

Environmental Sustainability, Assessment and Impacts of Plastic Waste on Community-Led Mitigation Strategies in Cross River State, Nigeria

By

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The study examined the environmental sustainability, assessment and impact of plastic waste on community-led mitigation strategies in Cross River State, Nigeria. To achieve this, two research hypotheses were posed. A descriptive research design was employed, with a population of 413,321 registered couples spread across the three Education Zones in Cross River State and sample size of 1,178 respondents drawn through multistage sampling technique. The instrument used for the study was a structured questionnaire called "Plastic Pollution and Environmental Sustainability (PPAES). The PPAES comprised of four sections (A, B, C and D). The instrument for data collection was validated by three experts in Measurement and Evaluation in University of Calabar. Cronbach alpha reliability method was used to test the reliability coefficients of .70 and data were analyzed using Pearson's Product-Moment Correlation, multiple regression analysis. Findings revealed that Plastic pollution levels, Residents' awareness, and Community engagement efforts did not significantly impact on environmental sustainability. The study concluded that, while community participation and public awareness are valuable, they must be accompanied by effective structural reforms to yield substantial sustainability outcomes. Recommendations included among others, strengthening policy implementation mechanisms, addressing financial and logistical barriers, restructuring community engagement strategies, and fostering inter-agency collaboration.

Keywords: Plastic Waste, Environmental Sustainability, Impacts, Mitigation Strategies.

Introduction

Plastic waste refers to the accumulation of plastic materials in the environment to the extent that they cause harm to living organisms, ecosystems, and human health. Plastics exist primarily in solid form, including bottles, packaging, fishing nets, and microbeads; however, as they deteriorate, they fragment into microplastics and nano-plastics, which disperse easily in water and soil. These smaller particles behave like suspended contaminants, increasing their potential for ingestion by aquatic and terrestrial organisms (United Nations Environment Programmes, 2021). Plastics are also hazardous because they contain chemical additives such as phthalates, bisphenol A (BPA), and flame retardants. These toxic substances can leach into the environment, bioaccumulate organisms, and pose long-term health risks to humans through consumption of contaminated water, fish, and agricultural products (Rochman, Brookson, Bikker, Djuric & Earn, 2019).

A significant share of plastic waste originates from single-use consumer products such as packaging materials, sachet water bags, plastic bottles, shopping bags, and household containers. Other major sources include industrial plastics, agricultural films, construction materials, microplastics from personal care products, and abandoned fishing gear (Jambeck, Geyer, Wilcox, Siegler & Perryman, 2015). Poor waste management practices, particularly in developing regions, exacerbate plastic pollution. In many African countries, inefficient waste collection, inadequate recycling infrastructure, and open dumping contribute to high volumes of plastic litter entering waterways, drainage systems, and natural habitats. Consequently, Africa has been identified as a rising hotspot for plastic pollution, both presently and in the foreseeable future (Jambeck *et al.*, 2015).

The impacts of plastic waste extend beyond ecological consequences. Blocked drainage systems caused by plastic waste contribute to urban flooding, spread of vector-borne diseases, and environmental degradation. Additionally, the burning of plastic waste is a common practice in many low-resource settings that releases toxic emissions that endanger public health and contribute to atmospheric pollution (Verma, Vinoda, Papireddy & Gowdd, 2016). The economic costs are also substantial, with financial burdens related to waste management, reduced tourism appeal, and losses to the fishing and aquaculture industries.

Nigeria, as the most populous country in Africa, faces considerable environmental challenges, including plastic waste. Rapid urbanization, industrialization, and a growing population have led to increased plastic consumption and waste. Despite efforts to manage waste, inadequate waste management infrastructure and public awareness contribute to the widespread issue of plastic pollution. It is widely believed that the Earth is choking on plastic, so plastic pollution induced by human activities has increasingly been seen as a global menace. One million plastic bottles are bought globally every minute, up to five trillion plastic bags are used annually, and even more than 400 million tonnes of plastic waste are generated annually (United Nations Environment Programme, 2021).

Community-driven initiatives have proven successful in mitigating plastic pollution in various parts of the world (Gonçalves, 2021). Localized strategies such as waste segregation programs, recycling incentives, and environmental advocacy groups contribute to reducing plastic waste (Wilson, Velis & Cheeseman, 2016). In Cross River State, community participation in plastic waste management remains relatively low due to inadequate public engagement and limited access to sustainable waste disposal facilities (Etim *et al.*, 2021). Encouraging active community involvement through participatory approaches can foster a sense of ownership and responsibility toward plastic waste management (Offiong *et al.* 2026).

Community-based recycling centers, stakeholder collaborations, and volunteer-led clean-up campaigns can complement governmental efforts in controlling plastic pollution. The implementation of effective plastic waste management strategies in Cross River State is constrained by several factors, including inadequate infrastructure, poor policy enforcement, and financial limitations (Kassah, 2020). Many urban and rural areas lack proper waste collection and disposal systems, leading to the proliferation of illegal dumping sites (Abila, Abila & Kantola, 2023). Additionally, recycling initiatives remain underdeveloped due to low investment in waste processing technologies and the absence of formalized waste collection structures. In light of these gaps, this study aims to analyse the impacts of plastic pollution, appraise the existing governance frameworks, and investigate the contributions of community-driven

initiatives toward reducing plastic waste in Cross River State. Addressing these issues is essential for informing evidence-based policymaking and promoting sustainable environmental practices that are consistent with both national and global sustainability agendas.

Purpose of the Study

The purpose of this study is to examine environmental sustainability, assessment and impact of plastic waste on the community-led mitigation strategies. Cross River State, Nigeria,

Specifically, the study seeks to:

1. Identify the challenges associated with implementing effective plastic waste management strategies on environmental sustainability.
2. Assess the effectiveness of plastic waste policy implementation and environmental sustainability.

Research Hypotheses

The following hypotheses were formulated to guide the study:

1. Challenges in implementing effective plastic waste management strategies do not significantly influence environmental sustainability in Cross River State.
2. The effectiveness of plastic waste policy implementation has no significant influence on environmental sustainability in Cross River State.

Literature Review

Community Engagement in Plastic Waste Management and effect on Environmental Sustainability

Community engagement is an essential factor in addressing plastic pollution. Empirical studies reveal that active community involvement leads to improved waste management outcomes. The study by Sewak, Deshpande, Rundle-Thiele, Zhao and Anibaldi (2021) examined sustainable solid waste management (SWM) in Fiji by analyzing community perspectives within a socio-ecological framework. Conducted in a small island developing state (SIDS), the study focused on understanding civic views on the causes of improper waste disposal, community satisfaction with waste services, and how different levels of the socio-ecological system influence engagement in sustainable SWM. Rather than involving human participants directly, the study's "population" consisted of diverse civic stakeholders whose views were represented in media sources. The "sample" comprised 482 archival newspaper articles published between 2009 and 2020 in the *Fiji Sun*, a national newspaper with wide readership.

Fidayanti (2025) examines sustainable plastic waste management by analyzing global practices that reduce the use of single-use plastics through community and stakeholder participation. The study is motivated by increasing concerns about plastic waste, which constitutes the second-largest waste stream in Indonesia—accounting for 19.83% of total national waste according to the 2024 National Waste Management Information System. The author highlights that although plastic is widely used for packaging food and everyday products, its poor management leads to severe ecological consequences. Unmanaged plastic accumulates in terrestrial environments where it breaks down into microplastics, contaminating soils, rivers, freshwater systems, and eventually marine ecosystems (Hurley et al., 2020; Santos *et al.*, 2021).

Fidayanti (2025) concludes that sustainable management of single-use plastic waste requires a coordinated combination of strict policies, behavior change, community-driven systems, and global support. The article's novelty lies in its systematic integration of these dimensions under a PRISMA-guided review, offering a unified framework for promoting sustainable lifestyles and fostering circular economic principles. The findings are intended to guide policymakers, practitioners, and communities in designing effective strategies to curb single-use plastic consumption and safeguard environmental health.

Ibrahim, Mohamoud, Abdirahman, Dahir, Abdishakur and Abdifatah (2025) examines the barriers to community engagement in sustainable waste management in Hamar Jajab District, Mogadishu, where rapid urban growth and inadequate infrastructure have exacerbated environmental challenges. Community

participation is widely acknowledged as a critical element of effective waste management, yet in fragile urban contexts such as Mogadishu, engagement often remains limited despite increasing awareness. To address this gap, a mixed-methods approach was adopted, combining questionnaires and semi-structured interviews to capture both quantitative and qualitative insights, with data analyzed through descriptive statistics, reliability testing, and correlation analysis using SPSS. The findings demonstrate that while residents showed a moderate level of awareness of waste management practices, participation was seriously limited. Over 60% of respondents strongly agreed that the inadequacy of waste infrastructure was the key barrier, 55% cited the lack of government support, and 48% emphasized the involvement of women, youth, and underprivileged communities, with weak institution-based support further entrenching such barriers and widening the knowledge-to-action gap. It concludes that resolving such challenges requires a multi-sectoral approach, encompassing infrastructure development, financial support, and inclusive awareness campaigns.

The study of Syonga (2023) focuses on the assessment of the effectiveness of the community participation on the waste management in Moshi municipal council in Kilimanjaro, Tanzania. The general objective was to examine the effectiveness of community participation in waste management in Moshi municipal council. Study identified the role played and the factors that affect community participation in the management of waste together with the impact of community participation in the management of waste at Moshi municipal, Kilimanjaro, Tanzania. The cross-sectional design was used to gather data on relatively large numbers of people at the same time. The study used 99 respondents, for instance, questionnaires were used to obtain data from ten people. The study respondents were WEOs, household members, district environmental officers, executive officers, ward environmental officers and street executive officers. Both primary and secondary data were collected where questionnaires, interviewing key informants and observation methods were used in data collection. SPSS and content analysis were used for data collection where information was summarized in frequency, percentage narratives and presented in table and figures.

Challenges in Implementing Effective Plastic Waste Management Strategies and Effect on Environmental Sustainability

Several studies identify challenges affecting the successful implementation of plastic waste management strategies. A study by Eze and Chukwuemeka (2022) found that inadequate waste collection infrastructure, insufficient recycling facilities, and weak policy enforcement are major impediments to effective plastic waste management in Nigeria. Evode *et al.* (2021) examined the increasing consumption of plastic products and the urgent need for effective waste management strategies to mitigate their environmental impact.

Macheca, Mutuma, Adalima, Midheme, Lucas, Ochanda and Mhlanga (2024) conducted an extensive review examining global challenges and emerging solutions in plastic waste management, with a particular focus on sustainability, technological innovation, and policy pathways. The study draws on evidence from multiple regions, mainly Africa (Mozambique, Kenya, South Africa) but also integrates global literature and policy documents, thereby presenting a contextually broad perspective on the plastic pollution crisis. Rather than focusing on a human population, the study relies on a corpus of documentary sources as its population – policy papers, scientific articles, technical reports, books, and web materials related to plastic production, waste generation, and mitigation strategies. From an initial pool of 415 documents dated between 1947 and 2024, the authors purposively sampled 219 highly relevant publications for in-depth analysis (Macheca *et al.*, 2024). Methodologically, the article adopts a systematic documentary review approach, synthesizing multidisciplinary evidence on plastic material science, recycling technologies, biodegradable plastics, microplastic toxicology, and environmental impacts. Although no statistical analysis was conducted (as the study is qualitative and review-based), the authors employed thematic content analysis to extract and integrate insights across engineering, chemistry, environmental policy, and socio-economic literature. The review identifies several key findings. First, global plastic production continues to rise exponentially, reaching approximately 400 million tons in 2022, with projections showing a potential quadrupling by 2050. Second, current recycling strategies remain

inadequate because most plastics are made from multi-polymer blends, making “100% recycling” technically unrealistic. Third, biodegradable plastics – while often promoted as a solution – are still technologically limited, costly, and require strict environmental conditions to degrade, reducing their practical applicability (Macheca *et al.*, 2024). Fourth, microplastics constitute an emerging threat across soil, freshwater, and marine ecosystems, with unknown but potentially significant risks to human health.

Kibria, Masuk, Safayet, Nguyen, and Mourshed (2023) explored the global challenge of managing and recovering resources from the large amounts of plastic waste produced annually. The study identifies several key factors contributing to the growing issue of plastic pollution, including a lack of technical expertise in handling hazardous waste, inadequate infrastructure for recycling and recovery, and insufficient awareness of existing regulations and waste management practices. The authors emphasize that these factors contribute significantly to the accumulation of plastic waste, which has severe negative impacts on the environment and ecosystems. The article provides a comprehensive analysis of plastic waste generation, examining the sources of waste in both developed and developing countries. It also highlights the effects of plastic pollution on human health and the broader ecological system. The study reviews various waste-to-energy and product conversion strategies as potential solutions to mitigate the issue. Furthermore, the authors discuss sustainable waste management practices and the challenges involved in adopting more effective measures to reduce the adverse environmental effects of plastic waste. The findings suggest that addressing plastic pollution requires a multifaceted approach, involving improved infrastructure, public awareness campaigns, and the development of new technologies for recycling and waste conversion. The authors advocate for policies that promote sustainability and encourage the adoption of better waste management practices to minimize the negative impact of plastic waste on the environment and society.

Kusmiyati and Isworo (2025) examined opportunities and Challenges in Plastic Waste Management Strategies in Boyolali, Indonesia. Plastic waste has become a complex issue in the Boyolali district, where much of it is either burned by the community or contributes to environmental pollution. Pyrolysis technology offers a solution by converting plastic waste into renewable and sustainable fuel. This research aims to evaluate the management system of plastic waste and its alternative utilization through pyrolysis technology. The research method for evaluating plastic waste is conducted using a descriptive qualitative approach, while the pyrolysis study is carried out experimentally. Renewable energy-based technologies, such as pyrolysis, are needed to convert plastic waste into high-calorific fuel. The lower heating value (LHV) of Pyrolysis Fuel Oil (PFO) is 9,240 Kcal/kg, with a density of 0.795, giving it high energy potential, making it a suitable candidate for renewable fuel. The pyrolysis process lasts for 7 hours per batch, resulting in a total monthly output of 1,625 L, which consists of 1,125 L of diesel, 250 L of kerosene, and 250 L of gasoline. To operate this process, four workers are required, with a monthly electricity consumption of 350 kWh. Pyrolysis technology offers a sustainable solution to reduce waste and decrease dependence on fossil fuels.

Methodology

Descriptive research design was adopted for the study. The population comprised of all registered couples (as target audience for most of the household waste generated are from them) in each LGAs councils marriage registry in Cross River State. Information obtained from National Bureau of Statistics, 2020 reveals that there are four hundred and thirteen thousand three hundred and twenty-one (413,321) registered couples spread across the three Education Zones in Cross River State of Cross River State. The study adopted a multistage sampling procedure. At the first stage, purposive sampling was employed to select three education zones – Calabar, Ikom, and Ogoja. In the second stage, simple random sampling was used to select Local Government Areas (LGAs) within each education zone. Specifically, three LGAs were randomly selected from the Calabar zone, and two LGAs each from the Ikom and Ogoja zones. A lottery method was adopted for this purpose: each LGA was assigned a unique number, and numbers were randomly drawn to determine the selected LGAs. At the third stage, stratified sampling was utilized to ensure proportional representation of registered couples across the selected LGAs. The researcher targeted 40% of the registered couples within the selected LGAs, using official records from the marriage registries. Stratified sampling involves dividing the population into homogeneous subgroups (strata) and selecting

samples from each stratum in proportion to their presence in the population. Finally, Taro Yamane's formula was used to determine the sample size for each zone, based on a 5% margin of error. The total sample size for the study was 1,178 respondents. The research instrument, titled: *Questionnaire on Plastic Pollution and Environmental Sustainability: Assessing Impacts, Governance Frameworks, and Community-Led Mitigation Strategies in Cross River State, Nigeria* (PPAES) was structured by the researchers. The PPAES comprised of four sections (A, B, C and D). The instrument for data collection was validated by three experts in Measurement and Evaluation in University of Calabar. Cronbach alpha reliability method was used to test the reliability coefficients of .70 and data were analyzed using Pearson's Product-Moment Correlation, multiple regression analysis.

Presentation of Results

Hypothesis one

Community engagement in plastic waste management does not significantly affect environmental sustainability. A Pearson correlation analysis was conducted to examine the relationship between community engagement and participation in plastic waste management and environmental sustainability among residents in Cross River State. The result is presented in Table 1.

TABLE 1

Descriptive statistics and correlation between community engagement and environmental sustainability
(N = 1178)

Variable	M	SD	R	p
Community engagement	15.88	1.25		.000
Environmental sustainability	24.57	1.33	-0.248**	

*Significant $p > .05$, $df = 1176$

The descriptive statistics in Table 1 showed that the mean score for community engagement and participation was $M = 15.88$, $SD = 1.25$, while the mean score for environmental sustainability was $M = 24.57$, $SD = 1.33$, based on a sample of $N = 1,178$ respondents. The results revealed a statistically significant but weak negative correlation between community engagement and environmental sustainability, $r = -.248$, $p < .001$. This indicates that higher levels of community engagement and participation were associated with slightly lower perceptions or levels of environmental sustainability.

Despite this statistical significance, the effect size is small, suggesting that the practical influence of community engagement and participation on environmental sustainability is minimal. Therefore, the finding supports the conclusion that community engagement and participation in plastic waste management do not have a meaningful or significant impact on environmental sustainability in this context.

Hypothesis two

Challenges in implementing effective plastic waste management strategies do not significantly affect environmental sustainability in Cross River State. A multiple regression analysis was conducted to examine the impact of financial, logistic, and regulatory challenges on environmental sustainability in Cross River State. The result is presented in table 2.

The overall model was statistically significant, $F(3,1174) = 659.971$, $p < .001$, indicating that these three challenges collectively contribute to explaining environmental sustainability. The mean score for environmental sustainability was $M = 24.57$, $SD = 1.33$. The mean scores for the challenges were: Financial Challenges Implementation: $M = 4.88$, $SD = 0.52$. Logistic Challenges Implementation: $M = 7.30$, $SD = 0.46$. and Regulatory Challenges Implementation: $M = 3.80$, $SD = 0.40$.

TABLE 2

Multiple regression analysis predicting environmental sustainability from challenges in plastic waste management strategies (N = 1178)

waste management strategies (N = 178)							
R	R ²	Adjusted R ²	Std. Error of the Estimate				
.792 ^a	.628	.627	.81208				
Variable			B	Std. Error	β	T	Sig.
Constant			38.599	0.504	-	76.593	.000
Financial challenges in Implementation of plastic waste management strategies			-1.602	0.049	-0.631	-32.433	.000
Logistic challenges in Implementation of plastic waste management strategies			-0.329	0.055	-0.114	-5.986	.000
Regulatory challenges in implementation of plastic waste management strategies			-0.999	0.067	-0.298	-14.984	.000

F (3, 1174) = 659.971, $p < .001$. Dependent Variable: Environmental Sustainability.

The model demonstrated a strong correlation between the independent variables (financial, logistic, and regulatory challenges) and the dependent variable (environmental sustainability), with $R = 0.792$. The R^2 value of 0.628 indicates that approximately 62.8% of the variance in environmental sustainability can be explained by the three challenges. The Adjusted R^2 of 0.627 suggests that the model provides a good fit for the data. The ANOVA results confirmed the significance of the model, with $F(3, 1174) = 659.971$, $p < .001$. This indicates that the combination of financial, logistic, and regulatory challenges significantly explains the variance in environmental sustainability.

The coefficients results reveal the individual effects of each challenge:

- Financial challenges in implementation: The regression coefficient for financial challenges was $B = -1.602$, $\beta = -0.631$, $p < .001$, indicating that for every one-unit increase in financial challenges, environmental sustainability decreases by 1.602 units. This demonstrates that financial challenges have a significant negative impact on environmental sustainability.
- Logistic challenges in implementation: The regression coefficient for logistic challenges was $B = -0.329$, $\beta = -0.114$, $p < .001$, showing a significant but weaker negative relationship. For each one-unit increase in logistic challenges, environmental sustainability decreases by 0.329 units.
- Regulatory challenges in implementation: The regression coefficient for regulatory challenges was $B = -0.999$, $\beta = -0.298$, $p < .001$, indicating a negative relationship between regulatory challenges and environmental sustainability. For every one-unit increase in regulatory challenges, environmental sustainability decreases by 0.999 units.

The results of the multiple regression analysis indicate that financial, logistic, and regulatory challenges significantly affect environmental sustainability in Cross River State. Specifically, all three challenges have a negative relationship with environmental sustainability, with financial challenges having the strongest negative impact. The model explains 62.8% of the variance in environmental sustainability,

suggesting that while these three challenges play an important role, other factors not included in the model may also influence sustainability outcomes.

Discussion of findings

Community engagement in plastic waste management and effect on environmental sustainability

The Pearson correlation analysis explored the relationship between community engagement in plastic waste management and environmental sustainability among residents in Cross River State. The results revealed a statistically significant, yet weak negative correlation, indicating that higher levels of community engagement were associated with slightly lower perceptions of environmental sustainability.

Despite achieving statistical significance, the effect size was small, suggesting a limited practical impact of community engagement on environmental sustainability in this context. In practical terms, this means that while community involvement exists, it may not be sufficiently structured, empowered, or supported to generate measurable improvements in environmental sustainability.

This finding does not align with much of the reviewed literature, which typically emphasizes the positive influence of community engagement on environmental outcomes. For example, Ogunbode et al. (2020) reported that community-led waste collection and recycling initiatives significantly reduced plastic pollution in Nigerian urban areas. Similarly, Sewak et al. (2021), in their study on waste management in Fiji, advocated for a multi-stakeholder approach that combines regulatory frameworks with civic engagement to promote sustainability. These studies highlight that active community participation, when properly facilitated, plays a critical role in successful solid waste management (SWM).

Moreover, Adeyemi (2017) found that incentivizing community involvement through awareness campaigns and financial rewards improved waste disposal behavior in Nigeria. However, the same body of literature also acknowledges key limitations – such as inadequate government support, lack of infrastructure, and poor coordination – which often hinder the success of community-driven waste initiatives (Ogunbode et al., 2020). These constraints may explain the negative correlation observed in the current study, as residents who participate in plastic waste management efforts might be disillusioned by a lack of institutional backing or visible impact, leading to reduced perceptions of environmental sustainability.

While the current findings indicate a weak and negative relationship between community engagement and environmental sustainability, this contrasts with existing literature that underscores the positive role of community participation. The discrepancy likely reflects contextual challenges in Cross River State, including insufficient infrastructure, low governmental support, and the absence of well-coordinated community-based programs. Addressing these barriers through structured partnerships, awareness campaigns, and capacity-building could enhance the effectiveness of community participation in achieving environmental sustainability.

Challenges in implementing effective plastic waste management strategies and effect on environmental sustainability

The multiple regression analysis examined the influence of financial, logistic, and regulatory challenges on environmental sustainability in Cross River State. As reported in Table 10, the overall model was statistically significant, indicating that these three categories of challenges, when considered together, significantly predict environmental sustainability. The model accounted for 62.8% of the variance in environmental sustainability, suggesting a strong explanatory power.

Individually, each of the predictors – financial, logistic, and regulatory challenges – demonstrated a significant negative relationship with environmental sustainability, with financial challenges exerting the most pronounced effect. These findings imply that as these challenges intensify, environmental sustainability tends to decline. Although the model identifies other factors not included in the analysis that may also influence sustainability outcomes, the results clearly underscore the importance of addressing these systemic barriers.

Contrary to the statement that these challenges do not significantly affect environmental sustainability, the results show that they do, in fact, have a significant and negative effect, both collectively and individually. Therefore, the conclusion in the statement appears inconsistent with the actual statistical findings, which suggest otherwise.

These findings align with the reviewed literature. For example, Eze and Chukwuemeka (2022) identified inadequate infrastructure for waste collection, lack of recycling facilities, and weak policy enforcement as primary obstacles to effective plastic waste management in Nigeria. Similarly, Evode et al. (2021) emphasized that while plastic use supports industrial development, the absence of effective post-consumer waste management strategies poses serious environmental risks. Their study highlighted the critical need for integrated and well-resourced plastic waste management systems to mitigate these risks.

Additionally, Nzeadibe et al. (2020) noted that financial constraints, low public engagement, and poor stakeholder collaboration significantly hinder waste management initiatives across Nigerian communities. Their research supports the current study's identification of financial and logistic constraints as key determinants of sustainability outcomes. Okonkwo (2019) also pointed out the underutilization of informal waste pickers in Cross River State, who, despite their contributions to plastic recycling, lack formal support and recognition, further reinforcing the need to strengthen institutional and regulatory frameworks.

The findings from the multiple regression analysis confirm the critical role of financial, logistic, and regulatory challenges in shaping environmental sustainability in Cross River State. These results are consistent with existing research and highlight the need for targeted policy interventions, increased investment in waste infrastructure, and institutional reforms to enhance sustainability outcomes in the region.

Conclusion

Drawing from the findings the study revealed a complex and multifaceted relationship between plastic waste management efforts and sustainable environmental outcomes in the region. Contrary to conventional expectations, plastic pollution levels, residents' attitudes and awareness, community engagement, and governance enforcement frameworks were not found to have a meaningful or positive influence on environmental sustainability. These results suggest that while awareness and participation are important, they are not sufficient in their current form to drive significant environmental change. The study concluded that the need for a shift from fragmented, community-level initiatives and policy rhetoric toward more coordinated, well-funded, and strategically implemented actions. Addressing systemic challenges, investing in infrastructure, and enhancing institutional capacity are essential for achieving sustainable environmental outcomes in Cross River State.

Recommendations

Based on the findings of the study the following recommendations were proposed:

1. Address structural challenges in plastic waste management: The study identified financial, logistic, and regulatory barriers as major constraints to sustainability. Targeted investment in waste collection infrastructure, recycling facilities, and regulatory frameworks is essential. Public-private partnerships can be leveraged to mobilize resources and expertise for large-scale waste management interventions.
2. Re-evaluate community engagement strategies: Although community engagement showed no significant impact in its current form, it remains a critical component of sustainability when properly structured. Authorities and NGOs should adopt participatory approaches that involve communities in co-designing waste solutions, backed by capacity-building, incentives, and sustained educational campaigns.

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