Status of Solid Waste Management Practices in Sapele, Delta State, Nigeria

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ABSTRACT: Solid waste has caused several health and environmental issues in most regions of the world, including Nigeria. The objective of this study is to assess the status of solid waste management practices in Sapele, Delta State, Nigeria using standard methods after administering 300 questionnaires through personal contact with heads of household. According to the findings, 93.3% of respondents are economically active between the ages of 31 and 60, meaning they have the purchasing power to consume and so generate garbage. Organic waste/food waste had the highest percentage of 96.7% followed by plastic (90%), paper waste (80%), textile and glass waste (76.7%), and metal waste (50%) and other waste (16.7%). The use of waste baskets (56.7%) appears to be the principal means through which respondents collects their household waste followed by plastic bags (53.3%), drums (36.7%) while (6.7%) use cartons in Okpe Road. 40% of respondents dispose wastes in open dump, 26.7% use Delta State Environmental Protection Agency (DSEPA), 20% use open burning/incineration, 13.3% indicated the absence of waste management agency in the study area. About 43.3% of respondents said the condition of the environment in Sapele has been a little better in the last five years, 13.3% said it has gotten much better, 23.3% said it has stayed the same, and 10% said waste disposal is a little worse and much worse. Sapele people require health education, a consistent supply of garbage collection facilities, and authorized final disposal locations. These will urge them to follow proper and suitable waste management methods.

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In most parts of the world, including Nigeria, solid waste has generated a number of health and environmental problems. Because of the inevitability of the waste generation, disposal, and management cycle, if solid waste problems are not addressed in a timely manner, they will degenerate into worse problems for humanity. Solid waste generation is unavoidable as long as humans continue to inhabit the globe, because waste products are formed in the course of daily life. Trash, garbage, and rubbish are all names for waste. Solid waste composition and characteristics differ by municipality (Adewole, 2009; Amukali *et al.,* 2020). Solid wastes are non-liquid and nongaseous byproducts of human activity that are deemed useless. It could take the forms of refuse, garbage and sludge

(Leton and Omotosho, 2004). Cities in Nigeria, being among the fast growing cities in the world (Onibokun and Kumuyi, 1996) are faced with the problem of solid waste generation. The implications are substantial when a country is quickly increasing and garbage is not adequately managed.

The waste generating scenario in Nigeria has been a source of tremendous concern both worldwide and domestically. Of the different categories of wastes being generated, solid wastes had posed a hydra-headed problem beyond the scope of various solid waste management systems in Nigeria (Geoffrey, 2005), as the streets experience continual presence of solid waste from commercial activities. Solid-waste

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management entails the collection, storage, transportation, treatment, recycling, recovery, and disposal of waste in such a way as to render them innocuous to human and animal life, ecology, and the environment as a whole (Fafioye and John-Dewole, 2013; Odiana and Olorunfemi, 2021). Waste management is a major issue that threatens developing African countries, particularly Nigeria. Several scholars have attempted to analyze the pattern of solid waste generation in Nigeria, although most of the studies are usually a case study of a certain state or locality in Nigeria, and it appears that awareness of solid trash generation in several other cities is veiled. Most Nigerian Local Government Authorities in charge of trash disposal are still battling collection and disposal difficulties rather than managing them sustainably. According to Amukali (2019), around 87% of Nigerians employ unhygienic solid waste disposal practices, which cause nuisance, are unsightly, emit unpleasant odors, and serve as a breeding ground for pests and diseases. These have had negative health and environmental consequences. Indiscriminate solid waste disposal is a threat to the nation, with mountains of rubbish littering most regions of the city (Amukali, 2019).

Today, emerging countries must balance economic expansion with environmental improvement within the framework of sustainable development. The indiscriminate dumping of MSW is increasing, and it is exacerbated by a cycle of poverty, population increase, declining living standards, inadequate governance, and a lack of environmental awareness. As a result, these wastes are illegally dumped onto any available location, known as open-dumps (Izugbara and Umoh, 2004). Ogbonna *et al*., (2002) have observed that little or no attention is given to some traditional suburban settlements for provision of waste collection and disposal services. Sapele, a traditional city in Nigeria, is now on the path of increasing population due to a remarkable rise in the number of commerce and industrial institutions in the state and a rising economy, but it has yet to be fully explored for adequate data and information on trash collection and disposal. The objective of this research is to analyze the current status of solid waste management practices in Sapele, Delta State, Nigeria.

MATERIALS AND METHODS

Description of the Study Area: Sapele is a town in Delta State, Nigeria, and a Local Government Area. The name is thought to be an anglicized form of the Okpe term 'Uriapele,' named after a native deity whose shrine may still be located in the city center. The then-

hamlet's name was changed to Sapele by British colonial rulers. The Okpe people live in Sapele. It is governed by the Orodje of the Okpe kingdom. It is located along the Benin River, right below the junction of the Ethiope and Jamieson rivers, 98 miles (158 kilometers) from the Escravos Bar and the entrance to the Benin Bight (Orhorhoro *et al.,* 2017). The town is located on a route that leads to Warri, Ughelli, and Asaba, and it is connected by ferry to the road that leads to Benin City. Sapele Local Government Area is located in the vicinity of latitude 5° 52' 46.9128" N and longitude 5° 42' 1.9116" E. Sapele is comprised of a number of cities and villages, including Elume, Ugborhen, Amukpe, Ogiedi, Onoghro, Okuoke, Inabome, and Amuokpokpo. The city was formerly a modest business village that has expanded into a growing trading community. Sapele LGA has a population of 298,310 people (Orhorhoro *et al.,* 2017), with the Urhobo ethnic group making up the majority of the population. The Urhobo language is extensively spoken in the LGA, while Christianity and traditionalism are widely practiced religions. In this study, three (3) settlements in Sapele LGA, Delta State, Nigeria were selected as case studies: Green Egbedi, Okpe Road, and Ugbeyiyi. Figure 1 depicts the Sapele Local Government Areas map.

Methodology: The study aimed to analyze waste management methods and the status of solid waste management in three Sapele Local Government Area settlements. In this work, the waste characterization approach of Bernache-Perez *et al.,* (2001), which was applied and described by Oyelola and Babatunde (2008) in (Okeniyi and Anwan, (2012), was used. The process comprises a review of the qualitative method utilized. The study used both primary and secondary data sources, with the primary source involving direct data collected through the use of a closed-ended questionnaire to find out public opinion on benefits to sort waste into bins at the source, level of awareness, general assessment of the efforts, and level of enforcement of trash disposal specifications, and the secondary source involving data retrieved or obtained from relevant publications. The study was a cross-sectional descriptive study that used survey method structural questions that were prepared, pre-tested, and used. The study population consisted of grown-ups (both males and females) in the study area who were 18 years of age or older who were familiar with the idea of garbage generation and disposal. Participants had to be residents of the area and household members willing to voluntarily engage in the study to meet the inclusion criteria. Non-locals and those who choose not to participate were excluded.
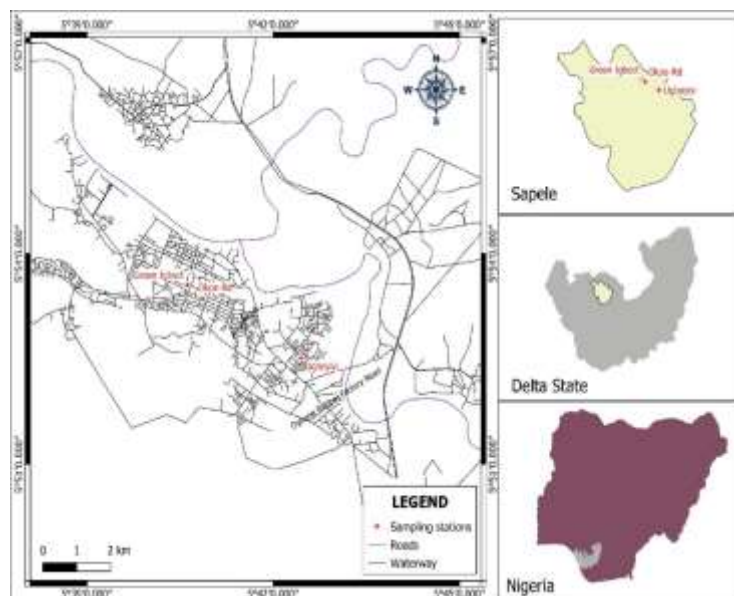
Fig. 1: Map of Sapele Local Government Areas showing the study area.

Sampling Technique and Area: A random selection strategy was employed to distribute questionnaires to 300 respondents, including 100 in each study location. Three hundred (300) surveys were distributed, with 300 receiving 100% answer. In this study, the household technique was employed to determine the responses of the respondents. According to the principles of simple random sampling, every object has the same probability of being selected or chosen, hence this is one of the methods of probability sampling and a basic type of sampling. Furthermore, simple random sampling ensures that every member of the study region has an equal chance of being chosen to participate in the study. Heads of households, on the other hand, were chosen.

According to the 2006 National Population Census, the estimated population of the research locations is around 240, 000 people, with approximately 4,000 homes including stores and businesses. Its people are primarily native civil servants, traders, and farmers. These residential areas were purposefully chosen to be very representative of the many zones to which they belong. These are the zones of high and medium density. Respondents were picked at random in each community based on their availability during sampling and waste-consciousness, regardless of their ability to understand English. An interpreter was utilized to interpret in Urhobo language for individuals who could not understand English. The questionnaire was prepared and constructed to allow respondents to freely express their sentiments as expressed or stated by variables, and it was distributed to the heads of households in the study area in the months of April and May 2022.

Data Analysis: Data was analyzed in this study using Microsoft Excel 2013 and the Statistical Package for Social Sciences (SPSS) version 16. This study's data was gathered utilizing frequency counts and percentages. The frequency counts are presented in tabular form and represent each question answered by the respondents. The mean of each respondent was calculated by counting the number of occurrences of demographic features of respondents from the administered questionnaires, after which the data was coded and totaled up at various locations. Also shown in the table are the percentage values and p-values using the chi-square goodness of fit? A 5% threshold of p-value was chosen as a guideline for establishing the significance of the associations, with $p>0.05$ indicating no significant difference and $p<0.05$ indicating a significant difference.

RESULTS AND DISCUSSION

Demographic Characterization of Respondents: The demographic characteristics of respondents in the research region are shown in Table 1. It was previously said that waste generation grew with population growth, resulting in a continuous trash generation and management cycle (Amukali *et al.,* 2018). This view has been supported by a couple of other researchers (Isu, 2005; Blanche *et al.,* 2006; Bhatia, 2010; Kumar *et al.,* 2016; Amukali *et al.,* 2020) in separate studies. The gender of respondents in this study shows that 56.7% are male and 43.3% are female. This suggests that more than half of the household heads interviewed are married men with children, which is consistent with the cultural backgrounds of the study area, where societies are mainly patrilineal (Ogah *et al.,* 2020).

This study's findings are comparable to those of Momoh and Oladebeye (2010), Igbinadolor *et al.*, (2019), and Ogbonna *et al.*, (2018) from Ado-Ekiti, Akure Municipality, and thirteen local government areas in Lagos State. In contrast, Adogu *et al,* (2015) recorded 63.8% of respondents were females while 36.2% were males in Imo state and opined that the dominance of female respondents in their study is a reflection of higher level of interest expressed by the female gender as reported in a qualitative study of preference for house hold tasks (Hewitt *et al.,* 2010; Adogu *et al.,* 2015) while a Togolese study on the intersection of gender, education and health, recognizes the pivotal role of women in household cleanliness and sanitation (Mattos *et al.,* 2012). Female (43.3%) respondents in this survey, on the other hand, constitute housewives separated from their

husbands, widows, or divorcees who now head families. Although the result shows more male representation, there is no clear indication as to whether an individual's gender greatly affects his or her ability to manage waste (Igbinadolor *et al.,* 2019). However, Ehrampoush and Moghadam (2005) showed that gender difference could influence people's perception on solid waste management.

The mean age of the sampled household heads in this study was found to be 37.5 years, with the majority (93.3%) of respondents falling within the economically active category (31-60 years). Age is expected to play a significant role as maturity could affect level of awareness on environmental health and sanitation (Bradley *et al.,* 1999; Eagles and Demare, 1999).

Table 1: Demographic Characterization of Respondents

Variables		Green Egbedi	Okpe Road	Ugbeyiyi Quarters	Frequency (n=300)	Percentage (%)	p-value
Sex							
	Male	70	60	40	170	56.7	p>0.05
	Female	30	40	60	130	43.3	
Status							
	Married	80	60	70	210 [a]	70.0	**p<0.001**
	Single	10	30	10	50 [b]	16.7	
	Widowed	10	10	20	40 [c]	13.3	
Age							
	18-30	10	10	0	20 [c]	6.7	**p<0.001**
	31-40	10	40	20	70 [b]	23.3	
	41-50	30	20	50	100 [a]	33.3	
	51-60	50	30	30	110 [a]	36.7	
Formal Education							
	Primary	20	10	50	80	26.7	p>0.05
	Secondary	30	50	40	120	40.0	
	Tertiary	50	40	10	100	33.3	
Household size							
	≤ 4	30	60	20	110 [a]	36.7	**p<0.05**
	5-6 persons	40	20	60	120 [a]	40.0	
	≥ 7	30	20	20	70 [b]	23.3	
Occupation							
	Government	40	10	20	70 [b]	23.3	**p<0.001**
	Private	30	20	50	100 [a]	33.3	
	Self Employed	20	60	30	110 [a]	36.7	
	Others	10	10	0	20 [c]	6.7	
How Long you lived in the Area							
	3-4 years	10	10	10	30 [c]	10.0	**p<0.001**
	5-6 years	40	10	20	70 [b]	23.3	
	7-8 years	10	20	20	50 [a]	16.7	
	10 years above	40	60	50	150 [a]	50.0	
Ever heard of SW							
	Yes	80	90	100	270	90.0	**p<0.001**
	No	20	10	0	30	10.0	
Monthly income							
	≤ # 30,000	10	0	0	10 [c]	3.3	**p<0.001**
	# 30,000 - 50,000	20	10	0	30 [b]	10.0	
	≥ # 50,000	70	90	100	260 [a]	86.7	

*No significant difference (p > 0.05), *p < 0.05 (significant difference) **p < 0.01 (highly significant difference) ***p<0.001 (very high significant difference).* Note: Similar letters (superscripts) indicate values that are not significantly different from each other (P>0.05)

Given that just roughly 30% of the respondents were under the age of 30, a large fraction of the respondents can be deemed mature, which is likely to positively affect proper waste management (Igbinadolor *et al.,*

2019). Similar results were obtained by Momoh and Oladebeye, (2010) and Igbinadolor *et al.,* (2019). Akpen and Aondoakaa, (2009) who observed a majority of 59% of the respondents fall within the

economically active group of 20-50 years in their study. The interest here is that they have the purchasing power to consume and hence generate wastes (Akpen and Aondoakaa, 2009). The current study also reveals that a sizable number of respondents in Sapele's selected areas have obtained a high level of education, with approximately 73% having more than 12 years of education (tertiary education) and the remaining group having primary education (26.7%). In terms of family size, most families have no more than 5 individuals and no more than 6-10 people. Larger households generate more garbage than smaller households (Akpen and Aondoakaa, 2009). The study region is dominated by households of 5-6 people, which account for around 40% of the population, followed by households of 4 people, which account for 36.7% of the population, and households of 7 people, which account for 23.3% of the population. The result of this study is different from Ogah *et al.,* (2020) who recorded household sizes ≥ 10 persons and above with a percentage of 60% while household sizes ≤ 9 persons had a percentage of 40%. Given the research's unequal family sizes, it is projected that the amount of garbage generated will be large, as the percentage of households with 5-6 and ≥ 7 people accounts for

63.3% of the study area. The average monthly income of the respondents in this study was found to be $\geq$ # 50,000 with about 86.7%, however, about 10% and 3% of respondent are earning less than 30,000 - 50, 000 and $\leq$ # 30,000, respectively. The income status of a people is an instrumental factor in demanding for goods and services (Akpen and Aondoakaa, 2009). Kabiru (2017) opined that those who are at lower socio-economic status engaged in open dumping compared with those who have highest income as they can afford better solid waste management services than those with lower income, and can be a victim's health impact of poor solid waste disposal. However, there are also people above the income range of 100,000 and above who are residents in the study area. The implication is that the rate of waste generation should be significant in the study area (Ogah *et al.,* 2020). This is in accordance with the results of the research work sponsored by World Bank on improving solid municipal waste management in India which revealed that income level, economic growth and lifestyle have strong influence on waste generation (Zhu *et al.,* 2008).

**Table 2: Physical Components of Household Solid Waste**

Variables	Green Egbedi	Okpe Road	Ugbeyiyi Quarters	Frequency (n=300)	Percentage (%)	p-value
Components of household waste						
Organic/Foodwaste	90	100	100	290	96.7	p>0.05
Plastic	80	90	100	270	90.0	p>0.05
Textile	70	80	80	230	76.7	p>0.05
Glass	80	60	90	230	76.7	p>0.05
paper	80	70	90	240	80.0	p>0.05
Metal	40	50	60	150	50.0	p>0.05
Others	10	10	30	50	16.7	p>0.05
component of organic waste						
Yam/Potato Peel	100	100	100	300	100.0	p>0.05
Plantain Peel	80	90	100	270	90.0	p>0.05
Egg Shell	80	80	100	260	86.7	p>0.05
Vegetables and Fruits	100	100	80	280	93.3	p>0.05
Components of Metal waste						
Empty Can Drinks	100	100	100	300	100.0	p>0.05
Caps of Bottles	80	90	100	270	90.0	p>0.05
Bent Spoons n Cups	60	70	60	190	63.3	p>0.05
Electrical/Mech Parts	30	50	60	140	46.7	p>0.05
Components of Plastic waste						
Pet bottles	80	80	100	260	86.7	p>0.05
Empty Sachet Water	100	80	80	260	86.7	p>0.05
Plastic Bags	80	100	100	280	93.3	p>0.05
Fast Food Packets	70	80	80	230	76.7	p>0.05

*No significant difference (p > 0.05), *p < 0.05 (significant difference) **p < 0.01 (highly significant difference)*

Physical Components of Household Solid Waste: Table 2 displays the physical components of respondents' home solid trash in the research area.

Food waste had the largest percentage of other solid waste generated in this study by percentage composition of solid waste. The result of this study is

similar to the study of Orhorhoro *et al.,* (2017). Akpen and Aondoakaa, (2009) and Orhorhoro *et al.,* (2017) recorded similar household solid waste composition in Gboko and Sapele respectively and the dominant materials are putrescibles (food remnants, fresh leaves and vegetation, glasses, ferrous metal can and ceramics, rubber, paper, wood, plastic, leather, textile) which are similar to the composition of waste obtained in this study. Decomposable wastes could be recycled as compost manures. Others, such as paper and metals, are recyclable. Food waste is mostly composed of leftovers, vegetables, fish and meat waste, fruits, and peels (cassava, yam, potato, orange, pawpaw, banana, and plantain). Correspondingly, the finding from this study agrees with the work of Igbinomwanhia *et al.* (2012) that reported seventy-eight (78%) percentage composition of food waste in Benin metropolis, Owamah, *et al.* (2015), Eisa and Visvanathan (2002), reported percentage composition of 77% and 87% of food waste for municipal solid waste characterization in Nigeria while Ajayi *et al.,* (2021) recorded 55% of household waste to be organic, 25% were plastics, 12% were paper and 8% were metal from three local Governments in Lagos state. Food waste had the greatest percentage composition in all documented cases, accounting for more than fifty percent (50%) of total solid waste created daily in Nigeria. Apart from food waste, which accounts for approximately 75% of the total trash in this study, plastic and rubber waste account for 10%, paper waste (6%), metal waste (3%), glass waste (4%), and other waste (2%). Figure 2 depicts the percentage breakdown of residential garbage in the research area.
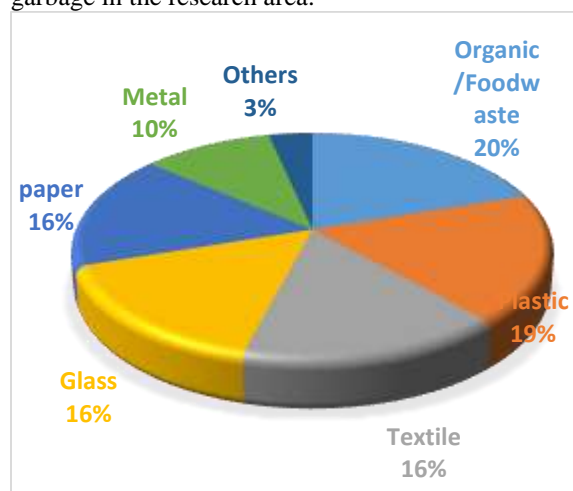
Fig 2: Percentage household waste composition in the study area

Given this study's extensive report on the percentage composition of waste generated, a combined solid waste management approach combining reuse, recycling, composting via anaerobic breakdown, and energy conversion processes may be the most appropriate choice for household solid waste management in Sapele, Nigeria. As a result, there is a need for anaerobic digester (AD) plants to be installed throughout Nigerian towns and cities as a means of handling waste from food production. Research had proven that AD process which is a green energy technology can be used to process food waste to energy, and organic fertilizer (Ebunilo *et al.,* 2016; Orhorhoro *et al.,* 2016; Paramagurua *et al.,* 2017).

Methods of Collecting and Disposing of Household Solid Waste: Table 3 shows the methods of household solid waste collection and disposal in the study area. Poor solid waste disposal is one of the major environmental problems in Sapele, Delta State and like other cities in Nigerian States as other developing countries are facing the same issues (Kabiru, 2017). The usage of trash baskets appears to be the primary technique by which respondents collect their household waste, accounting for around 56.7% of the total response elicited for waste collection methods. It is becoming obvious that a large majority of homes support the usage of garbage baskets as a traditional way of waste collection. This was followed by plastic bags, which accounted for 53.3%, drums, which accounted for 36.7%, and cartons, which accounted for 6.7% within the study region. This was comparable to the findings of Igbinadolor et al., (2019), who discovered that 73% of respondents in Akure municipality used dust bins as their primary form of garbage collection, while 24% used polyethene bags and only 3.6% dumped their refuse at a specified spot within their compound. In the study of Adogu *et al.,* (2015), 51.4% of respondents collect their waste in containers with covers and majority do not separate their waste before disposal (88.3%). The result of this study is in line with outcome of study done by Modebe *et al.,* (2011) in Awka.

Following waste collection, the next critical issue to evaluate is the method of refuse disposal used by families. Given that 40% of respondents dispose of waste in open dumps, 26.7% use the Delta State Waste Management Agency (DEWMA) or Delta State Environmental Protection Agency (DSEPA), 20% use open burning/incineration, and 13.3% indicated the absence of a waste management agency in the study area, this study has created a general picture of poor waste management practices among Sapele community residents. This study is in line with the study of Aderemi and Falade, (2012) who observed that the most popular methods of waste disposal known to the respondents were open dumping (98.94%) followed by burning (94.6%). Adogu *et al.,* (2015) also reported poor waste management practices among residents of Owerri Municipal as 66.3% of respondents practiced open dumping while 62.4%

preferred to burn their wastes. Kabiru (2017) recorded 75% of respondent in kano metropolis dispose their waste through open dump, 8% use land filling, 8% use incineration, 3% use composting while 6% use other disposal option. These procedures are not optimal because they can cause illness, pollution of the atmosphere, and aesthetic blithe.

Table 3: Methods of Household Solid Waste Collection and Disposal

Variables	Green Egbedi	Okpe Road	Ugbeyiyi Quarters	Frequency (n=300)	Percentage (%)	p-value
Type of Containers to collect waste						
Waste Baskets	70	40	60	170	56.7	p>0.05
Cartons	0	20	0	20	6.7	
Plastic Bags	50	40	70	160	53.3	p>0.05
Drums	30	40	40	110	36.7	p>0.05
How Often is waste emptied						
Once in two days	0	60	10	70[b]	23.3	**p<0.001**
Once in three days	10	20	10	40[b]	13.3	
Once a week	80	20	80	180[a]	60.0	
Others	10	0	0	10[c]	3.3	
Where do u dispose waste						
Public bin	50	20	10	80[b]	26.7	**p<0.001**
Roadside/Open dump	10	30	0	40[c]	13.3	
Waste van	30	50	90	170[a]	56.7	
Hole in own compound	10	0	0	10[d]	3.3	
Are thre public bins near you						
Yes	30	40	30	100	33.3	**p<0.001**
No	70	60	70	200	66.7	
How long does it take to get there						
5-10 mins	20	0	10	30[b]	10.0	**p<0.001**
11-15 mins	10	40	40	90[a]	30.0	
16-20 mins	30	0	10	40[b]	13.3	
21-25 mins	40	0	40	80[a]	26.7	
Others	0	60	0	60[a]	20.0	
Is waste disposal method a problem in your neighborhood?						
Yes	30	40	40	110	36.7	**p<0.01**
No	70	60	60	190	63.3	

*No significant difference (p > 0.05), *p < 0.05 (significant difference) **p < 0.01 (highly significant difference) ***p<0.001 (very high significant difference). Note: Similar letters (superscripts) indicate values that are not significantly different from each other (P>0.05)*

Improper waste disposal has been shown to constitute breeding grounds for rodents, flies, mosquitoes, snake and harbour for other dangerous animals as well as hindering the free flow of run-off (Fakere *et al, 2012*). This finding in this study however does not agree with the Modebe and Ezeama (2011), which showed that majority of the respondents in Awka (73%) disposed their waste through government waste management agency and only 27% dumped theirs in unauthorized area. This demonstrates that Awka inhabitants benefit from a strong and functional government waste management organization. As a result, Awka has a better coordinated waste management technique than Sapele, Delta State. Ogah *et al.,* (2020) research represented the Akwa scenario and concluded that the most acceptable waste disposal method in his study was by Nasarawa State Urban Development Board. The writers, however, emphasized that the waste disposed of at the depots remained at the dumpsites for an extended period of time before being removed. This is consistent with the study's findings that solid waste management falls short of expectations in Sapele, Delta State, due to the adoption of unorthodox and non-environmentally friendly disposal methods. This scenario is not dissimilar to the findings of other investigations. Open dumping remains the simplest and the most commonly used method for disposing municipal solid waste (Aderemi and Falade, 2012; Adogu *et al.,* 2015). According to the findings of this study, the frequency of removal of solid wastes in the study area by government agencies or private contractors was relatively low, with 60% of respondents having their waste disposed of once a week, 23.3% having their waste disposed of once in two days, 13.3% having their waste disposed of once in three days, and 3.3% having their waste disposed of more than once a week. Several researchers in different locations have documented weekly refuse collection, including Lagos, Nigeria (Adewole, 2009), Makurdi and surrounds, Nigeria (Aguoru and Alu, 2015), and Benin City, Nigeria (Omofonmwan and Eseigbe, 2009). Such practices lead to dissatisfaction with service delivery. No wonder it was reported that less than 60% of municipal solid wastes generated

were collected in developing countries because solid waste generation exceeded collection capacity (Isu, 2005). The need for better solid waste management in Sapele, Delta state remains paramount as well as in developing countries like Nigeria (Amukali *et al.,* 2020).

Contributing factors to poor solid waste disposal: Many variables contribute to inadequate solid waste disposal, such as the distance between a public dumpsite and a government stationary van. According to the findings of this study, 10% of respondents walked for 5-10 minutes, 30% walked for 11-15 minutes, 13.3% walked for 16-20 minutes, 26.7% walked for 21-25 minutes, and 20% did not know.

Table 4: Methods of Household Solid Waste Collection and Disposal

Variables	Green Egbedi	Okpe Road	Ugbeyiyi Quarters	Frequency (n=300)	Percentage (%)	p-value
State of public bin near you						
In a good state	10	40	50	100[a]	33.3	**p<0.05**
Not in a good state	20	10	20	50[b]	16.7	
Rotting/rusting	40	20	20	80[a]	26.7	
Don't know	30	30	10	70[a]	23.3	
How do you dispose your waste						
DS WMB	10	20	50	80[b]	26.7	**p<0.001**
Open dump	50	50	20	120[a]	40.0	
Burning	20	20	20	60[b]	20.0	
Absence of WMB	20	10	10	40[c]	13.3	
Do you know if there is a waste management centre around you						
Yes	30	30	60	120	40.0	**p<0.05**
No	70	70	40	180	60.0	
Are you satisfied with the current waste collection service?						
Yes	30	40	40	110	36.7	**p<0.01**
No	70	60	60	190	63.3	
If Yes to 13, What is the reason for your level of satisfaction?						
Reliable	40	40	10	90[b]	30.0	**p<0.001**
Unreliable	50	40	60	150[a]	50.0	
Cost/improper collection	10	10	30	50[c]	16.7	
Cooperation among tenants	0	10	0	10[d]	3.3	

No significant difference (p > 0.05), *p < 0.05 (significant difference) **p < 0.01 (highly significant difference) ***p<0.001 (very high significant difference). Note: Similar letters (superscripts) indicate values that are not significantly different from each other (P>0.05)

This study is in agreement with the study of Aliyu (2013) and Kabiru (2017) where they pointed out that the distance to disposal site is one of the factors that affect solid waste collection and disposal, and at the same time have direct or indirect effect to the president's health living near the solid waste dump site. Igbinadolor *et al.,* (2019) recorded that 37.8% of the respondents dump their waste indiscriminately because of the nearness of the unauthorized dumping sites to their residence while 12.8% claimed the absence of waste collection agency, 11.1% of the respondents revealed lack of affordable alternative as the major challenge to proper waste disposal while a higher percentage of the respondents (38.4%) gave no reason at all.

State of waste disposal system and level of satisfaction by respondents in Sapele: A third of those polled (33.3%) said Sapele's waste disposal systems were in good shape, 16.7% adjudge it not to be in a good state,

26.75 reported it to be in a rotting/rusting state while 23.3% of respondents did not express their views on this issue. Igbinadolor *et al,* (2019) reported a slightly diverse view in Akure municipality and indicated that 64% of sampled respondents adjudge the present state of waste disposal system as not good enough, 10.9% believed that they are satisfactory while 25.3% of respondent did not express their views on the issue. This survey also assessed the sampled respondents' level of satisfaction with the current status of waste managers who dispose of their waste. A high percentage of the sampled respondents (50%) judged the current level of satisfaction of waste disposal systems in Sapele to be unreliable, 30% judged it to be reliable, 16.7% reported it to be cost effective, and 3.3% stated that tenant cooperation was a problem among respondents. Figure 3 depicts the condition of the waste bin in the research location. In addition, 50%, 40% and 60% respondents at Green Egbedi, Okpre Road and Ugbeyiyi Quarters respectively

considers the level of satisfaction by waste managers to be unreliable. Ogah *et al.,* (2020) also recorded 59.9% of households heads who considered their waste disposal method in the area as inappropriate, 21.2% considered it to be appropriate, 10.9% observed the methods as highly inappropriate while 7.9% considered the method as high appropriate. However, Ogah *et al.,* (2020) opined that those respondent who considers the services to be reliable could be those with either high income level who are able to attract private contractors weekly to clear their waste or those with low level of education and environmental awareness in terms of waste management while those respondents that considered the methods as appropriate or highly appropriate could be those that dispose their waste directly into the waste collection tank provided in scattered locations by Waste Management Agencies and also because of their level of environmental awareness.
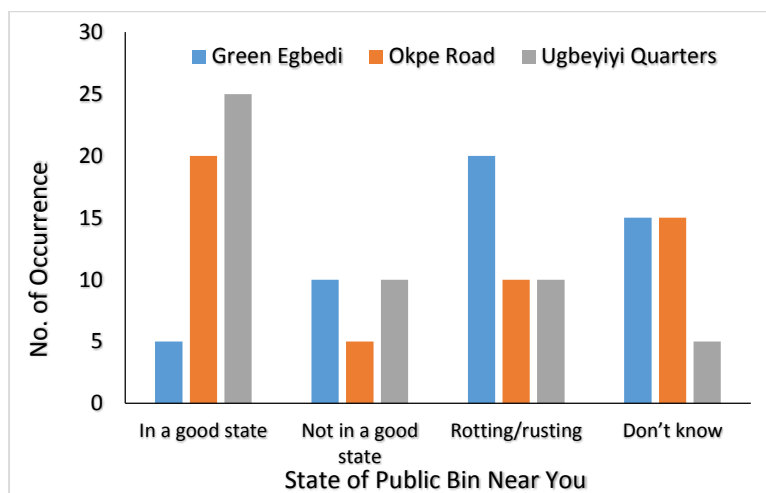

Fig 3: State of public Bin

Respondents Perception on solid waste management and sustainable development of solid waste management: Table 5 depicts the respondents' perceptions on solid waste management and the environmental impact of solid waste management development. According to the respondents' perceptions of solid waste management and sustainable development of solid waste management in Sapele, 63.3% of respondents strongly agree that urbanization and development processes have contributed to the impact on solid waste, while 3.3% of respondents were undecided in their response. This result is not surprising as Fakere *et al.,* (2012) showed that Akure has been experiencing expansion in terms of population density and explosion and this phenomenon is concomitant with multiplication of waste which therefore makes waste management a major challenge. Spontaneous development, population increase and changes in consumption pattern have directly (and indirectly) resulted in the generation of enormous amount of waste, ranging from biodegradable to synthetic waste (Ayuba *et al.,* 2013) and in the absence of effective waste management system, indiscriminate waste disposal will inevitably be on the increase. A little above half (60%) the population of the study area agreed to have a knowledge of sustainable development while 40% of respondent did not. However, 93.3% of respondents believe that everyone has a responsibility to contribute to the environment's long-term development. According to Adenaike and Omotosho (2020), in order to accomplish the United Nations Sustainable Development Goals, modern countries must transition to circular economies (CE) (Velenturf and Purnell, 2017). The development of more regenerative circular systems around the world is rapidly relegating traditional linear economies. The study examined the quality of the environment in the study region over the previous five years to determine whether or not the waste disposal systems in Sapele were mostly inadequate, as previously stated. About 43.3% of respondents said the quality of the environment in Sapele is a little better in the last five years, while 13.3% said it has improved significantly. However, 23.3% of respondents said it had remained the same, while roughly 10% of the total sampled respondents believed it had gotten a little worse or substantially worse during the last five years. The concept of labeling materials as garbage only to be disposed goes against the circularity principle. Due to the great demand for their waste products, Sapele and Nigeria as a whole have very high levels of implementation for resource recovery from agricultural wastes and e-wastes.

Table 5: Respondents Perception on solid waste management and sustainable development of solid waste management

Variables	Green Egbedi	Okpe Road	Ugbeyiyi Quarters	Frequency (n=300)	Percentage (%)	p-value
Would you personally say that solid waste is a major issue currently affecting your environment?						
SA	40	70	60	170	56.7	p>0.05
A	60	30	40	130	43.3	
U	0	0	0	0	0.0	
D	0	0	0	0	0.0	
SD	0	0	0	0	0.0	
Do you agree that urbanization and development process has an impact on solid waste in your area?						
SA	80	40	70	190[a]	63.3	**p<0.001**
A	20	50	30	100[b]	33.3	
U	0	10	0	10[c]	3.3	
D	0	0	0	0	0.0	
SD	0	0	0	0	0.0	
Do you agree that every single person has a responsibility to contribute to sustainable development in your area?						
Yes	90	90	100	280	93.3	**p<0.001**
No	10	10	0	20	6.7	
Overall, how would you rate the quality of the environment in your area compared to the environment you had five years ago						
Much better	0	30	10	40[b]	13.3	**p<0.001**
A little better	50	20	60	130[a]	43.3	
The same	20	30	20	70[b]	23.3	
Little worse	20	10	0	30[c]	10.0	
Much worse	10	10	10	30[c]	10.0	

significant difference (p > 0.05), *p < 0.05 (significant difference) **p < 0.01 (highly significant difference) ***p<0.001 (very high significant difference). Note: Similar letters (superscripts) indicate values that are not significantly different from each other (P>0.05)

Conclusion: In most parts of the world, including Nigeria, solid waste has generated a number of health and environmental problems. A review of the current state of solid waste management methods in Sapele municipality revealed flaws in waste collection and disposal. Long-term and effective waste management has been hampered by increased trash generation and inadequate waste management practices. Despite the state government's concerted efforts, such as outsourcing garbage collection to private sector operators and waste reduction, long-term waste management remains elusive.

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