total cost. In the modern landfills, refuse is spread thin 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).
2. *Incineration*: - refuse is also burned in incinerators, it is more expensive but safer method of disposal than landfills(Luke, 2002) 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 recover energy from the wastes.

Company's burn in plants wastes in conventional incinerators to produce steam. Pyrolysis a process of chemical decomposition 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).

3. *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, 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. Their close-loop wastes management system converts animal wastes into commercial quantities of the pathogenic free nutrient rich, soil building materials. System like this one are good example of the direction our country should be moving on when dealing with the wastes we generate (Revelle and Charles 1984; Pepper and Gerba, 1996).

4. *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 leveled at times. Most urban centers in Nigeria are resorting to this method disposal. However, the method is unsatisfactory and as adverse effects on the urban environment, it creates nuisance and health hazards (Kagu, 1996).
5. *Recycling*: - the practice of recycling solid waste is an old one (Danel, 1993). Metal implements were melted down and recast in prehistoric times (Ologholo, 1995).

Today, recyclable materials are recovered from municipals refuse number of methods including shredding, magnetic separation of metals, screening washing. Increasingly, municipalities require those who generate solid waste to keep recyclable items from other waste. It takes time ,energy, labor and money to make new products from recycled ones (Luke, 2000; Ologhobo, 1995).currently, it is more easier or cheaper for manufacturers to use virgin rather than recycled materials to make things (Luke, 2000).

5.0 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 of 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 were drawn at the end of the study:

1. Refuse collection containers either can be preferably plastic bag be provided to individual households at closer intervals in markets, shopping areas, streets and other commercial centers.
2. To facilitate the transportation, the state government should procure and more facilities and grounded vehicles 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 increase to improve the services of the agency.
6. The waste should be treated before final disposal.
7. House to house inspection should be conducted on routine bases.
8. A more comprehensive study on characteristics and quality of refuse used in the metropolis which will assist in designing a better system of disposal and possible recoveries.

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