RESEARCH ARTICLE

SOLID WASTE MANAGEMENT PROBLEMS IN YENAGOA CITY BAYELSA STATE, NIGERIA

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ABSTRACT

The study examined the problems of solid waste management in Yenagoa city Bayelsa State. Method of study was the cross sectional survey and proper identification of residential neighourhoods in the city for sampling. The data collection method was the primary and secondary sources. Analytical techniques used include; univariate and bivariate techniques and test of relationship were established between selected variables, such as between household size and the quantity of solid waste generated. The findings of the research were; residents of Yenagoa especially those dwelling in the high density areas pay extra fees to government contractors as well as private waste vendors for waste collection. The study also revealed that the major cause of waste piles on the streets and neighbourhoods apart from the residents' high population, was the activities itinerant traders who come from the neighbouring Rivers and Delta States to do business in the city. The study revealed that lack of data on volume of domestic waste generated in the city led to the ineffectiveness of the contractors because they cannot match waste generation with evacuation. Most importantly, the study has also shown that there was no blue print or any defined system of solid waste management in the State. The study recommended immediate registration of all scavengers in the city and more youths made to engage in scavenging business as it was the case in Quezon city of the Philippines where the (Vincentian Missionaries, 2002) adopted the same programme to organize scavengers into community based material recovery centers thereby harnessing the waste picking and recycling skills of scavengers into a micro-entrepreneurship programme for youth empowerment. and further skills on safety for environmentally friendly technology of solid waste management. Other recommendations include; short and long term measures to adequately tackle the issue of solid waste management in the city.

INTRODUCTION

In Yenagoa city the capital of Bayelsa state, as is the case with most cities in Nigeria, there was a marked imbalance between waste production and controlled waste disposal (Ofomata, 2008). This was because a clear priority has not been given to the different categories of solid wastes and as a growing city, attention has not been particularly given to the matter of industrial development and how the state can cope with the management of industrial wastes problems. Industrial development with its effects on the manufacture of goods and on the consumption patterns of the population, particularly in areas of high population density, has led to an appreciable increase in the volume of wastes (Ejunjobi, 2006). Inadequate municipal solid waste management poses a serious health problem for urban areas especially the city of Yenagoa. Solid wastes clog drainage systems, increasing flooding and water related diseases. If dumped into nearby water bodies, they can also reduce water quality, further increasing health risks. Poor solid waste management also lowers economic productivity (Adeniji *et al.,* 2008). Given the high social costs of improper disposal of municipal solid wastes, the health effects are commensurately high (Elenwo, 2015).

The costs of appropriate management programs, involving sanitary landfills, waste collection, and separation of selected wastes for recycling, are generally moderate in comparison to the effects. In urban areas, the residential land use constitutes the single most important generator of solid waste in the city, and very difficult to manage because of indiscriminate litters all around the neighbourhoods, and the most obnoxious because it commonly accumulates near communities where it constitutes grave health hazards as well as an insult to sight and smell sensitivities is avers to the socio-economic spatial structure of our cities (Eludoyin *et al.,* 2016).

Aim and Objectives of the Study

The study examined Solid Waste Management Problems in Yenagoa Metropolis, Bayelsa State, Nigeria.

Objectives: The objectives to achieve the aim are as follows to;

(i) Identify the various methods of solid waste management in Yenagoa city from 2010- 2015.
(ii) Assess the level of public involvement in management of solid waste in the city of Yenagoa.
(iii) Determine the problems of solid waste management in the city of Yenagoa.
(iv) Identify possible strategies for better management of solid waste in the city.

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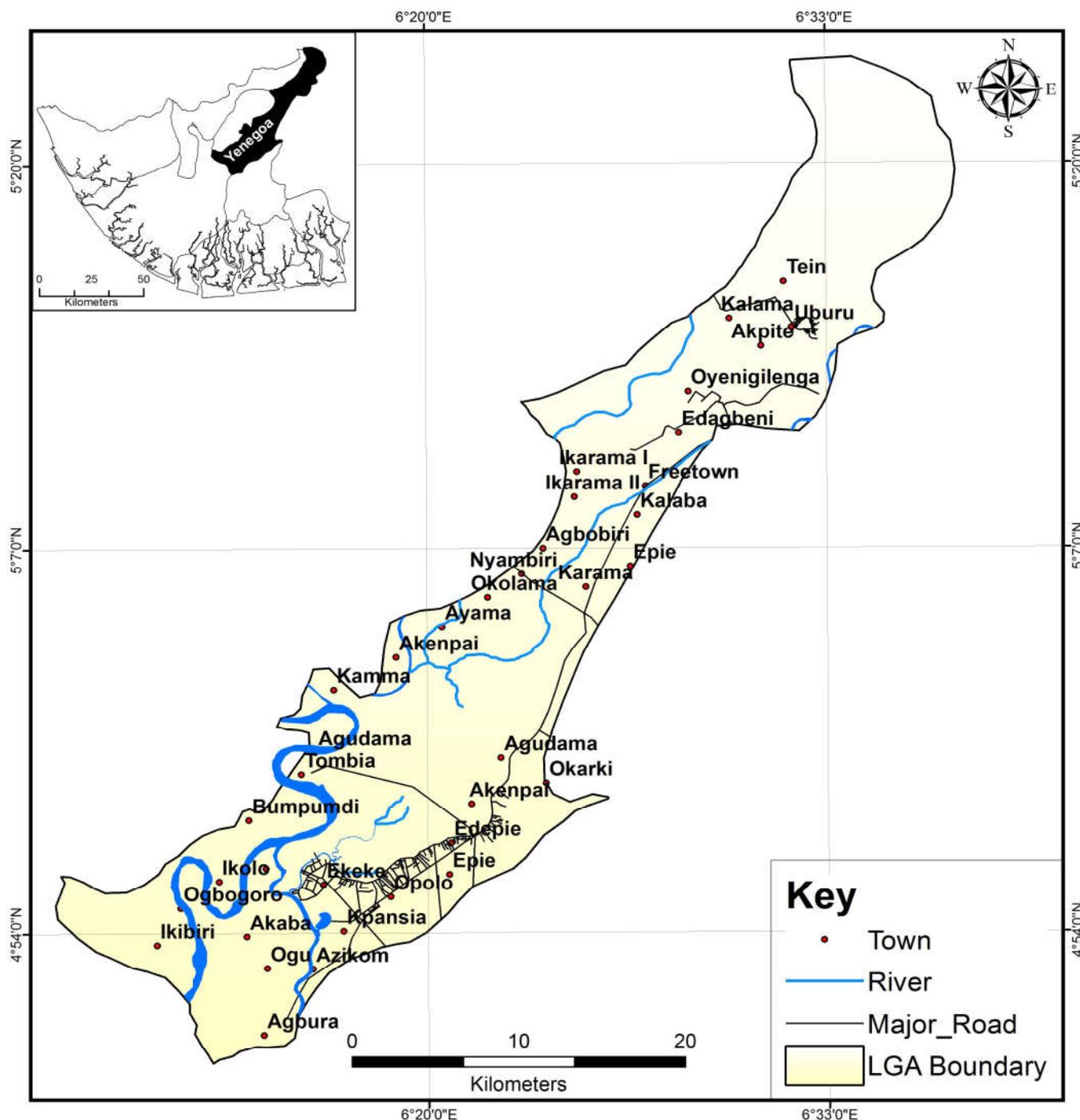
Figure 1. Showing Yenagoa City, Bayelsa State. (GEM Cartography Laboratory, 2017)

Hypotheses Statement

There is a statistical significant relationship between population densities and the volume of solid waste generation in the city of Yenagoa. There is a statistical significant relationship between the willingness of the public to participate in solid waste management and the rate of solid waste generation in the city of Yenagoa.

Brief over view of solid waste management problems in Yenagoa city

The Bayelsa State sanitation was beset with myriad of problems such as lack of spare parts for most of its machinery, lack of the requisite professionals, (engineers/instructors) and lack of provision for staff training, etc.

All these led to the low collection and disposal rate of refuse in the city (Kikile, 2016). More so, there are infrastructural and other capital intensive development projects that compete for funds with solid waste management which has been on the increase due to the peculiar nature of the state. Government revenue required to finance these projects has been on the increase and it is therefore the policy of government to priotize its programmes (By -SEEDS, 2015-2017). The present political regime in the state has made some efforts at refuse management, but these efforts were not quite commendable, this was because the government contracted the job of solid waste management to incompetent contractors under the supervision of the State Environmental Protection Agency, thereby rendering the state sanitation authority job redundant. There has not been clear-cut definition of functions between the workers of the state's sanitation authority and the contractor

in the area of revenue collection from residents or defaulter of sanitation laws in the city and lack of a coordinated solid waste collection and disposal in Yenagoa (Pilot survey, 2016).

Method of Study

The research design followed a multi-stage descriptive framework covering survey, data gathering, analysis and interpretation of data. The first stage involved the selection of residential neighbourhoods for assessment after determining the target population. The second stage covered the selection of streets within each of the selected residential neighbourhoods. In assessing the problems of solid waste management in Yenagoa city, the target populations identified for the research are as follows:

1. Households in different residential densities
   (i) High density residential areas
   (ii) Medium density residential areas
   (iii)Low density residential areas
2. Agencies involved in solid waste management in the city of Yenagoa (Bayelsa State Environmental Protection Agency).
3. Yenagoa city local government council.

Sampling Procedures

The sample for the study was drawn using the stratified random sampling method. The first stage of the sampling was the selection of residential neighbourhoods. One neighbourhood was picked from each stratum (Table 1). The neighbourhood data was adapted from Ogionwo (1979). At the end of the sampling, four strata emerged. For the high density neighbourhood H_3 was picked and H_4 was picked for High density areas. Similarly for the medium density neighbourhood, M_1 was picked which represents stratum III while for the low density neighbourhood; L_2 was picked which represents stratum I. The selections are recorded as shown in Table 2. The second stage of sampling was the selection of streets within the neighbourhoods using map of Yenagoa Metropolis. All the streets identified in each selected neighbourhood were listed. From this, we randomly selected the streets covered in our study. A maximum of ten streets were selected in each neighbourhood. The third stage was the selection of houses in each selected streets, using the interval of every 5th building in each selected street. Within the building, any household with an adult of about 18 years and above present was interviewed.

Instrumentation/Questionnaire Administration: This method, involves information to be collected in the presence of the respondent which eliminated a lot of biases. On the whole a total of four hundred (400) questionnaire were administered and it was structured in two ways, the open ended part were directed to the agencies while the closed ended part were directed to the residents of the sampled neighbourhoods. A total of 325 answered questionnaires were returned, 25 questionnaires, were wrongly filled with distorted information and therefore was not used, while 50 questionnaires were not returned. The 50 questionnaire not returned represents about 19% of total non-response rate while 325 returned (answered) questionnaire represents 81% response rate.

Key informant Interview: This was chosen on a purposive basis, in terms of their relevance, either as direct participants in the decision process overtime on solid waste management or indirectly, but having knowledge of what has been their experiences as regards domestic solid waste management in the city. To this end, interviews were directed to the following agencies involved in solid waste management in the state;

- Bayelsa State Ministry of environment
- Bayela State Environmental Protection Agency
- Yenagoa local government council
- Contractors handling solid waste management in the state

Analytical Technique: Analytical techniques used in the analysis of data for this research included, the univariate and bivariate analytical techniques. The univariate analysis involves the use of simple statistics example, percentages, and mean, presented with the aid of Tables. Bivariate analysis involved the examination of the relationship between variables. In this case, the X^2 technique was used to test the hypotheses stated earlier. This technique is given by equation;

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

Where
X^2 = chi - square
O=observed frequency
E=expected frequency

Decision rule for X^2: Reject H_o if (CV>tv) that is if calculated value is greater than the table value. Furthermore, a test for the strength of relationship between the variables was carried out, a technique used to test the strength of relationship called cramers V was employed. This technique is given by the equation.

$$V = \frac{X^2}{N(K-1)}$$

Where
V= Cramers V
X^2=Chi - square
N=Total number of cases
K=The smaller of the rows or columns

Measurement of the strength of relationship in Crammers V range from Zero to One, where one shows a very strong relationship.

RESULTS AND DISCUSSION

Socio-economic Characteristics of Respondents

Socio-economic characteristics of respondents were included in the Questionnaire and analysed. These characteristics were age, sex, income, number of household members, occupational status, marital status and educational status etc, as shown in Table 4.

Age and Sex of Respondents

In Tables 4 and 5 above, the age and sex structures of respondents' shows that 44.6% were males and 55.4% were females. In the age structure, most respondents were at the peak of their productive years, which was between 39 and 45 years of age which has 22.8% respondents in the sample.

Table 1. Neighbourhoods Selection According to Densities (Ref. Ogionwo, 1979)

Strata	Codes/NO	Density	Neighbourhoods
Stratum 1	L1	HD	Azikkoro
	L2	HD	Swali
	L3	HD	Yenagoa
	L4	HD	Ovom
	L5	HD	Onopa
	L6	HD	Amarata
	L7	HD	Okaki
	L8	HD	Yenizue-Epie
Stratum 3	M1	MD	Kpansia
	M2	MD	Yenizue-Gene
	M3	MD	Biogbolo
	M4	MD	Opolo
	M5	MD	Okutukutu
	M6	MD	Etegwe
	M7	MD	Edepie
	M8	MD	Akenpai
Stratum 4	H1	HD	Agudama-Epie
	H2	HD	Akenfa
	H3	HD	Yenegwe
	H4	HD	Igbogene

Ref. Ogiowo (1979) LD:Low density, MD:Medium density, HD: High density.

Table 2 List of Selected Residential Neighbourhoods

S/NO	Number picked/codes	Strata	Density	Neighbourhood
1	H3	I	HD	Yenegwe
2	H4	II	HD	Igbogene
3	M1	III	MD	Kpansia
4	L2	IV	LD	Swali

Table 3. Sampled Streets and Questionnaire Distribution

S/NO	Name of Residential Neighbourhood	Number of listed streets	Number of sampled streets	Number of questionnaire assigned
1	Yenegwe	26	10	100
2	Igbogene	10	10	100
3	Kpansia	30	10	100
4	Swali	18	10	100
	TOTAL	84	40	400

Table 4. Sex of Respondents

Sex	Yenegwe		Igbogene		Kpansia		Swali		Row Total	
	N	%	N	%	N	%	N	%	N	%
Male	55	65.5	25	32.0	34	42.0	31	38.0	145	44.6
Female	29	34.5	55	68.0	47	58.0	49	62.0	180	55.4
Total	84	100	80	100	81	100	80	100	325	100

Table 5. Age of Respondents

Age Group	Yenegwe		Igbogene		Kpansia		Swali		Row Total	
	N	%	N	%	N	%	N	%	N	%
18 - 25yr.	18	21.4	1	1.0	-	-	-	-	19	5.8
25 - 31yr.	12	14.3	11	13.8	5	6.2	2	2.5	30	9.2
32 - 38 yr.	9	10.7	13	16.3	7	8.6	2	2.5	31	9.5
39 - 45 yr.	28	33.3	13	16.3	5.	62	28	35.0	74	22.8
46 - 52yr.	16	19.0	23	28.8	30	37.0	16	20.0	85	26.2
53 -59yr.	1	1.2	19	23.8	25	30.9	20	25.0	65	20.0
60 - above	-	-	-	-	9	11.1	12	15.0	21	6.5
Total	84	100	80	100	81	100	80	100	325	100

Table 6. Marital Status of Respondents

Sex	Yenegwe		Igbogene		Kpansia		Swali		Total	
	N	%	N	%	N	%	N	%	N	%
Single	40	47.6	30	37.5	31	38.3	15	18.8	116	35.7
Married	44	52.4	50	62.5	50	61.7	65	81.2	209	63.3
Total	84	100	80	100	81	100	80	100	325	100

Table 7. Educational Status of Respondents

Level of Education	Yenegwe		Igbogene		Kpansia		Swali		Total	
	N	%	N	%	N	%	N	%	N	%
No formal Education	34	40.5	41	51.25	6	7.5	-	-	81	25.0
Primary/Sec.Educatio	16	19.0	30	37.5	3	3.70	3	3.75	52	16.0
Voc/Tech. Edu.	16	19.0	6	7.5	32	39.5	47	58.75	101	31
Poly/Uni Edu.	18	21.5	3	3.75	40	49.0	30	37.5	91	28.0
Total	84	100	80	100	81	100	80	100	325	100

The 18 years age bracket was chosen because it was the voting age in the constitution and also it was believed that at that age, the respondents should be knowledgeable enough to make meaningful contributions on issues. In terms of marital status, out of 209 respondents (63.3%) of the total sample were married while 116 respondents (35.7%) represented those unmarried. In terms of educational status respondent in Yenegwe and Igbogene had formal education (40.5% and 51.25%) while no formal education for respondents from Swali. Other results are as shown in Table 7 above.

Size of House Holds: Respondents were asked in Table 8 to indicate how many households lived in a house and it was discovered that out of 89 respondents (27.4%) of the total sample had 7 - 8 households resident in a house. This figure reflected more of the households sizes in Yenegwe as well as Igbogene . The situation in Kpansia and Swali was different. Out of 81 respondents (35.8%) and 50 respondents (61.7%) of the sample declared that they had 1 - 2 households and 3 - 4 households resident in a house. In the case of Swali, the houses were mainly occupied by Senior Civil Servants with some house helps and dependents and has 1 - 2 households while 3 - 4 households were mostly found in Kpansia areas. Furthermore, in Table 9 the occupational grouping reflects the largest percentage employed with the Local/State or Federal Government with 150 respondents (46.2%) of the total sample. Similarly, the number of unemployed showed about 80 respondents (24.6%) indicating a high unemployment rate and all these ones were engaged in one form of trade or the other. The self-employed persons were about 61 respondents (18.7%) out of the total sample. These persons either are having one form of goods or the other which they hawk along the streets and neighbourhoods generating more wastes to the already filthy environment of the neighbourhoods.

Income of Household Members: Table 10 above shows the average monthly income of households of the sampled neighbourhoods. Out of 78 respondents 24.0% of the total sample earn income was below N18, 000 and are found more in Yenegwe and Igbogene area. The other two neighbourhoods, Kpansia and Swali had high income earners with 66 respondents (20.3%) and 68 respondents (20.9%) earning between N48, 000 and above respectively. It was important to note that income was always under-reported by our people.

Characteristics of Waste in the Sampled Neighbourhoods Waste collection in the neighbourhoods: The research also examined the mode of waste evacuation mode in the neighbourhoods as shown in the Table 11. The data in the table shows that about 196 respondents (60.3%) out of the total sample agreed that tipper (open truck vehicle) were used for the evacuation of the waste in the neighbourhoods, also about 78 respondents (24%) said that wastes were never evacuated. Information on frequency of collection was also shown in table 12. The Table shows frequency of refuse collection by the contractors or cart drivers in the neighbourhoods. It further reveals that about 97 respondents (29.8%) of the total sample agrees that refuse are collected twice a week, while 76 respondents says that refuse were never collected and from these two Tables, it was obvious that refuse collection in the state was yet to be actualized. Generally the proportion of respondents, reporting absence of refuse collection (73.3%) occurs more in Igbogene. Furthermore, Table 13, shows the percentage composition by weight of solid waste generated in

the neighbourhoods. The Table at a glance shows that a greater percentage of the domestic wastes in the four neighbourhoods are composed of food waste (30.3%, 28.8%, 20.0% and 22.8% respectively). In Table 14, respondents were asked how much they pay for waste collection from their neighbourhoods. About 76 respondents (23.4%) admit payment ranging from N1000 – N2000 as waste collection charges either to sanitation authority or to hired contractor (cart drivers) and another group of about 48 respondents (14.8% admit payment ranging from N3000 - N5000 to the same persons or authority. These groups are more in Yenegwe and Igbogene. Generally, the bulk of respondents admit payment ranging from N4000. N5000 and above including 105 respondents (32.3%) and 86 respondents (26.5%) respectively. This research also examined waste handling in the neighbourhoods before collection by the contractors as shown in Table 15. The data available show that out of 180 respondents (55.4%) says the waste was either dumped on the streets or the river bank. Another funny attitude revealed was that most respondents admit dumping refuse into the drains (gutters) during rains. This attitude was not commendable and has helped in causing flooding in the city during rainfalls. The contractors condemn this attitude of the public in littering and indiscriminate dumping of waste in the street. Also about 109 respondents (33.5%) say that some wastes were burnt by residents before collection by contractors and most times the heaps are burning while they are evacuated. It was note worthy that the principal mode of waste handling in the neighbourhood was dumping on the streets and drains (gutter), this practice has reduced the environmental quality of the city of Yenagoa till date.

Refuse Disposal in the neighbourhoods

Table 16 above describes how long it takes for the waste containers used by members of the neighbourhoods to fill before disposal by the waste contractors. From the table it is obvious that saying that the more affluent the society becomes the more their consumption level increases. So the respondents attested to this as about 148 respondents (45.5%) and 120 respondents (36.9%) of the total sample agrees that the waste containers fill daily or 2-4 days respectively. Table 17 shows the analysis the rating of the performance by the contractors and hired labour (Cart pushers) involved in waste disposal in the neighbourhoods. From the table about 126 respondents (38.8%) declared that the services of the contractors are poor, while about 68 respondents (20.9%) commended the efforts of the contractors.

Perceptions of Respondents on Sanitary condition of Neighbourhoods

Table 18 examined the sanitary condition of the neighbourhoods. It reveals that about 135 & 116 respondents (77.2%) said that the neighbourhoods were very dirty. This tells us about the quality of our residential environment in the city of Yenagoa, while about 37 respondents (11.4%) out of the total sample says that the neighbourhoods are clean. More so, Table 19 elicited the willingness of respondents to participate in waste management in the city. About 234 respondents (7.2%) admitted their willingness to participate in waste management in the city, while 82 respondents (25%) declined not to be involved in waste management saying that it is the function of the government. Table 20 identified the problems of waste management in the city, 132 respondents (40.6%) stated that the problem is purely management.

Table 8 Number of Households in House

H/H Size	Yenegwe		Igbogene		Kpansia		Swali		Total	
	N	%	N	%	N	%	N	%	N	%
1- 2 H/H	3.	3.36	-	-	29	35.8	49	61.3	81	25.0
3 - 4 H/H	7	8.3	-	-	50	61.7	20	25.0	77	24.0
5 - 6 H/H	16	19.0	14	17.5	-	-	11	13.7	41.	12.6
7 - 8 H/H	34	40.5	53	66.2	2	2.5	-	-	89	27.4
8 H/H and above	24	28.6	13	16.3	-	-	-	-	37	11.0
Total	84	100	80	100	81	100	80	100	325	100

Table 9. Occupation of Respondents

Occupation	Yenegwe		Igbogene		Kpansia		Swali		Total	
	N	%	N	%	N	%	N	%	N	%
Unemployed	20.	23.8	30	37.5	18	22.2	12	15.0	80	24.6
Local/State/ Fed.employed	31	36.9	20	25.0	49	60.5	50	62.5	150	46.2
Organised Private sector	10	11.9	10	12.5	4.	5.0	10	12.5	34.	10.5
Self-employed	23	27.4	20	25.0	10	12.3	8	10.0	61	18.7
Total	84	100	80	100	81	100	80	100	325	100

Table 10. Average Monthly income of Respondents

Income Level	Yenegwe		Igbogene		Kpansia		Swali		Total	
	N	%	N	%	N	%	N	%	N	%
Less,than N18,000	41	48.8	37	46.3	-	-	-	-	78	24.0
N18,001 – N23,000	22	26.2	35	43.8	-	-	2	2.5	59	18.0
N23,001 – N28,000	5	6.0	3	3.6	-	-	2	2.5	10	3.0
N28,001 – N33,000	5	6.0	5	5.63	-	-	5	6.25	16	4.9
N33,001 – N38,000	-	-	`-	-	-	-	7	8.6	7	2.2
N38,001 – N43,000	-	-	-	-	9	11.1	13	16.3	22	6.7
N43,001 – N48,000	4	4.7	-	-	37	45.7	25	30.8	66	20.3
N53,000 and above	7	8.3	-	-	35	43.2	26	32.5	68	20.9
Total	84	100	80	100	81	100	80	100	325	100

Table 11. Households Mode of Waste Evacuation

Mode	Yenegwe		Igbogene		Kpansia		Swali		Total	
	N	%	N	%	N	%	N	%	N	%
Refuse not evacuated	20	23.8	57	71.3	1	1.2	-	-	78	24
Tipper (Open truck Vehicle	34	40.5	4	5.0	80	98.8	78	97.5	196	60.3
Wooden truck	1	1.2	19	23.7	-	-	-	-	20	6.2
Metal truck on wheel	29	34.5	-	-	-	-	2	2.5	31	9.5
Total	84	100	80	100	81	100	80	100	325	100

Table 12. Frequency of waste collection by Contractors assigned to the neighbourhood

Frequency of collection	Yenegwe		Igbogene		Kpansia		Swali		Total	
	N	%	N	%	N	%	N	%	N	%
Never collected	15	17.9	59	73.3	-	-	2	2.5	76	23.4
Daily Collection	18	21.4	1	1.3	-	-	-	-	19	5.8
Twice a week	23	27.4	-	-	37	45.7	37	46.3	97	29.8
Three times a week	2	2.4	-	-	-	-	-	-	2	0.6
Once a week	9	10.7	-	-	44	54.3	23	28.7	76	23.4
Once in three weeks	16	19.0	-	-	-	-	-	-	16	4.9
Once a month	1	1.2	20	25.0	-	-	18	22.5	39	12.0
Total	84	100	80	100	81	100	80	100	325	100

Table 13. Average Percentage composition by weight of solid waste generated in the neighbourhoods per day (%)

Components	Yenegwe	Igbogene	Kpansia	Swali
Foodwaste	30.3	28.8	20.0	22.8
Paper	5.0	6.2	10.3	22.2
Polyethene	20.2	25.2	10.5	10.2
Glass/cans &metals	5.5	6.3	25.2	15.3
Demolitions	20.3	22.5	18.00	12.0
Clothes	15.0	8.0	11.00	10.0
Leaves /grass	3.7	3.0	5.00	7.5
Total	100.00	100.00	100.00	100.00

Table 14. Waste collection charges per month by Neighbourhoods

Waste collection charges	Yenegwe		Igbogene		Kpansia N		Swali		Total	
	N	%	N	%		%	N	%	N	%
Less than N1000 per month	10	11.9	-	--	-	-	-	-	10	3.1
N1001 – N2000	41	48.8	35	43.7	-	-			76	23.4
N2001 – N3000 per month	22	26.2	8	10.0	9	11.1	9	11.25	48	14.8
N3001 – N4000	11	13.1	37	46.3	37	45.7	20	25.0	105	32.3
Above N5000 per month	-	-	`-	-	35	43.2	51	63.75	86	26.5
Total	84	100	80	100	81	100	80	100	325	100

Table 15. Waste handling by neighbourhood/perception of contractors

Waste handling Methods	Yenegwe		Igbogene		Kpansia		Swali		Total	
	N	%	N	%	N	%	N	%	N	%
Dumped(on street or river bank)	45	53.6	50	62.5	40	49.4	45	56.25	180	55.4
Buried	5	6.0	10	12.5	-	-	-	-	15	4.6
Burnt	34	40.4	20	25.0	35	43.2	20	25.0	109	33.5
Grinded	-	-	-	-	6	7.4	10	12.5	16	5.0
Shredded	-	-	`-	-	-	-	5	6.25	5	1.5
Total	84	100	80	100	81	100	80	100	325	100

Table 16. Households schedule of waste disposal

Frequency of waste Disposal	Yenengwe		Igbogene		Kpansia		Swali		Total	
	N	%	N	%	N	%	N	%	N	%
Daily	36	42.9	41	51.3	2	2.4	41	51.3	120	36.9
2-4 days	39	46.4	33	41.3	37	45.7	39	48.7	148	45.5
5-7 days	9	10.7	6	7.5	42	51.9	-	-	57	17.5
Total	84	100	80	100	81	100	80	100	325	100

Table 17. Rating of the performance of government contractors/Cart pushers on disposal of waste in the neighbourhood

Performance Rating.	Yenegwe		Igbogene		Kpansia N		Swali		Total	
	N	%	N	%		%	N	%	N	%
Very poor	13	15.5	28	35.0	10	12.0	2	2.5	53	16.3
Poor	45	53.6	29	36.2	27	33.8	25	31.2	126	38.8
Fair	18	21.4	13	16.3	24	9.6	23	28.8	78	24.0
Good	8	9.5	10	12.5	20	24.6	30	37.5	68	20.9
Total	84	100	80	100	81	100	80	100	325	100

Table 18. Rating of Sanitary condition of the neighbourhood by Respondents

Rating of neighbourhoods	Yenegwe		Igbogene		Kpansia		Swali		Total	
	N	%	N	%	N	%	N	%	N	%
Very Dirty	30	35.7	40	50.0	38	46.9	27	37.7	135	41.5
Dirty	40	47.6	31	38.7	25	30.9	20	25.0	116	35.7
Clean	8	9.5	6	7.5	10	12.3	13	16.3	37	11.4
Very clean	6	7.2	3	3.8	8	9.9	20	25.0	37	11.4
Total	84	100	80	100	81	100	80	100	325	100

Table 19. Willingness to participate in waste management by Respondents

Willingness to participate	Yenegwe		Igbogene		Kpansia		Swali		Total	
	N	%	N	%	N	%	N	%	N	%
Yes	53	63.1	41	51.2	81	-	59	13.8	234	72.0
No	22	26.2	39	48.8	-	-	21	26.2	82	25.2
Indifferent	9	10.7	-	-	-	-	-	-	9	2.8
Total	84	100	80	100	81	100	80	100	325	100

Table 20. Identification of Problems of waste management in the city by neighbourhoods

Problems	Yenegwe		Igbogene		Kpansia		Swali		Total	
	N	%	N	%	N	%	N	%	N	%
Lack,of awareness	23	27.0	13	16.0	27	33.3	29	36.0	92	28.4
Lack of education	6	7.0	20	25.0	-	-	13	16.0	39	12.0
Attitude of the people	17	20.0	7	9.0	-	-	-	-	24	7.4
Management	29	35.0	32	40.0	33	40.7	38	48.0	132	40.6
Culture of the people	9	11.0	8	10.0	21	26.0	-	-	38	11.6
Total	84	100	80	100	81	100	80	100	325	100

Table 21. Suggested measures for waste management in the city by neighbourhoods

Measures	Yenegwe		Igbogene		Kpansia		Swali		Total	
	N	%	N	%	N	%	N	%	N	%
Adequate supervision by govt	5	17.8	18	22.5	17	21.0	4	30.0	74	23.0
Effective Magt. by authorities or contractors	62	73.8	32	40.0	54	67.0	35	44.0	183	56.3
House to house collection	4	4 .8	17	21.2	6	7.2	21	26.0	48	14.7
Provision of waste bin	3	3.6	13	16.3	4	4.8	-	-	20	6.0
Total	84	100	80	100	81	100	80	100	325	100

Also 24 respondents (7.4%) declared that it is the attitude of the people of being indifferent in matters concerning waste. Other responses are shown in the Table 20. Similarly, Table 21 examined the possible measures as suggested by respondents to manage waste in the city. About 183 respondents (56.3%) of the total sample say that the only way to solve refuse problem in the city is by effective management by the authorities, contractors or government agencies concerned. Other suggestions made are contained in the Table 21 above.

Testing of Hypotheses: Relationship between Household size and volume of Generation in the City

Hypothesis 1

H_o: There is no significant relationship between Household size and the volume of waste generated in the city.
H_i: There is a significant relationship between Household size and the volume of waste generated in the city.

H3 (Yenegwe)

Table 22. Relationship between Household size and the volume of waste generation in the city

Household sizes	Number of days refusebins are filled		
1 - 2	Daily	2 - 4 days	5 - 7 days
	1	-	-
3 - 4	2	5	-
5 - 6	3	9	4
7 - 8	17	9	5
Above 8	13	25	-
Total	36	39	9

$X^2 = 16.32$
df = 10
Significance Level= 0.10
Critical value= 1.372
Cramer's V= 0.2

Conclusion: We reject H_0 and state that there is a significant relationship. Although a relationship has been established between these two variables, the cramer's V statistics shows that the relationship is moderately strong at 0.2 out of a maximum possible score of 1.0.

H4 (Igbogene)

Table 23. Relationship between household size and the volume of waste generation in the city

Household sizes	Number of days refuse bins are filled		
1 - 2	Daily	2 - 4 days	5 - 7 days
	-	5	9
3 - 4	-	4	9
5 - 6	-	24	-
7 - 8	6	-	23
Above 8	-	-	-
Total	6	33	41

$X^2 =5.64$
df=4
Significance Level=0.03
Critical value=2.776
Cramer's V=0.2

Conclusion: We reject H_0 and state that there is a significant relationship between household size and the volume of waste generated in this neighbourhood.

M1 (Kpansia)

Table 24. Relationship between Household size and the volume of waste generation in the city

Household sizes	Number of days refusebins are filled		
1 - 2	Daily	2 - 4 days	5 - 7 days
	-	-	2
3 - 4	-	-	-
5 - 6	-	17	10
7 - 8	2 37	20	30
Above 8	-	-	-
Column Total	6	37	42

$X^2 = 9.14$
df= 4
Significance Level= 0.06
Critical value=1.533
Cramer's V=0.3

Conclusion: We reject H_o and state that there is a relationship between house hold size and the volume of waste generated in this neighbourhood.

L2 (Swali)

Table 25 Relationship between Household size and the volume of waste generation in the city

House hold Size	Number of days refuse bins are filled		
	Daily	2-4 days	5-7 days
1-2	-		
3-4	4	7	-
5-6	3	7	--
7-8	9		-
Above 8	25		-
Column Total	41	39	-

$X^2 = 11.39$
df= 6
Significant level= 0.08
Critical value= 1.440
Cramers V= 0.4

Conclusion: We reject H_o and state that there is a significant relationship between household size and the rate of waste generation in this neighbourhood.

Relationship between public willingness to participate in waste management in the city and the rate of waste generation.

Hypothesis II

H_o: There is no significant relationship between public willingness to participate in domestic solid waste management in the city and the rate of waste generation.
H_1: There is a significant relationship between public willingness to participate in waste management and the rate of waste generation in the city.

Table 26. Relationship between Public willingness to participate in waste management in the city and the rate of waste generation in the city

Public Willingness	Responses	
	Yes	No
Yenegwe	39	45
Igbogene	39	41
Kpansia	70	11
Swali	52	28
Total	200	125

$X^2 = 25.84$
df= 12
Level of significance= 0.01
Critical value= 2.68
Cramers V= 1

Conclusion:We reject H_o and state that there is a significant relationship. The cramers V statistic shows a very strong relationship at the score of 1.0.

Key Informant Interview

Bayelsa State Ministry of Environment: The commissioner for environment during a brief interview with him re-affirmed the policy statement made by the governor of Bayelsa State to Bayesians, that the present practice of waste management is waste re-distribution and not disposal and (i) that the government will intensify adequate public enlightenment on waste management in the state and that this may be integrated into the school curriculum (ii) A modern gas powered incinerator will be acquired in the state for disposal of waste, etc.

Bayelsa State Environmental Sanitation Authority: The interview with the Bayelsa State Environmental Sanitation Authority, The functions of the authority's are as follows:

(1) Organize and carryout the collection, removal and disposal of refuse inYenegoa Metropolis and its environs and other places as may be specified by the state governor.
(2) Organize and carryout street cleaning.
(3) Be responsible for:

  (i) The maintenance of clean and healthy environment in its area of operation
  (ii) Provide waste collection points and centers for removal and final disposal of wastes.
  (iii)Directing and controlling the dumping of refuse in its area of operation
  (iv)Ensuring the cleaning of waste collection points and centers.
  (v) Devising and employing approved methods and measures for improved waste disposal. Other functions as may be found in the decree see appendix (c)

FINDINGS AND DISCUSSION

The residents of the city especially those that live in high density neighbourhoods such as Yenegwe and other high density areas pay additional fees to Cart pushers and to the government contractors for refuse collection apart from the normal environmental sanitation authority approved fees. It is an obvious fact that the increase in the population of residents in the city has aggravated the refuse generation in the state. Moreso, due to the growing nature of the city, people from the neighbouring states such as Port Harcourt, (Rivers State) and Warri, (Delta State) come on daily basis to sell their goods.

They go into the different streets and major roads displaying their wears (goods) thereby contributing to waste generation in the city. This research revealed that refuse containers or bins are filled 2-4 days awaiting collection for disposal by the contractor, it was also found that the rate of waste collection in the sampled neighbourhoods were very slow such that the contractors come twice a week to evacuate the refuse and it was not a healthy situation for residents in the neighbourhoods. This research also ascertained that due to this poor collection method by the contractor's that the neighbourhoods were very dirty as show in Table 18 above. It was also found out that the average percentage composition of household waste generation per day in the neighbourhoods shows a greater percentage of food waste, polyethen and demolitions as shown in Table 13. Furthermore, this research also revealed that there was no co-ordination of function among agencies involved in waste management in the state and this problem has been made worse because this research also showed that there is no blue-print or a system of waste management in the state therefore the agencies overlap in their functions. The attitude of the public was also investigated concerning waste management in the state and it was observed there was the willingness by the public to participate in waste management in the state. This was shown in Table 26 which exhibited a very strong relationship between public willingness and the rate of solid waste generation in the city. Also the relationship between the rate of waste generation in the city and the number of household size is moderately strong. Finally this research ascertained from respondents that the only solution to the problem waste management in the city is proper management and supervision of the government accredited contractor or agency.

Urban Development Issues and Solid Waste Management in Yenagoa city: The rapid growth of Yenagoa city has already been noted in the research as a result of the oil discovered twenty two years ago in Oloibri town in Bayelsa State has turned the economic fortune of the country and ruined the agricultural base her economy (Ayolagha, 2009). The boom in the oil sector attracted large immigrant from other States into Yenagoa city. The problems created by the city growth was enormous and have put pressure on land, water, coastline, air and other natural assets which were polluted. Thousands of people in the city live in substandard and sub-human environment plagued by lack of social amenities such as housing, electricity, water supply and inadequate waste disposal systems and flooded areas. These problems have brought large scale urban decay in the city centre and its environs (Kadiri, 2005). The peripheries of the city were emerging in an unplanned manner with basic infrastructures facilities lacking, this was the state of Yenagoa city and its suburbs. Some of these problems include;

Urban Policy: Until 1992 there was no coherent urban policy in Nigeria, but rather some legislative policy measures in response to some major urban problems. According to the Nigerian Urban Development Policy (1997) some of the legislative policy measures that are relevant to waste management were as follows:

• The Nigerian Town and Country Planning ordinance NO.4 of 1946
• Studies of twenty major urban Centres in Nigeria centered on urban infrastructural facilities

- Creation of infrastructural Development Fund (IDF) 1985
- Promulgation of the Decree NO.3 of 1992 establishing National Housing Fund
- Adoption of urban and Regional planning Decree NO.8 of 1992
- Establishment of Urban Development Bank 1992 etc.

Administrative, Political, Legal and financial Issues: Yenagoa city in Bayelsa State was one of the cities plagued with the myriad of problems of poor urban management. This research found out the issue of poor waste management in the city. The State governmental cannot boost of a well prepared dumpsite for disposal of waste. There was massive pollution of water bodies (surface and underground), flooding of streets and neighbourhoods and traffic obstruction etc. The resultant effect of the situation was epidemic diseases and this was not a healthy development for the public and was an indictment on the State health officers. The sanitary or health inspectors in the state were no longer relevant in the present dispensation as their roles have been usurped by others who operate under the cover of the Local Government Councils or the State Ministry of health and social welfare or the Ministry of Environment. On the Legal aspects, there are much Legislation regulating both physical and other dimensions of the environment, but for the purpose of the research the following are mentioned: The Federal Environmental Protection Agency Decree NO. 58, 1988

- The harmful waste special Criminal Provision Decree NO.42 1988
- The endengered Species (Control of International Trade and Traffic NO.11 of 1985.

All these Legislations are richly worded in their provisions concerning the regulation of the physical environment, but they were never enforced. The legal framework with regards to waste management should be reviewed especially in the present democratic dispensation. This research has suggested a number of measures to achieve effective waste management in the city, state and the country at large.

Technological Issues: The earth summit at Rio (1992) Agenda 21 which recommends that Local Environmental Action plans to be prepared by Local authorities. Chapter 28 of Agenda 21 discusses the particular role of Local Authorities in promoting and implementing sustainable Development policies and practices. Soon after the Rio meeting, some nations of the world have been in the vanguard of carrying out these programmes. No table was the United Kingdom where according to (Vincentian Missionaries, 2002) a body known as Local agenda 21 steering group was established to manage or control important aspects of Local Environment and can strongly influence the behaviour of other authorities, this was typical of the London Borough. In the developed countries of Europe, America and the far East as stated, technological advances which has occurred in recent years have resulted in the availability of environmentally cleaner and safer technologies. These technologies have the potential of reducing the total amount of solid waste produced in our homes, commercial and industrial areas. Now the vogue in Nigeria and other developing countries is that the technologies are being introduced without proper or any analysis of the Local condition and practices.

Conclusion

Waste has become a matter of imperative concern to environmentalists and the public of large. The disposal problems created by the avalanche of waste are becoming more serious. While infrastructural and other capital intensive development projects that complete for funds with waste management has been on the increase, government revenue required to finance these projects has been on the decrease. The handing over of solid waste management or better still the entire solid waste management to the public will give some relief to the government financially. This project asserts that the involvement of the public or a total handover of solid waste management to the public or any of the non-governmental agencies (NGOs) like the practice in the study in Payatas Philipines carried out, by the (Vincentian Missionaries, 2002) will save huge cost of revenue expended by the government in this venture. This measure will make the refuse contractors compete effectively with the public and the NGOs thereby making solid waste management a household name and also stem the environment of diseases and pollution caused by poor solid waste disposal. The hand-over of solid waste management to the public and the non-governmental organization (NGOs) should be a gradual process, it could start with a pilot scheme, after all necessary procedures have been put in place (legal/ administrative logistics) as recommended in the long term measures (the introduction of neighbourhood watchers)and later extended with adjustments made to accommodate unforeseen circumstances. The proposed system (measure) of public/NGOs participation towards achieving a clean and pollution free residential, commercial and industrial environment is worth giving a try. There is no doubt that it may have its own short comings, but it is expected that it will solve the lingering hydra headed solid waste management problem in the city of Yenagoa, the state as well as the nation at large.

Recommendations: Measures to achieve a better waste management in the city of Yenagoa are in two folds; short term and long term measures.

Short Term Measures: These measures will take into account the operational systems of solid waste management (storage, collection, transfer, processing and disposal) and the understanding of its criteria of operations as follows:

(i) Solid waste management must be stored properly while they await collection so that they do not cause unsightliness, create odors and attract rats and flies.
(ii) Collection must be organized so that it accomplishes aesthetics, efficiency and a safe environment. This requires good storage containers, proper equipment for collection, training of crews and proper routing, scheduling and supervision.
(iii) Disposal, whether by sanitary landfill or by incineration or any other disposal, methods, must be conducted according to the highest operating standards so as not to pollute the environment and endanger public health.
(iv) If collection or disposal operations are provided by private industry, local government, state or federal government should continue to assist to provide regulations and uniformity to acceptable standards through better co-ordination of these services.

Furthermore, the government should put all machinery in place with regards to funding its agency responsible for solid waste

management and providing all the technical support as well as man power to operate efficiently. Adequate enlightenment should be vigorously pursued and regular inspection conducted by the responsible government department (sanitary inspectors from ministry of health). Research and data bank should be established to work on regular basis to combat the menace of solid waste management and provide adequate data for future use. The state in conjunction with Federal government should incorporate as part of the general solid waste management policy and encourage companies as well as the public to use, re-usable or recyclable materials with reduction in the quality of their products to use such materials.

Long Term Measures: The long term measures will be in the education of the public which will take some time and when the level of awareness has been achieved, the possible handover of solid waste management to the public will be a success. The awareness of the public has already been reflected in this paper in the willingness of the public to participate in solid waste management in hypothesis (2) where we rejected the null hypotheses and accepted the alternative hypotheses and the relationship according cramer's V test of strength of relation is very strong. This research also wish to recommend the registration of all the cart drivers (private refuse vendors) in the city and make it a lucrative venture for young school leavers to participate in, instead of engaging in things that are not useful to the society. Moreso, the registration of scavengers all over the city and state should be pursued seriously and more youths made to engage in scavenging business as it is the case in Quezon city of the Philippines where the vicentian missionaries have adopted this efforts to organize scavengers into community based material recovery centre, harnessing the waste picking and recycling skills of scavengers into a micro-entrepreneur and further supplementing these skills with environmentally friendly technology of solid waste management. Another very important recommendation is the arrangement whereby able bodied men and women including youths in the different neighbourhood are organised to form solid waste watch groups or (neighbourhood watchers) who will oversee the sorting, collection, transportation, and disposal of solid waste in the different neighbourhood just as the organized neighbourhood vigilantes who watch over neighbourhood to avert crime. These solid waste watch group will collect a little token fee from the members of household in the neighbourhood based on their population to acquire the necessary materials needed to enhance these operations (Akor, 2008). The government on their side will provide and maintain disposal site and will in conjunction with multinational organisations as well as non-governmental organisations provide tippers, payloaders and vehicles needed for the disposal of these waste. More so, government should have an agency whose role is supervisory to oversee the operations of these solid waste watch group or neighbourhood watchers since they may not

necessarily posses the requisite skills concerning environmental management, but could be trained by the government through seminars, workshops etc. to improve their skills and performance. If these measures are adopted, the issue of solid waste management will be ruled out and everyone will live in Yenagoa and Bayelsa state happily.

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