

# JOURNAL OF ENVIRONMENTAL SCIENCE (JES)



**DEPARTMENT OF GEOGRAPHY**  
**FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA**  
**NIGER STATE, NIGERIA**

Maiden Edition

February, 2009





# AN EVALUATION OF SOLID WASTE MANAGEMENT OPTION IN SOME URBAN CENTERS OF NIGER STATE

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## **Abstract**

*Solid waste management is a major social development, and health problem in all developing countries, especially in growing cities which lack proper planning and facilities and facilities for its management. Niger state is experiencing this problem as waste dumps has sprung up all over the major cities thereby debasing the aesthetic value of the state with attendant health risk and environmental degradation. This study aimed at current practices and highlighted possible option for effective and efficient solid waste management. Questionnaires, literatures, interviews and observational methods were adopted for the study and the result revealed that apart from disposal problem waste is neither separated, nor stored properly and people attitude to waste management is very appalling. It is recommended that waste should be separated at source as a management strategy. Organic waste should be composted and used as fertilizer for food production, while reusable items should be retrieved and turned to useful items, thereby creating opportunity for waste to wealth in the state. Land fill is the most suitable method for final disposal of waste for now, while effort should be made to build appropriate incinerators for the disposal of toxic and hazardous waste. Nonetheless there is the urgent need for intensive information and education of the public on the need for proper waste management in the state. This should be backed up with enforceable regulation with private sector participation and systematic monitoring.*

## **1.1 Introduction**

Population growth, rising standard of living and the rapid pace of urbanization and industrialization pose many environmental challenges' for large cities. They have contributed to an increase in the amount and type of solid waste generated by different human activities. Solid waste management has continued to be a major development challenge. Nigerians, particularly those living in the urban areas, are now having constant memories of huge heaps of garbage in open spaces, especially if they have to cover their noses against all forms of odor when passing by the heaps. There is a general concern that a lot of heterogeneous waste generated and the volume and types have been on the increase in the country's cities.

By 1989, an estimated 2.2 million tons of garbage per year was being generated in Nigeria, equivalent to about 20kg of solid waste per capita. It was estimated by the year 2000; that Lagos metropolis alone has generated about 998,081 tones of solid waste per year (Adepoju 1990). There is clear evidence that the volume of solid waste is overwhelming urban administrators' capacity to plan, evacuate and dispose wastes. Yet we are running out of space to put all the trash we generate. In view of the constant land area and increased urbanization which may be reducing vacant lands, there is the justified fear that if appropriate measures are not put in place for sustainable waste management, Nigeria may be overwhelmed if not consumed by waste.



The management of solid waste generated within our urban centers has become one of the most intractable problems of development. In the last two decades, there has been a phenomenal increase in the volume of and range of waste produced in Nigeria. This is due to tremendous increasing rate of population growth, urbanization and industrialization, as well as general economic growth. It is not uncommon to find urban waste blocking street, roads and water ways there by contributing to problem of flood disaster in the cities.

## 1.2 The Study Area

Niger state is one of the second generation states of the federal republic of Nigeria. Created after General Murtala Ramat Muhammad assumed power in 1976 with the aim of bringing development closer to the grass root. The state is part of the north central Nigeria that is composed of the key tribes of Nupe, Gwari, and Hausa. Lying between latitude 8 15' and 11 20' north, and Longitude 3 75' and 7 25' east. It shares common boundary with Zamfara and Kaduna to the north and north east respectively, plateau state to the east and the federal capital to the south-east. It is estimated to cover a land area of about 85,244sq.km and has an estimated population of about 3,900,000 which is about 3% of the population of the country (2006 population census figures).

There are two major categories of settlements in the state, urban and rural. In the urban hierarchy of settlement Minna, Bida, Suleja and Kontagora are the four most important towns, which provide goods, and services of the highest grade, which is why they were sampled for this study.

Many years after the creation of the state, solid waste management have manifested in great dimension, which have created some concern among stakeholders and the general public. Today solid waste management problems in Niger state has become so pronounced that almost every little available space is turned into refuse dump site there by defacing the aesthetic value of the environment and also endangering environmental sustainability.

## 1.3 Definitions

**Solid Waste Disposal**, disposal of normally solid or semisolid materials, resulting from human and animal activities that are useless, unwanted, or hazardous. Solid wastes typically may be classified as follows:

*Garbage*: decomposable wastes from food.

*Rubbish*: either combustible (such as paper, wood, and cloth) or noncombustible (such as metal, glass, and ceramics)

*Ashes*: residues of the combustion of solid fuels

*Large wastes*: demolition and construction debris and trees

*Dead animals*

*Sewage-treatment solids*: material retained on sewage-treatment screens, settled solids, and biomass sludge

*Industrial wastes*: such materials as chemicals, paints, and sand

*Mining wastes*: slag heaps and coal refuses piles

*Agricultural wastes*: farm animal manure and crop residues



#### 1.4 Aim and Objectives

The aim of the study is to protect environmental health and promote the quality of the urban environmental condition by controlling pollution and ensure the sustainability of the urban ecosystem. With the objective of minimizing waste generation and maximizing waste recycling, reuse and ensure the safe and environmentally sound disposal of waste in the urban areas.

#### 1.5 Methodology

The Methodology adopted for the study includes; undertaken a sample survey of waste generation and management in the four most popular urban centers of the state. Literatures search and observations, internet materials and journals, questionnaire were given out in the sampled study areas as well as interviews were conducted.

#### 1.6 Results And Discussions

Information about sources, generation rate and composition are important as they help in the general planning for an integrated waste management system.

Table 1, gives a summary of the diseases associated with solid waste and their mode of transmission.

**Table 1: COMMUNICABLE DISEASES ASSOCITED WITH SOLID WASTES**

1	Fly transmitted diseases	Cholera, typhoid fever dysentery etc.
2	Mosquito borne diseases	Malaria fever, yellow fever, dengue etc.
3	Water borne diseases	Typhoid fever, dysentery, cholera.
4	Rodent borne diseases	Plague, rat bite fever, dermatitis rat tape wormed.
5	others	Soil fungus (associated with infected burred guild guinea worm

*Source:* (field questionnaire 2008)

Table 2 below shows the characteristics and composition of solid waste from three different classes,( these were classified according to their income) and figure 1and 2 gives a graphical presentation of the table, while table 3 and figure 3 gives the amount of waste generated by each of the urban centers in the state. Generally the waste has low per capital level and high aggregate levels. Because of the high social behavior of the people in the state and high food content, waste in these urban centers have a high organic and high moisture content, as well as low combustibile matter.

**Table 2: Characteristics and composition of urban solid waste in Niger state (from 3 social classes)**

characteristics			
Waste generation rate	low	medium	high
Paper	12.6	33.7	81.3
Leaves	13.2	11.3	2.5
Garbage	65.3	41.6	8.2
Tin	4.6	6.2	3.4
Glass	2.1	2.5	0.1
Rag	1.6	3.4	4.3
Dust	0.6	1.3	0.2
Density	256kg/m <sup>3</sup>	280kg/m <sup>3</sup>	296kg/m <sup>3</sup>
Moisture content	64.8%	61.4%	49.7%

Source: (field work 2008)

Typical of a low income country, the characteristics and composition of urban solid waste in the state as depicted in the table above have high moisture content because of high percentage of food waste and because they are often stored on the open ground awaiting collection. The high income class on the other hand has high paper and low food items.

**Fig. 1: Waste generation rate in three different classes as shown in table 2.**

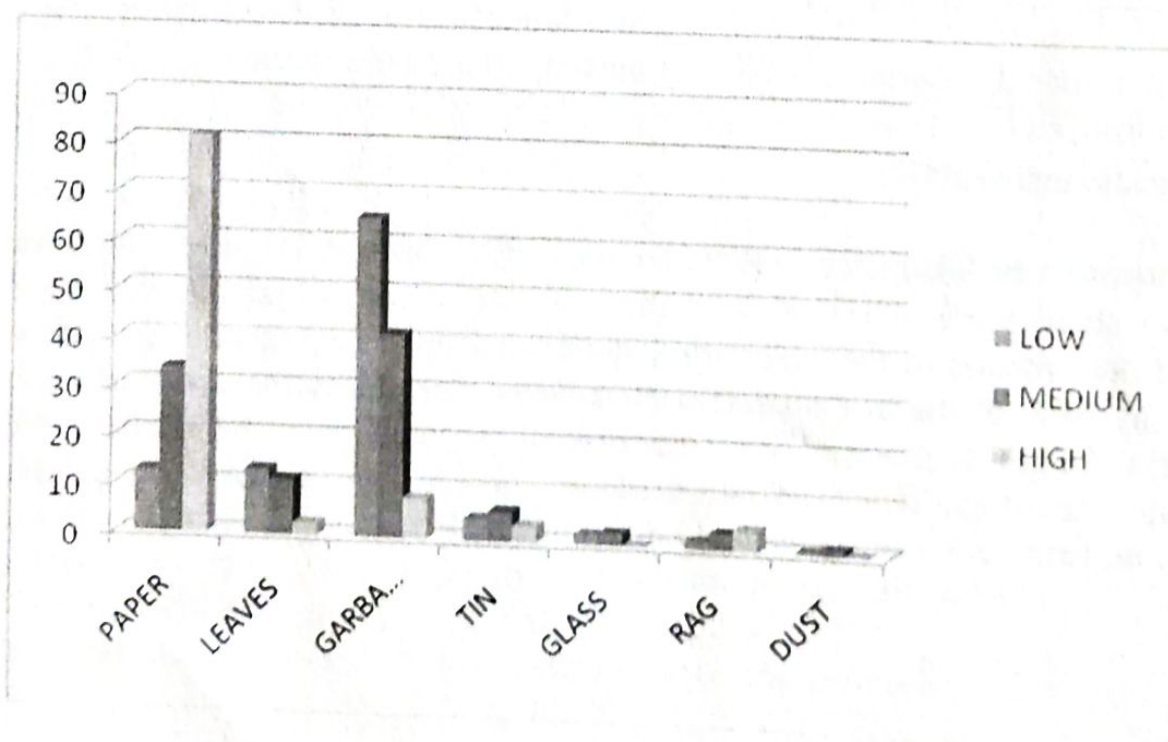




Fig 2 moisture content

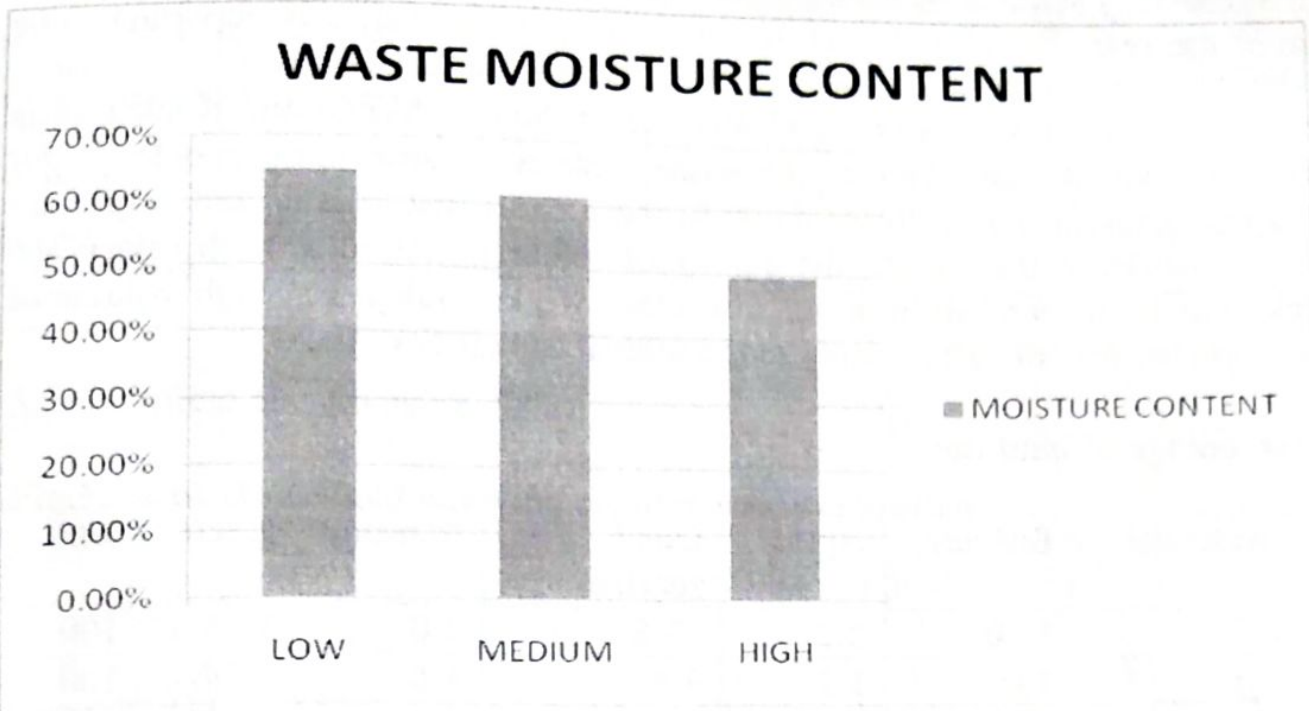
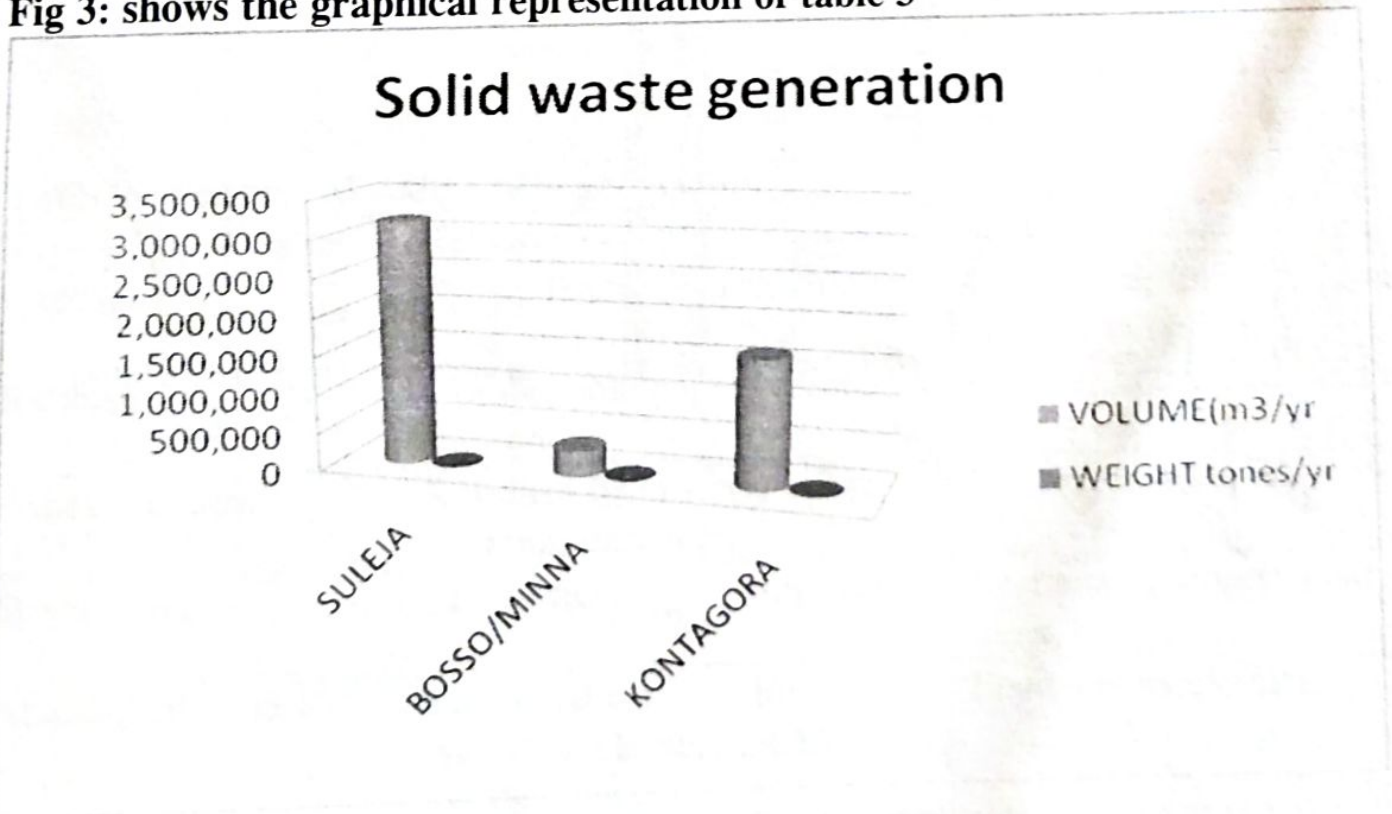


Table 3: solid waste generated.

TOWN	VOLUME(m3/yr	WEIGHT tones/yr
SULEJA	3,184,000	3,201
BOSSO/MINNA	342,075	205
KONTAGORA	1,645,820	1,851

Fig 3: shows the graphical representation of table 3



Within any of the four surveyed cities, the quantity and to certain extent the quality of refuse vary with days of the week, week of the month, month of the season and season of the year. For efficient refuse collection and disposal, it is important to be familiar with these variations.

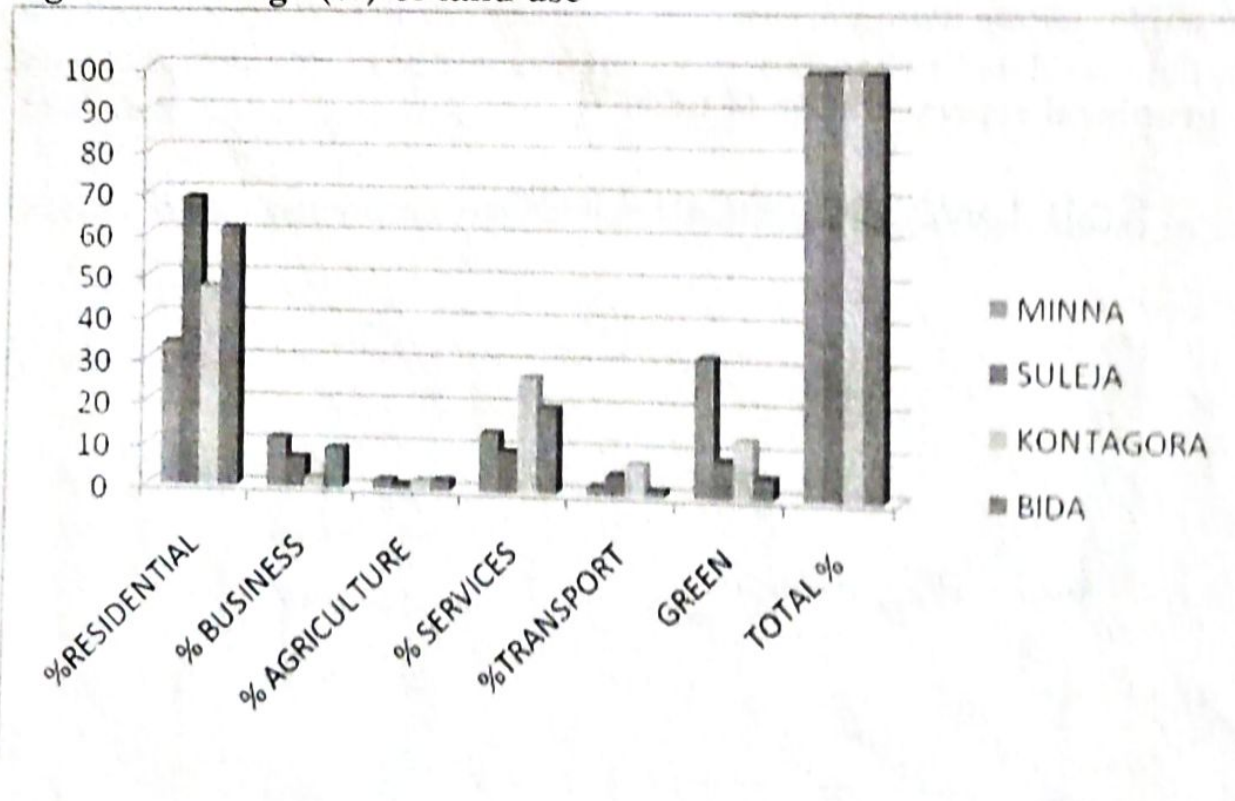
The quality of refuse produced at weekends in Suleja, Minna and Kontagora is often more than that of other days of the week. This is because more people go for shopping at weekends than at ordinary days. In these cities that salaries and wages are paid in certain weeks of the month, the quality of refuse produced at such salary and wages weeks has been found to be more than other weeks. Suleja has high volume of waste generation because of its proximity to the federal capital city Abuja.

**Table 4: percentage of land use**

Town	residential	Business	Agric	Other services	transport	green	total
Minna	37.7	11.6	2.2	13.8	2.0	32.5	100
Suleja	68.6	7.0	1.2	9.5	4.8	8.7	100
k/gora	47.2	2.4	2.3	27.0	7.5	13.5	100
Bida	61.5	9.5	2.5	20.0	1.5	5.0	100

Source: field work (2008)

**Fig 4: Percentage (%) of land use**

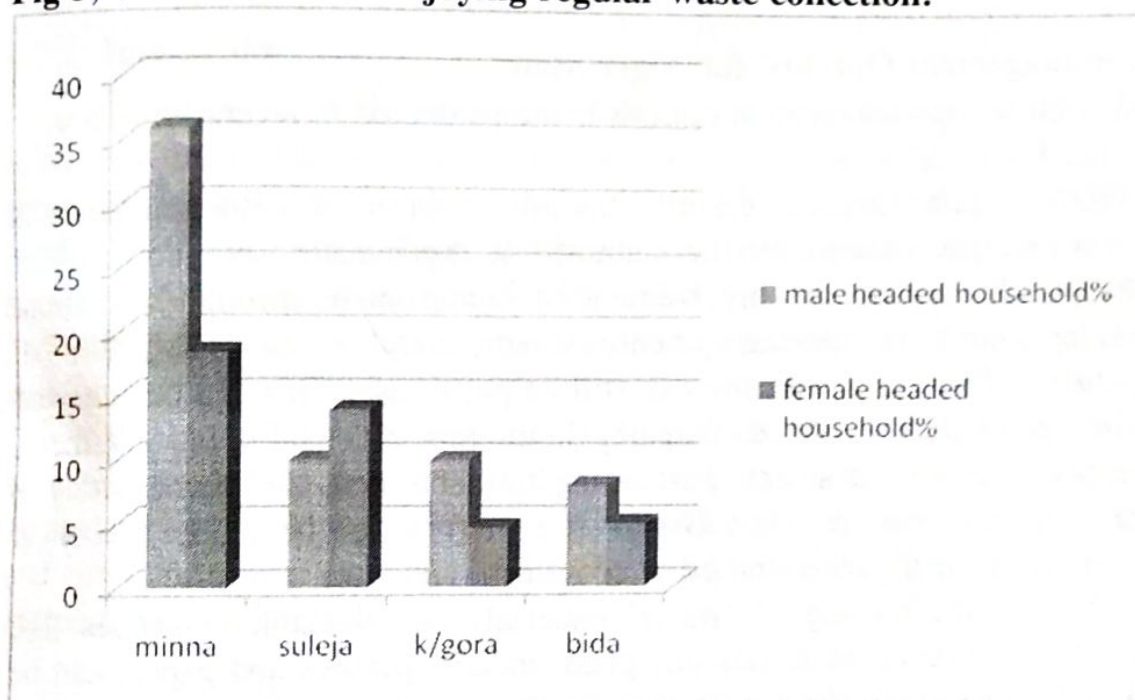




**Table 5: Percentage of households enjoying regular solid waste collection**

town	male headed household%	female headed household%
minna	36	18.5
suleja	10	14
k/gora	10	4.7
bida	8	5

Source: (field questionnaire 2008).

**Fig 5; % of Household enjoying regular waste collection.****Table 6: Sources of solid waste generation**

Type of solid waste	General compound	sources
Garbage	Waste from preparation of food, left over etc.	Household, kitchen, restaurant, stores and market,
Rubbish	Combustible paper, carbon rags etc.	Offices, household, and market.
Ashes and dust	Residues from fire used in cooking, carpentry.	Kitchen ,market etc.
Street trash	Leaf, litter, cans, fruit peels etc.	Restaurant, stores, road side trees, etc.
Abandoned vehicles	Unwanted cars, motor cycle/bicycle parts, other metals.	Roadside mechanics.

The fact that waste management is a fairly extended economic sector comprising a range of interlinked actors, activities and commodities has been neglected. Much emphasis has



been on getting rid of waste at minimal cost. Despite these efforts, table 5 and figure 5 shows that only a few proportion of household in the four urban centers have access to regular waste collection. Thus there are low waste collection efficiencies, varying between 7.5% and 27%. Such low collection efficiencies result in leftover accumulation that are either removed on irregular basis or burnt on site.

It was also observed that most house hold depend on house to house waste collectors, who are mostly boys between the ages of 11 and 15. They come around the houses for waste collection every 2 to 3 days and negotiate on how much they are to be paid depending on the quantity of the waste.

It is important to note that waste collectors by house holders was insufficient , usually open to abuses like dumping at street corners and into open drains, while the private waste collectors have been implicated for illegal waste dump along major highways in the cities.

### 1.7 Solid Waste management Options for Niger State

The conventional solid waste management options being promoted in recent times are:

- **REDUCTION**; which is used to describe the minimization of waste generation at source (or waste prevention) can be achieved at the industry and householder level. This would require the involvement of Government through education, incentives, legislation, monitoring and enforcement.
- **REUSE**; ensures that items with life can still be put to use. This can be achieved through the use of durable items, donating items to those who could use them, turning empty jars into containers, purchasing refillable pens and participating in collection of reusable items. For Niger state, effort can be made to collect scattered empty bottles, plastic and other containers for reuse.
- **RECYCLING**; is the turning of 'waste' materials into valuable resources (the waste to wealth concept). Materials like glass; metals, plastics and papers can be separated and sent to facilities where they are processed into new materials. The benefit of recycling are numerous and include stimulation of cleaner technologies, reduce quantity of waste into landfill, supply of valuable raw materials for industry, job creation and conservation of resources for generation yet unborn.
- **COMPOSTING**; is nature's way of recycling organic waste into new soil through decomposition, and thereafter can be used as manure. Composting protect soil from erosion, assist pollution remediation, can be started with little capital and operational cost, provide nutrient for the soil and reduces the need for fertilizers and pesticides. (EPA 2001)
- **WASTE SEPARATION**; is yet another major concern in the state. Studies have shown that domestic, commercial, industrial construction and even hospital and other hazardous waste are handled and disposed off in haphazard manner without taking into consideration the danger they pose to the environment, safety and public health. This can be practice with ease and it involves the separation of several waste bins up to three in public places and residential areas/homes. Each bin is clearly marked with label for the type of waste that should be thrown into it.



## **Landfill**

Sanitary landfill is the cheapest satisfactory means of disposal, but only if suitable land is within economic range of the source of the wastes; typically, collection and transportation account for 75 percent of the total cost of solid waste management. In a modern landfill, refuse is spread in thin layers, each of which is compacted by a bulldozer before the next is spread. When about 3 m (about 10 ft) of refuse has been laid down, it is covered by a thin layer of clean earth, which also is compacted. Pollution of surface and groundwater is minimized by lining and contouring the fill, compacting and planting the cover, selecting proper soil, diverting upland drainage, and placing wastes in sites not subject to flooding or high groundwater levels.

### **1.7.2 Incinerators**

In incinerators of conventional design, refuse is burned on moving grates in refractory-lined chambers; combustible gases and the solids they carry are burned in secondary chambers. Combustion is 85 to 90 percent complete for the combustible materials. In addition to heat, the products of incineration include the normal primary products of combustion—carbon dioxide and water—as well as oxides of sulfur and nitrogen and other gaseous pollutants; nongaseous products are fly ash and unburned solid residue.

Increasingly, municipalities and private refuse-collection organizations are requiring those who generate solid waste to keep bottles, cans, newspapers, cardboard, and other recyclable items separate from other waste. Special trucks pick up this waste and cart it to transfer stations or directly to recycling facilities, thus lessening the load at incinerators and landfills.

## **Hazardous Waste**

Hazardous wastes have been defined by the federal Environmental Protection Agency as wastes that pose a potential hazard to humans or other living organisms for one or more of the following reasons: (1) Such wastes are non degradable or persistent in nature; (2) their effects can be magnified by organisms in the environment; (3) they can be lethal; or (4) they may cause detrimental cumulative effects. General categories of hazardous wastes include toxic chemicals and flammable, radioactive, or biological substances. These wastes can be in the form of sludge, liquid, or gas, and solid.

Radioactive substances are hazardous because prolonged exposure to ionizing radiation often results in damage to living organisms and the substances may persist over long periods of time. Management of radioactive and other hazardous wastes is subject to federal and state regulation, but no satisfactory method has yet been demonstrated for disposing permanently of radioactive wastes.

Disposal of solid wastes on land is by far the most common method in Niger state and probably accounts for more than 90 percent of the nation's municipal refuse. Drainages constructed in the state capital years back have also been turned into waste



dump site and toilets as most of the drainages are filled up with refuse disallowing the passage of what it was really meant for (i.e. water). Although, the Incineration should have accounted for most of the remainder but not a single one is found within the major cities. Whereas composting of solid wastes accounts for only an insignificant amount. Selecting a disposal method depends almost entirely on costs, which in turn are likely to reflect local circumstances.

### **Conclusion**

Solid waste still constitute major health and environmental problem in Niger state despite efforts at abating the trend. Solid waste management strategies are poorly planned, and inefficiently implemented. Efforts have been on waste disposal rather than waste management. As a result of this, attention has not been paid to waste management options that could be applied in the state to reduce the problem of solid. On a more permanent basis every individual must participate in waste separation as a first step for solid waste management in the state. There is urgent need for stakeholders especially Niger state urban development board to mount public enlightenment program to educate the public on waste management issues and to involve them to participate actively in the process.

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