A Study of the Constraints to Residential Solid Waste Management in Benin Metropolis, Nigeria

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Abstract
Benin City like other fast urbanizing towns and cities in Nigeria are faced with a multitude of problems ranging from poor state of roads, insufficient water and electrical power supply, inadequate solid waste management etc. Among this multitude of problems 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 the metropolis in recent years. The work reported in this paper involves a study of the constraint to residential solid waste management in Benin metropolis in Nigeria. A site-specific study was carried out to estimate the quantity of residential solid waste generated in the metropolis. Structured questionnaires were applied to collect primary information such as size of households, educational level, and monthly income and from households. The results obtained indicated that of poor education, poor income of residence, insufficient funding, institutional structure, social disposition and cultural norms are the major constraints to solid waste management in the metropolis in which solid waste is in crisis stage. Feasible suggestion for improved solid waste management based on the prevailing educational and social-economic state of the residents in the metropolis has been presented.

Keywords: solid waste, quantity generated, constraints to management, Benin metropolis, Nigeria.

INTRODUCTION
In last few decades solid waste appears to be the most prominent among the multitude of problems existing in the fast urbanizing Benin metropolis. 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 the metropolis in recent years. Solid wastes are generated from domestic, commercial and industrial activities in Nigeria. The preliminary work of this study revealed that domestic and commercial solid waste stream constitutes the most problematic in Benin metropolis. Wastes generated from domestic and commercial activities are seen thrown and disposed off indiscriminately. Investigation revealed that the residents earn very low monthly income, their low income is not able to meet their daily financial need and they therefore avoid the services of the waste management agencies, hence they dispose off their solid waste indiscriminately in the metropolis.

The preliminary study further revealed that the agencies responsible for waste management are unable to develop adequate means of managing the solid waste generated in the metropolis. In fact they are faced with multitude of problems ranging from underfunded government, inadequate waste data and tools, poor public attitude etc (Doan 1998, Cointreau 1982). Solid waste management has therefore become a nightmare to waste management decision makers in the metropolis. The cultural practices of most Nigerians weigh more to consumption and waste generation than saving and investment (Audu, 2007). The sheer magnitude of the solid waste problem in Nigeria is hard to comprehend. There are not enough public wastes receptacles, and solid waste dumps are located on the side of the highway. When solid waste accumulates, households and businesses piles up the waste in the median of major roads and set them on open fire without pollution control (Wallin et al, 2004). A large proportion of the waste are dumped indiscriminate, around homes, market places, by the road side and on any piece of unused land. These waste dumped indiscriminately find their way into drainage system and waterways. And this has resulted to serious community environmental crisis in the metropolis. In addition waste data is almost non-existence in Nigeria and were it exists, it is only for few isolated cases in the country and they are not easily accessible and grossly inadequate for decision making (Njiribeako, 2003). Hence the poor state of solid waste management in urban areas of the country which is now not only an environmental problem, but also, a major economic and social handicap (Daskalopoulos et al., 1998). However in the last few decades the Edo State government had made effort to solve the solid waste problem in the
state particularly in the state capital Benin City, but the effort had not yielded good results. Hence, we propagated that there are some salient problems bedeviling this solid waste management sector in the metropolis that when addressed have the capacity to improve its environmental condition and improve the well-being of the inhabitant of Benin metropolis and Nigeria at large. The work reported in this paper was therefore aimed at identifying the problems that are constraints in the waste management sector in Nigeria using Benin metropolis as a case study.

**METHODOLOGY**

This study was broken down into two phases – A study of current waste management activities in Benin metropolis and survey study of household (Residential) waste using Oredo Local Government Area (LGA,) as a case study. The first phase of the study involves the study of published and unpublished government agencies reports/records, private Agency report, personal communication with private and government waste management agencies, literature review and a preliminary field work in Benin metropolis. The survey study involved the following steps – Determination a representative sample, selection of sampling units and the use of structured questionnaires to collect primary information such as size of households and firms, income, Educational level etc. from the selected sampling units. A multi-stage stratified sampling method (Drew, 1980) was applied for the sampling process and a total of 250 households (EPA, 1996) were selected for the survey. 156 households made up of 660 persons co-operated with the survey. Each selected household 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 and moderate size bags for storing their solid waste over the following seven days. The next visits were made at regular interval to collect the solid waste generated over seven days at each household. This sampling was carried out from April, 2008.

**RESULTS AND DISCUSSION**

The data collected from the survey and Site-Specific studies (USEPA, 2006) were analysed and results from the analysis were collated and record as shown in table 1. The results shown in table 1 revealed that 0.334kg per person per day (ppd.), (78.59%) of food waste, 0.037kg ppd. (8.65%) of plastic and rubber, 0.016kg ppd. (3.67%) of paper, 0.017kg ppd. (4.11%) of metal, 0.012kg ppd. (2.82%) glass and 2.10% of other waste is generated in the metropolis (Igbinnomwanhia et al., 2009). The responses to some solid waste management issue were collated from the questionnaire, analyzed and results from the analysis were recorded in table 2, table 3 and table 4. The results obtained from the analysis shown in table 4 revealed that 52.83%, earns monthly income which is less than or equal to about $300 USD and the results in table 2 showed that 20.13% dispose off their solid waste themselves, 66.04% patronize private independent waste disposal agents, 9.30% patronize hand Carts and 4.44% patronize government solid waste disposal agencies – Edo state waste management Board (ESWB) and Local Government Council (LGC). In addition results in table 4 showed that 58.49% pays less than or equal to about $3 USD for waste disposal per month. Considering the above responses it is clear that over 50% of the households live in a state of poverty. Hence the households are not able to pay good user service charges that can help in the development of a sustainable solid waste management system. The data collected also showed that 1.70% had no formal education, 8.81% primary education, 22.00% secondary education, 63.52% tertiary education and 5.03% vocational education respectively. In addition the response on responsibility and payment for solid waste disposal in table 3 showed that 26.42% said solid waste disposal is the sole responsibility of the government, 73.58% said solid waste disposal is not the sole responsibility of the government, 83.02% said they were willing to pay for disposal service and 16.98% said they were not willing to pay for disposal service. Some constraints to solid waste management in the metropolis were identified as follows:

**Constraints to Solid Waste Management in Benin Metropolis**

- **Economic Constraint**
  By definition, developing countries have weak economic bases, hence, insufficient funds for development of sustainable solid waste management systems (United Nations Commission on Sustainable Development, 1997). The survey revealed that an average of about 54.56% of the sampled households earn less than or equal to about $300, as monthly income. Considering the economic requirement of the family, a monthly income of less than or equal to $300 cannot meet the economic demand of the family hence as they can do without the service of a solid waste disposal agent they engage in crude open dumping of solid waste in drainages, around the streets and open market places, any peace of unused land, Open air burning without air pollution control. In addition economic constraints also make them to patronize cart pushers who are not able to get to the approved designated dump sites where the solid waste are expected to be managed properly.

- **Financial Constraint:**
  In general, solid waste management is given a very low priority in developing countries, except perhaps in capital and large cities (United Nations Commission on Sustainable Development, 1997). This study showed that this is the case in Benin Metropolis. Solid waste management is given very low priority in the budget due to limited finances (van Beukering et al., Omran and Read, 2008). As a
result very limited funds are provided to the solid waste management sector by the governments, and the levels of services required for protection of public health and the environment are not attained. The user service charges collected by the disposal agents is too little to make any meaningful impact on solid waste management. However, users’ ability to pay for the services is also limited by their income, and their willingness to pay for the services which are irregular and ineffective is not high either. More so the end point of the solid waste does provide financial reward to waste disposal agent hence the only source of finance to the disposal agent is the user service charges.

- Technical Constraint
In most developing countries, there is lack of human resources at both the national and local levels with technical expertise necessary for solid waste management planning and operation (Ogawa, 1996). Many officers in charge of solid waste management, particularly at the local level, have little or no technical background or training in engineering or management. In fact all the problems that the solid waste Management system is faced with are exacerbated by the lack of trained personnel. These include workers in all ranks, from the administrator to the refuse-men. There is no formal training program and communication is poor. Without adequately trained personnel sustainable solid waste management planning and implementation is not realizable (Zavodska, 2003). This study also revealed that there is ineffective solid waste collection and unreliable solid waste collection service. In fact the study showed that the coverage of solid waste collection service is very low, that solid waste generated is dumped at many undesignedated sites (e.g., open areas, water channels, streets, etc.). The lack of provision of sufficient public receptacles for solid waste storage is another technical problem worthy of note. Solid wastes were observed dumped in open areas in residential areas and market places. Aged vehicle fleet and poor road access were also observed. In addition a large proportion of the vehicle were observed to be open vans which results in waste littering on the way to the dump site. Open air burning of solid wastes was observed including medical waste in the dumpsite.

- Institutional Constraint
Several agencies have been created at the state level that is involved at least partially in solid waste management (Ogawa, 1996). Such agencies at the state level include – Edo State waste management board (ESWMB), Operation Cleanup Edo State, Special Environmental task force etc. However, there are often no clear roles/functions of the various state and local government agencies defined in relation to solid waste management and also no single agency or committee designated to coordinate their projects and activities. The local government environmental department has the responsibility of picking up and transportation of solid waste from public place (Schwarz-Herion et al, 2008). The ESWMB also has the mandate to pick up and transport solid waste to the dumpsite. However there is no body coordinating these activities. The lack of coordination among the relevant agencies often results in duplication of efforts, wastage of resources, and un-sustainability of overall solid waste management programs. The lack of effective legislation for solid waste management is partially responsible for the roles/functions of the relevant state and local government agencies not being clearly defined and the lack of coordination among them.

- Social Constraint
This study revealed that the social status of solid waste management workers is generally low (Agunwamba, 1998). This is due to the negative perception of the society regarding the work which involves the handling of solid waste. Such societal perception leads to low regards the work, low self-esteem for the workers especially the garbage men and in turn produces low working ethics and poor quality of their work (Ogawa, 1996). Where the society allows only a certain social class or group to deal with solid waste, the availability of work force for solid waste collection and disposal becomes constrained by this rule.

- Cultural Constraint
In the course of this study, materials such as dead animals, food items and cloth used for sacrifice were observed at the road junctions and by the road side. The practice of dumping material for sacrifices such as animal parts or full dead bodies of animal at road junctions and by the road side is a cultural norm acceptable in the Bini Kingdom. Such norms affect designs and implementation of sustainable solid waste management systems.

Feasible Suggestions for improved Solid waste management in Benin metropolis and Cities with Similar Characteristics

i. Public awareness on solid waste management needs to be improved in the metropolis. This can be achieved using a variety of factors such as the integration of environment education centered on solid waste management and the environment into the school curriculum beginning with the elementary schools. Public awareness can also be improved through some low cost methods such as seminars, workshops, news letters, speeches,
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 bins are old they should be replaced.

It is obvious that funding is a major issue in solid waste management; 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 fee and charges that will be paid by residence and business, in the metropolis. And this fee and charges should be dedicated to research such as development of solid waste management system and management of solid waste in general in the metropolis.

The results presented in table 2 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, financial no 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 approvals are given to the 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 that the waste become assets instead of liability.

The practice of technology support has moved forward in recent years, especially in the 1990s (Zavodzka, 2003). It is therefore imperative to develop new direction in concept and practice in accordance with the Nigerian environment to stimulate the growth of solid waste management in the metropolis. There is need for the government agencies and research institutions to run seminars and workshops on modern engineering and industrial practice of solid waste management to reorient the operators of solid waste management in Nigeria so as to increase their contribution to the gross domestic product (GDP.).

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.

CONCLUSION

The result from the characterization of solid waste in Benin metropolis showed that 0.425kg of solid waste is generated per person per day (ppd) in Benin metropolis and over 20% of recyclable solid waste is generated in Benin metropolis. This study also revealed that enough attention is not given to management of solid waste in Benin metropolis. The constraint to solid waste management in Benin metropolis has been identified. The major constraint is the lack of technical expertise require for solid waste management. However some feasible suggestions have been presented for improved solid waste management in the metropolis and Nigeria at large.

REFERENCE


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Table 1: Average component of household solid waste generated per person per day in Oredo LGA

<table>
<thead>
<tr>
<th>Components</th>
<th>Weight (Kg)</th>
<th>% Components</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Waste</td>
<td>0.334</td>
<td>78.59</td>
</tr>
<tr>
<td>Plastics</td>
<td>0.037</td>
<td>8.65</td>
</tr>
<tr>
<td>Paper</td>
<td>0.016</td>
<td>3.67</td>
</tr>
<tr>
<td>Metal Waste</td>
<td>0.017</td>
<td>4.11</td>
</tr>
<tr>
<td>Glass</td>
<td>0.012</td>
<td>2.83</td>
</tr>
<tr>
<td>Other waste</td>
<td>0.009</td>
<td>2.10</td>
</tr>
<tr>
<td>Total solid waste ppd</td>
<td>0.425</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: (Igbinomwanhia et al. 2009)
Ppd – per person per day
Other Waste – textile, foam, ceramics, ash etc

Table 2: Response on method of disposal of solid waste in Benin metropolis

<table>
<thead>
<tr>
<th>Waste Disposal Agent</th>
<th>Private Agent</th>
<th>LGC</th>
<th>ESWMB</th>
<th>Hand Cart</th>
</tr>
</thead>
<tbody>
<tr>
<td>%Tage response</td>
<td>20.13</td>
<td>66.04</td>
<td>1.89</td>
<td>9.43</td>
</tr>
</tbody>
</table>

LGC: Local Government Council
ESWMB: Edo State Waste Management Board

Table 3: Household Response to willingness to pay for disposal charges in Benin metropolis

<table>
<thead>
<tr>
<th>Is waste disposal sole responsibility of govt.?</th>
<th>% Yes</th>
<th>% No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willingness to pay for disposal</td>
<td></td>
<td></td>
</tr>
<tr>
<td>%Tage response</td>
<td>26.42</td>
<td>73.58</td>
</tr>
</tbody>
</table>

Table 4: Household Response on amount paid for disposal with reference to monthly income in Benin metropolis

<table>
<thead>
<tr>
<th>Monthly income</th>
<th>Amount paid for disposal/month</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than $300</td>
<td>$700 - $1000 - $1001 - $1300</td>
</tr>
<tr>
<td>$3 - $7</td>
<td>$7 - $15</td>
</tr>
<tr>
<td>% Response</td>
<td>52.83</td>
</tr>
</tbody>
</table>

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