Solid waste management during monthly environmental sanitation exercise in Ibadan municipality Nigeria

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Abstract

Purpose – The purpose of this paper is to investigate the management of solid waste during monthly environmental sanitation exercise in different residential areas of Ibadan municipality, Nigeria. The study also examined how the government performed its responsibility during the exercise. This is expected to assist in improving the conduct of sanitation exercise in one of Africa's populous indigenous settlement, Ibadan.

Design/methodology/approach – Collection of data for the study was through participant observation, administration of questionnaire, and interview. As a way of participating and observing, the authors were involved in the conduct of the exercise in the different residential areas of Ibadan municipality. Questionnaire was administered on respondents drawn from one of every ten buildings (10 percent) in the study area using systematic sampling technique. A respondent (preferably a household head) was surveyed from a floor of selected residential building. A total of 367 copies of questionnaire were completed and returned for analysis. Information provided in the questionnaire was analyzed using both descriptive and inferential statistics. Interview was conducted to collect information from the head of environmental sanitation unit in each of the five local government areas of Ibadan municipality.

Findings – The most widely used medium of storing solid waste was the polythene bag, which accounted for 22.8 percent of all the storage receptacles and was employed by 50.4 percent of the residents. Similarly, residents employed a combination of waste disposal methods which included burning, and dumping in the drains, river banks and on vacant plots. Methods of solid waste storage and disposal varied across the different residential areas of Ibadan municipality. It was established that despite the huge amount of money expended on the collection of solid waste during the exercise, only government-owned vans constituted less environmental health hazard.

Practical implications – It would assist in evaluating the success and failure of the monthly environmental sanitation exercise. It would also reveal to policy makers' direction to which policy initiative should focus. Findings of the study could serve as a guide for the management of solid waste from similar exercises in countries of the developing world with similar socio-economic and environmental sanitation practices.

Originality/value – Presented in this paper are results of an investigation into solid waste management during monthly environmental sanitation exercise in Ibadan municipality, Nigeria. The study was an attempt at examining the different storage and disposal methods employed by households in the management of solid waste during the exercise. It also revealed what is committed financially into the collection and transportation of solid waste for final disposal during the exercise by government.

Keywords Solid waste, Ibadan, Monthly environmental sanitation exercise, Residential zones/areas, Soild waste management

Paper type Research paper

1. Introduction
Environmental sanitation is a prominent issue in both the developed and developing nations of the world (Andy, 2007; Khatri and Vairavamoorthy, 2007; Kumar and Singh, 2010). Owing to the importance of environmental sanitation, year 2008 was declared as the International Year of Sanitation (United Nations General Assembly, 2006). Similarly, June 1of every year is also observed as the World Sanitation Day. The essence of setting aside this day is to create awareness for people to keep their environment clean and prevent the spread of diseases.

The sanitation exercise in Nigeria goes beyond observing only a day as environmental sanitation day. The history of the sanitation day exercise dates back to 1983. In 1983, the military administration launched the War Against Indiscipline campaign, with a cardinal focus on environmental sanitation. This was in response to the disgusting physical conditions of many Nigerian cities occasioned by the indiscriminate dumping of solid waste. Nigerians were by this campaign compelled by the federal government to observe environmental sanitation for three hours (7:00-10:00 a.m.) on the last Saturday of every month. That marked the beginning of the then monthly environmental sanitation exercise in the country. In order to ensure the observance of the exercise, states governments in the country also promulgated edicts establishing a day for monthly environmental sanitation exercise. Even after the exit of the military from governance, and with a view to legitimizing the exercise during the civilian regime, some states domesticated it as a law. An example in this regard is Section 37 of the Oyo State Environmental Protection Agency Edict (Oyo State Government, 1999). On the environmental sanitation exercise day, citizens are expected to engage in cleaning the environment. In the law establishing the exercise, no person is expected to engage in any other business and/or social activities other than general cleaning. Major activities performed by citizens during the exercise were sub-systems of solid waste management (SWM), namely: storing, collection and disposal of solid waste. It is important to note that certain waste components were generated at the household level before the monthly environmental sanitation day. In other words, SWM is imperative if the purpose for which the exercise was conceived would be achieved. Of concern to this paper is therefore the management (storage and disposal at the household level as well as the collection and transportation by the municipal government) of solid waste during the exercise.

SWM entails the effective practice and systematic control of an array of interdependent activities (Afon, 2008; Johari et al., 2014). These activities include generation, storage, collection, transfer and transportation, recycling and disposal. Other sub-systems are financial planning, engineering, administration and legal considerations as well as cost recovery. All over the world, issues on SWM have been widely discussed (Palczynski, 2002; Afon and Okewole, 2007; Sha'Ato et al., 2007; Kalu et al., 2009; Espinosa Llorens et al., 2010; Ejaz et al., 2010; Afon and Faniran, 2011). From these studies, it has been established that people's income, age, educational qualification, and place of residence, among others, are the determinants of waste generation. For example, the works of Cointreau and Collins and Downes cited in Afon and Okewole (2007) established that there is a link between residents' socio-economic attributes and solid waste generation. Similarly, the work of Sha'Ato et al. (2007) revealed that the quantity and component of solid waste generated by households in Markurdi (a typical Nigerian city) varied as density of residential areas varied. Another study (Arafat et al., 2007) revealed that residential area in Nablus District of Palestine (Refugee Camp, City Center, City Suburb and Village) influenced residents' rate of street litter generation. In general, the studies above are concerned with SWM activities in residential areas. However, the link between these residents' attributes and other aspects of SWM such as storage and disposal as obtained during monthly environmental sanitation exercise have not been adequately investigated. In Nigeria, there are research works with focus on the different SWM activities. These include the works of Agunwamba (1998), Agbede and Ajagbe (2004), Afon (2008) and Ogwuleka (2009). In these studies, the characteristics of solid waste, problems confronting the SWM system, as well as the pattern of generation, storage and disposal in the different residential areas of traditional Nigerian cities were highlighted. These aspects of SWM as applicable during the compulsory monthly environmental sanitation exercise in the different residential areas of Ibadan municipality have not been properly examined and documented. This is very important now, considering the fact that a cursory glance at the environment immediately after the exercise and even days after shows that heaps of uncollected solid waste dot the landscape of the municipality. Efforts of government and its agencies both at the local and state levels

are noticed in SWM, especially in the areas of collection, transportation and final disposal. As entrenched in the Nigerian Constitution, duties connected with environmental sanitation, such as collection/transportation and final disposal of solid waste, are responsibilities of the local government council (LGC) (Federal Government of Nigeria, 1999). Evidences abound that other government agencies are involved in environmental sanitation. For example, in Ibadan municipality, Oyo State Ministry of Environment is responsible for the development and maintenance of the environment through the formulation of policies, programs, guidelines, statutory rules and regulations. Similarly, Ibadan Solid Waste Management Authority (ISWMA) is in charge of SWM in the 11 local government areas (LGAs) of Ibadan. The LGCs are not left out in the area of monitoring and supervising residents' activities during the monthly environmental sanitation exercise. With the involvement of these agencies, what is committed financially into the exercise by the government deserves adequate investigation; more importantly, on collection and transportation of solid waste for final disposal. This is very important bearing in mind how many residents/households in the study area have ironically become more or less LGCs – managing solid waste in their own "best way," not minding how crude and environment-unfriendly. It is therefore important to find answers to the following questions. What are the socio-economic characteristics of respondents in the study area? What is the proportion of the different solid waste components emerging from households during the exercise? What is the method of solid waste storage and disposal at the household level during the exercise in different residential zones of the study area? What are the provisions made by government and its agencies for the collection, transportation and disposal of solid waste during the exercise? Providing answers to the above questions would reveal the weakness and strength in the provision made to manage waste from the exercise. Findings of the study would also be a guide to manage waste from similar exercises in countries of the developing world with similar socio-economic and environmental sanitation practices.

2. Material and methods
The study area
As noted by Adelekan (2012), Ibadan represents the pinnacle of pre-colonial urban development in Nigeria. It is currently the capital city of Oyo State, one of the 36 states of Nigeria. Ibadan comprises the municipality and the sub-city. The municipality is made of five LGAs, namely: Ibadan North, Ibadan North-East, Ibadan North-West, Ibadan South-East and Ibadan South-West. With the exception of Ibadan North-West LGA which has 11 political wards, each of the four other LGAs has 12 political wards (Oyo State Independent Electoral Commission, 2011). In other words, there are 59 political wards in Ibadan municipality. The sub-city is made up of six other LGAs. Residential areas in Ibadan municipality can be grouped into three distinct zones: the core, transition and sub-urban. The emergence of each of these zones is attributable to three different historical periods in the country (Onibokun, 1985). The core residential zone is home to the indigenes and early migrant settlers (Mabogunje, 1968). It is located in the heart of the city and houses the king's palace, traditional markets and the town hall (Mapo Hall). Houses in this zone predated the colonial period (Onibokun, 1985). This residential zone is also known to house a large proportion of the low-income group of residents (Afon and Faniran, 2013; Adigun, 2013; Adewale *et al.*, 2015). The area developed during the colonial rule is regarded as the transition zone. It emerged out of the need to accommodate people who were employed in the formal sector of the urban environment, in a zone different from the core (Afon, 2008). Buildings in this zone, unlike those in the core areas, are well laid-out and initially had adequate accessibility to urban basic facilities. Most of the residents in this zone can be regarded as the middle-income earners. The zone can also be classified as a medium density zone considering the density of housing. A handful development in the sub-urban

residential zone emerged during the post-independence period. Housing stock in this residential zone is low when compared with the other two zones. Building developments in this zone are also well laid-out. Residents in this zone are of high level of education and income status.

Research method
Data were collected through participant observation, administration of questionnaire and interviews. As a way of participating and observing, the authors and other field assistants were involved in the conduct of the exercise in the different residential areas of Ibadan municipality. Questionnaire was designed to collect information from respondents (household heads) in the study area. Multi-stage sampling technique was adopted in selecting the respondents. The first stage was the stratification of the study area into three residential zones. This was done by stratifying the 59 existing political wards into core, transition and sub-urban residential zones. There were 28, 19 and 12 political wards in the core, transition and sub-urban zones, respectively. In the second stage, one of every four political wards (25 percent) in each zone was randomly selected without replacement. In the third stage, systematic sampling technique was employed to select respondents from one of every ten buildings (10 percent) in the 15 selected political wards. A respondent was surveyed from a floor of selected residential building. Having completed the procedures in the multi-stage sampling, 367 copies of questionnaire were completed and returned for analysis. Respondents were asked to indicate their socio-economic characteristics, components of waste emerging from their households during the monthly environmental sanitation exercise, as well as the methods of solid waste storage and disposal used. Interview was conducted to collect information from the head of environmental sanitation unit in each of the five LGAs of Ibadan municipality. This was done to elicit information on the involvement of government (most especially financial commitment) in the monthly environmental sanitation exercise. Information provided in each of the above sets of questionnaire was first entered into a coding spread sheet on SPSS 17 software. Frequencies of responses were computed and expressed in percentages. These were later presented in tables. χ^2 and analysis of variance (ANOVA) were also employed to determine differences in the means of certain ordinal and interval scale data. It is important to state that data used in this paper were collected as part of a larger study that was undertaken to explore residents' perception of the monthly environmental sanitation exercise in Ibadan.

3. Results and discussion
Socio-economic characteristics of respondents
Three basic socio-economic characteristics of the respondents were examined, namely: age, education and income status. These were considered to have influence on issues related to environmental sanitation. The ages of respondents were categorized into three: the youth (19-30 years), the young adult (31-55 years) and the adults (56-65 years). These followed the taxonomy of Freund and Smith (1997), Togonu-Bickersteth (1987) and WHO (2011). Summary of age distribution of respondents in the three identified residential zones of Ibadan municipality is presented in Table I. The minimum age of respondents in the study area was 24 years, and the maximum was 63 years. The variation in the ages of the respondents showed that the mean age of respondents in the core was 40 years. It was 42 years in the transition, and 44 years in the sub-urban. Differences in the age of respondents across the three zones were found to be statistically significant at 95 percent (0.05) level of confidence. The result of ANOVA ($F = 5.761$ and $p = 0.003$) confirmed this. This finding suggests that there was the likelihood that there would be variation in SWM practices across different residential areas of Ibadan during monthly environmental sanitation exercise. Information obtained on respondents' education status as presented

Residents' characteristics	Core frequency (%)	Transition frequency (%)	Sub-urban frequency (%)	Total (%)
Age				
19-30	19 (5.3)	20 (5.5)	8 (2.2)	47 (13.0)
31-55	122 (33.8)	81 (22.5)	77 (21.3)	280 (77.6)
56-70	8 (2.2)	15 (4.2)	11 (3.0)	34 (9.4)
Total	149 (41.3)	116 (32.2)	96 (26.5)	361 (100.0)
Education status				
No formal education	57 (15.9)	29 (8.1)	16 (4.4)	102 (28.4)
Primary	21 (5.8)	6 (1.7)	2 (0.6)	29 (8.1)
Secondary	38 (10.6)	24 (6.7)	10 (2.8)	72 (20.1)
Tertiary	28 (7.8)	60 (16.7)	68 (18.9)	156 (43.4)
Total	144 (40.1)	119 (33.2)	96 (26.7)	359 (100.0)
Income status (₦000.00)				
Below 30	13 (4.1)	4 (1.2)	1 (0.3)	18 (5.6)
30-60	118 (37.0)	38 (12.0)	17 (5.3)	173 (54.3)
Above 60	7 (2.2)	52 (16.3)	69 (21.6)	128 (40.1)
Total	138 (43.3)	94 (29.5)	87 (27.2)	319 (100.0)

Note: ₦ represents Naira (Nigeria currency)

Table I.
Respondents' socio-economic characteristics in different residential areas of Ibadan

in Table I shows that the proportion of respondents without formal education qualification in the study area decreased as distance increased from the core to the sub-urban. In the core residential zone, 15.9 percent of respondents had no formal education qualification. In the transition and sub-urban zones, respectively, 8.1 and 4.4 percent of the respondents had no formal education. On the other hand, the study confirmed that sampled residents with higher education qualification were predominant in the transition and sub-urban residential zones. This corroborates the finding of Afon (2008) that residents in these zones are of higher education standing than residents in the core residential zone. Study established that there was a significant variation in the education status of respondents across the different residential zones of Ibadan municipality ($\chi^2 = 69.164$, $p = 0.001$ and $\alpha = 0.05$). Further analysis showed that the mean number of years spent in the pursuit of education qualification by respondents in the core, transition and sub-urban zones were 11.8, 14.6 and 15.8 years, respectively. By inference, this variation is also likely to influence aspects of SWM such as storage and disposal practices during the exercise.

Closely related to respondents' education status is the income status. For ease of analysis, monthly income was classified into three: low, medium and high. This was arrived at following the operational Oyo State Civil Service Salary Scale as at the period of survey. Thus, residents who earned below ₦18,000.00 (the minimum wage of civil servants in Nigeria) and between ₦18,000.00 and ₦30,000.00 (salary grade level 01-06) were grouped as low-income earners. The medium monthly income was ₦31,000.00 – ₦60,000.00 (salary grade level 07-12), while respondents with income above ₦60,000.00 (salary grade levels above 12) were grouped as high. Similar classifications have been employed in the works of Daramola *et al.* and Afon *et al.* (2016). It should be noted that the official exchange rate of US$1 to the Nigerian naira (₦) as at the time of study was ₦198.00. The study established that 54.3 percent of the respondents could be referred to as middle-income earners. Those that could be termed low- and high-income earners were 5.6 and 40.1 percent, respectively. The proportion of respondents in the high-income group increased from the core residential zone toward the sub-urban. This pattern was based on the fact that 5.1, 55.3 and 79.3 percent of the respondents in the core, transition and sub-urban residential zones, respectively, were high-income earners. The average income of respondents in the respective residential zones

was ₦25,288.00, ₦47,952.00 and ₦60,328.00. Result of one way ANOVA computed ($F = 116.413$, $p < 0.000$) at 0.05 level of confidence showed that respondents' incomes varied significantly across residential zones. With this variation in the monthly income, no doubt, there would be variation in SWM practices during the monthly environmental sanitation exercise. These practices are the focus of the next sub-section.

Residents' SWM practices during the monthly environmental sanitation exercise
Examined in this sub-section are components of solid waste generated during the exercise as well as the storage and disposal practices employed by households in the study area. It should be stated again, for emphasis, that certain waste components are usually generated at the household level prior to the sanitation day. The practice is usually the removal of such components as if they were generated in the process of the monthly environmental sanitation exercise. Ten waste components were identified as being generated during the exercise. These were: paper, nylon/polythene, food waste, metal and ashes. Others were animal dung, rag, grass, leather and rubber/plastic materials. These components were generated in different proportions in the different residential areas of Ibadan municipality (see Table II). These waste materials/components are similar to what is generated in cities of many developing nations (United Nations Environment Programme, 2005; Okot-Okumu, 2012), and especially Nigerian cities such as Oyo (Afon and Okewole, 2007), Ogbomoso (Afon, 2007), Markurdi (Sha'Ato *et al.*, 2007) among others. The examination of the waste components in different residential areas showed that: first, all the ten identified waste components were produced in every residential zone; the proportion of residents that produced a component, however, differed in the different residential zones. Second, nylon/polythene materials constituted the highest proportion of waste generated. This material was generated by 66.4, 63.2 and 68.7 percent of households in the core, transition and sub-urban residential zones, respectively. Third, the least generated component was metal. This was generated by 4.9 percent of the 367 households. Thus, it can be concluded that solid waste generation during the monthly environmental sanitation exercise is inevitable.

The study established that households employed a combination of methods for storing waste during the exercise. The 11 mediums of waste storing identified are as presented in Table III. The most widely used receptacle was polythene bag. It accounted for 22.8 percent of the waste receptacles, and it was used by 50.4 percent of the households. The waste receptacles were provided by individual households. The study established that the proportion of respondents that used polythene bag, bucket with cover and plastic drum with cover increased as distance increased from the core to the sub-urban; whereas, the use of sack, worn-out jerry can and local basket reduced as distance increased from the core to

Materials	Core frequency (%)	Transition frequency (%)	Sub-urban frequency (%)	Total (%)
Nylon/polythene	99 (10.2)	75 (7.7)	68 (7.0)	242 (24.9)
Food waste	78 (8.1)	72 (7.4)	49 (5.1)	199 (20.6)
Paper	39 (4.0)	40 (4.1)	36 (3.7)	115 (11.8)
Rubber/plastics	30 (3.1)	29 (3.0)	19 (2.0)	78 (8.1)
Ashes	55 (5.7)	17 (1.8)	4 (0.4)	76 (7.9)
Grass	11 (1.1)	29 (3.0)	30 (3.1)	70 (7.2)
Animal dung	44 (4.6)	8 (0.8)	7 (0.7)	59 (6.1)
Leather material	16 (1.6)	30 (3.1)	11 (1.1)	57 (5.8)
Rag	28 (2.9)	19 (2.0)	9 (0.9)	56 (5.8)
Metal	5 (0.5)	11 (1.1)	2 (0.2)	18 (1.8)
Total	405 (41.8)	330 (34.0)	235 (24.2)	970[a] (100.0)

Note: [a]This exceeded number of questionnaire administered because of residents' multiple responses

Table II.
Solid waste
components emerging
from households
during monthly
environmental
sanitation exercise

Materials	Core frequency (%)	Transition frequency (%)	Sub-urban frequency (%)	Total (%)
Nylon/polythene bag	54 (6.7)	62 (7.6)	69 (8.5)	185 (22.8)
Sack	52 (6.4)	40 (4.9)	25 (3.1)	117 (14.4)
Worn-out jerry can	59 (7.2)	31 (3.8)	11 (1.4)	101 (12.4)
Paper carton	27 (3.3)	36 (4.4)	27 (3.3)	90 (11.0)
Local basket	58 (7.1)	10 (1.2)	11 (1.4)	79 (9.7)
Bucket with cover	18 (2.2)	21 (2.6)	32 (3.9)	71 (8.7)
Bucket without cover	12 (1.5)	29 (3.6)	4 (0.5)	45 (5.6)
Metal drum with cover	5 (0.6)	19 (2.4)	14 (1.7)	38 (4.7)
Metal drum without cover	7 (0.9)	12 (1.5)	7 (0.9)	26 (3.3)
Plastic drum with cover	5 (0.6)	14 (1.7)	16 (2.0)	35 (4.3)
Plastic drum without cover	9 (1.1)	11 (1.4)	5 (0.6)	25 (3.1)
Total	306 (37.6)	285 (35.1)	221 (27.3)	812[a] (100.0)

Note: [a]This exceeded 367 because residents used more than one type of waste storage receptacle

Table III.
Storage receptacles for waste generated during the environmental sanitation exercise

the sub-urban. In other words, the use of receptacles that constitute less environmental hazard was predominant in sub-urban residential zone than in the core. On the other hand, waste receptacles utilized by larger proportion of households in the core residential zone were environment-unfriendly. As the storing of waste awaiting collection is very important, many of the receptacles used by respondents in storing waste in the study area were not waterproof and could breed rats, cockroaches, and mosquitoes, among many other vectors. This corroborates earlier submission of Afon (2008) that materials predominantly used by residents in a typical Nigerian traditional city are environment-unfriendly. Another inference could also be drawn that the choice of a desirable solid waste receptacle was influenced by residents' income. It would be recalled that 5.1, 55.3 and 79.3 percent of respondents in the core, transition and sub-urban residential zones of Ibadan municipality were high-income earners.

The study also showed that respondents employed different methods of waste disposal. Among the methods were: burning (30.4 percent), dumping in drains and on river banks (14.4 percent), depositing along road (8.0 percent) and in uncompleted buildings (8.9 percent). Each of these methods was, respectively, used by 49.3, 23.4, 13.1 and 14.4 percent of the households sampled. Other methods of disposal were burying, the use of designated open spaces, dilapidated buildings, and vacant plots of land (See Table IV). These methods are considered environment-unfriendly; naïve and dangerous (Afon, 2005;

Methods	Core frequency (%)	Transition frequency (%)	Sub-urban frequency (%)	Total (%)
Burning	90 (15.1)	54 (9.1)	37 (6.2)	181 (30.4)
In drains	47 (7.9)	21 (3.5)	18 (3.0)	86 (14.4)
On river bank	37 (6.2)	8 (1.3)	3 (0.5)	48 (8.0)
Along road	29 (4.9)	14 (2.3)	10 (1.7)	53 (8.9)
In uncompleted buildings	9 (1.5)	15 (2.5)	27 (4.6)	51 (8.6)
Burying	4 (0.7)	0 (0.0)	5 (0.8)	9 (1.5)
Designated open space	34 (5.7)	17 (2.9)	6 (1.0)	57 (9.6)
Dilapidated buildings	28 (4.7)	10 (1.7)	9 (1.5)	47 (7.9)
Vacant plots of land	29 (4.8)	25 (4.2)	10 (1.7)	64 (10.7)
Total	307 (51.5)	164 (27.5)	125 (21.0)	596[a] (100.0)

Table IV.
Solid waste disposal methods employed by respondents during the monthly exercise

Note: [a]This exceeded 367 because residents employed a combination of methods for solid waste disposal

Agamuthu *et al.*, 2009; Ayuba *et al.*, 2013). Findings of the study revealed that the use of each of burning, dumping in drains and on designated open spaces, along road and inside river reduced as distance increased from the core toward the sub-urban areas (Table IV). That the proportion of households that used each method varied along residential areas was a pointer to the fact that disposal methods were influenced by respondents' age, education and income status that varied significantly in Ibadan municipality.

Solid waste collection and final disposal by government agencies
As earlier stated, government agencies involved in the monthly environmental sanitation exercise in Ibadan metropolis were ISWMA and the LGCs in the city. Modalities for conducting the exercise were similar in the different LGAs of Ibadan municipality. The modes of operation, personnel and other logistics involved were also similar. During the exercise, refuse collection vans were provided by ISWMA to operate in the different residential zones. ISWMA-owned refuse vans were augmented with hired vehicles by the LGCs. The collection of solid waste by ISWMA and hired vehicles during the exercise were most popular in the core residential zone than in either of the transition and sub-urban zones. Indeed, 67.1, 53.8 and 39.4 percent of respondents in the core, transition and sub-urban residential areas, respectively, indicated that government and hired vans were always available to collect waste from their area during the exercise. Information collected from the environmental sanitation units in the different LGAs established that government and hired vans collected waste from specified locations in the municipality and transported the same to designated sites for final disposal. The study established that none of the dump sites was less than 10 km to core residential zone. As a result, it was difficult to make more than a trip within the period of the exercise by the vans. With this arrangement, solid waste generated during the exercise was usually left uncollected, many hours and in some cases days, after the exercise. This was despite the huge amount of money spent on the hiring of vehicles for the purpose of the exercise. Investigation showed that the amount paid for hiring a tipper lorry during the sanitation exercise was ₦35,000.00, while trucks and buses were ₦27,500.00 and ₦20,000.00, respectively, for the three hour exercise (7:00-10:00 a.m.). In this sense, a sum of ₦870,000.00, ₦627,500.00, ₦1,275,000.00, ₦725,000.00 and ₦667,000.00 were spent on hiring vehicles for the exercise in Ibadan North, Ibadan North-East, Ibadan North-West, Ibadan South-East and Ibadan South-West LGAs, respectively, on a monthly basis. Further analysis confirmed that the sum of ₦10,440,000.00, ₦7,530,000.00, ₦15,300,000.00, ₦8,700,000.00 and ₦8,004,000.00 would have been spent on hiring vehicles for the monthly sanitation exercise in a year in each of the LGCs, respectively. Indeed, the amount spent on the conduct of monthly environmental sanitation exercise in hiring vehicles alone for the collection of solid waste in the municipality was estimated to be ₦4,164,500.00 in a month and ₦49,974,000.00 per annum. This is to say nothing of other logistics for the exercise. Despite the huge amount expended on the collection of solid waste during the exercise, it was established that only government-owned vans constituted less environmental health hazard. This was because vehicles hired were open and the contents were not usually covered. Thus, waste materials were dropped along the road.

4. Conclusion
This study has presented findings of an investigation into SWM during the monthly environmental sanitation exercise in Ibadan. The study has ascertained how residents carried out the storage and disposal of waste during the exercise, and examined roles played by the government. The study established that despite the variation that existed in residents' age, income and education status, similar methods of solid waste storage and disposal were employed by residents across the different residential zones. Similarly, it was established that

methods used for storing and disposing waste were mostly environment-unfriendly. The study also showed that the primary constitutional responsibility of the LGCs had been taken over by state government and/or its agencies. The huge sum of money expended on the collection of solid waste emerging from the exercise had not yielded desired results. This was because the landscape of the study area is often dotted with heaps of uncollected waste several hours and days after the completion of the exercise.

The first thing the paper recommends toward solving environmental sanitation problem of Ibadan municipality, and by extension cities of developing countries with similar socio-economic and cultural situation is environmental education. This education/ sensitization should present dangers inherent in environment-unfriendly sanitation habits, most especially the methods of storage and disposal of solid waste. Similarly, the concept of resource recovery from waste generated at the household level should be incorporated into the sensitization program. This will assist in waste minimization and cost recovery. Residents should therefore be introduced to environment-friendly storage and disposal methods. The enlightenment may take the form of advert in daily tabloids, as well as announcements and jingles on the television and radio. It is important that the residents' age, income and education status are considered in preparing appropriate messages meant for each group of residents. Government should also put in place adequate legislation on SWM that goes beyond the conduct of monthly environmental sanitation exercise. Laws and regulations specifying types and quality of storage receptacles and means of disposing solid waste should be enacted, considering the variation in residents' socio-economic characteristics. More importantly, legislation on improvement should be made in the provision of refuse collection vans in the study area. The present idea of hiring vehicles for the exercise should be discouraged. Indeed, LGCs may collaborate with the state government in this regard. LGCs may also seek financial assistance from international donors and agencies as well as community-based organizations. Moreover, LGCs could involve private partners and individuals in the collection, transportation and final disposal of waste. It is hoped that if these recommendations are adopted, problems associated with SWM during monthly environmental sanitation exercise in Ibadan will be minimized. These recommendations can also be employed in other urban areas of Nigeria with similar residential settings and residents' socio-economic characteristics with Ibadan.

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