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The Evaluation of Waste Management Practices of Rivers State Waste Management Agency (RIWAMA)

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ABSTRACT

This study critically evaluates the waste management practices of the Rivers State Waste Management Agency (RIWAMA) based on perceptions and experiences of 420 residents in Port Harcourt and its environs. Using a structured questionnaire, the research assessed household access to waste collection services, adequacy of infrastructure, frequency of collection, safety compliance, and equity in service delivery. Results show that 58.8% of respondents live in rented properties, 42.4% reside in single rooms, and 46.7% are students, highlighting a predominance of low-income, high-density households. A significant 71.9% use polyethylene bags for primary waste storage, while 65.9% believe RIWAMA provides insufficient waste receptacles. Additionally, 57.6% indicated that waste collection vehicles are inadequate, and 48.6% stated that RIWAMA does not adhere to proper collection timing. Although 60.5% agreed that waste is handled with adequate safety, concerns remain over irregular service delivery, inaccessibility of some areas, and lack of community engagement. The study concludes that RIWAMA's efforts are hindered by infrastructural limitations, poor policy enforcement, and weak stakeholder collaboration. It recommends expanding waste collection logistics, enhancing public awareness, promoting community ownership, and adopting inclusive, data-driven strategies for improved environmental health and sustainable urban waste management.

Keywords: Waste Management, household waste, Environmental Sanitation, Waste collection and disposal, Public Health and Environmental Management, Urban Governance

INTRODUCTION

Solid waste management (SWM) remains one of the most pressing urban environmental challenges facing developing countries today. With rapid urbanization, population growth, and increasing consumerism, cities across the Global South are witnessing unprecedented volumes of municipal solid waste, much of which goes unmanaged or is poorly handled. Effective waste management is not only central to maintaining public health and environmental sustainability but also plays a vital role in promoting aesthetic urban environments and economic growth (UN-Habitat, 2020; World Bank, 2018; Ogboeli, et al., 2024). In Nigeria, the waste management sector has long struggled with inefficiency, underfunding, poor infrastructure, and institutional fragmentation, with consequences ranging from blocked drainage systems and flooding to disease outbreaks and environmental degradation (Adelekan, 2012; Ogbonna et al., 2015, Ogboeli, et al., 2025).

Rivers State, located in the oil-rich Niger Delta region, is one of Nigeria's most industrialized and densely populated states, with an estimated population exceeding 7 million people (National Population Commission [NPC], 2023). Its capital city, Port Harcourt, is a major economic hub and home to several industries, ports, and businesses. This level of urbanization and industrialization has led to high waste generation rates, placing enormous pressure on municipal waste systems. According to Eze et al. (2021), Port Harcourt alone generates

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over 1,000 metric tonnes of waste daily, yet significant proportions of this waste end up in unauthorized dump sites, street corners, and open drains due to systemic inadequacies.

The Rivers State Waste Management Agency (RIWAMA) was established by the state government to address these challenges and implement a structured and sustainable waste management framework. The agency is responsible for street sweeping, refuse collection, waste evacuation, disposal operations, and public sensitization campaigns on sanitation and hygiene (RIWAMA, 2020; Ogboeli, et al., 2024). RIWAMA operates through a zonal contractor model, engaging private operators to manage waste collection in designated zones across the state. The agency also partners with other government institutions, the media, and community-based organizations to promote compliance with sanitation laws and encourage citizen participation.

Despite its foundational efforts, RIWAMA's effectiveness has come under scrutiny in recent years. Numerous studies and local reports have documented persistent challenges such as irregular waste collection, poor coverage in peri-urban and informal settlements, limited waste segregation, and reliance on unsanitary open dumping (Nduka & Emenike, 2021; Ogbonna et al., 2021; Ogboeli, et al., 2025). In many parts of Port Harcourt and surrounding communities, waste is left uncollected for days or weeks, leading to unsightly heaps, odor nuisance, and blocked drains. This has contributed to frequent flooding during the rainy season and increased incidences of waterborne diseases such as cholera and typhoid (Ideriah & Stanley, 2020).

Furthermore, RIWAMA's operational approach has been criticized for being reactive rather than strategic. While the agency has invested in refuse trucks, mobile bins, and public awareness campaigns, its waste management strategy still largely focuses on collection and disposal, with limited emphasis on waste minimization, recycling, and resource recovery (Okeniyi & Anwan, 2022; Ogboeli, et al., 2025). This linear "collect-and-dump" model is not aligned with modern integrated solid waste management (ISWM) frameworks that prioritize waste reduction, reuse, and recycling (Wilson et al., 2012). The absence of material recovery facilities (MRFs), composting systems, or formal recycling programs further limits the state's capacity to reduce landfill dependency and environmental impact.

Another critical gap lies in the area of community involvement and public participation. Sustainable waste management systems are people-centered and depend heavily on behavioral change, citizen compliance, and inclusive governance. However, studies have found that many residents in Port Harcourt are either unaware of proper waste disposal practices or lack access to affordable and convenient waste services (Achi et al., 2022; Ogboeli, et al., 2025). Moreover, the agency's enforcement mechanisms, though existent, are often weak or inconsistently applied, resulting in poor adherence to sanitation regulations.

In light of these issues, there is a compelling need to systematically evaluate RIWAMA's waste management practices. Such an evaluation should assess the agency's efficiency, coverage, infrastructure, community engagement, environmental sustainability, and alignment with best practices and national/international standards. By doing so, stakeholders, including government officials, environmental experts, civil society, and the private sector, can identify policy and operational gaps, enhance institutional performance, and move toward a more sustainable and inclusive waste management system in Rivers State.

This study therefore, seeks to critically evaluate the practices of RIWAMA with the aim of determining their effectiveness in managing urban solid waste and improving environmental health in Rivers State. The evaluation will contribute to the literature on urban waste governance in Nigeria and offer practical recommendations for improving waste management practices, especially in fast-growing urban centers.

MATERIALS AND METHODS

Rivers State is located within the South-South geopolitical zone of Nigeria, encompassing an area of 11,077 square kilometers (4,277 square miles) and positioned at coordinates 4°45′N 6°50′E. The state is bordered to the south by the Atlantic Ocean, while to the north, it shares boundaries with Imo, Abia, and Anambra States. To the east, it is adjacent to Akwa Ibom State, and to the west, it is bordered by Bayelsa and Delta States. The Port Harcourt local government area is part of the Greater Port Harcourt region, situated at Latitude 4° 46' 38.71" N and Longitude 7° 00' 48.24" E, with UTM coordinates of 32N 279660.2215768 and

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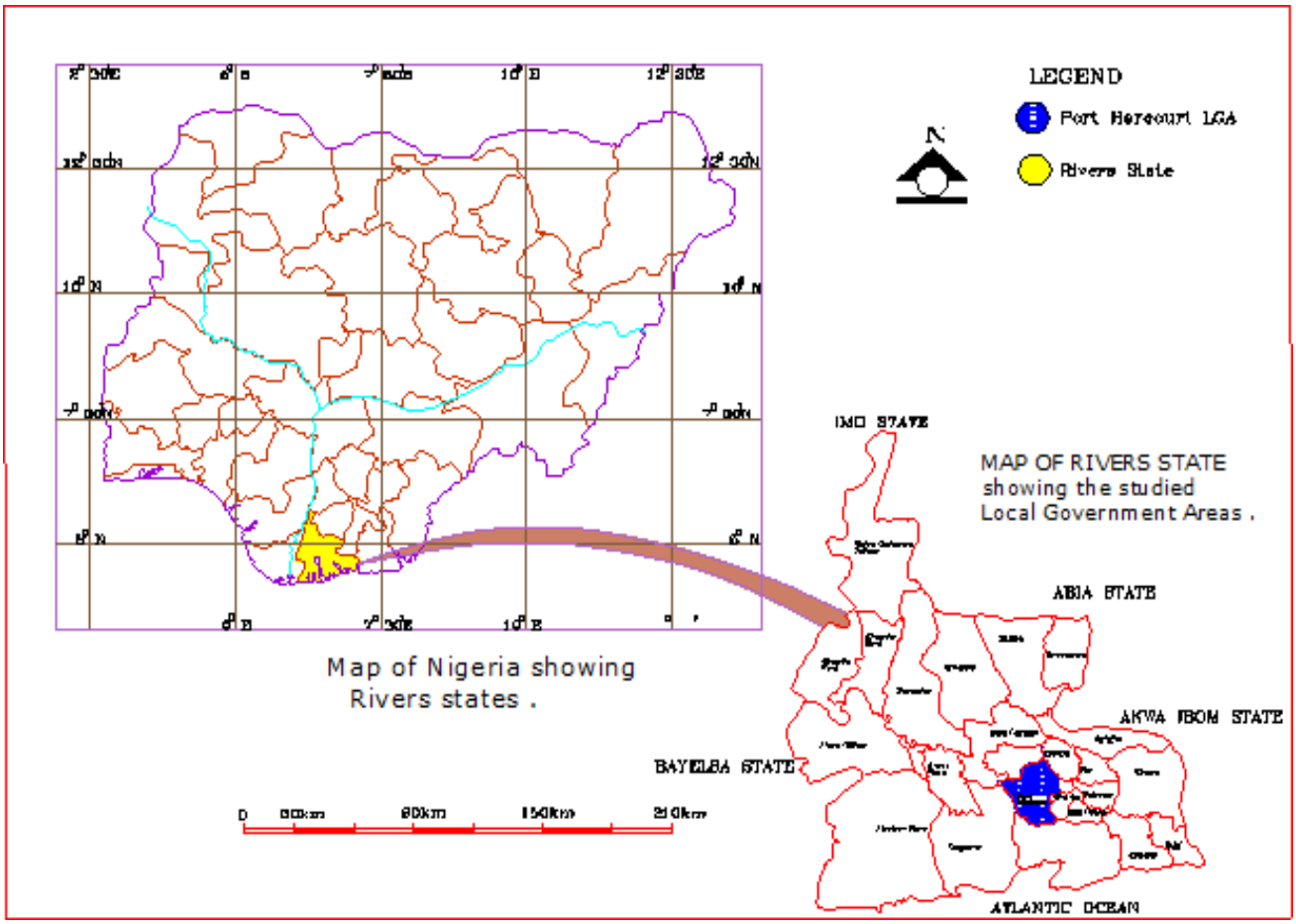
528378.96126353. This area is approximately 52 kilometers (32 miles) southeast of Ahoada and around 40 kilometers (25 miles) northwest of Bori. It is bordered to the south by Okrika, to the east by Eleme, to the north by Obio-Akpor, and to the west by Degema. The total area of Port Harcourt is 109 square kilometers (42 square miles), with a population density of 5,856.5 individuals per square kilometer (15,168 per square mile).



The population of the study is made up of all the inhabitants of Port Harcourt metropolis. This is because everybody generates and disposes refuse. Port Harcourt, the study area is the capital of Rivers State Nigeria, with area coverage of about 12,000Ha (NDDC, 2003). The population of the area is estimated at 1,200,000 million using a projection of 2.8 percent growth rate of the 1991 population figure (NPC, 1991). The population sample consisted of 450 people living very close to noticeable waste receptacles or dumping sites in the selected study areas in the metropolis. A simple random sampling technique was used to select respondents for the study. Nzeneri (2002) states that the technique is unbiased since each person, event, object or thing in the population is given equal opportunity of being selected for the study.

Zones	Area of Coverage	Location of receptacles
Zone 1	Choba – Rumuokwuta Checkpoint, Location – Mechanic (Ada Geroge Road), Ozuoba to Rumuolumeni	After 7, Okiltin Drive, Ozuoba Junct, Mini Olu Junct, Arcania Junct, Rumuepirikom Police Station, Agip Estate, Mechanic Junct, Rumukwuchi, CPS Ogbogoro, Isi-ewu Ogbogoro Junct, Egbelu, St Johns, Aka Junct, Big Tree
Zone 2	Mile 1 – Rumuodumaya (Ikwerre Road)	Ameachi Bus Stop, St. Thomos, Mile 3 Park, Custom Gate, School of Health, Market Junct, kala Police Station, Sevendays Adventist Church, MCC Main Gate, Rumuodumaya.
Zone 3	Mile 1 – Eleme Junction (Aba Road)	Oil-mill Junct, MTN, Rumuokrushi Junct, Shell Junct, Genesis, Market Junct, First Bank, INEC Office, St. Johns, Garrison, CFC, FRSC,

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Zone 4	Mile 1 – Borokiri (PH Township)	Mile one flyover, Station Road, Spar Super Market, Borokiri Township Market, Aggrey by Degema, Aggrey Extension, Aggrey by Okirika
Zone 5	Garrison - Elelenwo	Garrison, Nkpogwu, Bewac Junct, Mother Cat, Ordinance, Slaughter, New Road Extension, RSTV
Zone 6	Choba – Eleme Junction (East West Road)	Odums Junct, Alakahia Junct, Rumuosi Junct, Apara Sec. Sch. Junct, Nkpolu Junct, Bori-camp, Rumukpakolosi, Eliozu Slaughter, Adamac, Tank Junct,

Five (5) receptacles (sample points) were chosen randomly from each zone for questionnaire administration. These questionnaires were rated on a 4-point scale. Fifty (15) questionnaires were administered for each sample points. 450 questionnaires were sampled and 420 retrieved as shown in the table below;

Table showing the Sample size

Zone	**Questionnaires sampled**	**Questionnaire retrieved**
Zone 1	75	70
Zone 2	75	68
Zone 3	75	72
Zone 4	75	71
Zone 5	75	70
Zone 6	75	69
Total		**420**

The study utilizes a questionnaire as its research instrument. Evaluation of Effective Urban Solid Waste Management Questionnaire. (EEUSWM) developed by the researcher. The questionnaire shall be divided into three sections- A., B and C Section A elicits background information about the respondents. Section B seeks information about the respondents' communal behavioral pattern of urban waste management and C sought for 'public health, awareness of urban waste management in Port Harcourt metropolis. Each of the research questions shall have between one and five statements or items to elicit information from the respondents. Respondent were required to indicate their opinion on each item based on Likert five-point scale of Strongly Agreed (SA), Agreed (A) Disagreed (D) Strongly Disagreed (SD) and Undecided (U). Frequencies, Percentages, means (X) and standard deviation (SD) were the statistics used to take decisions on various research questions.

Ethical Considerations

Ethical clearance was obtained from the relevant institutional review board. Participation was voluntary, and informed consent was obtained from all respondents. Confidentiality of participants' information was maintained throughout the study.

RESULT

Gender Distribution of Respondents and Its Implications for Waste Management Awareness

The gender distribution of respondents, as revealed in Fig. 1, 32.4% male and 67.6% female, highlights a significant female dominance in participation, which aligns with patterns observed in environmental and household sanitation studies across sub-Saharan Africa. Women often serve as primary caregivers and are more directly involved in domestic waste management tasks such as collection, sorting, and disposal (UN-Habitat,

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2020). This heightened involvement likely explains their greater responsiveness and representation in WASH-related surveys. The findings underscore the critical role of women in shaping effective waste management practices. According to Afon (2012), women's proximity to household waste equips them with practical insights, making their participation essential in designing inclusive and sustainable sanitation solutions. However, the relatively lower male participation suggests a gender gap in awareness or engagement, reflecting cultural norms that often assign sanitation responsibilities to women (Aniah & Eja, 2015). This gender disparity calls for deliberate strategies to promote shared responsibility. Enhancing male involvement through targeted sensitization and encouraging their participation in community waste initiatives can foster more balanced engagement. Ultimately, integrating both male and female perspectives is vital for achieving effective, equitable, and sustainable waste management outcomes.

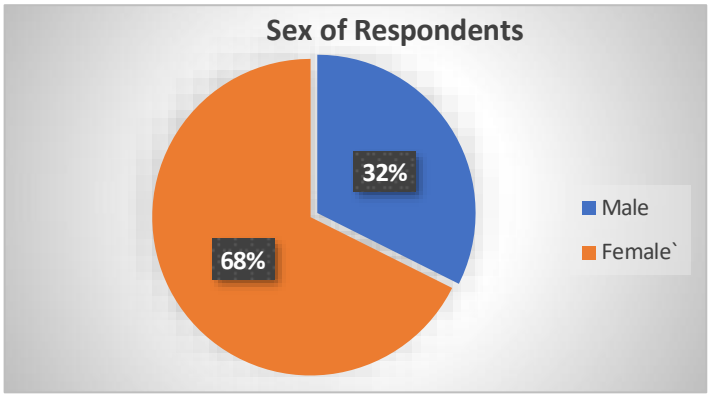

Fig. 1: Sex of Respondent

Age of Respondents

The age distribution of respondents reveals in Table 1 that the majority (44%) fall within the 21–30 age group, followed by 25% in the 10–20 age bracket, 17.6% between 31–40 years, and 13.3% aged 41 and above. This data suggests that younger individuals, particularly those between 10 and 30 years old, constitute a significant portion (69%) of participants in the study. This trend aligns with Nigeria's youthful demographic profile, where over 60% of the population is under the age of 30 (National Population Commission [NPC], 2023). The active participation of youths in the survey is encouraging, as they represent a dynamic force for change in environmental practices. Young people are more likely to be aware of and responsive to environmental issues, especially when engaged through schools, social media, and community-based campaigns (UNICEF, 2021). Their involvement is critical for the sustainability of waste management initiatives, as they can act as change agents in their homes and communities (Ajani & Tunde, 2020). Conversely, the relatively low participation from those aged 41 and above may reflect lower engagement or awareness of formal waste management processes, highlighting the need for inclusive awareness programs that target all age groups.

Table 1: Showing the Age of respondents

Age	**Frequency**	**Percentage**
10-20	105	25.0
21-30	185	44.0
31-40	74	17.6
41 and above	56	13.3
Total	**420**	**100**

Educational Status of Respondents

The data reveals that 48.8% of respondents had secondary education, followed by 26.7% with primary

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education, 20.5% with tertiary education, and 4.0% with no formal education. This suggests that a majority of the study population possesses at least basic literacy and comprehension skills, which are crucial for understanding and participating in waste management initiatives. The dominance of secondary education indicates a relatively informed community that can benefit from awareness campaigns and environmental education (UNESCO, 2021). The presence of 20.5% with tertiary education is promising, as this group may provide leadership and innovation in local sanitation efforts. However, the 26.7% with only primary education and the 4.0% with no formal education highlight a segment of the population that may face challenges in fully engaging with written sanitation guidelines or policy directives, emphasizing the need for inclusive, non-text-based communication methods such as visual aids and oral messaging (Adeyemo & Agunbiade, 2019). Educational attainment is a strong determinant of environmental behavior. As affirmed by Ajaero and Anokye (2018), individuals with higher education levels are more likely to adopt safe waste disposal practices. Therefore, WASH programs must tailor strategies to accommodate varying literacy levels within the community.

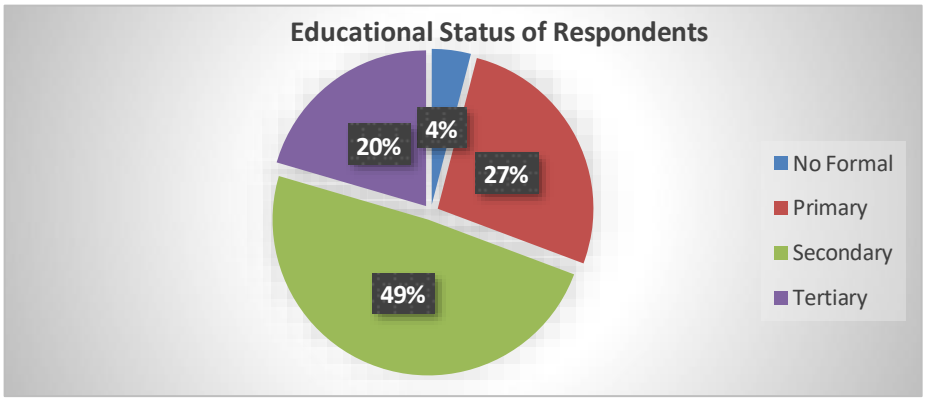

Fig. 2: Educational Status of Respondents

Occupation of Respondents

The occupational profile of respondents shows that the majority are students (46.7%), followed by business persons (29.5%), others (14.8%), and civil servants (9.0%). This distribution indicates a strong representation of youth and economically active individuals, especially students and informal business operators, who are often at the frontline of waste generation and disposal in urban communities (UN-Habitat, 2020). The high percentage of student respondents reflects the youthful demographic structure of Nigeria and highlights the importance of integrating environmental education into school curricula. As observed by Okpala and Chukwu (2017), students can serve as effective change agents in promoting responsible waste practices when adequately informed and engaged through academic and community-based activities. The significant proportion of business respondents underscores the relevance of targeting market and informal sector waste contributors in waste management planning. According to Adegoke and Oladipo (2019), informal businesses generate a substantial portion of municipal solid waste and often lack access to formal waste services. The relatively low number of civil servants (9%) suggests limited government representation in the sample, which may have implications for public sector engagement in sanitation advocacy. Strengthening partnerships between government agencies, student bodies, and local businesses is essential for inclusive and sustainable waste governance.

Table 2: Showing the Occupation of respondents

Occupation of Respondents	**Frequency**	**Percentage**
Civil Servants	38	9.0
Students	196	46.7
Business	124	29.5

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Others	62	14.8
Total	**420**	

Household Characteristics and Waste Generation

Type of Residential Property

The data indicates that 42.4% of respondents live in single rooms, followed by 28.1% in flats, 22.1% in duplexes, and 7.4% in detached houses. The high proportion of residents in single rooms suggests a prevalence of low-income, high-density housing in the study area, which has significant implications for waste management. Overcrowded living conditions are often associated with poor waste disposal practices due to inadequate storage space, limited access to waste services, and shared sanitation facilities (Akinbami et al., 2020; Ogboeli, et al., 2025). Flats and duplexes, which collectively account for about 50.2%, are more likely to have better infrastructure, including designated waste bins and formal collection services (Adegoke & Olatunji, 2019). However, disparities in property type reflect socio-economic inequalities that can influence the efficiency and equity of waste management efforts. Tailored interventions are needed to ensure inclusive sanitation access, especially for occupants of single rooms and informal settlements.

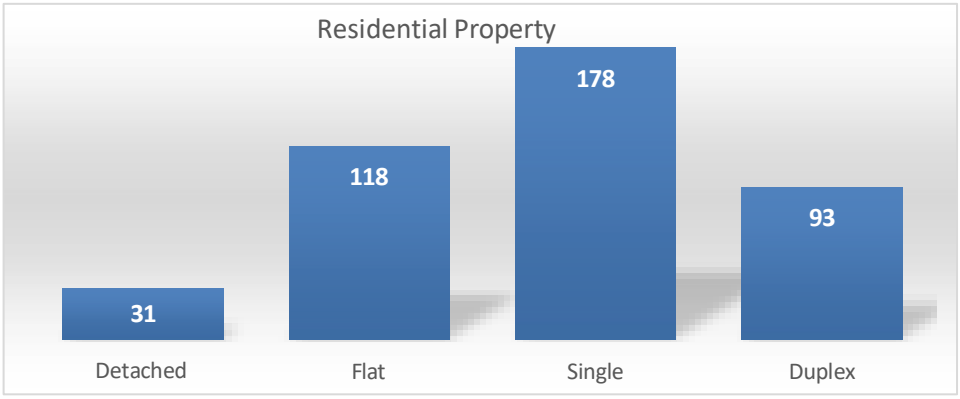

Fig. 3: Type of Residential Property

Type of House Ownership

The data shows that 58.8% of respondents live in rented accommodation, while 30.7% are homeowners and 10.5% reside in council-owned houses. The dominance of rented properties suggests that a significant portion of the population may have limited control over waste management infrastructure, such as waste bins, drainage, and sanitation facilities. Renters often rely on landlords for such provisions, and absentee or negligent landlords can result in poor WASH (Water, Sanitation, and Hygiene) outcomes (Afon, 2012). Homeowners, on the other hand, are more likely to invest in and maintain proper waste management systems, given their long-term stake in the property. The presence of council housing also implies government involvement, though past studies indicate that public housing often suffers from overcrowding and underfunded waste services (Ogu, 2000). These findings underscore the need for policy enforcement targeting landlords and local councils to ensure that waste infrastructure is adequate, regardless of ownership status.

Table 3: Showing the type of House ownership of Respondents

House Ownership	**Frequency**	**Percentage**
Owned	129	30.7
Rented	247	58.8
Council House	44	10.5
	420	**100**

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Number of Respondence per Apartment

The household size distribution reveals that 64.5% of respondents live in households with 4–6 persons, followed by 26.7% with 1–3 persons, and 8.8% with 7 or more members. This suggests that medium-sized households are the norm in the study area, aligning with national trends in Nigeria where the average household size is approximately 5 persons (National Bureau of Statistics [NBS], 2021). Larger households (4–6 members and above) often generate more waste, placing pressure on available sanitation infrastructure if waste collection systems are inadequate (Afon, 2012). In such settings, overcrowding can lead to improper waste disposal, especially when space for storage or bins is limited. Smaller households, while easier to manage, still require consistent access to waste services to maintain hygiene standards.

These findings emphasize the need for household-targeted waste policies and infrastructure development that consider family size, especially in high-density urban areas where shared facilities are common.

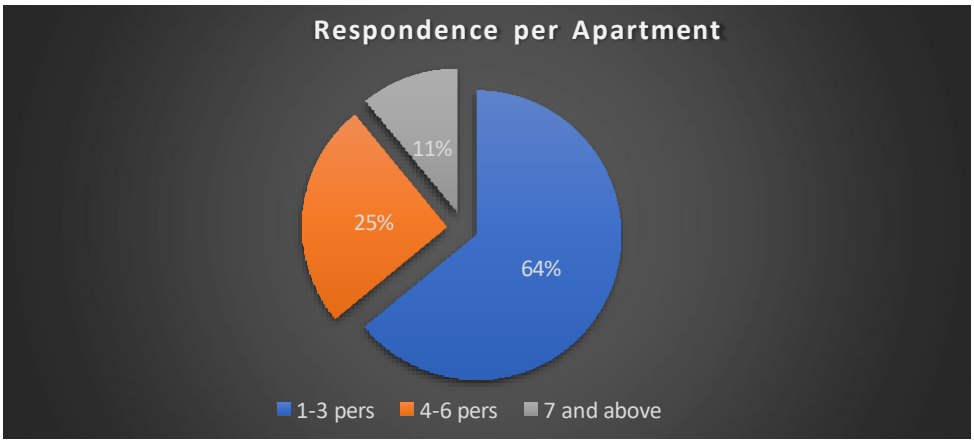

Fig. 4: Respondence per Apartment

Primary Waste Storage

The data indicates that 71.9% of respondents use polyethene bags as their primary waste storage method, followed by 25.2% using old buckets, 2.4% using sanitary bins, and 0.5% using baskets. The widespread reliance on polyethylene bags highlights a common but unsustainable waste storage practice in many Nigerian urban settings. While polyethylene bags are affordable and easily accessible, they are non-biodegradable and often disposed of improperly, contributing significantly to environmental pollution and drainage blockages (Ogunyemi & Adewole, 2017). The low usage of sanitary bins (2.4%) suggests limited awareness or affordability of more hygienic and environmentally friendly storage methods. Similarly, the use of old buckets (25.2%) reflects an improvised approach to waste containment in the absence of formal bins, particularly in low-income households (Adeleke et al., 2020; Ogboeli, et al., 2025). These findings underscore the need for public education on sustainable waste storage and increased access to affordable waste bins through local government support or community-based initiatives.

Table 4: Showing the Primary waste storage of respondents

Primary waste storage	**Frequency**	**Percentage**
Polyethene bag	302	71.9
Basket	2	0.5
Sanitary bin	10	2.4
Old bucket	106	25.2
Total	**420**	**100**

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Periodicity of Waste Disposal

The data in Table 5 shows that 46.0% of respondents dispose of waste once a day, while 45.2% do so once every two days. A smaller proportion disposes of waste once every three days (6.4%) and once a week (2.4%). This high frequency of daily or alternate-day disposal suggests a significant volume of household waste generation and indicates a potential awareness among residents about the need to avoid waste accumulation (Afon, 2012). Frequent waste disposal is vital in preventing environmental and health hazards, especially in densely populated urban areas where poor storage can lead to vector infestation and water contamination (UN-Habitat, 2020). However, the 8.8% who dispose of waste only once in three days or weekly may reflect poor access to waste collection services or lack of proper storage facilities. This underscores the need for improved waste collection infrastructure and education to support regular and hygienic waste disposal practices.

Table 5: Showing the Periodicity of waste disposal of respondents

Periodicity of waste disposal	**Frequency**	**Percentage**
Once a day	193	46.0
Once in two days	190	45.2
Once in three days	27	6.4
Once a week	10	2,4
Total	**420**	**100**

Evaluation of Waste Management Practice

Question 1: Collection of household waste is regular?

Figure 5 reveals that a majority of respondents either strongly agreed (42.9%) or agreed (29.0%) that household waste collection is currently being undertaken in their area. Conversely, 16.9% strongly disagreed and 11.2% disagreed, indicating dissatisfaction or absence of collection services in some locations. This mixed response suggests that while waste collection services exist in parts of the community, coverage and efficiency may be uneven or inconsistent (Adeleke et al., 2020).

The relatively high agreement levels (71.9% combined) reflect some level of functionality within the Rivers State Waste Management Agency (RIWAMA), but the 28.1% dissent underscores lingering service delivery gaps. Poor road accessibility, irregular collection schedules, and lack of proper waste bins are common challenges that affect collection efficiency in Nigerian urban centers (Ogwueleka, 2009; Ogboeli, et al., 2025). To improve coverage, RIWAMA may need to expand operations, enhance public engagement, and adopt inclusive strategies tailored to underserved areas.

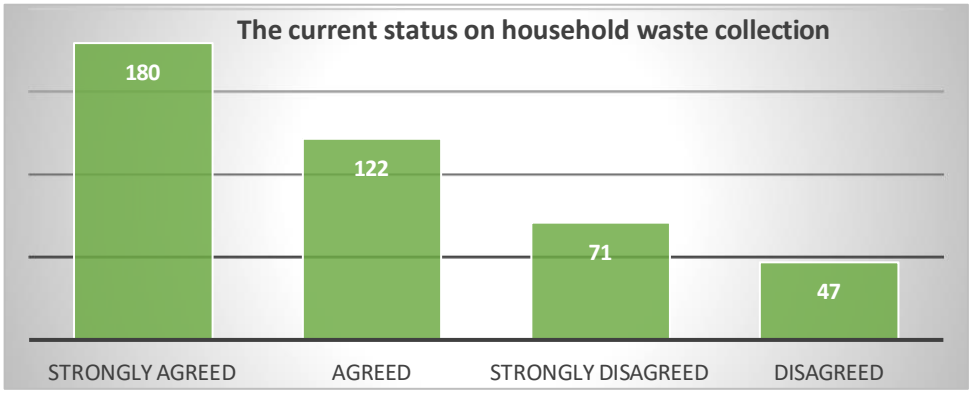

Fig. 5: The current status of household waste collection

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Question 2: The RIWAMA is not providing collection service, as I belong to a low-income area

Table 6 shows that a significant proportion of respondents, 43.1% strongly agreed and 23.3% agreed, that the lack of waste collection facilities in their area is due to low-income status. In contrast, 17.1% strongly disagreed and 16.4% disagreed, indicating mixed perceptions. The majority agreement (66.4%) underscores a recurring issue in many urban Nigerian settings where low-income communities are often underserved by municipal waste services due to infrastructural neglect, poor planning, or perceived inability to pay for services (Afon, 2012; Nzeadibe & Eziuzor, 2016; Dimkpa et. al. 2025). These areas may lack formal waste bins, regular collection schedules, or accessible waste disposal points, leading to indiscriminate dumping and associated health risks. Socioeconomic inequality plays a critical role in determining the availability and quality of environmental services, including waste management. Addressing this disparity requires pro-poor policy frameworks and targeted investments to ensure equitable access to sanitation infrastructure in low-income communities.

Table 6: Showing a lack of waste collection facilities in low-income areas

	Frequency	**Percentage**	**Valid perc.**
Strongly agreed	181	43.1	43.1
Agreed	98	23.3	23.3
Strongly disagree	72	17.1	17.1
Disagreed	69	16.4	16.4
Total	**420**	**100**	

Question 3: Unable to provide the collection service as our area is inaccessible to the collection vehicle

The findings reveal a divided perception regarding RIWAMA's household waste collection service. While 29.0% agreed and 28.6% strongly agreed that inaccessibility of their area prevents waste trucks from collecting waste, a larger portion, 42.3% believe their areas are accessible yet RIWAMA fails to collect waste. This suggests that, beyond logistical barriers like poor roads or narrow pathways, there may be institutional inefficiencies or operational neglect affecting service delivery (Ogwueleka, 2009; Adebayo & Ojo, 2015). Urban informal settlements often face exclusion from municipal services due to planning oversights or assumptions about service affordability (UN-Habitat, 2020). However, the 42.3% who report accessible areas but no waste collection point to deeper governance issues such as lack of accountability, inadequate resources, or irregular waste schedules. Improving RIWAMA's performance requires better mapping of service zones, stakeholder engagement, and investment in small-scale waste collection options tailored to underserved but accessible communities.

Fig. 6: Lack of waste collection due to inaccessibility

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Question 4: Waste is collected each day at a fixed time

The findings from the bar chart indicate that a majority of respondents, 30.9% strongly agreed and 28.8% agreed, believe that household waste collection by RIWAMA does not follow a consistent schedule. Conversely, 21.7% disagreed, and 18.6% expressed uncertainty or held differing views. This suggests that approximately 59.7% of the respondents perceive irregular or unpredictable waste collection practices, which may lead to waste accumulation and unsanitary living conditions (Afon, 2012; Ogbonna et al., 2007; Ogboeli, et al., 2025). Irregular waste collection undermines public confidence in municipal services and contributes to environmental degradation, especially in urban areas where timely collection is essential to prevent disease outbreaks and pollution (Nzeadibe, 2013). The inconsistency may stem from limited trucks, poor route planning, or management lapses within RIWAMA. To address this, structured schedules, public sensitization, and investment in fleet expansion or alternative waste pickup models could enhance reliability and accountability in waste management.

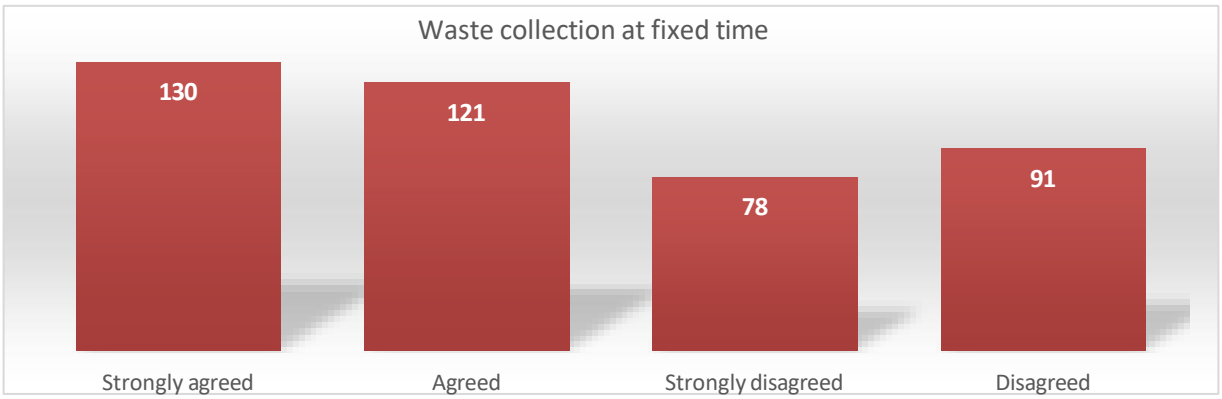

Fig. 7: Waste collection at fixed time

Question 5: There is certainty in the waste collection service of RIWAMA

Table 7 reveals mixed perceptions regarding the certainty and reliability of waste collection services provided by RIWAMA. While 19.0% strongly agreed and 23.3% agreed that there is no uncertainty in service delivery, a larger proportion, 29.3% strongly disagreed and 28.3% disagreed, believe the service is unpredictable or inconsistent. This indicates that 57.6% of respondents lack confidence in RIWAMA's regularity, highlighting operational inefficiencies or poor communication regarding collection schedules (Adewumi et al., 2014; Nzeadibe & Eziuzor, 2016).

Uncertainty in municipal waste collection is a common problem in urban Nigeria, often due to inadequate infrastructure, low funding, and insufficient manpower (Ogwueleka, 2009; Ogboeli, et al., 2025). When residents are unsure of collection times, it can lead to indiscriminate dumping and health risks, particularly in densely populated areas. Addressing these challenges requires RIWAMA to improve its service transparency, establish consistent waste pickup schedules, and engage more actively with communities.

Table 7: Showing no uncertainty in the waste collection service of RIWAMA

	Frequency	**Percentage**	**Valid percent.**
Strongly agreed	80	19.0	19.0
Agreed	98	23.3	23.3
Strongly disagree	123	29.3	29.3
Disagreed	119	28.3	28.3
Total	**420**	**100**	

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Question 6: The waste collection worker is handling waste with adequate safety precautions

The findings from the bar chart reveal a near-even split in public perception regarding the safety practices of waste collection workers under RIWAMA. A combined 59.8% of respondents (30.0% agreed; 29.8% strongly agreed) believe that waste is handled with adequate safety precautions, suggesting some level of operational compliance with occupational health standards. However, a significant minority, 21.2% disagreed and 19.0% strongly disagreed, indicating concern that waste is sometimes handled carelessly, even describing the process as being carried out like "kids play."

These perceptions reflect broader concerns in Nigeria about the lack of adequate training, protective gear, and professional protocols for waste handlers (Afon, 2012; Nzeadibe & Anyadike, 2012). Poor handling increases the risks of injury, infection, and environmental contamination. Therefore, to improve public confidence and worker safety, RIWAMA should implement stricter health and safety measures, including regular training, provision of personal protective equipment (PPE), and supervision.

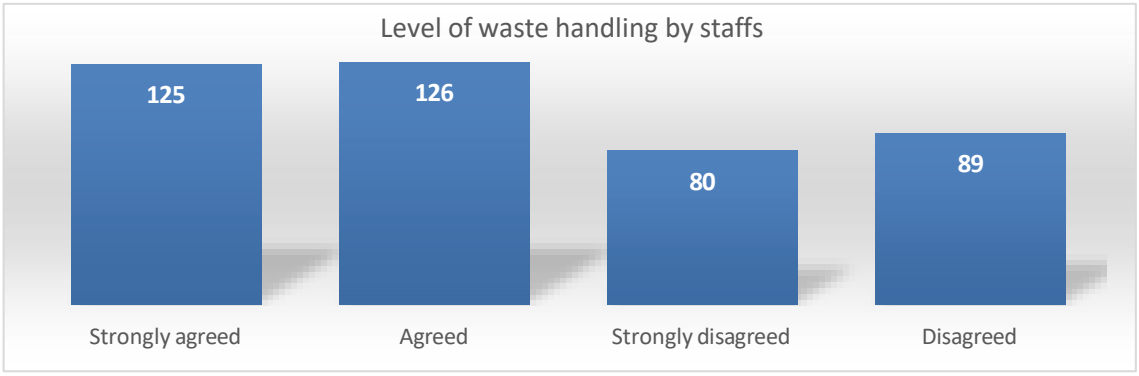

Fig. 8: Level of waste handling by staff

Question 7: Do waste collection staff wear gloves and masks to avoid direct contact with waste

Table 8 shows that a majority of respondents (57.6%), 27.1% strongly agreed, and 30.5% agreed, believe that RIWAMA staff comply with safety requirements during waste collection. However, a significant 42.4% (19.8% strongly disagreed; 22.6% disagreed) expressed skepticism or dissatisfaction with the level of safety compliance. This divided opinion suggests inconsistent implementation of safety protocols, likely stemming from disparities in training, availability of protective equipment, and enforcement of standard operating procedures. According to Ogwueleka (2009), adherence to safety measures is critical for protecting waste workers from hazards such as sharp objects, toxic substances, and disease exposure. Moreover, the World Health Organization (WHO, 2015) emphasizes that occupational safety is an essential component of sustainable waste management. Therefore, RIWAMA must improve monitoring systems, ensure all field staff are adequately equipped and trained, and address public concerns to enhance both worker welfare and public trust.

Table 8: Showing complaints about safety requirements

	Frequency	**Percentage**	**Valid perc.**
Strongly agreed	114	27.1	27.1
Agreed	128	30.5	30.5
Strongly disagree	83	19.8	19.8
Disagreed	95	22.6	22.6
Total	**420**	**100**	

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Question 8: The RIWAMA is providing waste receptacles for each zone

Table 9 highlights mixed perceptions regarding the provision of waste receptacles by RIWAMA across different zones in Rivers State. While 24.3% of respondents strongly agreed and 18.8% agreed that receptacles were provided, a slightly higher proportion, 27.6% strongly disagreed and 28.8% disagreed, believed otherwise. This indicates that over 56% of residents feel waste receptacle coverage is inadequate, which may contribute to indiscriminate dumping and poor sanitation practices. This finding aligns with prior studies noting that the lack of strategically placed and adequately maintained waste bins is a major hindrance to efficient urban waste management in Nigeria (Nzeadibe & Eziuzor, 2016; Achi et al., 2021; Ogboeli, et al., 2025). Proper waste receptacle placement encourages hygienic disposal habits and reduces environmental pollution. RIWAMA needs to improve receptacle distribution, particularly in underserved areas, and involve communities in siting decisions to enhance coverage and accessibility.

Table 9: Showing the provision of receptacles for its zone by RIWAMA

	Frequency	**Percentage**	**Valid perc.**
Strongly agreed	102	24.3	
Agreed	79	18.8	
Strongly disagree	116	27.6	
Disagreed	121	8.8	
Total	**420**	**100**	

Question 9: The number of receptacles provided in municipal areas is insufficient

The data shows that 65.9% of respondents (277 out of 420) believe that household waste receptacles provided by RIWAMA are highly insufficient, while only 34.5% disagreed with this assertion. This significant disparity underscores a serious shortfall in waste collection infrastructure, particularly at the household level. Insufficient receptacles can lead to indiscriminate dumping, clogged drainage systems, and heightened public health risks, especially in densely populated areas (Afon, 2012). This finding echoes studies by Ogbonna et al. (2007) and Nzeadibe (2009), which highlight the critical role of waste containers in facilitating proper domestic waste management. When receptacles are lacking, households often resort to open dumping or burning, exacerbating environmental degradation and disease transmission. For RIWAMA to improve service delivery, investments in widespread, durable, and strategically distributed waste bins are essential, alongside public awareness campaigns on proper usage and maintenance.

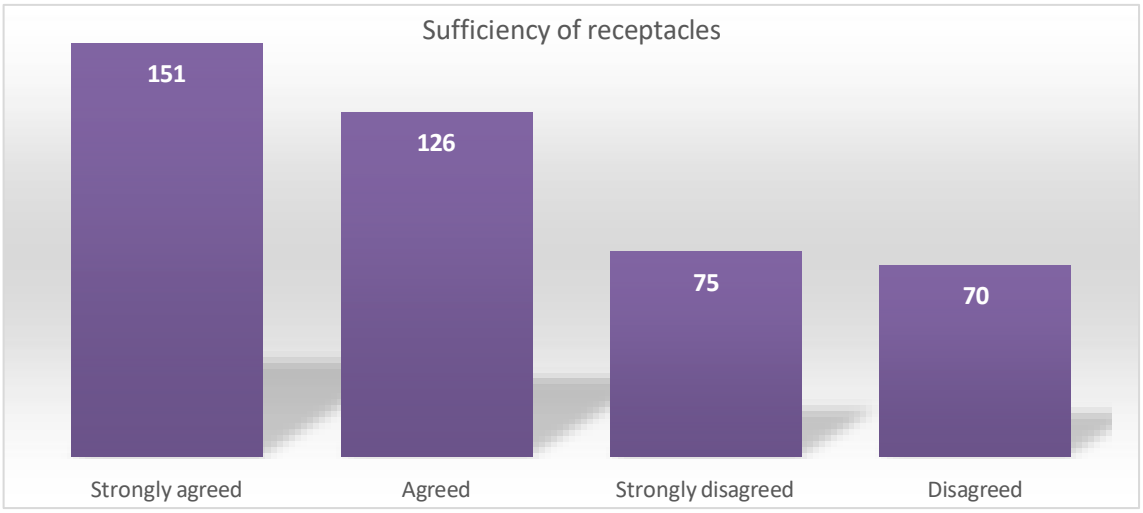

Fig. 9: Sufficiency of receptacles

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Question 10: The installed receptacles have a tap cover to prevent littering of deposited waste

Table 10 reveals that 42.4% of respondents (89 strongly agreed and 89 agreed) affirmed that installed waste receptacles provided by RIWAMA have proper tap (lid) covers, while a slightly higher 57.6% (120 strongly disagreed and 122 disagreed) believed otherwise. This suggests that a majority of residents perceive the receptacles as lacking adequate cover, raising significant concerns about environmental hygiene and public health.

Uncovered waste bins are known to attract pests, emit foul odors, and facilitate the spread of diseases, especially in tropical climates like that of Rivers State (Ugbogu et al., 2020). Additionally, exposure of waste to rain can cause leachate runoff, contaminate water sources and degrade local ecosystems (Afon, 2012). These findings emphasize the need for RIWAMA to ensure all waste receptacles are fitted with durable, secure lids to prevent health hazards and improve community sanitation standards.

Table 10: Showing the tap cover for installed receptacles

	Frequency	**Percentage**	**Valid perc.**
Strongly agreed	89	21.2	
Agreed	89	21.2	
Strongly disagree	120	28.6	
Disagreed	122	29.0	
Total	**420**	**100**	

Question 11: There are adequate machines, trucks, and vehicles to pick up waste at the waste collection centre's

Figure 10 indicates that 57.6% of respondents (242 out of 420) believe that machinery, such as trucks and vehicles, used by RIWAMA for household waste collection, is inadequate, while 42.4% (178 respondents) felt the equipment was adequate. This majority view reflects a perceived deficiency in waste collection logistics, which can lead to irregular pickups, waste accumulation, and illegal dumping in many parts of Rivers State.

According to Achi et al. (2021), insufficient waste transportation resources remain a key obstacle in Nigeria's urban waste management, often resulting from poor maintenance, outdated fleets, or underfunding. The lack of reliable vehicles hinders timely waste evacuation, especially in densely populated or hard-to-reach communities. As supported by Ogbonna et al. (2007), an efficient waste management system requires well-distributed and functioning machinery. RIWAMA must therefore invest in modern waste trucks and expand its operational capacity to improve coverage and service reliability.

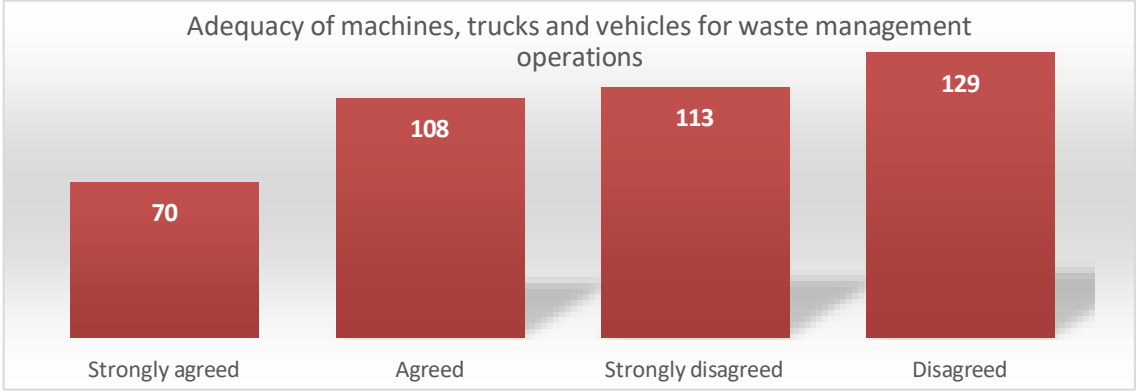

Fig. 10: Adequacy of machines, trucks, and vehicles for waste management operations

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Hypothesis testing

There is no statistically significant reduction in waste volume due to the waste management practice of RIWAMA.

Question 12: The current collection method is satisfactory

Table 11: Showing the level of satisfaction with household waste collection.

Observed Table

A	B	C	D	TOTAL
17	13	25	15	70
21	9	20	18	68
16	14	21	21	72
20	12	18	21	71
10	20	17	23	70
20	10	21	18	69
104	**78**	**122**	**116**	**420**

A	B	C	D
17.3	13.0	20.3	19.3
16.8	12.61	19.8	18.8
17.8	13.4	20.9	19.9
17.6	13.2	20.6	19.6
17.3	13.0	20.3	19.3
17.1	12.8	20.0	19.1

Expected table

$X^2 = \frac{(f_o - f_e)^2}{f_e} = 14.62$

Degree of freedom = 4 – 1=3, 6 – 1= 5, sum total = 15

Degree of freedom = 21.03

Calculated T-value = 14.62

T- critical = 21.03

Arising from this, the calculated Chi-square value is less than the critical Chi-square statistic at the 95% probability level. Hence, we reject the alternate hypothesis(H_1) and accept the null hypothesis (H_0) which states that there is no statistically significant reduction in waste volume due to waste management practice of

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RIWAMA.

CONCLUSION AND RECOMMENDATIONS

This study critically evaluated the waste management practices of the Rivers State Waste Management Agency (RIWAMA), focusing on residents' perceptions and operational challenges in Port Harcourt and its environs. Findings reveal key gaps in household waste collection services, including insufficient provision of waste receptacles, inadequate waste collection machinery, irregular service delivery, and poor compliance with safety standards. A significant portion of the population also perceives inequitable service distribution, especially in low-income or inaccessible areas, reflecting systemic inefficiencies in planning and execution. Despite RIWAMA's efforts, the agency still faces critical obstacles such as limited funding, weak community engagement, and poor infrastructure.

Recommendations

- Strengthen Operational Capacity: RIWAMA should invest in additional waste collection trucks, improve vehicle maintenance, and ensure strategic deployment across all residential zones, including hard-to-reach communities.

- Improve Waste Storage Infrastructure: The agency must provide more household receptacles with secure covers and position community bins at accessible, well-planned locations.

- Promote Community Participation: Engaging local stakeholders, youth groups, and residents in awareness campaigns, monitoring, and waste sorting initiatives will foster a sense of ownership and cooperation.

- Adopt Inclusive Policies: Waste management services must be inclusive, with priority given to marginalized areas. RIWAMA should collaborate with urban planners and local government for equitable service coverage.

- Leverage Technology and Data: Deploy digital tools for route optimization, citizen reporting, and real-time monitoring of waste collection to improve efficiency and transparency.

- Policy and Funding Support: The state government should increase budgetary allocation to the waste sector and explore public-private partnerships for long-term sustainability.

By implementing these recommendations, RIWAMA can enhance its service delivery, promote environmental sustainability, and contribute to public health and urban development goals.

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