

Household Solid Waste Management Practices and Environmental Effects in Barangay Bantug Norte, Cabanatuan City

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Abstract- *This study assessed household solid waste management (SWM) practices and their associated environmental effects in Barangay Bantug Norte, Cabanatuan City, Philippines. Anchored on Republic Act No. 9003 or the Ecological Solid Waste Management Act of 2000, the study examined household practices in waste segregation, collection, recycling, composting, and disposal, as well as environmental conditions related to scattered waste, drainage blockage, odor occurrence, and pest infestation. Using a descriptive-correlational research design, data were gathered from 169 randomly selected households through a researcher-developed questionnaire. Results showed that residents generally practiced solid waste management measures often ($WM = 3.50$), with high compliance in waste collection schedules and proper disposal practices. However, household recycling practices remained less consistently implemented. Environmental conditions associated with improper waste management were only slightly observed ($WM = 2.33$), although scattered waste remained the most visible concern within the community. Pearson correlation analysis revealed no significant relationship between household SWM practices and observed environmental conditions ($r = -0.122$, $p = 0.115$), suggesting that broader infrastructural and municipal factors may contribute more significantly to environmental issues than household practices alone. The findings highlight the need to strengthen recycling participation, improve waste management infrastructure, and enhance municipal waste services to support sustainable environmental management in the barangay.*

Index Terms- *Solid Waste Management, RA 9003, Waste Segregation, Environmental Impact, Community Participation*

I. INTRODUCTION

Solid waste management (SWM) remains a major environmental challenge in rapidly urbanizing communities due to increasing population growth,

changing consumption patterns, and expanding residential activities. Improper waste disposal contributes to environmental pollution, drainage blockage, flooding, pest infestation, and public health risks, particularly in densely populated urban areas. In the Philippines, local government units and barangays play a critical role in implementing effective waste management systems to address increasing volumes of municipal solid waste and reduce environmental degradation.

The implementation of solid waste management programs in the country is primarily guided by Republic Act No. 9003, otherwise known as the Ecological Solid Waste Management Act of 2000. The law mandates waste segregation at source, establishment of Materials Recovery Facilities (MRFs), regular waste collection, and environmentally sound disposal practices. Despite these policies, many barangays continue to experience challenges related to limited recycling participation, inadequate waste management infrastructure, inconsistent implementation, and insufficient community involvement.

Previous studies emphasized that improper waste management practices contribute significantly to environmental and public health concerns, including drainage obstruction, scattered waste accumulation, odor occurrence, and the spread of disease-carrying pests (Ferronato & Torretta, 2019). Moreover, effective household participation in waste segregation, recycling, and composting remains essential in reducing the amount of waste directed to disposal facilities and improving overall environmental conditions within communities.

Barangay Bantug Norte in Cabanatuan City continues to implement local solid waste management initiatives in compliance with national regulations. However, environmental concerns such as scattered waste, drainage blockage, and improper disposal practices remain observable in some areas of the barangay. Assessing the relationship between household solid waste management practices and environmental conditions is important in identifying gaps in implementation and improving community-based waste management strategies.

Hence, this study assessed household solid waste management practices and their associated environmental effects in Barangay Bantug Norte, Cabanatuan City. Specifically, the study examined waste segregation, collection, recycling, composting, and disposal practices, identified environmental conditions associated with current waste management practices, and determined the relationship between household SWM practices and observed environmental conditions within the community.

II. METHODS

Research Design

This study utilized a quantitative descriptive-correlational research design to assess household solid waste management (SWM) practices and their associated environmental effects in Barangay Bantug Norte, Cabanatuan City. The descriptive approach was used to determine the respondents' demographic profile, common sources and composition of household solid waste, existing SWM practices, and observed environmental conditions within the community. Meanwhile, the correlational approach was employed to determine the relationship between household SWM practices and environmental conditions associated with waste management.

Respondents of the Study

The respondents of the study consisted of selected households in Barangay Bantug Norte, Cabanatuan City. From an estimated population of 300 households, a total of 169 respondents were selected using simple random sampling to ensure unbiased representation of households within the barangay.

The respondents were composed of household residents who were directly involved in daily waste management practices such as segregation, storage, disposal, and participation in barangay waste collection activities.

Research Instrument

The researchers utilized a researcher-developed questionnaire as the primary data gathering instrument. The questionnaire was designed based on the objectives of the study and the provisions of Republic Act No. 9003 or the Ecological Solid Waste Management Act of 2000.

The instrument consisted of four parts. Part I gathered the demographic profile of the respondents. Part II identified the common types and sources of household solid waste generated within the barangay. Part III assessed household solid waste management practices in terms of waste segregation, collection, recycling/composting, and disposal practices. Part IV evaluated environmental conditions associated with current waste management practices, including scattered waste, drainage blockage, odor occurrence, and pest infestation.

A 5-point Likert scale was used to assess the respondents' SWM practices, where 5 corresponded to "Always," 4 to "Often," 3 to "Sometimes," 2 to "Rarely," and 1 to "Never." Meanwhile, environmental conditions were measured using a 4-point scale, where 4 represented "Highly Observed," 3 "Moderately Observed," 2 "Slightly Observed," and 1 "Not Observed."

Data Gathering Procedure

Prior to the conduct of the study, permission to administer the survey was secured from the barangay officials of Barangay Bantug Norte, Cabanatuan City. Upon approval, the researchers personally distributed the questionnaires to the selected respondents.

The purpose of the study was explained to the respondents before the administration of the survey to ensure proper understanding of the questionnaire items. The respondents were assured that all information gathered would be treated with confidentiality and used solely for academic purposes.

After the completion of the questionnaires, the researchers retrieved, organized, and prepared the data for statistical analysis.

Statistical Treatment of Data

Descriptive and inferential statistics were used to analyze the gathered data. Frequency count and percentage were utilized to describe the demographic profile of the respondents and identify the common types and sources of household solid waste. Weighted mean and standard deviation were used to assess the level of household SWM practices and the extent of observed environmental conditions within the barangay.

Pearson Product-Moment Correlation Coefficient (Pearson r) was employed to determine the significance of the relationship between household solid waste management practices and observed environmental conditions in Barangay Bantug Norte.

III. RESULTS AND DISCUSSION

Table 1. Demographic Profile of the Respondents

Variable	Category	Frequency (f)	Percentage (%)
Age	18–25 years old	47	27.8
	26–35 years old	—	—
	36–45 years old	—	—
	46–54 years old	—	—
	55 years old and above	49	29.0
Sex	Male	95	56.3
	Female	68	40.1
Educational Attainment	Elementary Level	—	—
	High School Level	54	32.0
	College Level	50	29.6
Household	1–3 members	—	—

Variable	Category	Frequency (f)	Percentage (%)
Size	4–6 members	73	43.5
	7 members and above	—	—
	Length of Residency		
	1–5 years	—	—
	6–10 years	—	—
	More than 10 years	99	58.9

Table 1 presents the demographic profile of the respondents in terms of age, sex, educational attainment, household size, and length of residency in Barangay Bantug Norte. The findings revealed that the largest age groups were respondents aged 55 years old and above and those aged 18–25 years old, indicating participation from both older and younger residents within the community. In terms of sex, male respondents comprised the majority of the participants. Most respondents had reached high school and college-level education, suggesting that a considerable portion of the residents possessed basic to higher educational backgrounds that may influence their awareness and understanding of proper solid waste management practices.

Moreover, the majority of households consisted of four to six members, indicating that medium-sized families are common within the barangay. Most respondents had also resided in Barangay Bantug Norte for more than ten years, suggesting familiarity with the community's environmental conditions and existing solid waste management practices. The presence of long-term residents provided more reliable responses regarding household waste generation and environmental conditions within the barangay.

Table 2. Household Solid Waste Management Practices

Indicators	Mean	SD	Interpretation
Waste Segregation			
Proper segregation at home	3.47	1.07	Often

Indicators	Mean	SD	Interpretation
Separation of biodegradable and non-biodegradable waste	3.46	0.98	Often
Collection and Transportation			
Regular collection service	3.54	0.93	Often
Compliance with collection schedule	3.63	0.99	Often
Recycling and Composting			
Home recycling practice	3.36	0.97	Sometimes
Composting of biodegradable waste	3.41	1.07	Often
Disposal Methods			
Disposal in designated areas only	3.54	0.98	Often
Avoidance of burning and illegal dumping	3.58	1.02	Often
Overall Mean	3.50		Often

As shown in Table 2, residents of Barangay Bantug Norte generally demonstrated positive solid waste management practices, with an overall weighted mean of 3.50 interpreted as “Often.” Compliance with scheduled waste collection obtained the highest mean score (WM = 3.63), indicating strong adherence to barangay waste collection systems and disposal schedules. Proper disposal in designated areas and avoidance of illegal dumping and open burning also received relatively high ratings, reflecting general compliance with the provisions of Republic Act No. 9003.

In contrast, home recycling practices obtained the lowest mean score (WM = 3.36), interpreted only as “Sometimes.” This suggests that while residents actively participate in collection and disposal activities, waste reduction practices such as recycling and composting remain less consistently implemented at the household level.

The results imply that residents are more responsive to structured and externally managed waste collection

systems than to voluntary waste minimization practices. Similar findings were reported by Ferronato and Torretta (2019), who emphasized that sustainable waste management requires stronger household participation in recycling and resource recovery activities in addition to proper disposal compliance.

Table 3. Environmental Conditions Associated with SWM Practices

Indicators	Mean	SD	Interpretation
Presence of scattered waste	2.50	0.96	Slightly Observed
Drainage blockage	2.19	0.95	Slightly Observed
Odor occurrence	2.28	1.01	Slightly Observed
Pest infestation (rats, mosquitoes, flies)	2.35	0.90	Slightly Observed
Overall Mean	2.33		Slightly Observed

As reflected in Table 3, environmental issues associated with solid waste management were generally observed at low to moderate levels within Barangay Bantug Norte, as indicated by the overall weighted mean of 2.33 interpreted as “Slightly Observed.”

Among the identified conditions, scattered waste obtained the highest mean score (WM = 2.50), making it the most visible environmental concern in the community. Pest infestation, odor occurrence, and drainage blockage were likewise observed, although only at slight levels. These conditions suggest that despite the generally acceptable household waste management practices, minor environmental sanitation issues remain present within some areas of the barangay.

The persistence of scattered waste and drainage-related concerns may indicate inconsistencies in waste handling, collection efficiency, or overall environmental maintenance within the community. According to the Environmental Management Bureau (2020), accumulated waste and improper disposal practices contribute directly to drainage obstruction,

pest infestation, and declining environmental sanitation conditions.

Table 4. Relationship Between Household SWM Practices and Environmental Conditions

Variables	r-value	p-value	Interpretation
Household SWM Practices and Environmental Conditions	-0.122	0.115	Not Significant

As presented in Table 4, Pearson Product-Moment Correlation analysis revealed a negative correlation coefficient of -0.122 with a p-value of 0.115, indicating no statistically significant relationship between household solid waste management practices and observed environmental conditions in Barangay Bantug Norte.

Although the negative correlation suggests that improved household waste management practices may correspond to reduced environmental problems, the relationship was not strong enough to establish statistical significance. This implies that household practices alone may not fully account for the environmental conditions observed within the barangay.

The findings suggest that broader factors such as municipal waste collection efficiency, drainage infrastructure, waste transport systems, and community sanitation management may contribute more substantially to environmental conditions than individual household behavior alone. Ferronato and Torretta (2019) similarly emphasized that environmental waste management problems are often influenced by institutional and infrastructural limitations in addition to community participation. Overall, the findings highlight the importance of strengthening both household participation and municipal waste management systems to achieve more sustainable environmental conditions within the community.

IV. CONCLUSION

The study determined that households in Barangay Bantug Norte generally demonstrated acceptable compliance with solid waste management (SWM) practices, particularly in waste collection adherence, source segregation, proper disposal, and avoidance of open dumping and open burning activities. However, waste minimization measures such as household recycling and composting were implemented less consistently, indicating limited participation in resource recovery and waste diversion practices at the source level.

Environmental conditions associated with existing SWM practices were observed at low to moderate levels within the community. Scattered solid waste remained the most evident environmental concern, while drainage obstruction, odor occurrence, and pest infestation were likewise observed in certain areas of the barangay. These conditions indicate the continued presence of localized environmental sanitation issues associated with waste handling and disposal activities. Furthermore, statistical analysis revealed no significant relationship between household SWM practices and the observed environmental conditions within the barangay. Although improved household waste management practices may contribute to the reduction of environmental impacts, the findings suggest that broader factors such as municipal waste collection efficiency, drainage infrastructure condition, waste transport management, and overall community sanitation systems exert greater influence on environmental quality within the study area.

Overall, the study highlights the importance of strengthening both household-level participation and municipal solid waste management infrastructure to improve environmental sanitation, reduce waste-related environmental impacts, and support sustainable community-based waste management practices in Barangay Bantug Norte, Cabanatuan City.

V. RECOMMENDATION

Based on the findings and conclusions of the study, the following recommendations are proposed:

1. Barangay officials and the Local Government Unit

(LGU) should strengthen the implementation and monitoring of solid waste management programs through stricter enforcement of waste segregation policies, regular environmental inspections, and consistent compliance with the provisions of Republic Act No. 9003.

2. The barangay should enhance waste diversion strategies by improving Materials Recovery Facility (MRF) operations and promoting community-based recycling and composting programs to reduce the volume of biodegradable and recyclable waste directed to disposal facilities.
3. Municipal waste collection systems and environmental sanitation infrastructure, particularly drainage maintenance and waste transport operations, should be improved to minimize scattered waste accumulation, drainage obstruction, and other waste-related environmental concerns within the community.
4. Community participation in sustainable waste management practices should be strengthened through continuous environmental education campaigns, information dissemination activities, and household-level training programs focusing on waste segregation, recycling, composting, and proper disposal methods.
5. Future researchers are encouraged to incorporate additional variables such as waste collection efficiency, infrastructure adequacy, environmental awareness, and institutional support to further assess factors influencing environmental conditions and solid waste management performance within urban communities.

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REFERENCES

- [1] Alhassan, H., Kwakwa, P. A., & Owusu-Sekyere, E. (2020). Households' source separation behaviour and solid waste disposal options in Ghana's Millennium City. *Journal of Environmental Management*, 259, 110055. <https://doi.org/10.1016/j.jenvman.2019.110055>
- [2] Camarillo, M. E., & Bellotindos, L. M. (2021). A study of policy implementation and community participation in municipal solid waste management in the Philippines. *Applied Environmental Research*, 43(2), 30–45. <https://doi.org/10.35762/AER.2021.43.2.3>
- [3] Cheng, K. W., Osman, S., Jusoh, Z. M., & Leby, J. (2020). The determinants of intention to practise solid waste segregation-at-source among households. *Malaysian Journal of Consumer and Family Economics*, 25(S1), 67–90.
- [4] Debrah, J. K., Vidal, D. G., & Dinis, M. A. P. (2021). Raising awareness on solid waste management through formal education for sustainability: A developing countries evidence review. *Recycling*, 6(1), 6. <https://doi.org/10.3390/recycling6010006>
- [5] Department of Environment and Natural Resources. (2021). National solid waste management status report. <https://nswmc.emb.gov.ph>
- [6] Environmental Management Bureau. (2020). Philippine environment statistics and waste management report. <https://emb.gov.ph>
- [7] Ferronato, N., & Torretta, V. (2019). Waste mismanagement in developing countries: A review of environmental and health impacts. *Environmental Science and Pollution Research*, 26(4), 3983–4002. <https://doi.org/10.1007/s11356-018-1515-5>
- [8] Hoornweg, D., & Bhada-Tata, P. (2012). What a Waste: A Global Review of Solid Waste

Management. World Bank.

- [9] Mishra, S. (2024). Policy, education, and community engagement in municipal waste management. *Journal of Environmental Management*, 312, 114944. <https://doi.org/10.1016/j.jenvman.2023.114944>
- [10] National Solid Waste Management Commission. (2022). National solid waste management status report 2022. <https://nswmc.emb.gov.ph>
- [11] Philippine Statistics Authority. (2022). Compendium of Philippine environment statistics. <https://psa.gov.ph>
- [12] Republic of the Philippines. (2001). Republic Act No. 9003: Ecological Solid Waste Management Act of 2000. https://lawphil.net/statutes/repacts/ra2001/ra_9003_2001.html
- [13] Singh, J., Laurenti, R., Sinha, R., & Frostell, B. (2014). Progress and challenges to the global waste management system. *Waste Management & Research*, 32(9), 800–812. <https://doi.org/10.1177/0734242X14537868>