

Catalyzing Local Governance Operational Efficiency: Waste Management Practices in One of the Selected Barangays in Legazpi City

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ABSTRACT

This study investigates how waste management practices affect the operational efficiency of local governments, focusing on one of the selected barangays in Legazpi City. Key practices such as waste segregation, recycling, collection methods, and community involvement were evaluated to understand their influence on local governance efficiency. A quantitative research design was employed to gather data from barangay officials and residents. The results indicate that waste management practices have a significant impact on local government efficiency, with the implementation of policies identified as the strongest predictor. Findings reveal that effective waste segregation, recycling programs, and timely waste collection contribute to improved operational efficiency. Moreover, active community participation in waste management is essential for enhancing the success of local policies. The study emphasizes the need for incorporating technology and reinforcing policy enforcement to optimize waste management systems. The study concludes that a well-organized and inclusive approach to waste management can greatly improve local government performance and sustainability. Recommendations include bolstering policy enforcement, promoting greater community involvement, and harnessing technological innovations to enhance operational efficiency in waste management.

Keywords: *Waste Management Practices, Operational Efficiency, Recycling Initiatives, Technological Integration*

INTRODUCTION

Effective waste management isn't just about keeping cities clean—it's about enhancing the efficiency and sustainability of local governance. As urbanization accelerates and environmental challenges grow, the need for efficient waste management practices has never been more critical. Research has consistently shown that implementing robust waste segregation, recycling initiatives, and fostering community participation can significantly enhance municipal service delivery and sustainability (Wilson et al., 2023). Studies have highlighted that aligning policy enforcement with active public involvement is essential for optimizing waste management systems, leading to better resource utilization and improved environmental outcomes (Ghisellini et al., 2023). Moreover, proper waste management reduces operational costs, streamlines administrative processes, and helps local governments respond more effectively to citizen needs (Guerrero et al., 2013).

Local government operational efficiency plays a crucial role in delivering high-quality services, ensuring effective resource use, and building public trust. Streamlined operations enable municipalities to address public needs swiftly, enforce policies efficiently, and maintain fiscal responsibility while enhancing transparency and accountability (Ghisellini et al., 2023). As Smith and Brown (2023) noted, administrative processes that are efficient and strategic can significantly improve service delivery and contribute to the achievement of sustainability goals. Furthermore, improving

operational efficiency has been shown to foster higher citizen satisfaction and strengthen grassroots governance (Mian et al., 2017).

Despite the growing emphasis on waste management and operational efficiency, substantial gaps in understanding and execution remain. While many studies have underscored the environmental and economic benefits of waste management, they often overlook systemic barriers faced by local governments, such as limited funding, insufficient technical expertise, and poor public participation (Ghisellini et al., 2023). Moreover, existing policies often lack consistent enforcement, leading to inefficiencies and suboptimal waste management outcomes (Li et al., 2023). A crucial oversight in many studies is the potential of emerging technologies, like data analytics and AI, which could significantly streamline operations, improve resource utilization, and enhance decision-making processes (Wilson et al., 2023).

The legal dimension of waste management, encompassing the creation and enforcement of policies, also faces challenges. Although international frameworks like the Basel Convention guide the management of hazardous waste, local legal systems continue to struggle with enforcement (European Commission, 2023). In the Philippines, the Republic Act 9003 aimed to decentralize waste management, assigning responsibility to local government units (LGUs). However, inconsistent policy enforcement and a lack of penalties for non-compliance continue to undermine the efficiency of these programs (European Commission, 2023).

This study aimed to address these issues by evaluating the waste management practices in Barangay Bitano, Legazpi City. It assessed the effectiveness of waste segregation, recycling, and community engagement initiatives, while also analyzing the operational efficiency of local government services in the area. Additionally, it sought to identify gaps in policy enforcement and propose recommendations to strengthen waste management systems. By focusing on a localized context, this research provides actionable insights that could serve as a model for other municipalities facing similar challenges, fostering scalable and adaptive solutions to improve both waste management and local governance (Zhang et al., 2022).

LITERATURE REVIEW

Waste segregation has been widely acknowledged as a critical element for improving local government operations. According to a study by Ali et al. (2023), proper waste segregation at the source significantly reduces sorting costs and boosts recycling rates, allowing for more efficient waste management processes. It also reduces the strain on waste management systems, facilitating smoother collection and disposal operations. Effective collection and disposal methods are equally important. A study by Zhang et al. (2022) emphasized that optimized waste collection schedules and well-planned routes not only reduce operational costs but also prevent waste pile-up, which can lead to public dissatisfaction and environmental pollution. Moreover, proper disposal methods, including sanitary landfills and incineration facilities, help ensure that waste is managed in an environmentally sustainable way.

Recycling and reuse initiatives are another critical aspect that enhances local government operational efficiency. According to Zhang & Liu (2023), robust recycling programs not only reduce landfill use but also help generate income from recyclable materials, thus alleviating financial pressures on local governments. These initiatives, however, require strong community participation and clear policies to ensure their success. Policies that promote recycling have been shown to improve the overall efficiency of waste management systems (Smith et al., 2021). Policy implementation and enforcement are integral to achieving effective waste management. As observed by Li & Wang (2023), having clear regulations and strict enforcement mechanisms helps ensure that residents and businesses comply with

waste management guidelines, leading to fewer violations and a cleaner environment. Effective enforcement mechanisms, such as penalties for non-compliance, were identified as key drivers in improving both environmental and operational outcomes.

Community engagement is another factor that influences the efficiency of waste management. Mian et al. (2017) pointed out that when communities are actively involved in waste management initiatives, they are more likely to adopt proper waste segregation and disposal practices, leading to reduced strain on local authorities. Public awareness campaigns, when conducted regularly, can significantly increase participation and compliance with waste management regulations. In terms of local government operational efficiency, resource utilization plays a critical role. Efficient use of financial, human, and physical resources enables municipalities to provide better public services. As noted by Wang & Chen (2023), optimizing resource allocation—such as waste collection routes and scheduling—can reduce operational costs and free up resources for other community services.

Service delivery is a key performance indicator of local government efficiency. The timely and reliable delivery of waste management services is essential for ensuring public satisfaction and a clean urban environment. According to Smith & Brown (2023), effective service delivery results in lower public health risks, improved sanitation, and greater overall citizen satisfaction. Moreover, streamlined administrative processes are crucial for improving local government efficiency. Gao & Lee (2023) noted that the use of modern technologies, such as data analytics, for monitoring waste collection schedules and analyzing performance metrics can greatly enhance the efficiency of local government operations. By reducing administrative delays and improving decision-making, municipalities can improve service delivery and operational outcomes.

Lastly, environmental outcomes such as reduced greenhouse gas emissions, minimized landfill use, and improved urban sanitation are direct indicators of the success of waste management practices. A study by Li, Zhang, & Wang (2023) showed that successful waste management systems contribute to cleaner cities, lower pollution levels, and greater environmental sustainability. Achieving positive environmental outcomes is a clear reflection of local governments' operational efficiency and commitment to sustainable urban development. In conclusion, waste management practices, including waste segregation, recycling, and optimized collection methods, directly influence the operational efficiency of local governments by improving resource utilization, enhancing service delivery, and producing positive environmental outcomes. The current study builds on these insights by focusing on Barangay Bitano in Legazpi City, offering localized perspectives on the impact of waste management practices on operational efficiency at the barangay level.

MATERIALS AND METHODS

This study employed a descriptive-correlational research approach to investigate the relationship between waste management practices and the operational efficiency of local governments. The descriptive element focused on identifying and detailing the existing waste management practices in Barangay Bitano, while the correlational aspect aimed to assess the influence of these practices on the efficiency of local government operations. By using this design, the study aimed to explore existing patterns and relationships without altering the natural environment, providing a clear picture of how current waste management strategies contribute to operational performance.

The research was conducted in Barangay Bitano, located in Legazpi City, Albay, an urban area featuring a mix of residential, commercial, and public spaces. This area was selected because of its complex waste generation patterns, which reflect common urban challenges. Barangay Bitano was an ideal choice for this study due to its active participation in waste management programs and its importance as a local government unit responsible for implementing environmental policies. The study

included two primary respondent groups: barangay officials and staff, who directly manage waste-related policies and operations, and the residents, who are the recipients of these services. Including both groups allowed for a comprehensive analysis of how waste management practices are both implemented and experienced by the community.

For data collection, the study used a mixed-method approach, combining structured surveys and key informant interviews. Surveys, consisting of Likert-scale questions, were administered to both barangay staff and residents to collect quantitative data on their views and experiences with waste management. Key informant interviews were conducted with barangay officials and members of the waste management committee to gather qualitative insights into the challenges, strategies, and successes of implementing waste management programs. Stratified random sampling was employed to ensure that the sample represented different groups within the barangay, with a total of 150 respondents selected using Cochran's formula to achieve a 5% margin of error. Data analysis included the use of descriptive statistics to summarize key trends, Pearson's correlation to examine relationships, and regression analysis to evaluate the impact of waste management practices on local government operational efficiency. Ethical standards were rigorously adhered to, ensuring that all participants provided informed consent and that confidentiality was maintained throughout the study.

RESULTS AND DISCUSSION

1. How do the respondents assess the waste management practices?

Table 1
Summary of Respondents' Assessment of the Waste Management Practices

Items	Mean	SD	Description	Interpretation
Waste Segregation Practices	3.54	0.55	Strongly Agree	Excellent
Collection and Disposal Methods	3.22	0.70	Agree	Good
Recycling and Reuse Initiatives	3.29	0.69	Agree	Good
Policy Implementation and Enforcement	3.23	0.66	Agree	Good
Community Engagement and Awareness	3.17	0.68	Agree	Good
Overall Mean	3.29	0.65	Agree	Good

Legend: 1.00 – 1.49 (Strongly Disagree), 1.50 – 2.49 (Disagree), 2.50 – 3.49 (Agree), 3.50 – 4.00 (Strongly Agree)

Table 1 summarizes the respondents' assessments of various waste management practices in Barangay Bitano. With an overall mean score of 3.29, which falls under the "Agree" category, it reflects that the respondents generally find the waste management practices in the area to be satisfactory, though there is still potential for improvement. As Smith and Brown (2023) point out, the success of waste management relies on both infrastructure and public participation, and the "Good" rating suggests that while the practices are functioning, additional efforts are needed to enhance their effectiveness.

The highest-rated category, Waste Segregation Practices, scored an impressive 3.54, classified as "Strongly Agree" and interpreted as "Excellent." This shows that respondents are highly committed to separating waste, demonstrating strong awareness and active participation in waste segregation. Ghisellini et al. (2023) highlight that effective waste segregation is a key practice in reducing landfill waste and improving recycling efforts. This result suggests that Barangay Bitano has effectively instilled proper waste segregation practices, which could serve as a model for other municipalities.

Conversely, Community Engagement and Awareness received the lowest rating, with a mean score of 3.17, categorized as "Agree." While this is still a positive score, it implies that there is room for improvement in engaging the community and raising awareness. Wilson et al. (2023) stress that

community involvement is essential for the long-term success of waste management programs. The finding suggests that Barangay Bitano could benefit from enhancing outreach efforts, such as increasing public participation in clean-up drives or improving waste management education. Strengthening community engagement will ensure that awareness is translated into more active participation, thus further enhancing the overall effectiveness of the waste management system.

2. How do the respondents assess the local government's operational efficiency?

Table 2
Summary of Respondents' Assessment of the Local Government's Operational Efficiency

Items	Mean	SD	Description	Interpretation
Resource Utilization	3.14	0.67	Agree	Good
Service Delivery	3.05	0.78	Agree	Good
Administrative Processes	3.19	0.68	Agree	Good
Policy Effectiveness	3.15	0.67	Agree	Good
Environmental Outcomes	3.18	0.62	Agree	Good
Overall Mean	3.14	0.68	Agree	Good

Legend: 1.00 – 1.49 (Strongly Disagree), 1.50 – 2.49 (Disagree), 2.50 – 3.49 (Agree), 3.50 – 4.00 (Strongly Agree)

Table 2 provides a summary of the respondents' assessment of the local government's operational efficiency, particularly in the context of waste management practices in Barangay Bitano. The overall mean score of 3.14, categorized as “Good,” suggests that both barangay officials and residents perceive the local government’s operations as generally effective in managing waste services. However, the variability in responses, especially in service delivery, indicates areas where improvements can be made. OpenGov (2023) emphasizes the importance of strengthening municipal governance through responsive service delivery, which aligns with the need for continuous refinement in Barangay Bitano’s waste management systems.

Among the five dimensions assessed, Administrative Processes received the highest mean score of 3.19, categorized as “Good.” This indicates that respondents generally perceive the barangay’s administrative processes related to waste management as efficient. Gao and Lee (2023) found that modernizing administrative systems, particularly through digital technologies, enhances efficiency and responsiveness in municipal waste management services. The relatively low standard deviation suggests that there is a consistent perception of strong administrative efficiency in Barangay Bitano, reinforcing the idea that well-organized procedures are crucial for effective waste management.

In contrast, Service Delivery received the lowest mean score of 3.05, still categorized as “Good” but with a higher standard deviation. This variability indicates that some respondents may have experienced inconsistencies in accessing waste management services, especially regarding the timeliness or reliability of waste collection. Zhao and Li (2023) emphasize that equitable access to waste management services is vital for ensuring the overall sustainability and effectiveness of the system. The findings suggest that while Barangay Bitano is progressing in service delivery, further improvements are needed in accessibility, responsiveness, and ensuring consistency in service provision.

3. Do the waste management practices influence the local government's operational efficiency?

Table 3

Linear Regression Analysis on the Influence of Waste Management Practices on the Government's Operational Efficiency

Model 1:

Predictors	Unstandardized Coefficients (B)	SE	Stand. Coeff. (β)	t-value (p-value)	Interpretation
(Constant)	1.181	0.291		1.181 (.000)	
X1: Waste Management Practices	0.609	0.089	0.492	6.809 (.000)	Significant
Adjusted R ²		0.237			
ANOVA for Regression		F = 47.207		p = .000	Significant

Table 3 presents the findings from a linear regression analysis examining the influence of waste management practices on the operational efficiency of local governments. The analysis reveals that waste management practices (X1) have a significant positive impact on government operational efficiency, as indicated by the unstandardized coefficient of 0.609 ($p < 0.001$). This suggests that for every unit increase in the effectiveness of waste management practices, there is a 0.609 increase in government operational efficiency. The standardized coefficient ($\beta = 0.492$) further reinforces the strength of this relationship, indicating a moderate but significant effect.

The adjusted R² value of 0.237 suggests that approximately 23.7% of the variance in government operational efficiency can be explained by the waste management practices implemented by the local government. While this indicates a moderate level of explanatory power, it also suggests that other factors may contribute to operational efficiency and warrant further investigation. The ANOVA results ($F = 47.207$, $p < 0.001$) confirm the overall significance of the model, highlighting that the relationship between waste management practices and operational efficiency is not due to random chance.

Recent studies have highlighted the importance of effective waste management in improving government operations. According to a study by Kim et al. (2023), implementing sustainable waste management practices can lead to cost reductions, better resource utilization, and improved public satisfaction, all of which contribute to enhanced government efficiency. Similarly, research by Zhang and Liu (2022) shows that waste management optimization can lead to better public health outcomes, which in turn reduce the burden on public healthcare systems, further contributing to operational efficiency in local governments.

Additionally, a study by Patel and Williams (2024) found that local governments that integrated technology-driven waste management solutions (such as smart waste bins and digital tracking systems) experienced a more significant improvement in operational efficiency compared to those relying on traditional waste management approaches. This aligns with the findings of the current study, which underscore the importance of innovative and efficient waste management practices in achieving higher operational performance.

The findings of this study have several important implications for local governments and policymakers. The significant positive relationship between waste management practices and operational efficiency suggests that local governments should prioritize the development and implementation of effective waste management strategies. This could include adopting technology-driven waste management solutions, promoting recycling programs, and improving waste collection and disposal systems.

Furthermore, as the adjusted R² value indicates that waste management practices explain a portion of the variance in operational efficiency, it is essential for future research to explore other factors, such

as administrative practices, budget management, and staff training, that may contribute to further enhancing government efficiency. This study provides a foundation for local governments to invest in better waste management solutions, ultimately leading to a more efficient and sustainable operational model.

CONCLUSION

The results of this study highlight the significant influence of waste management practices on the operational efficiency of the local government in Barangay Bitano, Legazpi City. Key factors such as collection and disposal methods, recycling and reuse initiatives, policy implementation and enforcement, and community engagement were found to directly impact the efficiency of waste management services. Notably, policy implementation emerged as the strongest predictor, emphasizing the vital role of governance and regulatory enforcement in achieving effective waste management. With an adjusted R^2 of 0.391 in Model 1, the study indicates that a substantial portion of the variation in operational efficiency can be attributed to these practices, underscoring the importance of well-structured and well-executed waste management strategies in enhancing government performance.

These findings are consistent with Systems Theory (von Bertalanffy, 1968), which posits that organizations operate as interconnected systems, where efficiency depends on the smooth interaction of all components. In this context, the study demonstrates that waste management practices, as integral subsystems of the local government, play a direct role in improving overall operational efficiency. Effective waste segregation, collection, disposal, and policy enforcement contribute to the optimization of the entire system, with inefficiencies in one area negatively affecting the overall performance, thereby reinforcing the interdependence of governance and service delivery.

The findings also align with Ecological Modernization Theory (Hajer, 1995), which asserts that environmental challenges can prompt institutional and technological reforms that improve governance efficiency. The study reveals that prioritizing waste management policies and community engagement initiatives results in more efficient local government operations, further supporting the principles of ecological modernization. The significant role of policy enforcement, as identified in the study, emphasizes the importance of regulatory frameworks and institutional strategies in integrating environmental sustainability with governance improvements.

In conclusion, this study confirms that waste management practices are not only environmental concerns but also crucial determinants of local government efficiency. By reinforcing both Systems Theory and Ecological Modernization Theory, the findings suggest that adopting a comprehensive and structured approach to waste management can significantly enhance operational effectiveness. This approach ensures that local governments function efficiently while also promoting sustainability, benefiting both the environment and the community.

Recommendations

Based on the findings and conclusions of the study, the following recommendations are proposed for various stakeholders involved in waste management and local government operational efficiency:

1. **Local Government Officials.** Local government officials may enhance their waste management strategies by prioritizing policy implementation and enforcement, as this was identified as the strongest predictor of operational efficiency. Strengthening monitoring mechanisms, improving waste collection systems, and investing in capacity-building programs for barangay staff might contribute to more efficient service delivery. Additionally, fostering partnerships with environmental organizations and private sectors may further improve waste management initiatives.

2. **Community Residents.** Community residents might actively participate in waste segregation, recycling, and reuse initiatives to reinforce the effectiveness of existing waste management programs. Engagement in awareness campaigns and local environmental projects may strengthen community involvement and encourage sustainable waste disposal practices. Moreover, providing feedback to local authorities regarding waste collection efficiency might help identify areas for improvement.
3. **Policymakers.** Policymakers may develop and refine waste management policies that align with best practices in environmental sustainability and local governance efficiency. Establishing incentives for proper waste disposal and recycling might encourage compliance among residents and businesses. Additionally, integrating waste management policies with broader environmental and urban development plans may contribute to long-term sustainability and operational efficiency.
4. **Environmental Advocates and NGOs.** Environmental advocates and NGOs might collaborate with local governments and communities to promote education campaigns on sustainable waste management practices. Organizing capacity-building workshops and community-based recycling programs may enhance public participation and awareness. Furthermore, advocating for policy reforms and resource allocation for waste management improvements might support the implementation of more effective environmental initiatives.
5. **Academics and Researchers.** Academics and researchers may conduct further studies on waste management efficiency, focusing on long-term environmental and socio-economic impacts. Exploring innovative waste disposal technologies and community-based solutions might contribute to evidence-based policymaking. Additionally, interdisciplinary research on waste management and governance efficiency may provide valuable insights into improving public service delivery.
6. **Business and Industry Stakeholders.** Business and industry stakeholders might adopt sustainable waste management practices by incorporating waste reduction, recycling, and eco-friendly packaging into their operations. Collaborating with local governments and environmental groups may lead to the development of corporate social responsibility initiatives that support community waste management efforts. Furthermore, investing in green technologies and circular economy models might reduce environmental impact while promoting business sustainability.

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