DOI: https://dx.doi.org/10.4314/gjss.v22i1.14

GLOBAL JOURNAL OF SOCIAL SCIENCES VOL 22, 2023: 167-178
COPYRIGHT© BACHUDO SCIENCE CO. LTD PRINTED IN NIGERIA. ISSN 1596-6216
www.globaljournalseries.com.ng; globaljournalseries@gmail.com

URBAN LANDUSE AND GENERATION OF SOLID WASTE IN CALABAR METROPOLIS, CROSS RIVER STATE, NIGERIA.

BASSEY JOHN BASSEY

(Received 28July 2023, Revision Accepted 11September 2023)

ABSTRACT

Despite various policies and agencies used by the government for waste management purpose, our streets continue to be littered with various solid wastes especially during raining periods while our gutters have been blocked due to various waste dumps in it. The author of this research conceptualized that efficient waste management can be archived only if the sources of waste can be identified, hence this study. This study was meant to identify various land uses, their associated wastes as well as, to test whether there are statistical differences on waste generated by the various land use systems in the study area. The study was a survey study, hence data were collected through questionnaire using a sample of 542 respondents comprising of respondents from all the identified landuse systems used in the study. Descriptive statistics was used to identify the various land uses and types of wastes associated with them, while inferential statistics of ANOVA was used to test the hypotheses formulated to guide the study at .05 level of significance. The various land uses found in the study were; commercial, agriculture, constructional and demolition, industrial, recreation, residential and transport. Various wastes generated by these landuses were also identify through percentage of responses among which included waste paper, metals; condemned tires, newspapers, concrete materials etc. ANOVA table shows a statistical significant difference among the waste generated by various land uses and the post hoc test specify groups with significant difference. Based on the findings of the study, it was recommended that careful assessment should be made apriori to determine which land use is proposed for a given urban space to ensure proper planning

KEYWORDS: Urban landuse, Solid wastes, waste generation, waste management

INTRODUCTION

Waste is more easily recognized than conceptualizing its meaning. Explicitly, once something is no longer useful to the owner or it is used and fails to fulfill its purpose, such automatically become waste.

Ukong (2009) succinctly notes that waste is any matter whether liquid, solid, gaseous or radioactive, which is discharged, emitted, or deposited in the environment. Waste can be categorized into solid, liquid, gaseous or radioactive waste, materials discarded in household dustbins, flushed down the toilets or

Bassey John Bassey, Department of Geography and Environmental Science, University of Calabar, Calabar, Nigeria.

used for chemical processing and so on. Solid waste could therefore be seen as those non-liquid and nongaseous products as a result of man's activities. It could be in form of refuse, sludge or garbage. Whichever forms it takes, waste generation has negative effect on the society. it obstructs legitimate for instance, human activities, form fertile grounds for the breeding of mosquitoes, rodents, flies and other pests that posed great threat to human health. The devastating effect of waste to the environment can only be reduced through efficient waste management (Ekpoh, 2009).

All over the world, solid waste management has been a major challenge to government especially in developing countries like Nigeria (Erdogan, Zaimoglu, Sucu, Budak&Kekec, 2008; Glawe, Viswanathan&Alamgir, 2005). This is because environmentally friendly solid waste management ought to go beyond the harmless discarding of waste, therefore, emphasis should be on minimizing the waste and maximizing reuse and recycling of generated waste. In a developing country like Nigeria; difficulty in waste management is a endemic. Presently, it is observed that most poor health cases and health issues resulted from air pollution, water pollution, and land pollution. Additionally, the rapid growth of urban centres in Nigeria, coupled with the development of defective infrastructural and social services have created an environmental situation in many parts of the country, which is becoming increasingly harmful to healthy living. The rapid growth of urban population, together with high rates of consumed resources, high living quality with introduction of modern technology and industrialization have brought an unintended and negative impact to the urban environment, with regard to waste generation, especially solid waste. In order to achieve the aim of solid waste management, it is mandatory to know the generators of the urban solid waste (preferably from landuse perspective), the justification, reason and concern. This may provide guidelines on the magnitude, nature of solid waste generated and essential management strategies.

Studies have in Nigeria shown that, municipal waste densities generally range from 250-370 kg/m3. Whereas the waste generation rate is 25 million tons annually and at a daily rate of 0.44kg - 0.66 kg/capita/day (Ogwueleka, 2009) as opposed to that of developed countries which according to Guangyu (2002) stands at 0.7kg-1.2 kg/h/d. Ogwueleka (2009) further noted that Lagos and Kano states generated about 9, 000 and 3, 849 tonnes/day of solid waste, which when combined are higher than that generated by the remaining 34 states of the federation. Other scholars found out that on average, Nigerian generated about 0.58Kg solid waste per person daily in some cities as follows: Abeokuta; Ogun state (0.60Kg/person/day), Ado-Ekiti; 0.71Kg, Akure, 0.54Kg; Ile-Ife 0.46Kg; Ibadan, 0.71Kg, Ilorin 0.43Kg (Adewumi et al., 2005; Yusuf &Oyewumi, 2008). Overall, Oyo state generated about 55 200Kg solid waste per day (Abel &Afolabi, 2007). Oluwemimo (2007) reported that the tonnes per year of solid waste generation in Kaduna, Onitsha, Aba, New Bussa and Uyo were estimated to be 4,313,124; 386,593; 236,703; 9,518 and 20,923 respectively as of 2007. A report on solid waste generation in Maiduguri in Borno State showed an estimate of 8.5 million tonnes for the year 2002 (Dauda&Osita, 2003). In Port Harcourt and Warri, Ajao and Anurigwo (2002) reported that there is an estimated solid waste generation of 164 029t/year and 66 721t/year, while Makurdi generated a household solid waste of 0.54Kg/capita/day (Sha'Ato et al., 2006). In 2007, Aziegbe (2007) reported solid waste generation in Abuja to be 0.55 kilograms per person per day, while Imam et al. (2007) recorded a slightly higher figure of 0.58 kilograms per person per day for the same year.

Broadly, land uses of municipal solid waste generation potential are residential, industrial, commercial, institutional and agricultural land uses, and construction as well as demolition process. In most of the research work cited earlier, waste generation are measured in terms of tonnage which can only be carried out by waste management agencies as each truck load from disposal bin to dumpsite.

In other cases, solid waste generated per person per day was determined through statistical estimation without actual field work usually accomplished by direct survey. Besides this, the data of pre-2010 seem outdated as more and more people are moving to the urban area daily in search for the greener pasture. Hence, the system of estimation and tonnage measurement may not be an appropriate method of waste estimation in Calabar context due to increase in population densities, varying characteristics of residents and irregular and unplanned urban waste management. Efficient assessment must connect waste generation to the core activities that make up the waste creation, the socioeconomic background of such activities or the built-in environment grade/quality (landuse). Land use aspects of urban solid waste assessment have a serious bearing on the quality and quantum of waste created.

According to the World Bank (2001) waste generation is significantly influenced by a country's development. This implies that more economically prosperous countries tend to generate more waste per capita than less economically prosperous countries. Moreover, methods/efficiency of waste management strategy adopted by any given country is the only factor bridging the gap between waste generation and its resultant effect. Notably, the scale of consumption of resources used, waste generated and its associated negative impacts vary dramatically from city to city, mostly based on the city's wealth, size and landuse system. Additionally, the increase of waste generation in the different regions of a country is indicative of its degree of urbanization. In cities, where standard of living is high, there is usually a higher waste output compared to rural areas (Amalu & Ajake, 2014). Furthermore, the highest levels of resources used and waste generated tend to occur in the wealthiest cities and among the wealthiest groups within the cities. Thus, wealthy cities contribute disproportionately to global environmental problems such as depletion of natural resources, emission of greenhouse gases, flooding and epidemics.

Today, there is, no doubt, that the world has increasingly become urban and the 21st Century has witnessed rapid and unprecedented urbanization of the world's population; 49% in 2005 and it is estimated that by 2030, 60% of the population will live in the cities. In Nigeria alone, the pattern, trend and characteristics of urbanization have been alarming. The towns and cities have grown phenomenally with pace of urbanization showing extraordinary high rates of 5%-10% per annum (Egunjobi, 1999). Consequently, there have been rapid expansion of Nigeria cities and area up to 10 fold their initial point of growth (Agbola, 1997) and the worrisome fact is that the growth has been largely unplanned and uncontrolled (Egunjobi, 2002;Olarenwaju, 2004). Studies have shown that inadequate planning of urban landuse in Nigeria and great intensity of use has exacerbated urban problems (Egunjobi, 2002). Joyce (2018) explains that the urban area is generally conform to a regular predictable pattern whereby the decision to develop a piece of land for a particular use may be made independently by various private businessman and women. The primary reason for allocating a specific use for land can be purely profit motive. Landuse involves the management and transformation of natural environment or bare land into built environment such as settlements and semi-natural habitats such as farms, fields, pastures and managed woods.

Waste is otherwise generated by activities in all economic sectors and is generally regarded as an unavoidable by product of economic activity (waste generated from inefficient production processes, low durability of goods and unsustainable consumption patterns). The generation of waste reflects a loss of materials and energy, and imposes economic and environmental costs on society for its collection, treatment and disposal. Waste forms an increasing part of the total material flow through the economy and particularly in Nigeria, it is increasingly being considered in the context of material flows as a whole.

Waste generation scenario in Nigeria has been of great concern both globally and locally, amongst different categories of wastes being generated, solid waste has posed a hydra-headed problem, beyond the scope of various solid waste management systems in Nigeria (Geoffrey, 2005) as the streets experiences continual presence of solid waste from commercial activities. Be that as it may, it has to be pointed out that while some wastes are organic and can decay e.g food decomposes into the soil others are inorganic, e.g tins, cannot decay or decompose, hence being dangerous to health.

Aim and objectives

This study is aimed at identifying the various landuse types, types of generated waste and difference in waste generation by the various landuse types in Calabar metropolis. The specific objectives are to:

(1) Identify the various landuse types in the study area

(2) Identify types of waste generated by various landuses

(3) Examine the difference in types of waste generated by the various landuse types

Research hypotheses

Ho: There is no significant difference in the types of waste generated by various landuses in Calabar metropolis.

H_1: There is a significant difference in the types of waste generated by various landuses in Calabar metropolis.

Study area

Location

Calabar metropolis is located within Latitudes of $4^0$50'N and $5^0$10'N and Longitudes $8^0$17'E and $8^0$20'E situated at the extreme south east of Nigeria. It is the headquarters of Cross River State. The city is sandwiched between two major rivers, the great Kwa River and the Calabar River. This makes it a great peninsular with abundance of water resources.

Calabar metropolis consists of two local government areas out of the eighteen (18) local government areas of Cross River State. It is the centre of major economic and commercial activities as part of it constitutes the central business district (CBD) of Calabar. The city is connected to outside world through the Margaret Ekpo International Airport.

Population and Socio-Economic Activities

According to population projection, the population of Calabar metropolis L.G.A (2016) is estimated at 440,500 inhabitants with the large chunk of the area's dwellers being members of Efik, Efut and Qua ethnic divisions. Christianity is the widely practised religion in the metropolis. The popular festivals held in Calabar metropolis include the widely acclaimed annual Calabar Carnival. The economic activities includes public services, farming, fishing, hunting, blacksmithing and trade with the area being home to several markets such as the Marian market and Watt market.

Climate

Calabar metropolis is generally affected by the weather conditions due to its unique coastal location and high rainfall associated with the humid tropical environment. The metropolis has two distinctive seasons. The dry and rainy seasons; and the dry season begins in late November and extends to March, while the wet (rainy) season falls between April and October, with most of its heaviest rains in June and July. The period between December and January experiences cool and dry condition which is called the Hamattan period. The annual rainfall is over 28,000mm and the temperature ranges from 26^0C to 29^0C.

Vegetation

The vegetation of Calabar is that of the altered rainforest, which is found mostly in the periphery of the metropolis, where urban growth has not yet spread to while the metropolis itself is highly replete with infrastructural development such as houses, roads, parks, recreational facilities and other cultural features. This makes the vegetation less noticeable in the central metropolitan of Calabar except in area such as the Calabar botanical garden and other green areas within the city which are the preserved remainsof the original vegetation. Ornamental trees and grass lawns can be found virtually everywhere in the city, especially along streets, parks and gardens.

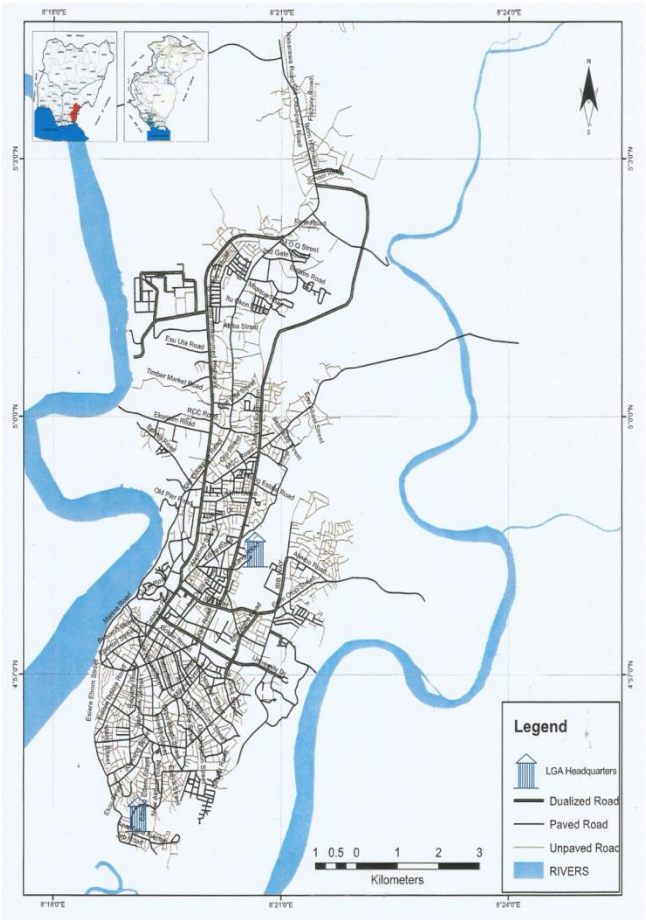

Fig.1: Map showing the study area, Calabar Metropolis.
Source: Department of Town Planning, Ministry of Lands and Urban Development Calabar, Cross River State.

Research Design

This study adopted the survey design in order to study the landuse wastes generation differential in Calabar metropolis. The research was, therefore, designed to focus on obtaining statistical data on various variables related to the subject matter.

Sampling Techniques and Procedures for Data Collection

The sampling techniques utilized for this study were the random, purposive and systematic random sampling techniques. The target population for the study were the inhabitants of the University of Calabar and the surrounding areas. The target population was purposively selected due to the fact that the University of Calabar in Calabar metropolis is the landuse with the highest agglomeration of people and as a result of this, the areas adjoining the school are safe to be called commercial hubs which also have many residential areas. The University, therefore, serves as a pull factor for other landuses so as to take advantage of the population

The simple random technique was then used to select three (3) areas from the adjoining areas. The three areas selected were Eta-Agbor axis, Mary Slessor Axis and IBB axis. The total of 200 questionnaires were administered to each of these areas (selected) using the systematic random sampling method. The first building in each of these areas were picked followed by every fifth notable building, until the allocated questionnaires per area were exhausted. Thus the total number of administered questionnaires for the study was 200. For the residential areas, these questionnaires were given to the head of households or as the situation arose the most senior member of the household present, while

they were administered to the cleaner or people identified as being saddled with the responsibility of disposing these wastes for the institutional and commercial.

Data Analysis

Descriptive and inferential statistics of one way analysis of variance were used for data analysis. Statistical analysis was done using SPSS software for windows (SPSS 25.00)

Presentation of Results

Various landuse types in the study area

To identify the various land use type in the subject area, descriptive statistics was used and the result is presented in table 1

Table 1: types of landuse

S/n	Land use	In existence	%	Not in existence	%	Total	Total %
1	Recreational	542	100	0	0	542	100
2	Transport	542	100	0	0	542	100
3	Agricultural	504	92.97	40	7.38	542	100
4	Commercial	542	100	0	0	542	100
5	Residential	542	100	0	0	542	100
6	Construction and demolition	542	100	0	0	542	100
7	Industrial	486	89.6	56	11.33	542	100
8	Others, please specify	369	68.08	173	31.19	542	100

Source: Author's fieldwork (January, 2023).

Table 1 shows the respondents agreement on the existence of various landuses in the study area. All the respondents totally agreed on the existence of recreational activities, transport activities, commercial activities, residential, and construction and demolition activities while 56 respondent representing 11.33 percent indicated that they were not aware of the presence of agricultural activities in the study area. Their responses may by as the result of urbanisation which could impede agricultural activities, or their view of the scale of agricultural activities referred in the questionnaire; however, a vast majority of respondents 504 representing 92.97percent agree on the existence of agricultural activities in the study area. On industrial and other unspecified landuses, there also exist differences on the respondent opinion. Nonetheless, high percentages of response on the existence of the aforementioned landuses indicated their presence in the study area.

Land Uses and the Associative Wastes

Different wastes associated with various landuses are presented in table 2, based on the percentage of responses

Table 2: Types of waste generated by land uses

Land use	Waste type produced	All the motioned waste %	Not all the mentioned waste %	Total
Recreational	Waste paper, residual food, plastic bags, bottles, cans, rubbers, water proof, waste plant product, leather, yard waste, aches etc.	89.9	10.1	100
Transport	Rubber, plastics, condemn tires, metals, hazardous waste, corrugated boxes, metals, batteries, nylons bags, water proof, rubbers, cans, bottles, plastics bags and waste paper	93.8	6.2	100
Agricultural	Waste plant product, yard waste, corrugated boxes aches, rubbers, wood etc	81	19	100
Commercial	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes	100	0	100
Residential	Food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, metals, ashes, special wastes (e.g. bulky items, consumer electronics, white goods, batteries, oil, tires), and household hazardous wastes	100	0	100
Construction and demolition	Wood, steel, concrete, dirt, etc.	78	22	100
Industrial	Housekeeping wastes, packaging, food wastes, construction and demolition materials, hazardous wastes, ashes, special wastes	95.7	4.3	100

Source: Author's fieldwork (January, 2023).

Table 2 shows waste generated on a daily basis by the different land uses highlighted for the purpose of the study. Recreational land use areas produced waste paper, waste food, plastic containers, plastic bags, bottles and cans. These come from the people that patronize these pleasure areas, majorly from the food consumed while enjoying pleasure. During games at the stadium for example, food vendors are seen selling and the consumers in most cases leave the used items behind. This is also experienced at the drinking joints, museums gardens and so on. The utilization of land through transportation also leaves waste in form of smoke, oil spillages, rubber, and plastics. Agricultural patches of land, majorly vegetable farms produce waste as well, from the leaves of the plants and weed during farm preparation and weeding. Commercial land use here encompasses office, institutions, banks, all of which produce electronic waste, waste plastic, paper and waste food as well. In general, the volume of waste generated is likely to relate to a greater extent with the land use. This means, a small and largely degradable land use with a population of rural origin for example and the kind of products used, such as food supply packs has degradable wastes. On the other hand, the urban population which is our focus in this work generates larger volume of non-degradable wastes, especially where food are supplied through packs of non-degradable materials.

Residential waste describes all waste materials coming from the shelter units. Several wastes are been generated from the homes on a daily basis.

These include: waste food, plastic and bottles, cloths, used cans, rubber etc. many of which are single used items, some are simply trashed upon failure to satisfy the desired aim of acquisition.

Hypotheses

H_O: There is no significant difference in the amount of waste generated by the different land use types in Calabar metropolis.

H_I: There is a significant difference in the amount of waste generated by the different land use types in Calabar metropolis.

To test this hypothesis, data collected were subjected to testing using one way analysis of variance (ANOVA) Table 3 present the result of the analysis.

Table 3: one way analysis of variance (ANOVA) of the difference in the amount of waste generated by the different landuse types in Calabar metropolis

	Sum of Squares	df	Mean Square	F	Sig.
Between groups	112883.324	6	18813.887	14.820	.00
Within Groups	2615229.033	2060	1269.529		
Total	2728112.357	2066			

Source: Author's fieldwork (January, 2023).

From Table 3, the F calculated was 14.820 and 6 and 2060 degrees of freedom with the p-value of .00 ($p<.05$). Since the observed p-value of .00 was less the accepted p-value of .05, hence the null hypotheses which stated that there is no significant difference in the amount of waste generated by the different land use types in Calabar metropolis was rejected while the alternate hypotheses was retain. From the results so far, we know that there are statistically significant differences between the groups as a whole. In table 4, **Multiple Comparisons,** show which groups differed from each other. The Bonferronipost hoc test was used for conducting post hoc tests on a one-way ANOVA, and the result of the analysis is presented in Table.

Table 4: BonferroniPost hoc test

(I) factor	(J) factor	Mean Difference (I-J)	Std. Error	Sig.
Agricultural Land	Commercial	-51.694*	12.718	.001
	Religion	-14.821*	2.324	.000
	Transport	-14.821*	2.324	.000
	Industrial	50.056	17.901	.110
	Residential	-14.821*	2.324	.000
	Recreation	17.806	9.682	1.000
Commercial	Agricultural Land	51.694*	12.718	.001
	Religion	36.873	12.690	.078
	Transport	36.873	12.690	.078
	Industrial	101.750*	21.819	.000
	Residential	36.873	12.690	.078
	Recreation	69.500*	15.792	.000
Construction and demolition	Agricultural Land	14.821*	2.324	.000
	Commercial	-36.873	12.690	.078
	Transport	.000	2.164	1.000
	Industrial	64.877*	17.881	.006
	Residential	.000	2.164	1.000
	Recreation	32.627*	9.645	.015
Transport	Agricultural Land	14.821*	2.324	.000
	Commercial	-36.873	12.690	.078
	Religion	.000	2.164	1.000
	Industrial	64.877*	17.881	.006
	Residential	.000	2.164	1.000
	Recreation	32.627*	9.645	.015
Industrial	Agricultural Land	-50.056	17.901	.110
	Commercial	-101.750*	21.819	.000
	Religion	-64.877*	17.881	.006
	Transport	-64.877*	17.881	.006
	Residential	-64.877*	17.881	.006
	Recreation	-32.250	20.201	1.000
Residential	Agricultural Land	14.821*	2.324	.000
	Commercial	-36.873	12.690	.078
	Religion	.000	2.164	1.000
	Transport	.000	2.164	1.000
	Industrial	64.877*	17.881	.006
	Recreation	32.627*	9.645	.015
Recreation	Agricultural Land	-17.806	9.682	1.000
	Commercial	-69.500*	15.792	.000
	Religion	-32.627*	9.645	.015
	Transport	-32.627*	9.645	.015
	Industrial	32.250	20.201	1.000
	Residential	-32.627*	9.645	.015

Source: Author's fieldwork, (January, 2023).

Bonferroni post hoc test in table 4 revealed that waste produced by agricultural land were statistically significantly differs when compare with commercial, Construction and demolition, transport and residential waste (p = .00 respectively). Commercial wastes were also different, when compared with industrial and recreation waste (P=00 respectively). Construction and demolition waste differs when compared with commercial and industrial waste (p = .00), transport wastes differed from that of recreation waste (p=.01), industrial waste differed from that of agriculture (p = .01), commercial, Construction and demolition, transport and residential waste (p = .00 respectively) and finally, recreation waste differed from that of commercial, transport and residential waste (.01 respectively). However, there were no differences between the following groups of land uses when compared; agriculture and recreation wastes (p>.05), commercial and Construction and demolition, transport and residential (p>. 05), agriculture and industrial (p>.05)

DISCUSSION

The author of this study aimed at identifying various landuse types, types of generated waste and difference in waste generated by the various landuse types in Calabar metropolis. Frequency and percentage count from table 1 indicate the availability of the following land use types in Calabar metropolis: agricultural, commercial, industrial, construction and demolition, residential, transportation and recreational. Studies have shown that landuse differs from place to place and are affected by many factors, among which include urbanization, topography of the area, climate, physical-soil fertility, soil drainage, slope angle, aspect, scenery, mineral potential, etc, economic-distance from markets, demand for different uses; social-population size, legislation, government policies, etc. (Amalu&Ajake, 2014). Ayo, Ibrahim and Mohammed (2010) reported that there are seven major sources of landuse namely; domestic/residential, commercial, agricultural, construction and demolition, mining, industrial and institutional wastes. Broadly, land uses of municipal solid waste generation potential are residential, industrial, commercial, institutional and agricultural land uses, and construction and demolition process (Anilkumar & Chithrab 2016). In the study conducted by Katpatal et al. (2011) in Nagpur, it is reported that by knowing the type of land use classes within the urban area, details of waste characteristics can be assessed.

The types of waste generated in Calabar metropolis was dependent on the types of land use. For instance, food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood, glass, metals, ashes, special wastes (e.g. bulky items, consumer electronics, batteries, oil, tires), and household hazardous wastes were generated in residential landuse, Housekeeping wastes, packaging, food wastes, construction and demolition materials, hazardous wastes, ashes, special wastes in industrial land use; while housekeeping wastes, packaging, food wastes, construction and demolition materials, hazardous wastes, ashes, special wastes were generated in commercial land use, and so on.

The hypotheses tested revealed a significant difference in the waste generated by various land use types in Calabar metropolis. The finding of this study supported the study conducted Olorunfemi & Odita (1998) in Ilorin, which observed that the nature of generated waste varied according to the nature of the land use and the properties being served and a positive relation between various landuse and waste generation

CONCLUSION

Land uses and waste generation are inseparable. Identification of the different landuses and their respective types and amounts of wastes generated is beneficial to waste management practices. In an event of waste pollution, water contamination or epidemic attack, it is easier to figure out from which wastes and land use the pollutant is come from. Furthermore, understanding the type, source, distribution of waste around a city is among the first steps toward achieving a clean city. It explains why a pile of waste is composed of different materials. This means that a change in land use invariably results in a change in the waste generated in that area. Urban land use assessments of this nature are paramount in understanding the urban space for appropriate decisions, either by law or the professionals. The author recommend that careful assessment should be made earlier to determine which land use is proposed for a given urban space to ensure proper planning and positioning of structures in order to avoid the negative effects of mixed land uses wastes.Waste disposal strategies should be

formulated and followed based on the land use type. For example, waste collection centres should be placed at designated points where it is collected and taken to the off-sight disposing site.

REFERENCES

Abel, O., and Afolabi, A., 2007. Solid waste generation and composition in Oyo State, Nigeria. Journal of Environmental Science and Technology, 1(1), 1-7.

Adewumi, J.R., Yusuf, R.O., and Oyewumi, O.R., 2005. Municipal solid waste generation and composition in Nigeria: A case study. Waste Management and Research, 23(1), 1-10.

Agbola, T and Agbola, E. O., 1997. The development of urban and regional planning legislation and their impact on the morphology of Nigerian cities. The Nigerian Journal of Economic and Social Studies 39(1) 123-144.

Ajoa, E. A and Anurigwo, 2002. Land-based sources of pollution in Niger Delta, Nigeria AMBIO: A Journal of the Human Environment 31(5) 442-445 https://doi.org/10.1579/0044-7447-31.5.442.

Amalu, U. C., and Ajake, A. O., 2014. Municipal solid waste management in Nigeria: Challenges and prospects. Journal of Environmental Science, Toxicology and Food Technology, 8(4), 1-9.

Amalun, T, E., and Ajake, A, O., 2014. Appraisal of solid waste management practices in Enugu city, Nigeria. Journal of Environment and Earth Science, 4(1),97-105

Anilkumar, P, P., and Chithrab, K., 2016. Landuse-based modeling of Solid Waste generation for Sustainable Residential Development in Small/Medium Scale Urban Areas. Procedia Environmental Sciences, 35, 229 – 237

Ayo, B., Ibrahim, B. and Mohammed, R.M., 2010. The Practice and Challenges of Solid Waste Management in Damaturu, Yobe state, Nigeria. Journal of Environmental Protection, 1, 384-388.

Aziegbe, O., 2007. Solid waste generation and composition in Abuja, Nigeria. Waste Management and Research, 25(6), 561-567. 2.

Dauda, M. and Osita, E., 2003. Solid Waste Generation in Maiduguri, Borno State: A Report. Journal of Environmental Studies, 10(2), 45-60.

Egunjobi L., 1999. Our gasing cities an inaugural lecture. University of Ibadan. 1th October 1999.

Egunjobi, L., 2002.and Olarenwaji D., 2004. Planning of the Nigerian cities for better quality of life. Environment, physical, planning and Development in Nigeria. Inaugural lectures, Akure: Federal University of technology; 26th October; 2004. Town Planning available means for poverty reduction.

Ekpoh, I. J., 2009. Climate, Society and Environment. St. Paul's publishing company Calabar, Nigeria.

Erdogan, R., Zaimoglu, Z., Sucu, M.Y., Budak, F., and Kekec, S., 2008. Applicability of leachates originating from solid waste landfills for irrigation in land fill restoration projects. Journal of Environmental Biology, 29,779-784.

Geoffrey, A., 2005. Solid waste management in Nigeria: Problems, prospects and challenges. Journal of Environmental Science and Technology, 3(9), 34-42.

Glawe, U., Viswanathan, C., andAlamgir, M., (2005, July5-7) Solid waste management in least developed Asian countries – A comparative analysis, International conference on solid waste management in South East Asian cities, Siem Reap, Cambodia

Guangyu, Y., 2002. “Point Sources of Pollution: Local effects and its control” – Vol 1; Amounts and Composition of Municipal Solid Waste.

Imam, A., Mohammed, A., and Aminu, M., 2007. Assessment of solid waste generation in

Abuja, Nigeria. Journal of Environmental Science and Technology, 4(3), 234-240.
Joyce, P., 2018. Urban land use planning: Fifth edition. Routledge.

Katapatal, Y. B and Roa R., 2011. Urban decision support system for municipal solid waste management of Nagpur urban area using high-solution satellite data and geographic information system. 137(1), 65-76.

Ogwueleka, T. C., 2009. "Municipal Solid Waste Characteristics and management in Nigeria". Iran Journal of Environment and Health Science, 6(3), 173-180.

Olarenwaju, A., 2004. Urban land use planning and management in Nigeria: A review of policies and practices. Journal of Environmental Planning and Management, 47(5), 737-752.

Olorunfemi, J. F., and Odita, C. O., 1998. Land use and solid waste generation in Ilorin, Kwara State, Nigeria. Environment Systems and Decisions, 18, (2), 67-75.

Oluwemimo, O., 2007. Solid waste generation and management in selected Nigerian cities. Journal of Environmental Science and Technology, 1(1), 8-15.

Sha'Ato, R., Iortyer, P., Ikyo, B., and Ikyo, A., 2006. Assessment of solid waste generation in Makurdi metropolis, Nigeria. Journal of Environmental Science and Technology, 1(1), 1-6.

Ukong, E., 2009. Environmental pollution and waste management. In Proceedings of the International Conference on Environmental Science and Technology 123-135. Springer.

Ukong, E., 2009. Waste management: A case study of Lagos, Nigeria. Journal of Environmental Science and Technology, 3(2), 74-82.

World Bank., 2001. Waste generation in developing countries. Retrieved from https://openknowledge.worldbank.org/handle/10986/13947

Yusuf, R.O., and Oyewumi, O.R., 2008. Municipal solid waste characteristics and management in Nigeria. Iranian Journal of Environmental Health Science and Engineering, 5(4), 257-262.