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Research article

ASSESSMENT OF WASTE TYPES AND GENERATION RATES IN SELECTED MARKETS OF ABIA SOUTH, NIGERIA

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ABSTRACT

This study assessed the waste types and generation rates in ten major locational markets in Aba Metropolis, Abia State, Nigeria, to provide information for sustainable waste management. The study covered Ariaria Market, Ahia Ohuru Market, Cemetery Market, Nkwo Ngwa Market, Allen Market, Salad Market, Good Morning Market, Ahia Nkwo Market, Afo Ule Market, and Ahia Umungasi Market. A cross-sectional survey and field-based waste assessment design were adopted. The study population comprised 18,440 registered and informal traders, from which 400 respondents were selected using Yamane's formula and proportionate stratified sampling. Data were collected through structured questionnaire, direct field observation, and waste characterization and weighing procedures. The findings revealed that mixed waste constituted 44.0 percent of the total waste generated, followed by organic and food waste (26.0 percent), plastic waste (18.0 percent), animal waste (8.0 percent), and metal and glass waste (4.0 percent). The ten markets generated a combined total of 23,950 kg of solid waste per day, representing an average of 2,395 kg per market per day. Ariaria Market recorded the highest daily waste generation of 5,420 kg/day, while Afo Ule Market recorded the lowest at 1,280 kg/day. The study concluded that sustainable waste management in the selected markets requires improved waste segregation, regular waste collection, effective recycling, and stronger enforcement of environmental sanitation regulations.

KEYWORDS

waste types, waste generation rate, market waste, solid waste management, waste composition, Abia South, environmental sanitation.

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Introduction

Solid waste generation and management have become major environmental and public health concerns due to rapid urbanization, population growth, industrialization, and changing consumption patterns. Markets are among the largest sources of municipal solid waste, producing substantial quantities of food residues, plastics, paper, textiles, metals, and other commercial wastes through daily trading activities. The increasing volume and diversity of market waste have placed significant pressure on waste management systems, particularly in developing countries (Markina et al., 2024). Globally, emphasis has shifted from waste collection alone to the assessment of waste composition and generation rates to support sustainable waste management, recycling, resource recovery, and circular economy initiatives. Accurate waste characterization provides essential information for planning efficient collection systems, reducing environmental pollution, minimizing landfill dependence, and promoting recycling, composting, and energy recovery (Tripathi et al., 2022; Chandrappa & Das, 2024).

Across Africa, the challenge of municipal solid waste management has intensified due to rapid urban expansion, inadequate waste collection infrastructure, weak policy implementation, limited financial resources, and increasing commercial activities within urban markets. Many African cities continue to experience indiscriminate waste disposal, open dumping, blocked drainage systems, and environmental degradation because waste generation often exceeds the capacity of existing management systems. Markets constitute major contributors to urban solid waste generation, with organic waste

accounting for a substantial proportion alongside plastics, cartons, metals, and glass materials. Recent studies across Sub Saharan Africa reveal that poor knowledge of waste generation rates and composition limits effective planning for waste collection, treatment, recycling, and disposal (Adedara et al., 2023).

In countries such as Ethiopia, detailed assessments of market waste generation have provided valuable information for designing location specific waste management strategies and improving resource recovery systems (Kassawe & Getahun, 2025). Similar findings have also been reported in South Africa, where increasing levels of solid waste generation have been linked to rapid urbanization and changing consumption patterns (Omotayo, 2026). Comparable concerns are evident in Nigeria, where rapid urbanization, increasing population density, expanding commercial activities, and changing consumption behaviour have significantly increased municipal solid waste generation. Nigerian markets generate substantial quantities of biodegradable waste, plastics, nylon, paper, bottles, and other recyclable materials, yet many urban centres still rely on inefficient collection systems and indiscriminate disposal practices. Current research has emphasized that understanding waste generation rates and composition is essential for improving waste collection efficiency (Adeniyi & Afon, 2022). It also supports recycling industries and enhances energy recovery from organic waste (Ajaero et al., 2023), while creating opportunities for material recovery and sustainable environmental management (Okafor et al., 2022).

In Abia State, particularly in the Abia South, Aba serves as a major commercial and industrial hub where intensive trading activities generate large volumes of municipal solid waste. Markets produce diverse waste materials, including food residues, plastics, paper, textiles, leather scraps, metals, bottles, packaging materials, and electronic waste (Felix et al., 2022). Despite their significant contribution to the state's economy, ineffective waste management practices, including poor waste segregation, irregular collection, and indiscriminate disposal, continue to degrade environmental quality and pose risks to public health and occupational safety. These challenges have increased the need for efficient and sustainable waste management systems capable of supporting urban development and improving environmental sanitation (Markina et al., 2024).

Recent studies in Aba and Umuahia have reported increasing volumes of commercial solid waste and emphasized the importance of waste characterization and quantification for effective waste management planning (Chioma et al., 2024). Research has also documented the composition of solid waste generated by commercial establishments in the state, highlighting the diversity of waste streams requiring appropriate management (Okpaleke & Ngoka, 2024). Similarly, investigations on waste disposal systems in Abia-Ohuru Market have stressed the need for sustainable strategies to address the growing commercial waste burden in Aba (Ayo-Odifiri et al., 2026). However, empirical information on the types and generation rates of waste across the major markets in Abia South remains limited. This knowledge gap constrains effective planning for waste collection, recycling, resource recovery, infrastructure development, and environmental policy implementation. Assessing waste types and generation rates in selected markets is therefore essential for generating reliable baseline data to support sustainable waste management and circular economy initiatives in the region (Ayo-Odifiri et al., 2026; Oguibe, et. al, 2026).

Markets in Abia South generate large quantities of solid waste from daily commercial activities, including food residues, plastics, paper, cartons, textiles, metals, glass, and other packaging materials. However, existing waste management practices are characterized by poor waste segregation, inadequate collection facilities, irregular evacuation, and indiscriminate disposal, resulting in environmental pollution, blocked drainage systems, and increased public health risks (Oko et al., 2023). Although these challenges are evident across major markets, effective management has been constrained by inadequate planning and weak implementation of sustainable waste management strategies.

A major limitation is the lack of reliable empirical data on the types and quantities of waste generated across the major markets in Abia South. While previous studies in Abia State have examined waste management practices and waste generation from hotels, abattoirs, and other commercial establishments (Chioma et al., 2024; Okafor et al., 2024; Okpaleke & Ngoka, 2024), little attention has been given to comprehensive waste characterization and generation rates in the region's major markets. This information gap limits the ability of government agencies and market authorities to accurately estimate waste volumes, design efficient collection schedules, provide appropriate waste storage facilities, promote recycling and resource recovery, and develop evidence-based waste management policies (Oko et al., 2024; Rotowa & Olaleru, 2025; Udoa & Jacob, 2024). Consequently, this study addresses this gap by assessing the waste types and generation rates in selected markets of Abia South, Nigeria, to provide baseline information for sustainable waste management planning.

The aim of this study was to assess the waste types and generation rates in selected markets of Abia South, Nigeria. Specifically, the study sought to:

1. identify the major types of solid waste generated in the selected markets of Abia South; and
2. determine the daily generation rates of solid waste in the selected markets of Abia South.

Methodology

The study adopted a cross-sectional survey and field-based waste assessment design to assess the types and generation rates of solid waste in ten selected markets within Aba Metropolis, Abia State, namely Ariaria, Ahia Ohuru, Cemetery, Nkwo Ngwa, Allen, Salad, Good Morning, Ahia Nkwo, Afo Ule, and Ahia Umungasi Markets. The study was conducted between January and March 2025 during the dry season. The study population comprised 18,440 registered and informal traders. Preliminary field reconnaissance identified 523 shops and 486 table tops located close to gutters, 206 shops and 134 table tops situated directly above gutters, and 382 shops located adjacent to waste dump sites, with trading points generally between 0.3 and 2.5 metres from gutters or waste disposal sites. These observations guided the selection of waste assessment locations. Using Yamane's (1967) formula at a 5 percent level of precision, a sample size of 400 respondents was obtained and proportionately allocated across the ten markets. Out of the 400-questionnaire administered, 392 were successfully retrieved, representing a response rate of 98.0 percent.

Proportionate stratified random sampling was used to select respondents from each market, with each market constituting a stratum. For the field assessment, purposive sampling was employed to identify twenty-seven major waste collection points across the selected markets based on waste generation intensity. Primary data were collected using structured questionnaires, observation checklists, and waste characterization and weighing procedures. Waste assessment was conducted for seven consecutive days, covering both weekdays and weekends. Waste generated within each collection point over a 24-hour period was sorted into biodegradable waste, plastics, paper, cartons, glass, metals, textiles, nylon, and other commercial wastes following the Federal Ministry of Environment's classification guidelines. Each waste category was weighed separately using a calibrated portable digital weighing scale with a capacity of 100 kg and an accuracy of ± 0.01 kg. To ensure measurement reliability, each sample was weighed twice and the average value recorded. Daily waste generation was calculated by dividing the total weight of waste collected during the assessment period by the number of assessment days, while the combined daily generation for the study area was obtained by summing the average daily values from the ten markets.

The questionnaire comprised two sections. Section A obtained respondents' demographic information, while Section B collected information on waste types and disposal practices. Only traders who had operated within the selected markets for at least one year and consented to participate were included in the study. The questionnaire and observation checklist were developed from relevant literature and validated by three experts in Environmental Management and Measurement and Evaluation at the University of Calabar. A pilot study involving 30 traders outside the study area produced a Cronbach's Alpha reliability coefficient of 0.84, confirming the reliability of the instrument. Ethical approval and permission to conduct the study were obtained from the market authorities, and market union executives. Participation was voluntary, informed consent was obtained from all respondents, and confidentiality and anonymity were maintained throughout the study.

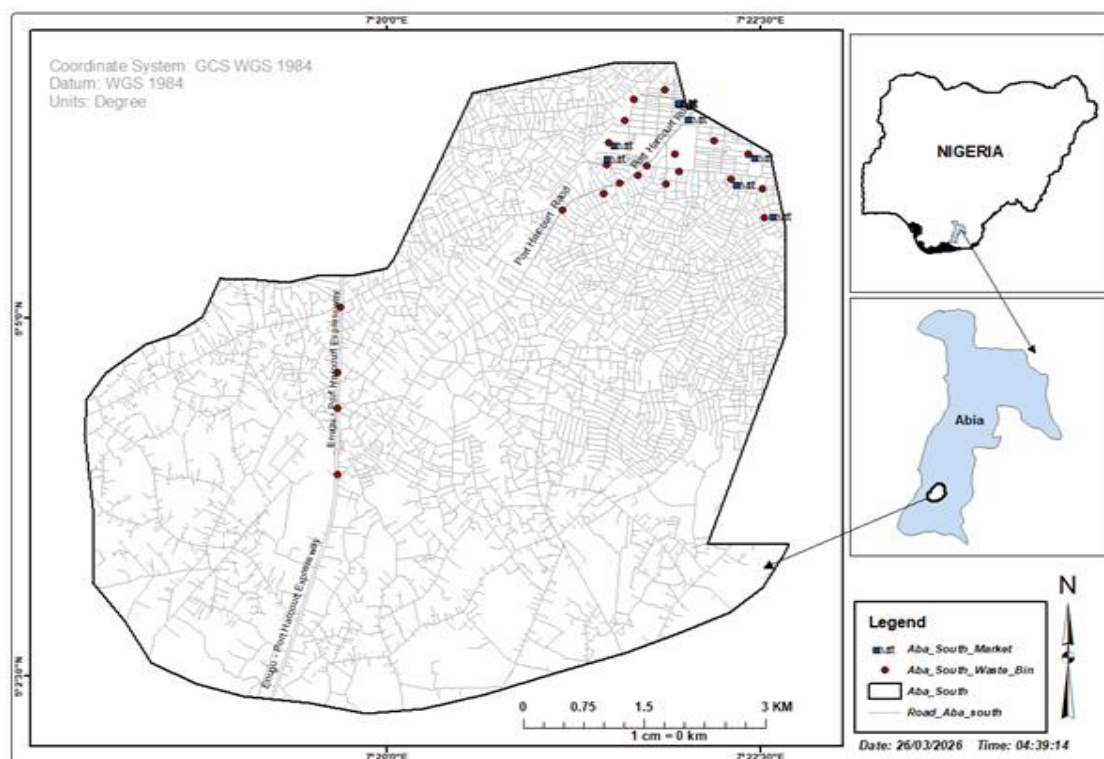


FIG 1: Spatial distribution and close proximity of trader's stalls to waste dumps in Aba South, Nigeria

Source: GIS Unit, Dept of Geography and Environmental Science (2025)

Findings

The results presented in Figure 2 show the percentage composition of the total weight of waste generated across the ten selected markets during the seven-day waste characterization exercise. The percentages were calculated by dividing the total weight of each waste category by the combined weight of all waste generated and multiplying by 100. Mixed waste constituted the largest proportion of the total waste generated (44.0 percent), followed by organic and food waste (26.0 percent), plastic waste (18.0 percent), animal waste (8.0 percent), and metal and glass waste (4.0 percent). These results indicate that mixed and biodegradable wastes were the dominant components of the market waste stream. The predominance of mixed waste suggests limited source segregation within the markets, where different waste materials are disposed of together before collection. Similarly, the substantial proportion of organic waste reflects the nature of trading activities involving food items, fruits, vegetables, and other perishable products. These findings provide baseline information on the composition of waste generated in the selected markets and underscore the need for source segregation, regular waste collection, and recycling and composting programmes to improve solid waste management.

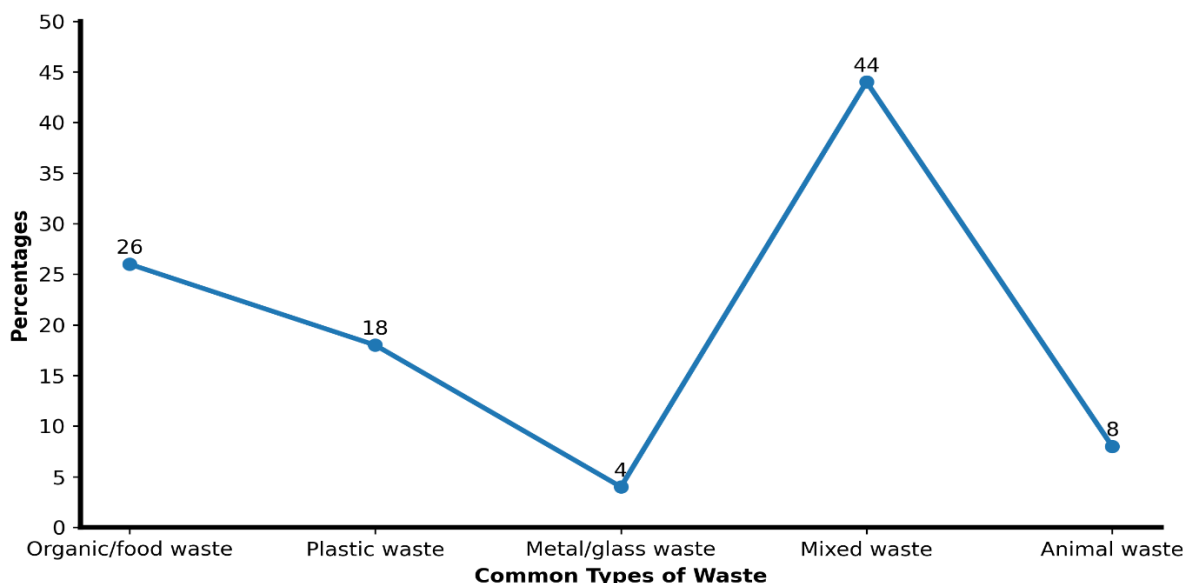


FIG. 2: Common types of waste around trading areas

Source: Author's research, 2025.

Table 1 presents the distribution of waste types and the observed mean daily waste generation rates across the ten selected markets in Aba Metropolis. The results show marked variations in both the quantity and composition of waste generated. Ariaria International Market recorded the highest observed mean daily waste generation of 5,420 kg/day, reflecting its large trader population and high commercial activities, while Afo Ule Market generated the least at 1,280 kg/day. The ten markets collectively produced 23,950 kg of solid waste per day, with a mean generation rate of 2,395 kg per market per day. Food waste, plastics, cartons, paper, nylon, and other organic materials constituted the dominant waste streams across the markets. Organic waste accounted for a mass-weighted average of 52.2 percent of the total waste generated, indicating that biodegradable materials formed the largest component of market waste. Ariaria, Nkwo Ngwa, Ahia Nkwo, and Ahia Umungasi Markets were predominantly characterized by commercial mixed waste, whereas Ahia Ohuru, Cemetery, Salad, Good Morning, and Afo Ule Markets were mainly organic dominated. Based on field observations of waste segregation, collection frequency, cleanliness, and waste storage conditions, four markets were rated as having poor waste management conditions, four as moderate, and two as fair. These findings suggest that waste generation patterns differ according to market size and trading activities, underscoring the need for market-specific waste management strategies to improve environmental sanitation and operational efficiency.

Table 1

Distribution of Waste Types and Observed Mean Daily Generation Rates in Selected Markets

Market Name	Dominant Waste Type	Observed Mean Daily Waste Generation (kg/day)	Predominant Waste Category	Estimated Organic Waste (%)	General Waste Management Condition
Ariaria International Market	Food waste, plastics, cartons	5,420	Commercial mixed waste	42	Poor
Ahia Ohuru Market	Food waste, nylon, paper	2,310	Organic dominated	58	Moderate
Cemetery Market	Vegetables, paper, plastics	1,850	Organic dominated	61	Moderate
Nkwo Ngwa Market	Plastics, food remnants, cartons	2,960	Commercial mixed waste	49	Poor
Allen Market	Mixed commercial waste	1,420	Mixed waste	46	Fair
Salad Market	Vegetable waste, fruits, organic matter	2,180	Organic dominated	69	Poor
Good Morning Market	Food waste, plastics, paper	1,760	Organic dominated	56	Moderate

Market Name	Dominant Waste Type	Observed Mean Daily Waste Generation (kg/day)	Predominant Waste Category	Estimated Organic Waste (%)	General Waste Management Condition
Ahia Nkwo Market	Plastics, cartons, food waste	2,740	Commercial mixed waste	47	Poor
Afo Ule Market	Organic waste, household waste	1,280	Organic dominated	65	Fair
Ahia Umungasi Market	Food waste, plastics, nylon	2,030	Commercial mixed waste	51	Moderate
Combined Total	—	23,950 kg/day	—	—	—
Mean per Market	—	2,395 kg/day	—	52.2 percent	—

Source: Author's research, 2025.

The results presented in Figure 4 show the frequency at which waste was disposed around trading stalls most frequently on a daily basis, as reported by 42.0 percent of respondents. This was followed by disposal occurring 5 to 6 days per week, accounting for 28.0 percent, while 18.0 percent indicated that waste was disposed 3 to 4 days per week. The least reported frequency was 1 to 2 days per week, representing 12.0 percent of respondents. The findings indicate that waste generation and disposal are continuous activities in the selected markets, reflecting the high volume of commercial transactions and daily trading operations. The predominance of daily waste disposal suggests that substantial quantities of waste accumulate within the markets each day, thereby requiring regular and efficient collection services to prevent waste build up. Where collection is inadequate, such frequent waste disposal can result in overflowing refuse, unpleasant odours, blocked drainage systems, environmental pollution, and increased risks to public health. These findings underscore the need for improved waste management practices, including timely waste collection, proper disposal systems, and effective sanitation measures to maintain a clean and healthy market environment.

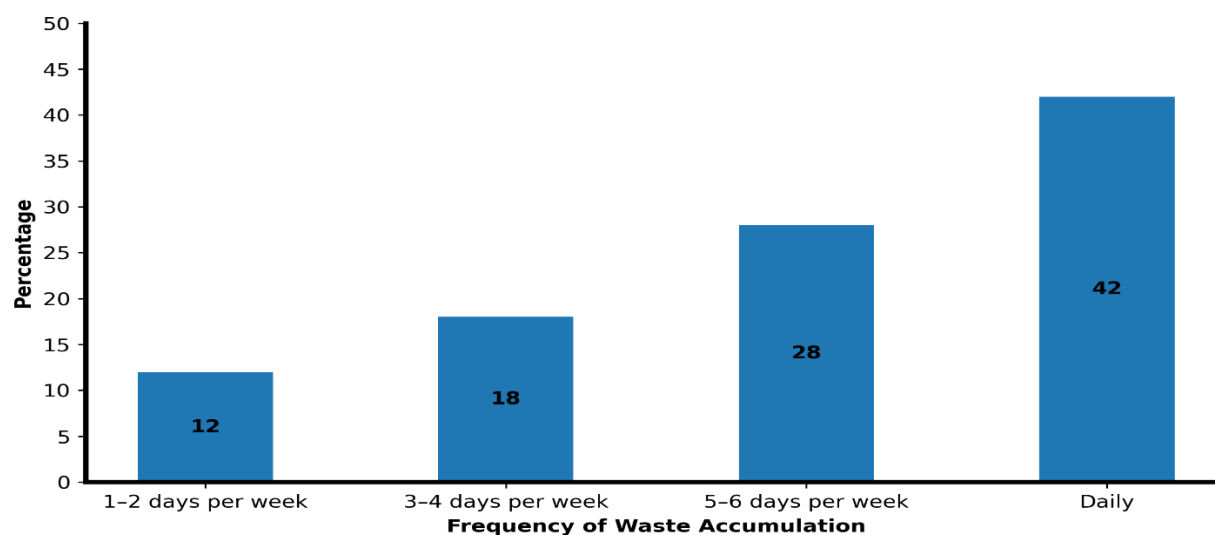


FIG.3: Frequency of Waste Disposed Around Trading Stalls

Source: Author's research, 2025.

Discussion

The findings revealed that mixed waste constituted the largest proportion of waste generated across the selected markets, followed by organic and food waste, plastics, animal waste, and metal and glass waste. This pattern reflects the nature of commercial activities within the markets, where food items, packaged goods, and household products are traded extensively. The dominant waste type for each market was determined from the waste category with the highest measured weight during the seven-day waste characterization exercise, while the predominant waste category reflected whether the measured waste stream was mainly organic or commercial mixed waste. The general waste management condition was determined by the researchers through field observations using a standardized assessment checklist that considered waste segregation practices, adequacy of waste storage facilities, frequency of waste collection, presence of litter, drainage obstruction, and cleanliness of the market environment. Markets were rated as Poor where indiscriminate disposal,

inadequate collection, and widespread waste accumulation were observed; Moderate where waste collection occurred regularly but segregation and sanitation remained inadequate; and Fair where relatively cleaner surroundings and more organized waste handling practices were evident. The findings are consistent with those of Okpaleke and Ngoka (2024), who reported that commercial activities in Aba and Umuahia generate diverse waste streams dominated by organic materials, plastics, and packaging wastes, thereby requiring improved segregation and sustainable management strategies.

The study further showed considerable variation in waste generation among the markets. Ariaria International Market generated the highest quantity of waste (5,420 kg/day), while Afo Ule Market recorded the lowest (1,280 kg/day). The ten markets generated a combined total of 23,950 kg of solid waste per day, equivalent to a mean daily generation of 2,395 kg per market per day. The relatively higher waste volumes recorded in Ariaria, Nkwo Ngwa, and Ahia Nkwo Markets reflect their larger trader populations and more intensive commercial activities. Likewise, the predominance of daily waste disposal by respondents indicates that waste is generated continuously during market operations, emphasizing the need for prompt collection services to prevent accumulation. These findings agree with Ayo-Odifiri et al. (2026), who observed that ineffective waste disposal systems in Aba markets contribute to environmental degradation and sanitation challenges. Although repeated waste measurements were undertaken over seven consecutive days to obtain average daily generation values, the observed variability among markets demonstrates that waste generation differs according to market size, trading intensity, and the types of commodities sold, reinforcing the need for market-specific waste management strategies.

Conclusion

The study concluded that the selected markets in Aba Metropolis generate substantial quantities of solid waste, with a combined observed mean daily generation of 23,950 kg, equivalent to an average of 2,395 kg per market per day. Mixed waste constituted the largest proportion of the waste generated, followed by organic and food waste, plastics, animal waste, and metal and glass waste, indicating that both biodegradable and non-biodegradable materials are major components of market waste. Waste generation varied across the markets, with Ariaria International Market recording the highest daily generation rate and Afo Ule Market the lowest. The study also established that waste disposal around trading areas occurs predominantly on a daily basis and that waste management conditions varied across the selected markets, with most markets rated as poor or moderate based on observed waste segregation, storage, collection, and sanitation practices.

Recommendations

1. The Abia State Environmental Protection Agency (ASEPA) and market authorities should prioritize regular waste collection in high-volume markets, particularly Ariaria International, Nkwo Ngwa, and Ahia Nkwo Markets, with more frequent evacuation to prevent waste accumulation.
2. Market authorities should introduce source segregation by providing separate bins for organic, recyclable, and residual waste. Organic waste should be directed to composting, while plastics, cartons, and paper should be recovered through recycling programmes.
3. The Abia State Ministry of Environment, ASEPA, and market management committees should conduct routine monitoring of waste segregation, collection, and sanitation practices, supported by periodic waste assessments to guide effective waste management planning and implementation.

Declarations

Funding

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Conflict of interest

The authors declares that there is no conflict of interest.

Authors contribution

The authors were responsible for the conceptualisation, study design, data interpretation, theatre-centred theoretical reframing, drafting, critical revision and approval of the final manuscript.

References

- Adedara, M. L., Taiwo, R., & Bork, H. R. (2023, April). Municipal solid waste collection and coverage rates in Sub-Saharan African countries: A comprehensive systematic review and meta-analysis. In *Waste* (Vol. 1, No. 2, pp. 389-413). MDPI.
- Adeniyi, L. A., & Afon, A. O. (2022). Seasonal quantification and characterization of solid waste generation in tertiary institution: a case study. *Journal of Material Cycles and Waste Management*, 24(3), 1172-1181.
- Ajaero, C. C., Okafor, C. C., Otunomo, F. A., Nduji, N. N., & Adedapo, J. A. (2023). Energy production potential of organic fraction of municipal solid waste (OFMSW) and its implications for Nigeria. *Clean technologies and recycling*, 3(1), 44-65.
- Ayo-Odifiri, S. O., Ukpabi, J. I., Ebekozen, A., & Aigbavboa, C. O. (2026). Sustainable human settlement through commercial solid waste disposal system: a case of Abia-Ohuru market in Aba Municipal, Nigeria. *Journal of Facilities Management*, 24(3), 642-665.
- Chandrappa, R., & Das, D. B. (2024). Waste quantities and characteristics. In *Solid waste management: principles and practice* (pp. 47-87). Cham: Springer International Publishing.
- Chioma, O. V., Bonaventure, A. I., & Kenechi, A. E. (2024). Hotel Solid Wastes: Quantity of Waste Generation in Aba and Umuahia Metropolis of Abia State, Nigeria.
- Felix, I. I., Ogechi, I. L., & Chibunna, B. J. (2022). Locating Suitable Solid Waste Dumping Sites using Remote Sensing and GIS Techniques in Aba Municipal, South-Eastern Nigeria." *European Journal of Applied Sciences. European Journal of Applied SCIENCES*, 10.
- Kassawe, A., & Getahun, E. (2025). Solid Waste Generation Rate, Composition Analysis, and Proposed Management Plan: A Case Study of Main Market Centers of Bahir Dar City. *The Scientific World Journal*, 2025(1), 8504268.
- Markina, L., Kovach, V., & Vlasenko, O. (2024). Analysis of the world market of waste management. *Technology audit and production reserves*, 3(3 (77)), 36-43.
- Oguiibe, A. L. N., Oko, P. E., Adindu, N. D., Bisong, J. O., Agbo, B. O., & Ekumankama, C. D. (2026). Environmental Hazards and Occupational Health Risk Exposure among Urban Market Traders Operating around Waste Disposal Sites in Aba, Nigeria. *Journal of Occupational Health, Risk Management, and Safety*, 1(2).
- Okafor, A. T., Okimiji, O. P., & Okafor, C. B. (2024). Assessment of challenges, knowledge, attitude and practices of abattoirs waste management in Aba and Abia State, South-East Nigeria. *J. Mater. Environ. Sci.*, 15 (7), 1051, 1069.
- Okafor, C. C., Nzekwe, C. A., Nduji, N. N., Ajaero, C. C., & Ibekwe, J. C. (2022). Energy and material recovery potential from municipal solid wastes (MSW) in Nigeria: challenges and opportunities. *Clean Technologies and Recycling*, 2(4), 282-307.
- Omotayo, A. O. (2026). Investigating the drivers of solid waste generation and disposal: evidence from South Africa. *Environment, Development and Sustainability*, 28(1), 671-703.
- Rotowa, O. O., & Olaleru, E. T. (2025). Assessment of waste collection and disposal methods in Akure markets. *European Journal of Sustainable Development Research*, 9(3).
- Tripathi, A., Prakash, A., & Prakash, J. (2022). Economics and market of wastes. In *Emerging trends to approaching zero waste* (pp. 319-338). Elsevier.
- Udoa, S. S., & Jacob, A. O. (2024). Impact of made-in-Nigeria products on solid waste generation and public health: challenges and solutions. *Environment*, 8(1), 73-80.