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Assessing the Role of Community Environmental Services in Promoting the Sustainability of Natural Ecosystems in Cross River State, Nigeria.

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Abstract
This study examined the relationship between community participation in environmental services, the effectiveness of community-based waste management practices, and the sustainability of natural ecosystems in Cross River State, Nigeria. Using a descriptive research design, data were collected from a sample of 397 respondents through structured questionnaires. The data were analyzed using the Pearson Product Moment Correlation Coefficient. Findings revealed a statistically significant and moderately positive relationship between community participation in environmental services and the sustainability of natural ecosystems ($r = 0.469$, $p < .05$). Similarly, a significant moderate positive correlation was found between the effectiveness of community-based waste management practices and ecosystem sustainability ($r = 0.443$, $p < .05$). These results suggest that increased community involvement in environmental activities and effective local waste management contribute meaningfully to the preservation and resilience of natural ecosystems in the study area. The study aligns with existing literature emphasizing participatory environmental governance as a key strategy for sustainable ecosystem management. It concludes that empowering communities to take active roles in environmental service delivery and waste management enhances environmental stewardship and promotes long-term ecological sustainability. Based on the findings, the study recommends strengthening community engagement, capacity building, and policy support to institutionalize inclusive and sustainable environmental practices in Cross River State.
Keywords: community participation, environmental services, waste management, ecosystem sustainability, Cross River State, environmental governance

Introduction and Background
The sustainability of natural ecosystems has become a central concern in the face of increasing environmental degradation, biodiversity loss, and climate change. Globally, ecosystems such as forests, wetlands, and watersheds are under pressure from rapid urbanization, unsustainable agricultural practices, and poor waste management (United Nations Environment Programme [UNEP], 2021). In response to these challenges, there has been a growing recognition of the importance of local communities in environmental governance. Community environmental

services—ranging from forest surveillance and waste management to eco-restoration and conservation education—are increasingly being viewed as essential components of sustainable development and ecological resilience (Gupta, Goyal & Singh, 2023).

In Nigeria, and particularly in Cross River State, natural ecosystems such as the Cross River National Park and the Afi Mountain Wildlife Sanctuary are globally significant for their biodiversity and ecological functions (World Wide Fund for Nature [WWF], 2022). These ecosystems not only support a wide range of flora and fauna but also provide vital ecosystem services such as water purification, soil fertility, and carbon sequestration. However, these ecosystems are facing mounting threats from illegal logging, encroachment, pollution, and unsustainable land use. While government efforts to protect these ecosystems have been notable, the role of communities as active custodians of the environment has gained increasing relevance in both policy and practice.

Community environmental services in Cross River State are often characterized by indigenous knowledge, participatory conservation activities, and collaborative initiatives between residents and environmental organizations. These services can significantly influence the sustainability of ecosystems by reducing environmental pressure, promoting awareness, and fostering local stewardship (McLeod, Kitson, Dorner, Tassell-Matamua, Stahlmann-Brown, Milfont & Hine, 2024). Despite their importance, there remains limited empirical evidence on how such services impact the sustainability of natural ecosystems in the region. Understanding the dynamics of community participation, the effectiveness of locally-led environmental actions, and the challenges they face is crucial for informing sustainable ecosystem management policies.

This study, therefore, seeks to assess the role of community environmental services in promoting the sustainability of natural ecosystems in Cross River State. By exploring the relationship between community-based environmental efforts and ecological outcomes, the research aims to contribute to the discourse on participatory environmental governance and sustainable natural resource management in Nigeria.

Statement of the problem

Cross River State, Nigeria, is home to some of the most biologically diverse and ecologically significant natural ecosystems in West Africa, including rainforests, wetlands, and wildlife habitats. These ecosystems provide essential services such as water regulation, climate moderation, soil fertility, and biodiversity conservation. However, in recent years, the

sustainability of these ecosystems has been increasingly threatened by deforestation, illegal logging, poor waste disposal, agricultural encroachment, and the effects of climate change (WWF, 2022). While government-led conservation initiatives exist, they are often under-resourced and poorly enforced, resulting in limited effectiveness in halting environmental degradation.

In this context, community environmental services—such as local waste management, forest protection, biodiversity monitoring, and environmental education—have emerged as grassroots responses to ecosystem threats. These services have the potential to support conservation efforts by leveraging indigenous knowledge, local stewardship, and participatory approaches to resource management. However, despite their growing presence, there is insufficient empirical evidence on how these community-based efforts contribute to the sustainability of natural ecosystems in Cross River State. Questions remain about the extent of community participation, the effectiveness of their interventions, and the challenges that hinder their impact.

The absence of clear data and analysis on the role of community environmental services presents a critical gap in environmental management and policy planning. Without a deeper understanding of how local communities influence ecosystem sustainability, interventions may continue to overlook a vital stakeholder group. Therefore, this study seeks to assess the role of community environmental services in promoting the sustainability of natural ecosystems in Cross River State, with the aim of informing more inclusive and effective environmental strategies.

Purpose of the study

The purpose of this study is to assess the role of community environmental services in promoting the sustainability of natural ecosystems in Cross River State, Nigeria. Specifically, the study seeks to:

1. Determine how active community involvement in environmental protection initiatives influences the preservation and resilience of natural ecosystems across selected communities.
2. assess the relationship between local waste management strategies and their impact on ecological health, biodiversity, and environmental quality in natural ecosystems across selected communities.

Research hypotheses

The following hypotheses were formulated to guide the study:

1. There is no significant relationship between the level of community participation in environmental services and the sustainability of natural ecosystems in Cross River State.

2. The effectiveness of community-based waste management practices does not significantly relate with the sustainability of natural ecosystems in Cross River State.

Literature review

Level of Community Participation in Environmental Services and the Sustainability of Natural Ecosystems

Several empirical studies have highlighted the critical role of community participation in promoting environmental sustainability and the protection of natural ecosystems. Community participation has been linked to increased environmental awareness, improved local stewardship, and the implementation of culturally relevant conservation practices (Ghaderi, Shahabi, Fennell & Khoshkam, 2022). For instance, Danladi, Oruonye, Babanyaya, Tebrimam, Anger, (2025) conducted an assessment of Local Community Perception of Effects of Landuse Land Cover Change (LULCC) on Biodiversity in Taraba Central Senatorial District Taraba State Nigeria, and found that participatory forest management contributed significantly to reduced deforestation rates and improved biodiversity conservation outcomes. Their findings suggest that when communities are actively engaged in environmental services such as forest monitoring, reforestation, and environmental education, there is a stronger collective sense of ownership and responsibility toward ecosystem preservation.

Similarly, Nwankwo, (2025) wrote on community-based approaches to capacity building for climate resilience: Lessons. Empowering Resilience: Women, Environment, and Socio-Economic Challenges in Nigeria and concluded that inclusive participation led to better resource use practices and resilience building. However, their study also revealed that community efforts are often constrained by limited access to technical knowledge, financial support, and enabling policies. In a study conducted in Cross River State, Udumo, Ambe, Aneshie, Agbor, Obun, Ojong and Onnoghen (2024) examined Wildlife conservation society's activities and biodiversity conservation in protected areas in cross river state, Nigeria and reported that local involvement in wildlife protection, community-driven surveillance activities significantly reduced illegal poaching in protected areas. These findings underscore the importance of fostering strong partnerships between local communities and environmental agencies to achieve long-term ecological sustainability.

Community-Based Waste Management Practices and Sustainability of Natural Ecosystems

Effective waste management is a key component of environmental services that can significantly influence ecosystem health and sustainability. Community-based waste

management (CBWM) practices, particularly in low- and middle-income regions, have emerged as viable approaches to addressing solid waste challenges through grassroots involvement (Irowarisima, 2023). In a study conducted in Aba, Nigeria, Nzeadibe and Ochege (2018) found that community waste cooperatives improved environmental sanitation and reduced pollution in urban slums. The study emphasized that the sustainability of such initiatives was dependent on community ownership, regular training, and access to recycling markets.

Egbuna and Okoroafor,(2024) examined the impact of CBWM on river ecosystem health in Anambra State and discovered that communities engaged in coordinated waste sorting, composting, and plastic recovery contributed to improved water quality and reduced ecological stress. Likewise, Amin, Ambali and Temitope (2024) investigated waste management strategies in southwestern Nigeria and found that involving local residents in waste monitoring and disposal significantly decreased illegal dumping and enhanced community compliance with environmental regulations.

A study by Lüthi, McConville and Kvarnström (2009) revealed that community-based environmental sanitation projects led to improved waste collection systems in peri-urban areas, which in turn reduced open dumping near sensitive ecological zones. However, the study noted that inadequate infrastructure, poor policy enforcement, and lack of sustainable funding remain persistent barriers to the effectiveness of CBWM practices. These findings highlight the need for institutional support and policy frameworks that can strengthen community-based waste initiatives to ensure the long-term sustainability of natural ecosystems.

Methodology

Research Design

This study adopted a descriptive survey research design, which is suitable for collecting data on current practices, perceptions, and relationships among variables. The design enabled the researcher to examine how community environmental services, such as participation in environmental activities and waste management practices, contribute to the sustainability of natural ecosystems in Cross River State.

Study Area

The study was conducted in Cross River State, Nigeria, a region known for its rich biodiversity and extensive natural ecosystems, including tropical rainforests, rivers, and protected areas such as the Cross River National Park. Selected local government areas (LGAs) with active community environmental initiatives—such as Akamkpa, Boki, Obanliku, and Etung—were

targeted due to their ecological significance and community engagement in environmental services.

Population of the Study

The population comprised community members, environmental volunteers, local leaders, and representatives of community-based organizations (CBOs) involved in environmental services within the selected LGAs. This population was chosen because of their direct involvement in or knowledge of community-led environmental initiatives.

Sample and Sampling Technique

A multi-stage sampling technique was used. In the first stage, four LGAs were purposively selected based on their environmental relevance. In the second stage, three communities were randomly selected from each LGA. In the final stage, a total of 397 respondents were selected through stratified and simple random sampling to ensure representation of both genders, age groups, and categories of environmental service participants.

Instrument for Data Collection

The primary instrument for data collection was a structured questionnaire titled Community Environmental Services and Ecosystem Sustainability Questionnaire (CESESQ). The questionnaire consisted of closed-ended items using a 5-point Likert scale (ranging from Strongly Agree to Strongly Disagree) and was divided into three sections: Section A: Demographic data, Section B: Level of community participation in environmental services, Effectiveness of community-based waste management and indicators and Section C: Ecosystem sustainability

The instrument was validated by experts in environmental education and education research, and a pilot test was conducted to ensure clarity and reliability. The reliability of the instrument was determined using Cronbach's alpha, which yielded a coefficient of .81, indicating a high level of internal consistency.

Method of Data Collection

Data were collected through face-to-face administration of questionnaires with the help of trained research assistants familiar with the local dialects. Informed consent was obtained from all participants, and ethical considerations such as anonymity and voluntary participation were strictly observed.

Method of Data Analysis

Data collected were analyzed using descriptive and inferential statistics.
Descriptive statistics such as frequencies, means, and standard deviations were used to summarize responses. Inferential statistics, particularly Pearson Product Moment Correlation (PPMC), were used to test the hypotheses at a 0.05 level of significance using SPSS version 26.

Presentation of results

Ho_1

The result of the analysis for Hypothesis One, which states that there is no significant relationship between the level of community participation in environmental services and the sustainability of natural ecosystems in Cross River State, was tested using the Pearson Product Moment Correlation. The analysis involved a sample size of 397 respondents. The mean and standard deviation for community participation in environmental services were 7.74 and 2.37 respectively, while those for the sustainability of natural ecosystems were 15.67 and 7.13.

The computed correlation coefficient (r) was 0.469, with a corresponding p-value of 0.000. Since the p-value is less than the 0.05 level of significance, the result is considered statistically significant. This indicates a moderate positive relationship between community participation in environmental services and the sustainability of natural ecosystems.

Based on this result, the null hypothesis is rejected. It is therefore concluded that there is a significant relationship between the level of community participation in environmental services and the sustainability of natural ecosystems in Cross River State. This finding implies that increased community involvement in environmental activities contributes positively to the sustainability and preservation of natural ecosystems in the region.

Table 1: summary result of Pearson product moment correlation analysis of the relationship between level of community participation in environmental services and the sustainability of natural ecosystems. (N= 397).

Variables	$\bar{X}$	σ	Cal. r	p-value
Community participation in environmental services	7.74	2.37		
			0.469*	.000
Sustainability of natural ecosystems	15.67	7.13		

Significant at 0.05 level, df = 395

H_{O2}

The result of the analysis for Hypothesis Two, which states that the effectiveness of community-based waste management practices does not significantly relate to the sustainability of natural ecosystems in Cross River State, was examined using the Pearson Product Moment Correlation. The analysis was conducted with a sample size of 397 respondents.

The mean and standard deviation for the effectiveness of community-based waste management practices were 7.27 and 4.29 respectively, while the sustainability of natural ecosystems had a mean of 15.67 and a standard deviation of 7.13.

The calculated Pearson correlation coefficient (r) was 0.443, with an associated p-value of 0.000. Since the p-value is less than the 0.05 significance level, the result is statistically significant. This indicates a moderate positive relationship between the effectiveness of community-based waste management practices and the sustainability of natural ecosystems.

As a result, the null hypothesis is rejected. This leads to the conclusion that there is a significant relationship between the effectiveness of community-based waste management practices and the sustainability of natural ecosystems in Cross River State. The implication of this finding is that effective waste management practices led by communities play a crucial role in promoting and maintaining the sustainability of natural ecosystems within the state.

Table 2: Summary of Pearson product moment correlation analysis of the relationship between community-based waste management practices and the sustainability of natural ecosystems (N= 397).

Variables	$\bar{X}$	σ	Cal. r.	P-value
effectiveness of community-based waste management practices	7.27	4.29		
			0.443*	.000
Sustainability of natural ecosystems	15.67	7.13		

Significant at 0.05 level, df = 395

Discussion of findings

Ho_1

The result of the analysis for Hypothesis One reveals a statistically significant relationship between the level of community participation in environmental services and the sustainability of natural ecosystems in Cross River State. Using the Pearson Product Moment Correlation, the study found a moderate positive correlation coefficient ($r = 0.469$) with a p-value of 0.000, based on responses from 397 participants. Given that the p-value is less than the 0.05 level of significance, the null hypothesis was rejected. This implies that increased community involvement in environmental services is associated with improved sustainability of natural ecosystems in the region.

This finding aligns with a growing body of empirical literature that underscores the pivotal role of community participation in promoting environmental sustainability and ecosystem protection. For instance, Ghaderi, Shahabi, Fennell, and Khoshkam (2022) argued that community engagement enhances environmental awareness, supports culturally appropriate conservation practices, and fosters local stewardship. These dimensions are critical to maintaining ecological balance, particularly in regions experiencing environmental degradation and biodiversity loss.

Supporting this, Danladi, Oruonye, Babanyaya, Tebrimam, and Anger (2025) found that participatory forest management significantly contributed to biodiversity conservation and reduced deforestation in Taraba State, Nigeria. Their study highlighted how community-led actions such as forest monitoring, reforestation, and environmental education cultivate a collective sense of ownership and accountability toward environmental preservation—findings that are consistent with the current study.

Further evidence from Nwankwo (2025) emphasized the effectiveness of community-based approaches in building climate resilience and improving resource use practices. Although the study acknowledged constraints such as limited technical knowledge and financial resources, it affirmed the positive outcomes of inclusive participation, particularly in fostering long-term adaptive capacity and sustainability.

In the context of Cross River State, Udumo et al. (2024) examined the impact of local involvement in wildlife conservation and found that community-driven surveillance significantly reduced illegal poaching in protected areas. Their work reinforces the view that partnerships between communities and conservation agencies can lead to effective and sustainable management of natural ecosystems.

In sum, the current finding is not only statistically significant but also strongly supported by literature that advocates for the integration of community voices in environmental governance. The evidence suggests that when communities are actively involved in environmental services—whether through waste management, biodiversity conservation, or forest protection—there are measurable benefits to ecosystem health and sustainability. Thus, policies and programs that aim to strengthen community participation should be prioritized to enhance ecological outcomes in Cross River State and beyond.

H_{O2}

The findings from this study demonstrate a statistically significant relationship between the effectiveness of community-based waste management (CBWM) practices and the sustainability of natural ecosystems in Cross River State. This outcome provides strong evidence to reject the null hypothesis, thereby affirming that CBWM efforts play a meaningful role in ecosystem sustainability.

This finding aligns closely with existing literature, which underscores the positive impact of CBWM on environmental health and sustainability. For instance, Irowarisima (2023) emphasized that CBWM practices are particularly effective in low- and middle-income regions where formal waste management infrastructure is often lacking. These practices leverage local knowledge and community participation to address waste challenges in ways that are contextually relevant and sustainable.

Similarly, a study by Nzeadibe and Ochege (2018) in Aba, Nigeria, revealed that community waste cooperatives not only improved environmental sanitation but also played a significant role in pollution reduction within urban slums. The sustainability of these efforts, as noted by the authors, was largely dependent on the level of community ownership, access to training, and integration into recycling economies. These conditions align with the current study's implication that when communities actively participate in and effectively manage waste, natural ecosystems benefit from reduced stress and enhanced resilience.

Further supporting this perspective, Egbuna and Okoroafor (2024) found that in Anambra State, coordinated community actions such as waste sorting, composting, and plastic recovery contributed to improved river ecosystem health. Their findings demonstrate that environmentally conscious waste practices at the community level can lead to tangible ecological improvements. Likewise, Amin, Ambali, and Temitope (2024) reported that

involving local residents in waste monitoring and disposal in southwestern Nigeria not only curtailed illegal dumping but also strengthened compliance with environmental regulations.
In summary, the findings from this study are consistent with and supported by the broader body of literature on CBWM. They reinforce the understanding that community-driven approaches to waste management are not only feasible but also essential for promoting sustainable environmental outcomes, especially in regions where centralized waste systems are either inefficient or underdeveloped.

Conclusion

This study investigated the relationship between community participation in environmental services, the effectiveness of community-based waste management practices, and the sustainability of natural ecosystems in Cross River State, Nigeria. The findings revealed statistically significant and moderately positive relationships between both community participation and waste management effectiveness with ecosystem sustainability. These results suggest that the active involvement of local communities in environmental services and waste management practices plays a critical role in sustaining natural ecosystems.

The study aligns with existing literature, which emphasizes the importance of grassroots engagement in environmental governance. When communities are empowered and actively involved in managing their local environment, there tends to be a stronger sense of ownership, accountability, and stewardship that promotes sustainable environmental outcomes. These findings underscore the value of participatory approaches in achieving ecological resilience and preserving biodiversity in the region.

Recommendations

Based on the findings of this study, the following recommendations are proposed:
Strengthen Community Engagement in Environmental Governance: Government agencies, NGOs, and development partners should promote and institutionalize community participation in all phases of environmental planning, implementation, and monitoring. This includes engaging local leaders, youth groups, and women in sustainable ecosystem management initiatives.

Provide Capacity Building and Environmental Education: Training programs should be organized to equip community members with knowledge and skills in sustainable waste management, ecosystem conservation, and climate-smart practices. Environmental education should be integrated into local awareness campaigns to foster long-term behavioral change.
Support Community-Based Waste Management (CBWM) Systems: Local governments should invest in and support community-led waste collection, sorting, recycling, and composting

systems. Provision of basic tools, funding, and access to recycling markets will enhance the efficiency and sustainability of such initiatives.

Develop Policies that Foster Inclusive Environmental Practices: Policymakers should design enabling frameworks that recognize and institutionalize community roles in environmental governance. This includes offering incentives for participation and integrating traditional knowledge into formal conservation strategies.

Foster Partnerships Between Stakeholders: Collaborative efforts between government institutions, civil society organizations, academic institutions, and local communities are essential to ensure shared responsibility in environmental protection and to scale up successful community-driven practices.

By implementing these recommendations, Cross River State can enhance the sustainability of its natural ecosystems and serve as a model for participatory environmental governance in Nigeria and beyond.

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