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ANALYSING MUNICIPAL SOLID WASTE MANAGEMENT SYSTEM IN SELECTED AREAS OF PORT-HARCOURT METROPOLIS

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ABSTRACT

The increasing global population in urban areas has greatly enhanced solid waste production. In underdeveloped countries, such as Nigeria, waste mismanagement increases as urbanisation increases. Enormous amounts of public solid waste are generated, and the concern of urban waste management are gaining traction because the uncollected garbage in the streets causes harm, environmental degradation, and public health risk. Port-Harcourt, which was popularly known as Nigeria's "Garden City" because of its neatness and the abundance of vegetation throughout the metropolis, is now known as the "Garbage City" due to poorly managed waste disposal system characterised by indiscriminate dumping that obstruct traffic flow, drainage systems, and cause frequent flooding. This research carefully assesses the present municipal solid waste management system in Port-Harcourt, focusing on Government Residential Area (GRA), Diobu, and Main Township Areas. The results obtained indicate that more nylon and other plastic wastes are generated by the residents of Diobu. G.R.A. ranks highest for nylon, glass, paper and plastics, although glasses and metals are the minor waste type generated in these study areas. Diobu and the old Port Harcourt Township have a central waste collection system. Residents dispose of their waste products on roadside kerbs and sometimes in waste vans parked by the roadside. In contrast, in the GRA, the waste bin system is practised where every household is required

to station a standard waste bin in front of their buildings and is carried out by the waste disposal contractors. It is recommended that the city's waste management situation be improved and modernized to cope with the increasing population pressures. Policies should also be implemented diligently to attack the rising menace of indiscriminate waste disposal.

KEYWORDS: Municipal solid waste, Waste disposal, Solid waste management, waste recycling.

1.0. INTRODUCTION

The activities of humans generate waste materials that are often discarded because they are considered useless. These wastes are generally solid, and the word 'waste' suggests that the material is useless or unwanted. However, most of these waste materials can be reused, and can become a resource for industrial production or energy generation if appropriately managed. (George Tchobanoglous, Frank Kreith, 2002). The health of Neighbourhoods' has always depended on their ability to manage their environment. (UNCHS (HABITAT), 1996). However, urban environmental management is concerned with providing a safe environment for people to live in by providing adequate water supply, sanitation, drainage and the regular collection and safe disposal of waste. Provision of water, sanitation, drainage and the safe removal of garbage is central to suitable housing and living conditions and health.

2.0. LITERATURE REVIEW

A waste management structure is the approach governments employ to dispose of, reduce, recycle, and prevent waste. Solid waste in a city causes odour problems and health hazards if not properly collected and disposed of. (Ugworah, 2003). It poses pollution risks by introducing fly breeding, strong odours, and complex biological interactions that pollute groundwater and spread disease among humans and animals. However, generated wastes should be well stored for accessible collection and disposal by the appropriate authority concerned. (Wokekoro, Ebiwari & Inyang, Mfrekemfon, 2007). Observation in the study area revealed that the waste generated is not adequately stored, regularly collected, and disposed of, especially as it is primarily a low-income neighbourhood.

Port Harcourt is located in the southern part of Nigeria, with an estimated population of 1,356,000 (Timiebi & Anthony, 2017). The city is characterised by two seasons; the rainy and dry seasons. The rainy season is characterised by heavy rainfall and occasional

flooding in some coastal communities and urban centres. It starts in April and ends in November, while the dry season starts in late November until March. However, Port Harcourt experiences rainfall for most of the year. The city's average temperature ranges from 24°C to 30°C, making it generally warm for most of the year.

This paper aims to survey the state of the waste management system in the Port Harcourt metropolis (GRA, Diobu and Main Township) and analyse the health implications of increasing indiscriminate household and human waste disposal in the area.

2.1 TYPES OF WASTE DISPOSAL STRATEGIES

Waste collection and disposal are vital components of a municipal solid waste management system. The waste collection aims to gather waste products suitably and economically to ease the subsequent waste sorting and treatment stage to maximise re-use and recycling. However, it is required that authorities in charge of the process design and implement strategies that depend on the features of the collection zone, either by the population density or building types and municipal acceptability of different collection methods.

Best practices for municipal solid waste collections are typically implemented via door-to-door or kerbside collection rounds from households and businesses when appropriate within a pay-as-you-throw system or at municipal waste collection centres. The collection rounds generally are provided for the most voluminous Municipal Solid Waste (MSW) fractions. Municipal waste collection centres accept many waste streams, including electrical and electronic equipment waste. Complementary systems can be used for other waste fractions, e.g. strategies that target specific waste fractions such as glass and chemicals.

Promising waste management techniques are recycling, composting, incineration, landfilling, bioremediation, waste to energy, and waste minimisation. These techniques can be combined or rearranged to form a waste management system that fits a community. Modern waste management techniques are directed toward sustainability. Other alternatives for waste management are to reduce, reuse and recycle waste.

i. **Recycling** is the best approach for managing inorganic waste such as plastic, glass, and metals. Though organic waste such as paper and food can also be recycled, composting is a better disposal method because it transforms organic waste intofertiliser.
ii. **Reusing** takes old or unwanted items you might throw away and finds a new use for

them.

iii. **Reducing** is simply creating less waste. It tackles the challenges of waste production at the source. It is directed towards purchasing items we need and in the right amount.

3.0. METHODOLOGY

The Port Harcourt Municipal is the study area, and the specific areas of concentration are the Diobu, Port Harcourt township and the GRA axes of the city. The residents of these neighbourhoods are considered the active element of the area as they have direct contact with the state of the waste management system.

In attaining the aim of this research, primary data were collected from field trips, observations, structured and unstructured interviews, and photographs. Secondary data were obtained from reviewed literature and official documents from RIWAMA, Rivers state ministry of land and survey, and Rivers state waste management agency. These were analysed using charts and simple arithmetic as the information was not complex.

4.0. DATA PRESENTATION AND FINDINGS

The Rivers state waste management agency (RIWAMA), a parastatal in the ministry of environment of the Rivers State Government, is responsible for handling waste and sanitation habits to maintain cleanliness within the greater Port Harcourt environment. The Agency employs the services of private waste contractors to collect and transport waste to final disposal sites. Base on the RIWAMA plan, the entire metropolis was sub-divided into thirty-one zones handled by thirty-one service providers, whose primary qualification for recruitment is the possession of at least two compactors and some other sundry requirements. Service providers are not necessarily assigned to zones but serve as contractors to primary industries producing MSW and a few households who utilise their services for a fee. (Ayotamuno, 2020).

Table I: Showing the Characteristics of study Areas in Port-Harcourt LGA.

LGA	Area (sq.km)	Population	Settlement	Settlement Type
Port Harcourt	109	541,115	Main Township	Planned
			Diobu	Unplanned
			GRA	Planned

Source: *(NPC, 2012)*

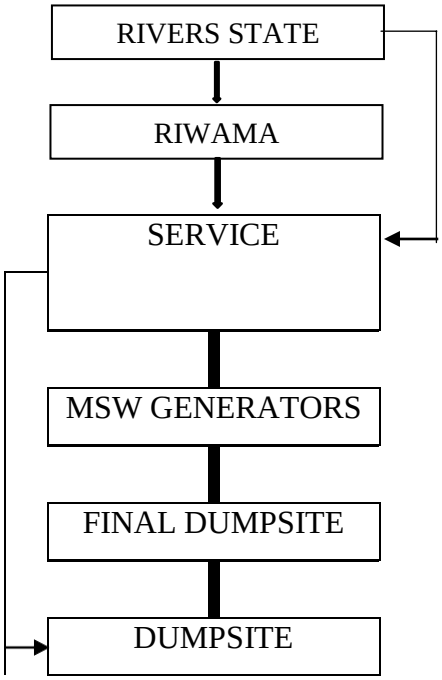


Plate I: ***Structure of MSWM in Port Harcourt Metropolis.***

Source: Author's Fieldwork, 2021.

4.1. OBSTACLES TO EFFECTIVE WASTE MANAGEMENT IN PORT HARCOURT The obstacles to effective municipal solid waste management in Port Harcourt include an unskilled workforce, lack of finance, and inadequate public enlightenment on the need to properly dispose of their waste and the attendant health implications of doing the contrary. (Josiah & Akuro, 2004). Implementing outdated waste management procedures has been a significant obstacle to effective waste management as it can't satisfy the current environmental protection and health laws. It is also inadequate to control the volume of waste generated by the populace.

Table II: ***Showing the population distribution and waste generation in study area.***

Zone	Area Covered	Population Estimate	Generation Rate/kg/day
1	Old Port Harcourt township up to UTC junction.	170,367	210,477
2	Diobu miles 1,2,3,3 up to Wimpey junction.	303,946	384,130
3	Port Harcourt expressway/GRA 1, 2, 3 up to Rumuokwuta junction.	210,441	262,573
	Total	**684,754**	**857,180**
Approximately 1.0kg per person per day			

Source: Author's Fieldwork (2021)

The population in each zone in the table above was estimated by counting the average

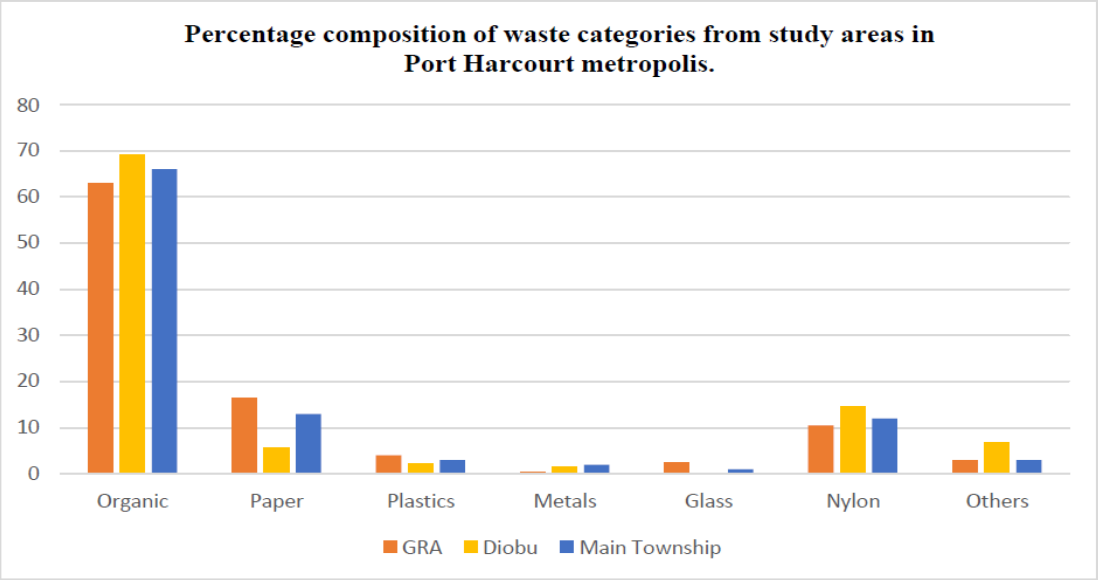
number of houses in each location and multiplying this by the average number of persons in each household. Depending on the area, the number of persons per household per zone ranged between 5.0-6.5. Diobu (zone 2) has the highest number of human concentrations per household (about 6.5). The amount of waste generated per person/day was calculated by dividing the total weight of waste generated by the total number of the estimated population.

Table III: Showing the sources and characteristics of waste developed in the study area.

No.	Sources	Types of waste generated
1	Market	Mostly organic with some plastics
2	Schools	Mainly papers
3	Prisons/Police/Military base	Mixed refuse
4	Industries	Spent chemicals, scrap metals, plastics and glass
5	Residential	Refuse
6	Commercial centres	Scrap metals, woods, plastics and glass
7	Automobile workshops	Scrap metals, plastics
8	Supermarket/grocery stores	Papers, plastics and garbage
9	Ports	Hazardous and mixed

Source: Author's Fieldwork (2021)

Table IV: Percentage composition of waste categories from study areas in Port Harcourt Metropolis.



Source: Author's Fieldwork (2021)

The chart above indicates that residents of Diobu mainly generate organic, nylon and other wastes. G.R.A. ranks highest for nylon, glass, paper and plastics, although glasses and metals are the minor waste type generated in these study areas. Refuse are being dumped without

proper sorting and exposed to the environment.

Plate II: ***RIWAMA approved dumpsite, Mile 3, Diobu.***

Source: Author's Fieldwork (2021)

Figure I: Waste dumped by a street corner in D/Line, Port Harcourt, 2019.

Source: Ayotamuno (2020).

Figure II: ***Bulldozers and scavengers at work at the Eliozu dumpsite, Port Harcourt.***

Source: Ukeame & Amina (2014).

Waste at the dumped site is left exposed on land without treatment which enters the rivers during rain through surface runoff and results in water pollution and danger to aquatic life.

Plate III: ***Waste evacuation along Ikwerre road.***

Source: Author's Fieldwork (2021)

Plate IV: ***Dumpsite at Iwofe waterside area.***

Source: Author's fieldwork (2021)

These dumpsites have no provisions for treatment, sorting or recycling and can result in the following.

i. Water pollution
ii. Land pollution
iii. Air pollution
iv. Epidemic
v. Traffic
vi. Flooding
vii. Undesirable environmental conditions.

5.0. CONCLUSION AND RECOMMENDATIONS

This high percentage of organic content in the waste stream in Port Harcourt and its suburbs can be harnessed for energy generation. It is estimated that one hundred tonnes of municipal refuse with 50 to 60% organic content can generate 1-1.5 Mega Watt of power depending on the characteristics of the waste (National Energy Education Development USA (NEED), 2011). Paper waste is reusable and recyclable and, if adhered to, can reduce solid waste significantly in the municipality. According to (National Energy Education Development USA (NEED), 2011), one ton of paper recycled from used papers instead of fresh fibres from wood saves 7,000 gallons of water, 17-31 trees, 4,000 kWh electricity and 60 lbs of air pollutants. Other recommendations from this research work are as follows.

i. A paradigm shift from conventional waste management practice to the integrated solid waste management system (ISWMS) is essential and recommended to effectively manage the volume of waste generated in Port Harcourt Metropolis.

ii. Sensitization of Port Harcourt residents on the dangers of poor solid waste management is also necessary as waste management practices lead toenvironmental and health risks and as well as waste of economic opportunities and resource.
iii. Waste bins should be placed in vehicles to stop drivers and passengers from littering the streets and highways.
iv. Waste management courses should be introduced in school's curriculum at all levels to create the necessary awareness early enough for school pupils to address the problem of waste from the grassroots.
v. Health inspector should be delegated to supervise solid waste management at the household level in the City.

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