Journal of Sustainability Perspectives

journal homepage: https://ejournal2.undip.ac.id/index.php/jsp/

Breaking the Waste Cycle: How Central Mindanao University Cut Waste from 30 Tons to 2 Tons

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Article Info

Received:
14 May 2025
Accepted:
13 October 2025
Published:
30 December 2025

DOI:
10.14710/jsp.2025.29864

Abstract. This study examines the effective waste management program at Central Mindanao University (CMU), which dramatically reduced its monthly waste generation from 30 tons to just 2 tons. The implementation of key strategies such as the Ban on Single-Use Plastics and the Color-Coded Sacks Policies, integrated into a broader framework aligned with sustainable development goals (SDGs), was crucial for this reduction. As the university transitioned back to in-person classes post-COVID-19, the campus population increased significantly from approximately 11,000 to 17,000, intensifying waste management challenges. In response, CMU established the Office of Environmental and Safety Management (OESM), which effectively tackled these issues by instituting structured policies that not only drastically reduced waste but also enhanced sustainability practices across the campus. The program's success was further amplified by robust community engagement and collaboration with local government, illustrating that a culture of environmental consciousness can effectively meet immediate waste management needs even in the absence of advanced technology. The study highlights how strategic planning and cooperative efforts can lead to significant environmental improvements, positioning CMU's program as a benchmark for eco-conscious management. It aligns with global zero-waste best practices and demonstrates significant impacts on environmental, social, and governance (ESG) standards.

Keywords:

Environmental Policies, Institution-Government Partnerships, Sustainability, Plastic Ban, Waste Management, Waste Reduction.

1. Introduction

The escalating challenge of waste generation in urban and institutional settings has spurred global attention, prompting the development of innovative strategies for sustainable waste management. Numerous studies have explored institutional responses to waste,

particularly within university campuses, which generate substantial volumes of solid waste due to high population densities and diverse consumption patterns. For instance, Nguyen et al. (2020) assessed solid waste composition and management practices in Vietnamese universities, revealing systemic inefficiencies in segregation and recycling. Similarly, Bashir et al. (2019) analysed campus sustainability initiatives in South Asia, identifying the critical role of policy enforcement and community engagement. Despite these efforts, most interventions rely heavily on technological solutions and external systems, often overlooking the role of localized, culturally embedded strategies in non-metropolitan contexts.

In the Philippines, existing literature focuses predominantly on urban waste management systems and city-level sustainability programs (e.g., Reyes & Tabunda, 2018), with minimal attention given to rural-based institutions and their potential as sustainability models. This presents a notable gap in research: the lack of documented, effective low-technology, policy-driven approaches to waste management in academic institutions located in rural or peri-urban settings.

This study addresses that gap by examining the case of Central Mindanao University (CMU), a public institution situated in a rural area of Bukidnon province. In response to the post-pandemic return to campus—during which the university population rose from approximately 11,000 to 17,000—CMU implemented a comprehensive, locally contextualized waste management program that reduced monthly waste generation from 30 tons to just 2 tons.

The novelty of this article lies in its documentation and analysis of a replicable, low-cost institutional strategy that influences behavioural change, internal policy-making, and local government collaboration rather than advanced infrastructure. By evaluating CMU's policies—such as the Ban on Single-Use Plastics and the Color-Coded Sacks Policy—and the operational role of the newly established Office of Environmental and Safety Management (OESM), this study demonstrates how non-technological innovations can achieve significant outcomes aligned with global sustainability frameworks, particularly the United Nations Sustainable Development Goals (SDGs).

This research contributes to the growing body of knowledge on institutional sustainability by providing a model for other rural universities and organizations seeking to adopt scalable, effective waste reduction strategies when access to high-end technologies remains limited.

2. Methodology

This study employs a qualitative case study methodology to examine how Central Mindanao University (CMU), located in the municipality of Maramag, Bukidnon, Philippines, drastically reduced its waste generation from 30 tons to 2 tons per month. The methodology is framed by Institutional Theory and the Circular Economy paradigm to explore both the organizational transformation within CMU and its resource-loop innovations in response to post-pandemic challenges. Institutional Theory is used to understand how formal governance structures and cultural norms shaped compliance, enforcement, and sustainability behaviour [7,10], while the Circular Economy model contextualizes the university's low-technology yet high-impact strategies for minimizing waste, particularly in a rural setting with limited infrastructure [5,9].

The study is situated in a period of intensified institutional strain—during the transition to full face-to-face operations following the COVID-19 pandemic—when the university's

population increased from approximately 11,000 to 17,000. This posed a significant increase in waste generation, prompting the urgent need for strategic intervention. The process began with the proposal and creation of the Office of Environmental and Safety Management (OESM), which was approved by the university's Administrative Council.

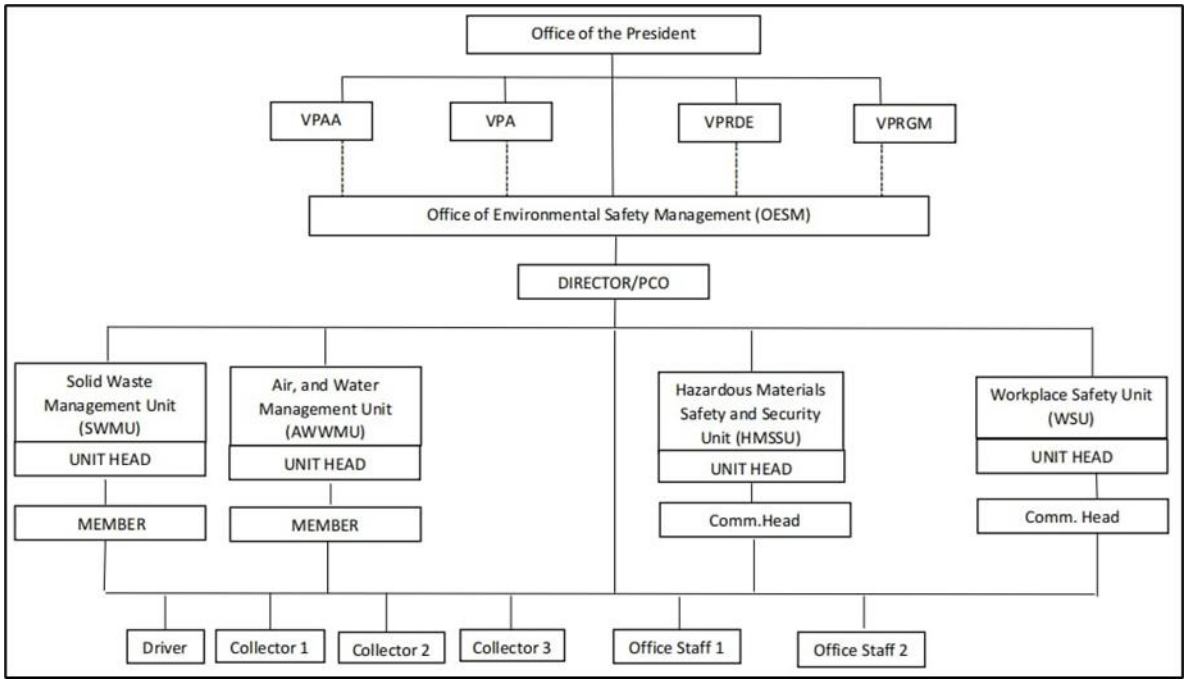

Figure 1. Board of regent's approved OESM Structure

The Office of Environmental Safety Management (OESM) at Central Mindanao University is strategically positioned under the Office of the President, signifying its critical role in institutional governance and environmental compliance. The OESM was granted structural authority and funding, establishing it as the central body accountable for environmental safety and waste management. This arrangement enhances its coordination with the Environmental Management Bureau (EMB) while promoting collaborative support from the Vice Presidents for Administration (VPA), Vice President for Academic Affairs (VPAA), Vice President for Research, Development and Extension (VPRDE), and Vice President for Resource Generation and Management (VPRGM). The OESM is tasked with leading the university's environmental safety and sustainability efforts, including regulatory compliance, risk mitigation, stakeholder education, and policy development. Its leadership requires expertise in environmental laws, sustainability trends, and effective team management.

The OESM operates through four specialized units: the Solid Waste Management Unit (SWMU), the Air and Water Wastes Management Unit (AWWMU), the Hazardous Materials Safety and Security Unit (HMSSU), and the Workplace Safety Unit (WSU). Each unit is mandated to ensure compliance with respective national regulations such as RA 9003, RA 9275, RA 8749, and RA 6969, and international standards like ISO 45001 and ISO 14001. These units manage solid waste systems, air and water pollution control, hazardous material handling, and workplace safety, integrating educational campaigns and student engagement. Additionally, the OESM oversees two support groups—the Hazardous Waste Management Associates (HWMA) and the University Safety Committee (WSC)—which ensure grassroots-level compliance and continuous improvement of safety protocols across university

operations.

The OESM initiated the development of policies that directly addressed the institution's primary sources of waste. A university-wide stakeholder survey was conducted to assess community support for proposed interventions. The survey, which included students, faculty, administrative staff, and vendors, indicated that 80% of stakeholders supported the implementation of stricter waste policies. This level of approval enabled the formal adoption of the proposed initiatives by the university's governing bodies, including the Commission on Higher Education (CHED) Board of Regents. The approved policies included the Ban on Single-Use Plastics, the Anti-Burning Memorandum in accordance with RA 9003 [8], the Color-Coded Waste Segregation System, the Compulsory Composting of Biodegradable Waste, and the Deputation of Waste Management Officers to ensure on-ground enforcement and compliance.

Once approved, the policies were disseminated through official memoranda to all affected constituents. The university initiated a series of training programs for deputized waste officers to properly handle policy enforcement and violations. Simultaneously, infrastructure support was enhanced, including the distribution of color-coded sacks, establishment of waste drop-off points, and allocation of composting areas within the campus. Community involvement was also prioritized through the conduction of environmental awareness campaigns, workshops, and on-site orientations aimed at embedding sustainable behaviour across the university population [6].

Critical to the success of these efforts was the establishment of an institutional partnership with the local government. A Memorandum of Agreement was signed between the CMU President and the Mayor of Maramag, formalizing a joint commitment to environmental governance. Through this agreement, CMU received technical guidance and policy reinforcement from the Municipal Environment and Natural Resources Office (MENRO) and the Environmental Management Bureau (EMB) Region 10. These partnerships also enabled coordination for policy compliance beyond campus boundaries, particularly with local vendors and waste disposal contractors.

Monitoring and evaluation were integral throughout the process. Waste generation was tracked monthly by the OESM in coordination with MENRO, and regular audits of waste segregation practices were conducted. Policy compliance and behavioural change were also assessed through field observation and documentation. A post-implementation evaluation conducted via the Citizen Satisfaction Index Study (CSIS) further validated the program's effectiveness, reflecting high levels of satisfaction from campus stakeholders and the surrounding community.

This methodological framework illustrates a step-by-step institutional transformation grounded in stakeholder engagement, policy innovation, and community-government partnerships. It demonstrates how coordinated, data-informed decision-making, embedded in both local context and global sustainability frameworks, can result in substantial environmental impact even in resource-constrained settings [11].

3. Results and Discussions

The solid waste management program implemented by Central Mindanao University (CMU) resulted in a dramatic reduction in waste output, from 30 tons to 2 tons per month, marking a significant milestone in institutional environmental governance. This section presents the program's results in three stages: Institutional Policy Context and Governance Framework, stakeholder collaboration, and monitoring outcomes, supported by quantitative

data and stakeholder feedback.

3.1. Institutional Policy Context and Governance Framework

The creation of the Office of Environmental and Safety Management (OESM) enabled the institutionalization of waste policies with clear authority and funding. Through inclusive policy development, CMU introduced campus-wide environmental reforms, institutionalizing two landmark environmental policies to address the increasing solid waste management challenges on campus: the Ban on Single-Use Plastics Policy and the Color-Coded Sacks for Waste Segregation Policy. Both measures, officially approved by the Board of Regents (BOR), align with Republic Act 9003 or the Ecological Solid Waste Management Act, and reflect CMU's shift toward a campus culture rooted in sustainability, compliance, and community accountability.

The Ban on Single-Use Plastics Policy prohibits the sale and use of a wide array of disposable plastic items within the university's academic, residential, and commercial spaces. Specifically, plastic cellophanes, sando bags, PET bottles, drinking straws, coffee stirrers, Styrofoam food packaging, plastic cups, cutlery, and even non-essential decorations like balloons and plastic buntings are explicitly banned. This directive extends to all campus events, seminars, and gatherings, thereby establishing an institution-wide standard. All vendors and business establishments—including sari-sari stores, food kiosks, and campus canteens—are mandated to adopt eco-friendly alternatives and are required to post official environmental signages that advocate behavioral change, such as "Save the Environment, Bring Your Own Bag/Baunan." designed by the institution's Public Relations and Information Office (PRIO). Enforcement is carried out by the Office of Environmental and Safety Management (OESM) and a designated Technical Working Group (TWG), who monitor compliance, issue Environmental Violation Receipts (EVRs), and escalate unresolved violations to the CMU Legal Office. Example is the three-strike penalty system for violators and license cancellation on the third offense for business establishments inside campus. Notably, penalties collected are strictly allocated for environmental programs and activities administered by the OESM.

Complementing this ban is the Color-Coded Sacks Policy, a practical waste segregation system designed to address the root issue of non-segregation at source. Under this scheme, households, campus offices, and commercial vendors must segregate their waste using color-specific sacks—blue for recyclables, green for biodegradables, black for residuals, and red for special wastes like sanitary products and used tissue. Each sack for a fee and is available through the Enterprise Management Office. Compliance is strictly monitored: sacks must be correctly filled based on waste type, and those not meeting the segregation standard are subject to collection refusal and monetary penalties for unsegregated sack. For institutional violators such as faculty, staff, and students, non-compliance can result in community service (e.g., litter pickup) or suspension, depending on offense frequency. Additionally, every household is mandated to construct a compost pit for biodegradables—failure to do so invokes the "No Compost Pit, No Collection" policy.

To encourage proper waste practices, CMU offers a system of positive reinforcement. Households that demonstrate a reduction in sack usage over successive months are rewarded with free sacks. For retail establishments, customer incentives such as "point systems" and "green lanes" serve as advocacy tools to promote the reuse of containers and bags. Final waste disposal is also clearly systematized: recyclables go to the Materials Recovery Facility (MRF), biodegradables are processed at the university's vermicomposting facility, and both

residual and special wastes are transported to designated sanitary landfills.

Together, these two policies signify CMU's integrated, rules-based, and participatory approach to campus waste governance. By embedding compliance requirements, economic incentives, and community engagement within its environmental strategies, CMU not only responds to the ecological demands of a growing academic population These policies were approved by the Administrative Council and Commission on Higher Education (CHED) Board of Regents following a stakeholder survey where 80% expressed support. This participatory process was a key factor in gaining early buy-in, allowing smooth implementation across campus. The deputation of waste management officers and training activities ensured these policies were enforced efficiently.

Table 1. Residual Wastes in Metric Tons Delivered to Local Government Landfill from Year 2022 to 2025

GARBAGE IN METRIC TONS				
YEAR	**2022**	**2023**	**2024**	**2025**
January	13.5	19.9	11.28	0.2144
February	6.7	19.78	10.54	0.2884
March	17.98	28.27	5.5	0.228
April	14.18	24.88	2.79	0.301
May	20.95	21.11	2.75	0.2126
June	15.75	28.49	1.27	-----
July	27.35	24.81	1.34	-----
August	33.55	30.2	0.49	-----
September	36.37	28.25	0.39	-----
October	25.17	20.36	1.00	-----
November	24.49	16.81	0.56	-----
December	21.7	16.96	0.72	-----

The table illustrates a dramatic decline in garbage generation at Central Mindanao University from 2022 to 2025. From high monthly volumes ranging between 6.7 to 36.37 metric tons in 2022 and 2023, the figures show a consistent and steep reduction beginning in 2024, with values dropping below 3 tons per month. By 2025, data available for January to May indicates waste volumes reduced to less than 0.31 metric tons monthly. This trend reflects the successful implementation of robust environmental policies, including segregation, composting, and landfill diversion strategies, positioning the university as a model for sustainable waste management.

The line and bar graphs (Figure 2) illustrate the monthly volume of garbage in metric tons at Central Mindanao University from 2022 to 2025, showing a clear and consistent downward trend over the years. In the line graph, the curves for 2022 and 2023 fluctuate significantly between 15 and 35 metric tons, indicating high and variable waste generation. The line for 2024 shows a sharp drop, stabilizing below 5 tons by mid-year, while the 2025 line is nearly flat and close to zero, reflecting an impressive reduction in waste starting January.

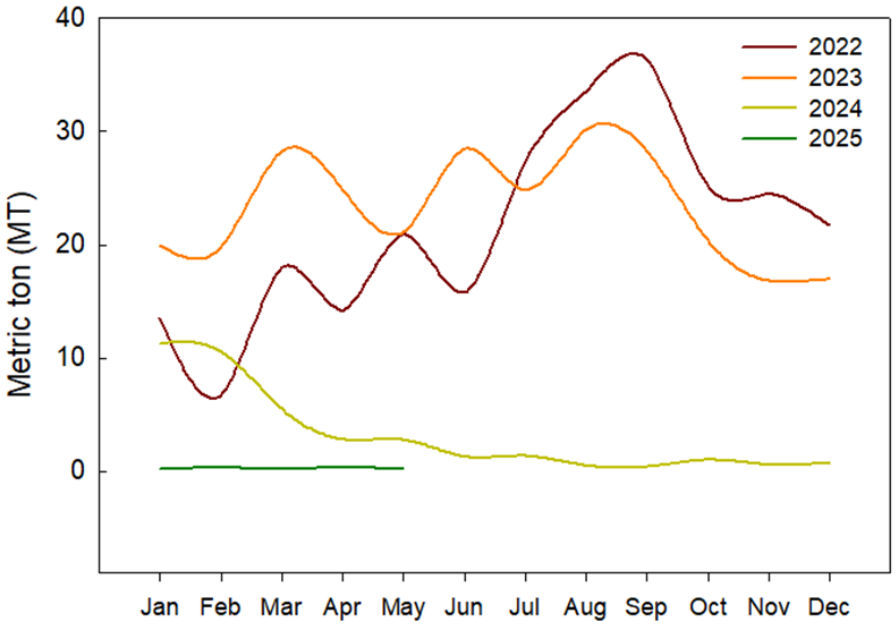

Figure 2. Line graph showing waste generation trend before and after program implementation

Similarly, the bar graph complements this trend by visually emphasizing the comparative monthly volumes across the four years. Bars representing 2022 and 2023 are consistently taller, showing high waste levels, while 2024 bars become significantly shorter, and 2025 bars are barely visible, particularly from January to May. Together, the graphs vividly demonstrate the effectiveness of CMU's environmental interventions, highlighting a transition from heavy landfill dependency to near-zero waste generation within a span of just three years.

3.2. Stakeholder Collaboration and LGU Partnership

Collaboration was instrumental to the success of Central Mindanao University's (CMU) solid waste management initiatives. Internally, the Office of Environmental and Safety Management (OESM) coordinated closely with the university's administrative leadership including the Vice Presidents for Administration, Academics, and Resource Management to mainstream environmental policies into the university's operational and academic systems. This ensured that sustainability principles were not treated as standalone initiatives but were embedded within institutional processes and decision-making structures.

Externally, CMU formalized its partnership with the Local Government Unit (LGU) of Maramag through a Memorandum of Agreement (MOA) signed in April 2024. This agreement established a collaborative governance framework anchored in mutual accountability, jurisdictional clarity, and shared commitment to environmental stewardship. It enabled the university to harmonize its campus-based enforcement mechanisms with municipal waste regulations, bridging institutional mandates and local laws.

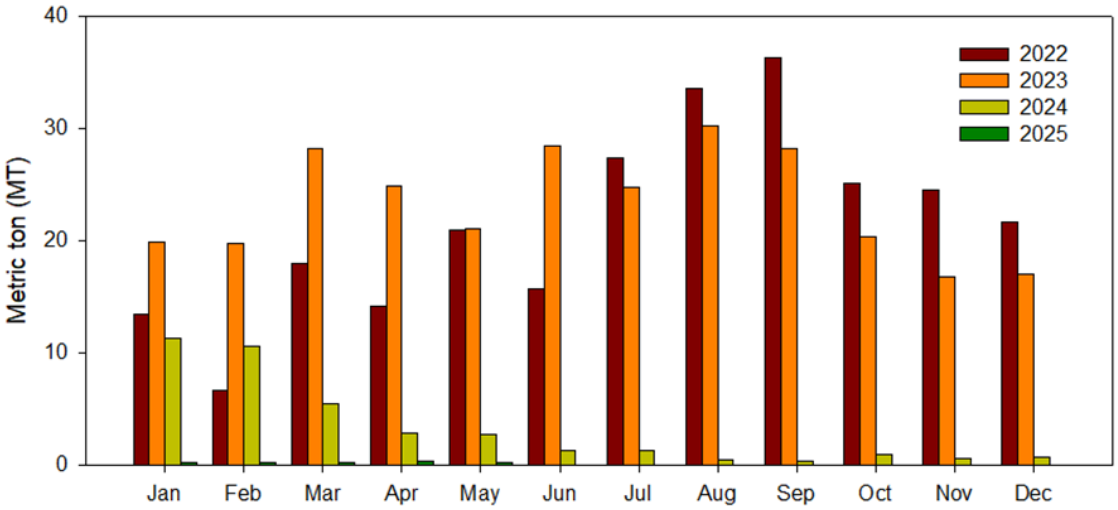

Figure 3. Bar graph showing waste generation trend before and after program implementation

Under the MOA, specific roles and responsibilities were delineated: the LGU committed to the monthly transport of properly segregated waste from CMU's Materials Recovery Facility to the municipal sanitary landfill in Panadtalan, while CMU provided the necessary manpower and segregation compliance. The agreement also granted CMU, subject to approval by its Board of Regents, the authority to deputize personnel to issue citation tickets in accordance with local ordinances, an unprecedented move that empowered the university to act as an extension of municipal enforcement. Penalties for violations were to be implemented in line with both LGU ordinances and CMU policies.

Moreover, the MOA acknowledged CMU's institutional autonomy in enforcing its environmental regulations such as the Ban on Single-Use Plastics and the Color-Coded Sack Segregation Policy while also obligating the LGU to provide technical assistance through the Municipal Environment and Natural Resources Office (MENRO) and to support policy implementation via monitoring, community campaigns, and capacity-building activities. Technical guidance from the Environmental Management Bureau (EMB) Region 10 further reinforced compliance and ensured alignment with national standards.

Ultimately, this partnership exemplifies a decentralized and intergovernmental model of environmental governance on one that recognizes the university as both a policy-maker and enforcement agent within its domain, while maintaining synergy with local government frameworks. It demonstrates how legal instruments, shared logistics, and continuous communication can institutionalize sustainability practices, not just within CMU, but in the broader community it serves.

Figure 4 illustrates how stakeholder and government alignment contributed to increased community engagement and efficient waste processing, with strategic roles distributed across policy creation, enforcement, and evaluation.

The figure illustrates a collaborative governance framework in which Central Mindanao University (CMU), the Local Government Unit (LGU) of Maramag, and the Environmental Management Bureau (EMB) Region 10 work together to strengthen community engagement and improve waste processing. Each stakeholder plays a distinct but interconnected role across the core functions of policy creation, enforcement, and evaluation. CMU, through its Office of Environmental and Sustainability Management (OESM) and administrative units,

leads the development of institutional policies on solid waste management. These policies such as the ban on single-use plastics and the color-coded segregation system are designed to integrate sustainability into the university's daily operations.

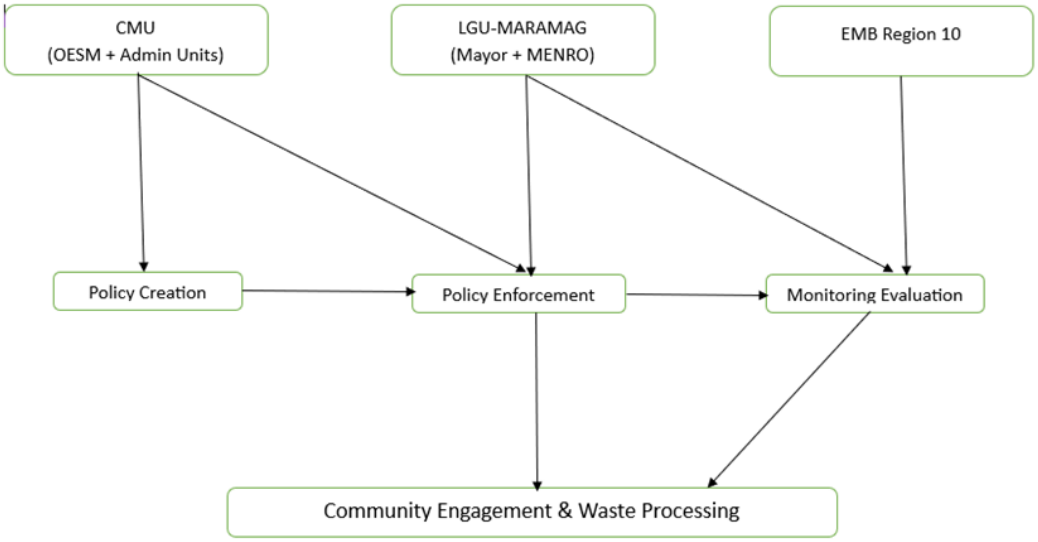

Figure 4. Collaborative framework among CMU units, LGU-Maramag, MENRO, and EMB region 10 in policy enforcement and monitoring

Once policies are in place, LGU-Maramag, particularly the Office of the Mayor and the Municipal Environment and Natural Resources Office (MENRO), plays a key role in enforcement. The LGU collaborates with CMU to ensure that campus policies align with municipal waste regulations, including the transport of segregated waste to the designated facility. Importantly, the LGU also grants CMU the authority to deputize personnel to enforce local ordinances on campus, reinforcing shared enforcement responsibilities.

Meanwhile, EMB Region 10 oversees the monitoring and evaluation component. As a national regulatory agency, it provides technical support and ensures that local initiatives meet broader environmental standards. This function is essential in validating the effectiveness of enforcement activities and policy outcomes. The feedback from monitoring efforts informs both CMU and the LGU, allowing for continuous improvement of strategies and operations.

The convergence of these roles leads to increased community engagement and more efficient waste processing. CMU mobilizes students and staff to practice proper waste segregation, the LGU ensures compliance and logistics, and the EMB validates performance and impact. Altogether, the figure demonstrates how strategic alignment across institutions adopts a decentralized, participatory approach to sustainability grounded in clear policies, shared enforcement, and collaborative evaluation.

3.3. Monitoring, Satisfaction, and Feedback

Post-implementation monitoring was carried out through monthly waste audits and the Citizen Satisfaction Index Study (CSIS). Table 2 shows Awareness and satisfaction data of strong service visibility but moderate satisfaction due to implementation challenges.

Table 2. Stakeholder Satisfaction with OSEM Services (CSIS 2024, N = 104)

Service	Awareness (%)	Satisfaction (%)	Areas for Improvement
Color-coded sack program	99.0	63.9	Sack quality, affordability
Garbage collection	99.0	55.5	Schedule reliability, coverage
Compliance monitoring	96.2	65.3	Enforcement consistency, follow-through

The Citizen Satisfaction Index Study (CSIS) at Central Mindanao University reveals a notable disconnect between high awareness and actual satisfaction with environmental services. Although awareness levels for initiatives like color-coded sack issuance, garbage collection, and compliance monitoring reach nearly 99%, satisfaction lags behind—ranging from 55% to 65%. Availment also remains moderate, with many stakeholders not fully engaging with the services despite knowing about them. The need for further action, as reflected in the graph, is particularly evident in garbage collection and compliance monitoring, indicating that visibility alone does not equate to effectiveness. These findings echo global studies showing that awareness must be accompanied by enabling conditions and trust in institutional systems for sustainable behavior to take root [12,13].

The data highlight that behavioral change is not immediate and often encounters resistance due to convenience, scepticism, and entrenched habits. The dramatic drop in waste generation—reaching near-zero levels by 2025—is a strong testament to the effectiveness of CMU's compulsory waste segregation and disposal system. This policy-driven approach, enforced through the university's environmental framework, has overridden many behavioral barriers, proving that structural mandates, when supported by adequate infrastructure and monitoring, can shape collective behavior over time (UNEP, 2021; DENR-EMB, 2023). To build on this momentum, CMU must strengthen enforcement, address accessibility issues such as sack availability and affordability, and intensify engagement strategies to convert awareness into sustained, voluntary compliance.

3.4. Implication and Theoretical Interpretation

The case of Central Mindanao University (CMU) demonstrates how academic institutions—particularly in rural and resource-constrained settings—can take a transformative role in advancing sustainability, provided that formal governance mechanisms are empowered and integrated with broader cultural shifts. CMU's institutional journey illustrates that sustainability is not solely a matter of technological innovation or infrastructure investment; rather, it is deeply rooted in organizational behavior, policy coherence, and cultural alignment. This underscores the practical application of Institutional Theory, which posits that organizations tend to adopt behaviors that are legitimized by formal rules, normative expectations, and established structures.

A core implication of CMU's experience is that sustainable transformation is most effective when environmental policies are not treated as peripheral or symbolic initiatives but are institutionalized into the core of governance and operations. The establishment of the Office of Environmental and Safety Management (OESM)—reporting directly to the university president—exemplifies how environmental priorities can be elevated to the highest levels of decision-making. This direct line of authority lent legitimacy and institutional weight to sustainability goals, fostering an environment where compliance became not only expected but embedded in the institutional psyche.

Furthermore, the inclusive and participatory process used to formulate environmental policies—such as stakeholder consultations and surveys—ensured that new norms were not imposed top-down but rather co-created. This participatory governance helped build consensus and social buy-in, transforming policy enforcement into a collective commitment rather than a purely administrative function. The deputation of waste enforcement officers, who received formal training and operational support, played a dual role: enforcing rules and modelling normative behaviors. Their presence reinforced the university's commitment to environmental accountability and encouraged a sense of shared responsibility among faculty, staff, and students.

The integration of policy design, institutional structure, and behavioral reinforcement created a synergistic framework that transcended isolated interventions. CMU's success reveals that when organizational rules (policies), social expectations (norms), and enabling mechanisms (structures) are aligned, they become mutually reinforcing. This institutional coherence allows environmental practices to transition from reactive measures to enduring habits and organizational identity.

However, the case also recognizes persistent barriers to transformation, including behavioral inertia, logistical constraints, and initial resistance to enforcement. Institutional Theory helps interpret these challenges as part of the natural evolution of compliance behavior, where new practices must be reinforced through repeated exposure, feedback loops, and consistent application. CMU's approach—anchored in norm internalization and legitimacy-building—illustrates that over time, even initially resisted behaviors can become normalized, especially when they are visibly supported by leadership and embedded into daily operations.

By operationalizing Sustainable Development Goals (SDGs) 11 (Sustainable Cities and Communities), 12 (Responsible Consumption and Production), and 13 (Climate Action) within a university context, CMU provides a concrete model for how academic institutions can localize global frameworks. The alignment of campus practices with SDG targets enhances not only institutional resilience but also contributes to broader community and environmental outcomes.

In sum, CMU's case validates the theoretical claim that organizational change is most sustainable when policy compliance is reinforced by both formal authority and shared cultural meaning. The university's transformation offers valuable insights into how institutions can institutionalize sustainability not just through policy, but through the deliberate cultivation of environmental values, socialization, and governance innovation. It is a compelling example of how structural and cultural dimensions of institutions can converge to produce lasting, meaningful environmental impact.

4. Conclusions

The case of Central Mindanao University (CMU) offers a compelling demonstration of how a rural academic institution can drive substantial environmental transformation through a cost-effective, policy-oriented approach. The dramatic reduction in monthly waste—from 30 tons to just 0.21 tons—stands as clear evidence of the effectiveness of institutional commitment, multi-level stakeholder engagement, and strategic governance frameworks.

Central to this success was the establishment of the Office of Environmental and Safety Management (OESM), which played a pivotal role in embedding sustainability within the university's organizational fabric. Through the implementation of cornerstone policies—such

as the Ban on Single-Use Plastics and the Color-Coded Sacks Policy—CMU institutionalized environmental compliance, monitoring, and behavior change mechanisms. Importantly, these interventions were aligned with the United Nations Sustainable Development Goals (SDGs), particularly Goals 11, 12, and 13, positioning CMU as a model for localized SDG implementation in low-resource settings.

This study reinforces the principle that meaningful environmental change in academic institutions is attainable when behavioral, structural, and policy dimensions are deliberately integrated. Despite ongoing challenges—such as behavioral resistance and inconsistent enforcement—the CMU experience illustrates that robust governance, inclusive policy-making, and inter-agency collaboration can foster long-term, systemic change.

Notably, the findings affirm the applicability of Institutional Theory, which emphasizes that compliance and sustainable practices are most effectively adopted when legitimacy, authority, and social norms are aligned. CMU's transformation highlights how sustainability can evolve from an aspirational goal to an embedded institutional identity.

As global calls for decentralized and context-specific sustainability solutions grow stronger, CMU's experience provides actionable insights for other higher education institutions. It demonstrates that even in the absence of advanced technology, environmental leadership is possible through well-designed institutional mechanisms, community involvement, and adaptive governance. Moving forward, universities—particularly in developing or rural contexts—can look to CMU as a blueprint for operationalizing sustainability in a way that is inclusive, enforceable, and enduring.

Acknowledgment

The authors gratefully acknowledge the support of the Central Mindanao University Research and Development Office under grant number CMU-ERGO-20253-1. We also thank the OESM staff and the LGU-Maramag MENRO for their continuous efforts in data collection, field assistance, and operational support which were critical to the successful implementation and evaluation of the waste management program.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

Authors Contribution

All authors contributed substantially to the work. **C.O.B**. conceived the research idea, designed the methodology, and provided supervision as the corresponding author and Director of Office of Environmental and Safety Management. **R.G.E**. functions as the approving authority for the allocation of funds and resources. **B.M.B., A.K.M., R.A.A., D.P.L**., and **R.C.C.** carried out the data collection, policy implementation, and operational aspects of the waste management program. **J.A.A.O**. and **J.P.S**. conducted the data analysis, interpretation of the results, and contributed to the manuscript writing and critical revision. All authors reviewed and approved the final version of the manuscript.

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