PLASU Journal of Environmental Sciences, E-ISSN 2360-9222, Vol.2, No. 1, December 2025, Published by the Faculty of Environmental Sciences, Plateau State University, Bokkos. https://www.pjes.ng
DOI: 10.5281/zenodo.17780326

# CHALLENGES AND PROSPECTS OF PLASTIC WASTE MANAGEMENT IN YENAGOA METROPOLIS

**[1]Francis Tamarautare Disi, *[2]Meshach Owhotemu Ojile**

[1-2]*Department of Environmental Management, Faculty of Environmental Sciences, Niger Delta University, Bayelsa State, Nigeria.

[1]https://orcid.org/0009-0009-2897-2059

[2]https://orcid.org/0000-0001-8579-6607

*Corresponding author's email: mesh.ojile@ndu.edu.ng.

## ABSTRACT

*Plastic waste management remains a critical environmental challenge in Yenagoa Metropolis, where rapid urbanization and increasing consumption of plastic products have intensified waste accumulation. This study examined the challenges and prospects of plastic waste management in the metropolis, highlighting factors impeding effective plastic waste disposal and management, exploring potential solutions. The study employed a descriptive survey method, collecting data through administered copies of the questionnaire to 276 households across nine communities. The data were analyzed using descriptive and inferential statistics. Findings revealed that plastic waste constituted the largest portion of the waste stream, alongside organic waste. Plastic bottles and plastic bags dominate the plastic waste stream. Additionally, inadequate waste collection infrastructure and the absence of formal recycling facilities significantly hinder proper plastic waste management. Financial constraints and weak enforcement of waste management regulations further exacerbate the problem. Despite these challenges, the study identifies several opportunities for improving plastic waste management, particularly through reuse and recycling, public-private partnerships, increased community participation, and the promotion of plastic recycling initiatives to mitigate environmental impacts. Strengthening waste management policies, enhancing public awareness programs, and investing in sustainable waste disposal technologies are crucial steps toward improving plastic waste management in Yenagoa. The study recommends the establishment of a formal recycling system and government incentives for waste reduction. Addressing these issues could significantly enhance plastic waste management and contribute to a cleaner, healthier environment in Yenagoa Metropolis.*

***Keywords:*** *Plastic waste; waste management; recycling; public awareness; Yenagoa Metropolis.*

## 1. INTRODUCTION

Plastics are synthetic materials characterized by their large molecular structures, which are formed by chemically bonding smaller units known as monomers including polyethylene, polystyrene, and polyvinyl chloride (Koushal, Sharma, Sharma, & Sharma, 2014; Sidi & Yahaya, 2022; Gada, 2024; Adekanmbi et al., 2024). These materials have become indispensable in modern society due to their versatility, lightweight nature, affordability, and resistance to a wide range of chemicals (Gada, 2024). Their durability and cost-effectiveness have made them a preferred choice for a multitude of applications, ranging from packaging to construction (Adekanmbi et al., 2024).

Accordingly, Ibiyeye (2021) pointed out that plastic production has grown at a geometric rate since 1950 due to its durability, persistence, and low cost, which has grown along with the world population. Sharma, Sharma & Chatterjee (2023) noted that global plastic production has increased rapidly, with over 400 million tons annually and forecasted to reach 1,100 million tons by 2050 (United Nations Environment Programme, 2018). This has lately added to the problem of poor waste stream management globally due to its durability, environmental persistence, and non-biodegradability.

In Nigeria, plastic waste management has been unsustainable so far, with only a small fraction being recycled or recovered (Duru, Ikpeama, & Ibekwe, 2019). The World Population Review (2023) estimates Nigeria's population at approximately 226 million and ranked as the second largest importer and consumer of plastics in Africa; sixth global marine plastic polluter and ninth global plastic waste generator (Ibiyeye, 2021; National Bureau of Statistics, 2022, World Population Review, 2023). By 2030, in the absence of changes, a total of over 40 million metric tons of plastic is expected to have been imported and consumed in Nigeria (Ibiyeye, 2021) with poor data; lack of effective visible management plans and limited manpower (Duru et al., 2019).

In urban areas like Yenagoa, the capital of Bayelsa State, urbanization has significantly influenced the population dynamics and consequently brought notable benefits to its socio-economic development and human Capital development (Ohwo & Abotutu, 2015; Ekpenyong, 2020). However, this rapid increase in population and urban expansion in Yenagoa has placed immense pressure on the growing issue of plastic waste management. The increase in consumption of plastic products has intensified waste accumulation, contributing significantly to the city's environmental problems. Plastics and nylons alone constituted 19% of the waste stream in Yenagoa Metropolis (Angaye, Konmeze, Gbodo, & Apollos, 2019) and is expected to rise, with the ever-growing population, with a negative environmental turnover (Onu & Onukogu, 2019). Environmental problems of plastic waste are well documented in Okpala (2016); Okeme, Opara, & Ihezie (2019); Onwuka and Uzor (2022); leaving a noticeable disconnect between policy intentions and action; jeopardizing the achievement of SDG 3 (good health and well-being); SDG 6 (clean water and sanitation); SDG 11 (sustainable cities and communities); and SDG 12 (responsible consumption and production). These, further emphasize the pressing need to explore better and more sustainable solutions to plastic waste management, leveraging on potential opportunities for improvement in the metropolis (Burlakovs et al., 2019).

Interestingly, numerous studies conducted on waste management in the area, there is limited research on the specific challenges and opportunities in plastic waste management. There is also a lack of reliable quantitative data and factors that influence plastic waste generation, composition, and management practices in Yenagoa. These gaps highlight the importance of this study to drive effective policy and practical solutions. Hence, this study aimed at assessing the challenges and prospects of plastic waste management in Yenagoa Metropolis; by assessing plastic waste composition, examine the relationship between household size and the volume of plastic waste produced, and propose evidence-based strategies that create a more sustainable and efficient waste management system in alignment with the SDGs.

## 2. MATERIALS AND METHODS

### 2.1 Study Area

The study area is Yenagoa Metropolis in Yenagoa LGA of Bayelsa State. It lies along latitudes between 4° 48′ 00″ North and 5° 24′ 10″ East; and longitudes between 6° 12′ 00″E and 6° 39′ 30″E (Figure 1); bounded by Rivers State in the Northeast, Northwest by Delta State; Southeast by Ogbia LGA; and Southern Ijaw in the Southwest (Eludoyin, Obafemi, & Hardy, 2017). Yenagoa LGA is located within the lower delta plain believed to have been formed during the Holocene of the quaternary period by the accumulation of sedimentary deposits. The climate of Yenagoa LGA is an equatorial type of climate (Iyorakpo, 2015) with a mean monthly temperature range of 25$^0$C to 30$^0$C; and a diurnal temperature range of about 3$^0$C to 5$^0$C (Arokoyu, Emenike, & Atasi, 2016). Yenagoa LGA is drained by many rivers and creeks among which are Epie Creek, Nun River, Orashi River, and Ekole Creek (Eludoyin et al., 2017). The Yenagoa area which had a population of 50,000 persons in 1991 was estimated to have grown to 350,000 in 2019" (National Population Commission 1991, 2006; Ojile, 2019). The study communities have a projected population of over 71,000 total persons as of 2023.

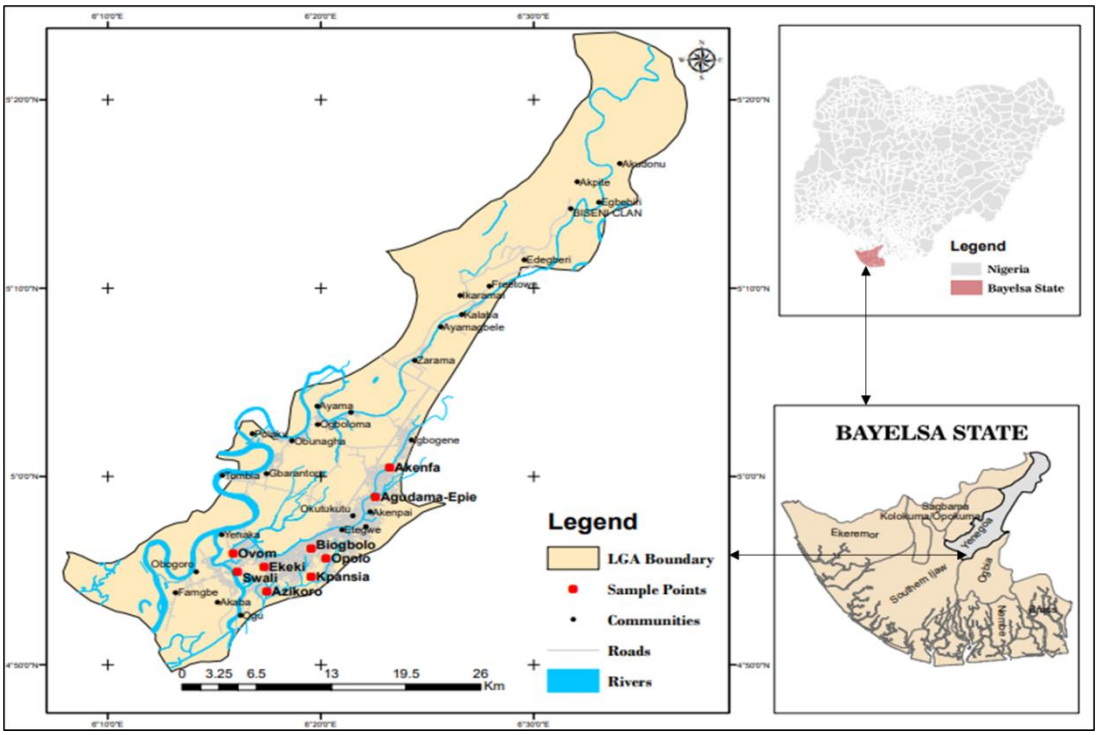

Figure 1: Map of Yenagoa Local Government Area Showing Study Area

### 2.2 Research Design and Sampling

The study employed the descriptive survey research design, using hard copies structured questionnaires administered to households in the various zones in the study area. A multi-stage sampling approach was further utilized in this study; consisting of three stages. Firstly, stratified sampling was used to divide in order to narrow the study area into four distinct zones (A, B, C, and D). In the second stage, purposive sampling was used to select nine (9) communities within

the metropolis. Finally, the third stage involved the use of random sampling to ensure an unbiased distribution of questionnaires across various households. The questionnaire was distributed to 276 household across the various zones.

### 2.3 Data Analysis

The data collected was analyzed using both descriptive (frequencies and percentages) and inferential statistical tools (Pearson's Product Moment Correlation Coefficient). The data were analyzed using Microsoft word Excel, and Statistical Package for the Social Sciences (SPSS) software (version 26.0).

## 3. RESULTS AND DISCUSSION

### *Volume of plastic waste generated in Yenagoa Metropolis*

The study found that (42.8%) of households generates between 1–5 kg of plastic waste weekly (Chart 1), accounting for 42.4% of the overall plastic waste generation, with communities such as Agudama (60.0%), Biogbolo (41.4%), and Opolo (42.9%) showing the highest contributors to this figure. This aligns with findings from other urban centers, where moderate waste volumes are linked to average household sizes and increasing reliance on packaged goods (Akindele, Adeola, & Okonkwo, 2023; Agunbiade & Oyebanji, 2020). Conversely, 23.6% of households generate less than 1 kg weekly, with notable contributions from Akenfa (37.5%), Opolo (42.9%), and Swali (40.6) (Chart 1). Additionally, 18.9% of households produce over 11 kg weekly, which is most significant in Ekeki (50.0%), followed by Akenfa (37.5%) and Ovom (24.1%) (Chart 1) similarly reported by Mongtoeun, Fujiwara, & Vin (2019). This variation revealed that households in predominantly residential areas such as Agudama, Akenfa, Ovom, Azikoro and Biogbolo generate more plastic waste per week than those in predominantly commercial areas like Opolo, Kpansia, Ekeki, & Swali. In contrast, 28.7% households in commercial areas generate less than 1 kg of plastic waste per week, compared to 19.6% in residential areas; While 17.2% in residential areas generated 6–10 kg, compared to 11.4% in commercial areas. Similarly, 19.6% of households in residential areas generated 11 kg and above, compared to 18.0% in commercial areas (Chart 1). The observed difference is basically influenced by the purchasing power of the individual's households.

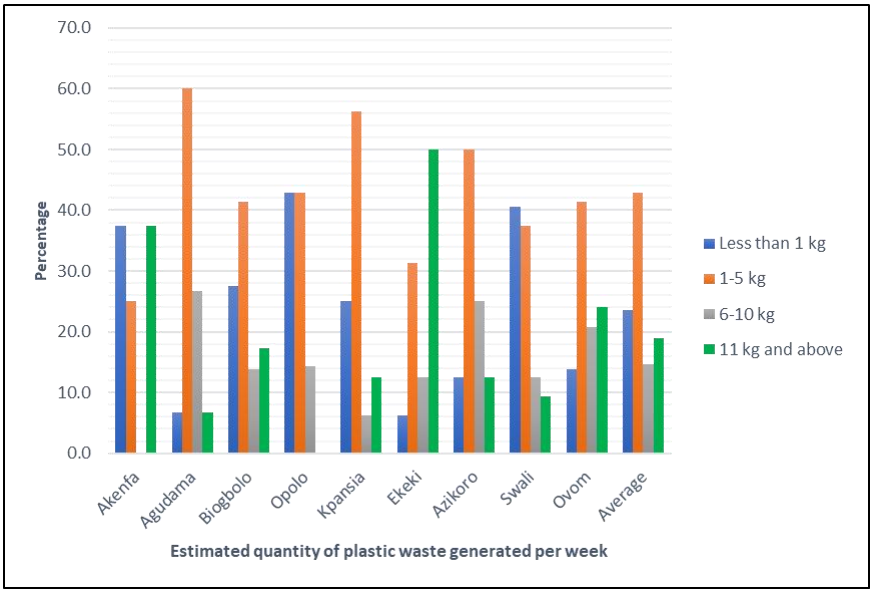


Chart. 1: Estimated quantity of plastic waste generated per week
Source: Author's fieldwork, 2024.

Chart 2 shows the frequency of purchasing plastic-packaged items were 57.5% of respondents engage in daily purchasing habits. Communities such as Kpansia (87.5%), Biogbolo (72.4%), and Ovom (72.4%), show a very high inclination to such habits. 30.8% engage weekly purchases, with prominent figures from Agudama (33.3%), Ekeki (64.5%), and Azikoro (31.3%) (Chart 2). Monthly purchases are rare (5.0%), seen only in Agudama (13.3%) and Swali (25.0%). Similarly, Kibria, Masuk, Safayet, Nguyen & Mourshed (2023) and Lange, Senekane, & Naicker (2022) detail the challenges involving waste management in a larger household.

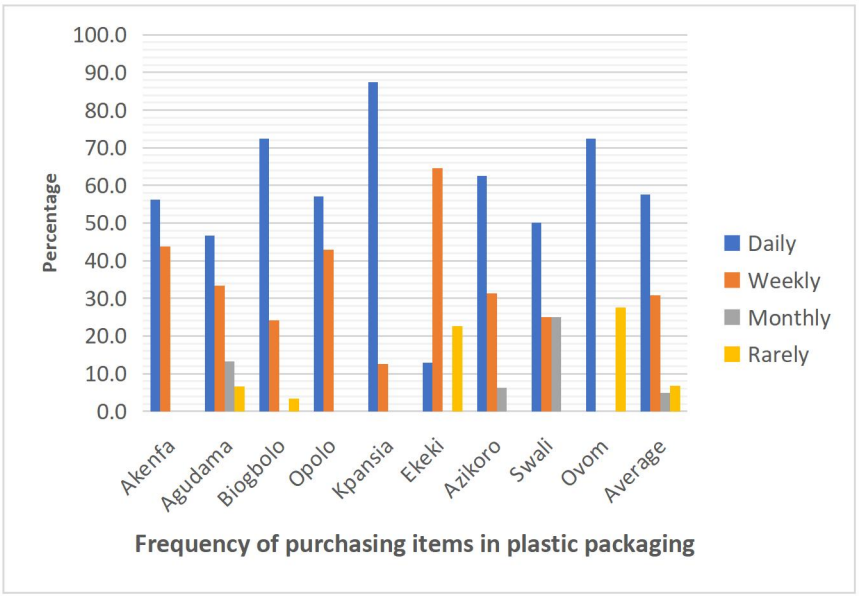


Chart. 2: Frequency of purchasing items in plastic packaging

### *Composition of plastic waste in Yenagoa Metropolis*

Chart 3 shows that plastic waste accounts for 35.8% of total waste in the study area, which is similar to the proportion of organic waste (33.5%), complementary trends of developing urban centers. This report is considerably higher than the values reported by Angaye et al. (2019) of 19%, and Simon and Opololaoluwa (2022) of 20.38% for Yenagoa Metropolis, explaining the rapid increase in the consumption of plastics products over the years.

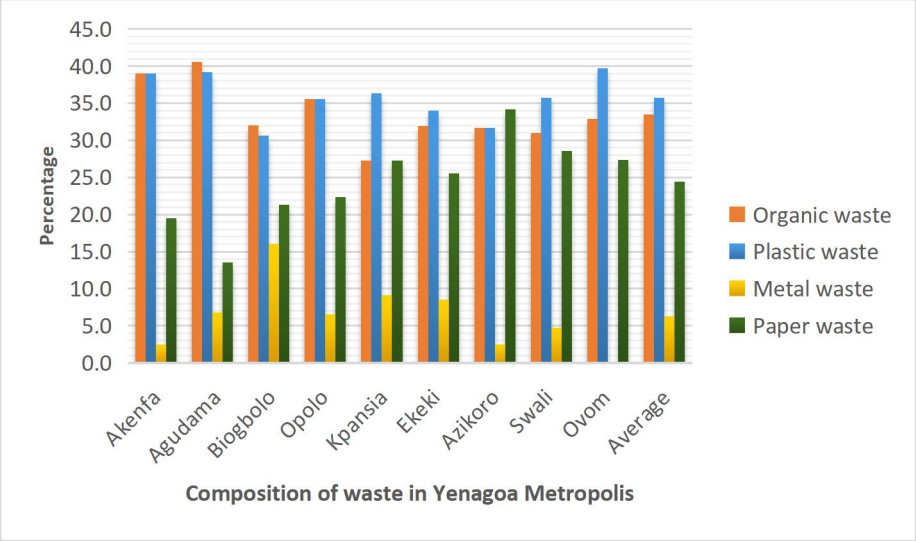


Chart. 3: Composition of waste in Yenagoa Metropolis

### *Plastic waste stream*

Among the most common types of plastic waste in Yenagoa, plastic bottles (21.0%) and plastic bags (22.2%) constituted larger proportion of the plastic waste stream (Chart 4); a common features among urban centers, where plastic bottles and bags dominate waste streams due to their widespread use in packaging beverages and carrying items (Lawal, Shittu, & Abdulraheem, 2021; Winton, Marazzi, & Loiselle, 2022; Alteneiji et al., 2024). Aside from the plastic bottles and bags, sachet water packaging occupied the third major contributor to plastic waste, accounting for 20.2% (Chart 4); reflecting the community's reliance on sachet water as an affordable and accessible drinking water source, a trend common across Nigerian cities.

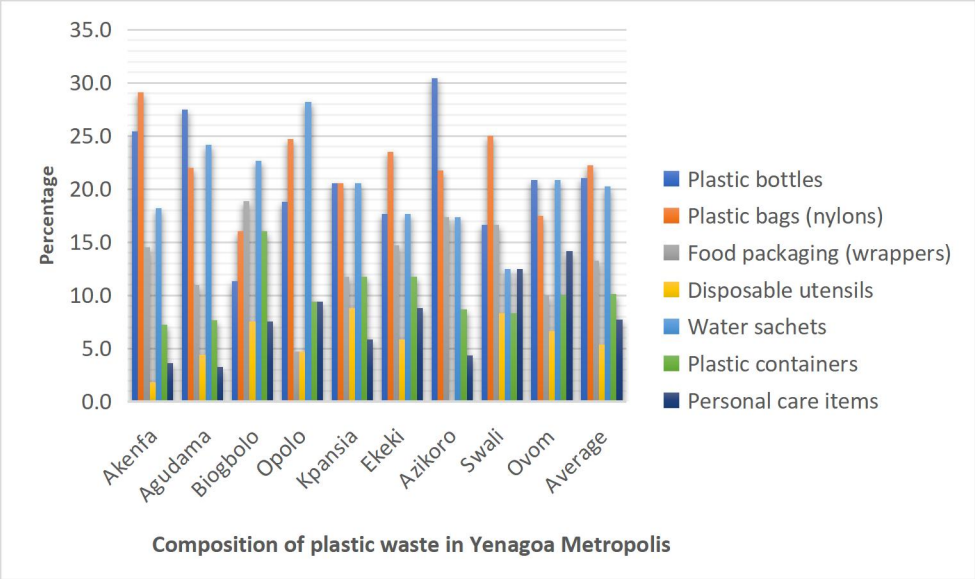


Chart. 4: Composition of plastic waste in Yenagoa Metropolis
Source: Author's fieldwork, 2024.

Moreso, Chart 4 also reveals that food packaging waste, which includes wrappers, containers, and disposable food trays, constituted 13.3% of the total plastic waste; reflecting on the changing consumption patterns among urban dwellers (Babayemi, Nnorom, Osibanjo, & Weber, 2019). Disposable utensils and personal care plastics contribute less to the overall waste stream (5.4% and 7.7%, respectively) (Chart 4), yet remain an environmental concern due to their persistence in the environment and limited recyclability. Similarly, Hồng, Ngoc, & Giao, 2022; Fred-Ahmadu et al. (2022) have echoed on the challenges of managing such waste within a circular economy framework.

***Relationship between household size and the volume of plastic waste produced***

The relationship between household Size and volume of plastic waste shows that 33.3% respondents at Kpansia (43.8%), Ovom (34.5%), and Biogbolo (34.5%) strongly agree that larger household sizes contribute to increased plastic waste generation (Chart 5) while Communities such as Agudama (50.0%), Ekeki (50.0%), and Ovom (41.4%) report higher levels of agreement (Chart 5). This is similar to the report of Akindele et al., (2023); Kibria et.al., (2023) and Karami, Abbaspour, & Hosseinzadeh (2020) that larger households typically produce more waste due to higher consumption rates.

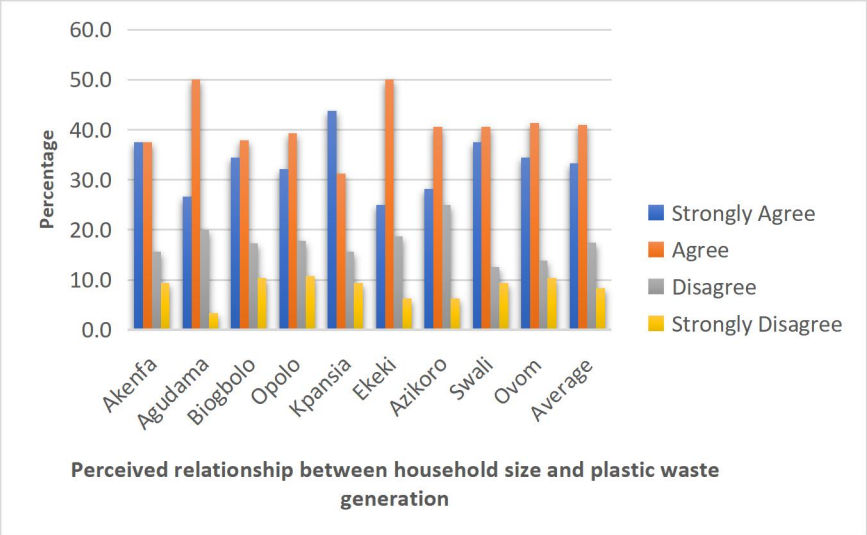


Chart. 5: Relationship between household size and plastic waste generation

The statistical analysis further supports this observation. As shown in Table 1, the Spearman's correlation coefficient ($r = 0.928$) indicates a very strong positive relationship between household size and the quantity of plastic waste generated. The correlation is statistically significant ($p < 0.001$) at the 0.01 level (1-tailed), confirming that as household size increases, the volume of plastic waste generated also rises substantially.

**Table 1: Correlation Between Household Size and Quantity of Waste Generated**

**Correlations**

| | | | Household size | Quantity of plastic waste generated |
|---|---|---|---|---|
| **Spearman's rho** | Respondent's household size | Correlation Coefficient | 1.000 | .928** |
| | | Sig. (1-tailed) | . | .000 |
| | | N | 276 | 276 |
| | Quantity of plastic waste generated per week | Correlation Coefficient | .928** | 1.000 |
| | | Sig. (1-tailed) | .000 | . |
| | | N | 276 | 276 |

****. Correlation is significant at the 0.01 level (1-tailed).**

**Level of awareness of households regarding opportunities for effective plastic waste management**

Awareness plays a significant role in plastic waste generation/management as pointed out by Herdiansyah and Nuraeni (2024). This study shows that 49.1% respondents are aware of the importance of proper plastic waste management, with communities like Azikoro (81.3%) and Swali (62.1%), while 26.8% and 24.1% lack proper plastic waste management awareness (Chart 6).


Chart 6: Awareness of proper plastic waste management practices

Regarding the channels or sources of awareness, findings from Table 2 show that 40% of respondents identified the media (television, radio, and social media) as their primary source of information on plastic waste management. This trend was most evident in Azikoro (64.3%) and Ekeki (61.4%) (Table 2), where the majority relied on media platforms for environmental awareness. Emphasizing the crucial role media outlets play in disseminating information and shaping public understanding of waste-related issues across the study communities.

**Table 2: Sources of Awareness of Proper Plastic Waste Management**

| *S/N* | | *Percentage* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ***Ak*** | ***Ag*** | ***Bio*** | ***Op*** | ***Kpa*** | ***Eke*** | ***Azi*** | ***Swa*** | ***Ov*** | ***Average*** |
| *1.* | Media (TV, radio, social media) | 29.4 | 34.6 | 18.3 | 37.7 | 40.0 | 61.4 | 64.3 | 51.9 | 22.8 | 40.0 |
| 2. | Community programs | 15.3 | 17.9 | 8.5 | - | - | 11.4 | - | 7.4 | 22.8 | 9.3 |
| 3. | School or educational campaigns | 25.9 | 14.1 | 28.2 | 27.5 | 20.0 | 27.3 | 21.4 | 29.6 | 31.6 | 25.1 |
| 4. | Personal research | 18.8 | 21.8 | 18.3 | 17.4 | 40.0 | 0.0 | 14.3 | 11.1 | 22.8 | 18.3 |
| 5. | Friends and family | 10.6 | 11.5 | 26.8 | 17.4 | - | - | - | - | - | 7.4 |
| | **Total** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |

*Note: Akenfa (Ak), Agudama (Ag), Biogbolo (Bio), Opolo (Op), Kpansia (Kpa), Ekeki (Eke), Azikoro (Azi), Swali (Swa) and Ovom (Ov).*

### *Challenges affecting participation in effective plastic waste management*

### *Disposal Method*

35% of respondents across all communities dispose their plastic waste through the use of public waste bins, with Akenfa (54.5%) and lowest in Kpansia (24.7%) (Table 3). Other commonly used methods identified include; burning (27.9) with Akenfa (36.4%) and Opolo (36.5%), dumping in public (20.4%) with Opolo (26.9%) and Ekeki (30.8%), while burying (6.5%) and government waste collectors (10.1%) (Table 3). Studies by Nzeadibe, Oladele, & Anyanwu (2018) and Ikelle, Olivia, & Ogah (2023) had previously identified open burning as a major contributor to environmental pollution in urban Nigeria. The frequency at which waste is disposed, 62.7% of households engage in weekly disposal, accounting for 42.4% of the overall plastic waste generated in the Metropolis (Table 3). Communities such as Swali (87.5%), Ekeki (75.0%), and Kpansia (50.0%) recorded the highest figures in this regard while daily disposal (29.7%), is prominent in Biogbolo (35.7%), Ovom (44.8%), and Akenfa (25.0%) and monthly disposal (4.4%) is uncommon, observed mainly in Akenfa (6.3%) and Biogbolo (10.7%) respectively (Table 3). However, the overall records revealed that 54.8% of households do not dispose of their plastic waste properly, with 62.7% engaging in weekly disposal practice (Table 3).

**Table 3: Method/Frequency of plastic waste disposal**

| *S/N* | | *Percentage* | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ***Ak*** | ***Ag*** | ***Bio*** | ***Op*** | ***Kpa*** | ***Eke*** | ***Azi*** | ***Swa*** | ***Ov*** | ***Average*** |
| | ***Method of plastic waste disposal*** | | | | | | | | | | |
| ***1*** | Use of public waste bins | 54.5 | 36.6 | 39.2 | 36.5 | 24.7 | 38.5 | 25.0 | 30.0 | 30.4 | 35.0 |
| ***2*** | Burning | 36.4 | 34.1 | 29.4 | 36.5 | 31.5 | 30.8 | 16.7 | 30.0 | 5.8 | 27.9 |
| ***3*** | Burying | - | 7.3 | - | - | 11.0 | - | 8.3 | 20.0 | 11.6 | 6.5 |
| ***4*** | Dumping in public spaces | 9.1 | 12.2 | 23.5 | 26.9 | 21.9 | 30.8 | 25.0 | 20.0 | 14.5 | 20.4 |
| ***5*** | Collection by waste collectors | - | 9.8 | 7.8 | - | 11.0 | - | 25.0 | - | 37.7 | 10.1 |
| | **Total** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |
| | **Frequency of plastic waste disposal in respondent household** | | | | | | | | | | |
| ***1*** | Daily | 25.0 | 16.7 | 35.7 | 42.9 | 37.5 | 12.5 | 39.3 | 12.5 | 44.8 | 29.7 |
| ***2*** | Weekly | 68.8 | 66.7 | 53.6 | 57.1 | 50.0 | 75.0 | 60.7 | 87.5 | 44.8 | 62.7 |
| ***3*** | Monthly | 6.3 | 10.0 | 10.7 | - | 12.5 | 0.0 | - | - | - | 4.4 |
| ***4*** | Rarely | - | 6.7 | - | - | - | 12.5 | - | - | 10.3 | 3.3 |
| | **Total** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |

### *Obstacles to plastic waste management*

The most commonly challenge recorded is the lack of public waste bins (31.6%), particularly in Azikoro (54%) and Akenfa (34.9%) (Table 4); 16.9% respondents reported the issue of irregular waste collection services, with Agudama (23.6%) and Opolo (23.6%) showing the highest proportion with regards to this (Table 4). The high cost of waste collection (6.9%) and lack of awareness about proper disposal methods (19%) are challenges that significantly affect Kpansia and Biogbolo communities. The absence of recycling facilities (25.5%) also emerged as a critical issue, with Kpansia (32.6%) and Biogbolo (31%) expressing the most concern (Table 4). Similar problems were reported by Joseph, Kumar, Majgi, Kumar, & Prahalad (2016); Van et al., (2021).

**Table 4:** ***Obstacles to plastic waste management***

| *S/N* | | Percentage | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Ak | Ag | Bio | Op | Kpa | Eke | Azi | Swa | Ov | Average |
| ***1.*** | Lack of public waste bins | 34.9 | 34.7 | 29.8 | 26.4 | 28.3 | 23.6 | 54.0 | 31.7 | 21.0 | 31.6 |
| ***2.*** | Irregular waste collection | 18.6 | 23.6 | 4.8 | 23.6 | 17.4 | 23.6 | 10.0 | 15.8 | 14.8 | 16.9 |
| ***3.*** | High cost of waste collection | 0.0 | 12.5 | 4.8 | 1.8 | 2.2 | 11.2 | 4.0 | 5.0 | 21.0 | 6.9 |
| ***4.*** | Lack of awareness of proper disposal methods | 27.9 | 15.3 | 29.8 | 21.8 | 19.6 | 11.2 | 10.0 | 20.8 | 14.8 | 19.0 |
| ***5.*** | Lack of plastic waste recycling facilities | 18.6 | 13.9 | 31.0 | 26.4 | 32.6 | 30.3 | 22.0 | 26.7 | 28.4 | 25.5 |
| | **Total** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |

***Plastic Waste Management Practices (reuse and recycling initiatives)***

Amid the existing challenges, the study revealed strong potential for improving plastic waste management through reuse and recycling initiatives in the study area, but both at an informal stage. 26.6% respondents manage plastic waste (plastic bottles (34.8), plastic bags (38.4) and food packaging materials (26.8) through reuse, particularly in Kpansia (29.1%) and Azikoro (28.7%). This informal reuse aligns with the findings of Alabi, Ologbunjaye, Awosolu, & Alalade (2019), who noted that cost-saving motives drive plastic reuse in low and middle-income regions. The study also found that there are untapped opportunities for formalizing and promoting recycling practices; as 14% of households practice an informal recycling system through financial exchange, while 57% respondents indicated willingness to participate in recycling activities, whereas 40.9% expressed readiness to pay for improved plastic waste management services. This presents an opportunity for policymakers and private investors to develop structured recycling programs, such as community collection points and buy-back schemes, which could incentivize household participation. Studies like Adebayo & Balogun, 2021; Kibria et al., 2023 recommended for strong public support for recycling initiatives.

## 4. CONCLUSION

This study assessed the challenges and prospects of plastic waste management in Yenagoa Metropolis, revealing significant deficiencies in waste collection, disposal, and recycling. The findings indicate that while plastic waste forms a large portion of municipal solid waste, its management remains inadequate due to poor infrastructure, weak policy enforcement, and limited public awareness. Improper disposal methods, such as open dumping and burning, continue to pose environmental and health risks. Although challenges exist, opportunities for improvement are evident particularly through reuse and recycling. Establishing recycling technologies, implementing waste-to-energy solutions, fostering public-private partnerships, and increasing community participation can enhance waste management practices. Strengthening regulatory frameworks and promoting sustainable waste management strategies will be crucial in addressing the growing plastic waste crisis. Addressing these issues effectively will not only mitigate environmental degradation but also create economic opportunities and improve overall public health in the metropolis.

## 5. RECOMMENDATIONS

Based on the findings, the study recommends the establishment of a formal recycling system alongside the improvement of existing waste collection infrastructure to ensure efficient plastic waste management. Government policies should be formulated and effectively implemented to regulate the generation, use, and disposal of plastic waste across communities. The introduction of incentives, such as tax reliefs or subsidies, can further encourage industries and individuals to adopt waste reduction practices. In addition, the creation of waste buy-back centres, where individuals can exchange plastic waste for cash or other benefits, will stimulate community participation in recycling and significantly reduce indiscriminate disposal.

## REFERENCE

Adebayo, A. O., & Balogun, I. S. (2021). Household plastic waste recycling in Nigeria: A review of current challenges and future opportunities. *Environmental Challenges, 5*, 100246.

Adekanmbi, A. O., Ani, E. C., Abatan, A., Izuka, U., Ninduwezuor-Ehiobu, N., & Obaigbena, A. (2024). Assessing the environmental and health impacts of plastic production and recycling. *World Journal of Biology Pharmacy and Health Sciences, 17*(2), 232-241.

Agunbiade, O., & Oyebanji, T. (2020). Assessment of plastic waste generation and management in Ilorin, Nigeria: A DPSIR approach. *Waste Management Journal, 45*(3), 123–134.

Akindele, E. O., Adeola, R., & Okonkwo, J. (2023). Household plastic waste generation and composition in selected areas of Kaduna Metropolis, Nigeria. *International Journal of Environmental Studies, 80*(1), 1–15.

Alabi, O. A., Ologbunjaye, K. I., Awosolu, O., & Alalade, O. E. (2019). Public and environmental health effects of plastic waste disposal: A review. *Journal of Toxicology and Risk Assessment, 5*(2), 1–13.

Alteneiji, S. M., Mathew, B. T., Mohammed, H. A., Abu-Elsaoud, A. M., El-Tarabily, K. A., & Al Raish, S. M. (2024). Knowledge, attitudes, and practices towards single-use plastic bags in the United Arab Emirates. *Sustainability, 16*(17), 7396.

Angaye, T. C. N., Konmeze, O., Gbodo, E., & Apollos, U. (2019). Characterization of commercial solid waste stream in Bayelsa State, Nigeria. *Journal of Experimental and Clinical Toxicology, 1*(2), 12–16.

Arokoyu, S. B., Emenike, G. C., & Atasi, L. T. (2016). Assessment of road junctions' noise levels in Yenagoa metropolis, Nigeria using geographic information systems. *Nature and Science, 14*(3), 82-99.

Babayemi, J. O., Nnorom, I. C., Osibanjo, O., & Weber, R. (2019). Ensuring sustainability in plastics use in Africa: Consumption, waste generation, and projections. *Environmental Sciences Europe, 31*(1), 60-79.

Burlakovs, J., Kriipsalu, M., Porshnov, D., Jani, Y., Ozols, V., Pehme, K. M., Rudovica, V., Grinfelde, I., Pilecka, J., Vincevica-Gaile, Z., & Turkadze, T. (2019). Gateway of landfilled plastic waste towards circular economy in Europe. *Separations, 6*(2), 25-34.

Duru, R. U., Ikpeama, E. E., & Ibekwe, J. C. (2019). Challenges and prospects of plastic waste management in Nigeria. *Waste Disposal & Sustainable Energy, 1*(2), 117–126.

Ekpenyong, A. S. (2020). Investigating the effects of urbanization on environmental degradation in Yenagoa Metropolis, Bayelsa State, South-South Nigeria. *Journal of Business and Social Science Review, 1*(3), 49–57.

Eludoyin, O. S., Obafemi, A. A., & Hardy, T. (2017). Effects of urbanization changes on land use in Yenagoa Metropolis, Bayelsa State, Nigeria (1986–2013). *International Journal of Development and Sustainability, 6*(8), 728–745.

Fred-Ahmadu, O. H., Bhagwat, G., Oluyoye, I., Benson, N. U., Ayejuyo, O. O., & Palanisami, T. (2022). Plastic pollution in the environment in Nigeria: A rapid systematic review of the sources, distribution, research gaps, and policy needs. *Science of the Total Environment, 821*, 153483.

Gada, S. N. (2024). Plastic solid waste management assessment among selected schools in Gwadabawa Local Government, Sokoto, Nigeria. *Mikailalsys Journal of Advanced Engineering International, 1*(1), 74–91.

Herdiansyah, H., & Nuraeni, N. (2024). Environmental awareness and plastic use behavior during the COVID-19 pandemic. *Global Journal of Environmental Science and Management, 10*(2), 419–434.

Hồng, T., Ngoc, L., & Giao, N. (2022). Plastic waste generation and management in Thoi Lai District, Can Tho City, Vietnam. *Journal of Applied Sciences and Environmental Management, 26*(9), 1575–1582.

Ibiyeye, A. A. (2021). *An assessment of the legal framework and regulatory policies on plastic waste management in Nigeria* (Master's thesis, University of Ilorin, Nigeria).

Ikelle, I. I., Olivia, E. N., & Ogah, O. A. (2023). Innovations for sustainable plastic waste management in Nigeria. *Environmental Contaminants Reviews, 6*(2), 66–74.

Iyorakpo, J. (2015). Impact of rapid urbanization on environmental quality in Yenagoa Metropolis, Bayelsa State, Nigeria. *European Scientific Journal, 11*(23), 255–268.

Joseph, N., Kumar, A., Majgi, S. M., Kumar, G. S., & Prahalad, R. B. (2016). Usage of plastic bags and health hazards: A study to assess awareness level and perception about legislation among a small population of Mangalore City. *Journal of Clinical and Diagnostic Research, 10*(1), 1–4.

Karami, P., Abbaspour, A., & Hosseinzadeh, S. (2020). Composition and management of plastic waste in urban areas: A case study from Middle East cities. *Waste Management Research, 38*(3), 125–132.

Kibria, M. G., Masuk, N. I., Safayet, R., Nguyen, H. Q., & Mourshed, M. (2023). Plastic waste: Challenges and opportunities to mitigate pollution and effective management. *International Journal of Environmental Research, 17*(1), 20. doi:10.1007/s41742-022-00413-9.

Koushal, V., Sharma, M., Sharma, R., & Sharma, V. (2014). Plastic waste and effects. *International Journal of Waste Resources, 4*(1), 1–6.

Lange, S. L., Senekane, M. F., & Naicker, N. (2022). Understanding the Socio-Demographic Profile of Waste Re-Users in a Suburban Setting in South Africa. *Resources*, *11*(5), 45-53.

Lawal, M. A., Shittu, I. A., & Abdulraheem, O. H. (2021). Plastic waste generation and its challenges in urban Nigeria: A focus on single-use plastics. *Journal of Environmental Sustainability, 14*(4), 78–89.

Mongtoeun, Y., Fujiwara, T., & Vin, S. (2019). Household solid waste generation and socio-economic factors in the capital city of Cambodia. *International Journal of Environmental Science and Natural Resources*, 20(1), 556029.

National Bureau of Statistics. (2024). *Demographic Statistical Bulletin 2022.* Retrieved from https://nigerianstat.gov.ng/elibrary/read/1241422

National Population Commission (NPC). (2006). *Population and housing census of the Federal Republic of Nigeria.*

Nzeadibe, T. C., Oladele, O., & Anyanwu, C. N. (2018). Open burning of plastic waste in Nigerian urban areas: Health and environmental implications. *Environmental Pollution, 240*, 879–887.

Ohwo, O., & Abotutu, A. (2015). Environmental impact of urbanization in Nigeria. *British Journal of Applied Science & Technology, 9*(3), 212–221.

Ojile, M. O. (2019). Population growth and residential housing land demand in Yenagoa, Bayelsa State, Nigeria: The imperative for sustainable urban development. In O. D. Azuwike, C. E. Ezedike, & D. U. Omenukor (Eds.), *Two worlds straddled: Festschrift for a Geographer, Professor Uzo M. Igbozurike* (pp. 155–170). Owerri: Applause Nig. Ltd.

Okeme, I. A., Opara, C. C., & Ihezie, C. C. (2019). Challenges and prospects of plastic waste management in Lagos, Nigeria. *Journal of Environmental Studies, 45*(3), 221–235.

Okpala, H. O. (2016). An assessment of waste management activities in Amassoma, Bayelsa State, Nigeria. *Journal of Environmental Management, 10*(2), 45–54.

Onu, M., & Onukogu, S. (2019). Urbanization and waste management in Yenagoa, Bayelsa State, Nigeria. *International Journal of Environmental Sciences, 6*(2), 45–56.

Onwuka, J. C., & Uzor, O. (2022). Plastic waste pollution and management strategies in Nigeria: A review. *Nigerian Journal of Environmental Sciences, 9*(2), 145–158.

Sharma, S., Sharma, V., & Chatterjee, S. (2023). Contribution of plastic and microplastic to global pollution and climate change: A review. *Science of the Total Environment, 857*, 159328.

Sidi, A. S., & Yahaya, U. F. (2022). Chemical additives of concern in electronic plastics: Theoretical view. *ISSRA Journal of Applied Medical Sciences, 1*(3), 12–19.

Simon, C. E., & Opololaoluwa, I. (2022). Characterization of municipal solid waste in Yenagoa Metropolis and its associated management problems, Nigeria. *International Journal for Research in Applied Science and Engineering Technology, 10*(3), 1460–1466.

United Nations Environment Programme. (2018). *Single-use plastics: A roadmap for sustainability.* Retrieved from https://wedocs.unep.org/handle/20.500.11822/25496

Van, L., Hamid, N. A., Ahmad, M. F., Ahmad, A. N. A., Ruslan, R., & Tamyez, P. F. M. (2021). Factors of single-use plastic reduction behavioral intention. *Emerging Science Journal, 5*(3), 269–278.

Winton, D., Marazzi, L., & Loiselle, S. (2022). Drivers of public plastic (mis)use: New insights from changes in single-use plastic usage during the COVID-19 pandemic. *Science of the Total Environment, 849*, 157672.

World Population Review. (2023). *Nigeria population 2023.* Retrieved from https://worldpopulationreview.com/countries/nigeria-population