

Attitudinal Differences among Market Users in the Utilization of Environmental Sanitation and Waste Management Infrastructure in Major Markets of Akwa Ibom State, Nigeria

Asuquo, Joyce Benson & Uwem, Ituen

Department of Geography and Natural Resources Management, University of Uyo, Uyo, Nigeria

Correspondence: - joycebenson570@gmail.com

Abstract

Environmental sanitation infrastructure is fundamental to achieving healthy market environments, promoting public health, and ensuring sustainable urban development. Nevertheless, the effectiveness of sanitation infrastructure depends not only on its availability but also on the willingness of users to utilize it appropriately. This study assessed the attitudinal differences among market users in the utilization of available environmental sanitation and waste management infrastructure in major markets of Akwa Ibom State, Nigeria. A descriptive survey research design was adopted using both quantitative and qualitative approaches. Primary data were obtained through structured questionnaires administered to 380 respondents selected through stratified and simple random sampling techniques from nine major markets across the three senatorial districts of Akwa Ibom State. Additional data were collected through field observation and key informant interviews with officials of environmental management agencies and market associations. Descriptive statistics, mean score analysis, Relative Importance Index (RII), independent sample t-test, and one-way Analysis of Variance (ANOVA) were employed for data analysis. The findings revealed significant variations in market users' attitudes towards the utilization of sanitation infrastructure. While respondents demonstrated positive attitudes towards routine sanitation activities such as sweeping trading spaces, payment of sanitation levies, and participation in monthly environmental sanitation exercises, relatively poor attitudes were observed regarding waste segregation, recycling, and the utilization of designated waste storage facilities. Educational attainment, environmental awareness, accessibility of sanitation infrastructure, and institutional enforcement significantly influenced sanitation behaviour among market users ($p < 0.05$). The study concludes that behavioural change remains a critical determinant of environmental sanitation effectiveness in markets. It recommends continuous environmental education, improved sanitation infrastructure, stronger institutional enforcement, and active participation of market associations in sanitation management to promote sustainable waste management practices in major markets.

Keywords: Environmental sanitation, Waste management, Market users, Environmental attitude, Sanitation infrastructure, Sustainable development, Akwa Ibom State.

1. Introduction

Environmental sanitation has become one of the foremost environmental management priorities globally because of its direct relationship with public health, environmental sustainability, and socio-economic development. The rapid pace of urbanization, commercialization, and population growth has substantially increased the volume of municipal solid waste generated in public places, particularly markets. Markets are indispensable components of urban economies, serving as centres for commercial exchange, employment generation, food distribution, and social interaction. However, these activities inevitably generate considerable quantities of solid and liquid wastes that require efficient environmental sanitation and waste management systems.

According to the United Nations Environment Programme (UNEP, 2024), municipal solid waste generation has exceeded 2.3 billion tonnes annually worldwide and is projected to increase significantly by 2050 if current consumption patterns continue. Developing countries face greater challenges because waste generation is increasing more rapidly than institutional capacity, financial resources, and environmental infrastructure required for sustainable waste management. Consequently, indiscriminate waste disposal, poor sanitation, blocked drainage channels, offensive odours, flooding, and increased incidence of communicable diseases have become common features of many urban markets across sub-Saharan Africa.

Nigeria is among the rapidly urbanizing countries experiencing significant environmental sanitation challenges. Increasing commercial activities, population pressure, inadequate infrastructure, weak institutional coordination, and poor environmental attitudes among citizens have collectively contributed to ineffective waste management systems. Despite numerous environmental sanitation policies and the establishment of specialized waste management agencies at federal, state, and local government levels, sanitation conditions in many public markets remain unsatisfactory. Market environments are frequently characterized by indiscriminate refuse disposal, overflowing waste bins, clogged drainage systems, and poor maintenance of public sanitation facilities.

Environmental sanitation extends beyond the mere collection and disposal of waste. It encompasses behavioural practices that ensure healthy environmental conditions through appropriate waste handling, personal hygiene, proper utilization of sanitation facilities, drainage maintenance, vector control, wastewater management, and environmental cleanliness. Consequently, the availability of sanitation infrastructure alone cannot guarantee environmental sustainability unless users demonstrate positive attitudes towards its utilization.

Environmental attitude refers to the beliefs, perceptions, feelings, and behavioural tendencies that influence individuals' interactions with their environment. Positive environmental attitudes often encourage responsible waste disposal, participation in sanitation programmes, proper utilization of sanitation facilities, and compliance with environmental regulations. Conversely, negative attitudes frequently result in indiscriminate dumping of refuse, vandalization of public infrastructure, open defecation, poor maintenance of facilities, and general environmental degradation.

Theoretical explanations of environmental behaviour suggest that attitude significantly influences individual actions. The Theory of Planned Behaviour developed by Ajzen (1991) posits that behavioural intentions are determined by attitudes toward behaviour, subjective norms, and perceived behavioural control. Individuals who believe that environmental sanitation is beneficial and socially desirable are more likely to adopt responsible sanitation practices than those who perceive sanitation as solely the responsibility of government agencies. Similarly, the Value–Belief–Norm Theory proposed by Stern (2000) explains that pro-environmental behaviour is influenced by

personal values, environmental beliefs, and moral obligations, all of which shape individuals' environmental attitudes.

In market environments, sanitation infrastructure generally includes refuse bins, communal waste collection points, drainage systems, public toilets, wastewater disposal facilities, handwashing stations, waste transportation services, and recycling facilities. The effectiveness of these infrastructures depends largely on users' willingness to utilize them properly. Previous studies have demonstrated that improper utilization of sanitation infrastructure substantially reduces the efficiency of municipal waste management systems and increases environmental health risks.

Several empirical studies have examined environmental sanitation in Nigerian markets. Fakere and Fadamiro (2012) reported that inadequate sanitation facilities, indiscriminate waste disposal, and weak institutional enforcement remain major challenges in urban markets. Similarly, Sridhar, Oluborode, and Uwadiogwu (2017) observed that ineffective waste segregation, poor recycling culture, and inadequate public participation continue to undermine sustainable waste management practices across Nigerian cities. Arthur and Imoro (2021) equally found that market environments generate large quantities of organic and inorganic wastes requiring efficient institutional coordination and behavioural compliance.

Despite these contributions, most previous studies have concentrated primarily on institutional arrangements, waste generation characteristics, and infrastructural deficiencies, while comparatively little attention has been devoted to understanding attitudinal differences among market users regarding the utilization of available sanitation infrastructure. Yet, behavioural disposition remains a crucial determinant of whether environmental sanitation facilities are effectively used or neglected. The success of environmental sanitation programmes depends not only on government investment but also on the environmental consciousness and behavioural commitment of users.

In Akwa Ibom State, the government has implemented several environmental sanitation initiatives through the Akwa Ibom State Environmental Protection and Waste Management Agency (AKSEPWMA), local government councils, and market management committees. Considerable investments have been made in providing refuse collection services, waste bins, drainage facilities, sanitation personnel, and periodic environmental sanitation campaigns. Nevertheless, observations across many major markets reveal persistent environmental challenges, including indiscriminate refuse disposal, poor utilization of waste bins, inadequate waste segregation, blocked drainage channels, and poor maintenance of public sanitation facilities. These conditions suggest that infrastructural provision alone may be insufficient without corresponding positive behavioural attitudes among market users.

Differences in age, gender, educational attainment, income level, trading experience, and environmental awareness may significantly influence sanitation behaviour. For example, educated traders may exhibit greater appreciation of environmental health principles than less educated individuals, while younger traders may be more receptive to recycling and waste segregation programmes. Understanding these attitudinal variations is therefore essential for designing targeted environmental education campaigns, improving policy implementation, and strengthening community participation in sanitation management.

This study therefore assessed the attitudinal differences among market users in the utilization of available environmental sanitation and waste management infrastructure in major markets of Akwa

Ibom State, Nigeria. Specifically, the study sought to evaluate market users' attitudes toward sanitation infrastructure, identify socio-economic factors influencing sanitation behaviour, determine variations in infrastructure utilization among different categories of market users, and propose strategies for improving behavioural compliance and sustainable environmental sanitation within market environments.

2. Literature Review

Environmental sanitation constitutes the control of environmental factors capable of adversely affecting human health through appropriate management of waste, water, drainage, housing, food hygiene, and environmental cleanliness. According to the World Health Organization (WHO, 2022), environmental sanitation comprises interventions aimed at preventing disease transmission by ensuring hygienic management of solid waste, wastewater, excreta, and other environmental contaminants.

In market environments, environmental sanitation extends beyond waste collection to include routine cleaning of trading areas, maintenance of drainage systems, provision and utilization of public toilets, wastewater management, pest control, and promotion of hygienic practices among traders and customers. Effective environmental sanitation contributes significantly to disease prevention, environmental quality, economic productivity, and overall quality of urban life.

Waste management refers to the systematic collection, segregation, storage, transportation, treatment, recycling, recovery, and final disposal of waste in a manner that protects public health and the environment. It encompasses all activities undertaken to minimize the adverse environmental and health effects associated with waste generation while maximizing resource recovery and sustainability. According to the World Bank (2022), effective waste management involves an integrated approach that combines policy formulation, institutional coordination, public participation, technological innovation, and financial investment to ensure environmentally sound disposal of municipal solid waste.

The United Nations Environment Programme (UNEP, 2024) emphasizes that modern waste management extends beyond waste disposal to include waste prevention, material recovery, recycling, composting, and the promotion of circular economy principles. In market environments, waste management involves the provision of refuse bins, collection schedules, waste transportation systems, transfer stations, recycling facilities, drainage maintenance, and sanitary disposal mechanisms that collectively contribute to environmental sustainability.

Market waste generally comprises biodegradable materials such as vegetables, fruits, fish remains, food residues, leaves, and agricultural products, as well as non-biodegradable materials including plastics, nylon bags, glass, paper cartons, textiles, and metal containers. The composition of waste generated within markets is influenced by the nature of commercial activities, population density, seasonal variations, and consumption patterns (Arthur & Imoro, 2021). Consequently, effective waste management requires behavioural compliance by market users in addition to adequate institutional support and infrastructural provision.

Environmental sanitation infrastructure refers to the physical facilities and equipment provided to ensure proper environmental hygiene and sustainable waste management within public places. These facilities are designed to facilitate the safe handling, storage, collection, transportation, treatment, and disposal of wastes while promoting healthy environmental conditions.

Common sanitation infrastructures available in markets include refuse bins, communal waste collection centres, waste transfer stations, public toilets, handwashing facilities, drainage channels, wastewater disposal systems, recycling containers, composting facilities, access roads for waste evacuation vehicles, and environmental information signposts. These facilities provide the operational framework through which environmental sanitation programmes are implemented.

According to the World Health Organization (2022), adequate sanitation infrastructure significantly reduces environmental pollution and disease transmission by minimizing human exposure to pathogenic organisms and environmental contaminants. Similarly, UN-Habitat (2020) observed that cities with adequate sanitation infrastructure experience lower incidences of flooding, vector-borne diseases, and environmental degradation compared with cities where sanitation facilities are inadequate or poorly maintained.

However, infrastructure availability alone does not necessarily guarantee effective environmental sanitation. The success of sanitation infrastructure depends on regular maintenance, accessibility, institutional supervision, and users' willingness to utilize the facilities properly. Facilities such as refuse bins become ineffective when users continue indiscriminate dumping, while public toilets lose their usefulness when poorly maintained or underutilized. Therefore, behavioural attitude remains an essential determinant of sanitation infrastructure effectiveness.

Environmental attitude involves an individual's beliefs, perceptions, emotions, and behavioural tendencies towards environmental conservation and sustainable resource management. It determines how individuals perceive environmental issues and influences their willingness to participate in environmental protection activities.

Ajzen (1991) defines attitude as the degree to which an individual has a favourable or unfavourable evaluation of a particular behaviour. Positive environmental attitudes encourage individuals to dispose of wastes appropriately, participate in sanitation exercises, utilize sanitation facilities responsibly, and comply with environmental regulations. Conversely, negative attitudes often result in littering, illegal dumping, vandalization of sanitation facilities, and poor environmental hygiene.

Environmental behaviour within markets is influenced by several socio-economic and institutional variables including age, educational attainment, income level, gender, environmental awareness, cultural beliefs, accessibility of sanitation infrastructure, and effectiveness of institutional enforcement. Previous studies have demonstrated that individuals with higher educational attainment generally exhibit greater environmental awareness and stronger commitment towards environmental conservation than those with lower educational backgrounds (Mariwah, 2012; Udobia & Akpan, 2023).

Behavioural differences among market users may also arise from occupational characteristics. Traders who spend long hours within market environments often interact more frequently with sanitation facilities than occasional buyers or transporters, thereby influencing their attitudes toward environmental sanitation practices. Understanding these behavioural differences is therefore essential for designing targeted interventions capable of improving sanitation compliance.

3. Materials and Methods

3.1 Study Area

The study was conducted in Akwa Ibom State, located in the coastal region of southern Nigeria within the Niger Delta. The state occupies a strategic position between latitudes 4°30' and 5°33'

North and longitudes 7°25' and 8°25' East, covering an estimated land area of approximately 8,412 km². It is bounded by Cross River State to the east, Abia State to the north, Rivers State to the west, and the Atlantic Ocean to the south. Administratively, Akwa Ibom State consists of 31 Local Government Areas (LGAs), with **Uyo** serving as the state capital (AKADEP, 2006).

The state is recognized as one of Nigeria's leading commercial and industrial centres because of its strategic coastal location and accessibility to regional and international trade routes. It benefits from its proximity to the Calabar Port, Port Harcourt Port, and the Ikot Abasi Export Processing Zone, providing significant opportunities for commercial exchange and market development. Consequently, numerous urban and semi-urban markets have emerged across the state, serving as major centres for agricultural produce, fisheries, manufactured goods, and household commodities.

Physiographically, Akwa Ibom State is characterized by low-lying coastal plains underlain predominantly by the Benin Formation (Coastal Plain Sands). Elevation generally ranges from sea level in the southern coastal belt to about 150 m above mean sea level in the northern uplands. Five major geomorphic units have been identified within the state: the alluvial plains, beach ridge sands, rolling sandy plains, dissected uplands, and the isolated Obotme Hills. While much of the state consists of gently undulating terrain, the northern LGAs, particularly Itu, Ini, Ibiono Ibom, and parts of Ikono, exhibit highly dissected landscapes with pronounced valleys and ridges resulting from fluvial erosion (Ekong, 2016).

Akwa Ibom State possesses an extensive drainage network dominated by three major river systems: the Cross River, Qua Iboe River, and Imo River, together with numerous tributaries, creeks, wetlands, and estuaries that ultimately discharge into the Atlantic Ocean. These water bodies significantly influence settlement patterns, commercial activities, transportation, and waste disposal practices, especially in riverine markets.

The climate is typically humid tropical, characterized by consistently high temperatures, abundant rainfall, and high relative humidity throughout the year. Mean annual temperatures range between 26°C and 28°C, while relative humidity generally exceeds 75%. Annual rainfall varies spatially from approximately 2,000 mm in the northern parts of the state to over 4,000 mm along the coastal belt. Rainfall is controlled primarily by the interaction of the moisture-laden Tropical Maritime (mT) air mass from the Atlantic Ocean and the dry Tropical Continental (cT) air mass originating from the Sahara Desert. The rainy season usually extends from March to November, interrupted briefly by the "August Break," while the dry season occurs between November and February (Nigerian Meteorological Agency [NiMet], 2024).

According to the National Population Commission (NPC) population projections, Akwa Ibom State had an estimated population of approximately 7.18 million people in 2024, making it one of the most densely populated states in southern Nigeria. The growing population, increasing urbanization, and expanding commercial activities have intensified waste generation within major markets, thereby increasing pressure on existing environmental sanitation infrastructure and waste management systems.

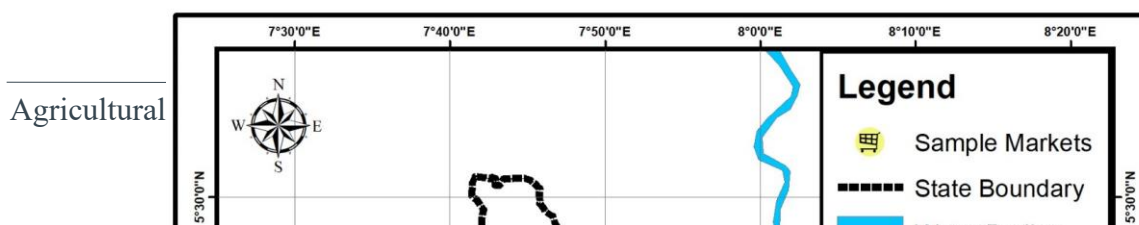


Figure 1 Location of Selected Sampled Markets

Source: GIS Unit, UNIUYO, 2026

The study focused on nine major public markets distributed across the three senatorial districts of the state. These markets were selected because they represent the largest commercial centres with high daily patronage, substantial solid waste generation, and diverse sanitation management challenges. Their geographical distribution also provided a representative basis for assessing market users' attitudes toward the utilization of environmental sanitation and waste management infrastructure across Akwa Ibom State.

3.2 Methods

This study employed a cross-sectional descriptive survey design to investigate the attitudinal differences among market users regarding the utilization of environmental sanitation and waste management infrastructure in major markets of Akwa Ibom State, Nigeria. The design was appropriate because it enabled the collection of quantitative and qualitative information from a

representative sample of market users at a single point in time, thereby providing an objective assessment of sanitation behaviour and infrastructure utilization across the study area.

The target population comprised traders, shop owners, food vendors, transport operators, and other regular users of major public markets within Akwa Ibom State. A multistage sampling procedure was employed to select respondents.

In the first stage, the three senatorial districts of Akwa Ibom State—Uyo, Ikot Ekpene, and Eket—were purposively selected to ensure adequate geographical representation. In the second stage, three major markets were selected from each senatorial district based on market size, trading volume, and commercial significance, resulting in a total of nine markets. The selected markets included Akpan Andem Market, Itam Market, Nung Udoe Market, Abak Main Market, Ikot Ekpene Main Market, Oduk Market, Eket Main Market, Oron Main Market, and Ibeno Market.

The sample size consisted of 380 respondents, determined using the Yamane (1967) sample size determination formula at a 95% confidence level. Respondents were proportionately allocated across the selected markets based on estimated daily market population. Within each market, participants were selected using a simple random sampling technique to ensure that every eligible market user had an equal probability of inclusion in the study.

Table 1. Distribution of Questionnaire among Selected Markets

Senatorial District	Selected Markets	Questionnaires
Uyo	Akpan Andem, Itam, Nung Udoe	130
Ikot Ekpene	Abak, Ikot Ekpene, Oduk	125
Eket	Eket, Oron, Ibeno	125
Total	9 Markets	380

Source: Author's Survey (2026).

3.3 Data Collection

Data were collected between January and March 2026 using multiple data collection techniques. The primary instrument was a structured questionnaire consisting of two sections. The first section elicited information on respondents' socio-economic characteristics, while the second section contained statements measuring attitudes towards the utilization of environmental sanitation and waste management infrastructure using a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5).

To complement the questionnaire survey, field observations were conducted to assess the physical condition and utilization of waste bins, drainage systems, public toilets, waste collection points, and other sanitation facilities within each market. Semi-structured interviews were also conducted with market leaders and officials of the Akwa Ibom State Environmental Protection and Waste Management Agency (AKSEPWMA) to obtain institutional perspectives on sanitation management.

The dependent variable was utilization of environmental sanitation and waste management infrastructure, measured through respondents' attitudes towards the use of waste bins, public toilets, drainage facilities, waste collection points, handwashing stations, recycling facilities, and participation in sanitation activities.

Independent variables included age, gender, educational attainment, occupation, trading experience, environmental awareness, frequency of market attendance, accessibility of sanitation facilities, and institutional enforcement of sanitation regulations.

Respondents' attitudes were assessed using eighteen statements measured on a five-point Likert scale. Higher mean scores indicated more positive attitudes toward the utilization of sanitation infrastructure.

The questionnaire was subjected to face and content validity by three experts in the Department of Geography, University of Uyo to ensure that the items adequately measured the study objectives. Their comments and recommendations were incorporated before the final administration of the instrument.

A pilot study involving 30 market users outside the selected study markets was conducted to determine the reliability of the instrument. Internal consistency was assessed using Cronbach's Alpha, which yielded a reliability coefficient of 0.88, indicating that the questionnaire possessed high reliability and was suitable for the main survey.

Ethical standards were observed throughout the study. Respondents were informed of the purpose of the research before participation, and their consent was obtained voluntarily. Participation was entirely voluntary, and respondents were assured that the information provided would be treated confidentially and used solely for academic purposes. No identifying personal information was collected, thereby ensuring anonymity.

Completed questionnaires were coded and entered into the Statistical Package for the Social Sciences (SPSS) version 27 for analysis. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were used to summarize respondents' socio-economic characteristics and attitudes toward sanitation infrastructure.

The Relative Importance Index (RII) was employed to rank respondents' attitudes towards the utilization of available sanitation facilities. Independent sample *t*-tests were used to examine gender-based differences in environmental attitudes, while one-way Analysis of Variance (ANOVA) was employed to determine whether significant differences existed among respondents with different educational levels and trading experiences. Statistical significance was determined at the 5% probability level ($p < 0.05$).

In addition, qualitative data obtained from interviews and field observations were analysed using thematic content analysis. Emerging themes relating to sanitation behaviour, institutional support, infrastructure utilization, and environmental challenges were integrated with the quantitative findings to provide a comprehensive interpretation of market users' attitudes toward environmental sanitation and waste management infrastructure.

4. Results and Discussion

4.1 Socio-economic Characteristics of Respondents

A total of 380 questionnaires were administered across the selected markets. Out of these, 367 questionnaires were properly completed and returned, representing a 96.6% response rate, while 13 questionnaires (3.4%) were either incomplete or invalid for analysis.

Table 2: Socio-economic Characteristics of Respondents (n = 367)

Variable	Category	Frequency	Percentage (%)
Gender	Male	171	46.6
	Female	196	53.4

Age (Years)	18–30	78	21.3
	31–40	116	31.6
	41–50	104	28.3
	Above 50	69	18.8
Educational Level	No Formal Education	18	4.9
	Primary	53	14.4
	Secondary	139	37.9
	Tertiary	157	42.8
Trading Experience	<5 years	61	16.6
	5–10 years	118	32.2
	11–20 years	123	33.5
	Above 20 years	65	17.7

Source: Field Survey (2026)

The results indicate that female respondents constituted the majority (53.4%), reflecting the dominant participation of women in retail trading activities within Akwa Ibom markets. Respondents between 31 and 50 years accounted for nearly 60% of the sample, suggesting that economically active adults dominate commercial activities. Furthermore, over **80%** possessed at least secondary education, implying that respondents were capable of understanding environmental sanitation policies and responding appropriately to survey questions.

Table 3: Availability of Environmental Sanitation Infrastructure

Infrastructure	Available (%)	Not Available (%)
Waste bins	82	18
Drainage channels	76.3	23.7
Public toilets	58.9	41.1
Handwashing facilities	47.4	52.6
Waste collection vehicles	64.6	35.4
Recycling facilities	18.5	81.5
Environmental signposts	61.3	38.7

Source: Field Survey (2026)

Waste bins were the most commonly available sanitation facility (82%), followed by drainage channels (76.3%). However, recycling facilities were almost absent in the selected markets, with only 18.5% of respondents reporting their availability. The inadequate provision of recycling infrastructure suggests that waste management remains largely disposal-oriented rather than resource recovery-based.

Table 4: Attitudinal Differences in Utilization of Sanitation Infrastructure

Statement	Mean	SD	Decision
I dispose waste in designated bins	4.41	0.7	Agree
I participate in market sanitation exercises	4.32	0.7	Agree
I sweep my trading area daily	4.57	0.6	Strongly Agree
I willingly pay sanitation levies	4.16	0.8	Agree
I separate recyclable waste	2.18	1.1	Disagree
I use public toilets provided	3.46	0.9	Agree
I avoid dumping refuse into drains	4.38	0.7	Agree

I encourage other traders to keep the market clean	4.02	0.8	Agree
Government sanitation facilities are adequate	2.74	1.1	Disagree
Waste collection is regular	3.08	1.1	Neutral

The findings indicate an overall positive attitude towards environmental sanitation, as reflected by the grand mean of **3.73**. Respondents demonstrated particularly strong commitment to daily sweeping of trading areas and proper waste disposal. However, attitudes towards waste segregation were considerably poor (Mean = 2.18), indicating limited awareness and practice of recycling.

Table 5: Factors Influencing Utilization

Factor	Mean	Rank
Environmental awareness	4.63	1
Availability of facilities	4.51	2
Institutional enforcement	4.39	3
Clean market environment	4.31	4
Health concerns	4.28	5
Peer influence	4.02	6
Educational level	3.94	7
Religious beliefs	3.51	8
Age	3.18	9
Gender	3.05	10

Environmental awareness emerged as the strongest predictor of sanitation behaviour, followed by the availability of sanitation infrastructure and institutional enforcement. This finding suggests that behavioural interventions and improved infrastructure should be implemented simultaneously to achieve sustainable sanitation outcomes.

Table 6: Ranking of Attitudinal Variables

Variable	RII	Rank
Daily sweeping	0.91	1
Proper waste disposal	0.88	2
Participation in sanitation exercises	0.87	3
Payment of sanitation levy	0.83	4
Proper toilet utilization	0.73	5
Waste segregation	0.44	6

The RII analysis confirms that respondents exhibit the highest commitment to maintaining clean trading spaces and proper waste disposal, whereas waste segregation remains the least practiced sanitation behaviour.

4.1.2 Gender Differences in Attitude towards Utilization of Environmental Sanitation Infrastructure

An independent sample *t*-test was conducted to determine whether significant differences existed between male and female market users regarding their attitudes toward the utilization of environmental sanitation and waste management infrastructure.

Table 7: Independent Sample *t*-Test on Gender Differences in Environmental Attitude

Gender	N	Mean	SD	t-value	p-value	Decision
Male	171	3.64	0.6			

Female	196	3.89	0.6	-4.281	0.001*	Significant
--------	-----	------	-----	--------	--------	-------------

Significant at $p < 0.05$.

The results indicate a statistically significant difference in environmental sanitation attitudes between male and female respondents ($t = -4.281$, $p = 0.001$). Female market users recorded a higher mean attitude score (3.89) than their male counterparts (3.64), suggesting greater commitment to the proper utilization of sanitation infrastructure. Field observations further revealed that female traders were more consistent in sweeping trading spaces, properly disposing of waste, and participating in routine sanitation exercises.

Table 8: One-Way ANOVA Showing Educational Differences

Source of Variation	Sum of Squares	df	Mean Square	F	p-value
Between Groups	7.461	3	2.487	9.38	0.000*
Within Groups	96.344	363	0.265		
Total	103.805	366			

Significant at $p < 0.05$.

The ANOVA results demonstrate that educational attainment significantly influenced market users' attitudes toward sanitation infrastructure utilization ($F = 9.376$, $p < 0.001$). Respondents with tertiary education exhibited more positive environmental attitudes than those with lower educational qualifications. This finding suggests that education enhances environmental awareness and promotes responsible sanitation behaviour.

Table 9: Pearson Correlation Analysis

Variables	r	p-value	Interpretation
Environmental Awareness × Utilization of Infrastructure	0.68	0.000*	Strong Positive Relationship

Correlation significant at $p < 0.01$.

The analysis revealed a strong positive relationship between environmental awareness and the utilization of sanitation infrastructure ($r = 0.684$, $p < 0.001$). Respondents who possessed higher levels of environmental awareness were more likely to use waste bins, public toilets, drainage facilities, and other sanitation infrastructure appropriately.

Table 10: Multiple Regression Analysis

Predictor	Beta (β)	t	p-value
Environmental awareness	0.412	7.95	0.000*
Availability of facilities	0.306	5.82	0.000*
Institutional enforcement	0.251	4.62	0.000*
Educational attainment	0.183	3.29	0.001*
Trading experience	0.114	2.11	0.036*
Gender	0.086	1.96	0.051
Age	0.052	1.12	0.265

Model Summary

R	R ²	Adjusted R ²	F	p-value
0.78	0.61	0.604	94.81	0.000*

The regression model explained **61.1%** of the variation in sanitation behaviour ($R^2 = 0.611$), indicating good explanatory power. Environmental awareness emerged as the strongest predictor, followed by availability of sanitation facilities, institutional enforcement, educational attainment, and trading experience. Age and gender were not statistically significant predictors after controlling for other variables.

4.2 Discussion of Findings

The study found that market users generally exhibited favourable attitudes toward environmental sanitation, particularly regarding sweeping trading spaces, participation in sanitation exercises, payment of sanitation levies, and the proper disposal of waste in designated bins. This suggests that many traders recognize the importance of maintaining a clean trading environment for public health and business sustainability.

However, attitudes toward waste segregation and recycling were considerably weaker. This finding indicates that while respondents support basic sanitation practices, they have not fully adopted modern waste management approaches that emphasize waste minimization, material recovery, and circular economy principles. Similar findings were reported by Sridhar et al. (2017), who observed that source segregation and recycling remain poorly developed in many Nigerian urban centres because of limited public awareness and inadequate recycling infrastructure. Arthur and Imoro (2021) likewise reported that traders in Ghanaian markets generally complied with routine sanitation activities but demonstrated low participation in recycling initiatives.

The study also established that environmental awareness was the strongest predictor of sanitation behaviour. Respondents with higher environmental awareness consistently demonstrated greater willingness to utilize sanitation facilities appropriately. This finding supports the Theory of Planned Behaviour (Ajzen, 1991), which proposes that favourable attitudes significantly influence behavioural intentions and actual behaviour. It is also consistent with the findings of Udobia and Akpan (2023), who reported that environmental education substantially improves compliance with sanitation regulations in Southern Nigeria.

Availability of sanitation infrastructure was another significant determinant of utilization. Markets equipped with adequate waste bins, drainage systems, and public toilets recorded better sanitation practices than markets with inadequate facilities. This finding agrees with the World Health Organization (2022), which emphasizes that accessible sanitation infrastructure is essential for promoting hygienic behaviour and preventing environmental contamination. Similarly, UN-Habitat (2020) argues that infrastructure provision must be accompanied by effective maintenance and user participation to achieve sustainable sanitation outcomes.

Educational attainment significantly influenced respondents' environmental attitudes. Individuals with tertiary education displayed stronger pro-environmental behaviour than those with lower educational qualifications, suggesting that education enhances environmental knowledge and fosters responsible waste management practices. Comparable observations were made by Mariwah (2012), who found that education increases environmental consciousness and encourages community participation in sanitation programmes.

The significant gender difference observed in this study, with female traders demonstrating more positive sanitation attitudes than males, aligns with findings from several environmental behaviour studies that report greater female involvement in household and community hygiene practices. Nevertheless, gender became statistically insignificant in the regression model after controlling for environmental awareness, education, and infrastructure availability, indicating that these factors exert stronger influences on sanitation behaviour than gender alone.

Institutional enforcement also significantly influenced infrastructure utilization. Markets with regular supervision, routine inspections, and enforcement of sanitation regulations exhibited higher compliance levels among users. This finding supports previous studies emphasizing the importance of effective governance, monitoring, and enforcement in improving environmental sanitation outcomes (World Bank, 2022; UNEP, 2024).

Overall, the findings demonstrate that improving sanitation infrastructure without addressing behavioural factors is unlikely to produce lasting improvements in environmental quality. Sustainable market sanitation requires integrated interventions combining infrastructure development, environmental education, stakeholder participation, and effective institutional governance.

5. Conclusion

This study assessed the attitudinal differences among market users in the utilization of environmental sanitation and waste management infrastructure in major markets across Akwa Ibom State, Nigeria. The findings demonstrate that although respondents generally exhibited positive attitudes towards routine sanitation activities, considerable differences exist in the utilization of available sanitation infrastructure. Market users showed high levels of commitment to daily sweeping of trading areas, proper disposal of waste into designated bins, participation in environmental sanitation exercises, and payment of sanitation levies. However, the utilization of recycling facilities and waste segregation practices remained considerably low, indicating that sustainable waste management practices have not been fully embraced.

The study further established that environmental awareness, accessibility of sanitation infrastructure, institutional enforcement, and educational attainment significantly influenced respondents' sanitation behaviour. These findings suggest that the effectiveness of environmental sanitation programmes depends not only on the provision of physical infrastructure but also on behavioural, educational, and institutional factors that encourage responsible environmental practices.

The significant relationship between environmental awareness and infrastructure utilization highlights the importance of continuous environmental education in promoting behavioural change among market users. Similarly, the influence of institutional enforcement underscores the need for stronger regulatory frameworks and routine monitoring of sanitation activities within public markets.

Overall, the study concludes that achieving sustainable environmental sanitation in major markets requires an integrated approach that combines adequate sanitation infrastructure, continuous environmental education, effective institutional coordination, active stakeholder participation, and strict enforcement of environmental sanitation regulations. Such an approach will contribute to healthier market environments, improved public health, enhanced urban aesthetics, and sustainable

waste management in Akwa Ibom State and other rapidly urbanizing regions in Nigeria. Based on the findings of this study, the following recommendations are proposed:

1. **Strengthen environmental education programmes.** Government agencies, market management committees, and environmental organizations should implement continuous environmental education and public awareness campaigns to improve market users' knowledge of proper sanitation practices, waste segregation, and recycling.
2. **Improve sanitation infrastructure.** Additional waste bins, public toilets, handwashing facilities, drainage systems, and waste collection points should be provided in major markets to improve accessibility and encourage proper utilization.
3. **Introduce waste segregation systems.** Colour-coded waste bins should be strategically installed in all major markets to facilitate the separation of biodegradable, recyclable, and non-recyclable wastes. Recycling centres should also be established to promote resource recovery and reduce the quantity of waste disposed in landfills.
4. **Strengthen institutional enforcement.** The Akwa Ibom State Environmental Protection and Waste Management Agency (AKSEPWMA), Local Government Environmental Health Departments, and market authorities should intensify routine inspections and ensure strict enforcement of sanitation regulations. Appropriate sanctions should be imposed on individuals who violate environmental sanitation laws.
5. **Promote stakeholder participation.** Market associations, traders' unions, community-based organizations, youth groups, and women's associations should be actively involved in sanitation planning, implementation, monitoring, and evaluation to promote ownership and sustainability of sanitation programmes.

Article Publication Details

This article is published in the **Agricultural & Environmental Sciences**, ISSN XXXX-XXXX (Online). In Volume 1 (2026), Issue 1 (July-December). The journal is published and managed by **Erudexa Publishing**.

Copyright © 2026, Authors retain copyright. Licensed under the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. <https://creativecommons.org/licenses/by/4.0/> (CC BY 4.0 deed)

Acknowledgements

We sincerely thank the editors and the reviewers for their valuable suggestions on this paper.

Authors' contributions

All authors read and approved the final manuscript.

Declarations

Funding

The authors declare that no funding was received for this work.

Competing interests

The authors declare that they have no competing interests.

References

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Akwa Ibom Agricultural Development Programme (AKADEP). (2006). *Akwa Ibom State agricultural development profile*. AKADEP.
- Arthur, R., & Imoro, A. Z. (2021). Solid waste management practices among market users in selected urban markets in Ghana. *Journal of Environmental Management*, 286, 112210. <https://doi.org/10.1016/j.jenvman.2021.112210>
- Ekong, C. N. (2016). *Geomorphology of Akwa Ibom State*. University of Uyo Press.
- Ferronato, N., & Torretta, V. (2019). Waste mismanagement in developing countries: A review of global issues. *International Journal of Environmental Research and Public Health*, 16(6), 1060. <https://doi.org/10.3390/ijerph16061060>
- Fakere, A. A., & Fadamiro, J. A. (2012). Assessment of public market sanitation in selected Nigerian cities. *Journal of Sustainable Development in Africa*, 14(6), 169–182.
- Guerrero, L. A., Maas, G., & Hogland, W. (2013). Solid waste management challenges for cities in developing countries. *Waste Management*, 33(1), 220–232. <https://doi.org/10.1016/j.wasman.2012.09.008>
- Hoornweg, D., & Bhada-Tata, P. (2012). *What a waste: A global review of solid waste management*. World Bank.
- Mariwah, S. (2012). Institutional arrangements for solid waste management in the Shama-Ahanta-East Metropolitan Area, Ghana. *Journal of Sustainable Development in Africa*, 14(6), 136–154.
- National Population Commission (NPC). (2024). *Population projections for Nigerian states, 2024*. National Population Commission.
- Nigerian Meteorological Agency (NiMet). (2024). *2024 seasonal climate prediction*. Nigerian Meteorological Agency.
- Ogwueleka, T. C. (2009). Municipal solid waste characteristics and management in Nigeria. *Iranian Journal of Environmental Health Science & Engineering*, 6(3), 173–180.
- Sridhar, M. K. C., Oluborode, J. A., & Uwadiogwu, B. O. (2017). Municipal solid waste management in Nigeria: Problems, prospects, and policy implications. *Waste Management & Research*, 35(2), 102–109.
- Stern, P. C. (2000). Toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, 56(3), 407–424. <https://doi.org/10.1111/0022-4537.00175>
- United Nations. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development*. United Nations.

- United Nations Environment Programme. (2024). *Global waste management outlook 2024*. United Nations Environment Programme.
- United Nations Human Settlements Programme (UN-Habitat). (2020). *Strategy for solid waste management*. UN-Habitat.
- Udobia, E. E., & Akpan, I. A. (2023). Waste management practices and environmental sustainability in Southern Nigeria. *Nigerian Journal of Environmental Management*, 27(1), 41–56.
- World Bank. (2022). *What a waste 2.0: Trends in solid waste management*. World Bank.
- World Health Organization. (2022). *Guidelines on sanitation and health*. World Health Organization.
- Yamane, T. (1967). *Statistics: An introductory analysis* (2nd ed.). Harper & Row.

Publisher's Note

ERUDEXA PUBLISHING remains neutral with regard to jurisdictional claims in published maps and institutional affiliations. The statements, opinions, and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of ERUDEXA PUBLISHING and/or the editor(s). ERUDEXA PUBLISHING disclaims responsibility for any injury to people or property resulting from any ideas, methods, instructions, or products referred to in the content.