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DETERMINANTS OF SOLID WASTE COLLECTION AND DISPOSAL: DIFFERENTIALS OF HIGH AND LOW DENSITY AREAS OF SANGO – OTA METROPOLIS

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ABSTRACT

Solid waste collection and disposal is a serious problem in many urban cities in Nigeria. It is further heightened by the growing populations, rapid economic growth and consumption patterns which have accelerated the generation rate of solid waste, thus making its collection and disposal a major challenges. This paper assessed the determinants of solid waste collection and disposal; differentials of high and low density areas of Sango – Ota metropolis. The descriptive research method was employed for the study. A total of sixty (60) respondents were used representing thirty (30) each for high and low density areas respectively. The research instrument was a questionnaire tagged High and Low Density Waste Generation Questionnaire (HLDSWGQ). Three hypotheses were tested at 0.05 level of significance using t-test (paired comparison) and all were accepted. Recommendation was made that government at all levels especially those at the local level, should provide the money, men and materials for the prompt collection and disposal of waste in their respective areas of jurisdiction.

INTRODUCTION

Human activities create waste, and it is the way these wastes are handled, stored, collected and disposed of, that pose risks to the environment and to public health. Seo, Aramaki, Hwang and Hanaki (2004) stated that rapidly growing populations, rapid economic growth and rise in community living standards have accelerated the generation rate of Municipal Solid Waste (MSW) causing its management to be a major worldwide challenge. Particularly in urban cities of developing countries, Municipal Solid Waste Management (MSWM) is a highly neglected area (Zhen-shan, Lei, Xiao-Yan, and Yu-mei 2009; Batool and Ch, 2009). In urban areas, especially in the rapid urbanizing cities of the developing world, problems and issues of MSWM are of immediate importance (Imam, Mohammed, Wilson and Cheeseman, 2008). After waste generation at the household level, it has to be handled in a manner that facilitate easy disposal. Waste handling and separation involves activities that are associated with the management of waste until they are placed in storage containers for collection (Manyanhaire, Sigauke and Munasirei, 2009).

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Waste storage involves the management of waste after the generator has placed them in a suitable container for collection. Storage containers include black refuse bags, hard plastic bins, skips, metal bins, informal bags and bulk container.

The collection system in most developing countries is grossly inadequate and local authorities are blamed for inefficient and unreliable domestic waste collection with 30%-50% of domestic waste generated left collected (Andrew-Essien and Akintoye, 2012). Manyanhaire, *et al* (2009) stated that in high density and low density areas of Zimbabwe, there is a growing tendency towards illegal disposal of waste by residents mainly due to the fact that local authorities are failing to execute their duty of waste collection. Ogunyanwo (2011) observed that waste generation is closely linked to population, urbanization and affluence. The growth of a city is characterized by an increase in its economic and developmental activities that are typically driven by the production and consumption pattern. The improved standards of living and the extent of commercialization in the cities have significantly changed the consumption patterns and thereby also change the waste composition (Ogunyanwo, 2011). Zurbrugg, (2003) stated that municipal solid waste collection schemes of cities in the developing world generally serve only a limited part of the

urban population. One of the reasons is the lack of financial resources to cope with the increasing amount of generated waste produced by the rapid growing cities. Often, inadequate fees are charged and insufficient funds from a central municipal budget cannot finance adequate levels of service. However, not only financial problems affect the availability or sustainability of a waste collection service. Operational inefficiencies of solid waste services managed by municipalities can be due to inefficient institutional structures, inefficient organizational procedures, or deficient management capacity of the institutions involved as well as the use of inappropriate technologies. Several states in Nigeria today are coming up with various means of waste collection initiated by both public and private sectors, although the effectiveness of this is largely a function of location; and where the collection is done by private sectors, it is a function of income of the owner of waste to be able to pay the amount charged (polluter pays principle). Babayemi and Dauda (2009) reported several systems of solid waste collection already in some states, however more modern solid waste management systems are still being solicited for.

Statement of Problem

Dealing with the environmental costs in rapidly growing economic development, urbanization and improving living standards in cities have led to an increase in the quantity and complexity of generated waste, presenting a phenomenal challenge (UNDP, 2004). This is particularly true in the area of solid waste management, while cities are generating an ever- increasing volume of waste, the effectiveness of their solid waste collection and disposal systems are declining. In urban centers throughout African regions, less than half of the solid waste produced is collected, and 95 percent of that amount is either indiscriminately thrown away at various dumping sites on the periphery of urban centers, or at a number of so-called temporary sites typically empty lots scattered throughout the city (Mohammed, 2003). Most of the municipal solid waste in low income Africa countries which is collected is dumped on land in more or less uncontrolled manner. Ogunyanwo (2011) noted that Nigeria has no clear cut policy for waste management hence due to increase in economic and developmental activities including urbanization and consumption patterns, the waste composition is mounting by the day.

Sango-Ota is the headquarters of Ado-Odo, Ota local government of Ogun state, which is fast growing into a mega-city due to its proximity to Lagos. It has the traditional inner cores of slums and gettos as well as new but emerging estates. The inner cores are the local area with a high population density (High density) and no doubt the 'high brow' GRA estates such as Otunba Gbenga Daniels Estate with a lower population density (Low density). They are therefore densely and sparsely populated areas respectively. As a fast growing city, the inner cores (the traditional areas) are becoming overcrowded with high population density, so also new estates (with low population densities) are being developed. More and more refuse are being generated in both the high density and low density areas of the metropolis. The need for appropriate collection and disposal of solid wastes in this community is becoming more germane than hitherto.

Objective of Study

This study seeks to assess the determinants of solid waste collection and disposal; differentials of high and low density areas of Sango- Ota Metropolis

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Research Hypotheses

- The methods of solid waste collection do not vary between the highly populated and low density areas of the metropolis.
- Solid waste disposal methods do not vary between the highly and low density areas of the metropolis
- The manners by which the Local Government Environmental Health Staff evacuates and disposes of solid wastes do not differ in high and low density areas?

MATERIALS AND METHODS

The descriptive research design was employed for this study. A total of two hundred and forty (240) respondents were used representing one hundred and twenty (120) each for the high and low density areas of Sango metropolis selected by systemic sampling technique. Each area was numbered and selected houses were picked using the K^{th} number after the first house was randomly picked in each area. The primary source of data collection is the use of a well structured questionnaire and personal interview. The reliability of the instrument was established through the test retest method. The instrument was administered twice with an interval of two weeks on some respondents that were not part of the sample from Ijebu Ode and Sagamu Local Government of Ogun state. The scores from the two sets of responses were correlated using Pearson Product Moment Correlation method with a reliability coefficient of r=0.74.

Data Analysis

The statistical methods used in this research consisted of descriptive statistics of frequency count, percentage, mean and standard deviation. Other statistical methods employed included z-test and Pearson product moment correlation in order to determine the significant difference or relationship between high and low density residents.

RESULTS

Table 1 dealt with respondents' reaction to the method of solid waste collection in both areas. Of the 120 respondents for high density area, 32 (26.7%) uses dustbin with lid to collect their refuse, 24 (20%) uses special black polythene bags, while 64 (53.3%) respondents being the majority of the respondents in the high density area use any container without lid to dispose their refuse. In the same vein, the results from the low density area revealed that 56 (46.7%) respondents' uses any container with lid for waste collection being the most popular method adopted just as in the high density area too. Other results revealed that 44 (36.7%) use dust bin with lid and 20 (16.7%) employ the use of special black polythene bags. This result buttresses the fact that the manners of refuse collection in both the high and low density areas of the study community are nearly the same.

Table 1 also shows a z-value of 1.585 which is not significant at 0.05, ($p > 0.05$). It follows therefore that there is no significant difference between the method of refuse collection of respondents from high density area and these from low density area. The mean values, 2.27 for high density and 1.90 for low density shows that the method in high density area is better though not at significant level.

Hypothesis 1

HO: There is no significant difference in the method of Solid Waste Collection in high and low density areas of Sango – Ota.

Hypothesis 2

Solid Waste Disposal Methods in the High Density Area do not differ from those of Low Density area.

Table 2 dealt with respondent's reaction to the method of final solid waste disposal. Of the 120 respondents in high density areas, 40 (33.3%) disposes off their solid waste by the use of incineration/burning, 20 (16.7%) disposes off by land filling, while (50%) that represent 60 respondents being the majority in the high density area dispose of their solid waste through the waste authorities. Likewise in the low density area, where 92 (76.7%) respondents dispose off their solid wastes through the waste authorities also is the majority as in the case of high density area. However, how well the local authorities carryout this duty is still in doubt, as the rubbish find their ways into the stock pile of neighborhood dumps.

Sixteen (16) respondents representing (13.3%) dispose off their refuse by the use of incineration or burning and twelve (10%) employ the use of land filling. This result underscores the fact that the methods of final refuse disposal in both high and low density areas of the study community are nearly the same. The table above shows a t-value 0.750 which is not significant at 0.05, ($p > 0.05$). It follows therefore that there is no significant difference between the method of solid waste disposal of respondents from the high density and those from the low density area of Sango Ota metropolis. The mean values, 2.00 for high density and 1.87 for low density shows that the method in high density area is better though not at significant level.

Hypothesis 3

The manner by which the local government environmental health staff handles and disposes off solid waste between high and low density areas do not differ significantly.

From Table 3 above shows respondents reaction to solid waste management activities by the local government environmental health staff. When quizzed about customer's level of satisfaction to the manner by which the environmental health staff manages/evacuates solid wastes. Of the 120 respondents, 20 (16.7%) felt satisfied, 8 (6.7%) were very satisfied; while (76.7%) that is 92 respondents in the high density area were not satisfied. The same pattern repeated itself in the low density area, eighty four (84) or (70%) of the respondents were unsatisfied (being the majority as in the high density area), twenty (16.7%) felt very satisfied and sixteen (13.3%) were satisfied with the local government health staff evacuation of solid waste from their area. This result underscores the fact that waste evacuation and management by local government environmental health staff in both high and low density areas of the study community do not differ. Table 3also shows a t-value of 1.571 which is not significant at 0.05, ($p > 0.05$). It follows therefore that there is no significant difference between the manners by which local government environment health staff handles and disposes solid wastes in both high and low density areas of Sango Ota metropolis.

Table 1. Methods of Solid Waste Collection

AREAS	DBL	SBPB	ACL	TOTAL	Mean ± SD	z
HIGH	32(26.7%)	24 (20%)	64(53.3%)	120	2.27 ± 0.92	
LOW	44(36.7%)	20(16.7%)	56(46.7%)	120	1.90 ± 0.87	1.585
TOTAL	76	44	120	240		

NOTES: DBL: - Dust bin with lid, SBPB: - Special black poly bags, ACL: - Any container without lid

Table 2. Methods of FinalSolid Waste Disposal

AREAS	WA	I/B	LF	TOTAL	Mean ± SD	Z
HIGH	60(50%)	40 (33.3%)	20(16.7%)	120	2.00 ± 0.53	
LOW	92(76.7%)	16(13.3%)	12(10%)	120	1.87 ± 0.82	0.750
TOTAL	152	56	33	240		

NOTES: WA: Waste Authorities I/B: Incineration/ Burning LF: Land filling.

Table 3. Solid Waste Management by Local Government Environmental Health Staff

AREA	ITEMS	VS	S	DS	TOTAL	Mean ± SD	Z
HIGH	Customers satisfaction of evacuation, transportation and disposal	8	20	92	120	4.40 ± 1.037	
LOW	Customers satisfaction of evacuation, transportation and disposal	20	16	84	120	3.97 ± 1.039	1.571

NOTES: VS- very satisfied, S- satisfied, DS- Dissatisfied

The mean values, 4.40 for high density and 3.97 for low density shows that the manner of evacuation, transportation and disposal of solid wastes in high density area is better though not at significant level.

DISCUSSION

Afulloand Frank (2009) in their study of solid waste storage gaps experienced in households of an under-developed country like Nairobi indicated that households irrespective of

their socioeconomic status (either living in high or low density areas) mostly employ the excess but undesirable use of cheap plastics and small bins available in the market. This has led to an unmet demand for metallic bucket bins of medium size (5-15litres) and larger containers but a surplus demand for the small and cheaper containers. They further observed that the households are largely unable to purchase the large containers due to lack of funds, which can also expose the households to garbage handling hazards from emptying the heavy full bins when compared with small containers. This finding is also consistent with Manyanhaire *et al* (2009) who in a study of the Analysis of Domestic Solid Waste management System in Zimbabwe observed that residents of both high and low density areas employ the same method for waste collection as they usually have only one bin where they mix all type of waste and could not afford to buy more than one bin for the separation of waste. Ogunyanwo (2011) also noted that Nigeria has no clear cut policy for waste management, hence most of the municipal solid was in low income African countries such as Nigeria are often collected in a more or less uncontrolled manner irrespective of the area.

This study is in agreement with Manyanhaire, *et al* (2009) who observed that the local authorities are responsible for disposal of domestic solid waste. In their study of the Analysis of Domestic Solid Waste management System in Zimbabwe both in the high density and low density areas of Zimbabwe, they stated that there is a growing tendency towards illegal disposal of waste by residents mainly due to the fact that local authorities are failing to execute their duty of waste collection. This finding is also consistent with United Nation Environmental Programme Report (1999) which observed that between 20-80% of solid wastes in Africa are disposed by dumping indiscriminately as a result of inadequate infrastructure put in place by the local authorities to execute proper collection. It further posited that residents hence result in open burning where solid waste are simply set on fire and left to burn. Equally, Andrew-Essien *et al* (2012) posited that household wastes evacuated in both low density areas and high density areas are disposed off in numerous identical ways, as the general consensus is that government agencies should be responsible for waste management resulting into observable environmental degradation.

This study is also in line with Aibor and Olorunda (2006) who observed no difference in the methods being employed in the collection of refuse from both low and high density areas of different neighborhoods. This findings tally with Longe, Longe, and Ukpebor (2009) asserted that the banes of the solid waste disposal problems include but are not limited to lack of financial resources, weak institutional and legal frame work, adding that other factors are inappropriate choice of technology, inadequate collection and transportation systems as well as unsafe final disposal options. The public confidence on the ability and the capability of the LGAs to play this statutory role diminished in the face of these problems, leading to mounting heaps of refuse on major roads and highways. This is not without its ensuing environmental pollution that has made the entire system unsatisfactory. Even though the fundamental objectives of any solid waste management programme are to minimize environmental pollution, these goals become unachievable in the absence of sustained funding, affordable local technological option and lack of participatory approach to integrated solid waste management. This finding also collaborated by Ogunyanwo (2011) who in a review of the monthly environmental sanitation exercise in Nigeria opined that the Environmental Health Officers (EHO) of the 21st century Nigeria is faced with problems of logistics in the handling and the evacuation of waste in the country, he further stated that even the richest of the local government councils such as in Abuja and Lagos do not have the adequate materials, tools and equipment for the prompt evacuation of refuse within their respective Local Government Areas.

Conclusion

Waste collection, transportation and disposal have been and still is presenting a number of challenges in most sub-urban and urban cities of developing nations. The rate at which the 'waste- stream' is being generated either on the density populated or the high areas far out-weighs the rate at which it is being collected, evacuated and disposed. The problem is further compounded by an impoverished citizenry that prefers indiscriminate collection and haphazard disposal since the local government do not possess the financial 'muscle' to provide the money, the men and the materials needed for effective solid waste management.

Recommendations

Based on the findings, the following recommendations were made.

- Awareness campaign on the environmental implications and the health consequences of indiscriminate collection and disposal of solid wastes in every community should be embarked upon especially by the local authorities or the waste management agencies as the case may be.
- Efforts should be made at the community level whether for high density or low density areas through landlord associations or the Community Development Associations or the community ownership/management of waste collection, evacuation and disposal within their enclaves. The community may resort to salvaging re-usable/ spent items and sell such to the industry as spent items
- At the education level, institutions should endeavor to incorporate environmental hygiene into their respective curricular with a view to make the students learn the rudiments of terming waste to wealth.
- Government at the local level should rise up to their responsibility of waste collection and disposal by providing skip eaters, refuse vans, equipment and tools required for prompt collection and evacuation of solid waste, to the final sanitary landfill.

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