Waste Management and Environmental Sustainability in Akwa Ibom State

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Abstract
This study examined the relationship between solid waste management (SWM) and environmental sustainability in Akwa Ibom State, Nigeria, focusing on flooding and clean environment as key indicators. Despite the State's rapid urbanization and population growth, waste management practices remain inadequate, resulting in indiscriminate dumping, flooding, and environmental degradation. The study adopted a correlational research design, with a sample of 384 respondents selected through multi-stage sampling techniques. Data were collected using the Solid Waste Management Inventory (SWMI) and Sustainable Development Rating Scale (SDRS), and analyzed using Pearson Product Moment Correlation (PPMC) and regression analysis. Findings revealed a significant but moderately low negative relationship between SWM and flooding ($r = -0.223$, $p < 0.05$) and a significant low negative relationship between SWM and clean environment ($r = -0.141$, $p < 0.05$). These results indicate that while SWM efforts exist, they have not effectively translated into improved environmental outcomes, partly due to infrastructural gaps, policy inconsistencies, and low public participation. The study concludes that strengthening waste management systems, promoting public awareness, and improving institutional capacity are critical to achieving sustainable development in the state. It recommends improved waste collection coverage, proper disposal infrastructure, and sustained sensitization campaigns to foster behavioral change and enhance environmental sustainability.

Keywords: *Solid waste management, sustainable development, flooding, clean environment, Akwa Ibom State, Nigeria*

INTRODUCTION

The term "waste" is frequently used to refer to any material or substance generated and disposed of or intended to be abandoned by the individual responsible for its oversight. Waste management has become a critical global issue, particularly in developing countries where

rapid urbanization, population growth, and industrialization have outpaced the capacity of waste management systems. In Nigeria, and particularly in Akwa Ibom State, poor waste management practices have resulted in a wide range of environmental, health, and socio-economic problems.

Akwa Ibom State, located in the Niger Delta region of Nigeria, has witnessed significant urban expansion, especially in cities such as Uyo, Eket, Ikot Ekpene, and Oron. This growth has increased the volume and complexity of waste generated from households, markets, industries, and healthcare facilities. Unfortunately, waste collection, segregation, recycling, and disposal have not matched this growth, leading to indiscriminate dumping of refuse in drains, roadsides, water bodies, and open spaces.

Solid waste management refers to the activities and actions that handle solid waste materials. It involves collection, transportation, and disposal of waste. Waste prevention, recycling, reuse, and recovery are important solid waste management strategies that ease the burden on landfills, incineration and saves energy. This helps utilize resources more effectively and sustainably. Solid waste management is a by-product of most human activities, which is tremendously unavoidable in human existence. Several years past, human beings have been craving to improve the environment they live; the attempt to develop the environment for decades have negatively affected the environment people inhabit today and subsequently endangering the survival of the earth and the future generations. The efforts to develop the environment have given rise to increasingly unfavourable climate changes and natural disasters, also aided by wars, political and socioeconomic instability. The attempts to advance the environment have caused some changes in the behaviour aiming towards more rational and efficient management of all resources that will allow less pressure and environmental impact (Muhammad & Marzuki 2024). Hence, such responsible behaviour continued will ensure the long-term exploitation of resources, without jeopardizing the future generations is considered within unauthenticated concept of sustainable development (Muhammad, et al 2024). Addressing these issues can significantly contribute to sustainable development in the region.

Sustainable development is a holistic approach that seeks to meet the needs of the present without compromising the ability of the future generations to meet their own needs. It encompasses three core pillars viz; Economic Growth, Social Inclusion, and Environmental Protection. In the context of Akwa Ibom State, Nigeria, sustainable development is particularly relevant due to its rich natural resources and diverse ecosystems, which are under threat from rapid urbanization and inadequate waste management practices. Thus, this study focuses on the relationship between solid waste management and sustainable development in Akwa Ibom State from 2015 to 2023, with specific consideration on flood control, clean environment, pollution control, job creation, and public awareness as key indicators of sustainable development.

Statement of the Problem

Despite various interventions, Akwa Ibom State continues to face critical barriers in establishing an efficient and sustainable solid waste management system. One major concern is the inadequate coverage of waste collection services, especially in rural and peri-urban communities. This has led to widespread illegal dumping and open burning practices that compromise both environmental integrity and public health. Additionally, while there are pockets of recycling activity, the state lacks the infrastructure necessary for large-scale recycling and composting operations. This limitation restricts the potential for resource recovery and undermines the development of a circular economy.

Public apathy toward proper waste disposal remains a significant challenge. Despite the introduction of public awareness campaigns, many residents continue to demonstrate reluctance in adopting hygienic waste management practices. This resistance is often

influenced by entrenched cultural norms and the absence of adequate incentives to encourage behavioural change. Moreover, policy inconsistencies hamper the implementation of waste management programmes. A lack of sustained funding, coupled with irregular enforcement of regulations, has further weakened institutional capacity. The limited participation of the private sector in waste management contracts also contributes to inefficiencies and restricts opportunities for innovation.

These interconnected issues highlight the urgent need for a comprehensive and sustainable approach to solid waste management in Akwa Ibom State—one that integrates infrastructure development, behavioural change strategies, robust policy frameworks, and inclusive stakeholder participation.

Objectives of the Study

The primary objective of this study is to ascertain the relationship between solid waste management and sustainable development in Akwa Ibom State, Nigeria. Specific objectives of the study are:

1. To determine the relationship between solid waste management and flooding in Akwa Ibom State.
2. To ascertain the relationship between solid waste management and clean environment in Akwa Ibom State.

Research Questions

The following research questions were formulated to guide the study.

(i) Is there any relationship between solid waste management and flooding in Akwa Ibom State?

(ii) What is the relationship between solid waste management and clean environment in Akwa Ibom State?

Research Hypotheses

The following null hypotheses were generated to guide the study.

(i) There is no relationship between solid waste management and flooding in Akwa Ibom State.

(ii) The relationship between solid waste management and clean environment in Akwa Ibom State.

METHOD

This study adopted correlational research design. This research design according to Nworgu (2016) establishes the relationship that exists between two or more variables. The researcher adopted this design because it was the appropriate for collecting data on occurring issues in the society. Correlation research design is used when the population of study cannot be accessed in totality Nworgu (2016). Nevertheless, information is needed upon which certain statements could be made about the whole population. This will enable the establishment of both direct and indirect causal linkages between the dimensions of waste management and sustainable development in Akwa Ibom State, Nigeria.

The study area for this research is Akwa Ibom State, located in the South-South geopolitical zone of Nigeria. Akwa Ibom is bordered by Cross River State to the east, Abia State to the north, Rivers State to the west, and the Atlantic Ocean to the south. The state has 31 Local Government Areas (LGAs) and is known for its rich natural resources, particularly oil and gas, as well as its growing investment in infrastructure and aviation development.

The state capital, Uyo, which serves as the administrative, political, and economic hub of the state is a rapidly growing city with expanding rural-urban migration, road networks, hospitality services, and an increasing presence of modern businesses.

The population of this study consisted of the projected figure of Akwa Ibom State as at 2019. This was drawn from all the 31 local government areas of the state. According to available statistic, the total population from the 31 local government areas in the state stood at 4,780,581 (National Bureau of Statistics).

The sample size was determined using the Krejcie and Morgan (1970) sample size determination table, which provides an efficient method for selecting a statistically significant sample. For a population of approximately 700,000 and above, the table recommends a minimum sample size of 384 respondents at a 95% confidence level and a 5% margin of error. A multi-stage sampling technique was adopted to ensure adequate representation and reliability of findings. Three approaches were adopted to include:

(i) Cluster Sampling – Out of the 31 Local Government Areas (LGAs) in Akwa Ibom, 9 LGAs were purposively selected to represent urban and semi-urban areas with high waste generation activity

(ii) Stratified Sampling – Within each selected LGA, the population was categorized into four strata with 11 respondents from each stratum based on the type of location with high waste generation activity. These include market, hospital, motor parks and banks.

(iii) Proportional Random Sampling – The total sample size of 384 respondents was proportionally distributed across the four strata of which each category received approximately 96 respondents. Simple random sampling was employed within each stratum to select respondents, ensuring each individual had an equal chance of participation.

The research instruments used for this study were Solid Waste Management Inventory, (SWMI) and Sustainable Development Rating Scale (SDRS). These comprise of two sections of A and B. Section A contains the demographic data of the respondents while section B contains the proxies of sustainable development which was divided into six (6) clusters. Each of the clusters had five (5) items each of which a total of 30 items instruments was adopted on a five Likert scale type of Undecided (U) strongly agree (SA), agree (A), disagree (D), and strongly disagree (SD) each on a scale point of 5,4, 3, 2, 1, respectively.

The copies of the Solid Waste Management Inventory, (SWMI) and sustainable development rating scale (SDRS) were given to two experts, one from department of sociology, Akwa Ibom State University, Obio Akpa campus and one from Research, Measurement and Evaluation, Akwa Ibom state University. The experts were asked to scrutinize the items with respect to the relevance of the items to the instruments of the study, simplicity of vocabulary, the clarity of the items of the instruments and total coverage for the use of collection of data for the study. Content validity was adopted for this study.

To determine the reliability of the instruments, (SWMI and SDRC) were subjected to trial testing with thirty (30) respondents, from some local governments in other organisations that was not be part of the study. Estimate of internal consistency was used to determine the reliability of SWMI. Specifically, Cronbach Alpha method was used to determine the reliability of SDRS. The reliability coefficient of flood control and clean environment were 0.79 and 0.71 respectively. On the other hand, the reliability of SWMI was determined using estimate of internal consistency and split-half method and the coefficient of 0.95 was obtained.

The instruments were administered by the researcher by visiting each of the sampled organisations. The researcher obtained permission from the heads of the selected organisation to conduct the research. The researcher sampled the adults and thereafter, administered the instruments simultaneously to them. It took the researcher eight weeks to go around the listed organisations to collate the data.

The data obtained were analysed using Pearson Product Moment Correlation (PPMC) and Regression Analysis to answer the research questions and test the null hypotheses. This is possible because the study measures the relationship between the dependent variable and the independent variables

RESULTS

Research Question 1: What is the relationship between solid waste management and flooding in Akwa Ibom State?

Table 1: Pearson Product Moment Correlation Analysis of the relationship between solid waste management and flooding in Akwa Ibom State?

(N=384)

Variable	Mean	SD	R
Solid waste management	22.87	4.55	
			-0.223
Flooding	18.90	4.72	

The information in Table 1 shows that there is a moderately low negative relationship between solid waste management and flooding in Akwa Ibom State (r= -0.223).

Research Question 2: What is the relationship between solid waste management and clean environment in Akwa Ibom State?

Table 2: Pearson Product Moment Correlation Analysis of the relationship between solid waste management and clean environment in Akwa Ibom State.

(N = 384)

Variable	Mean	SD	R
Solid waste management	22.23	4.13	
			-.141
Clean environment	18.90	4.72	

The result in Table 2 shows that there is a low negative linear relationship between solid waste management and clean environment in Akwa Ibom State

Hypothesis One: There is no significant relationship between flooding and sustainable development in Akwa Ibom State, Nigeria. To test this hypothesis, the levels of flooding and sustainable development in Akwa Ibom State were compared using the Pearson Product Moment Correlation analysis. The result is presented in Table 3.

Table 3: Correlation analysis of the relationship between flooding and sustainable development

Variable	Mean	SD	R	p-value
Solid waste management	22.87	4.55		
			-0.223	0.000
Flooding	18.90	4.72		

(n=384)

*Significant at the 0.05 level of significance.

The information in Table 3 shows that there is a significant negative relationship between solid waste management and flooding (r = 0.233, p = 0.000). This means that flooding decreases with increase in solid waste management in Akwa Ibom State. Hence the null hypothesis which state that there is no significant relationship between flooding and sustainable development in Akwa Ibom State is rejected.

Hypothesis Two:

There is no significant relationship between solid waste management and clean environment in Akwa Ibom State.

The null hypothesis states that there is no significant relationship between solid waste management and clean environment in Akwa Ibom State.

To test this hypothesis, Pearson Product Moment Correlation analysis was employed to correlate solid waste management with clean environment as reported in Table 4.

Table 4: Pearson Product Moment Correlation Analysis of the relationship between solid waste management and clean environment

(n=384)

Variable	Mean	SD	r	p-value
Solid waste management	22.23	4.13		
			-0.141	0.001
Clean environment	18.90	4.72		

*Significant at the 0.05 level of significance

The result in Table 4 shows that there is a significant negative linear relationship between solid waste management and Clean environment in Akwa Ibom State (r=0.141, P=0.001). This means that clean environment decreases with increase in solid waste management in Akwa Ibom State. Hence the null hypothesis that there is no significant relationship between solid waste management and clean environment in Akwa Ibom State is rejected at the 0.05 level of significance.

Summary of Findings

i. There is a relationship between solid waste management and flooding
ii. There is a significant relationship between solid waste management and clean environment in Akwa Ibom State.
iii. The results of this study showed that there is a significant moderately low negative relationship between solid waste management and flooding. It is surprising that level of solid waste management could relate negatively with the level of flooding. This means that while solid waste may appear properly managed, flooding might not be effectively considered productive or meaningful. This agrees with a study by Amusan,

et al (2018) which showed the level of limited focus on community engagement and participation in waste management initiative.

Solid waste management and clean environment

Findings showed that there is a low negative linear relationship between solid waste management and clean environment. It is not surprising however because this distraction from core management focus, over-engagement with non-management activities, mismatch with development structured nature, lack of interest in waste management-specific rigor, limited support, and cultural and environmental factors. The reason for this finding can also be due to several reasons based on the strategies of solid waste management and their influence on sustainable development. The findings of this study are in line with that of Magazzino, et al (2020) who demonstrated that proper waste management reduces environmental pollution by minimizing waste leakage into ecosystems, enhancing sustainability. The study is in contrast with the findings of Basnayake, et al (2020) who linked effective waste practices to resource conservation and pollution reduction, underscoring their role in maintaining ecological balance. Also, the study is in contrast with the findings of Nagpure (2019) which showed that sustainable waste management directly mitigates environmental degradation by reducing landfill reliance and promoting recycling.

Conclusion

This study establishes that solid waste management (SWM) critical relates to sustainable development in Akwa Ibom State, with significant implications for environmental health, economic growth, policy effectiveness, infrastructure development, and community public awareness. The findings reveal a strong correlation between SWM practices and outcomes such as clean environments, job creation, and pollution control, underscoring its role in achieving broader sustainability goals.

The study's regression analysis further confirms that SWM is a robust predictor of sustainable development, emphasizing its interconnectedness with socio-economic and environmental well-being. However, systemic challenges-such as outdated policies, inadequate infrastructure, and knowledge gaps-persist as barriers to optimal SWM.

Recommendations

Based on the findings, it is recommended that;

1. Solid waste management systems should be strengthened by the government to improve waste collection frequency and coverage, especially in flood-prone areas; and also provide adequate waste bins and ensure proper disposal points to reduce indiscriminate dumping in water ways to avoid flooding.
2. The Ministry of Environment should be tasked to improve the efficiency of waste management systems to ensure proper transportation and disposal facilities to prevent littering and environmental pollution. The state should promote public participation and awareness by conducting sensitization campaigns on the importance of proper waste disposal and its link to clean environment.

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