Evaluation of Domestic Solid Waste Disposal in Two Selected Housing Estates in Awka, Anambra State (Case Study of Udoka and Real Estates).

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Abstract
Sequel to the need to efficiently and effectively tackle the problem of urban waste disposal management in Nigeria, this work was conceived, evaluating indiscriminate domestic solid waste disposal in two selected housing estates in Awka, Anambra State (Udoka and Real Estates) with the aim of ascertaining effective ways of managing the so generated in the area. The study adopted survey method employing Questionnaire and Field observation. The data so generated was tested using chi-square and percentages and it was found that there is a significant relationship between the indiscriminate disposal of solid waste and the health problems.

INTRODUCTION
1.1   BACKGROUND OF THE STUDY
Domestic solid waste is any unwanted or discarded solid materials from residential activities that cause environmental, social and health problems. The World Health Organization (WHO) refers to waste as" something which the owner no longer wants at a given time and space which has no current or perceived market value". In the words of Ikhuoria (2002), waste is refuse, garbage, ashes and rubbish that are derived from places of human and animal habitation. He further grouped solid waste elements into two – decomposable refuse and non-decomposable refuse. Nwobu (2002) in his study of solid waste disposal and management in Awka, Anambra state, defined solid waste as anything discarded or unwanted whose physical state is solid or semi-solid.

Kimberly (2005) carried out a study on composition of solid waste in Florida State, United States of America, in his study, he made a classification of solid wastes based on the material composition, these include garbage, or food waste, paper, glass, cars and other household wastes.

According to Aina (1994), of all the environmental problems facing the nation, the most obvious and most embarrassing and the one which has consistently been employed as blackmail to us as environmentalists is the municipal solid waste disposal problems. Homes towns and cities have their most devastating impact not through what they consume but what they waste.

Ajadike (2001), states that urban waste crisis arises in Nigeria because of three fundamental factors namely, rapid increase in urban population, heavy consumption pattern of urban dwellers and the inefficiency of the authorities whose statutory responsibilities includes efficient waste disposal in cities.

Ekugo (1998), in most urban areas of the developing countries of which Nigeria is one of such, waste is indiscriminately dumped along the streets into gutters, in open dumps or major roads and highways. Many urban centers in Nigeria are suffering from the menace of improper waste disposal which has resulted into health problems, high level of pollution, traffic problems, and poor aesthetics and flooding in urban centers like Awka, residents are known to dump their waste on the streets during rains (Okoye 2004). Adesoji (2004) took a study of solid waste disposal in Ibadan, in his works, he discovered that various landfill sites and open dump sites in the town are mismanaged and these sites harbour disease carrying pathogens such as rat, cockroaches, mosquitoes, houseflies, fleas etc. These organisms find their way into various homes and transmit diseases such as malaria, fever, yellow fever, cholera, dysentery etc.

According to Okoye (2004), residents in Awka throw their waste inside flood water during rain. These are of course carried to our surface water bodies. Okoye (2007) revealed that residents in the public housing estates in Awka complained of air pollution problem especially in the evenings arising from smokes due to burning of waste dumps. Residents dump their waste on lands near the aesthetic quality of the estate expanse of land that could have been used for other purposes like building of schools, pipe-borne waters, health centres etc (Okoye, 2008). Kevin (1995) stated that the issue's surrounding these health risks, and environmental damage only surfaced in the last two decades. From previous researches carried out, it is evident that most environmental, economic and health related problems in human and the environment can be attributed to the incidence of solid wastes. This work goes further to ascertain the situation in the study area.

1.2   STATEMENT OF THE PROBLEM

Domestic solid waste disposal is one of the major environmental problems faced by the study area. The quantity of waste disposal in some selected housing estates in Awka urban have increased tremendously over the years because of some factors like population increase and the inability of conventional waste management authorities to promptly clear these solid waste from the environment.

The indiscriminate handling of domestic waste has led to the littering of different kinds of solid waste materials in the study area, thereby making it to look untidy and loose its aesthetics value. Most of these waste materials are disposed in drainage channels and river channels therefore causing the blockage of these channels and subsequent flooding in the area during raining season and consequent road and infrastructure deterioration. A good example is the indiscriminate waste dump in Real Estate and in Udoka Housing Estate, Awka.

Organic domestic solid wastes in particular pose serious health risk, since they ferment creating conditions favorable to the survival and growth of microbial pathogens. They are hazardous, if they become intermixed with human excreta due to poor sanitation if waste is disposed improperly, for example, ground water used for drinking purposes can become chemically or microbiologically polluted. Direct dumping of untreated waste in rivers, lakes or seas can also result in the accumulation of toxic substance in the food chain due to their uptake by plants and animals. Thus this work becomes necessary in the study area as a living environment.

1.2.1   GEOGRAPHICAL LOCATION

Awka is located on latitude 6^0 25N and longitude 7^0E. The city is transverse by the old Enugu road (Zik's Avenue). Awka is bounded with Nibo in the south west, Mgbakwu and Okpuno in the northern east and their Umuawulu, Isiagu, Ezinato, in the south east. As one moves from Onitsha to Enugu, the town stretches over a distance of 26 kilometers. (Source: ministry of lands, survey and urban planning, Awka).

1.3   AIMS AND OBJECTIVES

The aim of this study is to ascertain the effective ways of solid waste disposal in two selected housing estates in Awka.

The aim may be achieved through the following objectives;
1.   To identify and map out the dump sites in the study area.
2.   To determine the composition of these solid waste at the dump sites.
3.   To evaluate the performance of the ANSEPA in evacuation of these wastes.
4.   To examine the problems associated with improper disposal of domestic solid waste.
5.   To proffer solutions to the problems of solid waste disposal in the study area.

2.0   METHODOLOGY

2.1   SAMPLE FRAME/SAMPLE SIZE

For the ease of this study, the study area was divided into two zones. Zone A and B. These zones are:

Zone A   -   Udoka housing estate
Zone B   -   Real estate

The study area has a total number of twenty four (24) roads. Due to the fact that the twenty four (24) roads that make up the study area cannot be studied. The researcher employed a simple random sampling technique to select 70% of the entire roads for study. The reason for using this technique was purposive by the researcher so as to acquire a large representation of the entire sample population. The names of the entire roads of the study area was written on different pieces of papers, the papers were put into a container, shuffled and picked at random without replacement. After carrying out the exercise, the following results were obtained;

Table 1: Distribution of sampled road in the study area

Zone	Number of roads	Number sampled
A	18	12
B	6	5
Total	24	17

Source: Researcher's fieldworks, 2009.

While carrying out this research work, the sample size was determined through the use of the Bourley's sample size determination formular.

$$S = \frac{N}{1 + N(e)^2}$$

Where   S   =   sample size
               N   =   population size
               e   =   margin of error (assumed)
               I   =   theoretical constant

For the purpose of this study, the population of the two estates was used. The total average population of Udoka housing estate is 1896 while that of the Real estate is 1242. This result was obtained based on the united nations data of an average of six (6) persons per household in Nigeria and other developing nations.

Mathematically, Udoka estate has a total of 316 households x 6 = 1896 people. Real estate has 203 households x 6 = 1218 people. Now, the total population is 3114 people.

S_2 = sample size

N_2 = 3114

e_2 = 0.10

Sample size = $\dfrac{3114}{1 + 3114 (0.10)^2}$

S = 96.889

Therefore S = 97

From this, the sample size is ninety-seven (97). This also means that the same quantity of questionnaire was prepared and administered to each estate.

2.2   METHODS OF DATA COLLECTION AND ANALYSIS

During the process of carrying out this research work, two major methods/procedures were used to collect the required data they include **Questionnaire and Field observation.** Sample percentage, pie chart, bar chart and tables are used in analyzing the research objectives. The hypothesis was tested with chi-square (X^2) statistical tool. This tool is used because it has a general application to variables and thus it is one of the standardized statistical tools used in testing hypothesis. This statistical tool was developed by Karl Pearson in 1900. Total of ninety seven (97) questionnaires were distributed to the respondents in the two zones of the study, ninety (90) questionnaires were completed and returned.

Table 2: Number of questionnaires distributed and returned in the two estates

Estates/zones	No of questionnaires distributed	No of questionnaires returned	% of questionnaires returned
Udoka (Zone A)	67	64	71.1%
Real (Zone B)	30	26	28.9%
Total	97	90	100.0

Source: Researcher's fieldwork, 2009.

2.3:   Identification of dump sites

Table 3:   Shows the number of during sites in the study area.

Number of dump sites	No of respondents	Percentage (%) of respondents
1	19	21.1%
2	38	42.2%
3	24	26.7%
Above 3	9	10.0%
Total	90	100.0

Source: Researcher's fieldwork, 2009.

From the table 3 above, it is observed that 42.2% of respondents said that the number of dump sites is 2, 26.7% said 3 dump sites, 21.1% and 10.0% of respondents supposed that the number of dump sites is 1 and above 3 respectively.
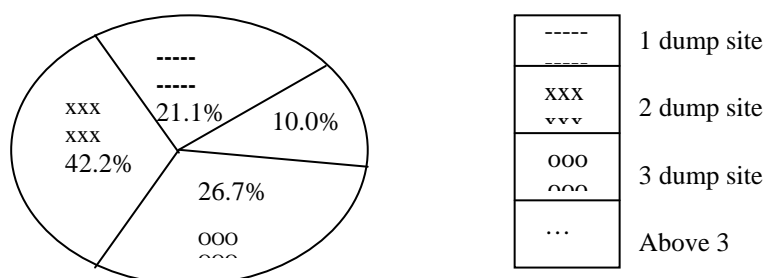
Figure 1: A pie chart showing the percentage of number of dump sites. Source: Researcher's fieldwork, 2009.

2.4:   The composition of solid waste at the dump sites in the two estates.

Table 4: Shows type and composition of solid waste in the area.

Type of waste	Waste composition	No of respondents	% of respondents
Biodegradable	Organic materials such as leaves, wood, grass, bones, garbage etc.	14	15.6%
Hazardous	Spent chemicals, expired drugs	3	3.3%
Non-biodegradable	Plastics, polythene bags, rubber, bottles	45	50.0%
Non-hazardous	Metals, tins, cans, rags scrap, dust etc	28	31.1%
Total	-	90	100.0

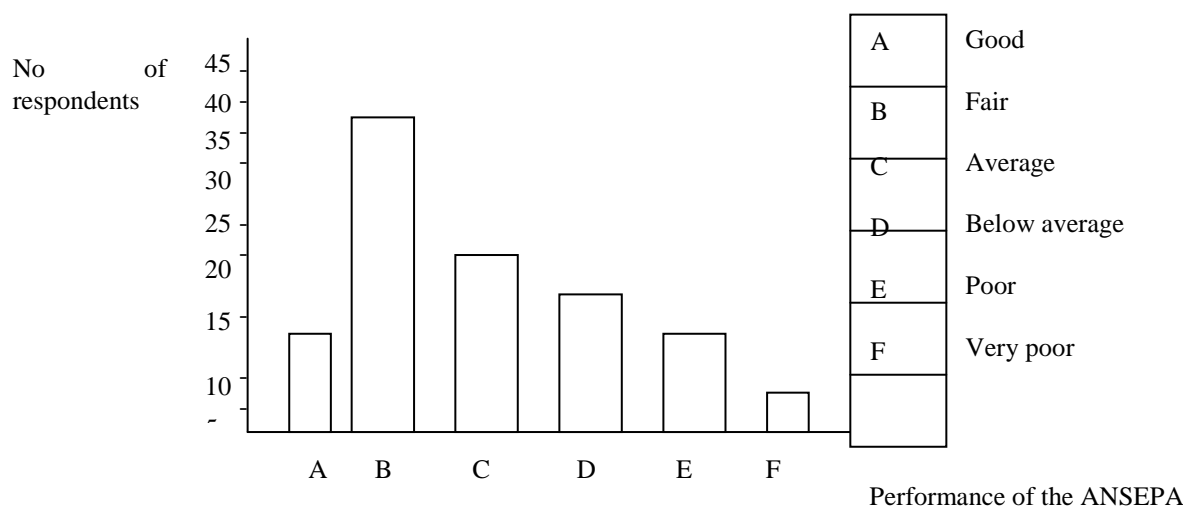**Source: Researcher's fieldwork, 2009.**

From table 4, it is observed that plastics, polythene bags, rubber, bottles are the most waste composition in the study area. This is also known as non-biodegradable waste. The second highest percentage of 31.3% of respondents supported biodegradable and hazardous waste.

Table 5:Evaluation of ANSEPA's performance in the study area.

Performance of the ANSEPA	No of respondents	Respondents %
Good	9	10.0%
Fair	37	41.1%
Average	21	23.3%
Below average	14	15.6%
Poor	7	7.8%
Very poor	2	2.2%
Total	90	100.0

Source: Researcher's fieldwork, 2009.

The table 5 above shows the performance of the ANSEPA in evacuation of waste in the study area. From the table above, 41.1% of respondents said that the performance of the ANSEPA is fair which is highest in the table 23.3% of respondents supported average as the performance of the ANSEPA, while 15.6% and 10.0% of respondents accessed the performance of the ANSEPA to be below average and Good. Thus the performance of the ANSEPA in the study area is fair, and if encouraged will go a long way to reduce the number of dump sites that harbour disease carrying organisms and flies. In these two estates (Udoka and Real), its also observed that most of the residents store their waste with bags and sacs waiting for the ANSEPA for final disposal while few of them throw waste indiscriminately thereby littering the estate environment and increasing the number of disease carrying organisms.

Figure 2: A bar chart showing the performance of the ANSEPA in evacuation of solid waste heaps. Source: Researcher's fieldwork, 2009.

2.5 Examination of effects emanating

Table 6: Shows whether indiscriminate disposal of solid waste have effects on the, health of the people living in the two estates.

Does indiscriminate disposal of solid waste have any effect on health	No of respondents	Percentage (%) of respondents
Yes	81	90.%
No	9	10.0%
Total	90	100.0

Source: Researcher's fieldwork, 2009.

From the table 6 above, 90.0% of respondents agreed that indiscriminate disposal has some health on the people, while 10.0% of respondents said No.
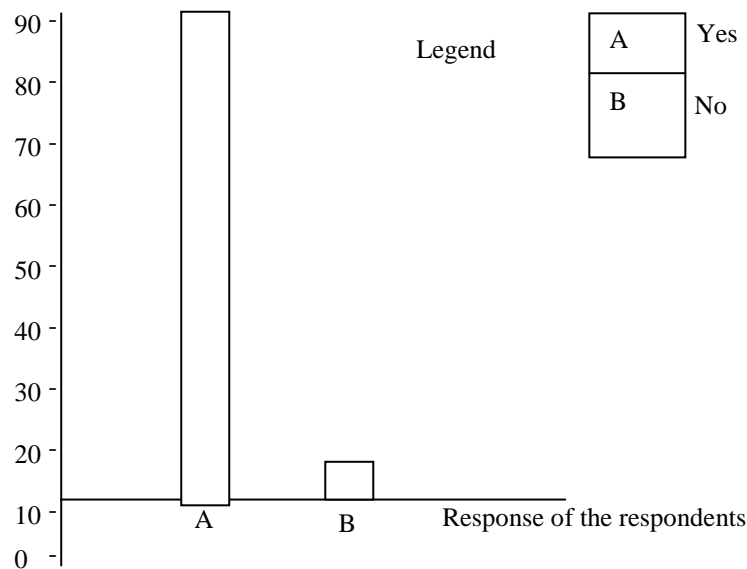

Figure 3: A bar chart showing the number of respondents that strongly agreed that indiscriminate disposal effect on health and those that do not agree. Source: Researcher's fieldwork, 2009.

3.0   DATA ANALYSIS

In order to evaluate effects of domestic solid wastes disposal problem in the study area, the following hypothesis will be tested;

Ho: There is no significant relationship between the indiscriminate disposal of solid waste and the health problems.

H1:   There is a significant relationship between the indiscriminate disposal of solid waste and the health problems.

The statistical tool used is chi-square as given below;

$$X^2 = \Sigma \frac{(O-E)^2}{E}$$

Where O   =   is the observed value

E   =   expected value

Σ =   is the summation

X^2 =   chi-square

But E for contingency table

$$E = \frac{\text{Row total x column total}}{\text{Grand total}}$$

Ho: Represent null hypothesis

H1:   Represents alternative hypothesis

Degree of freedom for a contingency table

= (r-1)(c-1)

Table 7: TESTING HYPOTHESIS ONE

Response of the respondent on the effects indiscriminate disposal on health	Zones of the study area		Total
Yes	60	21	81
No	4	5	9
Total	64	26	90

Critical value of chi-square with degree of freedom 1 at 99% level of confidence is 0.000157.

Decision Rule: Reject the null hypothesis, if the calculated value is greater than the critical value and accept the null hypothesis, if the calculated value is lower than the critical value.

Decision: Since the calculated value of X^2 (3.46) is greater than the critical table value 0.000157 at 99% confidence level, Ho is rejected and the alternative hypothesis (H1) is accepted that is there is a significant relationship between the indiscriminate disposal of solid waste and the health problems.

4.0   SUMMARY OF FINDINGS
The summary of the research finding are as follows;
1.   Respondents of the area under study said that the number of dump sites is two (2).
2.   The bank of solid waste disposal at the dump sites in the study area is non-biodegradable such as plastics, polythene bags, scrap metals etc.
3.   It was observed that the performance of the ANSEPA (Anambra State Environmental Protection Agency) in the two selected housing estates in the study area is fair.
4.   Respondents from the area of study said that indiscriminate disposal of solid waste have effects on the health of the inhabitants.

4.1   RECOMMENDATIONS
Based on the above findings, the following recommendations will be made.
1.   The most fundamental way to reduce waste is to prevent it from becoming waste in the first place. Using this material in packaging, producing consumer products in concentrated form and compositing yard waste are all examples of source reduction.
2.   The agency responsible for solid waste management (ANSEPA and or the newly integrated ASWAMA) should be properly provided with enough equipment, qualified personnel and funds for more effective and efficient.
3.   The government and private sector entrepreneurs should set up solid waste recycling and processing plant in the study area, so as to recycle and process most of the solid waste generated by the residents in the area since the major composition of these waste materials at the dump sites in the two estates can be converted into other economic uses.
4.   There should be frequent public enlightenment on methods of solid waste collection and disposal. This can be achieved through the combined efforts of public and private organizations.
5.   Public education enlightenment campaign should be organized so as to explain to the masses the health implications of indiscriminate waste disposal.
6.   There should be proper prosecution and punishment of individuals who generate and dispose solid wastes indiscriminately. This gesture can be done through appropriate legislations and enforcement actions.
7.   Government or concerned agency should stipulate standards for the sitting, construction and design of solid waste management systems such as land fillings, incinerations, compositing, recycling process/system, etc.

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