



## A Study of the Solid Waste Chain in Benin Metropolis, Nigeria

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**ABSTRACT:** Benin metropolis like other fast urbanizing towns and cities in Nigeria is faces with a solid waste management problem. Solid waste is seen in huge heaps on any piece of unused land, around buildings, in the open market places and in drainage and water ways. The work reported in this paper involves a study of the path traced by solid waste in the process of management in Benin metropolis. Structured questionnaires were applied to collect primary information such as size of method of waste disposal, Educational level, monthly income etc. from households. Solid waste dump sites – legal and illegal were visited. Water drainages were also observed during the study. The results obtained indicated that poor education, poor income of residence, none existence of solid waste data and insufficient funding for solid waste management are the major causes of solid waste management problems in Benin metropolis. Some feasible suggestion for improved management of solid waste based on the prevailing economic and educational state of the residents in the metropolis has been presented. @JASEM

*Key words:* Solid Waste, Waste Chain, Household, Collection, Disposal, Management, Benin metropolis

Waste is of enormous concern all over the world due to the fact that man's quest for better living has resulted to the development of technologies for processing raw materials, increased energy supply, increased food production, for better communication, etc, and these processes generates by-products which becomes waste products. In addition over population due to influx of people to the urban area from the less developed part of the country and misuse of essential goods and services has resulted to massive generation of waste materials.

Generally waste include three streams – Solid, liquid and gaseous waste streams. However solid waste stream is the most problematic in the world today. In most cities and large towns of the world, solid waste is not only heaped in huge quantities on refuse dumps but also thrown and made to lie around in piles in the street and in small illegal dump on any piece of unused land. Most third world countries have worst cases than industrialised countries which have the money, technical knowhow and public attitudes to control and manage their waste to some degree.

Among the multitude of problems existing in the fast urbanizing towns and cities in Nigeria - limited budget, social issues such as hunger, unemployment and illiteracy, poor road condition and waste management (Zavodska 2003) Solid waste management appears to be the most prominent in recent years. Solid waste is seen in huge heaps on any piece of unused land, around buildings and in the open market places. Living with solid waste littered around appears to be an acceptable way of life among the people in most cities in Nigeria in recent years. Solid waste management has become a night mare to the government and waste management decision makers across the country.

Solid waste management was commonly thought of in Nigeria as simply pick up the waste and go dump it in a hole somewhere. Burying waste in the ground certainly appears to be inefficient materials management (McDougall, et al, 2001).The term solid waste management is used to encompass all the activities dealing with solid waste, from the point of generation through to 'collection' and finally to 'disposal' (Davis and Masten, 2004). The overall objective of solid waste management is to minimize the adverse environmental effect and economic damage caused by the indiscriminate disposal of solid waste especially hazardous waste (Okojie et al., 2002).

Waste management is an important element of environmental protection. Its purpose is to provide hygienic, efficient and economic solid waste storage, collection, transportation and treatment or disposal of waste without polluting the atmosphere, soil or water system. The path trace by solid waste in the management of solid waste from generation to the point of sanitary disposal and management is referred to as solid waste chain. Solid waste management is a complex process, involving multiple steps (solid waste chain) shown in fig. 1. As indicated in the fig. 1, the first step in the solid waste chain is the generation of solid waste. Once a material no longer has value to the owner, and the owner does not want to take responsibility for it, it is considered to be a waste (Palmer, 1992). The generation of waste varies by country, socioeconomic status and as a result of many other practices (Davis, eta al 2004).

Once solid waste is generated, it must be handled properly and processed at source. The processing and handling may include sorting or segregation, washing and storage so as to ensure recycling of some portion of the waste. Other steps included in the solid waste

chain are collection, transfer to central storage facility, final processing facility, product utilization and disposal (Davis, et al 2004).

A preliminary study on solid waste management in Benin metropolis revealed a serious deviation from the path shown in figure 1. Solid waste was seen in huge heaps in illegal solid waste dump site, in the open market place, around home and in drainage systems. And this has resulted to serious community environmental crisis in the metropolis such as water flooding and diseased epidemic.

Against this background this study was initiated to take a critical look at the solid waste chain in the Benin metropolis with view to proffering solution to the waste management crisis in Nigeria

## METHODOLOGY

This study was broken down into two phases. The first phase of the study involves the study of published and unpublished government agencies reports and records, private agencies reports, personal communication with private and government waste management agencies, literature review and a preliminary field work in the Benin metropolis. The second phase of this study was Solid waste survey. Structured questionnaires were used for the collection of primary data such as sex, status, method of waste disposal etc from respondents. The survey involved the following steps – Selecting a representative sample, administration of the questionnaires, collation and analysis of the data from the questionnaires.

A multi-stage stratified random sampling method was applied for the sampling process and a total of 250 households were selected for the survey (EPA, 1996). 156 households co-operated with the survey.

Each selected house hold was visited several times. In the first visit, contact was made and participation consent requested. Upon approval, a second visit was made to distribute questionnaires. The next four visits were made at regular interval to collect the questionnaire. Some households were assisted in filling the questionnaires.

## RESULTS AND DISCUSSION

Data were collated from the questionnaire and analysed. The results from the analysis are shown in the table 1. The results showed that 20.13% dispose off their solid waste themselves, 66.04% patronize private independent waste disposal agents, 9.43% patronize hand carts and 4.41% patronize government solid waste disposal agents – Local Government

Council (LGC) and Waste management Board (WMB) in the metropolis respectively.

**Table 1** Response on disposal agent

Waste Disposal Agent	% Response
Self	20.13
Private Agent	66.04
LGC	2.52
WMB	1.89
Hand Cart	9.43

The response of residents to solid waste issue presented in the questionnaires indicates that they have some concerns for solid waste but verbal interview with them really revealed their true disposition to solid waste. They mention the aesthetic loss from the unsightly condition resulting from indiscriminate disposal of solid waste in the environment, but no one expressed serious concern about health. This can be explained by the fact that solid waste in the street are a normal part of daily life since it has always been there, no one cares about it and life goes on. Many people suggested that the government should put more attention to the issue of waste. Almost everyone agrees that they would like to see an improvement in solid waste management and indicated that they would be ready to pay a fee if it were to improve the condition of the environment. This of course is not something that can be relied upon. It is very easy for people to indicate a willingness to pay for solid waste management service but putting it into action is what matters. (Zavodska, 2003). The solid waste chain in Benin metropolis was then developed as shown in figure 2. The terms in the solid waste chain in Benin Metropolis show in figure 2 are as follow:

*Generation:* Generation refers to the source of solid waste. Municipal solid waste is generally made up of waste generated from domestic and commercial activities.

*Internal Storage:* Internal storage refers to storage of waste within the house or office at source. The study revealed that small waste bin such as perforated bins, small plastic bags, empty paint drums, plastic and metal buckets etc were used for storing waste internally at source. The wastes are usually stored in the internal waste bins until the bins are filled up and then transferred to the external waste bins.

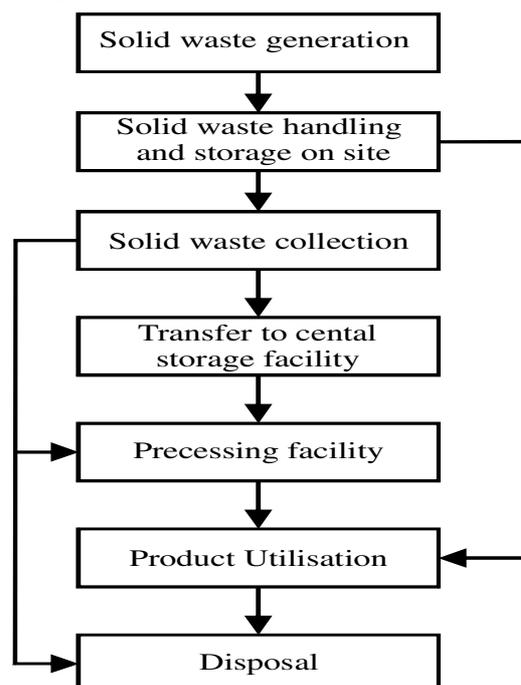
*Re-use:* In most cases, the generator keeps solid waste items such as bottles and beverage cans for storing liquids (kerosene, cooking oil etc), salt and other food

items. In addition other solid waste items such as paint cans, buckets and drums were also kept for storing water in the home and commercial unit. After a while, they become waste and find their ways back to the waste stream when they become broken or old.

*External Storage:* External storage is the temporary storage of the wastes in bins usually located outside the house for domestic source and outside the premises for commercial source. The types of external waste bins in use in Benin metropolis include - Metal and plastic drums, Bins constructed with blocks, Pits, Sacks, etc.

*Collection:* This refers to the collection of solid waste from the generators for disposal by waste disposal agents. This study showed that some households have their solid wastes left in the external storage bin for a period of one while others have theirs left for up to four week before collection by the disposal agent in Benin metropolis.

*Environment:* Environment in this context means the surroundings of houses and business premises in the metropolis.



**Fig. 1** The solid waste Chain

These include road sides, drainage system, market areas, etc. This study revealed that large amount of solid waste were thrown and made to lie around the environment in the metropolis.

*Illegal Dumpsites:* These are unauthorized solid waste dumpsites where solid wastes were dumped

indiscriminately by residents in the metropolis. This study revealed that many unused lands were converted to solid waste dumps illegally; In fact, the waste control agencies are unable to enforce the environmental laws and hence resident do whatever they like with their waste including illegal dumping littering in the metropolis.

*Approved Dump sites:* Approved dump sites are authorized supposed landfill sites, where solid wastes are dumped and managed by the waste management agencies. At the time of this study, there were eight approved dumpsites in the metropolis, but only two were functional due to neglect by the authorities in charge. Hence, there was indiscriminate dumping of solid wastes even at the approved dump sites by disposal agents.

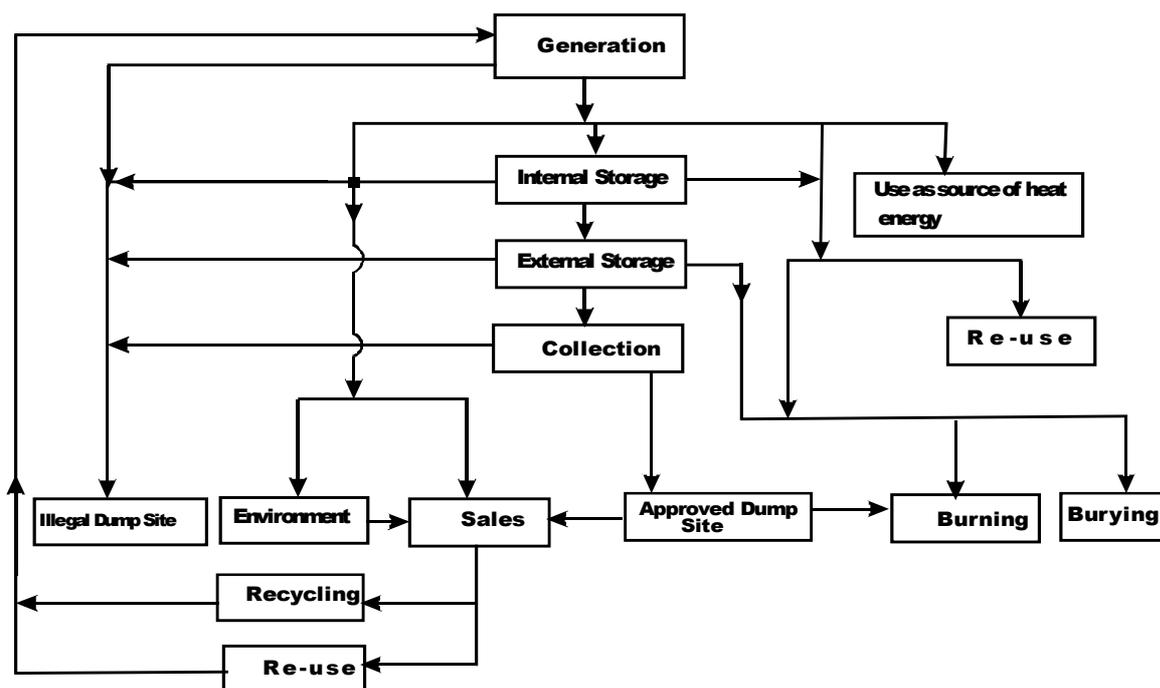
*Sales:* This study revealed that the generators sell some of their solid waste such as waste bottles which buyers use for various purposes such as storage of vegetable oil and other cooking items. Bottles used for packaging medicine were also sold.

*Recycling:* Recycling is the process of adding value to waste, that make it economically useful. This study revealed that some recyclable waste such as nylon and plastic/rubber bags were sorted and sent for recycling in the metropolis. However, recycling is at very low ebb in Benin metropolis.

*Burning:* This is the process of setting the waste on fire and allowing it to burn to ashes. This study revealed that uncontrolled open burning of solid waste was practiced by generator and waste management agents around houses, business premises and at the dumpsites in the metropolis.

*Burying:* Burying of waste refers to covering waste in holes made in the ground. Burying of solid waste is wildly practiced in Benin metropolis. This study revealed that residents dig holes behind their houses to get sand for filling foundation of their houses to damp proof course (DPC) levels during construction. When they move in to live in the houses they bury their solid waste in such holes dug behind their houses during construction of the houses.

*Use as source of heat energy:* This study also revealed that residents of Benin metropolis burn solid waste to generate heat energy for cooking purpose. For example, some residents in the metropolis go to the wood processing shops for collection of wood sawdust and shavings which they burn to get heat for cooking their meals. In addition, during the corn season, the boiled-corn seller burns the corn curb to get heat for cooking corn for sales.



**Fig. 2** Solid Waste Chain in Benin metropolis

*Conclusion:* The problem of solid waste in Benin metropolis is not a significant increase in solid waste generation or even a trend toward more dangerous component in the near future. The main problem is the management of solid waste – handling, collection and disposal.

There are laws in the metropolis regarding solid waste management but most of them are not followed as there is virtually no enforcement.

Living with solid waste littered around appears to be an acceptable way of life among the people in the metropolis in recent years.

#### FEASIBLE SUGGESTIONS

- i. The public awareness on solid waste management is very poor. When households and business operators generate waste they throw them around in the environment. Therefore there is urgent need for improvement of public awareness and attitude on waste management in the metropolis. This can be achieved using some low cost methods such as seminars, workshops, news letters, speeches, church bulletin and measages, special seminars in the open market places, motor parks, notices and columns in news papers.
- ii. Public awareness should not be confused with public involvement. At this stage while some

public involvement may be sought it must be approached slowly and cautiously. Changes can be proposed and discussed with the public but at the beginning, the changes need to be implemented without too much public interference and with a good sense of purpose.

- iii. There should be improved litter control in the metropolis. A very good way for promoting this is by providing more public receptacles throughout the metropolis. If these bins are available, then at least people will have the option of using them. Without available bins, the only choice that people will have is to throw solid waste around in the environment as it is currently practiced. In addition, when the waste receptacles are old they should be replaced.
- iv. Wastes were seen accumulated in drainage and waterways. In the metropolis, there must be more attention paid to prevention of blocking of drainages and water ways. Not only is this an unpleasant sight, but a medium for breeding of pest. It also causes flooding in the metropolis. Part-time positions that are overseen by supervisors should be created. This will help to reduce the financial burden of employing fulltime staff.
- v. This research showed that funding of solid waste is very poor, hence special attention should be paid to financial planning by the ministry of environment and the health department of the Local

Government Areas in the metropolis. The Ministry should create special fees and charges that will be paid by residence and business, in the metropolis. The financial plan should be made in such a way that eliminate the present difficulty with associated with collection of levies and charges and these fees and charges should be dedicated to research on development of solid waste management system and management of solid waste in general in the metropolis

vi. The results presented in table 1 showed that 20.13 of residents dispose off their solid waste themselves, 66.04% patronize private independent waste disposal agents, 9.30%, patronize hand Cart and 4.44% patronize government solid waste disposal agents in the metropolis. It therefore mean that a large proportion patronize private independent waste disposal agent. However the study showed that none of the waste management agents has any training in engineering or management. Apparently, they do not do anything with the waste. They neither sort the waste nor subject the waste to further treatment, hence, no financial return at the end point of the waste as what they do is simply solid waste relocation. They collect waste from the generators and relocate them from the point of generation to the approved dumpsite where the waste is subjected to open air burning without pollution control. It is therefore instructive that when approval is given to waste management agents, it should be given to those that have plans that will bring financial return at the end point of the waste. This will ensure sustainability as the waste become assets instead of liability.

vii. This study revealed that several policies have been developed in line with the international policies for waste management. It is crucial to develop new policies and strategies with reference to the immediate environment in addition to those already prompted by the international bodies to suit Nigeria's peculiar situation. New policies should be created for the management of solid waste in the metropolis and these new policies should be officially implemented by the responsible body. The new policies and strategies to be formulated should be targeted at implementation of government policies for developing solid waste management system in the metropolis.

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