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Environmental Pollution and Public Health Implications of Poor Solid Waste Management Practices in Developing Countries: Evidence from Urban Cities in Nigeria

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Abstract

Purpose - This study investigates the health and environmental impacts of poor solid waste management practices in urban cities across Nigeria. It explores how increasing population and urbanization contribute to rising waste volumes and the reliance on open dumpsites, which pose serious risks to public health and the environment.

Design/methodology/approach - A mixed-methods research design was adopted, combining survey questionnaires and in-depth interviews. Field data were collected from three urban areas where open dumping is common. A total of 150 questionnaires were distributed to residents living within a two-kilometer radius of the dumpsites, with 138 valid responses received (92% response rate). In addition, ten interviews were conducted with waste management officials and healthcare personnel. Data were analyzed using descriptive statistics.

Originality - This study contributes to the understanding of the link between improper waste disposal and public health in the Nigerian urban context. It highlights the socio-environmental consequences of unmanaged waste and offers insights into the institutional and community-level responses.

Findings and Discussion - The results reveal that existing waste management systems in Nigerian urban centers are largely ineffective. Poor waste handling practices have led to increased cases of communicable diseases such as malaria, cholera, typhoid, and diarrhea. However, the study also identifies economic opportunities in recycling and waste-related employment, if properly managed.

Conclusion - The findings underscore the need for stronger public awareness, improved waste recycling infrastructure, and strict enforcement of environmental laws. A sustainable waste management strategy should combine community education with institutional reforms to reduce health risks and improve environmental quality.

Keywords - Pollution, Solid Waste, Public Health, Waste Management, Diseases and Economic Benefit

Introduction

Urbanization and industrialization are pivotal drivers of economic growth and development in developing countries. Nigeria, is one of the developing countries experiencing rapid population expansion and urban sprawl, (Musa, 2021). As Africa's most populous country, Nigeria has witnessed significant rural-urban migration, with cities such as Lagos, Abuja, and Port Harcourt emerging as centers of economic activity and industrial development (Adelekan, 2016). This rapid urban expansion, fueled by industrial growth, has transformed settlement patterns, economic structures, and environmental conditions. The proportion of urban dwellers has risen from 9% in 1950 to over 50% in 2019 (Jemiluyi, 2021). Industrialization, marked by the exploration and utilization of natural resources, has driven economic growth. However, prioritizing industrial expansion over environmental quality has led to significant degradation. Industrial activities in urban cities in Nigeria exert immense pressure on natural resources, leading to pollution, deforestation, and ecological depletion (Dubey & Narayanan, 2010).

Urbanization exacerbates these effects through increased energy consumption, poor waste management, and deforestation (Mahmood et al., 2020). Since the 1960s, Nigeria has implemented policies to boost industrialization (Audi et al., 2014), However, inadequate enforcement of environmental regulations has led to significant deterioration in air quality, contamination of water resources, and adverse impacts on public health. While industrialization and urbanization have contributed to job creation, infrastructure development, and improved living standards, they have also introduced numerous environmental and public health challenges (Mehmood et al., 2024). The rapid pace of urbanization has outstripped infrastructure development, resulting to overcrowding, poor waste disposal, and the proliferation of informal settlements, resulting in air and water pollution, deforestation, and soil contamination, all of which threaten human health (Eze et al., 2020).

The environmental and public health impacts of these processes are profound. Industrial activities contribute to greenhouse gas emissions, land degradation, and pollution (Musa et al., 2021). Urbanization intensifies environmental stress through rising demands for housing, transportation, and waste management services, (Ohwo & Abotutu, 2015). These conditions have led to increased cases of respiratory diseases, waterborne infections, and other health complications. Given these challenges, this paper explores the environmental and public health consequences of poor solid waste management in Nigeria urban cites (Lagos, Abuja, Onitsha and Porthacourt).

Statement of the Problem

Nigeria's urban areas have experienced a significant surge in population and spatial expansion in recent decades. The United Nations

projects that by 2030, approximately 60% of Nigeria's population will reside in urban areas, a sharp increase from 50% in 2020 (UN-Habitat, 2020). This urban growth is largely fueled by rural-to-urban migration, high birth rates, and the concentration of economic activities in cities (Adelekan, 2016). Despite this growth, the development of infrastructure and essential urban services has lagged behind, creating a range of environmental concerns. One of the most critical among these is the poor management of solid waste. Improper disposal of waste not only contributes to pollution but also creates favorable conditions for the spread of vector-borne diseases such as malaria, as mosquitoes thrive in unmanaged waste sites (Eze et al., 2020; Omokaro et al., 2024).

In addition, although a number of studies have explored the effects of environmental pollution, there remains a limited focus on practical and inclusive strategies for managing solid waste. Few works address the roles of all stakeholders or consider the impact of corruption within public institutions and the instability of policy implementation. Given these persistent gaps, this study aims to critically examine the underlying factors contributing to these challenges and offer recommendations based on evidence and field-based insights.

Objectives of the Study

1. To examine the pattern and trends of environmental solid waste in selected urban cities in Nigeria
2. To examine the public health risks associated with improper solid waste management in specific urban areas of Nigeria.
3. To explore and recommend effective strategies for solid waste management in selected Nigerian urban centers

Literature Review

Conceptualizing Solid Waste

Wastes refer to substances or materials deemed no longer useful by their producers or users and are thus discarded. They appear in solid, liquid, or gaseous states. Solid waste, as defined by the World Health Organization (Nnadozie, 2022), includes unwanted materials from homes, industries, communities, and farms that do not have enough liquid content to flow freely. Waste generation is a continuous and universal process. All living organisms naturally produce waste through metabolic processes, and human activities such as farming, construction, food processing, and carpentry contribute to environmental waste (Adelkan, 2016). Historically, most waste was organic and biodegradable, posing minimal danger to the human health or environment.

Solid waste management involves a series of processes such as collection, storage, transportation, treatment, recycling, and recovery, followed by final disposal, all aimed at minimizing risks to human health, animals, and the environment (Fafioye and John-Dewole, 2013). This issue is especially problematic in developing African countries like Nigeria, where it threatens health, water, air, and land quality. In Nigeria, improper municipal

waste management is widespread, with many urban areas lacking public disposal services. Residents often burn or bury their waste, leading to disorganized and unsafe disposal practices (Abila and Kantola, 2013).

Managing waste effectively in Nigeria has proven difficult. Ezeah and Roberts (2012) pointed out that the main contributing factors are poverty, fast population growth, urban expansion, and weak infrastructure. Esohe (2023) added that issues like limited funding, poor coordination, inadequate facilities, and low public awareness further complicate waste management. According to Abir, Datta, and Saha (2023), socio-economic factors e.g. income, education, family size, and place of residence influence waste generation. Financial limitations hinder municipal efforts to manage waste efficiently. Basu (2009) emphasized that proper waste processing is necessary to protect public health. Solid waste presents a major Problem for both rural and urban places in Nigeria and other developing nations. Its consequences include public health risks, land degradation, and various social and economic issues. Due to poor enforcement of environmental regulations, many people dump waste in gutters, on roadsides, or in waterways. Without reliable public services, communities often resort to dangerous disposal methods, including burning toxic or infectious materials, which harm human and animal life (Musa et al., 2020).

Trends in Solid Waste Disposal in Nigeria

In most Nigerian cities, waste is poorly managed and often discarded in burrow pits, on streets, or in open drains. Ogwueleka (2003) noted similar patterns in Nsukka, where residents discarded waste in open spaces or burned it in their backyards. In Abeokuta, Babayemi and Dauda (2009) found a high rate of waste generation with no matching disposal technologies. Nkwocha et al. (2011) observed only a 61% efficiency in Owerri's waste collection system, attributing the low performance to social and technical challenges. Ogwueleka (2009) found that most waste in nine Nigerian cities was organic, yet management was poor due to lack of funding and resources.

Medical waste and other hazardous materials are also improperly disposed of, often near residential and market areas, increasing health risks. Puopie and Owusu-Ansah (2014) and Nabegu (2010) also observed widespread informal dumping practices. Anyanwu and Adefilia (2014) noted that many residents discard waste close to their homes or workplaces, creating large, unmanaged waste piles. According to Ogbonna et al. (2002), Samuel et al. (2013), and others reported that many people dispose of solid waste in open areas, contributing to environmental degradation. Poor waste habits increase disease risks. Komolafe (2011) warned that rotting waste attracts pests that transmit illnesses like cholera, typhoid, and diarrhea.

Health Implications of Poor Waste Management

Sanitation is critical to health, environmental protection, and economic development. In Nigeria, ineffective sanitation systems threaten both urban and rural populations. From major cities to remote communities, unmanaged waste continues to endanger lives. Improper waste disposal is a national challenge (Selin, 2013; UN global -Environment, 2017; Sultanova et al.,

2021). Rapid industrialization and improved living standards increase waste output (Kurakalva et al., 2016). Countries like China, Mexico, and Brazil struggle with waste-related health issues (Getis et al., 2018; Kotze, 2020). The World Bank In Japan, predicts waste generation could reach 2.2 billion tonnes annually by 2025, with less than half properly collected (UN Environment, 2017). Waste includes municipal, industrial, and agricultural types (Kwun Omang et al., 2021). Uncontrolled waste causes air, soil, and water pollution, leading to climate impacts and public health problems (Kwun Omang et al., 2021). African nations like Nigeria face growing waste volumes and limited collection capacity (Kumar and Agrawal, 2020). Health issues like diarrhea are common among children in these regions. Ziraba et al. (2016) found that up to 70% of waste in developing cities remains uncollected.

In Ghana, Kosoe and Amoah (2014) discovered that only 216 out of 810 daily tonnes of waste were collected, leaving 594 tonnes as a public health risk. Ferronato et al. (2017) highlighted the dangers of waste dumped into water bodies. Risk perception studies show that women tend to be more concerned about environmental hazards. Mamady (2016) found higher waste-related health concerns among women in Guinea. Kanhai et al. (2021a) reported that Ghanaian women in focus groups linked waste to diseases like malaria and diarrhea. However, other studies argue that health risks from poor waste management affect both genders equally. Adeniyi and Oni (2016) and Adewoyin (2017) documented shared respiratory and waterborne disease risks. Waste also fosters vectors like mosquitoes and rodents, increasing risks of malaria and leptospirosis. In South Africa, poverty and urban growth have overwhelmed waste services (Akmal and Jamil, 2021). In addition to health impacts, poor waste practices can reduce a city's economic and social value. Studies from the UK have connected improper waste practices to increased illness and death (Giusti, 2009). Research has emphasized the broader economic and social costs of waste mismanagement (Schenck et al., 2022,Burcea, 2015; Khoso et al., 2018;).

Solid Waste Management Strategies in Nigeria

Solid waste management includes all steps from generation to disposal, with the aim of making waste harmless to people and nature (Fafioye and John-Dewole, 2013). In Nigeria, poor infrastructure and service delivery continue to hinder effective waste control (Abila and Kantola, 2013). Many urban areas lack formal waste services, causing people to resort to burying or burning waste (Abir et al., 2023). To achieve sustainable management, all steps—generation, sorting, transportation, treatment, and disposal—must be efficient (Opara and Uwakwe, 2016). In most Nigerian cities, the waste management process is basic, often lacking sorting or characterization. This causes inefficiencies but also some benefits, such as localized solutions.

Waste management involves handling and treating waste safely while protecting human health and the environment (Adewoyin, 2017). Properly managed waste—whether solid, liquid, or hazardous—can improve life quality and environmental sustainability. Atsegbua (2023) described waste management as the collection and disposal of waste in a way that prevents harm. Burcea (2015) emphasized waste treatment methods that reduce

environmental damage. Modern waste management now includes prevention, recycling, and resource recovery. Alama and Ahmed (2013) stressed that regulations and public awareness are key to stopping illegal dumping and repairing past damage. Mahmood et al. (2020) described waste management in simple terms: collecting and reusing discarded materials to reduce environmental harm. Ogbonna et al. (2002) noted that effective waste management depends on practical steps, including policies and laws, as well as institutional support. Nigeria has assigned clear roles to federal, state, and local governments. These roles include waste collection, transportation, treatment limits, hazardous waste handling, and color-coded labeling for medical waste.

Methods, Data, and Analysis

Composting: Uses microorganisms to break down food scraps and leaves into compost. It improves soil health and reduces landfill use. Composting can be aerobic (with oxygen) or anaerobic (without oxygen) (Nwocha et al., 2011; Basu, 2009).

Incineration: Burns waste in a controlled furnace called an incinerator, producing non-toxic ash. It is commonly used in places with limited landfill space like Japan (Anyanwu and Adefilia, 2014).

Landfilling: Involves burying waste in pits, far from residential areas. It is the oldest and most widely used method of waste disposal (Esohe, 2023). Nigeria's environmental policies are guided by several national and international laws. The 1999 Constitution sets the foundation, stating that the government must protect natural resources, including water, air, and wildlife (Musa et al., 2021). These provisions support the implementation of environmental treaties and laws.

Empirical Review

Urbanization and technological growth have intensified waste problems in developing nations. Cities undergoing rapid change face serious challenges in managing waste (Momoh and Oladebeye, 2010). In Nigeria, cities struggle to keep up with growing waste volumes, leading to environmental crises (Abel and Afolabi, 2007).

In Abeokuta, Babayemi and Dauda (2009) found high waste levels and low management efficiency. Only 35.8% of respondents used formal waste services. Okeniyi and Anwan (2012) observed that food waste and plastic bags made up the largest portions of daily waste at Covenant University. Ogu (2000) discovered that most households in Benin-City lacked formal collection services due to limited government resources. Onwughara et al. (2010) studied waste practices in Umuahia, where a population of 1.2 million produced hundreds of metric tons of waste daily. Most waste came from markets and included hazardous components. The authors emphasized the importance of separating, treating, and recycling waste before disposal.

Gap in Literature

Although many studies have looked at pollution and health problems caused by poor waste management in developing countries, there is still not enough recent research focused on Nigerian cities. Most of the past studies talk about general issues like open dumping and burning of waste, but they do not give clear and current data on harmful substances like metals or plastics in the environment. Also, the health effects are often described in general terms without strong local evidence. Because of this, it is hard to create practical and effective solutions for waste problems in fast-growing Nigerian cities.

Research Method

A mixed-methods research design was adopted, combining survey questionnaires and in-depth interviews. Field data were collected from three urban areas where open dumping is common. A total of 150 questionnaires were distributed to residents living within a two-kilometer radius of the dumpsites, with 138 valid responses received (92% response rate). In addition, ten interviews were conducted with waste management officials and healthcare personnel. Data were analyzed using descriptive statistics.

This study analysed data collected descriptively using Statistical Package for Social Scientists (SPSS) software (version 21). Qualitative data, in the form of open-ended questions, was also analysed thematically and using descriptive statistics.

Methods, Data, and Analysis

Demographic Analysis of Respondents

Table 1. Gender Distribution of Respondents

Responses	No of Respondents	Percentage
Male	82	60
Female	56	40
Total	138	100

Table: 1 indicates that out of the 138 individuals who completed the questionnaire, 82 (60%) were male, while 56 (40%) were female. This suggests a higher level of participation from male respondents compared to their female counterparts.

Table 2. Age Distribution of Respondents

Responses	No of Respondents	Percentage
35 to 45 years	55	40
25 to 35	66	48
36 years and above	17	12
Total	138	100

Table 2 reveals that among the 138 respondents, 55 (40%) were aged between 25 and 35 years, 66 (48%) were within the 36 to 45-year age range, while 17 (12%) were 46 years and above. This indicates that the majority of respondents were 25 years and older, with no representation from individuals below the age of 25.

Table 3. Length of Residence Distribution of Respondents

Responses	No of Respondents	Percentage
1 to 10 yeaars	69	50
11 years to 20 years	61	44
21 years and above	8	6
Total	138	100

Table 3 showed that out of 138 respondents that attended the questionnaire, 69 (50%) had stayed in the cities for 1 year to 10 years, 61 (44%) of the respondents had stayed for 11 years to 20 years and 8 (6%) of the respondents had stayed for 21 years and above. Therefore, there are more respondents that had stayed in the cities from 1 year to 10 years.

Table 4. Marital Distribution of Respondents

Responses	No of Respondents	Percentage
Married	97	72
Divorced	14	10
Single	11	8
Total	138	100

Chart 4 illustrates that out of the 138 participants, 97 (72%) were married, 14 (10%) were divorced, and 11 (8%) were single. This indicates that the majority of respondents were married.

Table 5. Educational Qualification Distribution of Respondents

Responses	No of Respondents	Percentage
BSC	77	56
M.Sc	52	38
Ph.D	8	6
Total	138	100

Table 5 showed that out of 138 respondents that attended the questionnaire, 77 (56%) were obtained B.Sc, 52 (38%) of the respondents obtained M.Sc and 8 (6%) of the respondents obtained Ph.D. Therefore, there are more respondents B.Sc educational Qualification.

Table 6. Patterns and trends of Environmental Solid Waste in Selected Urban Cities in Nigeria

Items	Number	Mean Statistics	Std. Error	Std Deviation
Household waste indiscriminate disposal is a one of the trends in urban cities in Nigeria	138	3.1800	.11317	.80026
There is a high level of indiscriminate disposal of solid waste in markets in urban cities in Nigeria	138	3.2800	.10706	.75701
Solid waste from manufacturing and processing industries is high in urban cities in Nigeria	138	3.3800	.11025	.77959
There is serious agricultural and organic waste disposal in urban cities in Nigeria	138	3.1600	.11556	.81716
Valid N (listwise)	138			

Patterns and trends of Environmental Solid Waste in Selected Urban Cities in Nigeria

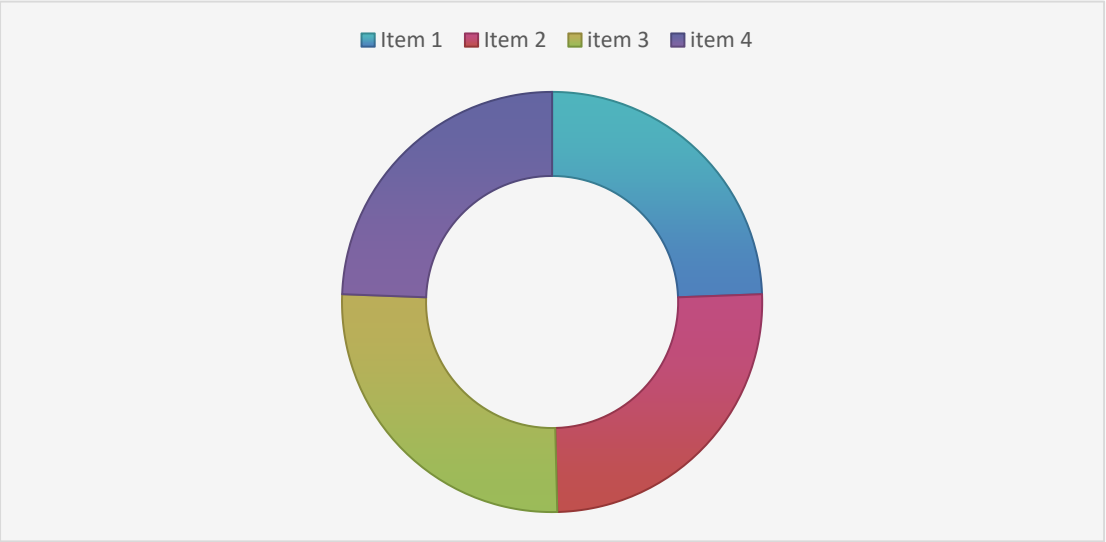

Chart 1. Patterns and trends of Environmental Solid Waste in Selected Urban Cities in Nigeria

Given to standard deviation on the patterns and trends of environmental solid waste in selected urban cities in Nigeria, the SPSS calculated indicated that all items were above 2.5 mean acceptance resulting to the general acceptance that there is significant pattern patterns and trends of environmental solid waste in selected urban cities in Nigeria. Based on this, the table showed that household waste indiscriminate disposal is a one of the trends in urban cities in Nigeria, there is a high level of indiscriminate disposal of solid waste in markets in urban cities in Nigeria, solid waste from

manufacturing and processing industries is high in urban cities in Nigeria, there is serious agricultural and organic waste disposal in urban cities in Nigeria.

Table 7. Public Health Implications of poor Solid Waste management practice in Selected Urban Cities in Nigeria

Items	Number	Mean Statistics	Std. Error	Std Deviation
Accumulated waste attracts vector like mosquito, flies, rodents that causes diseases to human	138	3.2000	.12778	.90351
Burning of solid waste especially plastic and other hazardous material releases toxics fumes that cause respiratory diseases.	138	3.1400	.11432	.80837
Leachate from water dumps can infiltrate ground water causing contaminated and waterborne disease	138	3.2200	.12219	.86402
Improperly disposed glasses and metals can cause cuts, punch wounds and infections	138	3.1800	.12352	.87342
Valid N (listwise)	138			

Patterns and trends of Environmental Solid Waste in Selected Urban Cities in Nigeria

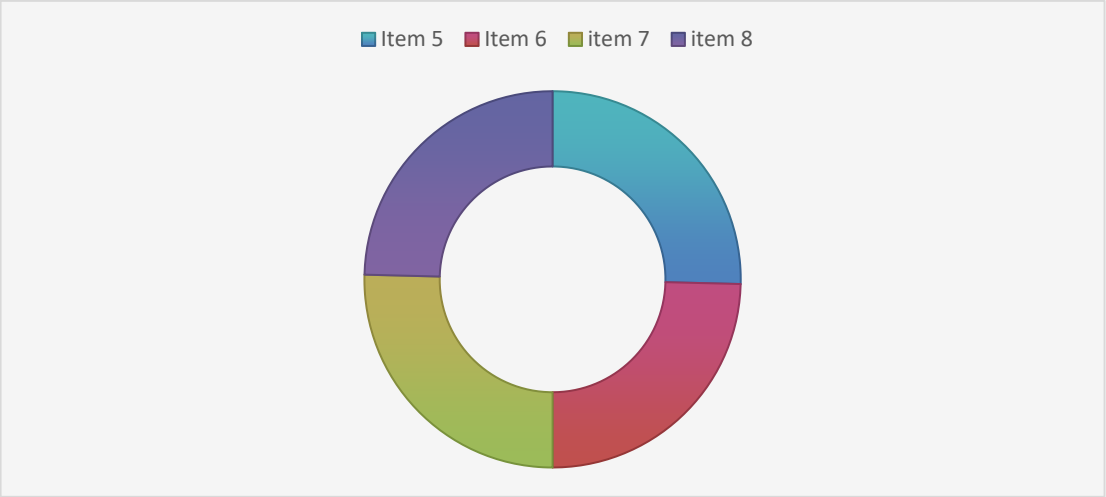

Chart 2. Patterns and trends of Environmental Solid Waste in Selected Urban Cities in Nigeria

Given to standard deviation calculation on public health implications of poor solid waste management practice in selected urban cities in Nigeria, the table presented that accumulated waste attracts vector like mosquito, flies, rodents that causes diseases to human, burning of solid waste especially plastic and other hazardous material releases toxics fumes that cause

respiratory diseases, leachate from water dumps can infiltrate ground water causing contaminated and waterborne disease, improperly disposed glasses and metals can cause cuts, punch wounds and infections and living near dirty, smelly or overflowing waste dumps can cause mental and emotional stress.

Table 8. Perfect Solid Waste management strategies in Selected Urban Cities in Nigeria

Items	Number	Mean Statistics	Std. Error	Std Deviation
Public awareness and education campaign on proper solid waste management is vital	138	3.1800	.12017	.84973
Enforcement of environmental laws and penalties is fundamental	138	3.3000	.10400	.73540
The provision of adequate waste collection facilities is very important in urban cities	138	3.2800	.14009	.99057
Promotion of waste segregation and recyclizing is very essence in urban cities	138	3.1000	.14639	1.03510
Valid N (listwise)	138			

Patterns and trends of Environmental Solid Waste in Selected Urban Cities in Nigeria

Chart 3. Patterns and trends of Environmental Solid Waste in Selected Urban Cities in Nigeria

Given the standard deviation calculation on the perfect solid waste management strategies in selected urban cities in Nigeria, the table showed that all items in the table were accepted leading to public awareness and education campaign on proper solid waste management is vital, enforcement of environmental laws and penalties is fundamental, the provision of adequate waste collection facilities is very important in urban cities, promotion of waste segregation and recyclizing is very essence in urban cities.

Results

Data Analysis Based on Qualitative Analysis

Qualitative Analysis of Interview Themes: Patterns and trends of Environmental Solid Waste in Selected Urban Cities in Nigeria. The interviewees' responses consistently reflected the core issues identified in the initial findings: Indiscriminate Disposal as a Dominant Trend: Participants from all cities, especially Aisha Bello (Lagos) and Fatima Musa (Abuja), vividly described the common practice of dumping waste in unauthorized areas, roadsides, and waterways. This reinforced the finding of "household waste indiscriminate disposal" as a pervasive trend.

Discussion

The findings on the patterns and trends of environmental solid waste in selected urban cities across Nigeria revealed a consistent and concerning waste disposal behavior. The study showed that indiscriminate disposal of household waste is a common practice in these areas. Similarly, a high rate of uncontrolled waste dumping was observed in urban markets. Waste generation from manufacturing and processing industries was also notably high, along with considerable volumes of agricultural and organic waste. Furthermore, plastic and packaging waste were frequently found discarded improperly across major cities in the country. These outcomes align with the observations of Anyanwu and Adefilia (2014), who reported that many individuals tend to dispose of refuse near their residences or daily activity locations, resulting in large waste accumulations along streets, gutters, and roadsides. The present findings also support earlier reports by Ogbonna et al. (2002), Samuel et al. (2013), Naphtali and Vimtim (2016), Opara et al. (2016), and Opara and Uwakwe (2016), which highlighted widespread use of open spaces for waste disposal, contributing significantly to the inefficiencies in waste management systems.

In respect to public health implications of poor solid waste management practice in selected urban cities in Nigeria, the result from the study revealed that accumulated waste attracts vector like mosquito, flies, rodents that causes diseases to human, burning of solid waste especially plastic and other hazardous material releases toxics fumes that cause respiratory diseases, leachate from water dumps can infiltrate ground water causing contaminated and waterborne disease, improperly disposed glasses and metals can cause cuts, punch wounds and infections and living near dirty, smelly or overflowing waste dumps can cause mental and emotional stress. This agreed with existing studies. Improper disposal of waste contributes significantly to pollution of the air, soil, and water, and indirectly accelerates the greenhouse effect, posing risks to public health, environmental quality, and economic stability (Kwun Omang et al., 2021). Countries in Africa—particularly Nigeria, Kenya, and those within the Sub-Saharan region—face high population densities, which have resulted in increased consumption of natural resources and rising volumes of waste. This situation is further worsened by a notable decline in waste collection, processing, and disposal efforts (Selin, 2013; Kumar and Agrawal, 2020). Health problems linked to

inadequate waste management, such as cases of diarrhea, are especially evident among young children in areas like Odukpani and Akamkpa (Kwun Omang et al., 2021).

As regards to perfect solid waste management strategies in selected urban cities in Nigeria, the findings indicated that public awareness and education campaign on proper solid waste management is vital, enforcement of environmental laws and penalties is fundamental, the provision of adequate waste collection facilities is very important in urban cities, promotion of waste segregation and recyclizing is very essence in urban cities and public-private partnership is a key strategy for solid waste management in urban cities. The findings are consistent with previous research. Solid waste management involves the processes of collecting, storing, transporting, treating, recycling, recovering, and ultimately disposing of waste materials in a manner that ensures they pose no harm to human health, animal life, ecological systems, or the environment as a whole (Fafioye and John-Dewole, 2013).The problem of waste management is a primordial and poses threats in developing countries in Africa, particularly Nigeria. Municipal waste management problems in Nigeria cut across concerns for human health, air, water, and land pollution among others. The analysis of the key problem affecting the efficient management of municipal waste is critical for developing a workable solution in an emerging economy like Nigeria's (Abila and Kantola, 2013).

Conclusion

Nigerian urban centers show clear patterns in solid waste, including widespread indiscriminate disposal of household waste, high levels of market waste, substantial industrial waste, and significant agricultural/organic waste. Plastic and packaging waste are also frequently found. Poor waste management leads to serious health risks as accumulated waste attracts disease vectors (mosquitoes, flies, rodents) and burning waste, especially plastics, releases toxic fumes causing respiratory issues. Effective solid waste management can be improved through public education, strict enforcement of environmental laws, adequate waste collection systems, waste segregation and recycling, and strong collaboration between government and private sectors.

Recommendations

Based on the findings, here are three key recommendations for improving solid waste management in Nigerian cities: 1) There is need to strengthen existing environmental regulations related to waste disposal and actively enforce penalties for non-compliance. This includes targeting indiscriminate dumping by households, markets, and industries. 2) The government should provide sufficient and accessible waste collection facilities across urban areas. This involves ensuring regular collection services and promoting waste segregation at the source (households, markets, industries) to facilitate recycling. 3) The citizens need to be educated on the health and environmental consequences of poor waste management and the benefits of

proper disposal, segregation, and recycling. Foster a sense of collective responsibility and encourage community participation in waste management initiatives.

References

Abel, O. A. (2009). Patterns of solid waste production in a traditional Nigerian urban center: A case study of Ogbomoso. Environment and Urbanization, 19(2), 527–537.

Abila, B., & Kantola, J. (2013). Challenges of managing municipal solid waste in Nigeria: Developing knowledge-based solutions. International Journal of Environmental, Chemical, Ecological, Geological and Geophysical Engineering, 7(6), 303–308.

Abir, T., Datta, M., & Saha, S. (2023). Factors shaping municipal solid waste management efficiency in Barishal metropolitan region. Journal of Geoscience and Environment Protection, 11, 49–66. https://doi.org/10.4236/gep.2023.111004

Adelekan, I. O. (2010). Exposure of low-income coastal residents to flood hazards in Lagos, Nigeria. Environment and Urbanization, 22(2), 433–450.

Adeniyi, C. O. (2016). Urban planning deficiencies and their health impacts in South-Eastern Nigeria. Journal of Environmental Research and Management, 3(4), 46–51.

Adewuonyin, J. C. (2017). Cost-effective strategies for solid waste collection and disposal. Journal of Solid Waste Technology and Management, 29(3), 154–160.

Akana, C. C., & Jamil, N. (2018). Waste management in Nigeria: Key challenges, policy gaps, and prospects. Journal of Solid Waste Technology and Management, 44(2), 163–172. https://doi.org/10.5276/JSWTM.2018.163

Alam, A. H., & Ahmed, S. D. (2013). Managing household waste in Port Harcourt, Nigeria. Applied Energy, 84(6), 664–670.

Amoah, A., & Kosoe, O. (2014). Contributions of the informal sector to solid waste handling in Lagos, Nigeria. Habitat International, 31(2), 193–204.

Anyanwu, N. C., & Adefila, J. O. (2014). Solid waste control practices in Karu, Nasarawa State, Nigeria. American International Journal of Contemporary Research, 4(11), 149–159.

Audi, M., Mohammed, A., & Ola, R. (2014). Nigeria's industrial growth and its link to sustainable development: Issues and solutions. Journal of Sustainable Development Studies, 6(1), 1–15.

Awomuti, A. A. (2008). Waste generation trends and disposal behaviors in Ilorin, Nigeria. Lapai International Journal of Management and Social Sciences, 1(1), 171–183.

Babayemi, J. O. and Dauda, K. T. (2009). Evaluation of solid waste generation, categories and disposal options in developing countries: A case study of Nigeria. Journal of Applied. Science 13(3): 83-88.

Basu, R. (2009). A model approach to managing solid waste. Journal of

Management, 6, 20–24.
Burcea, D. O. (2015). Efficient solid waste management as a preventive tool for disease and environmental improvement in Bayelsa State, Nigeria. International Journal of Academic Research in Education and Review, 3(3), 65–75.
Dubey, B., & Narayanan, A. S. (2010). Mathematical modeling of the effects of industrial activity, demographic changes, and pollution on renewable natural resources. Nonlinear Analysis: Real World Applications, 11, 2833–2848.
Esohe, D. O. (2023). Generation and categorization of municipal solid waste: A case example from Ota, Nigeria. International Journal of Environmental Science and Toxicology Research, 3(1), 1–8.
Ezeah, J., & Robert, N. C. (2012). Solid waste management in urban Nigeria and its contribution to environmental sustainability: Evidence from Abakaliki. European Scientific Journal, 12(23), 155–183.
Ezeh, C. C., Onyema, V. O., Obi, C. J., & Anene, N. M. (2024). Systematic review of oil spill effects on populations in oil-producing areas of Nigeria. Environmental Science and Pollution Research, 31, 34761–34786.
Fafioye, O. O., & John-Dewole, O. O. (2013). Evaluating waste management issues in Ibadan South West Local Government Area, Nigeria. Greener Journal of Environmental and Management Studies, 2(2), 60–64.
Ferronato, D. J., Kigun, P. A., & Ogalla, M. (2017). Integrated approaches to solid waste management as a solution to existing challenges: A case from Jabi District, Abuja. Ethiopian Journal of Environmental Studies and Management, 9(6), 769–779.
Flynn, D. I., & Ohwovoriole, E. N. (2013). Exploring barriers to residential solid waste disposal in Benin metropolis, Nigeria. Journal of Emerging Trends in Engineering and Applied Sciences, 3(1), 103–107.
Getis, A. I., Joseph, K. U., & Atu, J. E. (2018). Perception and behavior of city residents toward solid waste handling in Calabar, Nigeria. European Journal of Sustainable Development, 1(1), 22–34.
Giusti, O. F. (2009). Municipal waste recovery and recycling strategies in Lagos, Nigeria. Waste Management, 27(9), 1139–1143.
Hammed, T. B., Soyingbe, A. A., & Adewole, D. O. (2011). Composting as a method for managing slaughterhouse wastewater: A case study from Alesinloye recycling complex. International Journal of Interdisciplinary Social Sciences, 6(2), 67–78.
Jemiluyi, O. O. (2021). Impacts of urban growth on child health outcomes in Nigeria. Journal of Population and Social Studies, 29, 586–603.
Kanhai, A. S., Adzimah, S. K., & Karikari, C. M. (2021). Time series analysis of solid waste handling practices in Tarkwa municipality, Ghana. Journal of Environment and Earth Science, 2(10), 139–147.
Komolafe, S. F. (2011). Achieving sustainable waste management as a remedy to environmental and hygiene challenges in Ibadan, Nigeria. Journal of Environmental Science and Technology, 4(2), 119–122.
Kotze, S. I. (2020). Composting as a sustainable approach to managing urban waste in Katsina, northern Nigeria. International Journal of

Bioscience, Biochemistry and Bioinformatics, 4(1), 11–13.
Kurakaalva, P. O. U., Uwakwe, K. A., Egenti, N. B., Okwuoha, A. P., & Nkwocha, I. B. (2016). Evaluation of waste handling practices among residents in Owerri Municipal, Imo State, Nigeria. Journal of Environmental Protection, 6(5), 446–456.
Kwungn, O., Omran, A., & Rapp, H. P. (2021). Managing municipal solid waste in industrialized nations: A case study of Karlsruhe, Germany. Journal of Engineering Annals, 6(3), 266–273.
Letcher, T. G., & Vallero, O. (2014). Operational aspects of landfill sites in Nigeria's Niger Delta. Engineering Geology, 73(1–2), 171–177.
Mahmood, H., Alkhateeb, T. T. Y., & Furqan, M. (2020). Exploring the link between industrial development, urban expansion, and CO_2 emissions in Saudi Arabia: An asymmetric analysis. Energy Reports, 6, 1553–1560.
Mamadu, A. O. (2016). Quantifying municipal solid waste generation in Oyo, Nigeria. Journal of the Nigerian Institute of Town Planners, 19(1), 49–65.
Momodu, N. S., Dimuna, K. O., & Dimuna, J. E. (2011). Addressing the impact of solid waste in Nigerian cities. Journal of Human and Ecological Sciences, 1(34), 125–133.
Momoh, J. J., & Oladebeye, D. H. (2010). Public knowledge, attitudes, and readiness for household waste recycling in Ado-Ekiti, Nigeria. Journal of Applied Sciences in Environmental Sanitation, 5(1), 93–105.
Musa, K. S., Maijama'a, R., Shaibu, H. U., & Muhammad, A. (2019). Investigating the effect of crude oil prices and exchange rates on Nigeria's economic growth: An ARDL approach. Open Access Library Journal.
Naphtali, G., & Vimtim, E. (2016). Application of GIS in assessing sustainable locations for waste disposal in Mubi. Sky Journal of Soil Science and Environmental Management, 5(2), 26–32.
Nkwocha, E. E., Pat-Mbano, E. C., & Dike, M. U. (2011). Analysis of solid waste collection efficiency in Owerri city, Nigeria. International Journal of Science and Nature, 2(1), 89–95.
Nnadozie, B. U. (2022). Challenges of waste management practice in Owerri West LGA of Imo State (Unpublished undergraduate project). Department of Estate Management, Federal Polytechnic Nekede.
Ogbonna, D. N., Ekweozor, I. K. E., & Igwe, F. U. (2002). Waste control as an environmental protection tool in Nigeria. AMBIO: A Journal of the Human Environment, 31(1), 55–57. https://doi.org/10.1579/0044-7447-31.1.55
Ogu, V. I. (2000). Engaging the private sector in municipal waste services: Evidence from Benin City, Nigeria. Environment and Urbanization, 12(2), 103–117.
Ogwueleka, T. C. (2009). Characterization and handling of municipal solid waste in Nigeria. Iranian Journal of Environmental Health Science and Engineering, 6(3), 173–180.
Ogwueleka, T. C. (2003). Urban solid waste analysis in Nsukka, Nigeria. Journal of Solid Waste Technology and Management, 29(4), 239–246.

Ohwo, O., & Abotutu, A. (2015). The environmental footprint of urbanization in Nigeria. British Journal of Applied Science and Technology, 9(3), 212–221.

Okalebo, S. E., Opata, G. P., & Mwasi, B. N. (2014). Household waste generation and management patterns in Eldoret, Kenya. International Journal of Agricultural Policy and Research, 2(2), 76–89.

Okeniyi, J. O., & Anwan, E. U. (2012). Solid waste streams in Covenant University, Nigeria: A sustainability-focused analysis. Journal of Environmental Science, 3(2), 419–424.

Omokaro, G. O., Idama, V., Airueghian, E. O., & Michael, I. (2024a). Overview of water resource management and pollution in Nigeria. American Journal of Environmental Economics, 3(1), 5–18.

Onwughara, I. N., Nnorom, I. C., & Kanno, O. C. (2010). Roadside dumping of urban waste: Implications and sustainable practices for Nigeria. International Journal of Environmental Science, 1(5), 409–418.

Opara, J. A., Akuei, J., & Sempewo, J. (2016). Waste management and urbanization impacts on environmental health in Bor, South Sudan. International Journal of Bioinformatics and Biological Sciences, 4(1), 19–33.

Opara, J. A., & Uwakwe, F. (2016). Environmental waste control and sustainability in developing nations. International Journal of Applied Science and Engineering, 4(2), 51–60.

Puopie, L. F., & Owusu-Ansah, J. (2014). Solid waste challenges in Ghana: A case from Tamale metropolis. Journal of Environment and Earth Science, 4(17), 129–147.

Samuel, E. S., Gemson, G. S., & Ezebuiro, V. O. (2013). Solid waste attitudes among primary healthcare workers in Taraba State, Nigeria. African Journal of Educational Research and Administration, 6(1), 121–129.

Schwarz-Herion, O., Omran, A., & Rapp, H. P. (2008). Solid waste management strategies in developed nations: A case from Karlsruhe, Germany. Journal of Engineering Annals, 6(3), 266–273.