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An Evaluation of Solid Waste Characterization in Marketplaces in Benin Metropolis: Case Study of Uselu Market

S. A. Aliu, B. A. Aburime and H. O. Egware

[123]**Department of Mechanical Engineering, University of Benin, Benin City, Nigeria.**

Abstract

The work reported in this paper is an investigation of the characterization and segregation of solid waste in markets in Benin Metropolis, Edo State, Nigeria. Uselu Market was chosen as the study area. Primary data on the number of stores in the market was collected in order to determine the sample size required for adequate representation. Opinion sampling questionnaires were administered as the main instrument and interviews were conducted to fill gaps. The results show that 12.95% of the stores generate food waste, 27.58% paper waste, 5.51% glass/bottles, 12.47% tin or cans, 25.90% plastics and 15.59% other kinds of waste such as textiles, leather, oil, hair attachments and kitchen wares etc. It can be seen that a greater percentage of respondents cutting across the various categories of educational status favoured payment for solid waste management and participation in the sorting of solid waste. Ironically more of those with the least education are more favourably disposed to joining sorting of solid waste.

Keywords: Characterization, marketplaces, solid waste, Benin metropolis, educational status.

1.0 Introduction

European Union [1] defined waste as any substance or object, which the holder discards, intends to discard or is required to be discarded. According to Harris et al. [2] a material is only a "waste" if it is useless and as soon as it is usable it becomes a resource but Jagannath [3] insists that there is nothing like waste in nature, it is only a resource at a wrong place. A clean environment is essential for human health and well-being[4]. Waste therefore has to be disposed off in an environmentally acceptable manner to ensure a "clean" environment. It is also a fact that there is no absolutely "clean" environment but man must continuously strive to achieve a reduction of the level of pollutants in the environment. Currently the state of solid waste disposal in markets in Benin metropolis presents a number of challenges. These are brought about by socio technical trends like increasing use of packaging materials and disposable short life goods in addition to local agricultural waste. Prior to collection, solid waste is dumped near the market area on the roadside, on open land or in open steel bins. The high content of biodegradable matter of market waste makes this unsightly, creates unpleasant odours and is unsanitary. Waste often spreads from these sites into drains causing blockages leading to local flooding [5].

Rapid urbanization and conurbation makes it imperative that discarded goods must be disposed in an environmentally acceptable manner. With rising standard of living and population growth large volumes of solid wastes are generated in markets in Benin metropolis. In view of the fact that most foodstuffs are marketed in their raw form, the implication is an increased magnitude of crop waste generation, both at the market and household levels[6].

The present arrangement in our urban markets for solid waste disposal is for the Edo State Waste Management Board to carry solid wastes from designated depots in the markets to government approved dump sites. All sorts of generated wastes in the markets irrespective of nature and composition are disposed off in this manner.

This makes the management of the enormous volume of waste a very difficult task for the municipal councils to handle effectively. About (30-50)% of their annual budgets will be required if they are going to be able to handle this effectively[7]. Heaps of wastes in deteriorating conditions are constantly shown on electronic media competing for space with traders and constituting a nuisance to the general public.

It is observed that the present solid waste management in markets in Benin metropolis has not taken into consideration the resource conservation and simple economic factors that will accrue from the conversion of solid waste to wealth. Efforts that

Corresponding author: S. A. Aliu, E-mail: sufianu.aliu@uniben.edu, Tel.: +2348028938141 (Egware H.O)

have been made to look into measures and means of effective and efficient disposal of the market waste has not really explored the economic and sustainability factors. Recycling is one of the techniques that can ensure sustainability of solid waste management. The first major step in planning a solid waste management which will include recycling is characterization [8].United States Environmental Protection Agency, USEPA [9] also listed identification of materials to be collected, existing regulations on solid waste management, the markets for materials proposed to be collected and the costs and benefits of collecting materials for recycling compared with the cost of disposal as guidelines for waste reduction in market places.

This preliminary investigation of the characteristics and segregation of solid waste in markets in Benin metropolis is to serve asa basis for finding an alternative solid waste disposal management system which will divert most of the solid waste for material and resource recovery.

2.0 Methodology

3.0 Study Area

The study covers an urban market in Benin City, Edo State Nigeria. The market is Uselu in Egor Local Government Council.

4.0 Method

This investigation was carried out in two stages. The first stage was to collect Primary Data on the number of stores in the market in order to determine the sample size required for adequate representation.

The second was the administration of opinion sampling questionnaires and interview. This enabled us to accurately investigate the characterization and segregation of solid wastes in the markets. Questionnaires were employed as the main instrument while interviews served as the complimentary tool which was sparingly used to fill the gaps

Generated wastes were grouped as garbage and rubbish. Garbage comprises of putrescible organic material while rubbish comprises of plastics, paper, metal and glass.

5.0 Model Specification

The sample size was determined using the model

$$SS = \frac{Z^2 \times P \times (1-P)}{C^2} \quad (1)$$

Where: Z = 1.96 for 9.5% confidence level

P = Percentage picking of choice

C = Confidence interval expressed as decimal e.g. 0.04 for $\pm$ 4

The value of the sample size was modified using

$$SS_n = \frac{SS}{1+\frac{SS-1}{Pop}} \quad (2)$$

Where SS_n refers to the new sample size and pop. refers to the population of the area of interest.

Equations (1) and (2) were obtained from [10]

Using the above model, the sample size for which questionnaires (See Appendix) were administered for the market was determined.

6.0 Results and Discussion

Data gathered from the surveys were analyzed and the results presented. The sample size was determined according to the specified model. The respondents consist of 80.76% females and 19.24% males. This shows that women form the larger percentage of traders in our markets especially in the southern part of Nigeria where they are never kept in seclusion. Table 1 shows the educational status of respondents. It can be seen that 91.84% have some level of education, 13.70% have tertiary education and only 8.16% have no form education whatsoever. This shows that majority of traders in the market are educated which is a positive development which should be improved upon though. The results shown in Table2 indicated that in Uselu market 12.95% of the stores generate food waste,27.58% paper waste, 5.51% glass/bottles, 12.47% tin/cans, 25.90% plastics and 15.59% other kinds of waste. By other kinds of waste we refer to such waste as textiles, leather, oil, hair attachments and kitchen wares etc. From this composition of waste it could be seen that the waste management option of recycling is needed if we desire sustainable solid waste management. This practice will ensure that income is generated to fund waste management.

It is common to see heaps of waste in varying decomposing levels in our markets constituting hindrances to smooth movement in around the market place. The stench from these heaps cause discomfort to visitors and traders who on their part ignore it as they go about their businesses. The respondents unanimously decried the situation and stressed on the need for government to address the matter of solid waste with all seriousness. Considering the fact that markets are very important and

integral part of societies and there is no alternative, it becomes imperative that the unhealthy and unfriendly nature of market places be given urgent and utmost attention. Table 3 shows the readiness of respondents to pay for solid waste management. It is important to state here that many of the respondents declined comments as to whether they would be willing to pay or not for solid waste management. It can be seen that 56.25% of respondents with no formal education, 100% of those with vocational education, and 75.76% of those with primary education, 75.61% of those with secondary education and 80.95% of those with tertiary education favoured payment for solid waste management.

The readiness of respondents to join source sorting of solid waste is presented in Table 4. It is cheering to find that a greater number of the respondents were prepared to join source sorting of solid waste. It can be seen that 85.72% of respondents with no formal education, 83.34% of those with vocational education, and 74.33% of those with primary education, 73.40% of those with secondary education and 65.95% of those with tertiary education favoured participation in the sorting of solid waste. It is quite ironic that those with the least education are more favourably disposed to joining sorting solid waste.

Table 1: Educational status of respondents

Educational status	**%**
No formal	8.16
Primary	21.58
Secondary	54.81
Tertiary	13.70
Vocational Educ.	1.75

Table 2: Solid waste components

Type of waste	**% Component**
Food	12.95
Paper	27.58
Glass/bottle	5.51
Tin/can	12.47
Plastics	25.90
Others	15.59

Table 3: Readiness to pay for solid waste management with respect to sex and educational status

Educational Status	**Male**		**Female**		**Total**
	Yes	**No**	**Yes**	**No**	
No formal	37.50	Nil	18.75	43.75	100
Primary	12.12	Nil	63.64	24.24	100
Secondary	21.95	3.66	53.66	20.73	100
Tertiary	33.33	Nil	47.62	19.05	100
Vocational Educ.	nil	Nil	100	nil	100

In the questionnaire, the general data of respondents was obtained in order to gain insight into the size of the market, the characterization of waste being generated and the level of awareness regarding the importance of efficient waste management. Waste generation and storage was also looked into in order to have an idea of the volume of waste generated per store and the attitude of the average trader to the disposal of waste generated from their stores. We equally focused on the current regime of waste disposal practice in the market to ascertain its efficiency, financial cost on the partof the traders and their readiness to be a part of efforts geared at improving the situation. A picture of the present state of waste management infrastructure in the market was sought at so as to know the areas of need. Finally, the general willingness of traders to waste sorting was investigated to know the possibility of planning sustainable solid waste management which must of necessity include characterization.

Table 4: Readiness to join source sorting of solid waste with respect to sex and educational status

Educational Status	**Male**		**Female**		**Total**
	Yes	**No**	**Yes**	**No**	
No formal	17.86	7.14	67.86	7.14	100
Primary	9.46	1.35	64.87	24.32	100
Secondary	17.02	3.19	56.38	23.41	100
Tertiary	14.89	10.64	51.06	23.41	100
Vocational Educ.	16.67	Nil	66.66	16.67	100

7.0 Conclusion

The solid waste generated by stores in Uselu market in Benin City consists of 72% recyclable waste. The biodegradable waste is over 20% which consists of food leftovers, textiles, leather and oil. It is not expected that individual traders should be the ones making arrangements for solid waste management in the markets. A larger percentage of the traders are willing to join source sorting of solid waste which should serve as encouragement for the authorities to provide an effective centralized arrangement for solid waste management. Regular and prompt evacuation of waste in our markets will ensure a clean market environment. It is clear that if appropriate measures are adopted for the management of solid wastes generated in market places it will translate to a huge source of revenue rather than being a liability that it is presently.

8.0 Appendix

MUNICIPAL SOLID WASTE - A CASE STUDY OF MARKET IN BENIN METROPOLIS
QUESTIONNAIRE
INTRODUCTION

This questionnaire is designed for collection of data that will help in estimation of the solid waste generated in markets in Benin metropolis for the purpose of developing a suitable and effective waste disposal and management system in the metropolis. Several efforts and attempts have been made by government and private individuals in the past to manage solid waste, but such efforts proved inadequate and ineffective. This work is part of a research work aimed at evolving an effective and economic waste management system for the Benin metropolis. I hereby seek your understanding and cooperation as you provide answers to the questions. The purpose of this study is purely academic, and any information given here is held in strict confidence. Thank you

Section 1: Respondents General Data

Please fill the following information or tick as appropriate:

1. Name of Quarter_____
2. What type of trade are you involved in? Foodstuff ☐ Provision ☐ Cosmetic ☐ Canteen ☐ Others specify _____
3. Number of people working in your store_____
4. Age of respondent. 18-24yrs ☐ 25-30yrs ☐ 31-36yrs ☐ 37-42yrs ☐ Above 42yrs ☐
5. Sex: Male ☐ Female ☐
6. Educational Background (Tick the highest level of education). No formal education ☐ Primary education ☐ Secondary Education Tertiary/Higher education ☐ ☐ Vocational education ☐
7. How long have you been in this trade? 1-5yrs ☐ 6-10yrs ☐ 11-15yrs ☐ 16-20yrs ☐ Above 20yrs ☐ I don't know ☐

Section 2: Waste Generation And Storage

8. Which of the following are the types of waste generated in your store? Food waste Paper ☐ Can/Tins ☐ Glass/Bottles ☐ Plastics ☐ others (specify) _____
9. Do you have waste bins in your store or shade? Yes ☐ No ☐
10. I f yes, how many? 1 ☐ 2 ☐ 3 ☐ 4 ☐ Above 4 ☐
11. What type of waste bin do you have in your store? Perforated plastic bin ☐ Paint drums ☐ Plastic bag ☐ sack ☐ Cartons ☐
12. How long does it take the waste bins to get full? 1day ☐ 2days ☐ 3days ☐ 4days ☐ 5days ☐ 6days ☐ One week ☐
13. When they are full where do you store them before disposal? _____
14. If you do not have waste bins, how do you store your waste before it is collected for disposal? _____

SECTION 3: WASTE DISPOSAL

15. How do you dispose off your waste? Self ☐ Private agents ☐ Cart pushers ☐ L. G Council ☐ Edo state waste management board ☐
16. If not self, how often is waste collected from the premises of the market? Everyday ☐ once a week ☐ twice a week ☐ once a month ☐ twice a month ☐
17. How much do you spend on waste disposal monthly? Below N500 ☐ N500 - N900 ☐ N1, 000 - N2, 000 ☐ above N2, 000 ☐
18. How effective is the waste collection? Satisfactory ☐ unsatisfactory ☐
19. If unsatisfactory, why _____

20. If self, how and where do you dispose off your waste? Nearest dumping site ☐ Road side ☐ Burning any fallow land ☐ Others (specify) _____
21. If self are you willing to pay a little money for the service of the waste disposal agents?

Yes ☐ No ☐

22. If no, why are you not willing to contribute for the service of waste disposal agents? _____

SECTION 4: DUMP SITE

23. Are there any dumping sites/refuse depots within the markets? Yes ☐ No ☐
24. If yes, how many?

1 2 3 above 3 I don't know

25. Are they all approved dump sites/refuse depots? Yes ☐ No ☐
26. If no, how many are the approved dumpsites? _____
27. What is the distance of the nearest one to your store?

Below 250m ☐ 250m-500m ☐ 500m-1000m ☐ above 1000m ☐

28. How often are the dump sites/ refuse depots cleared?

Never Daily Twice a week weekly

29. Who is in charge of clearing the dump sites/ refuse depots?

Traders ☐ Local Govt. (Council) ☐ ESWMB ☐ I don't know ☐

30. Do you know the final destination of the waste collected from your market premises for disposal? Yes No
31. Do you pay market maintenance levy? Yes ☐ No ☐
32. If yes how much per annum? Less than N5, 000 ☐ N5, 000 - N10, 000 ☐

N10, 000-N15, 000 ☐ above N15, 000 ☐

33. Does the levy cover waste disposal? Yes ☐ No ☐
34. What other things does it cover?

Security ☐ Market maintenance ☐ Plumbing ☐

35. Do you consider the disposal of waste the sole responsibility of the govt.? Yes ☐ No ☐
36. If no, would you be prepared to pay a small fee for this service? Yes ☐ No ☐
37. If yes how much? _____
38. If no, why? _____

SECTION 5: WASTE MANAGEMENT

It is being planned that solid waste should be sorted before collection for disposal. In that case, different waste bins will be used for the different type of solid waste (Food waste, plastics etc.)

39. Are you willing to join in this plan for the use of more than one waste bin in your store?

Yes ☐ No ☐

40. If no why? _____
41. Do you have any recommendations/ suggestions? Yes ☐ No ☐
42. If yes, please state them below _____

_____

9.0 References

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