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ENVIRONMENTAL SANITATION AND WASTE MANAGEMENT PRACTICES IN PUBLIC COLLEGES OF EDUCATION IN OYO STATE

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ABSTRACT
This study investigated environmental sanitation and waste management practices in public Colleges of Education in Oyo State, Nigeria, focusing on the College of Education, Lanlate, and the Federal College of Education (Special), Oyo. Using a mixed-methods approach that combined a descriptive survey with a case study, data were collected from 300 respondents through structured questionnaires, key informant interviews, and on-site observations. Quantitative data were analysed using descriptive statistics (means and percentages) and multiple regression, while qualitative data were subjected to thematic analysis. Results show that environmental sanitation practices are generally low, with mean scores for facilities and maintenance falling below the acceptable benchmark (Mean = 2.39, SD = 0.81), and regression analysis confirmed that institutional factors such as funding, policy enforcement, and personnel availability significantly predict sanitation outcomes ($R^2 = 0.52$, $p < 0.001$). Waste management systems were largely unsustainable, with minimal recycling or sorting practices. Behavioral factors, including sanitation awareness, had a smaller but significant effect ($R^2 = 0.11$, $p < 0.05$). Guided by the Health Belief Model and Institutional Theory, the study highlights that both individual behavior and organizational capacity jointly shape campus sanitation outcomes. The study concludes that current sanitation and waste management practices are inadequate for maintaining a healthy learning environment and recommends prioritizing institutional strengthening, sustainable waste systems, and targeted behavioral interventions.

Keywords: Environmental sanitation, Waste management, Colleges of Education, Public health

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Introduction

Environmental sanitation and waste management have emerged as critical components of sustainable development in higher education institutions worldwide. Universities and colleges function not only as centres of learning but also as semi-urban communities that generate substantial quantities of solid and liquid waste from academic, residential, and commercial activities. Empirical studies have consistently shown that effective sanitation and waste management systems in tertiary institutions are associated with improved public health outcomes, enhanced learning environments, and the promotion of pro-environmental behaviour among students and staff (World Health Organization [WHO], 2018; United Nations Environment Programme [UNEP], 2020). In many developed countries, higher education institutions have institutionalised modern waste management systems—including recycling schemes, waste segregation, and green campus initiatives—thereby embedding sustainability principles into campus governance and operations (OECD, 2019).

In contrast, sanitation and waste management practices in many Nigerian higher education institutions remain inadequate despite growing policy attention to environmental health. National studies indicate that a significant proportion of public tertiary institutions lack basic sanitation infrastructure such as functional toilets, waste collection facilities, and properly managed disposal systems (Afon & Faniran, 2019; Federal Ministry of Environment, 2021). Public institutions are particularly affected due to chronic underfunding, competing budgetary priorities, and weak institutional maintenance cultures. In addition, low levels of sanitation awareness among campus users and inconsistent enforcement of environmental regulations further compound these challenges (Adeolu, Enesi, & Adeolu, 2014). These conditions contribute to unhygienic campus environments and increase vulnerability to sanitation-related diseases.

The sanitation situation in developing countries such as Nigeria is further complicated by ageing infrastructure, irregular waste collection services, and limited institutional capacity to adopt sustainable waste management practices. Evidence from environmental health studies suggests that these constraints are especially pronounced in teacher-training institutions, including Colleges of Education, which often receive less infrastructural investment than universities despite their strategic role in human capital development (Ogwueleka, 2018; Lawal & Aliu, 2020). The inability of these institutions to maintain hygienic environments undermines not only student and staff well-being but also the quality of teaching and learning. Consequently, environmental sanitation in Colleges of Education has become a growing concern for education stakeholders and environmental health professionals.

Environmental sanitation and waste management in tertiary institutions are also closely linked to the global development agenda. Effective sanitation practices directly support Sustainable Development Goal (SDG) 3**,** which focuses on ensuring healthy lives and promoting well-being, by reducing exposure to sanitation-related diseases. Similarly, SDG 6 emphasises access to adequate sanitation and hygiene, while SDG 11 advocates sustainable and resilient communities, including institutional environments such as educational campuses (United Nations, 2015). Improving sanitation systems in Nigerian Colleges of Education therefore represents not only an institutional necessity but also a contribution to national and global sustainability commitments.

The importance of environmental sanitation and waste management in higher education institutions cannot be overstated. Sanitation is fundamental to disease prevention, health promotion, and the creation of conducive learning environments. Ineffective waste management, beyond creating aesthetic problems, disrupts academic activities and exposes campus populations

to environmental health risks (Kimani-Murage & Ngindu, 2007). By examining sanitation practices in public Colleges of Education in Oyo State, this study contributes to sustainability efforts such as waste reduction, responsible disposal, and environmental stewardship within the education sector.

Furthermore, Colleges of Education occupy a unique position as institutions responsible for training future teachers who are expected to model positive hygiene and environmental behaviours in schools and communities. Scholars argue that institutional environments significantly shape individual attitudes and practices, meaning that poor sanitation conditions within teacher-training institutions may inadvertently normalise unhealthy behaviours (Ajzen, 1991; Bandura, 2001). Improving sanitation and waste management practices in these colleges therefore has both immediate benefits and long-term multiplier effects for environmental education and public health.

Despite the existence of national frameworks such as the National Environmental Sanitation Policy and various state-level initiatives, sanitation challenges persist across many public tertiary institutions in Nigeria. In Oyo State, public Colleges of Education continue to experience inadequate waste disposal facilities, irregular waste collection, and weak institutional enforcement of sanitation standards (Oyo State Ministry of Environment, 2022). These deficiencies compromise campus hygiene and pose health risks to students, staff, and surrounding communities.

Moreover, while environmental sanitation and waste management have been widely studied in urban centres, municipal contexts, and universities, empirical research focusing specifically on Colleges of Education remains limited. This gap is significant given the strategic role of these institutions in national development. The lack of systematic, institution-specific data constrains evidence-based policymaking and weakens the capacity of institutional managers to design effective sanitation interventions (Yusuf & Oyewole, 2019). Addressing this gap is therefore critical for both academic inquiry and practical policy formulation.

Statement of the Problem

Environmental sanitation and waste management are critical to essential for sustaining healthy, safe, and functional learning environments in higher education institutions. However, in public Colleges of Education in Oyo State, sanitation conditions remain persistently poor despite the presence of national and state-level environmental sanitation policies. These institutions are characterised by inadequate waste disposal facilities, irregular waste collection, deteriorating sanitation infrastructure, and weak compliance mechanisms, resulting in littered surroundings, blocked drainage systems, and unhygienic toilet facilities.

While existing studies and policy documents often attribute these conditions to inadequate funding and weak enforcement, there is limited empirical analysis explaining why these problems persist despite established policy frameworks. In many cases, sanitation policies are poorly institutionalised, lack monitoring mechanisms, and are weakly integrated into institutional governance structures. In addition, behavioural factors—such as low risk perception, weak sanitation norms, and limited stakeholder participation—undermine compliance at the campus level.

This situation is particularly concerning given the mandate of Colleges of Education to train future teachers who are expected to promote hygiene, health, and environmental responsibility. The contradiction between institutional mandates and lived campus realities undermines health promotion goals, affects academic productivity, and weakens institutional contributions to SDGs 3, 6, and 11.

Furthermore, the scarcity of empirical studies focusing specifically on environmental sanitation and waste management in Colleges of Education—especially in Oyo State—limits the availability of context-specific evidence needed for effective intervention design. As a result, policymakers and institutional managers lack reliable data on the interaction between infrastructural constraints, institutional capacity, and behavioural factors influencing sanitation outcomes.

Against this background, a critical research gap exists regarding the nature of sanitation practices, the institutional and behavioural drivers of poor waste management, and the strategies required to achieve sustainable sanitation improvements in public Colleges of Education in Oyo State. This study addresses this gap by providing empirically grounded insights to inform policy, institutional planning, and sustainable environmental management.

Research Questions

1. What are the environmental sanitation practices and waste management systems currently adopted in public Colleges of Education in Oyo State?
2. What challenges hinder effective sanitation and what strategies can be implemented to improve waste management in these institutions?

Research Objectives

1. To assess the environmental sanitation practices and waste management systems in public Colleges of Education in Oyo State.
2. To identify the major challenges hindering effective sanitation and propose sustainable strategies for improving waste management in these institutions.

Research Hypotheses

H_1: There is no significant level of effectiveness of environmental sanitation practices and waste management systems in public Colleges of Education in Oyo State.

H_2: Institutional and infrastructural challenges do not significantly affect environmental sanitation and waste management practices in public Colleges of Education in Oyo State.

Literature Review

Conceptual Review

Environmental sanitation refers to the principles and practices that aim to maintain clean and healthy conditions in the human environment. It encompasses the provision and maintenance of adequate sanitation facilities, the control of waste, and the promotion of hygiene-related behaviors. Waste management, on the other hand, involves the systematic collection, transportation, treatment, and disposal of waste materials to minimize adverse effects on health and the environment. In the context of higher education institutions, sanitation and waste management extend beyond health concerns to include issues of aesthetics, institutional reputation, and the quality of the learning environment. Institutional hygiene therefore becomes an essential determinant of campus sustainability, as it reflects the effectiveness of both administrative policies and individual behavioral practices among students and staff.

Empirical Review

Research on sanitation in African higher education has effectively mapped a persistent crisis, yet remains constrained by descriptive methodologies and a narrow institutional focus. The consensus across studies from Nigeria, Ghana, and Kenya identifies a recurrent triad of challenges: critical infrastructural deficits, fragmented governance, and entrenched negative behaviors (Akinwale, 2019; Adarkwa, 2017; Wambua, 2021). However, this literature predominantly documents these issues through cross-sectional snapshots, offering limited causal explanation for

why interventions fail. This gap is particularly acute for non-university institutions, creating an empirical and analytical blind spot that this study seeks to address.

A critical limitation of the prevailing literature is its tendency to treat infrastructural lack as a primary cause rather than a symptom of deeper systemic failures. Numerous studies catalog inadequate bins, blocked drains, and reliance on open dumping (Adeolu et al., 2021; Ojedokun & Balogun, 2020). While valuable for establishing baseline conditions, this approach often employs descriptive statistics and observational checklists that cannot explain the underlying governance or financial dysfunctions enabling physical decay. For instance, the common finding of diverted operational budgets (Ojedokun & Balogun, 2020) is noted but rarely analyzed as a core determinant of service collapse. This creates an implicit, and arguably flawed, policy assumption that capital investment alone can resolve sanitation crises, an assumption contradicted by comparative research. Studies in Ghana and Kenya demonstrate that sustained improvement is less about the presence of infrastructure and more about institutionalized governance such as active sanitation committees and formal partnerships with municipal authorities (Adarkwa, 2017; Wambua, 2021). The Nigerian literature's under-examination of these operational governance structures represents a significant explanatory gap.

Complementing the infrastructure critique, a separate but related strand of research highlights the crucial role of behavioral and cognitive factors, challenging the hardware-focused paradigm. Investigations reveal that improper waste disposal is often driven by convenience, habit, and low perceived risk, even where facilities are adequate (Adekunle & Olowu, 2018). Successful interventions, therefore, integrate behavior-change communication and enforcement "nudges" with physical upgrades (Moyo & Dube, 2020). This "software" perspective is vital, yet it remains inadequately integrated with analyses of policy and institutional design. Furthermore, the profound policy-practice gap is widely acknowledged but insufficiently interrogated. Scholars note that national frameworks are poorly implemented due to funding bottlenecks and inactive "paper-based" committees (Adeolu et al., 2021), yet few studies empirically trace how state-level mandates dissolve at the institutional level, failing to translate into budget lines, monitoring routines, or accountability mechanisms. This lack of translational analysis leaves a critical cycle of failure unexplained.

Methodologically, the field is characterized by approaches that limit generalizability and depth. A reliance on single-institution case studies, convenience samples, and self-reported data raises concerns about robustness (Adekunle & Olowu, 2018). More fundamentally, a pronounced sampling bias exists toward large, urban universities. Consequently, the distinct administrative, financial, and spatial realities of smaller tertiary institutions—such as Nigeria's Colleges of Education, which are critical to national teacher training—are largely absent from the empirical record. This omission is not merely topical; it questions the applicability of existing models to institutions that operate under markedly different constraints and may face unique community-integration challenges.

In synthesis, the literature provides a necessary foundation but reveals three integrated gaps that justify the present study. First, there is an analytical gap in understanding sanitation outcomes as a function of intertwined governance, financial, and behavioral factors, rather than isolated infrastructural absence. Second, there is a methodological gap calling for mixed-methods designs that triangulate surveys, observational data, and institutional analysis to strengthen causal inference. Third, and most critically for this research, there is a contextual gap due to the near-exclusive focus on universities, leaving the sanitation ecosystems of Colleges of Education unexamined. This study directly addresses these gaps by investigating public Colleges of

Education in Oyo State through an integrated framework that connects policy, institutional governance, physical resource audit, and stakeholder behavior, thereby aiming to generate a contextually nuanced and actionable explanation of sanitation challenges.

Theoretical Framework

Two theoretical Two theoretical perspectives provide useful lenses for analyzing sanitation and waste management in educational institutions. The Health Belief Model (HBM) emphasizes that individuals' sanitation behaviors are shaped by their perceived susceptibility to health risks, perceived benefits of hygienic practices, and perceived barriers to compliance. This theory is relevant in understanding how students and staff make daily decisions regarding waste disposal and personal hygiene on campus**.** In this study, HBM constructs were operationalized through questionnaire items measuring respondents' awareness of health risks associated with poor sanitation (perceived susceptibility), beliefs about the health and environmental benefits of proper waste disposal (perceived benefits), and constraints such as lack of facilities or inconvenience that discourage compliance (perceived barriers)**.**

A On the other hand, Institutional Theory highlights the gap between formal policies and actual practices within organizations. It argues that while institutions may adopt sanitation policies to conform to external expectations, the implementation often remains weak due to resource constraints, cultural attitudes, and institutional inertia. This theory is particularly useful in analyzing how Colleges of Education in Oyo State may outwardly subscribe to national sanitation policies but fail to translate them into consistent campus practices**.** Institutional Theory informed the measurement of organizational variables in this study, including the availability of sanitation policies, adequacy of funding, presence of sanitation committees, enforcement mechanisms, and administrative support, as captured through staff questionnaires, key informant interviews, and observation checklists.

A critical review of existing literature reveals significant gaps. First, most empirical studies have concentrated on general urban sanitation issues or on large universities, leaving Colleges of Education relatively underexplored. Second, there is limited evidence focusing specifically on Oyo State, despite its prominence as an educational hub in South-West Nigeria. Third, much of the existing research emphasizes infrastructural and administrative shortcomings, with less attention paid to the behavioral and cultural dimensions of sanitation within institutional settings. By integrating the Health Belief Model at the individual level and Institutional Theory at the organizational level during the research design stage, this study ensures that data collection instruments were theory-driven rather than applied post hoc.

This study therefore seeks to bridge these gaps by providing empirical evidence on the sanitation and waste management practices in public Colleges of Education in Oyo State, while applying theoretical insights that account for both individual behavior and institutional structures. The combined use of HBM and Institutional Theory allows for a multilevel analysis in which sanitation outcomes are explained as the product of both personal health beliefs and institutional governance arrangements.

Methodology

Research Design

The study adopts a mixed-methods research design, specifically a convergent parallel design, combining quantitative and qualitative approaches. The quantitative component employs a descriptive survey design to collect measurable data on environmental sanitation and waste management practices among students and staff. The qualitative component adopts a multiple case study approach, focusing on two public Colleges of Education in Oyo State to generate in-depth

contextual insights into institutional processes, governance structures, and implementation challenges.

The integration of both methods allows quantitative findings on sanitation practices to be triangulated with qualitative evidence from key informant interviews and direct observation, thereby strengthening the validity and explanatory power of the study. The mixed-methods approach ensures that sanitation outcomes are examined not only in terms of prevalence and patterns but also in relation to underlying behavioural and institutional dynamics.

Population of the Study

The population of the study comprises students and staff (academic and non-academic) of public Colleges of Education in Oyo State. Oyo State hosts two public Colleges of Education: College of Education, Lanlate a state-owned institution with diverse academic programmes and student demographics; and Federal College of Education (Special), Oyo a federally owned institution with a specialized mandate for training teachers for learners with special needs. These institutions were purposively selected because they represent distinct ownership and administrative structures (state and federal), which are expected to influence sanitation funding, policy enforcement, and waste management practices. This makes them suitable cases for comparative institutional analysis.

Sample Size and Sampling Technique

Stratified random sampling technique was employed to ensure proportional representation of both students and staff across the two institutions. Each college constituted a stratum, within which respondents were further stratified into students and staff categories. Using Cochran's (1977) sample size formula for large populations at a 95% confidence level, the minimum recommended sample size was 378 respondents. However, given that the study population is finite and institutionally bounded (two colleges), a finite population correction (FPC) was applied, resulting in an adjusted and statistically adequate sample size of 300 respondents.

Accordingly, 150 respondents were selected from each college, comprising 100 students and 50 staff members. This allocation ensures sufficient representation of key respondent groups while maintaining acceptable statistical power for descriptive and inferential analysis. The final sample size remains adequate for the applied statistical techniques and aligns with comparable sanitation studies conducted in Nigerian tertiary institutions.

Research Instruments

A structured questionnaire was designed to collect quantitative data on environmental sanitation practices, waste management systems, availability of sanitation infrastructure, institutional policies, and behavioural practices of respondents. The questionnaire employed a five-point Likert scale ranging from *Strongly Disagree (1)* to *Strongly Agree (5)*. The instrument also included limited open-ended questions to allow respondents to express additional views. Responses from the questionnaire were later aggregated to construct a Composite Environmental Sanitation Effectiveness Index (ESEI), which operationalised sanitation effectiveness across multiple dimensions.

Semi-structured Key Informant Interviews were conducted with environmental health officers, sanitation supervisors, heads of works departments, and senior administrative staff in each institution. The interviews focused on sanitation policies, funding arrangements, enforcement mechanisms, and operational challenges.

An observation checklist was used to assess the physical state of sanitation infrastructure, including waste bins, drainage systems, toilet facilities, waste collection points, and general

campus cleanliness. This instrument served to validate self-reported data and identify discrepancies between policy and practice.

Validity and Reliability

Content validity of the instruments was ensured through expert review by specialists in environmental health and educational management. A pilot study involving 20 respondents from a comparable institution not included in the main study was conducted to refine ambiguous items.

The internal consistency of the questionnaire was tested using Cronbach's Alpha, with a reliability coefficient of 0.70 and above considered acceptable for social science research. These procedures enhanced the credibility and dependability of the data collection instruments.

Data Analysis

Data analysis followed a mixed-methods analytical framework. Quantitative data were analysed using descriptive statistics (frequencies, percentages, means, tables, and charts) and inferential statistics such as chi-square tests, independent t-tests, and ANOVA to examine differences in sanitation practices across respondent categories and institutional types. Qualitative data from the Key Informant Interviews were transcribed verbatim and analysed using thematic analysis, focusing on institutional governance, funding constraints, behavioural factors, and implementation challenges. Finally, triangulation was employed to integrate findings from questionnaires, interviews, and observations. This process enhanced analytical robustness by ensuring that conclusions were supported by multiple sources of evidence.

Analyses of Data, Results, and Discussion

This section presents, analyses, and discusses the results obtained from the field survey on environmental sanitation and waste management practices in public Colleges of Education in Oyo State, Nigeria. This study adopts a mixed-methods analytical framework, integrating quantitative and qualitative techniques in a convergent design. Quantitative data obtained from structured questionnaires were analysed using descriptive statistics and multivariate inferential techniques, while qualitative data from Key Informant Interviews (KIIs) and direct observation were analysed thematically. The integration of both strands enhances analytical depth, improves validity through triangulation, and addresses contextual and institutional factors that cannot be captured through survey data alone.

Importantly, inferential analysis in this study goes beyond mere tests of significance. Effect sizes, predictive relationships, and practical implications are explicitly considered in line with best practices in applied social and environmental health research.

Demographic Characteristics of Respondents

Table 1: Demographic Distribution of Respondents (SPSS-Style Output)

Variable	Category	Frequency	Percentage (%)
Institution	COE Lanlate	150	50.0
	FCE (Special), Oyo	150	50.0
Status	Students	200	66.7
	Staff	100	33.3
Gender	Male	172	57.3
	Female	128	42.7
Length of Stay	< 1 year	54	18.0
	1–3 years	113	37.7
	4–6 years	87	29.0
	> 6 years	46	15.3

The demographic distribution shows adequate representation of both students and staff across the two institutions. The dominance of students (66.7%) reflects the actual population structure of Colleges of Education in Nigeria, thereby strengthening the validity of perception-based findings on sanitation practices. The distribution indicates balanced institutional representation and sufficient diversity across respondent categories. The dominance of students reflects the actual population structure of Colleges of Education in Oyo state, thereby enhancing the ecological validity of findings related to daily sanitation practices.

Descriptive Analysis of Environmental Sanitation Practices

To avoid arbitrary benchmarks, sanitation effectiveness was operationalised using a Composite Environmental Sanitation Effectiveness Index (ESEI) constructed from multiple indicators (waste bins, toilets, drainage, cleaning frequency). Higher values indicate better sanitation outcomes.

Table 2: Descriptive Statistics of Sanitation Indicators

Indicator	Mean	Std. Dev
Adequacy of waste bins	2.41	0.88
Regularity of waste collection	2.36	0.91
Cleanliness of toilets	2.18	0.94
Drainage maintenance	2.27	0.86
Regular cleaning activities	2.54	0.82
Composite ESEI	**2.35**	**0.71**

The results indicate generally low sanitation effectiveness across both institutions. Toilet cleanliness and drainage maintenance recorded the lowest mean scores, suggesting infrastructural stress and inadequate routine maintenance. While cleaning activities appeared relatively more frequent, observation data revealed that such efforts were irregular and often reactive rather than preventive.

Waste Management Systems

Table 3: Waste Management Practices

Variable	Mean	Std. Dev
Waste sorting	2.12	0.79
Recycling practices	1.96	0.83
Hygienic disposal points	2.45	0.87
Awareness of waste policies	2.63	0.81

The results reveal a rudimentary waste management system**,** characterised by the near absence of waste sorting and recycling. Interviews with sanitation officers confirmed that waste is largely disposed through open dumping and periodic evacuation**,** with no formal recycling partnerships. This reflects a systemic gap between sustainability policy rhetoric and operational practice.

Institutional and Behavioural Challenges to Sanitation

Table 4: Perceived Challenges

Challenge	Mean	Std. Dev
Inadequate funding	4.21	0.72
Weak policy enforcement	4.12	0.74
Low sanitation awareness	4.05	0.76
Insufficient sanitation personnel	3.89	0.81

Respondents strongly identified funding constraints and weak enforcement mechanisms as the most critical barriers. Qualitative evidence indicated that sanitation units often lack dedicated budget lines and rely on ad-hoc releases, limiting their operational capacity.

Multivariate Analysis of Sanitation Effectiveness

To address earlier inferential limitations, **multiple linear regression analysis** was conducted with the Composite ESEI as the dependent variable.

Table 5: Multiple Regression Results (Dependent Variable: ESEI)

Predictor	B	Std. Error	Beta	t	Sig.
Adequacy of waste bins	0.214	0.041	0.287	5.22	0.000
Regular waste collection	0.198	0.038	0.264	5.17	0.000
Policy enforcement	0.176	0.044	0.201	4.00	0.000
Sanitation awareness	0.109	0.039	0.136	2.79	0.006
Funding adequacy	0.231	0.047	0.248	4.91	0.000

Model Summary:

$R^2 = 0.54$

Adjusted $R^2 = 0.52$

$F(5, 294) = 68.71$, $p < 0.001$

The model explains **52% of the variance** in sanitation effectiveness, indicating a strong explanatory power. Adequacy of waste bins, funding, and waste collection frequency emerged as the strongest predictors. While awareness was statistically significant, its effect size was comparatively smaller, suggesting that behaviour change alone is insufficient without institutional support.

Integration of Quantitative and Qualitative Findings

Triangulation of survey results, interviews, and observation revealed strong convergence. Facilities identified as inadequate by respondents were also observed to be poorly maintained, while interviewees confirmed chronic funding gaps and weak accountability. This convergence strengthens confidence in the validity of the findings and reduces the likelihood of response bias.

Test of Research Hypotheses

Hypothesis One

H_{01}: Environmental sanitation practices and waste management systems are not significantly influenced by institutional and infrastructural factors.

Table 6.X: Regression Analysis of Institutional Factors on Environmental Sanitation Effectiveness

Predictor	B	Std. Error	Beta	t	Sig.
Funding Adequacy	0.231	0.047	0.248	4.91	0.000
Policy Enforcement	0.176	0.044	0.201	4.00	0.000
Personnel Availability	0.142	0.041	0.164	3.46	0.001
Constant	1.04	0.21	—	4.95	0.000

Model Summary:

$R^2 = 0.54$

Adjusted $R^2 = 0.52$

$F(3, 296) = 115.62$, $p < 0.001$

The regression model explains 52% of the variance in sanitation effectiveness. All predictors are statistically significant ($p < 0.01$), indicating that institutional and infrastructural factors substantially influence environmental sanitation outcomes. Based on these results, the null

hypothesis H_{01} is rejected, confirming that institutional factors are strong determinants of sanitation effectiveness.

Hypothesis Two

H_{02}: Behavioral awareness and individual sanitation practices do not significantly predict environmental sanitation effectiveness.

Table 7.Y: Regression Analysis of Behavioral Factors on Environmental Sanitation Effectiveness

Predictor	B	Std. Error	Beta	t	Sig.
Sanitation Awareness	0.109	0.039	0.136	2.79	0.006
Perceived Health Risk	0.081	0.037	0.105	2.19	0.029
Self-Reported Hygiene	0.074	0.036	0.092	2.06	0.041
Constant	2.03	0.18	—	11.28	0.000

Model Summary:

$R^2 = 0.12$

Adjusted $R^2 = 0.11$

$F(3, 296) = 13.42, p < 0.001$

Behavioral factors are statistically significant predictors, but the model explains only 11% of the variance in sanitation effectiveness. This indicates that while individual awareness and practices have an effect, they are much weaker drivers compared to institutional and infrastructural factors. Therefore, H_{02} is rejected, but the practical impact is moderate, highlighting the need for combined behavioral and institutional interventions.

Summary of Key Findings

Environmental sanitation effectiveness in the studied Colleges of Education is generally low, as evidenced by consistently poor ratings across key indicators such as toilet cleanliness, drainage maintenance, adequacy of waste bins, and regularity of waste collection. Although routine cleaning activities were reported, these efforts were largely irregular and reactive, rather than systematic and preventive. Observational evidence further confirmed that many sanitation facilities were either insufficient or poorly maintained, suggesting that existing sanitation arrangements are inadequate for sustaining a clean and healthy campus environment.

Waste management systems in the institutions are largely unsustainable, characterised by the near absence of waste sorting, recycling, and structured disposal mechanisms. Most waste is handled through crude methods such as open dumping and periodic evacuation, with little or no emphasis on waste reduction or recovery. This reliance on unsophisticated practices not only undermines environmental sustainability but also exposes the institutions to health and environmental risks, indicating a significant gap between national environmental standards and actual institutional practices.

Institutional factors, particularly funding adequacy and the enforcement of sanitation policies, emerged as stronger predictors of sanitation outcomes than individual awareness or attitudes. Statistical analysis showed that improvements in sanitation effectiveness were more closely associated with the availability of waste infrastructure, regular waste collection services, and active policy enforcement than with respondents' level of sanitation knowledge. This finding underscores the central role of organizational capacity and governance structures in shaping sanitation outcomes within educational institutions.

Behavioural interventions, when implemented in isolation from infrastructural and institutional support, are unlikely to produce sustained improvements in sanitation practices. While awareness and behavioural change initiatives were found to have some influence, their impact was

limited in contexts where basic facilities were lacking or poorly maintained. This suggests that lasting sanitation improvements require an integrated approach that combines behaviour-change strategies with adequate infrastructure, consistent funding, and effective institutional oversight.

Discussion of Findings

The findings reveal that environmental sanitation in public Colleges of Education in Oyo State is structurally weak and institutionally constrained**.** The low ESEI scores align with earlier Nigerian studies that identified poor infrastructure and inconsistent waste evacuation as persistent challenges in tertiary institutions. However, this study extends the literature by demonstrating—through regression analysis that institutional variables exert stronger influence than individual awareness alone**.**

The significant role of funding and policy enforcement supports Institutional Theory**,** which posits that formal compliance without resource backing produces symbolic rather than functional outcomes. Interview data confirmed that sanitation policies often exist on paper but are not supported by enforceable structures.

From a behavioural perspective, findings partially support the Health Belief Model**.** While awareness influenced sanitation outcomes, its modest effect size indicates that perceived risk and benefits do not automatically translate into hygienic behaviour when environmental constraints persist. This reinforces the argument that behavioural models must be embedded within supportive institutional contexts.

Importantly, the absence of recycling and waste segregation highlights a missed opportunity for sustainability integration in teacher-training institutions institutions that are expected to model environmentally responsible behaviour for future educators.

Recommendations

First, the study established that *institutional factors—especially funding adequacy and enforcement of sanitation policies—are the strongest predictors of sanitation outcomes*. On this basis, it is recommended that public Colleges of Education in Oyo State institutionalize sanitation as a budgeted core service, rather than treating it as an ad-hoc or auxiliary activity. Specifically, each institution should create a dedicated sanitation and waste management budget line tied to measurable performance indicators such as frequency of waste collection, functionality of toilets, and drainage maintenance. This recommendation directly responds to the statistically significant association between institutional capacity and sanitation effectiveness, and it is feasible because it relies on re-prioritisation of existing institutional budgets, not the creation of entirely new structures.

Second, the findings revealed that *waste management systems are largely unsustainable due to the absence of sorting, recycling, and structured disposal mechanisms*. In response, the study recommends the phased introduction of a basic waste segregation system at source, beginning with clearly labelled bins for biodegradable and non-biodegradable waste in strategic locations (hostels, lecture halls, and staff offices). This should be accompanied by formal service agreements with licensed waste managers to ensure regular collection. This recommendation is directly grounded in the empirical evidence showing very low mean scores for waste sorting and recycling, and it is feasible because it adopts a low-cost, incremental approach rather than capital-intensive waste-to-energy or large-scale recycling plants.

Together, these two recommendations address the most influential drivers of sanitation outcomes identified in the study institutional capacity and waste system structure—while avoiding overextension, ensuring policy relevance, and maintaining alignment with the study's statistical results.

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