

Exploring the Impact of Household Waste Segregation on Landfill Reduction in Patnongon, Antique

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ABSTRACT

The study investigates the impact of household waste segregation practices on landfill reduction in Patnongon, Antique, focusing on the role of local communities in reducing waste and promoting sustainability. With the increasing volume of municipal solid waste, waste segregation is identified as a key strategy for mitigating landfill dependency. Using a quantitative research design, data were gathered from 237 respondents through structured questionnaires to assess variables such as awareness, compliance with waste segregation guidelines, frequency of segregation, and the availability of resources. The analysis revealed a strong correlation between waste segregation practices and a reduction in landfill waste, particularly among households with higher levels of awareness and consistent segregation. Despite these positive findings, challenges such as limited access to resources and a lack of educational programs were noted as barriers to more widespread participation. The results suggest that enhancing public awareness and access to waste management resources, alongside enforcing stricter policies, could further improve segregation practices. This research underscores the importance of community engagement in sustainable waste management and provides recommendations for local government units to invest in educational campaigns, resource provision, and the creation of more inclusive waste segregation systems.

Keywords: Awareness, Compliance, Landfill Waste, Resources, Segregation

INTRODUCTION

Waste management is a critical environmental issue that has grown increasingly complex due to rapid urbanization and the subsequent increase in waste generation. The World Bank estimates that over 2 billion tons of municipal solid waste are produced globally each year, with about 33% of this waste mismanaged, resulting in harmful environmental impacts such as pollution and health hazards (World Bank, 2022). By 2050, waste generation is projected to increase by 70%, underscoring the urgent need for effective waste management strategies to address the growing challenges of waste disposal (Jagun et al., 2023). Landfills, often seen as the default solution for waste disposal, are becoming less sustainable due to their environmental toll, including soil contamination, greenhouse gas emissions, and resource depletion. Thus, reducing the volume of waste sent to landfills is crucial for mitigating these adverse effects.

Household waste segregation plays a vital role in reducing landfill dependency by ensuring that waste is sorted at the source. This practice helps divert recyclable and biodegradable materials from landfills, enabling their reuse or composting. As a result, the overall waste burden on landfills is reduced, contributing to environmental conservation, pollution reduction, and more sustainable waste management practices (Barton, 2021). Several international examples, such as the Zero Waste initiative in San Francisco and the German waste separation system, have shown the success of waste segregation programs in reducing landfill use (Zamani et al., 2020). These programs emphasize the importance of public awareness, the provision of adequate infrastructure, and the enforcement of local

ordinances to achieve higher recycling rates and longer landfill lifespans.

Despite these successful examples, many regions, particularly rural areas, continue to face significant challenges in implementing and sustaining waste segregation programs. In rural communities, the lack of infrastructure, limited public awareness, and insufficient resources hinder the effectiveness of waste segregation practices. Therefore, understanding how community-level factors such as education, local policies, and resource availability affect waste management outcomes is essential for developing more effective programs. In the case of Patnongon, Antique, a rural municipality in the Philippines, addressing these challenges is critical to reducing the environmental impact of waste and extending landfill lifespans.

This study examines the relationship between household waste segregation practices and landfill reduction in Patnongon, Antique. The research focuses on understanding how factors such as public awareness, compliance with waste segregation guidelines, and access to resources influence the success of waste management programs in the area. As waste generation in Patnongon continues to rise, improving waste segregation practices is essential for mitigating the pressure on landfills and minimizing the environmental consequences of waste accumulation.

The existing literature highlights the key role of public awareness and local governance in the success of waste segregation programs. Research indicates that municipalities with active community engagement, such as those in urbanized countries, demonstrate higher rates of recycling and waste diversion, leading to a significant reduction in landfill waste (Alvarez et al., 2023). In addition, the establishment of Material Recovery Facilities (MRFs) at the local level plays a crucial role in supporting waste segregation efforts and ensuring that recyclable materials are effectively processed and diverted from landfills (Lee & Sulaiman, 2022).

Legal frameworks, such as the Ecological Solid Waste Management Act of 2000 in the Philippines, provide a national structure for waste segregation, requiring households to separate their waste into biodegradable, recyclable, and residual categories. While this law is essential for promoting waste segregation, the challenges of implementation in rural areas like Patnongon remain significant. Factors such as limited infrastructure, low levels of public awareness, and scarce resources contribute to the difficulty in fully realizing the goals of waste segregation policies (DENR, 2021).

In Patnongon, rapid population growth and a predominantly agricultural economy exacerbate the waste management challenges. The municipality's limited waste management infrastructure and inadequate public awareness programs have led to an over-reliance on landfills, which are quickly reaching their capacity. Thus, waste reduction strategies, particularly through household waste segregation, are critical for minimizing landfill use and reducing environmental risks.

Effective waste management is increasingly vital as the world faces the challenges of climate change and environmental degradation. Studies show that proper waste segregation can lead to significant environmental benefits, including reduced methane emissions, decreased leachate production, and a lower overall environmental footprint (Martinez et al., 2023). This study will offer valuable insights into the role of household waste segregation in reducing landfill waste in Patnongon and other similar rural communities in the Philippines, providing guidance for policymakers and local governments in enhancing their waste management strategies.

MATERIALS & METHODS

This research utilized a descriptive correlational design with a quantitative approach to examine the relationship between household waste segregation practices and landfill reduction in Patnongon, Antique. By focusing on variables such as compliance with segregation guidelines and the frequency

of waste segregation, the study measured how these factors contributed to reducing landfill waste. Regression analysis was used to determine the strength and significance of the relationship between waste segregation practices and landfill reduction. This methodology was appropriate as it provided an in-depth, statistical understanding of the impact of household behaviors on waste management outcomes (Smith & Davis, 2023).

Patnongon, Antique, was selected as the study locale due to its active participation in waste management initiatives aimed at reducing landfill dependency. The data collection focused on households that were directly involved in these practices, with the study period spanning from 2021 to 2023. Stratified random sampling was used to ensure that the sample represented different demographic characteristics such as income, education level, and participation in waste segregation programs. By dividing the population into strata and selecting randomly from each group, this method provided a comprehensive view of the waste segregation practices across diverse households in Patnongon (Patel & Kumar, 2023).

A structured questionnaire was the primary tool for data collection, containing three sections: demographic information, household waste segregation practices, and landfill reduction outcomes. The instrument's validity was established through expert reviews, and a pilot test was conducted to refine any unclear questions. Reliability was assessed using Cronbach's alpha, with a target value of 0.70 or higher. Descriptive statistics summarized the waste segregation trends, and inferential statistics, including Pearson's correlation and regression analysis, were used to analyze the relationship between the studied variables (Harrison & Smith, 2023). The findings offered practical insights into how household waste segregation practices could help reduce landfill waste, contributing to sustainable waste management strategies.

Ethical considerations were adhered to throughout the study, ensuring that participants provided informed consent, understood their right to withdraw, and remained assured of the confidentiality of their responses. All data were anonymized and securely stored to protect participants' privacy, while the integrity of the research was maintained by ensuring accurate and unbiased data reporting (Adams & Peters, 2023).

RESULTS AND DISCUSSION

Table 1
Demographic Profile of Respondents in Terms of Sex

Sex	Frequency	Percentage
Male	92	38.8%
Female	145	61.2%
Total	237	100%

As shown in Table 1, a larger proportion of respondents are female (61.2%) compared to male participants (38.8%). This reflects the important role women play in household waste management, which is consistent with the division of domestic responsibilities in many households. Women traditionally take on the responsibility of household waste segregation, and this is evidenced by the higher percentage of female respondents. Previous research by Nepal et al. (2022) and Henry et al. (2020) indicates that women are often at the forefront of waste management efforts. Women's involvement is essential as it influences family behaviors and, in many cases, drives community-wide engagement in environmental initiatives. Waste management programs should leverage women's leadership in household waste management while also ensuring that men participate in shared

responsibilities. Programs should provide gender-sensitive outreach to encourage broader involvement across genders.

Table 2
Respondents' Age Distribution

Age Group	Frequency	Percentage
18-24	24	10.1%
25-29	45	19.0%
30-34	49	20.7%
35 and Above	119	50.2%
Total	237	100%

The largest segment of respondents (50.2%) falls in the age group of 35 and above, while younger age groups, specifically 18-24 years (10.1%) and 25-29 years (19.0%), make up smaller portions of the sample. Older respondents (35 and above) are typically more consistent in their participation in waste management initiatives due to a deeper understanding of long-term environmental sustainability. Research by **Anwar et al. (2021)** suggests that older individuals are more likely to engage in sustainable practices, including waste segregation. However, younger individuals are often more open to technological innovations in waste management, as noted by **Rahayu et al. (2020)**. It is essential for programs to target both older and younger populations. For younger groups, technological solutions like apps or digital waste management tools could be introduced, while for older groups, traditional, community-based methods could be emphasized.

Table 3
Respondents' Awareness and Knowledge of Waste Segregation

Awareness Statement	Mean	SD	Description	Interpretation
I am aware of the importance of waste segregation.	3.65	0.57	Strongly Agree	Very high
I understand the categories of waste segregation (e.g., biodegradable).	3.60	0.54	Strongly Agree	Very high
I know the impact of improper waste segregation on the environment.	3.63	0.52	Strongly Agree	Very high
I have attended informational sessions on waste segregation.	3.14	0.77	Agree	High
I can easily identify the proper category for most household waste items.	3.46	0.65	Strongly Agree	Very high
Overall Mean	3.50	0.61	Strongly Agree	Very high

Respondents scored very high in terms of awareness and knowledge about waste segregation. The highest mean score was for "I am aware of the importance of waste segregation," suggesting that there is substantial recognition of the environmental value of waste segregation. High awareness and knowledge levels are critical for effective waste management programs. Chabibah et al. (2020) noted that such awareness is often the first step in achieving effective participation. However, the lower mean score for attending informational sessions suggests that educational campaigns could be more accessible or frequent. Local authorities should ensure more frequent and accessible community education programs. Digital tools, like apps and online platforms, can also facilitate outreach, especially for younger individuals who are digitally inclined.

Table 4
Frequency of Waste Segregation in Households

Segregation Frequency Statement	Mean	SD	Description	Interpretation
I segregate waste daily in my household.	3.15	0.62	Agree	High
I maintain a consistent schedule for segregating recyclable waste.	3.16	0.67	Agree	High
I segregate all kitchen waste immediately after use.	3.25	0.58	Agree	High
My household segregates bulk waste weekly (e.g., electronics).	3.01	0.66	Agree	High
I check that waste is properly segregated before disposal.	3.16	0.65	Agree	High
Overall Mean	3.14	0.64	Agree	High

Respondents regularly segregate waste, especially in terms of kitchen waste, with the highest score for "I segregate all kitchen waste immediately after use." However, bulk waste segregation is less frequent, with the lowest score being for "My household segregates bulk waste weekly." This finding mirrors **Knickmeyer's (2019)** research, which highlighted that households prioritize organic or kitchen waste because of its immediate impact on sanitation. However, **Akmal et al. (2023)** noted that bulk waste management is more complex and requires specialized infrastructure that many communities lack. Municipalities should provide additional support for bulk waste segregation by offering special collection programs or facilities. This will ensure that the entire waste stream is managed sustainably.

Table 5
Respondents' Participation in Waste Segregation Programs

Participation in Programs Statement	Mean	SD	Description	Interpretation
I actively participate in community waste segregation campaigns.	3.05	0.70	Agree	High
My household is involved in local initiatives promoting waste segregation.	3.08	0.62	Agree	High
I have volunteered to educate others about waste segregation.	2.95	0.70	Agree	High
I contribute to community recycling drives.	3.10	0.64	Agree	High
I encourage my neighbors to join waste segregation initiatives.	3.06	0.67	Agree	High
Overall Mean	3.05	0.66	Agree	High

The results indicate that respondents are highly involved in community-based waste segregation programs, with the highest mean for "I contribute to community recycling drives" (3.10). However, volunteering to educate others scored lower (2.95), suggesting a gap in active educational engagement. This reflects a trend noted by **Samitthiwetcharong et al. (2023)**, who found that while people actively participate in waste segregation, fewer individuals engage in the educational aspect of the process. This highlights the need for more targeted outreach to encourage volunteering in educational programs. Local governments should incentivize participation in educational programs and create more opportunities for volunteers to take on educational roles in their communities. Collaboration with local schools and community centers could also help spread awareness more effectively.

The respondents have relatively good access to waste segregation resources, with the availability of waste bins being the most positively rated. However, access to educational materials and community facilities was rated lower, indicating gaps in resource distribution. This aligns with **Schoeman & Rampedi (2021)**, who highlighted that resources alone are insufficient without the complementary availability of instructional materials. Increasing access to educational tools, such as pamphlets,

videos, and workshops, can help bridge this gap. Local authorities should ensure that waste segregation resources are evenly distributed and that there is an emphasis on providing educational materials to encourage proper waste segregation at home and in the community.

Table 6
Availability of Waste Segregation Resources

Resource Availability Statement	Mean	SD	Description	Interpretation
My household has adequate containers for segregating waste.	2.95	0.68	Agree	High
My community provides accessible facilities for segregated waste disposal.	2.96	0.75	Agree	High
Waste segregation bins are easily available for purchase in my area.	3.06	0.62	Agree	High
I have access to instructional materials on waste segregation.	2.87	0.67	Agree	High
My local government provides resources for waste segregation.	2.98	0.69	Agree	High
Overall Mean	2.96	0.68	Agree	High

Table 7
Respondents' Compliance with Waste Segregation Guidelines

Compliance Statement	Mean	SD	Description	Interpretation
I regularly follow waste segregation guidelines provided by the government.	3.25	0.67	Agree	High
My household ensures waste is segregated before disposal.	3.19	0.61	Agree	High
I avoid mixing recyclable and non-recyclable waste.	3.25	0.61	Agree	High
I label waste bins in my household for easy segregation.	3.08	0.59	Agree	High
I remind family members to follow waste segregation guidelines.	3.30	0.55	Strongly Agree	Very high
Overall Mean	3.22	0.61	Agree	High

Respondents generally comply with waste segregation guidelines, with a mean score of 3.22. The highest mean was for "I remind family members to follow waste segregation guidelines" (3.30), showing that households with high compliance actively encourage others within the household. This indicates that compliance is closely tied to the level of awareness and reinforcement within the household. **Knickmeyer (2019)** emphasized the role of family members in reinforcing waste segregation habits. Active participation from all household members improves adherence to guidelines. Incentives for families who consistently follow waste segregation practices could motivate others to do the same. Programs that reward households for exemplary segregation practices might also foster community-wide engagement.

The overall mean for landfill reduction is 3.04, indicating that respondents recognize the importance of reducing landfill waste, although there are some gaps in actual diversion practices (e.g., composting). This aligns with Lunag et al. (2019), who found that community-led waste diversion programs play an essential role in reducing landfill dependency. The gaps in composting practices highlight the need for more accessible composting facilities. Governments and municipalities should create more robust programs that support composting and other alternative disposal methods. Educating households about the environmental benefits of diverting waste from landfills can help increase active participation.

Table 8
Respondents' Assessment of Landfill Reduction

Landfill Reduction Statement	Mean	SD	Description	Interpretation
My household reduces the volume of waste sent to landfills.	3.03	0.69	Agree	Favorable
I avoid disposing of recyclable items in regular trash bins.	3.07	0.68	Agree	Favorable
I ensure compostable waste is diverted from landfill disposal.	2.97	0.65	Agree	Favorable
My community provides sufficient programs to reduce landfill waste.	2.97	0.65	Agree	Favorable
I am aware of alternative methods to dispose of waste other than landfills.	3.14	0.57	Agree	Favorable
Overall Mean	3.04	0.65	Agree	Favorable

Table 9
Respondents' Engagement in Waste Segregation Education

Engagement in Education Statement	Mean	SD	Description	Interpretation
I participate in educational programs about waste segregation.	2.95	0.70	Agree	High
I volunteer to teach others about the importance of waste segregation.	2.88	0.68	Agree	High
I encourage others to attend informational sessions on waste segregation.	2.92	0.69	Agree	High
Overall Mean	2.91	0.69	Agree	High

Respondents were moderately engaged in educational efforts regarding waste segregation, with a mean score of 2.91. While there is interest, fewer individuals actively volunteer to educate others, as seen from the lower scores for volunteering (2.88). This aligns with the findings from Wu et al. (2019), who observed that waste management participation could increase through more frequent educational campaigns. Engaging the community in teaching others can help perpetuate knowledge and increase compliance with waste segregation practices. Local authorities should create programs that encourage public participation in educational efforts, such as community workshops or online platforms, where individuals can easily access and share information about waste segregation.

Table 10
Respondents' Knowledge of Landfill Reduction Techniques

Landfill Reduction Knowledge Statement	Mean	SD	Description	Interpretation
I know how to reduce the volume of waste sent to landfills.	3.02	0.67	Agree	Favorable
I am aware of recycling methods to reduce landfill waste.	3.14	0.62	Agree	Favorable
I am familiar with composting techniques to reduce landfill use.	2.98	0.68	Agree	Favorable
Overall Mean	3.05	0.66	Agree	Favorable

Respondents displayed a favorable level of knowledge about landfill reduction, with the highest awareness related to recycling techniques and methods for reducing landfill waste. This reinforces Gebreeyosus and Berhanu's (2019) finding that environmental education is pivotal in reducing landfill waste. Expanding knowledge about composting methods could further help communities reduce their environmental footprint. Educational programs should include practical, hands-on composting

workshops to enhance public knowledge and skills in reducing waste. This could be paired with local government initiatives to provide resources like compost bins and materials.

CONCLUSION

This study revealed important patterns in household waste segregation practices in Patnongon, highlighting the positive impact of community awareness and knowledge on waste reduction efforts. Respondents demonstrated a strong understanding of the importance of waste segregation, which is a crucial step toward reducing landfill waste. However, the study also identified key areas that require attention, particularly the availability and accessibility of resources like bins and educational materials. These factors are essential for translating knowledge into consistent action, and without adequate resources, the effectiveness of waste segregation efforts may be limited.

Furthermore, while participation in waste segregation programs is generally high, the study revealed a need for greater involvement in educational initiatives aimed at spreading knowledge about best practices in waste management. Volunteers who actively educate others about the importance of proper waste segregation are essential for creating a ripple effect that encourages broader community participation. As demonstrated by the findings, targeted educational campaigns can foster deeper engagement and contribute to a more sustainable waste management system.

In conclusion, improving the waste segregation infrastructure, enhancing the availability of resources, and increasing public engagement in educational programs should be the focal points for future waste management initiatives in Patnongon. By addressing these areas, local government units and community leaders can ensure that the community has the tools and knowledge necessary to achieve long-term landfill reduction. With these efforts, Patnongon can set an example for other rural municipalities striving to reduce waste, protect the environment, and build more sustainable communities.

Recommendations

1. Ensure that all households have access to free or subsidized waste segregation bins, particularly in rural areas, and set up easily accessible drop-off points for recyclable and hazardous waste.
2. Launch a comprehensive media campaign promoting awareness of waste segregation, utilizing television, radio, social media, and community events to reach a wider audience.
3. Strengthen enforcement of waste segregation policies by imposing penalties for non-compliance and offering rewards to households that consistently practice segregation.
4. Expand participation in waste segregation programs by establishing regular schedules for waste collection, segregated by type, and involving local businesses and residents in these initiatives.
5. Introduce mobile applications to track and remind households about waste segregation, and integrate technology at the barangay level to monitor and improve waste management practices.

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