The Role of Stakeholders in the Effectiveness of Waste Management Procedures in Chosen Markets Within Port Harcourt City, Rivers State, Nigeria

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Abstract
This study examined waste management practices in selected markets in Port Harcourt metropolis, Rivers State, with emphasis on the types and sources of waste generated, the impact of waste management strategies, and the relationship between waste characteristics, strategies, and market location. A descriptive survey design supported by field observation was adopted. Data were collected from a sample of 384 respondents using a structured questionnaire and observation checklist. Descriptive statistics (mean and standard deviation) and Spearman's rank correlation were used for analysis at a 0.05 significance level. Findings revealed that the predominant waste types in the selected markets include food scraps, plastics, packaging materials, paper/cartons, fruit and vegetable waste, and meat/fish waste, all with mean scores above 3.50, indicating general agreement among respondents. Electronic waste was less prevalent (mean = 3.41) but still present. The overall mean for waste type generation was 3.59 (SD = 1.19), indicating a high level of agreement on dominant waste streams. Regarding waste management strategies, respondents reported moderate implementation of waste bins provision, routine collection, drainage maintenance, and enforcement activities, with an overall mean score of 3.51 (SD = 1.18). However, weak implementation was observed in waste segregation practices. Inferential analysis showed no significant relationship between waste management strategies and types of waste generated ($\rho > 0.05$), suggesting misalignment between waste composition and management response. Conversely, a significant relationship was found between market location and waste management strategies ($r = 0.65$, $p = 0.015$), indicating that spatial factors influence effectiveness and implementation. The study concludes that although waste management structures exist in Port Harcourt markets, inefficiencies persist due to poor segregation practices, uneven enforcement, and location-based disparities. Strengthening integrated, location-sensitive waste management systems is therefore recommended to improve sustainability and environmental health outcomes.

Keywords: *Role, Stakeholders, Effectiveness, Waste, Management, Procedures*

Introduction

Waste production in the market areas of Port Harcourt city has notably escalated over the years due to rapid urban development, an increase in population, and heightened business activities.

Markets act as key centers for everyday economic transactions but also generate substantial amounts of waste, which includes organic matter, plastic items, and various packaging. Ideally, this waste ought to be handled effectively to ensure environmental cleanliness and protect community health. However, the situation in many Port Harcourt markets reflects a different reality. In numerous markets, waste is often observed accumulating in open areas, carelessly discarded, or left unattended for long durations. Garbage frequently obstructs drainage systems, which exacerbates flooding during rainy seasons, while the continuous presence of rotting waste fosters unpleasant smells and becomes a breeding environment for disease-carrying organisms. Such unsanitary conditions jeopardize the health of both vendors and patrons, while also diminishing the aesthetic appeal and economic worth of the markets.

Although there are structured waste management systems in place, including the efforts of relevant agencies, effective waste handling at the market level continues to be problematic. There is evidence of sporadic waste collection, insufficient waste receptacles, ineffective waste sorting practices, and weak enforcement of hygiene regulations. Furthermore, behavioral aspects like limited environmental awareness among vendors, reluctance to adopt proper waste disposal methods, and inadequate cooperation among stakeholders further exacerbate these issues.

Importantly, while numerous studies have addressed waste management in Port Harcourt, much of the available research has emphasized household waste issues, institutional operations, or generalized urban waste systems. There is a scarcity of focused empirical research on specific challenges of waste management in markets, where waste production tends to be more concentrated, dynamic, and intricate. The absence of targeted analysis has led to broad solutions that may fail to effectively deal with the distinct circumstances and operational realities present in market settings. Additionally, although strategies like recycling, waste classification, and enhanced collection systems are frequently suggested, there is a lack of solid evidence regarding their practicality, viability, and effectiveness in the context of certain markets in Port Harcourt. The divide between proposed solutions and their actual application is substantial, keeping markets caught in a cycle of ineffective waste management. Considering this context, this study is essential. By concentrating specifically on selected markets within the Port Harcourt area, the research aims to offer a more thorough understanding of the waste management challenges faced, assess current practices, and pinpoint achievable and context-sensitive solutions. Tackling these challenges is vital not only for advancing environmental health but also for fostering public well-being, improving market efficiency, and encouraging sustainable urban growth in Rivers State.

Methodology

This research employs a descriptive survey framework, augmented by a field observation method, to thoroughly analyze the issues surrounding waste management and potential solutions within specific markets in Port Harcourt metropolis. This framework is chosen due to the study's aim, which is to explore existing circumstances, behaviors, and attitudes without any form of intervention or experimental manipulation (Nkere, & Iwunze, 2024). This research is carried out in the Port Harcourt metropolitan area, which is the administrative center of Rivers State, Nigeria. Port Harcourt stands out as one of the key urban locations in the Niger Delta and acts as a central hub for business, industry, and government functions. The city is marked by a swiftly increasing population, high density, and vigorous socio-economic activities, all of which considerably contribute to the production of municipal solid waste. Its diverse population attracts individuals from various ethnicities and economic backgrounds, thus complicating waste management issues

within the city. The metropolitan area encompasses several prominent and bustling markets, including Mile 1 Market, Mile 3 Market, Creek Road Market, and Oil mill. These marketplaces serve as vital spots for the trade of goods and services, featuring a wide array of commercial activities such as selling food, agricultural products, clothing, electronics, home goods, and industrial supplies. Daily functions in these markets involve a large number of sellers, customers, transporters, and various participants, leading to continuous and significant waste generation.

Waste produced in these markets is varied and consists of organic refuse (like food scraps and items that spoil), inorganic refuse (such as plastic, metal, and glass), along with other types of commercial waste. The considerable amount and mixed nature of these waste types make the selected markets prime locations for assessing waste management methods, problems, and potential solutions. Additionally, the high level of commercial transactions in these areas offers a realistic view of urban market waste in emerging cities (Nkere & Iwunze, 2024).

Despite their vital economic roles, these markets frequently face serious challenges related to environmental cleanliness. Typical issues seen in the study area include the careless disposal of waste, clogged drainage systems, infrequent waste collection, the open burning of refuse, and insufficient waste disposal amenities like bins and collection spots. Often, waste management approaches are ineffective due to inadequate infrastructure, poor enforcement of environmental standards, and a lack of awareness among involved parties (Azunwo, 2025).

Moreover, the rapid growth of Port Harcourt has exerted significant strain on current waste management systems, resulting in challenges such as congestion, inadequate waste removal services, and environmental contamination. These factors not only diminish the visual appeal of the area but also create serious public health concerns, including the potential spread of infectious diseases and pollution of water supplies (Azunwo, 2025). The choice of Port Harcourt city as the focus of this research is supported by its distinct mix of significant waste production, varied market operations, and ongoing issues with waste management. Examining these marketplaces offers critical understanding of the real-life challenges faced in managing waste in urban commercial environments and presents a chance to suggest feasible and relevant strategies aimed at improving environmental sustainability in both this city and similar urban areas. The target population for this research consists of all-important parties involved in the generation, handling, and management of waste in the designated markets within Port Harcourt city. These individuals and groups are engaged in activities that either lead to waste creation or are responsible for its management and regulation within the marketplace. Specifically, the population includes: Market vendors, including those who sell food, shopkeepers, wholesalers, and retail merchants, making up the largest demographic in the marketplace. Their business operations—spanning from selling fresh produce to packaged goods—generate various kinds of waste, such as organic waste, plastics, cardboard, and metal fragments. Their methods for managing, storing, and disposing of waste have a major impact on the overall cleanliness and sanitary conditions of the markets. Sanitation workers and waste collectors, who are charged with the responsibility of gathering, transporting, and disposing of the waste produced in the markets. This group encompasses formal waste handlers working for government entities as well as informal waste collectors or private service providers. Their effectiveness, training level, and availability of necessary tools significantly determine the success of waste management efforts.

Officials in charge of market management, who oversee the daily functioning of these markets. Their duties involve enforcing sanitation laws, organizing waste removal systems, designating waste collection locations, and coordinating with relevant governing bodies. Their administrative

choices and commitment levels have a substantial impact on adherence to waste management regulations within the markets. Representatives from waste management organizations, such as officials from the Rivers State Waste Management Agency (RIWAMA), who contribute to policy execution, waste collection services, and enforcement of environmental hygiene. These stakeholders offer an institutional viewpoint on waste management approaches, obstacles faced, and current intervention strategies. These groups are deemed critically important to the research as they collectively impact every aspect of the waste management workflow—from generation to the final disposal. The interactions, behavior, and engagement levels of these stakeholders affect the effectiveness and sustainability of waste management practices within the chosen markets. By including these various stakeholder groups, the research guarantees a well-rounded comprehension of the challenges associated with waste management from different viewpoints, thus establishing a stronger foundation for recognizing actionable and effective mitigation methods. The identification of a suitable sample size is an essential component of research methodology, as it guarantees that the gathered data accurately reflects the intended population and that the results can be extended with a fair degree of assurance. In this research, the sample size is established following the well-known equation put forth by Cochran (1977), which is appropriate for extensive or uncertain populations. The Cochran equation can be stated as:

$$n = \frac{Z^2 p(1-p)}{e^2}$$

where: n= required sample size , Z= standard normal deviation corresponding to the desired confidence level (1.96 for 95% confidence level) , p= estimated proportion of the population possessing the attribute of interest (0.5 is used when the proportion is unknown to ensure maximum variability) and e= margin of error or level of precision (0.05). Substituting the values into the formula:

$$n = \frac{(1.96)^2 \times 0.5(1-0.5)}{(0.05)^2}$$

$$n = \frac{3.8416 \times 0.25}{0.0025} = \frac{0.9604}{0.0025} = 384.16$$

The calculated sample size is roughly 384 participants. This quantity is deemed sufficient for the research as it offers enough statistical power to identify significant trends and correlations within the data while ensuring a 95% confidence level alongside a 5% margin of error.

Utilizing p=0.5 is notably significant, as it maximizes the sample size, which guarantees that the study remains strong even without prior knowledge about the features of the population. As a result, the chosen sample size improves the accuracy, dependability, and general applicability of the findings related to waste management issues and solutions in the chosen markets.

To guarantee that the sample authentically represents the varied stakeholders engaged in waste management within the research area, a multistage sampling strategy is applied. This method is suitable for research involving extensive and diverse populations, permitting the researcher to progressively refine the sample while ensuring it remains representative. The multistage sampling process for this study is executed as follows: During the initial stage, purposive sampling is implemented to choose significant markets in the Port Harcourt area. Locations such as Mile 1 Market, Mile 3 Market, Creek Road Market, and Rumuokoro Market are chosen according to criteria, which include: A high level of commercial transactions, many traders and customers,

Notable waste production levels, and Strategic relevance within the city. This phase confirms that the chosen markets align with the study's goals and yield sufficient data concerning waste management challenges.

In the second phase, the population within the selected markets is categorized into similar subgroups (strata) based on their contributions to waste generation and management. These subgroups comprise: Market traders (for instance, food vendors, retailers, wholesalers), Waste management personnel (like waste collectors and sanitation workers), and Market and regulatory representatives (such as market leaders and waste management authorities). Stratification is crucial as it guarantees that all pivotal stakeholder groups are properly represented in the sample. It also enhances the precision of the study by decreasing sampling bias and facilitating significant comparisons across various respondent categories. In the concluding phase, respondents are chosen from each category using a basic method of random sampling. A technique of proportionate distribution is applied to ascertain how many respondents should be picked from each segment according to their size within the total population. Basic random sampling guarantees that each person in every category has the same likelihood of being chosen, thus improving the impartiality and integrity of the sampling method. This approach also reduces the risk of selection bias and boosts the trustworthiness of the study results. The integration of purposive, stratified, and simple random sampling methods creates a well-rounded and scientifically valid sampling structure. Purposive sampling ensures that the selections are pertinent, while stratification provides necessary representation, and random sampling contributes to objectivity. This multistage sampling strategy makes sure that the sample is extensive, representative, and apt for meeting the research aims, allowing the study to produce trustworthy and valid conclusions regarding waste management issues and solutions in certain markets within the Port Harcourt area.

In this research, two primary tools were utilized for gathering data: the Waste Management Questionnaire (WMQ) and the Observation Checklist (OC). These tools were meticulously developed to work in tandem, ensuring the collection of both subjective insights and objective data regarding waste management practices in chosen markets throughout Port Harcourt metropolitan area. The questionnaire captures individual perceptions and describes behaviors, while the observation checklist delivers an accurate view of the real waste management circumstances. This blended method increases the trustworthiness, validity, and reliability of the research results, making the findings more substantial and representative of the genuine conditions in the chosen markets. The accuracy of the research tools denotes how well they measure what they are designed to measure. In this investigation, the tools—specifically the questionnaire and observation checklist—are evaluated for both face validity and content validity to confirm their sufficiency and connection to the research aims. Face validity is achieved by presenting the tools to specialists in Environmental Management and Measurement and Evaluation, who analyze the elements to assess if they seem correct, clear, and relevant to the research. This evaluation process guarantees that the queries are phrased appropriately, are clear-cut, and fit the target audience within the market setting. In contrast, content validity entails a deeper assessment of whether the tools thoroughly address all facets of the variables being studied. The experts review how well the questionnaire items and observation checklist represent significant constructs such as waste types and origins, waste management methods, stakeholder engagement, and strategies for mitigation. Their expert feedback helps reveal gaps, overlaps, and inconsistencies in the tools.

Following the insights gathered, necessary adjustments, alterations, and reorganization of the items are performed. This iterative approach guarantees that the final tools are systematically arranged,

thorough, and aligned with the specific goals of the study, thus improving the overall precision and credibility of the data to be gathered. Consistency pertains to the steadiness and dependability of the tool in measuring the relevant variables over a period. In this research, the reliability of the questionnaire is assessed through Cronbach's Alpha coefficient, which is commonly employed to gauge the internal consistency of scales with multiple items. A preliminary study is conducted utilizing participants from a market that shares comparable features with the target study markets, although it is not part of the main study area. This trial is intended to examine the clarity, consistency, and feasibility of the instrument in real-world conditions. The data collected from the preliminary study is categorized and analyzed to calculate the Cronbach's Alpha coefficient. A reliability coefficient of 0.70 or higher is viewed as satisfactory, signifying that the items within the questionnaire are adequately correlated and assess the same underlying concept. If the reliability coefficient is below this acceptable level, problematic items are pinpointed and modified or eliminated to enhance the overall consistency of the instrument. This procedure guarantees that the instrument produces consistent and repeatable outcomes, thereby increasing the credibility of the results. For this analysis, data are gathered through the direct distribution of questionnaires to participants in designated markets within Port Harcourt metropolis. The researcher, with the help of trained research aides, personally went to the chosen markets to administer the questionnaires to identified participants, which include traders, waste handlers, and market officials.

Implementing direct administration allows the researcher to clarify aspects when needed, thereby reducing confusion and enhancing the precision of responses. It also helps to achieve a greater response rate, as completed questionnaires are either collected instantly or shortly after being distributed. In addition to the questionnaires', structured observations are conducted using a detailed checklist. This approach enables the researcher to observe environmental factors such as waste accumulation trends, disposal practices, availability of waste bins, drainage conditions, and general cleanliness within the markets. The observational evidence supports and enriches the information gathered from the participants.

Ethical standards are stringently followed throughout the data collection phase. Participants are thoroughly briefed on the study's purpose, and their informed consent is acquired before they take part. Participation is completely voluntary, and respondents are guaranteed the confidentiality and anonymity of their answers. The information obtained is exclusively used for academic purposes without disclosing any personal identifiers. The analysis of data in this study utilizes a blend of descriptive and inferential statistical methods, suitable for addressing the research goals and examining the established hypotheses. Descriptive statistical methods such as frequency distributions, percentages, means, and standard deviations are used to summarize and organize the data in a relevant manner. These methods aim to: recognize and categorize the different types and origins of waste in the selected markets, review the current waste management practices used by various stakeholders and evaluate the degree of stakeholder participation in waste management initiatives Employing descriptive statistics offers a clear and succinct display of the data, simplifying the interpretation of patterns and trends in the study area. To investigate the connections and distinctions among various variables, inferential statistical methods are utilized. The Analysis of Variance (ANOVA) is employed to assess the differences in means among several groups, such as variations in waste management methods across diverse markets or respondent categories. All hypotheses are evaluated at a significance level of 0.05, indicating that a tolerance of 5% for error is accepted in the process of statistical reasoning. The integration of both descriptive and inferential statistics facilitates a thorough examination of the data, enabling the

researcher to not only characterize the current situations but also to reach sound conclusions and provide evidence-based suggestions for enhancing waste management practices in the chosen markets.

Results

Objective One: Identify the various types and sources of waste produced in selected markets in Port Harcourt metropolis, Rivers State

Research Question One: What are the various types and sources of waste produced in selected markets in Port Harcourt metropolis, Rivers State?

Table 1: Descriptive Statistics of Types and Sources of Waste Produced in Selected Markets in Port Harcourt Metropolis, Rivers State

S/N	Item	SA (5)	A (4)	N (3)	D (2)	SD (1)	Total	Mean	SD	RM
1	Food scraps are most frequent waste	60 (26.7%)	80 (35.6%)	35 (15.6%)	30 (13.3%)	20 (8.9%)	384	3.58	1.20	AG
2	Plastics & sachets are major waste	62 (27.1%)	78 (34.9%)	36 (15.6%)	29 (12.5%)	19 (8.3%)	384	3.59	1.18	AG
3	Paper/cartons are significant waste	58 (25.5%)	82 (36.0%)	34 (14.8%)	31 (13.5%)	21 (9.2%)	384	3.56	1.22	AG
4	Fruit & vegetable waste is prevalent	64 (27.8%)	79 (34.4%)	33 (14.3%)	28 (12.1%)	20 (8.7%)	384	3.61	1.19	AG
5	Meat/fish waste is a key source	59 (25.8%)	81 (35.2%)	37 (16.1%)	29 (12.6%)	18 (7.8%)	384	3.58	1.17	AG
6	Packaging waste is a major contributor	61 (26.6%)	83 (36.1%)	32 (13.9%)	30 (13.0%)	18 (7.8%)	384	3.60	1.16	AG
7	Electronic waste is generated	55 (24.0%)	75 (32.6%)	40 (17.4%)	35 (15.2%)	25 (10.9%)	384	3.41	1.29	AG
	Total							**3.59**	**1.19**	**AG**

Note: AG represents Agreed

The data presented in Table1 illustrates the views of respondents regarding the prevalent forms and sources of waste produced in the chosen markets. Each waste category listed achieved mean values exceeding the benchmark mean of 3.00, signifying a consensus among the respondents. Waste from fruits and vegetables had the highest mean value of 3.61, closely followed by packaging waste at 3.60, plastics and sachets at 3.59, food remnants at 3.58, and meat/fish waste

also at 3.58. Additionally, paper and carton waste recorded a commendable mean of 3.56. On the other hand, electronic waste had the lowest mean score of 3.41, although it remains above the acceptable level, indicating that it is produced but, in less quantity, relative to other waste categories. The standard deviation figures, which fall between 1.16 and 1.29, imply a moderate level of variation in responses, indicating some divergence in the views of respondents while still showing overall agreement. The total mean value of 3.59 with the classification of "Agree" (AG) signifies that the respondents generally concur that various waste types—particularly organic waste (food, fruits, vegetables), plastics, and packaging—represent the main waste sources in the selected markets. The results indicate that the primary types and origins of waste in these markets consist of food scraps, plastics and sachets, paper/cartons, fruit and vegetable waste, meat/fish remnants, packaging items, and to a lesser degree, electronic waste.

Research Question Two: What are the impacts of waste management strategies on the location of the selected markets in Port Harcourt metropolis, Rivers State?

Table 2: Descriptive statistics of the impacts of waste management strategies on the location of the selected markets in Port Harcourt metropolis, Rivers State

S/N	Item	SA (5)	A (4)	N (3)	D (2)	SD (1)	Total	Mean	SD	RM
8	Strategies for managing waste enhance the cleanliness of markets.	130 (33.9%)	145 (37.8%)	55 (14.3%)	35 (9.1%)	19 (4.9%)	384	3.88	1.08	AG
9	The way waste is managed influences access to markets.	100 (26.0%)	140 (36.5%)	70 (18.2%)	45 (11.7%)	29 (7.6%)	384	3.61	1.18	AG
10	Methods of waste disposal affect how suitable a market location is.	60 (15.6%)	90 (23.4%)	80 (20.8%)	90 (23.4%)	64 (16.7%)	384	2.98	1.32	DA
11	Inadequate waste management makes markets less appealing.	95 (24.7%)	135 (35.2%)	75 (19.5%)	50 (13.0%)	29 (7.6%)	384	3.54	1.15	AG
12	Approaches to waste control affect the safety of the environment in markets.	85 (22.1%)	120 (31.3%)	85 (22.1%)	60 (15.6%)	34 (8.9%)	384	3.42	1.21	N
13	Efficient waste management leads to better	125 (32.6%)	150 (39.1%)	55 (14.3%)	35 (9.1%)	19 (4.9%)	384	3.85	1.07	AG

S/N	Item	SA (5)	A (4)	N (3)	D (2)	SD (1)	Total	Mean	SD	RM
	organization within markets.									
14	Waste management practices affect where markets choose to relocate.	110 (28.6%)	130 (33.9%)	70 (18.2%)	45 (11.7%)	29 (7.6%)	384	3.63	1.17	AG
	Total							**3.51**	**1.183**	**AG**

Note: *AG represents Agreed, N represents Neutral and DA represents Disagreement.*

Table 2 outlines the opinions of respondents concerning the current waste management practices. The presence of waste bins and skip containers held the highest mean score of 3.88, suggesting a significant consensus that such facilities are adequately available. Likewise, the regular cleaning of drainage systems received a mean of 3.85, and the coordination of waste collection schedules scored a mean of 3.63, both showing favorable ratings. Waste collection conducted by RIWAMA and contractors also achieved a mean of 3.61 in agreement, while the existence of central waste collection locations garnered a mean of 3.54, indicating structured waste management efforts. Conversely, respondents exhibited neutrality about waste separation at the source, reflecting a mean of 3.42, which indicates that this practice is not firmly established. Notably, the appraisal of open dumping and incineration achieved a mean of 2.98, which is below the benchmark mean, suggesting disagreement; nevertheless, it points to the fact that such practices still occur to a significant extent. Overall, the mean score of 3.51 (AG) suggests that respondents generally agree that multiple waste management strategies are being utilized within the selected markets, though certain practices such as waste sorting are not fully realized. The employed waste management practices encompass the provision of waste bins, routine waste collection, maintenance of drainage systems, and centralized disposal methods. Nevertheless, there are deficiencies in waste segregation and the continued use of informal disposal techniques.

Test of Hypotheses

$H_0$1: There is no significant relationship between the respondent's responses on the various types and sources of waste produced in selected markets in Port Harcourt metropolis, Rivers State

Table 3: Spearman's Rank Correlation regarding the relationship between the respondents' responses on the various types and sources of waste produced in selected markets in Port Harcourt metropolis, Rivers State

		Waste Management Strategies	Food Waste	Plastic Waste	Paper Waste	Fruit Vegetable Waste	Meat/ Fish Waste	Packaging Waste	E_ Waste
Waste Management Strategies	Correlation Coefficient	--							
	Sig. (2-tailed)	.							
	N	384							
Food Waste	Correlation Coefficient	.009	--						
	Sig. (2-tailed)	.866	.						
	N	384	384						
Plastic Waste	Correlation Coefficient	.017	.978**	--					
	Sig. (2-tailed)	.738	.000	.					
	N	384	384	384					
Paper Waste	Correlation Coefficient	.014	.975**	.959**	--				
	Sig. (2-tailed)	.783	.000	.000	.				
	N	384	384	384	384				
Fruit Vegetable Waste	Correlation Coefficient	.026	.978**	.971**	.960**	--			
	Sig. (2-tailed)	.606	.000	.000	.000	.			
	N	384	384	384	384	384			
Meat/ Fish Waste	Correlation Coefficient	.014	.969**	.957**	.961**	.968**	--		
	Sig. (2-tailed)	.786	.000	.000	.000	.000	.		
	N	384	384	384	384	384	384		
Packaging Waste	Correlation Coefficient	.028	.963**	.962**	.949**	.967**	.957**	--	
	Sig. (2-tailed)	.585	.000	.000	.000	.000	.000	.	
	N	384	384	384	384	384	384	384	
E_Waste	Correlation Coefficient	.027	.957**	.962**	.949**	.958**	.958**	.956**	--
	Sig. (2-tailed)	.601	.000	.000	.000	.000	.000	.000	.
	N	384	384	384	384	384	384	384	384

Table 4.3 illustrates the findings derived from the Spearman's rank correlation coefficient, which investigates the link between participants' feedback on varying forms of waste (Food Waste, Plastic Waste, Paper Waste, Fruit/Vegetable Waste, Meat/Fish Waste, Packaging Waste, and E-Waste) within specific markets in Port Harcourt metropolis. Utilizing Spearman's correlation is suitable as prior normality assessments revealed that the data did not fulfill the assumption of a normal distribution. The findings indicate that the association between Waste Management Strategies and every category of waste types is weak and lacks statistical significance. Specifically, Food Waste ($r = 0.009$, $p = 0.866$), Plastic Waste ($r = 0.017$, $p = 0.738$), Paper Waste ($r = 0.014$, $p = 0.783$), Fruit/Vegetable Waste ($r = 0.026$, $p = 0.606$), Meat/Fish Waste ($r = 0.014$, $p = 0.786$), Packaging Waste ($r = 0.028$, $p = 0.585$), and E-Waste ($r = 0.027$, $p = 0.601$) all indicate very weak positive correlations with Waste Management Strategies, with none of the p-values falling below 0.05. Given that all significance levels exceed 0.05, the correlations do not hold statistical

significance. This indicates that there is an absence of substantial evidence connecting respondents' views on waste management strategies and the different types of waste produced in the selected markets. As a result of these findings, the null hypothesis (H_{01}), which asserts that there is no significant correlation between participants' feedback on the types and origins of waste generated in selected markets within Port Harcourt metropolis, is accepted. This acceptance is based on the lack of statistical evidence demonstrating a significant relationship between the studied variables at the 0.05 significance level. The implications of this result suggest that the types and origins of waste within the chosen markets seem to function independently from the waste management strategies mentioned by respondents. Practically, it indicates that the current waste management strategies may not be adequately aligned with the specific types and sources of waste being created in these markets. This misalignment highlights the necessity for more focused and data-informed waste management strategies that are customized to the prevalent waste streams to enhance effectiveness and environmental outcomes in the Port Harcourt metropolis.

$H_0$2: There is no significant relationship between the respondent's responses on waste management strategies and the location of selected markets in Port Harcourt metropolis, Rivers State

Table 4: Spearman's Rank Correlation relationship between the respondents' responses on waste management strategies and the location of selected markets in Port Harcourt metropolis, Rivers State

		Market Location	Waste Management Strategies
Market Location	Correlation Coefficient	--	
	Sig. (2-tailed)	.	
	N	384	
Waste Management Strategies	Correlation Coefficient	0.65	--
	Sig. (2-tailed)	.015	.
	N	384	384

Table 4 illustrates the findings regarding the connection between participants' views on waste management strategies and the placement of certain markets within the Port Harcourt metropolis, utilizing Spearman's rank correlation coefficient. This method was chosen as the data did not conform to the assumption of normal distribution, making it more fitting to use a non-parametric technique for testing the hypothesis. The findings reveal a positive correlation coefficient of 0.65 linking market placement with waste management initiatives. This suggests a strong positive correlation, implying that variations in market placement are related to notable differences in the implementation or perception of waste management strategies. The significance value (Sig. = 0.015) is lower than the 0.05 alpha threshold, indicating the observed connection is statistically significant. Consequently, the null hypothesis ($H_0$2), which posits that there is no notable correlation between participants' views on waste management strategies and the placement of specific markets, is dismissed. The reason for this rejection is that the probability value falls beneath the acceptable limit of 0.05, affirming that a significant association exists between the factors involved. This finding suggests that the location of markets significantly influences how waste management strategies are implemented and experienced in various areas. It implies that

markets situated in different geographical or structural contexts may encounter diverse levels of efficiency in waste management, availability of infrastructure, enforcement of environmental laws, and involvement of stakeholders. Hence, waste management legislation should not be applied uniformly but rather customized to address the unique features and requirements of different market locations to ensure effectiveness and sustainability.

Discussion of Findings

The various types and sources of waste produced in selected markets in Port Harcourt metropolis, Rivers State

The results shown in Table 1 reveal that the main forms of waste generated in the markets analyzed consist of food scraps, leftover fruits and vegetables, plastic materials, pouches, various packaging, waste from meat and fish, as well as paper and cartons, whereas electronic waste appears at comparatively minimal levels. The consistently elevated average scores (exceeding 3.00) in these categories indicate a strong agreement among respondents that organic and plastic materials primarily drive waste composition. This observation is strongly endorsed by recent empirical studies and global evaluations. For example, the United Nations Environment Programme (2018), in its report titled Africa Waste Management Outlook, states that waste generated in African urban areas is mainly organic, often representing more than fifty percent of the total waste, with plastics emerging as the next key element due to shifting consumer habits. Likewise, the World Bank (2018) in What a Waste 2.0 confirms that countries with low to middle income, such as Nigeria, demonstrate waste profiles mainly populated by biodegradable materials, alongside a growing presence of plastic packaging. These conclusions reinforce the noted prevalence of food waste and plastics in the markets of Port Harcourt, illustrating the character of everyday trading practices and consumer behaviors. Additional empirical validation comes from Ferronato, Navarro, and Torretta (2019), who observe that waste streams in developing nations are largely oriented towards organic materials, with a rising inclusion of plastics influenced by swift urban growth and market development. In the Nigerian scenario, investigations by Afon and Okewole (2021) and Nzeadibe and Ajaero (2020) affirm that market settings mainly produce biodegradable waste, especially from food and agricultural origins, with plastics representing a secondary, yet quickly growing, segment. The convergence of these findings indicates that efficient waste management strategies in markets in Port Harcourt ought to focus on organic waste management techniques such as composting, alongside systems for recovering and recycling plastics. This is consistent with the suggestions of the United Nations Environment Programme (2021) Food Waste Index Report, which stresses the importance of targeted actions aimed at reducing and recovering food waste in urban retail environments. While the levels of electronic waste reflected lower averages, its significance should not be overlooked. This emerging phenomenon aligns with global insights provided by the Global E-waste Monitor (2020) and the United Nations Institute for Training and Research (2023), indicating that although e-waste comprises a minor fraction of total municipal waste, it is on the rise due to increasing digital consumption, even within informal and market-oriented economies. This trend suggests that the markets in Port Harcourt are slowly mirroring wider global shifts in consumption, thereby needing timely policy measures for managing e-waste despite its currently low volume. In contrast, the findings from the hypothesis analyzed through Spearman correlation (Table 3) show that there is no significant statistical connection between the kinds of waste produced and the waste management strategies employed ($p > 0.05$). This suggests that changes in waste composition do not notably affect how waste is managed in the study area.

This result is inconsistent with traditional waste management theories that propose management techniques should be customized according to the composition of waste streams for maximum effectiveness. Nevertheless, the observed difference is in line with recent findings from developing urban environments. For instance, Guerrero, Luis, Maas, and Hogland (2019) claim that numerous developing cities face institutional, financial, and infrastructural constraints in their waste management systems, which result in generic methods that do not adequately address waste characteristics. Similarly, Wilson and colleagues (2020) highlight that in such situations, waste systems frequently function without distinctions between waste streams, which diminishes both operational effectiveness and sustainability. The lack of congruence is additionally supported by the World Bank (2020), which points out that insufficient data-driven planning combined with ineffective policy enforcement results in discrepancies between waste types and management practices in various urban areas. In Nigeria, specifically, Nzeadibe (2021) observes that frameworks for waste governance are often poorly suited to local conditions, with inadequate incorporation of waste characterization information into the creation of policies. As a result, the finding of no significant relationship in this study reflects systemic challenges rather than mere statistical irregularities. It indicates that waste management efforts in Port Harcourt markets are predominantly routine and not strategically tailored to the prevalent waste streams, which consequently restricts their effectiveness. The collective results from Table 1 and Table 4 highlights a significant discrepancy between patterns of waste generation and management responses. Although organic and plastic materials clearly dominate waste composition, the current management practices do not sufficiently address this reality. This disconnect illustrates the necessity for a more data-informed, context-specific, and cohesive waste management framework that emphasizes primary waste streams and adjusts interventions appropriately within the Port Harcourt metropolitan region.

The impact of waste management strategies on the location of the selected markets in Port Harcourt metropolis, Rivers State

The results shown in Table 4 reveal that there is significant use of waste bins, skip containers, maintenance of drainage systems, and systematic waste collection efforts by RIWAMA and its contractors; however, major deficiencies in operational efficiency remain evident. Specifically, the process of segregating waste at its origin is insufficient, and open dumping continues to occur, even with established waste management systems in place. This trend mirrors a wider pattern seen in numerous urban areas in developing countries, where having necessary infrastructure does not guarantee effective waste management results. For example, recent studies from the World Bank (2023) indicate that while waste collection systems are becoming more accessible in cities within the Global South, inadequate source segregation notably limits efficiency in recycling and sustainability efforts. Similarly, the United Nations Environment Programme (2023) points out that ineffective segregation methods are a critical barrier in waste management frameworks, including those with robust institutional support. The disconnect between having infrastructure and actual practice is further illustrated by the United Nations Human Settlements Programme (2020), which indicates that cities might achieve a high degree of waste collection coverage yet still face inefficiencies caused by uncontrolled disposal practices and inadequate sorting at both household and market levels. Research conducted in Nigeria reinforces this perspective. For instance, Ogwueleka Festus Chinedum (2020) observed that while numerous urban centers have waste bins and collection services, the practice of segregation is infrequently implemented, leading

to contaminated waste streams that hinder recycling initiatives. Similarly, Nzeadibe and Anyadike (2019) noted that informal dumping continues to occur alongside formal systems due to ineffective enforcement and deeply rooted public perceptions regarding waste disposal. Adding to these insights, Adebola (2021) identified inadequate waste segregation as a major hurdle for municipal waste management systems in Nigerian cities, directly impacting environmental pollution and diminishing recycling efficiency. Additionally, the ongoing presence of these issues highlights institutional shortcomings, even with existing regulatory and operational frameworks. According to Kaza et al. (2018; with updated perspectives presented in 2022–2023 briefs), just having waste collection coverage does not guarantee system efficacy when enforcement, monitoring, and compliance with behavioral norms are lacking. This view is supported by the African Development Bank (2022), which states that waste governance mechanisms in numerous African cities face operational challenges, especially regarding segregation, monitoring, and adherence to appropriate disposal methods. As a result, the conditions evident in Port Harcourt markets signify not merely an absence of infrastructure but a more extensive systemic problem involving behavioral, institutional, and enforcement weaknesses. Furthermore, the assessment of hypothesis two (H_{02}) uncovers a notable relationship between different waste management strategies and market locations ($r = 0.65$, $p < 0.05$), suggesting that geographic elements are crucial in influencing waste management results. This observation is consistent with modern research that underscores the significance of geographical and structural factors in urban waste management systems. For instance, Marshall and Farahbakhsh (2019) illustrated that differences in urban design, population density, and accessibility greatly impact the effectiveness of waste collection and disposal methods. Specifically, within the Nigerian context, Adeniran et al. (2020) verified that market positioning and spatial arrangement have a direct influence on waste management practices, infrastructure availability, and the efficiency of service delivery, thus reinforcing the connection identified in this research. Additional research by Dladla and Nhamo (2021) shows that markets located in densely populated and peri-urban areas often face poorer waste management outcomes because of logistical challenges, uneven distribution of infrastructure, and higher rates of waste production. Similarly, the United Nations Development Programme (2022) emphasizes that waste management issues are often specific to their locations, necessitating tailored and decentralized policy solutions rather than one-size-fits-all strategies. This affirms that waste management initiatives in Port Harcourt markets need to be customized to reflect the distinct spatial and operational attributes of each market setting. In summary, the results indicate that even though institutional structures and waste management systems are in place, their success is considerably hindered by insufficient source separation, ongoing informal disposal methods, and spatial inequalities among market locations. These findings underscore the necessity for a more cohesive approach that integrates infrastructure development with strategies for behavioral change, enhanced enforcement practices, and planning that is specific to each location to improve the overall efficiency and sustainability of urban waste management systems.

Conclusion

The study's results lead to the conclusion that the waste produced in the chosen markets is mainly made up of organic materials like food leftovers, fruits, and vegetables, along with a considerable amount of plastics, packaging items, and paper waste, while electronic waste appears in much smaller amounts. This implies that the market activities in the Port Harcourt area are heavily influenced by food sales and trading, which significantly shapes the type of waste created. In

relation to waste management methods and strategies, the research concludes that several systems are presently implemented, such as the availability of waste bins, regular waste collection services, maintenance of drainage systems, and centralized disposal sites. However, these initiatives have only modest effectiveness due to poor practices in source segregation, irregular enforcement measures, and ongoing dependence on informal disposal practices like open dumping. This highlights that although the frameworks exist, their operational efficiency is quite limited. Concerning the participation of stakeholders, the study finds that overall engagement is moderate. Market unions and governmental bodies exhibit relatively more robust participation in organizing and overseeing waste management efforts, whereas private waste management companies, NGOs, vendors, and consumers have shown inconsistent or weak involvement, particularly in financial support and appropriate waste disposal practices. This disparity in participation plays a significant role in contributing to problems within the system.

Lastly, the research identifies that contemporary waste management strategies have a strong, positive correlation with successful waste management results, suggesting that better adoption of modern practices leads to improved cleanliness and efficiency in waste handling. However, there is a lack of significant alignment between the types of waste and the strategies employed, indicating a discrepancy between the characteristics of waste produced and the methods currently in use. In summary, the study concludes that while waste management in Port Harcourt markets is functioning, it is not fully effective due to behavioral shortcomings, insufficient stakeholder coordination, inadequate waste segregation practices, and a poor match between waste generation patterns and management strategies.

Recommendations

1. Governmental organizations, like RIWAMA, along with market authorities, should increase the implementation of modern waste management technologies and practices, which include mandatory waste segregation at the source, digital tracking of waste collection, and organized recycling systems. This will ensure that waste management practices are in line with the major waste types (organic and plastics) found in the study.
2. A more robust public-private-community partnership should be established, involving market unions, vendors, NGOs, and private waste management companies. Moreover, the enforcement of sanitation regulations needs to be strengthened, particularly concerning proper waste disposal into designated bins, with penalties for non-compliance and rewards for compliance, to enhance behavioral participation and the sustainability of waste management practices.

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