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Assessment of the Effectiveness of Solid Waste Management Methods in Enugu Metropolis, Nigeria

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Abstract

Solid waste management (SWM) is a growing concern in rapidly urbanizing Nigerian cities. In Enugu Metropolis, the persistence of open dumping, irregular collection, and low levels of awareness has led to increased environmental hazards and disease outbreaks. The aim of the study is to assess the effectiveness of SWM methods in Enugu metropolis. A descriptive cross-sectional study design was employed. Using multistage sampling, 384 residents from diverse locations such as markets, households, health centers, and universities were selected. Data were collected through interviewer-administered questionnaires and analyzed with SPSS version 23. Descriptive statistics (frequencies, percentages, and means) and inferential statistics (Chi-square tests) were used to interpret findings. The result of the study showed that most (55.5%) of the respondents were females and majority (25.0%) were within the age group of 26-35 and 41.3% had tertiary level of education, while majority were traders (31.3%). 44.2% of respondents never segregated their waste, while only 23.9% reported doing so consistently. Solid waste was mostly stored in sacks (34.5%) and collected primarily by government agencies (37.6%). Although 37.6% reported daily waste collection, 11.6% stated that waste was never collected in their area. Perceived problems included overflowing waste bins (16.1%) and air pollution from burning (11.1%). Environmental impacts were widely reported, with 77.4% observing pollution-related problems - especially land pollution (22.6%) and blocked drainage causing flooding (19.1%). Health problems linked to poor waste management were reported by 68.2% of respondents, with gastrointestinal diseases (23.0%), skin infections (21.3%), and malaria (20.5%) being most common. While only 45.5% of respondents were aware of proper waste management practices, awareness was significantly associated with higher levels of compliance ($\chi^2 = 176.644$, $p < 0.001$). Solid waste management practices in Enugu Metropolis are still largely ineffective due to poor waste segregation, irregular collection, and low public awareness. Although some residents perceive current efforts as somewhat effective, widespread environmental and health risks remain.

Keywords: *Solid Waste Management; Environmental Impact; Public Health; Disposal; Waste Collection; Awareness; Compliance*

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1. Introduction

Solid waste management has become a critical environmental concern in urban areas globally. As cities grow and population densities rise, the volume of waste generated increases substantially, thereby overburdening existing waste disposal infrastructures (Ukala *et al*., 2020). Poorly managed waste not only leads to environmental pollution but also threatens public health, thereby diminishing the quality of life in urban settings (Nwosu & Chukwueloka, 2020).

In many developing nations, ineffective solid waste management (SWM) poses a major risk to both human health and environmental sustainability, disproportionately affecting low-income communities in urban and rural areas. A key factor behind the inefficiency of SWM systems in these countries is the mismanagement and limited allocation of financial resources. Waste management typically receives minimal budgetary attention, except in a few major cities such as Johannesburg, Abuja, Pretoria, Soweto, Tunis, Cairo, and Accra (Amalu & Ajake, 2014). Additionally, in countries like Nigeria, the issue of proper waste disposal has long been neglected or underestimated, as it was often viewed as a secondary concern in the race toward rapid economic development. This perception is rooted in the assumption that waste generation is an

unavoidable consequence of progress (Afolayan *et al*., 2022).

As the most populous nation in Africa and the ninth globally, Nigeria generates over 32 million tons of solid waste annually. However, only about 20–30% of this waste is collected, with the remainder being indiscriminately dumped in unsafe areas (Bakare, 2016). Waste management in the country is hampered by inadequate service coverage in many urban areas and the continued use of inefficient collection methods. Hazardous and municipal wastes are often disposed of together in unlined landfills, open spaces, drains, and unauthorized sites, leading to widespread environmental pollution (Mba & Nnamdi, 2022).

Despite lacking a fully integrated and coordinated national system for waste management, responsibility for SWM in Nigeria is distributed among the Federal and State Ministries of Environment, and the Environmental Health Departments at the Local Government level. Several legal frameworks guide waste management activities, including the Harmful Waste (Special Criminal Provisions, etc.) Act of 1988, the National Environmental Standards and Regulations Enforcement Agency (NESREA) Act of 2007, the Environmental Impact Assessment Act of 1992, and other sanitation-related environmental regulations (Onyishi *et al*., 2023). In line with these regulations, all Nigerian states have now established waste management authorities under their respective Ministries of Environment. The Enugu State Waste Management Authority (ESWAMA) was created under this mandate to address waste challenges specific to the region (NESREA, 2007).

Waste disposal has become a growing concern in Enugu city, where the daily accumulation of refuse is becoming increasingly difficult to manage. Most waste originates from households, with additional contributions from small-scale industries, artisans, and street traders who often dispose of waste carelessly in nearby areas (Onyishi *et al*., 2023). Inadequate collection and disposal practices have led to numerous environmental issues, such as blocked drainage systems and polluted water bodies (Nwosu & Chukwueloka, 2020). Addressing these problems requires a collaborative effort between government bodies and the public, with a shift toward comprehensive and sustainable waste management practices to protect environmental and public health.

The formation of waste management agencies in various Nigerian states has led to the implementation of diverse strategies tailored to local needs. These include conventional approaches like waste generation tracking, collection, transportation, and disposal, as well as more progressive waste minimization practices involving reduction, reuse, recycling, and resource recovery (Nwosu & Chukwueloka, 2020). Evaluating how effective these strategies are in Enugu is essential for promoting sustainable urban development, safeguarding public health, and enhancing both the visual and economic appeal of the city. This study, therefore, aims to assess the effectiveness of solid waste management methods in Enugu metropolis, Nigeria.

2. Materials and Methods

Study area

The study was carried out in Enugu metropolis, Enugu state Nigeria. Enugu metropolis has an estimated population of 820,000 (2006 census) and is located between latitudes $6^{o}20`$ N and $6^{o}32`$N of the equator and longitudes $7^{o}28`$E and $7^{o}36`$E of the Greenwich meridian. It extends over an area of about 145.8 square kilometres (Enugu State Ministry of Lands and Survey, 2022). The area is administered by three Local Government Authorities namely: Enugu North, Enugu South and Enugu East Local Government Areas (LGAs). Enugu metropolis is bounded in the north by Isiuzo and Igbo Etiti LGAs, in the west by Udi LGA and in the south and east by Nkanu west and Nkanu east LGAs respectively. Enugu metropolis as a political entity has many administrative divisions basically into: LGAs, zones, wards, layouts among others. Available records in the ESWAMA main office indicates that Enugu metropolis was divided into ten (10) zones based on their SWM coverage schedule. These include: Abakpa, Trans-Ekulu, Emene, Idaw River, GRA, Ogui, Independence Layout, Agbani Road, Uwani and New Haven. The study area has a robust economy, including public and private institutions such as banks, hotels, hospitals, recreational locations, restaurants and shopping malls. These places are prone to generation of solid waste which may cause burden to the environment.

Study Design

A descriptive cross-sectional study design was used for this research because; it enabled data to be collected from many individuals at a single point in time and allowed for the examination of associations between variables of interest.

Study Population

The study population consisted of residents of Enugu Metropolis who have been living and working in the study area for at least six (6) months. Residents of Enugu Metropolis who were above 18 years; live or work within the study area and who provided informed consent to participate in the study were included, while individuals who were below 18 years; who did not live or work in the selected study locations; environmental agencies and policy makers; and anyone who did not provide consent was excluded from the study

Sample Size Determination

The minimum sample size was determined using Fisher's formula (Ojewola *et al*., 2017)

$n = (z^2pq/d^2)$

Where n= the desired minimum sample size.

Z = the standard normal deviate, corresponding to 1.96 at 95% confidence interval.

P = Estimated proportion of the population with the characteristic of interest in a previous study (51% = 0.51) (Onuegbu, 2024)

Q = Complementary probabilities [q = (1 - P) = 1 - 0.51 = 0.49)].

D = degree of accuracy desired (set at 0.05)

$$n = \frac{(1.96)^2 \times 0.51 \times 0.49}{(0.05)^2} = 384.01$$

Sample size = 384.

Sampling Technique

Multistage sampling method was used. Enugu Metropolis comprises Enugu North, Enugu South and Enugu East LGAs. By simple random sampling method, Enugu North was selected. For inclusiveness to ensure representative sample, the areas of the survey in Enugu North were selected according to the following major gathering representative units: Markets, health centres, universities, and wards. There are two major markets, two main public universities and 13 wards in Enugu North LGA. By simple random sampling technique using balloting, one market (ogbete market), a university (ESUT), one health centre (Park Lane) and 2 political wards will be selected including New Haven and Independence layout. The sample size was then divided among the representative units proportionately according to estimated population. The selected representative units were visited on different days and participants that meet the inclusion criteria and who give informed consents were selected through simple random sampling techniques and the questionnaire was administered by the trained research assistants.

Data Collection

Primary data was collected using an interviewer administered questionnaire with close-ended and open-ended questions. The questionnaire was developed by the researcher after rigorous review of literatures, pretested and necessary adjustments made before the final exercise. The questionnaire was designed to consist of 5 sections. Section A contained information on the socio-demographic characteristics of respondents. Section B assessed the current waste management methods employed in Enugu metropolis. Section C assessed the efficiency and effectiveness of the identified waste management methods in Enugu metropolis. Section D assessed the residents' experiences of environmental and health-related problems associated with solid waste management practices in Enugu metropolis. Section E ascertained the relationship between awareness and compliance with proper waste management practices among residents in Enugu metropolis.

Ethical Consideration

Ethical clearance certificate was sought and obtained from the health research ethics committee of University of Nigeria Teaching Hospital, Enugu, Nigeria and permission to administer questionnaires to participants was obtained from the participants themselves using an informed consent form. The respondents were informed about the objective and purpose of the study, confidentiality was ensured and information was recorded anonymously.

Data Analysis

Completed questionnaires were collected from respondents and sorted out for ease of computation. The Statistical Product and Service Solutions (SPSS) version 23 was used for data analysis. Descriptive data was presented using frequency tables, percentages and means. Association between variables was determined using Chi-Square test statistics. A P-value less than 0.05 was considered statistically significant. For Likert scale scoring, means above 3.0 were considered as high acceptability while means below 3.0 were considered as low acceptability.

3. Results

The results obtained from the analysis of data from the survey are presented in this chapter. The results are presented in Tables with appropriate descriptions. Out of 384 questionnaires that were administered, 380 were fully completed and analysed, giving a response rate of 98.96%.

Table 1 shows the socio-demographic characteristics of the respondents. The result of the analysis revealed that majority of the respondents were female (55.5%) and 25.0% of the respondents were within the age bracket of 26-35. 41.3% of the respondents had tertiary level of education, while majority of the respondents were traders (31.3%), and 45.0% of the respondents were in a market residence. Table 2 show the solid waste management methods used in Enugu Metropolis. The result of the analysis shows that majority of the respondents do not segregate the wastes that come from the house into categories (44.2%). 20.5% of the respondents reported that the item they segregate is glass, bottle, and cans while majority of the respondents reported that they store the solid waste generated within their premises in a sack (34.5%). Table 3A and 3B shows the efficiency and effectiveness of the identified solid waste management methods in Enugu Metropolis. The result of the analysis revealed that majority of the respondents reported that government agencies are responsible for waste collection in their area (37.6%). 37.6% of respondents reported that waste collection in their area was on a daily basis, while 30.8% of the respondents reported that waste disposal facilities were very accessible. 28.2% of the respondents rated the efficiency of waste collection service in their area as efficient while 56.1%, of the respondents reported that they experience problems related to waste disposal. Among the respondents that reported experiencing problems, 16.1%, reported overflowing waste bins as the common problem encountered. 46.8% of the respondents reported yes to the effectiveness of the current waste management methods in Enugu Metropolis.

Table 4 shows the suggested improvements for better waste management. The result of the analysis revealed that 55.5% of the respondents agreed to more frequent waste collection, 28.2% agreed and strongly agreed each to more public waste bins, 45.3% agreed to better waste bins, 40.5% agreed to increased public awareness campaigns, while 31.6% agreed to a stricter waste disposal regulation as improvements for better waste management.

The mean analysis revealed that items 1-5 had mean scores of 3.7, 3.6, 3.9, 3.8, and 2.9 respectively. Since the mean score of items 1, 2, 3, 4 are above 3.0, we therefore accept More frequent waste collection, more public waste bins, better waste recycling programs, and increased public awareness campaigns as ways to improve waste management. Table 5 shows residents' experiences of environmental and health-related effects associated with the solid waste management practices employed in Enugu metropolis. The result of the analysis showed that majority of the respondents (77.4%) have noticed environmental effects of poor waste management. 22.6% reported that they had noticed land pollution (open waste dumps, littered streets).

Table 6 shows the level of awareness and compliance with proper waste management practices. The results of the

analysis revealed that majority of the respondents were not aware of the solid waste management practices in their area. 35.3% reported a moderate level of awareness with regards to proper waste management practices. 56.1% of the respondents reported that they sometimes comply with proper waste management practices.

Statistical analysis showed that there was significant relationship between awareness and the compliance of solid waste management practices in Enugu. Table 8 shows the preferred method by the respondents for improving their knowledge about waste management. The result of the analysis revealed that majority of the respondents' preferred Open seminars (27.1%).

Table 1. Socio-demographic Characteristics of Respondents

Variables	Frequency	Percentage (%)
Gender		
Male	169	44.5
Female	211	55.5
Age		
18-25	55	14.5
26-35	95	25.0
36-45	90	23.7
46-55	90	23.7
55 and above	50	13.2
Level of Education		
Primary	46	12.1
Secondary	130	34.2
Tertiary	157	41.3
No formal education	47	12.4
Occupation		
Student	45	11.8
Civil servant	100	26.3
Trader	119	31.3
Health worker	46	12.1
Others	70	18.4
Residence/study area		
Household	113	29.7
Market	171	45.0
Health Centre	46	12.1
University	50	13.2
Total	**380**	**100.0**

Table 2. Solid Waste Management Methods Used in Enugu Metropolis

Variables	Frequency	Percentages (%)
Segregate waste that comes from premise/house into categories.		
Yes, always	91	23.9
Sometimes	121	31.8
No, never	168	44.2
Items that are segregated/separated		
Metal	47	13.4
Plastic	63	17.9
Glass, Bottle, Cans	71	20.5
Organic waste	32	9.1
Electronic waste	48	13.7
Textile and old shoes	63	17.9
Others	26	7.4
Place of storage of the solid waste within the premises/house		
Sack	131	34.5
Basket	70	18.4
Metal Container	49	12.9
Plastic Container	60	15.8
Private Pit	53	13.9
Others	17	4.5

Table 3A. Efficiency and effectiveness of the identified solid waste management methods in Enugu metropolis

Variables	Frequency	Percentage
Agency or officials responsible for waste collection in the neighbourhood		
Government agencies	143	37.6
Private waste collectors	88	23.2
Community Groups	86	22.6
No formal collection systems	63	16.6
Frequency of waste collection in the neighbourhood		
Daily	143	37.6
2-3 times per week	48	12.6
Weekly	39	10.3
Monthly	65	17.1
Irregularly	41	10.8
Never	44	11.6
Accessibility of waste disposal facilities		
Very accessible	117	30.8
Accessible	94	24.7
Neutral	87	22.9
Not accessible	82	21.6
Perceived efficiency of waste collection services in the neighbourhood		
Very Efficient	90	23.7
Efficient	107	28.2
Neutral	79	20.8
Inefficient	57	15.0
Very Inefficient	47	12.4
Perceived problems related to waste disposal in the neighbourhood		
Yes	213	56.1
No	167	43.9

Table 3B. Efficiency and effectiveness of the identified solid waste management methods in Enugu metropolis

Variables	Frequency	Percentage
If yes, type of problems		
Irregular waste collection	12	5.6
Overflowing waste bins	61	16.1
Air pollution from waste burning	42	11.1
Open dumping and littering	39	10.3
Presence of disease-carrying pests (e.g., rats, flies)	36	9.5
Others	23	6.1
Perceived effectiveness of the current waste management methods		
Effective	178	46.8
Not effective	129	33.9
Not sure	73	19.2

Table 4. Suggested Improvements for Better Waste Management

Frequency & Percentage	SD (%)	D (%)	U (%)	A (%)	SA (%)	Mean
More frequent waste collection	36(9.5)	10(2.6)	46(12.1)	211(55.5)	77(20.3)	3.7
More public waste bins	7(1.8)	74(19.5)	85(22.4)	107(28.2)	107(28.2)	3.6
Better waste recycling programs	38(10.0)	21(5.5)	12(3.2)	172(45.3)	137(36.1)	3.9
Increased public awareness campaigns	84(22.1)	22(5.8)	0(0.0)	154(40.5)	120(31.6)	3.8
Stricter waste disposal regulations	116(30.5)	41(10.8)	34(8.9)	120(31.6)	69(18.2)	2.9

Table 5. Environmental and health-related problems associated with solid waste management

Impact	Frequency	Percentage
Presence of environmental problems related to poor waste management in neighbourhood		
Yes	294	77.4
No	86	22.6
If yes, type of environmental problem		
Water pollution (contaminated rivers, drainage blockage)	236	19.8
Air pollution (smoke from burning waste)	237	19.9
Land pollution (open waste dumps, littered streets)	269	22.6
Increased flooding due to blocked drainage	228	19.1
Other	221	18.6
Presence of health problems related to poor waste management?		
Yes	259	68.2
No	121	31.8
If yes, type of health problem?		
Respiratory diseases (asthma, bronchitis)	139	14.0
Skin infections	211	21.3
Gastrointestinal diseases (cholera, typhoid)	228	23.0
Malaria or other mosquito-borne illnesses	203	20.5
Other	209	21.1

Table 6. Awareness and Compliance with Proper Waste Management Practices

Variables	Frequency	Percentage
Awareness about solid waste management practices in neighbourhood		
Yes	173	45.5
No	207	54.4
Level of awareness about proper waste management practices		
Very high	53	13.9
High	76	20.0
Moderate	134	35.3
Low	70	18.4
Very low	47	12.4
Compliance with proper waste management practices		
Yes, always	91	23.9
Sometimes	213	56.1
No, never	76	20.0
Perceived compliance by residents in the neighbourhood		
Yes, most people comply	64	16.8
Some people comply	142	37.4
No, very few comply	118	31.1
Not sure	56	14.7
Interested in learning more about solid waste environmental impact		
Yes	236	62.1
No	144	37.9

Table 7: Relationship between the Awareness of the respondents and the Compliance with Solid Waste Management Practices in Enugu.

	Compliance			χ^2	P-Value
Variables	**Always**	**Sometimes**	**Never**		
Awareness of respondents					
Yes	91(52.6%)	82(47.4%)	0(0.0%)	176.644	0.00
No	0(0.0%)	131(63.3%)	76(36.7%)		
Total	**91(23.9%)**	**213(56.1%)**	**76(20.0%)**		

Table 8. Preferred Methods of Knowledge Improvement

Variables	Frequency	Percentage
Preferred method of knowledge improvement		
Open seminars	64	27.1
Brochures distributed to residents	56	23.7
Radio/Tv Campaigns	59	25.0
Door to door education	57	24.2

3. Discussion

This study assessed the effectiveness of solid waste management (SWM) methods in Enugu Metropolis by evaluating waste disposal practices, efficiency, environmental and health impacts, and the role of public awareness in compliance. The findings reveal significant gaps in waste management systems, highlighting areas where improvements are needed to achieve sustainability.

The study found that a significant proportion of residents do not segregate their waste. Among those who practice waste separation, the most commonly sorted waste items were found to be glass, bottles, and cans; followed by plastics then textiles. These findings indicate a general lack of proper waste segregation, which is a key barrier to effective recycling and waste reduction. Studies by Onyishi *et al*. (2023) and Amalu & Ajake (2014) similarly found that low public awareness and inadequate infrastructure hinder waste sorting practices in Nigerian cities. Regarding waste storage, sacks were the most commonly used storage method, followed by baskets and plastic containers. The reliance on sacks and baskets suggests an informal and unstandardized approach to waste storage, which can contribute to environmental hazards such as littering, exposure to pests, and contamination of public spaces. This aligns with findings from Dimkpa *et al*. (2023), who reported that improper waste storage contributes to increased pollution in urban areas.

The study further explored different disposal methods used by residents, revealing that burying waste and disposing waste at dump sites were the most common practices. Government-provided waste bins were frequently used by 24.2% of respondents, while recycling was the least practiced, with 28.4% of respondents never engaging in recycling.

The findings highlight a critical issue: the overreliance on open dumping and informal disposal methods. Open dumpsites pose serious environmental and health risks, contributing to pollution and the spread of vector-borne diseases. These results are consistent with studies by Onyishi *et al*. (2023) and Eneh & Anamalu (2013), which noted that poor waste disposal practices in Nigerian cities lead to air and water contamination, worsening public health challenges. It also buttresses the point of Nwosu & Chukwueloka, 2020 that illegal dumpsites result to loss of aesthetic beauty, endangers man and the environment, causing the spread of diseases and the pollution of the entire environment. The low adoption of recycling (mean score of 2.5) indicates the need for stronger incentives, infrastructure, and awareness campaigns to encourage sustainable waste management practices. Countries with effective waste management systems, such as Sweden and Germany, have implemented structured recycling programs, which could serve as models for Enugu (Karim & John, 2020).

On the effectiveness and efficiency of the waste management methods, Government agencies were identified as the primary actors in waste collection, with private waste collectors and community groups also playing significant roles. However, a considerable proportion of respondents reported inefficiencies in waste collection, with waste being collected irregularly or left uncollected for long periods. Only 28.2% of respondents rated waste collection services as efficient, while 56.1% reported experiencing problems related to waste disposal. Among the key challenges reported, "overflowing waste bins**"** was the most common problem, followed by "air pollution from burning waste" and "open dumping and littering". The inefficiencies in collection services often lead to the accumulation of waste, forcing residents to resort to unsanitary disposal methods such as open dumping and burning. Studies by Amalu & Ajake (2014) and Onuegbu (2024) highlight similar findings, emphasizing the need for improved waste collection logistics, increased frequency of collection, and proper enforcement of waste disposal regulations.

Despite these challenges, majority (46.8%) of respondents considered the current waste management methods effective, while 33.9% disagreed, and 19.2% were uncertain. This suggests that while there are notable gaps in waste management, some residents recognize efforts being made, likely due to improvements in government waste collection initiatives or private-sector involvement.

A significant proportion of respondents reported noticing environmental effects of poor waste management in their area. The most commonly observed issues included land pollution, air pollution from burning waste and water pollution. Additionally, 19.1% of respondents noted increased flooding due to blocked drainage systems, an issue that has been widely reported in urban Nigeria. The health impact of poor waste management was also evident, with a large number of respondents reporting that they or someone they knew had suffered from waste-related illnesses. The most common health issues were gastrointestinal diseases, followed by malaria, then skin infections. This aligns with findings by Dimkpa *et al*. (2023) and Azzara *et al*. (2021), who documented the link between waste mismanagement and increased disease outbreaks in urban communities. These results highlight the urgent need for improved waste collection, proper disposal systems, and public health interventions to mitigate the environmental and health risks associated with poor SWM.

One of the key objectives of this study was to examine the link between public awareness and compliance with proper waste management practices. The findings indicate a statistically significant relationship between awareness and

compliance. Among the respondents who were aware of SWM practices, a major percentage (52.6%) of them indicated they always complied with proper waste management practices, while others indicated that they complied sometimes. However, the respondents who were unaware of SWM practices also showed a high level of compliance with proper waste management practices. These findings suggest that while awareness is a strong determinant of full compliance, some level of compliance occurs even among those unaware of SWM practices. This could be attributed to external factors such as community norms, environmental regulations, or the presence of waste collection services in some areas. The findings align with Behavioral Change Theories, which suggest that increased knowledge leads to improved environmental practices (Glanz *et al*., 1990). The study by Tomera (2013) also supports this, indicating that awareness-driven interventions enhance adherence to waste management guidelines.

Additionally, the respondents showed strong interest in improving knowledge, with 62.1% of respondents expressing a willingness to learn more about SWM. The most preferred learning method identified was "open seminars", followed by "radio/TV campaigns".

4. Conclusion

This study assessed the effectiveness of solid waste management methods in Enugu Metropolis, revealing significant gaps in waste segregation, collection efficiency, environmental impact, and public awareness. While government agencies play a central role, challenges such as irregular waste collection, overflowing bins, and open dumping persist, contributing to environmental and health risks. The study found a direct relationship between awareness and compliance with proper waste management practices, emphasizing the need for targeted public education campaigns. Improving waste collection frequency, promoting recycling, and enforcing stricter regulations could enhance waste management efficiency.

Ultimately, sustainable waste management in Enugu requires a multi-stakeholder approach, involving government agencies, private waste collectors, community groups, and residents. Implementing these recommendations will contribute to a cleaner, healthier, and more sustainable urban environment.

Declarations

Ethics approval and consent to participate

Ethical clearance certificate was sought and obtained from the health research ethics committee of University of Nigeria Teaching Hospital, Enugu, Nigeria.

Consent for publication

All authors have read and consented to the submission of the manuscript.

Availability of data and material

Not Applicable.

Competing interests

All authors declare no competing interests.

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Afolayan, A. A., Ogunbiyi, O. O., & Adebayo, A. O. (2022). Assessment of solid waste management practices and public health implications in urban communities in Nigeria. Journal of Environmental Health Science and Engineering, 20(2), 1345–1356. https://doi.org/10.1007/s40201-022-00789-4.

Amalu, T.E. & Anim O. Ajake, A.O. (2014). Appraisal of Solid Waste Management Practices in Enugu City, Nigeria. Journal of Environment and Earth Science, 4(1): ISSN 2225-0948.

Azzara, A., Guarino, D. P., & Napoli, C. (2021). The impact of municipal solid waste management on global warming: A life cycle assessment of Italian scenarios. Waste Management, 126, 46-56. https://doi.org/10.1016/j.wasman.2021.04.034

Bakare, W (2016). Solid Waste Management in Nigeria. Bio-Energy Newsletter 5: 68-72.

Dimkpa, G.C., Dozie, N.S., Paul, J.N., Nwikasi, K., Obia, J.C., Ogba, A.A., Ihua, C.W., George, S.T. & Ekine, S.O. (2023). Assessment of Solid Waste Management Strategies in Elele Community, Ikwerre Local Government Area, Rivers State, Nigeria. Saudi J Med Pharm Sci, 9(4): 258-269.

Eneh, O.C. & Anamalu, N.P. (2013). An Appraisal Of The Effectiveness Of The Enugu State Waste Management Authority. Technoscience Review, 4(1).

Enugu State Ministry of Lands and Survey. (2022). Enugu State land use and urban development report. Enugu State Government. Retrieved from [official ministry website]

Glanz, K., Lewis, F. M., & Rimers, B. K. (Eds.). (1990). Health Behavior and Health Education: Theory, Research, and Practice. San Francisco, CA: Jossey-Bass.

Karim, M.A. & John, T.W. (2020). A comparative study of solid waste management in the United States, Europe and Asia. Ann Civil Environ Eng. DOI: 10.29328/journal.acee.1001019

Mba, A.C. & Nnadi, E.E. (2022). Solid Waste Management and its Challenges in Nigeria. IDOSR Journal of Experimental Sciences 7(1): 8-18.

National Environmental Standards and Regulations Enforcement Agency (NESREA). (2007). National Environmental Standards and Regulations Enforcement Agency (Establishment) Act, 2007. Federal Republic of Nigeria.

Nwosu, A.O & Chukwueloka, H.E. (2020). A Review of Solid Waste Management Strategies in Nigeria. Journal of Environment and Earth Science, 10(6): ISSN 2225-0948.

Ojewola, R.W, Oridota, E.S., Balogun, O.S., Ogundare, E.O., Alabi, T.0., Banjo, O.O., Laoye, A., Adetunmbi, B., Adebayo, B.O. & Oluyombo, R. (2017). Knowledge, attitudes and screening practices regarding prostatic diseases among men older than 40 years: a population-based study in Southwest Nigeria. *PanAfrican Medical Journal.* 27(151):1937-8688.

Onuegbu, F.E. (2024). Assessment of Solid Waste Disposal Practices and Management Strategies in Eke Okigwe

Market, Imo State, Nigeria. Mediterranean Journal of Social Sciences, 15(1): ISSN 2039-2117.

Onyishi, C. J., Wali, E. & Okwakpam, I.O. (2023). Solid Waste Management System in Enugu Metropolis, South-Eastern Municipality, Nigeria. Journal of Geography, Environment and Earth Science International. 27(6): 1-15.

Tomera, A.N. (2013). Analysis and Synthesis of Research on Responsible Environmental Behaviour: A Meta-Analysis. The Journal of Environmental Education, 18; 1 – 8.

Ukala, D.C., Akaun, H. I. & Owamah (2020). A Review of Solid Waste Management Practice in Nigeria. Journal of Science and Technology Research, 2(3).