


# ASSESSMENT OF SOLID WASTES DISPOSAL TECHNIQUES AND ITS PROBLEMS IN PORT HARCOURT MUNICIPALITY, RIVERS STATE. A PLANNING PERSPECTIVE.

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**Abstract**
*Waste is an unavoidable by-product of human activities. Its generation and disposal are an essential part of any functional society be it developed or developing. The aim of this study is to assess solid waste disposal techniques and its problems in Port Harcourt municipality. The objectives are to; identify the types and components of solid wastes generated in the study area; ascertain the techniques employed in the disposal of solid wastes, examine the problems associated with the techniques employed in the disposal of solid wastes and determine possible measures to the identified problems of the different techniques employed in solid wastes disposal. The study employed the quantitative research approach and descriptive research design to measure the elements of solid waste disposal techniques. One hundred (100) household heads were arrived at with the aid of Taro Yamane formula. Data was collected from both primary and secondary sources. Univariate summary statistic comprised of frequency distribution, mode, percentages and standard deviation was used to analyze data collected from the field. The findings of the study revealed the types of wastes generated in the study area as household wastes, commercial wastes, industrial wastes, biomedical/healthcare wastes; techniques of solid waste disposal to include open dumping, open burning, sea dumping, landfilling, composting and recycling; the problems associated with different methods to be myriads and specific to each technique. The study therefore, recommended proper waste segregation mostly from point of generation for easy collection, transportation and proper management, regular evacuation of wastes from temporal dumpsites to the point of final disposal, and the implementation of environmental and waste management laws and regulations. The study concluded that residents are to be conscious and decisive about the issue of waste generation, disposal and management in the study area so as to limit the effects of improper wastes disposal on residents and the environment.*
**Keywords: Disposal Techniques, Municipality, Planning, Port Harcourt and Solid Waste.**

## 1.0 Introduction

Waste is an unavoidable by-product of human activities, its generation and disposal are an essential part of any functional society be it developed or developing (Brown, 2015). The management of solid wastes is a growing problem in many urban centres in Nigeria today and the reasons for this has been that during the recent decades urban centres in Nigeria have experienced processes of urbanization due to increasing population growth and high rate of immigration from rural areas to the city (Ike, et al., 2018). The urban population of the world is expected to double to more than 15 million people in the next 35 years, with 90 percent of the growth taking place in developing countries (Medina, 2009). This implies that there is a corresponding increase in quantity of wastes generated daily by the increasing population




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without adequate wastes management. The main problem of urban wastes management however is worth noting not only due to the large quantities of wastes generated and the spatial spread, but also the problems encountered in setting up the systems for collection, transportation and disposal of the wastes (Murali, et al., 2014). The organic component of solid wastes that is generated may not be too much of a problem (depending on the disposal option) as it is bio-degradable, but the inorganic components are quite problematic because they are non-biodegradable and therefore, can remains in the environment for a considerable length of time causing severe problems (Mandpe et al, 2020).

Proper management of solid wastes is a key to environmental sanitation (Sule 2001). The different techniques employed in the management of solid wastes depends on the nature, types, characteristics and the components of such wastes stream, which in turn has concomitant effects on all aspects of the environment. According to Abubakar, et al, 2022, in recent times, the quality of life in most of the cities of the developing world is being diminished by uncontrolled and poorly managed solid wastes in the urban environment, culminating in a serious environmental pollution most especially in the residential districts of the urban area of Port Harcourt (Abubakar, et al, 2022). The results have been that there is a total decline_in the aesthetic view, quality of life, and the ambient quality of air, water, and the soil environment which in turn leads to serious environmental degradation of the urban Centre.

The deterioration of the Port Harcourt urban environment in terms of indiscriminate dumped and accumulated solid wastes is vexing owing to the increasing rate of urban population growth, processes of urbanization and its corresponding wastes generation (Ogbonna & Udotong, 2021& Ayotamuno & Gobo, 2004). The visual effects of these illicit waste dumps are root cause of urban decay in Port Harcourt (Sule 2001). indiscriminate dumping of waste in Port Harcourt has often resulted in ponding of water along streets due to blockage of street drains with waste and thereby, causing flash floods. Waste management is the systematic control of waste generation, storage, collection, transportation, processing, and disposal in a manner that protect public health, promote economic and environmental sustainability, and demonstrates community needs and values. (UNEP,2024). However, the processes and procedures of managing solid wastes in Port Harcourt Municipality does not takes in to consideration these principles of proper solid wastes management programmes.

The problems of solid wastes generation and management in Port Harcourt municipality cannot be over-emphasized as solid waste disposal and collection does not match the standard of waste management in the city. This underscores the basis of this study. The aim of this study is to assess solid waste disposal techniques and its problems in Port Harcourt municipality and with the following objectives, to;

i. Identify the types and components of solid wastes generated in the study area;

ii. Ascertain the techniques employed in the disposal of solid wastes in the study area;




iii. Examine the problems associated with the techniques employed in the disposal of solid wastes in the study area;

**iv.** Determine measures to the identified problems of the different techniques employed in solid wastes disposal in the study area.

## 2.0 Literature Review

### Types and Sources of Solid Wastes

Municipality generates different types and sources of solid wastes and it is due to urbanization processes. The types and sources of waste include the following (see Table 1).

**Table 1 Types and Sources of Solid Wastes**

| Source | Facility | Types of Wastes |
|---|---|---|
| **Domestic** | Single-family dwelling, multi-family dwelling, low, medium and high-rise apartments | Food, paper, packaging, glass, metals, ashes, bulk household wastes, hazardous household wastes |
| **Commercial** | Shops, restaurants, markets, offices, buildings, hotels and motels, institutions. | Food, paper packaging, glass, metals, ashes, bulk household wastes, hazardous household wastes |
| **Industrial** | Fabrication, light and heavy manufacturing, refineries, chemical plants, mining, power generation. | Industrial process wastes, metal, lumber, plastics, oils, hazardous wastes |
| **Biomedical/hospital waste** | Clinical laboratories, biological labs, pathological labs and repository | Bowl, syringes and ampulla |
| **Construction and demolition** | Construction sites | Soil, concrete, timber, steel, plastic, glass, vegetation, lumber roofing conduit pipes, wire insulation, scraps etc. |
| **Agricultural Waste** | Food processing, animal waste, crop waste and hazardous wastes | Animal carcasses, manure, pruning, vegetables and fruit droppings, sugarcane bagasse and corn stalks, herbicides, insecticides and pesticides. |
| **E-waste** | Electronic devices and equipment | Computers, mobile phones and laptops |

***Source: Yang et al., 2018 and Noor, et al.,2020***

In the same vein, Sule (2001) presented an empirical study revealing the different types/ percentage of solid wastes generated in Port Harcourt metropolis as shown in Table 2.




**Table 2. Types/ percentage of generated solid wastes in Port Harcourt Metropolis**

| Types | Weight (tone) | Percentage |
|---|---|---|
| **Garbage (organic)** | 140,364 | 41 |
| **Paper/ plastic** | 119,823 | 35 |
| **Expired chemical – waste/drug** | 7,268 | 2 |
| **Scraps Metals/Glass** | 54,510 | 15 |
| **Construction wastes** | 14,510 | 4 |
| **Sludge** | 10,27114,536 | 3.0 |

***Source: Sule, (2001)***

**Techniques of Solid Wastes Disposal and Management**

Solid waste management procedures vary enormously between areas, nations, and even within countries (Hoornweg & Bhada-Tata,2012; Giusti, 2009). Modern municipal non-hazardous solid waste can be managed and disposed of through a variety of techniques as waste management systems advocate trash reduction; practices such as safe landfill disposal, composting, reuse, recycling was rarely followed while huge share of garbage in underdeveloped nations are not recycled and Waste sorting is also uncommon, making recycling and composting challenging (Needhidasan, et al., 2014; Aniah & Okpiliya 2003). Waste management techniques are somehow a direct reflection of the existence of waste management policies and laws, as well as the amount to which they are enforced, available financing, and the type and quantity of trash created. In many countries that are undergoing development, the responsibility of managing solid waste belongs to both local governments and private suppliers (Needhidasan, et al., 2014).

Though, no single method can be universally regarded as the most effective approach, as the suitability of any waste management strategy depends largely on the specific characteristics and circumstances of a particular settlement. Factors such as population size, volume and composition of waste generated, available financial and technical resources, environmental conditions, institutional capacity, and existing infrastructure must therefore be carefully considered (Aniah & Okpiliya 2003). Subsequently, an effective municipal solid waste management system should adopt an integrated and context-specific approach that reflects the unique socioeconomic, environmental, and spatial conditions of each settlement (Aniah & Okpiliya 2003).

**Problems Associated with the Techniques of Solid Wastes Management**

A successful solid waste management system needs to address both the physical (technical) elements (collection, disposal, recycling) as well as the 'soft' governance aspects– the public opposition that most (high-income) countries face when siting waste treatment or disposal facilities, or the challenges of changing people's behaviour to increase separate collection for recycling or waste prevention (Wilson, et al 2013). The main problem of cities in Nigerian to poor environmental conditions can be associated to improper management of solid wastes (Sule, 2001). In most developing countries, the disposal and management of solid waste constitute a




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substantial challenge to environmental sanitation and sustainable urban development. Unlike many developed countries, where scientific waste management practices such as sanitary landfilling, recycling, composting, and other modern waste treatment technologies have largely replaced rudimentary methods, many cities in the developing world continue to rely on open dumping and open burning (Sule, 2001). These inadequate disposal practices contribute to environmental pollution, public health risks, blocked drainage systems, flooding, and the degradation of urban environments. Thus, the growing volume of waste generated by rapid urbanization and population increase has become a major obstacle to effective environmental management, thereby undermining efforts to achieve cleaner, healthier, and more sustainable cities (Sule, 2001).

Amoah & Kosoe, (2014), opines that solid wastes treatment and disposal methodologies are fraught with problems. Przydatek & Kanownik, (2019) Land fill-sites, and dumpsites in particular, cause soil and ground water contamination if not properly operated. Alimba, (2013), emphasizes that additional environmental problems with Landfills are leachate, odours, liters, gas diffusion, scavengers, fires and rat infections.
Several waste-management and disposal methods present varying environmental and public-health challenges. Incineration, although capable of significantly reducing waste volume, may generate air pollutants and unpleasant odours when facilities are poorly designed, operated, or inadequately controlled (Zakaria, et al., 2020). Similarly, composting can produce odour and environmental concerns where organic waste is poorly managed or contaminated with substances such as heavy metals. Open dumping is mostly problematic because it provides little or no control over waste, creating conditions that can contribute to soil, water, and air pollution and increase exposure to disease vectors (Zakaria, et al., 2020).

Uncontrolled dumpsites can support the proliferation of flies, rodents, mosquitoes, cockroaches, and other pests, thereby increasing potential risks to public health. Consequently, contemporary waste-management practice emphasizes controlled collection, treatment, resource recovery, and environmentally sound final disposal rather than reliance on open dumping (Awino & Apitz, 2024).
Surface runoff passing through open dumps can dissolve and mobilize harmful chemicals and other pollutants present in the waste (Gunasekara, et al., 2025). These contaminants may later leach into the soil and be transported into groundwater or nearby surface water bodies (Gunasekara, et al., 2025). Such pollution can degrade water quality, pose serious risks to human health and aquatic ecosystems, and contribute to wider environmental degradation, particularly in areas where waste disposal sites are poorly managed or located close to water sources. Methane gas could be released in to the surrounding air as micro-organism decompose the garbage (Gunasekara, et al., 2025).

Sea dumping technique is responsible for the pollution of the marine environment with heavy metals. In most cases, it results to the reduction of Biochemical Oxygen Demand (BOD) of the aquatic environment which thus affect the aquatic life, alter the quality of the water and cause extinction of species within the catchment's area (Singh, et al., 2026).


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**Solid Waste Management and Planning Issues**

Sustainable waste management has become an essential component of urban planning, particularly in response to increasing global waste generation and the challenges associated with its treatment and disposal (Sharma, et al., 2026). Public health and environmental standards for solid waste management have become increasingly imperative because inappropriate waste handling, collection, treatment and disposal can expose communities to environmental pollution and health risks (Abubakar, et al., 2022). Effective solid waste management therefore requires suitable technical systems, regulatory oversight, monitoring and environmentally sound disposal practices (McAllister, 2015). Empirical studies from developing countries shows that poorly managed waste facilities, including open dumpsites and landfills, can contribute to air, soil, and water pollution and create conditions that increase exposure to disease vectors and other health hazards (Ferronato & Torretta, 2019; Ncube et al., 2021; Mahajan, 2023). The Environmental Impact Assessment (EIA) Directive list in its Annex I that an EIA be carried out for waste disposal installations for the incineration, chemical treatment or landfills of toxic and dangerous wastes. It also lists in annex II that EIA be carried out for installations for the disposal of industrial and domestic wastes (Margallo, et al.,2014). In Nigeria, inadequate waste-management infrastructure, weak institutional capacity, inadequate public awareness, and inappropriate disposal practices continue to present challenges to effective waste management and public-health protection (Onyekwelu et al., 2022; Benjamin & Benjamin, 2023). These challenges highlight the need for improved waste collection and transportation systems, appropriate treatment and disposal facilities, recycling and resource-recovery initiatives, and stronger regulatory enforcement. Such measures can aid to reduce environmental pollution, protect public health, and promote more sustainable waste-management practices.

## 3.0 Methodology

Port Harcourt City Local Government Area also called Port Harcourt Municipality is one of the area councils that make up the Port Harcourt Metropolis. The 1975 Port Harcourt City Master Plan which covered both Port Harcourt City Area Council and Obio/Akpor showed that Port Harcourt Local Government Area Council has a total of 100km2 landmass out of which about 45% (17.3km2) of it is wetland area (Visigah, 2017). The area has a population of 546,789 Persons (National Population Commission, NPC 2006), and its headquarters is located at Old Port Harcourt Township (Ajie & Dienye, 2014).

Geographically, Port Harcourt City Local Government Area is bounded by Obio/Akpor to the North, Okrika to the South and it is located approximately within latitudes 405'11" and 5o15'45" North and longitudes 6o22'25" and 8o05'12" East (Ajie & Dienye, 2014) (Fig.1).

The study area has a tropical monsoon wet climate. It has two seasons, the raining season and a very short dry season. The area experiences heaviest precipitation during the months of June to September with an average rainfall of 367mm yearly (Chinago, 2020). The driest month is December with a mean rainfall of 20mm and mean annual temperature is typically between 25oC – 28oC and relative humidity is within 75% to 78% (Chinago, 2020).

Port Harcourt Municipality is generally a low land area with average elevation below 30 metres above sea level. It has a flat surface pattern that

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falls within the coastal belt dominated by low-lying coastal plains which structurally belong to the sedimentary formation of the recent Niger Delta region (Mmom, et al., 2016). The geology of the study area consists of alluvial sedimentary basin and basement complex. The area has a dendritic drainage pattern that is most drain by a network system of rivers and creeks. The drainage basin of the area is drained by the Ntawogba creek, Trans Amadi creek, Mini-Ekere/ Woji creek, Waja creek, New Calabar, and the Bonny River (Mmom et al, 2017). The soil and vegetation of Port Harcourt City Local Government Area consist of deltaic plain soils which are in the wetland and upland areas and is rich in iron but has a low mineral reserve and low fertility due to high rainfall resulting to soil leaching Mmom et al (2017).

This study adopted the quantitative Research approach, utilizing the descriptive research design. The research approach enables the researcher to collect quantitative data in the Eight (8) communities randomly selected from the 25 communities that made up the study area. The communities so selected include; Borikiri, Amadi-Ama, Ogbunabali, Abuloma, Bundu, Elekahia, Oromenike and Nkpogu (Fig. 3).

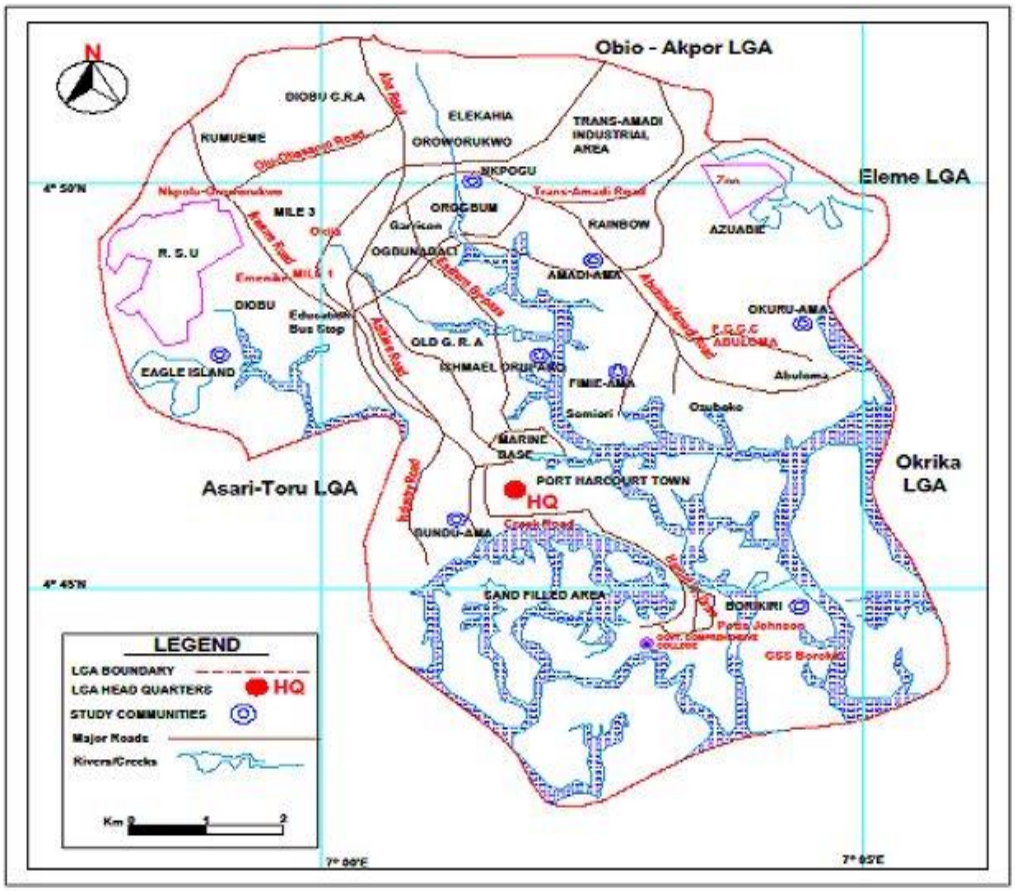



***Figure. 1. Port Harcourt Showing Communities***
***Sources: GIS Lab. Dept. of URP Rivers State University, Port Harcourt,2025.***

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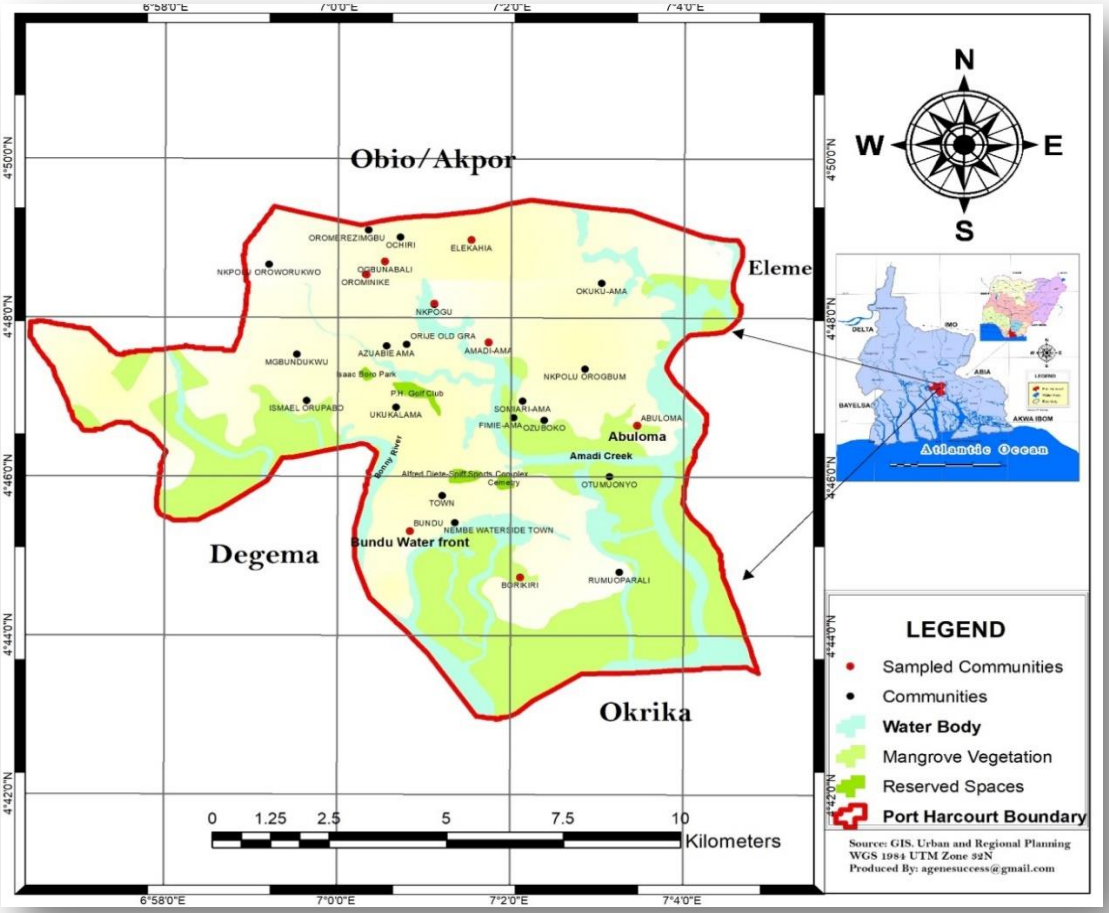



***Figure 2. Port Harcourt Municipality Showing Sample Locations***
***Source: GIS Lab, Urban and Regional Department, Rivers State University, Port Harcourt ,2025.***

The population of the eight selected communities as at 1991 was one hundred and forty-five thousand, and sixty-three (145,063) persons (NPC, 1991), and a projected population for the year 2026 is one million, three hundred and fourteen thousand, six hundred and three (1,314,603) persons using the population projection model given as $Pn = P_o (1 + r)^n$ with an annual growth rate of 6.5% (NPC, 2018). An average household size of 6 persons per household was used to determine the total household of the study area. Two hundred and nineteen thousand, one hundred (219,100**)** household was determined. The Taro Yamane formula was used to determine the sample size of the study. However, one hundred (100) household heads from two hundred and nineteen thousand, one hundred (219,100) household heads with a 0.10% level of significance were ascertain as the sample size for this study.




**Table 3. Population and Sample Size**

| S/N | Communities | 1991 Pop | Projected Pop (2026) | Household Size | % of Pop | No. of Questionnaire |
|---|---|---|---|---|---|---|
| **1** | Borikiri | 39,214 | 355,369 | 59,228 | 27.0 | 27 |
| **2** | Amadi-Ama | 7,034 | 63,744 | 10,624 | 4.8 | 5 |
| **3** | Ogbunabari | 15,014 | 136,061 | 22,677 | 10.3 | 10 |
| **4** | Abuloma | 10,454 | 94,737 | 15,790 | 7.2 | 7 |
| **5** | Bundu | 16,266 | 147,407 | 24,568 | 11.2 | 11 |
| **6** | Elekahia | 15,302 | 138,671 | 23,112 | 10.5 | 11 |
| **7** | Oromenike | 21,377 | 193,725 | 32,288 | 14.7 | 15 |
| **8** | Nkpogu | 20,402 | 184,889 | 30,815 | 14.1 | 14 |
| | **Total** | **145,063** | **1314603** | **219,100** | **100** | **100** |

***Source: National Population Commission (NPC) (1991) & Researchers' Computation, 2026***

## 4.0 Results and Discussion

**Types, Sources and Components of Solid Wastes Generated in the Study Area.**

The evidence on the types of solid wastes generated in the study area is contained in Table 4. The results revealed the types of solid wastes generated in the study area to include commercial wastes having 24.4% of the total respondents, household wastes with 20%, industrial wastes having 16.7%, institutional wastes 11.1%, biomedical/healthcare wastes 10%, while 8.9% and 5.6% identified electronic wastes, construction and demolition, including agricultural wastes as types of wastes generated in the study area. The results so presented on the types of solid wastes generated in the study area showed that the variety of wastes generated are as a result of different land uses of the area. It is observed that individual land use generates specific waste types which are typical of their activities. The results collaborate with the findings of Yang et al., 2018 and Noor, et al.,2020, who noted that the types and components of solid waste generated are functions of land uses and the feeding patterns of residents.

**Table 4: Types of Solid Wastes Generated in the Study Area.**

| S/N | Types of Solid wastes generated | Frequency | Percentage |
|---|---|---|---|
| **1** | Household wastes | 18 | 20.0 |
| **2** | Commercial wastes | 22 | 24.4 |
| **3** | Industrial wastes | 15 | 16.7 |
| **4** | Construction and demolition | 5 | 5.6 |
| **5** | Biomedical/Healthcare wastes | 9 | 10 |
| **6** | Electronic wastes. | 8 | 8.9 |
| **7** | Institutional wastes | 10 | 11.1 |
| **8** | Agricultural wastes | 3 | 3.3 |
| | Total | 90 | 100 |

***Source: Researchers' Field Survey, 2026***

Moreso, Table 4 reveals the sources of the different types of solid wastes generated in the study area. The analysis of the results reveals that 24.4% of the sampled respondents said the sources of the household wastes are food scraps, packaging, paper, plastic bottles, textiles, glass and cans, while 20% said the sources of commercial wastes are food scraps, packaging, paper, plastic bottles, textiles, glass and cans.


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16.7% said the sources of industrial wastes area from factories and manufacturing such as paper, plastics, metals, chemicals, sludge. 11.1% said the sources of Institutional wastes are schools, prisons and offices. 8.9% said the sources of electronic wastes are old phones, computers, TVs, batteries, wires, bulbs etc. 10% and 5.6% said the sources of Biomedical/Healthcare wastes, construction and demolition include; hospital and clinic bandages, syringes, gloves, lab wastes, expire medicines and concrete, bricks, woods, metals, drywall, asphalt respectively. 3.3% of the sampled respondents identified agricultural wastes as a type of waste and acknowledged the sources to include; crop residues, manure, pesticide containers and animal carcasses.

The results showed that the sources of wastes generated in the study area are a component of the functions of activities of the study area which is acknowledged to have multi-land uses. The study area is an urbanized area with high population density having multiple of land uses and activities. These results collaborate with the findings of Przydatek & Kanownik, 2019 & Ike, et al., 2018), who noted that the sources of solid wastes generation in urban area are myriads owing to the heterogeneity of the urban environment.

Again, information on the components and compositions of solid wastes generated in the study area was also examined and the results presented in Table 5. The analysis of the results shows that 28.9% of the sampled respondents identified plastics as a component of solid wastes generated in the study area and confirmed its compositions to include; PET bottles, nylon bags, sachets, containers, wrappers, toys and rubbers. 27.8% said the component of solid wastes generated in the area is Organic/biodegradable with composition comprises of food scraps, fruit peels, vegetables, leftover meals, garden trimmings, leaves. 10% each said glass and textiles with compositions of bottles, jars, broken glasses and clothes, rags, shoes, bags, and fabric scraps. 8.9% of the respondents said paper/cardboard having composition of newspapers, magazines, cartons, packaging boxes, while 7.8% and 6.7% of the respondents said wood and metals with compositions of pallets, furniture parts, branches and cans, aluminum foil, bottle caps, scrap metals, wires. The composition of wastes generated in the study area cut across all types of human activities having multiple land uses. It is a replica of an urbanized society having heterogeneous setting.

**Table 5: Components and compositions of Solid Wastes Generated in the Study Area.**

| S/n | Components | Composition | Frequency | Percentage % |
|---|---|---|---|---|
| **1.** | Organic/ biodegradable | Food scraps, fruit peels, vegetables, leftover meals, garden trimmings, leaves. | 25 | 27.8 |
| **2.** | Paper/cardboard | Newspapers, magazines, cartons, packaging boxes. | 8 | 8.9 |
| **3.** | Plastics | PET bottles, nylon bags, sachets, containers, wrappers, toys, rubber | 26 | 28.9 |
| **4.** | Glass | Bottles, jars, broken glasses | 9 | 10 |

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| | | | | |
|---|---|---|---|---|
| **5.** | Metals | Cans, aluminum foil, bottle caps, scrap metals, wires. | 6 | 6.7 |
| **6.** | Textiles | Clothes, rags, shoes, bags, fabric scraps. | 9 | 10 |
| **7.** | Wood | Pallets, furniture parts, branches | 7 | 7.8 |
| **.** | Total | | 90 | 100 |

***Source: Researcher's Field Survey, 2026***

**Techniques Employed in the Disposal of Solid Wastes in the Study Area**

The different techniques employed by residents of the study area for the disposal of solid wastes generated in the area is presented in Table 6. The results showed that 24.4% of the sampled respondents said open dumping is more prevalence as compare to other forms of disposal methods. 22.2% said landfilling although not rampant in the area but rudimentary method of burying wastes was employed by residents. 16.7% said open burning is mostly seen as residents burnt their wastes openly at will. They set fire on wastes and the wastes keep burning over days causing lots of environmental pollution in the area. 13.3% said sea dumping and this is profoundly carried out by residents living close to the river. It is easily seen rivers and stream blocked by municipal solid waste dumped in the river and this has contributed to blocking river channels and water ways within the study area causing urban flooding and accident along waterways. 11.1% and 8.9% also identify recycling and composting as methods employed in solid wastes disposal and management in the study area. The results of the techniques of solid wastes disposal employed in the study area have shown that the different components of wastes generated in the area require different methods of disposal hence the residents adopted the easiest way to get out of waste accumulation.

**Table 6: Techniques Employed in the Disposal of Solid Wastes in the Study Area**

| S/N | Techniques of Solid Waste Disposal | Frequency | Percentage |
|---|---|---|---|
| **1** | Open dumping | 22 | 24.4 |
| **2** | Open burning | 15 | 16.7 |
| **3** | Sea dumping | 12 | 13.3 |
| **4** | Incineration | 2 | 2.2 |
| **5** | Landfilling | 20 | 22.2 |
| **6** | Composting | 8 | 8.9 |
| **7** | Recycling | 10 | 11.1 |
| **8** | Pyroclastic | 1 | 1.1 |
| | Total | 90 | 100 |

**Source: Researcher's Field Survey, 2026**

**Problems Associated with the Techniques Employed in the Disposal of Solid Wastes in the Study Area**

The study also examines the problems associated with the specific techniques employed in the disposal of solid wastes in the study area. The results of the data collected is presented in Table 7. From the results, it is shown that 27.8% of the sampled respondents said open dumping has such problems as air pollution, leachate, odours, breeding ground for rodents, pests and disease vectors. 20.0% said landfilling has problems of land take-up, leachate, landfill gas, odour, pest, litters. 16.7% said sea dumping has problems of water pollution, destruction of aquatic life, blockage of water ways. 13.3% said composting has the problems of odour, pests, contamination,


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slow process, while another 13.3% said recycling has the problems of contamination, creating eye saw, energy and water use, down cycling. 8.0% confirmed the problems of incineration to include air pollution, ash disposal, high cost, and public opposition. The findings of this segment of the research on the problems associated with the techniques employed in solid wastes disposal have shown that all the methods adopted in solid waste disposal has a number of problems ranging from pollution, breeding ground for disease vectors, leachate, eye saw, deterioration of the urban environment and this has resulted to a culture shock in terms of environmental aesthetic.

**Table 7: Problems Associated with Specific Techniques Employed in the Disposal of Solid Wastes in the Study Area.**

| S/N | Solid Wastes Disposal Techniques | Associated Problems | Frequency | Percentage |
|---|---|---|---|---|
| **1** | Landfilling | Land take-up, leachate, landfill gas, odour, pest, litters | 18 | 20.0 |
| **2** | Incineration | Air pollution, ash disposal, high cost, and public opposition. | 8 | 8,9 |
| **3** | Composting | Odour, pests, contamination, slow process, | 12 | 13.3 |
| **4** | Open dumping | Air pollution, leachate, odours, breeding ground for rodents, pests and disease vectors. | 25 | 27.8 |
| **5** | Sea dumping | Water pollution, destruction of aquatic life, blockage of water ways. | 15 | 16.7 |
| **6** | Recycling | Contamination, creating eye saw, energy and water use, down cycling | 12 | 13.3 |
| | **Total** | | **90** | **100** |

***Source: Researcher's Field Survey, 2026***

**Measures to the Problems of the Different Techniques Employed in Solid Wastes Disposal in the Study Area.**

The information on possible measures to the problems of the different techniques employed in solid wastes management in the study area is presented in table 8. The results show that 22.2% suggests the measures for open dumping to include close and remediation of dumpsites, formal waste collection, enforcement and fines, community clean-up and awareness, provides alternative drop-off points. 20.0% suggests measures to landfilling to include engineered sanitary landfills, landfill gas capture, daily soil cover and compaction, post closure monitoring. 21.1% suggests measures for Composting to include source segregation, aerated/in-vessel system to speeds up process and control smell, temperature monitoring, public education. While 15.6% suggested measures for sea dumping to include laws and regulations, public enlightenment, fines and the prohibition of the practice. However, it should be noted that the measures so suggested by residents centered on pollution control, public enlightenment, regulations and the enforcement of laws that enhance public compliance to waste management and environmental conservation practices.




**Table 8: Possible Measures to the Problems Associated with the Different Techniques Employed in Solid Wastes Disposal.**

| S/N | Techniques | Problems | Measures | Freq. | % |
|---|---|---|---|---|---|
| **1** | Landfilling | Land take-up, leachate, landfill gas, odour, pest, litters | Engineered sanitary landfills, landfill gas capture, daily soil cover and compaction, post closure monitoring | 16 | 20.0 |
| **2** | Incineration | Air pollution, ash disposal, high cost, and public opposition. | Advance air pollution control using scrubbers, filters and continuous emission monitoring, energy recovery, proper ash treatment. | 13 | 14.4 |
| **3** | Composting | Odour, pests, contamination, slow process, | Source segregation, aerated/in-vessel system to speeds up process and control smell, temperature monitoring, public education | 19 | 21.1 |
| **4** | Open dumping | Air pollution, leachate, odours, breeding ground for rodents, pests and disease vectors. | Close and remediate dumpsites, formal waste collection, enforcement and fines, community clean-up and awareness, provides alternative drop-off points | 20 | 22.2 |
| **5** | Sea dumping | Water pollution, destruction of aquatic life, blockage of water ways. | Laws and regulation, public enlightenment, fines, prohibit the practice. | 14 | 15.6 |
| **6** | Recycling | Contamination, creating eye saw, energy and water use, down cycling | Colour coded bins and education, better sorting techniques, refund deposit scheme, design for recycling. | 10 | 11.1 |
| | Total. | | | 90 | 100 |

***Source: Researcher's Field Survey, 2026***

## 5.0 Conclusion

This study assessed solid wastes disposal techniques and its problems in Port Harcourt Municipality with a planning perspective. The motivation for the study is premised on the background that proper solid waste management is essential for maintaining environmental sanitation and protecting the quality of urban life. In Port Harcourt, poor waste management has contributed to declining environmental quality, including worsening the visual appearance of the urban environment and pollution of air, water, and soil. These conditions can also create breeding grounds for disease vectors, generate offensive odours, produce leachate and increase risks to public health and environmental sustainability.




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The nature and composition of solid waste generated within the study area are linked with existing land-use patterns and the activities of residents. As a densely populated urban centre with substantial industrial, commercial, and institutional activities, Port Harcourt generates diverse forms of solid waste, necessitating different disposal and management methods. However, each disposal method is associated with particular environmental and management challenges, particularly where appropriate facilities, monitoring, and enforcement are lacking.

Therefore, the study highlights the need for more effective and sustainable solid waste management practices. From a planning standpoint, improving waste disposal requires greater public awareness, appropriate facility provision and siting, effective monitoring, and stronger institutional measures. Also, encouraging residents to adopt responsible waste-generation and disposal practices, together with improved planning and management interventions is indispensable for reducing the environmental and public-health consequences of improper in Port Harcourt Municipality.

## Recommendations

Owing to the findings of this research, it is therefore recommended that:

i. Residents should ensure proper waste segregation mostly from point of generation for easy collection, transportation and proper management by Rivers State Waste Management Agency.

ii. The techniques employed in the disposal and management of solid wastes should be environmentally friendly devoid of pollution that affects the environment and human alike.

iii. There should be regular and timely evacuation of wastes from temporal dumpsites to the point of final disposal by the Rivers State Waste Management Agency to reduce the generation of offensive odours and leachate.

iv. Law enforcement agency should ensure full compliance of all environmental, waste management laws and regulations from the citizens on the issues of wastes disposal and management in the Port Harcourt Municipality and also, residents should avoid the recent pattern of feeding so as to discourage indiscriminate waste disposal practice and focus on ways to better environmental quality.

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