

**AWARENESS AND COMPLIANCE ON THE PRACTICES OF ECOLOGICAL SOLID WASTE  
MANAGEMENT IN SELECTED BARANGAYS OF BAYOMBONG, NUEVA VIZCAYA:  
BASIS FOR HEALTH EDUCATION-INFORMATION ACTIVITIES**

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**ABSTRACT**

Solid waste management remains one of the most pressing environmental issues in the Philippines. Globally, the increasing volume and variety of waste in recent years have underscored the urgent need for sustainable waste solutions. In response, the United Nations introduced the Sustainable Development Goals (SDGs) in 2015 as a worldwide initiative aimed at ending poverty, safeguarding the environment, and fostering peace and prosperity by the year 2030. Several of these goals are directly connected to addressing the challenges of solid waste management (United Nations, 2015). This study evaluated the awareness and compliance of residents and garbage collectors in Barangays Don Mariano Marcos, District IV, and Salvacion in Bayombong, Nueva Vizcaya, regarding Republic Act 9003, the Ecological Solid Waste Management Act. Using a quantitative-descriptive design, the study surveyed 340 respondents: 161 from Salvacion, 108 from District IV, and 71 from Don Mariano Marcos. Data were collected using validated questionnaires and analyzed using descriptive statistics in IBM SPSS. Awareness was generally high, especially concerning health and environmental impacts. However, compliance was inconsistent, with weaker adherence to segregation and disposal practices. Garbage collectors showed better compliance than residents, despite limited resources and training. Barriers included irregular collection schedules, poor access to facilities, low seminar attendance, and weak policy enforcement. There is a gap between awareness and actual waste management practices. The study recommends barangay-based education, improved waste infrastructure, and stricter enforcement of local ordinances to enhance compliance and promote environmental sustainability.

*Keywords:* Adherence, ecological solid waste management, health promotion, R.A. 9003, knowledge, sustainability, waste collection, waste disposal, waste segregation

**INTRODUCTION**

Solid waste management remains a critical environmental issue in the Philippines, with the country generating over 21 million metric tons of waste annually, far exceeding its current capacity to manage it. Daily waste production totals approximately 43,684 tons, including substantial amounts of plastic waste, much of which cannot be properly processed due to inadequate infrastructure. Despite existing recycling technologies, most waste ends up in landfills, and the Philippines has become the leading contributor of plastic waste to the ocean. In Bayombong, Nueva Vizcaya—a municipality known as the province's educational hub—waste generation is intensified by the influx of students, resulting in substantial daily amounts of residual, biodegradable, and recyclable waste. While local officials enforce strict waste segregation and collection policies, issues persist, particularly in Barangay Don Mariano Marcos, where improper disposal remains evident, with garbage accumulation near boarding houses and clogged canals being common.

Waste production has clearly reached a turning point worldwide (Clean Management Environmental Group, 2021), making garbage management more challenging. As people produce waste constantly and in increasing amounts, it contributes to the spread of numerous diseases. But as Gupta (2021) said, all inhabitants of the world are accountable for keeping the

environment clean to prevent sickness. If nothing is done about this problem, improper waste management not only ends up in an unpleasant sight, but it additionally makes an impact on a country's whole economy, such as water contamination, soil contamination, air contamination, harm to animals and marine life, and public health (Goyal, 2021). Moreover, according to the United States Public Health Service, the primary health issues linked to ineffective municipal solid waste management include gastrointestinal problems, malaria, dengue fever, respiratory infections, and asthma (Omang et al., 2021).

To address the nationwide problem of improper waste disposal, Republic Act No. 9003, the Ecological Solid Waste Management Act of 2000, was enacted. The law aims to institutionalize proper waste management practices and includes provisions for local implementation. However, implementation gaps remain, with a limited number of sanitary landfills and material recovery facilities serving only a fraction of the country's local government units and barangays. Despite the legal framework and initiatives, non-compliance and poor practices continue.

As a fundamental aspect of waste management, waste collection plays a critical role in maintaining cleanliness, public health, and environmental preservation. Literature on waste collection highlights its significance and sheds light on the various factors and challenges associated with this essential process. One notable study by Schaubroeck et al. (2018) discusses how efficient waste collection, coupled with source segregation and recycling, can significantly reduce the volume of waste sent to disposal facilities. This reduction not only extends the lifespan of landfills but also minimizes the environmental and financial costs associated with waste disposal, promoting sustainable waste management practices.

In conclusion, waste collection plays a pivotal role in maintaining clean, healthy environments, particularly in urban areas. Efficient waste collection systems contribute to reduced environmental impacts, improved public health, and resource conservation. While challenges exist, particularly in developing countries, innovative approaches and community involvement can help overcome these hurdles, paving the way for more sustainable waste management practices. Waste collection is not just about waste disposal; it is an integral part of our collective responsibility to safeguard the environment and promote a cleaner, healthier future for all.

This study aims to fill a gap in local research and generate data to inform targeted waste management strategies. The findings will benefit community members, local authorities, and healthcare professionals by promoting environmentally sustainable habits, improving local waste practices, and supporting policymaking. Furthermore, the study emphasizes the vital role of nurses as educators in promoting a clean and healthy environment, reinforcing the link between environmental health and public well-being. Through health education and community engagement, nursing professionals can significantly improve ecological conditions and overall health outcomes.

### **Statement of the Problem**

This study was conducted from September 2023 to May 2025. It aimed to determine the level of awareness and compliance with the provisions of the Ecological Waste Management (R.A 9003) of residents and garbage collectors in three selected barangays of Bayombong, Nueva Vizcaya, namely District IV, Salvacion, and Don Mariano Marcos. Specifically, the study sought to answer the following problems:

1. What is the profile of the respondents in terms of
  - a. Age;

- b. Gender;
  - c. Educational attainment;
  - d. Occupation;
  - e. Monthly income;
  - f. Household size;
  - g. Type of housing;
  - h. Years of residency in the barangay;
  - i. Participation in SWM seminars/workshops;
  - j. Involvement in SWM activities; and
  - k. Access to waste disposal facilities?
2. What is the level of awareness of respondents in the following areas?
    - a. Regulations and ordinances
    - b. Standards
    - c. Health and environmental effects of waste disposal
  3. What is the extent of compliance with solid waste management ordinances?
    - a. Collection Practices
    - b. Disposal Practices
    - c. Proper Segregation Practices
  4. What are the respondents' recommendations regarding health teaching and information activities on SWM practice?

## METHODOLOGY

This study utilized a quantitative-descriptive design to determine the level of awareness and compliance of the residents and garbage collectors in Bayombong, Nueva Vizcaya, regarding Ecological Solid Waste Management (SWM). The research was conducted in Bayombong, Nueva Vizcaya, focusing on the urban barangays of Don Mariano Marcos, Salvacion, and District IV. These areas were selected for their proximity to the town center, commercial establishments, and schools, resulting in higher population density and greater accessibility for data collection.

The respondents for this study included heads of households from selected families, chosen based on their availability and willingness to participate. To ensure they were familiar with the community's waste management practices, respondents must have lived in the area for at least one year and possessed basic proficiency in the local language for effective communication.

The study used a validated quantitative survey adapted from Panganiban-Santos and Pastrana (2021), with separate questionnaires for household heads and garbage collectors. It measured awareness of waste regulations and health impacts, as well as compliance with Republic Act 9003 on waste collection and disposal. A Likert scale assessed responses, and participants. The researchers first coordinated with barangay officials to obtain permission and gather essential information, including population data, to identify 340 respondents across three barangays.

IBM SPSS Software was used for data processing. The mean was used to describe respondents' awareness and compliance with ecological solid waste management practices. The study adhered to the ethical standards approved by the Saint Mary's University Research Ethics Board. Informed consent was obtained, and confidentiality was ensured through the use of pseudonyms, coding, and secure data storage. Only the researcher had access to the data, which

will be destroyed after five years. Risks such as discomfort or inconvenience were minimized through respectful engagement and flexible participation. The study's benefits, including improved waste management, health education, and environmental awareness, outweighed any risks. No conflicts of interest were declared, and the research was conducted with fairness and transparency.

## RESULTS AND DISCUSSION

### Section 1. Respondents' Demographic Profile

**Table 1**

*Population and Sample Sizes of the Three Barangays*

Barangay	Population	Percent	Sample Size
Salvacion	1,395	47.42	161
District IV	932	31.68	108
Don Mariano Marcos	615	20.90	71
Total	2942	100	340

Table 1 shows the population and sample sizes per barangay. The proportionate stratified sampling method was used.

The respondents in the study were 340 individuals from three selected barangays in Bayombong, Nueva Vizcaya: Salvacion, District IV, and Don Mariano Marcos. These included household heads and garbage collectors. In terms of age, most household respondents were middle-aged adults, indicating they were in their productive years, while garbage collectors were generally older. Gender-wise, household respondents were predominantly female, which suggests that women are often responsible for managing household waste. In contrast, the garbage collection workforce was slightly male-dominated. Regarding educational attainment, most household respondents were high school or college graduates. At the same time, garbage collectors had lower educational levels, mainly completing elementary or high school.

Regarding occupation, many household respondents were students, followed by self-employed and unemployed individuals, indicating a diverse range of economic backgrounds. Most garbage collectors, on the other hand, were employed by the government. Regarding monthly income, a significant portion of household respondents earned below ₱10,000 or chose not to disclose their income. At the same time, all garbage collectors fell under the lowest income bracket. Household sizes in both groups commonly range from 4 to 6 members, which may influence waste generation and management practices. Most households resided in permanent housing, suggesting more stable living conditions. In contrast, garbage collectors were more likely to live in temporary homes.

Years of residency also varied, with most household respondents having lived in the barangay for more than ten years, indicating a strong familiarity with local policies and practices. In contrast, garbage collectors were generally newer residents. Participation in solid waste management (SWM) seminars and workshops was moderately high among household respondents, though limited among garbage collectors. Similarly, involvement in SWM activities was mostly occasional for households, with a smaller proportion participating regularly or frequently; garbage collectors showed minimal involvement overall. Lastly, most households and all garbage collectors reported having access to waste disposal facilities. However, a small number of households lacked such access, which could affect their ability to comply with proper waste management practices.

## Section 2. Level of Awareness of Respondents on Ecological Waste Management

### A. Level of Awareness of Respondents in Terms of Regulations and Ordinances

**Table 2**

*Level of Awareness of the Respondents in Terms of Regulation and Ordinances*

Statement	Salvacion	DMM	District 4	Overall	QD
- Knows about the rules for managing solid waste.	4.78	4.67	4.81	4.75	Very High
2 - Know there is a waste management plan in the barangay.	4.68	3.25	4.7	4.21	High
3 - Familiar with 5S (Sort, Set in Order, Shine, Standardize, Sustain).	4.18	3.55	4.30	4.01	High
4- Recognizes symbols used for waste disposal.	4.61	4.76	4.77	4.71	Very High
5 - Understands that waste should be separated into different types.	4.78	4.73	4.86	4.79	Very High

District IV and Salvacion consistently demonstrated high awareness and understanding of waste management practices, particularly in knowledge of rules, waste management plans, the 5S system, and segregation practices. In contrast, Don Mariano Marcos (DMM) scored lower across several indicators, especially in awareness of the waste management plan and the 5S system, suggesting potential gaps in communication, education, and community engagement. While all barangays demonstrated strong awareness of waste symbols and segregation, DMM's lower scores highlight the need for improved outreach, leadership, and structured educational efforts to ensure more equitable and effective waste management awareness across the communities.

### B. Level of Awareness of Respondents in Terms of Standards

**Table 3**

*Level of Awareness of Respondents in Terms of Standards*

Level of Awareness	Salvacion Residents	DMM Residents	District 4 Residents	Overall	QD
1 - Is familiar with the 3Rs (Reduce, Reuse, Recycle).	4.78	4.73	4.83	4.78	Very High
2 - Knows that waste containers should be protected from vermin and other animals.	4.59	4.61	4.7	4.63	Very High
3 - Understands that the disposal area should be placed strategically.	4.67	4.63	4.8	4.7	Very High

All three barangays—Salvacion, Don Mariano Marcos (DMM), and District IV—demonstrated very high levels of knowledge on waste management practices, particularly the 3Rs (reduce, reuse, recycle), with mean scores exceeding 4.5. District IV consistently scored

the highest, peaking at 4.83, suggesting stronger local engagement, possibly due to more active leadership or information campaigns. Despite the slightly lower score (4.63) on protecting waste containers from vermin, all results still fall within the "very high" category, indicating effective environmental education across the board. The narrow score range (0.17) reflects consistent knowledge levels across communities. However, a minor dip in technical aspects, such as container protection, highlights a need to strengthen practical application through more hands-on or community-based approaches. Overall, the data suggests that waste management awareness is well-integrated culturally, forming a strong base for future improvements.

### C. Level of Awareness of Respondents in Terms of Health and Environmental Effects on Waste Disposal

**Table 4**

*Level of Awareness of Respondents in Terms of Health and Environmental Effects of Waste Disposal*

Level of Awareness	of	Salvacion Residents	DMM Residents	District 4 Residents	Overall	QD
1 - Knows that solid waste should not be left in food preparation areas overnight.		4.54	4.43	4.58	4.52	Very High
2 - Understands that improper handling of solid waste can cause food-borne illness		4.67	4.49	4.81	4.66	Very High
3 - Is aware that improper waste disposal can lead to environmental damage		4.74	4.72	4.83	4.76	Very High

The data reveal consistently very high knowledge of waste management across all barangays, with District 4 leading in all areas, particularly in awareness of environmental impact (mean score of 4.83). Even the lowest score, 4.43 from DMM on kitchen waste practices, remains within the "Very High" category. This suggests strong overall awareness, likely due to effective public education efforts, particularly in District 4. However, the slightly lower scores on managing waste in food-preparation areas—especially in DMM—highlight a subtle but important gap in practical application, indicating that while residents are well-informed, certain behaviors may not yet be fully internalized.

### Section 3. Extent of Compliance with Solid Waste Management Ordinances

#### A. Collection Practices

##### 1. Collection Practices Schedule

**Table 5**

*Extent of Compliance with Solid Waste Management Ordinances in Terms of Collection Practices Schedule*

Collection Practices	Salvacion Residents	DMM Residents	District 4 Residents	Overall	QD
1 - Collects waste materials according to the schedule.	5	5	4.8	4.93	Very High
2 - Collects waste materials during weekends.	5	3.5	4.8	4.43	
3 - Informs departments about the garbage collection schedule.	5	5	4.6	4.87	Very High
4 - Ensures no garbage is left uncollected on the scheduled day.	5	5	5	5	Very High

Table 5 reveals that waste collection practices across Salvacion, Don Mariano Marcos (DMM), and District 4 are generally characterized by very high compliance, particularly in collecting waste on schedule and ensuring no garbage is left uncollected on designated days, with all barangays, especially Salvacion, scoring perfectly. However, DMM showed notably lower compliance (3.5) in weekend waste collection, suggesting a need for improved engagement and communication in that area.

District 4, while also showing high compliance, displayed slight weaknesses in communication with local waste authorities, consistent with Santos et al. (2022) observation that strong resident participation doesn't always equate to effective dialogue with officials. Improving structured feedback systems could further enhance performance. DMM's lower weekend engagement aligns with Villanueva et al. (2021) findings that relaxed weekend attitudes and inconsistent truck schedules hinder proper disposal. Enhancing weekend awareness and incentivizing compliance may help.

## 2. Collection Practices in Institutions and Establishments in the Barangays

**Table 6**

*Extent of Compliance with Solid Waste Management Ordinances in Terms of Collection Practices in Institutions and Establishments in the Barangays*

Collection Practices	Salvacion Residents	DMM Residents	District 4 Residents	Overall
1 - The maintenance staff collects waste materials.	4.25	5	5	4.75
2 - Does not collect infectious waste, chemical waste, or toxic substances together, whether they are contaminated (if applicable).	4.25	5	5	4.75
3 - Does not dispose of waste in rivers, canals, seas, or vacant lots.	4.5	5	5	4.83
4 - Ensures departmental or office compliance.	4.5	5.5	5	5

Table 6 shows a generally high level of compliance with proper waste management practices among residents of Salvacion, DMM, and District 4, with DMM and District 4 consistently achieving perfect scores across most practices. Salvacion residents, while performing well overall, scored slightly lower in areas such as maintenance-led waste collection (4.25) and segregation of hazardous waste (4.25), indicating room for improvement in logistics and awareness. The lower scores in Salvacion may reflect gaps in localized implementation or public education, as supported by Jeremias and Fellizar (2019) and Apostol et al. (2022). However, all three barangays scored high in avoiding illegal dumping and demonstrated perfect compliance with department-level waste protocols, suggesting strong institutional enforcement and community cooperation.

### B. Disposal Practices

#### 1. Disposal Practices at Legal Dumping Areas and Using Approved Disposal Methods

**Table 7**

*Extent of Compliance with Solid Waste Management Ordinances in Terms of Disposal Practices at Legal Dumping Areas and Using Approved Disposal Methods*

Waste Disposal Practices	Salvacion Residents	DMM Residents	District 4 Residents	Overall	QD
1 - Does not dispose of solid waste in rivers, canals, seas, or vacant lots.	5	2	4.8	3.93	High
2 - Disposes of solid waste according to legal methods.	5	5	4.6	4.87	Very High

3 - Collect solid waste according to schedule.	5	5	4.8	4.93	Very High
4 - Disposes of leftover food in separate trash bins.	5	5	4.8	4.93	Very High

Table 7 reveals generally strong adherence to proper waste disposal practices among Salvacion, DMM, and District 4 residents, with most behaviors—such as legal disposal, following collection schedules, and separating leftover food—rated very highly (4.87 or above). Salvacion residents consistently scored perfectly across all practices, demonstrating exemplary compliance, while District 4 maintained high and steady performance. However, a significant concern arises with Practice 1, which involves avoiding illegal disposal in rivers or vacant lots, where DMM residents scored notably low at 2.0, pulling the overall rating down to a "High" level of 3.93. This disparity highlights a critical environmental risk specific to DMM. It signals the urgent need for targeted interventions through enhanced education, stricter enforcement, and improved community monitoring.

## 2. Hazardous Waste Disposal Practices

**Table 8**

*Extent of Compliance with Solid Waste Management Ordinances in Terms of Hazardous Waste Disposal Practices*

Waste Disposal Practices	Salvacion Residents	DMM Residents	District 4 Residents	Overall	QD
1 - Disposes of solid waste in the designated collection area.	5	5	5	5	Very High
2 - Properly disposes of chemical waste, sharps, and toxic substances.	5	5	4.8	4.93	Very High
3 - Uses marked high-density garbage bags for solid waste disposal.	5	5	4.6	4.87	Very High

Table 8 shows that residents and garbage collectors in Salvacion, DMM, and District 4 demonstrate very high compliance with waste disposal standards, with all mean scores at or above 4.6. Salvacion and DMM scored a perfect 5.0 in placing waste in designated areas and properly disposing of hazardous materials, while District 4's slightly lower scores—4.8 for hazardous waste and 4.6 for using marked high-density bags—suggest gaps in awareness or access to resources.

### 3. Specific Disposal Practices

**Table 9**

*Extent of Compliance with Solid Waste Management Ordinances in Terms of Specific Disposal Practices: 3Rs, 5S, MRF Implementation, and Waste Disposal Site Management*

Waste Disposal Practices	Salvacion Residents	DMM Residents	District 4 Residents	Overall	QD
1 - Practices the 3Rs (Reuse, Reduce, Recycle).	5	5	4.8	4.93	Very High
2 -Applies 5S (Sort, Set in Order, Shine, Standardize, Sustain).	5	5	5	5	Very High
3 - Implements the Material Recovery Facility (MRF), if applicable.	5	5	5	5	Very High
4 - Ensures the disposal area is strategically located.	5	5	5	5	Very High
5 - The disposal area is strategically located.	3.25	5	5	4.42	High

The data reveals generally "Very High" compliance across most waste disposal practices in the three barangays, with four out of five key practices—practicing the 3Rs, applying the 5S system, implementing the MRF, and ensuring strategic disposal area location—scoring between 4.93 and 5.00 overall. DMM and District 4 reported perfect scores for the strategic siting of disposal areas. In contrast, Salvacion scored notably lower at 3.25, bringing the overall average for this practice down to 4.42, which is categorized as "High." This suggests Salvacion residents are less confident about the proper placement of disposal sites, highlighting a specific gap despite strong compliance in other areas.

### 4. Household Waste Disposal Practices

**Table 10.** *Extent of Compliance with Solid Waste Management Ordinances in Terms of Household Waste Disposal Practices*

Waste Disposal Practices	Salvacion Residents	DMM Residents	District 4 Residents	Overall	QD
1 - Properly disposes of solid waste materials.	3.25	5	5	4.42	High

2 - Uses designated areas for disposing of chemical wastes like cleaning materials.	2.5	5	5	4.17	High
3 - Ensures safe disposal of chemical wastes such as cleaning materials.	3.25	5	5	4.42	High
4 - Does not leave solid waste in food preparation areas overnight.	4.25	3	2.6	3.28	High

The data shows that residents in DMM and District 4 exhibit "Very High" compliance with proper disposal of solid and chemical wastes, but report only "Average" compliance in avoiding leaving solid waste in food preparation areas overnight. Conversely, Salvacion residents generally show lower compliance, scoring "High" on solid waste disposal and food area practices but only "Average" on using designated chemical waste zones, suggesting gaps in awareness and access to resources.

### C. Proper Segregation Practices

#### 1. Biodegradable and Nonbiodegradable Segregation Practices

The data indicates generally "Very High" or "High" compliance with waste segregation practices across the barangays of Bayombong, Nueva Vizcaya, with District 4 and Salvacion consistently outperforming Don Mariano Marcos (DMM). DMM residents score lower on key segregation practices, such as separating recyclables and avoiding waste mixing, highlighting a persistent, systemic gap likely linked to weaker local leadership, limited resources, or insufficient monitoring.

#### 2. Segregation Practices

**Table 11.** *Extent of Compliance with Solid Waste Management Ordinances in Terms of Segregation Practices*

Waste segregation practices	Salvacion Residents	DMM Residents	District 4 Residents	Overall	QD
1 - Reads waste bin labels before throwing away garbage.	4.57	3.88	4.65	4.37	High
2 - Observes proper waste segregation.	4.67	4.28	4.74	4.56	Very High

3 - Practices proper waste segregation in other places, just like at home.	4.55	4.1	4.64	4.43	High
4 - Segregates waste properly even without reminders.	4.77	4.04	4.75	4.52	Very High
5 - Practices segregation to set an example and influence others.	4.46	4.21	4.52	4.4	High

The data reveal that District 4 residents demonstrate the highest compliance with proper waste segregation, scoring between 4.52 and 4.75 across key behaviors such as reading bin labels, observing segregation protocols, and segregating waste without reminders, practices rated mostly as "Very High." In contrast, Don Mariano Marcos (DMM) residents scored lowest, especially in reading bin labels (3.88), indicating a need for targeted education and intervention. District 4's success aligns with studies emphasizing the importance of knowledge, positive attitudes, and social norms in fostering solid waste management behaviors.

**Section 4. Respondents' Recommendations Regarding Health Teaching and Information Activities on SWM**

Residents recommended placing more garbage cans throughout the barangays, with clear signs and illustrations indicating proper waste segregation. They also suggested increasing garbage collection frequency and posting collection schedules to prevent waste buildup. Additionally, they called for more seminars focused on health, waste segregation, and proper disposal practices.

**CONCLUSION AND RECOMMENDATIONS**

**Conclusion**

The study concludes that although respondents demonstrate general awareness of the environmental and health consequences of improper waste management, there remains a lack of understanding of specific solid waste regulations and inconsistent adherence to proper practices, particularly in segregation and disposal. These issues are further compounded by limited participation in SWM seminars and unequal access to disposal facilities. Respondents expressed a need for more community-based, engaging health education activities led by barangay officials to enhance involvement and effectiveness. In response, the researchers designed targeted interventions focused on food and packaging waste to address these identified gaps and support sustainable, health-aligned waste management behaviors.

**Recommendations**

Based on the findings, the researchers recommend that residents participate in community seminars on proper waste segregation and disposal, with landlords in high-density

areas such as Don Mariano Marcos enforcing these practices. Garbage collectors should receive regular training on health risks and safe waste handling, supported by nursing students providing first aid and education. Barangay officials are urged to improve communication, conduct awareness campaigns, enforce waste policies, and collaborate with health workers and landlords. Future researchers should explore barriers to compliance, the health risks associated with dumping sites, and the role of nurses in promoting environmental health through targeted education and community-based interventions.

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