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Characterization study of solid waste in university of port Harcourt, River State, Nigeria

Woke G.N. and Babatunde B.B.

Department of Animal and Environmental Biology, University of Port Harcourt.

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ABSTRACT

This study was undertaken to assess the characteristics of solid waste generated in the three campuses of the university viz Abuja, Delta and Choba campus. Open dumpsites were identified in each campus and a representative sample of solid waste (5kg) was obtained. The results showed that food waste contributed the highest percentage composition of 35.9% in Choba followed by Abuja (25.49%) and Delta Park (17.39%). Paper had the highest percentage composition of 26.45% in Delta Park, followed by Abuja Park (23.14%) and Choba (10.71%). Wood had the least composition of 1.96% in Abuja Park but absent in Delta and Choba Park. The results further showed that food waste had the highest composition of M.S.W generated in Choba (Weight kg) 3.55, followed by Abuja Park (2.6) and Delta Park (2.1) while wood had the least weight generated of 0.20 in Abuja Park and absent in Delta and Choba Park. The data analysis revealed that there was no significant difference in the composition of waste in the different campuses at $p<0.05$. It is believed that given the characteristics of these waste streams, an integrated solid waste management system in the University will enhance the adequate utilization of the various categories of solid waste in the areas of resources, recovery and waste-to-energy.

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Introduction

Waste is any unwanted material intentionally thrown away for disposal. Oresanya (1998). Solid waste management in the University of Port Harcourt is a fundamental issue that must be addressed in order to achieve success. The problem of solid waste management is the deficiency of appropriate and adequate policies plan legislations, and environmentally stimulated and enlightened the public. Waste can be any garbage, sludge, gaseous and any other material that is released into the environment without need for it (Leton and Omotosho, 2004).

Waste characterization and composition study is an exhaustive and empirical study that reveals the make-up of the waste stream of a particular area (Zurbrugg, 2003). It makes use of practical approach to analyze the waste components and their individual percentage contribution to the entire waste stream. It is thus useful to carry out such studies to enhance proper waste management strategies and plans. The data obtained will be useful for policy redress and more importantly, the harnessing of waste for socio-economic gains (Philip, *et al.,* 2014). For example, waste containing more of organic components may be utilized for biogas production and also used for composting.

Evidently, waste characterization and composition is an important and integral part of proper waste management system and its relevance cannot be over emphasized as the 3Rs – reduce, reduce and recycle can only be effective if the composition by proportion of the waste stream is fully appreciated (Babatunde *et al.*, 2013).

The quality and generation rate of solid waste in Nigeria have increased at an alarming rate over the years without corresponding efficient and modern technology for managing the waste (Babayemi and Dauda, 2009). The indiscriminate and improper dumping of solid waste in developing countries is increasing and is compounded by a cycle of poverty, population explosion, decreased standards of living and poor governance and low level of environmental awareness. Solid waste in Nigeria poses many problems including blockage of drainage and channels causing flooding and presenting breeding grounds for mosquitoes and other vectors and pathogens (Igoni*et al.,* 2007).

University of Port Harcourt where the present study was undertaken is unique to most universities in Nigeria. Therefore, the major consideration was characterization of solid waste at University of Port Harcourt and the objective was to determine the components of the waste stream among the three campuses of the University of Port Harcourt, mainlyuniversity (Abuja) Park, Delta Park and Choba Park and to determine the percentage composition of each component and to find out the weight of the individual components by mass.

Study Area

The study area, University of Port Harcourt is located in Obio/Akpor Local Government Area, Rivers State of Nigeria. The University is located on the latitude 4°53“14”Nthrough4°54“42”N and longitude 6°54“0”E through 6°55“50”E. The University community comprises of three main campuses; University (Abuja) Park, Delta Park andChobaParkFig.1.1.

Tele:
E-mail address: g.woke@yahoo.com

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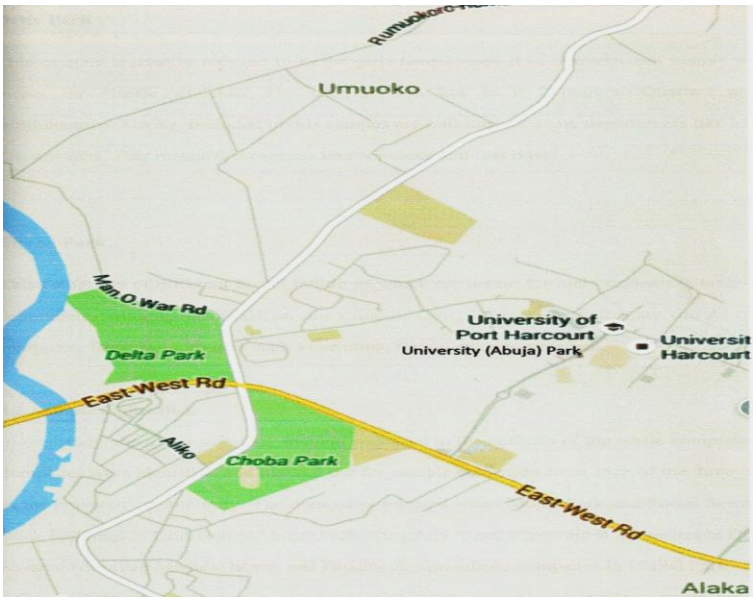

Fig. 1. Map showing study area.

University (Abuja) Park

This is the main administrative campus that has in it the senate building which is the main administrative complex. It also have inside it lecturer's quarters, where the University Staff live. The University Park, otherwise called Abuja campus has different faculty buildings and classrooms.

The campus is considered to be the biggest among the three campuses in terms of space, structure and activities.

Delta Park referred to as the girls hostel since it is characterized mainly by hostels meant for femalestudents.The ampus also has in it lecturer's quarters and some administrative blocks.

Choba Park

This comprises of different hostel buildings which are meant for male students, classrooms and department buildings also exist in this campus. Business activities such as printing and typing etc. are prevalent. The campus is situated close to the community and it is the starting point of the university in 1978.

Materials and Methods

Direct sampling method was used in the analysis of the waste components. Two dumpsites were identified and marked out for sample collection from each of the three campuses of the University community. The dumpsites selected were: Motor Park and Social Science (First Bank Building) (University Park), King Jaja A and B dumpsites (Delta Park), Kwame Nkruma Medical Hostel and faculty of Agriculture dumpsites (Choba Park).

At each dumpsite, a randomly collected solid waste was placed inside a waste bin bag and weighed to obtain a 5kg representative sample or unit of the dumpsite. The collected sample was then poured out onto a material, placed on the ground before commencing the sorting procedure.

Sorting and Weighing

The sorting process was carried out manually. The waste sample was sorted into different categories with the use of hand and sticks. The categories were food waste, paper plastic textiles, rubber and leather, nylon, wood, glass, metals and others.

The already sorted solid waste components were then placed inside different polythene bags and weighed separately to obtain the weights of the various waste categories. The waste components were weighed using a weighing scale and the categories of different wastes were recorded.

Results and Discussion

The results of municipal solid waste in the three campuses showed that food waste contributed 25.49%, paper 23.1%, plastic 8.43%, nylon 25.49%, wood 1.96%, glass 8.43%, metal 2.55% and others 4.5%, all in Abuja campus of the University (Table 1.1). Food waste in Choba campus had the highest mean density of 1.78 $\pm$ 0.47, followed by Abuja Park 1.30 $\pm$ 0.55 and Delta Park 1.05 $\pm$ 0.15 (Table 1) in all the three campuses collected, while textile had no collection in Abuja Park, Rubber & Leather had no collection in Abuja Park and Delta Park. Also wood had 0.10 $\pm$ 0.13 in Abuja Park but none in Delta and Choba Park (Table 2) (Fig.2).

In Delta Park, the percentage composition of food waste was 17.39%, paper 26.45%, plastic 5.79%, textile 23.14%, nylon 13.22%, glass 2.48% metal 4.1% and others 7.44% (Table 1).

However, in Choba Park, the percentage composition of food waste was 35.9%, paper 10.71%, plastic 9.69%, textile 12.12%, nylon 18.79%, glass 3.64% while leather and others had same percentage value of 3.03% (Table 1).

The results further showed that Choba Park recorded the highest percentage composition of food waste (35.5%), followed by University Park 25.4% while Delta Park recorded the least percentage composition of 17.36%.

Table 1: Percentage (%) Composition of Generated M.S.W. in University of Port Harcourt

Waste category	University (Abuja) Park	Delta Park	Choba Park
Food waste	25.49	17.36	35.96
Paper	23.14	26.45	10.71
Plastic	8.43	5.79	9.69
Textile	-	23.14	12.12
Rubber &leather	-	-	3.03
Nylon	25.49	13.22	18.79
Wood	1.96	-	-
Glass	8.43	2.48	3.64
Metal	2.55	4.13	3.03
Others	4.51	7.44	3.03

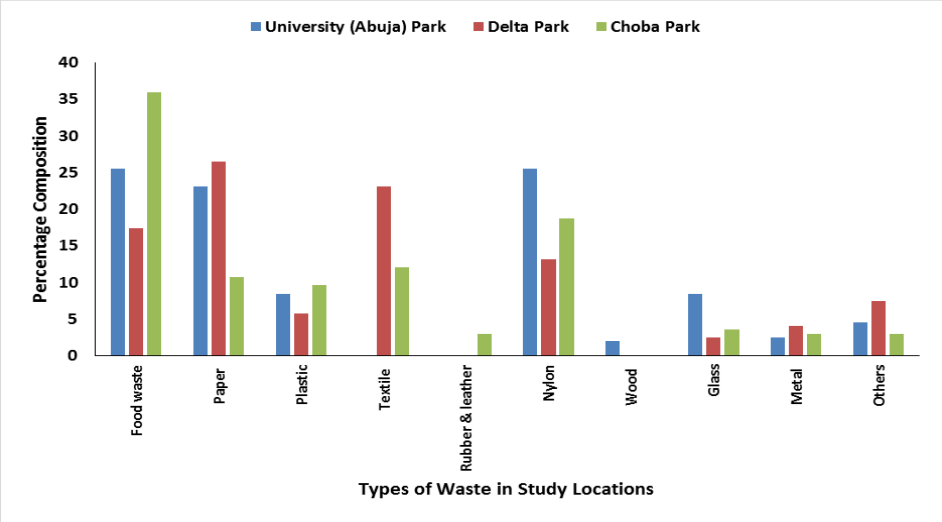

Fig. 2. Waste composition comparison in University of Port Harcourt.

The waste characterization study revealed that the composition of the solid waste in University of Port Harcourt was dominated by food waste, followed by paper. Food waste normally tops other waste categories. But that of paper is as a result of the environment which involves much work with paper. Thus discarded paper become much available in waste dumpsites in the university.

The high percentage of food waste may be attributed to the consumption of unprocessed food as compared to processed food consumed in more developed countries (Babatunde *et al.,* 2013). World Bank (1999) reported that generally low and middle income countries have a high percentage of combustible organic matter in the urban waste stream, ranging from 40-85%. Igoni*et al.,* 2007, reported 69.3% of organic content in MSW in Port Harcourt and opined that the energy content of refuse generated in Port Harcourt gave 1.733kcal/g which is sufficient for biochemical conversion to yield gas and heat for electricity. This high percentage of organic content in the waste stream in Abuja campus and its suburbs can be harnessed for energy generation. It is estimated that 100 tons of municipal refuse with 50-60% organic content can generate 1-1.5 megawatt of power depending on the characteristics of the waste (NEED, 2011).

Nylon recorded the highest composition at Abuja Park followed by Choba for reasons stated earlier in this report and Delta Park recorded the least nylon composition.In Delta Park, paper waste composition was highest followed by Abuja Park and Choba Park where the least composition of paper waste was recorded. Choba experiences the highest commercial activities among the three campuses of the University. Mean values were not statistically significant ($p<0.05$) in all the centers due largely to the presence of human activities in the location. Rubber and leather were not presence in Abuja Park and Delta Park and also applicable is the absence of wood in Delta Park and Choba Park due to serious urbanization in the area.

The results showed that the municipal solid wastes generated at the study locations were heterogeneous and can be sorted at source to ease collection, transportation and ultimate disposal problems allowing the municipalities to adequately recover and utilize the resources abundant in the waste streams. Colour coded disposal bins can be provided by municipal authorities for home sorting at residential areas of the university, market places and offices.

An organized collection system can be established by legislation which may include the cart pushers which pick up the sorted waste according to colour codes and deliver to a transfer stations designated for specific waste type under a designated contractor who uses compactor vehicle or convey the waste type to final destination for recycle, energy generation or resource recovery (Babatunde*et al.,* 2013).

The multiplying effect of a sustainable solid waste management cannot be overemphasized as the benefits are indeed many.

Greenhouse gases such as Methane and CO_2 which are the major gases produced from waste will be substantially reduced if the waste is reduced, reused or recycled (UNEP, 2002).

Conclusion

This characterization study has revealed the make-up of the waste streams of the University Community and thus is necessary to be sued in formulating a better and sustainable waste management system. This will not only drastically change the look of the University environment, but will also add to the institution's reputation. Clean and healthy environment attracts people. Also the present method of final disposal of the generated waste in the University can be modified to suit the waste components present in the waste stream.

The responsibility of proper management of solid waste should not be left to the government alone or to some certain group of individuals. The way to a better and sustainable waste management system starts from understanding of the types of waste generated in an area (Benjamin *et al.,* 2014). Waste characterization study helps to generate such information that will aid in understanding the various waste components that exist in the waste stream of such environment. Although the study is relatively expensive, unnecessarily cumbersome and time consuming, the results obtained from such study are an invaluable set of information that will drastically change the waste management policy and system of such area. Such transformation can only occur if the results obtained are channeled into practicable use and not abandoned to just a mere paper work.

References

Babatunde, B.B. Vincent – Akpu, I.F., Woke, Atarhinyo, E., Aharanwa, U.C., Green A.F. Isaac-Joe O. (2013): Comparative analysis of municipal solid waste (MSW) composition in three local government areas in Rivers State, Nigeria. African Journal of Environmental Science and Technology Vol. 7(9), pp. 874-881.

BabayemiJ,.O. DaudaK.T. (2009): Evaluation of solid waste generation, categories and disposal options in Developing Countries: A case study of Nigeria. *J. Appl. Sci. Environ. Mgt.* 13:83-88.

Benjamin T.A. Emmanuel E.O. and Gideon, A.D (2014). Characterization of municipal solid waste in the Federal Capital Territory, Abuja, Nigeria. *Global Journal of Science Frontier Research: H Environment and Earth Science* 14, pp. 287-316.

Igoni, A.H., Abowei, M F N, Ayotamuno, J.M., Eze,C.L. (2007). Effect of total solids concentration of municipal solid waste in anaerobic bath digestion on the biogas produced. *J. Food Agrenl. Environ.* 5:353-337.

Leton, T.G. and Omotosho O. (2014): Landfill operations in the Niger Delta region of Nigeria. Engineering Geology, 73(1-2):171-177.

National Energy Education Development (NEED) (2011): Museum of solid waste. The NEED project. P.O.Box 10101, Mamassa, VA 20108.

Oresanya, O. (1998) Waste Control Measures and Responsibility of a waste manager within the framework of recent management methods and Development in Municipal and industrial wastes. Paper presented at the workshop on effective waste management in Nigeria organized by the Nigerian Society of Engineers, Lagos.

Philip, O.M., Albert, A.A. and Godfrey O.B. (2014): Characterization of solid waste in the AtwimaNwaginga District of Ashanti region, Kumasi – Ghana. *International Journal of Waste Management and Technology*. Vol. 2(1):1-14.

United Nations Environment Programme, UGA (UNEP) (2002). Contribution from waste to climate. http://www.vitalgraphics.net/waste/html file/42-43 climate.

World Bank (1999): What a waste: solid waste management in Asia. The World Bank Report, Washington D.C. USA.

Zurbrugg, M. (2003) Solid Waste Management in Developing Countries – SANDC/EAWAG.