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ORIGINAL ARTICLE

WASTE DISPOSAL TECHNIQUES AND PLANNING IMPERATIVES IN PORT HARCOURT METROPOLIS

Bright Chika Ajoku
Department of Geography and Environmental Studies,
Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt, Nigeria.
brightajoku7@gmail.com

Maduka Vivian Ifeoma
Department of Geography and Environmental Studies,
Ignatius Ajuru University of Education, Rumuolumeni, Port Harcourt, Nigeria.
vivianchinweze@yahoo.com

Abstract

Solid waste collection is a crucial aspect of urban sanitation, especially in rapidly growing cities like Port Harcourt, Nigeria. This study investigates the waste disposal techniques in Port Harcourt metropolis. The study was guided by two research question. Using experimental survey research designs, data were collected from 175 solid waste workers employed by service providers to the Rivers State Waste Management Agency (RIWAMA). Findings revealed that the primary source of waste was residential areas (49.1%), followed by institutional, industrial, and commercial sources. Waste composition included food waste (22.3%), plastic (19.4%), sanitary waste (14.3%), and other hazardous materials such as glass and heavy metals. While nearly half of the respondents reported using RIWAMA receptacles for waste disposal, a significant number still engaged in unsafe practices such as open dumping (19.4%) and burning (8.5%). These practices expose waste workers to a range of occupational hazards, including respiratory infections, skin diseases, and musculoskeletal injuries, due to poor handling techniques and lack of personal protective equipment. The study also found that many waste workers operate under informal employment conditions, lacking adequate training, healthcare access, and safety regulations. The research highlights the urgent need for policy interventions, improved waste infrastructure, public education on proper waste disposal, and better protection for waste workers. Strengthening institutional frameworks and promoting source segregation can significantly reduce health risks and improve environmental quality in Port Harcourt Metropolis.

Keywords: Solid Waste, Health Hazard, Waste Workers, RIWAMA, Occupational Safety, Planning Imperatives.

INTRODUCTION

Solid waste collection remains an essential activity worldwide, as waste generation is an inevitable consequence of human existence and daily activities. Collection practices vary across regions and may include the use of plastic or paper bags, mobile bins, drums, and wheeled containers designed for easy transport and storage of waste (UN-Habitat, 2020). The nature of the work demands significant physical effort, often requiring workers to lift, carry, push, or pull heavy waste materials repeatedly, which can contribute to fatigue and

occupational injuries if not properly managed (World Health Organization [WHO], 2022; Ogbonna & Okechukwu, 2021).

With increasing population growth, industrialization, and urban expansion in Port Harcourt in Rivers State, Nigeria, there has been a corresponding rise in the volume of solid waste generated. This surge has created enormous challenges in waste collection, disposal, and management, especially for the workers who are at the frontline of this system.

Solid waste in Rivers State is generated from diverse sources, including households, markets, hospitals, industries, and public institutions. These waste components vary from organic and inorganic materials to hazardous substances like broken glass, medical waste, heavy metals, and decaying food matter (Afon, 2012). Waste workers, both in formal and informal sectors, handle these mixed wastes without proper segregation, exposing them to severe health risks such as respiratory infections, gastrointestinal illnesses, skin diseases, and musculoskeletal disorders (Otitoju et al., 2019).

Moreover, the methods of waste disposal in Port Harcourt remain largely ineffective and unsustainable. While the Rivers State Waste Management Agency (RIWAMA) provides some disposal infrastructure such as receptacles and designated dumpsites, many residents still resort to open dumping, burning, or disposing of waste in unauthorized locations (Nzeadibe & Mbah, 2015). This not only undermines environmental quality but also exacerbates the exposure of waste workers to hazardous substances.

The informal nature of employment for many of these waste workers further compounds their vulnerability. Without access to proper protective gear, training, or health insurance, these individuals operate in unsafe conditions that elevate their risk of infections, injuries, and long-term health complications (Adewuyi & Aderemi, 2016). Studies have shown that poor public attitudes and limited institutional support significantly impact the well-being and safety practices of these workers (Ekpu & Archibong, 2007).

Despite their critical role in keeping urban environments clean, solid waste workers in Port Harcourt Metropolis face severe and often overlooked health hazards. These workers are daily exposed to hazardous materials without adequate protection or training, placing their health at great risk. The situation is exacerbated by the poor state of solid waste management in the city, characterized by inefficient collection systems, indiscriminate dumping, and inadequate infrastructure.

A major issue lies in the nature and sources of the waste these workers handle. With unsegregated waste comprising medical, industrial, organic, and electronic components, workers face multiple risks including exposure to pathogens, toxic chemicals, and physical injuries (Ideriah et al., 2013). Yet, there is a dearth of local data on the specific sources and compositions of solid waste in Port Harcourt that directly affect worker safety.

Moreover, the methods employed for waste disposal—such as open dumping, burning, and the use of unauthorized plots—further intensify health risks, especially in areas where regulation and monitoring are weak. This increases the likelihood of waste workers coming into contact with harmful substances during collection and transportation.

Given the indispensable nature of their work, the lack of structured support systems, such as occupational safety programs, health screenings, and proper training, is both a public health and human rights concern. Therefore, the focus of this paper is to explore waste disposal techniques in Port Harcourt metropolis.

Research Questions

In order to help the researcher achieve the set objectives, the following research questions were asked;

What are the sources and compositions of solid wastes in Port Harcourt Metropolis of Rivers State?

What are the waste disposal methods in the study Area?

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Study Area

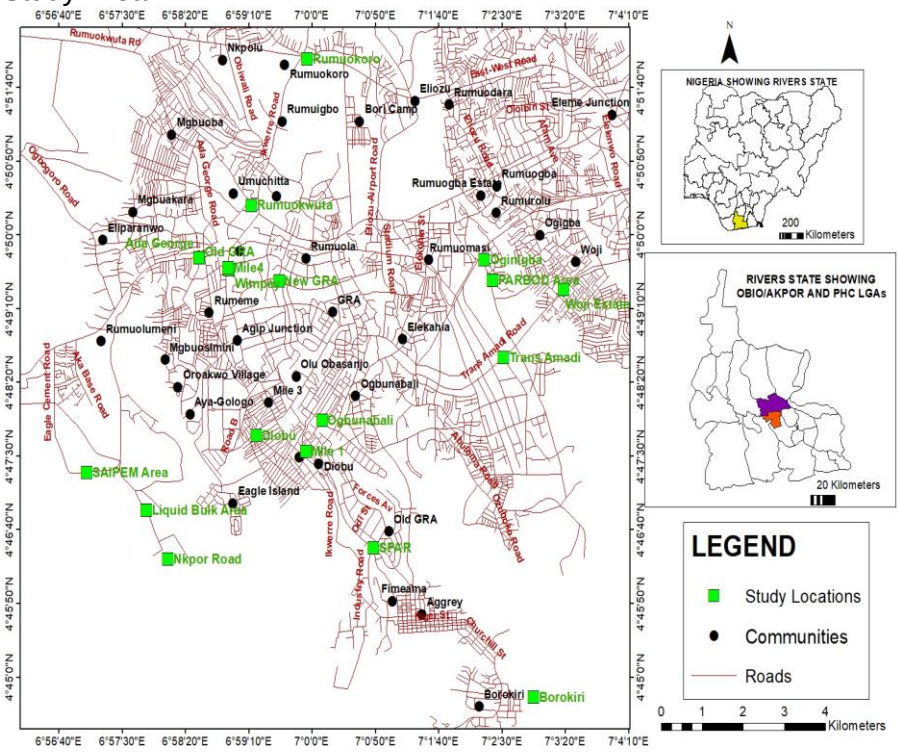

Fig 1.1: Port Harcourt Metropolis showing Locations used for sampling
Source: Rivers State ministry of Lands and Survey – Digitized in the GIS Lab UNIPORT

METHODOLOGY

Research Design

This study adopted experimental and survey research design.
Population of the Study: The sampling frame for this study constitutes the ninety-five (95) service providers to Rivers State Waste Management Agency (RIWAMA).

Source of Data

The study used both primary and secondary data for analysis. The primary sources of data were obtained from the structured questionnaire, interviews, field observations and laboratory analysis, especially the blood serum samples of the solid waste workers. The secondary sources of data were obtained from RIWAMA clinic, text books, internet materials, both published and unpublished useful academic materials, journals, government gazettes etc.

Sample Size and Sample Techniques

The sample for the study was 30 service providers from where the sample population for the study was collected from the different parts of Port Harcourt metropolis. To get the sample for the study, multi-stage sampling technique was adopted to obtain a sample of one hundred and seventy five (175) waste workers.

Method of Data Collection

One hundred and seventy-five (175) copies of questionnaire was administered to the sampled waste workers of the different service providers to RIWAMA. The research instrument was clear and not ambiguous.

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RESULTS

Research Question 1. What are the source and composition of solid waste in the study area, two categories of questions were asked; they included what are the sources of Solid waste and what are the types of Solid waste generated.

Table 1: Sources of Solid Waste by land use in the study area (N=175)

Items	Frequency	(%)
Residential	86	49.1
Commercial	20	11.4
Industrial	21	12
Institutional	25	14.3
Others	23	13.1

Source: Researcher's Fieldwork, 2022

Table 1 above shows the sources of solid waste as indicated by the respondents. Data Analysis based on multiple response revealed that majority of the respondents had their opinion that the major source of solid waste is from residential landuse accounting for 49.1% (86). Others are from industrial, 12% (21); Institutional 14.3% (25) and commercial accounted for 11.4% (20). Other sources of waste such as electronic and vehicle mechanic workshops, agricultural, poultry, abattoir amongst others accounting for 13.1% (23).

Table 2: Compositions of Solid Waste generated by residents of study area (N=175)

Age Range	Frequency	(%)
Paper	10	5.7
Plastic	34	19.4
Glass	12	6.9
Metal	13	7.4
Sanitary	25	14.3
Food Waste	39	22.3
Debris	12	6.9
Hazardous Waste	5	2.9
Animal Waste	13	7.4
Ashes	12	6.9
Total	175	100.0

Source: Researcher's Fieldwork, 2022

On the composition of solid waste, data analysis as seen in table 2 revealed that 7.4% (13) of the respondents indicated that metal was part of the composition of the solid waste they handled, 19.4% (34) constitutes plastic, 6.9% (12) constitutes glass hardwares; 14.3% (25) constitutes sanitary waste; 22.3% (39) constitute food waste; 6.9% (12) were made up of Debris; and Hazardous waste make up 2.9% (5). Others are Animal waste making up 7.4% (13); 6.9% (12) were made up of ashes. However, respondents indicated that paper waste constitutes 5.7% (10) as one of the major compositions of solid waste.

Research Question 2: What are the waste disposal methods in the study area?

Table 3: Waste disposal Methods in the study area

Item	Frequency	(%)
RIWAMA (receptacles)	86	49.1
Authorized dump site	15	8.5
Unauthorized empty plot	34	19.4
Burning	15	8.5
Personal Bin	25	14.2

Total	175	100

Source: Researcher's Fieldwork, 2022.

Table 3 shows the waste disposal methods adopted by residents. Data analysis reveals that majority of the respondents 49.1%(186) indicated that residents use RIWAMA receptacles to dispose their waste, 19.4%(34) respondents indicated that residents use unauthorized empty plot to dispose their waste, 14.2%(25) of the respondents indicated that most residents use their personal bin, 8.5% (15) of the respondents indicated that most residents prefer burning and 8.5% (15) use authorised dump site for dumping their waste.

Table 4: Duration of Waste Disposal

Items	Frequency	(%)
Daily	134	75.6
1-5 days	31	17.7
6-10 days	10	5.7
>10 days	-	-
Total	175	100

Source: Researcher's Fieldwork, 2022

Table 4 shows duration it takes residents to dispose their waste. Majority of the respondents said most residents normally dispose their waste daily, 75% (134); 17.7% (31) of the respondents indicated that most residents dispose their waste within 1-5days while 5.7% (10) of the respondents dispose their waste within 6-10 days. None of the respondents indicated that the duration of waste disposal is more than 10 days. This position is clear to the extent that most waste generated are household waste which may likely begin to decompose as days increases and cause health risk for the occupants and the neighbourhood alike.

DISCUSSION OF FINDINGS

The study also revealed that the primary source of solid waste in Port Harcourt Metropolis is predominantly from residential land use, accounting for 49.1% (n=86) of the respondents. This finding aligns with the observations of Afon (2007), who reported that residential areas contribute the highest proportion of municipal solid waste in Nigerian urban centers due to the daily domestic activities of the increasing population. Similarly, Imam et al. (2008) found that in most Nigerian cities, residential waste comprises the bulk of waste generated, largely made up of food remnants, plastics, and packaging materials.

Other identified sources in the present study included industrial waste (12%, n=21), institutional waste such as from schools and hospitals (14.3%, n=25), and commercial establishments like markets and shopping complexes (11.4%, n=20). In comparison, Ogwueleka (2009) emphasized the growing contribution of commercial and institutional activities to urban solid waste due to the expansion of business districts and service-based institutions in metropolitan areas. Additionally, 13.1% (n=23) of respondents cited other waste sources such as electronic and vehicle mechanic workshops, agricultural waste, poultry droppings, and abattoir refuse, indicating a diverse waste stream in the metropolis, a finding also echoed by Ogbonna, Amangabara, and Ekere (2007) in their study on Port Harcourt's waste dynamics.

Regarding waste composition, the study found that food waste made up the highest proportion (22.2%, n=39), followed by plastic (19.4%, n=34) and sanitary waste (14.2%, n=25). Other components included metal (8%, n=14), animal waste (7.4%, n=13), debris (6.8%, n=12), ashes (6.8%, n=12), glassware (6.8%, n=12), paper (5.7%, n=10), and hazardous waste (2.8%, n=5). These results are consistent with Nzeadibe and Eziuzor (2006), who reported similar compositions in their study of solid waste in southeastern Nigerian cities, emphasizing food and plastic as dominant materials due to consumption patterns and poor packaging disposal practices.

The methods of waste disposal used by residents further highlight systemic issues in municipal waste management. According to the study, 49.1% (n=186) of respondents noted the use of RIWAMA (Rivers State Waste Management Agency) receptacles, suggesting that government-provided infrastructure is widely utilized. However, 19.4% (n=34) of respondents indicated that some residents still resort to unauthorized dumping on vacant plots, while 14.2% (n=25) use personal bins, 8.5% (n=15) dispose waste by burning, and another 8.5% (n=15) use authorized dumpsites. This practice of illegal dumping and open burning aligns with the findings of Adejobi and Olorunnimbe (2012), who observed widespread use of informal waste disposal practices in Nigerian cities due to limited access to formal waste collection services and inconsistent waste policy enforcement. Babayemi and Dauda (2009) also reported that poor community attitudes and the inadequacy of waste infrastructure contribute significantly to open burning and illegal disposal, exposing both residents and waste workers to environmental hazards.

CONCLUSION

Waste generation have been growing rapidly in all over the world and exert a serious problem on the environment. The findings in this study present the current solid waste generation, collection and disposal methods and how it affects the overall health of waste workers in Port Harcourt metropolis, Rivers State. A need for introducing the source separation system, improved collection system, application of waste treatment techniques and creating social consideration among the people helps to promote the possibility for long term improvement.

RECOMMENDATIONS

Based on the findings, the study recommended the following;

Waste management agency or regulator should adopt a method of waste disposal that guarantees the sustenance of the ecosystem and human wellbeing especially the waste workers.

The government should ensure the autonomy of the waste management Institution, in order to enable the agency decisively carry out its task.

Improved working conditions for the exposed waste workers and proper treatment of industrial wastes to reduce environmental degradation in the industrial vicinities are strongly recommended.

Public education should promote the separation of waste at the household level to reduce hazardous exposure to workers. Providing color-coded bins for different waste categories will support this.

Stronger policies and public sensitization campaigns are needed to reduce open dumping and unauthorized burning of waste. Community enforcement units can be introduced to monitor waste disposal compliance at the household and business levels.

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