International Journal of Science and Research Archive
eISSN: 2582-8185
Cross Ref DOI: 10.30574/ijsra
Journal homepage: https://ijsra.net/

(RESEARCH ARTICLE)

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Household characteristics on the disposal of plastics in Malaybalay City, Province of Bukidnon

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International Journal of Science and Research Archive, 2025, 16(02), 622-633

Publication history: Received on 01 July 2025; revised on 09 August 2025; accepted on 11 August 2025

Article DOI: https://doi.org/10.30574/ijsra.2025.16.2.2339

Abstract

Improper plastic disposal significantly contributes to pollution, especially in urbanized areas like Malaybalay City, Bukidnon. This study aimed to assess the awareness, knowledge, practices, management, and values formation of the respondents regarding plastic waste disposal. The study was conducted at the urban barangays of Malaybalay City, using a stratified random sampling 109 respondents were interviewed through a researcher-made instrument. Findings showed that most respondents were 25-44 years old (46.80%), predominantly female (70.60%), majority were college graduates (53.20%), primarily business owners (40.40%), and most respondents earned ₱10,957 and below (58.70%), mostly in Barangay Casi sang (36.70%). This reflects the role of working-age adults and women in managing household waste. Low-income residents in densely populated barangays indicate that socioeconomic and geographic factors affect plastic waste disposal. The respondents demonstrated high awareness ($\bar{x}$= 3.63) and knowledge ($\bar{x}$= 3.70) indicating that they are well-informed of plastic waste issues while showed low practices ($\bar{x}$= 3.33), management ($\bar{x}$= 3.27), and values formation ($\bar{x}$= 3.28), which were notably concerning, while respondents understood proper plastic waste disposal, their practices and values were not consistently applied. This gap highlights the need for stronger reinforcement of sustainable practices. The most common plastic products that are disposed of by the respondents are sachet wrappers and plastic bags (94.50%), while the most recycled were plastic bottles (78.90%). These findings showed the importance of improving the implementation of the Malaybalay City Ordinance 962. Strengthening education campaigns and extending enforcement efforts beyond business establishments are essential to bridging the gap between awareness and action.

Keywords: Solid Waste Management; Policy Implementation; SDG 11 Sustainable Cities and Communities; Plastic Waste Disposal Behavior; Environmental Awareness

1. Introduction

The pollution caused by disposable plastic products is becoming more and more serious, and "plastic limit" has become a global consensus [1]. Plastic waste has become a major environmental problem worldwide, and its negative impacts are particularly evident in urban areas. The United Nations Department of Economic and Social Affairs launched Sustainable Development Goals (SDGs) to build international alliances that tackle important social problems including plastic waste disposal management [2]. SDG 11: Sustainable Cities and Communities plays a central role in solving plastic waste disposal problems faced by urban areas. The goal addresses the requirements needed to develop inclusive resilient sustainable urban environments. SDG 11 targets two essential goals to achieve sustainable cities which involve enhanced waste management systems and air quality protection (Target 11.6) and making public spaces both safe and green (Target 11.7). The sustainable urban environment depends on proper plastic waste disposal techniques which help maintain cities healthy for both humans and the environment. The linkage confirms the urgent need to incorporate

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sustainable plastic waste disposal solutions within city development strategies because these strategies function toward attaining global targets.

Single-use plastic bag waste disposal without proper management has evolved into a worldwide alarming situation because these items form a substantial portion of plastic waste accumulation issues. Plastic bans now serve as an environmental mitigation strategy for developing countries' urban areas as discussed by [3]. The environmental problem of plastic waste continues to endure as the manufacturing and disposal along with decomposition stages produce greenhouse gas emissions. Global warming grows worse due to the extended decomposition duration of polystyrene along with other plastic types. Sustainable waste disposal methods for plastics must become the core priority because it will decrease their adverse environmental impact.

The Philippines established R.A. 9003 referred to as the Ecological Solid Waste Management Act of 2000 as the national law to develop an ecological waste management system and regulate specific activities while enforcing fines for violations. This national law derives from United Nations policies thus it functions as the foundation for Malaybalay City Ordinance No. 962 which becomes known as The Solid Waste Integrated Management Ordinance of Malaybalay City. The ordinance establishes regulations to run effective solid waste management by focusing on waste reduction from the source alongside proper separation and disposal methods and encouraging citizen participation in pollution prevention along with reusable option promotion. Numerous issues persist in plastic waste management because the country lacks adequate infrastructure and resources and many people improperly dispose of plastic materials.

Since Malaybalay City became the capital of Bukidnon in Northern Mindanao it has developed quickly which in turn caused both increased plastic usage and waste output. The City Environment and Natural Resources Office (CENRO) reports that urban barangays of the city produce estimated 3.03 tons of plastic waste per day along with 1,104.21 tons of plastic waste collection increases of approximately 38% from 2020 levels. The cassette of daily solid waste generation in urban barangays amounts to 75.63 tons as data shows a total of 27,605 tons was collected in 2024 and this figure continues to rise steadily since 2020. The statistics demonstrate that plastic waste disposal represents a critical problem in the city area. Landfills and rivers together with other bodies of water receive most plastic waste which causes environmental pollution and creates substantial health risks for residents. Plastic waste management suffers because of insufficient infrastructure support combined with poor monitoring despite all attempts to introduce waste sorting and recycling systems.

The city government runs multiple waste management initiatives consisting of three major programs named City Linis Project, Eco-savers Program, and Waste Recycling and Composting. The provisions of Ordinance No. 962 establish both financial penalties and rewards that support proper waste management while discouraging plastic waste misuse. For the year 2023 a total of 286 citation tickets were issued and total of ₱172,200 were collected from the penalty. Most common violations were related to the plastic regulation provision covering 212 citation tickets, 50 for non-segregation, 13 for open dumping and 11 for open burning. The number of citation tickets and the collected penalty were much higher in 2024 compared to 128 citation tickets and ₱36,000.00 collected penalty in the previous year.

While these efforts demonstrate progress, there remains a lack of comprehensive understanding regarding the level of awareness, knowledge, and practices of residents in terms of plastic disposal. The significant increases in both plastic waste and solid waste volumes over the years underscore the urgent need to assess how well residents understand and comply with existing policies and to identify gaps in their practices. This study aims to contribute to the formulation of additional policies, programs, and community-based initiatives that can enhance waste management and promote sustainable practices. This research is essential for supporting the city's goal of reducing plastic pollution and ensuring a cleaner and healthier environment for its residents.

2. Materials and Methods

The study utilized a descriptive research design, a quantitative research approach. This method systematically and accurately describes the facts and characteristics of a population or area of interest. Additionally, it seeks to observe, describe, and document aspects of a situation while identifying associations or relationships among selected variables [4]. The study examined into how residents' understanding and awareness of plastic disposal impact their daily habits and decisions regarding plastics. By examining whether people with higher awareness and knowledge are more likely to engage in sustainable practices. This descriptive research will provide a clear snapshot of how plastics are disposed and perceived in Malaybalay City. Understanding this is vital for creating effective strategies to promote environmental sustainability in Malaybalay City.

2.1. Research Environment

The target population was the residents of the urban barangays of Malaybalay City, particularly Población, Casi sang, and Sompong shown in violet color, aged 18 and above, who have disposed of plastic products. The sample size was determined based on the total number of voters of Malaybalay City which is 40,715 as determined by the COMELEC in 2023. The Cochran's formula no = Z2pq/e2 was used to calculate for the sample size from the total population with 5% marginal error and 95% confidence level, with 109 respondents for the sample size followed by the small sample correction formula n = no/1+(no-1)/N. This process is utilized to identify sample size needed for the study; stratified random sampling nh = Nh/N x n was also applied.

The distribution of the study's sample among the chosen urban barangays of Malaybalay City is presented in Table 1. It ensures that the numbers in the data represent each barangay well, depending on each barangay's total population.

Table 1 Distribution of the number of respondents in Malaybalay City urban barangays

Barangays	Population Size	Number of Sample	Percentage (%)
1	3,524	10	9.17
2	906	2	1.83
3	674	2	1.83
4	624	2	1.83
5	663	2	1.83
6	857	2	1.83
7	1,610	4	3.67
8	920	2	1.83
9	5,824	16	14.68
10	2,248	6	5.50
11	2,153	6	5.50
Sompong	5,715	15	13.76
Casi sang	14,997	40	36.70
Total	40,715	109	100.00

In Table 1, a stratified sampling method established the distribution pattern of respondents across urban barangays located in Malaybalay City as shown in the table. The sampling method adopted maintained proportional distribution of selected barangay representatives based on their population numbers. Through stratified sampling, it obtained an even distribution of participants who adequately represented the research study.

3. Validity and Reliability of Instruments

The research questionnaire has undergone a content evaluation and reliability test. The questionnaire has been checked and validated by professionals in the City Environment and Natural Resources Office, Natural Sciences Department, Community Development Department, and Climate Change Corporation Philippines. After the validity of questionnaire, the researcher conducted pilot testing in Valencia City. Jamovi software has been utilized to assess the reliability of the questionnaire by calculating Cronbach's alpha coefficient resulted into 92.80%. This statistical test determined the internal consistency of the items, ensuring they reliably measure the intended constructs within the study.

3.1. Data Gathering Procedure

A familiarization visit to each of the sampled barangays was conducted prior to the data collection. The researcher examined the sample sizes based on calculations with the real population during these visits. Permission to conduct research in Población areas has been obtained from the Department of the Interior and Local Government as well as the Malaybalay City Local Government. The respondents have received thorough explanations of the study's goal and the

importance of the data collection administration. Additionally, the respondents' consent has been requested through a consent form. The researcher has administered the research questionnaires. The survey takes 5-10 minutes to complete.

3.2. Statistical Instruments/Procedure

The data collected in this study were quantitative. The data go through three stages, namely coding, typing, and editing which was done by the researcher through the use of Microsoft Excel. The typing of data from paper questionnaires has been done twice. The second time includes identifying any possible mismatches between the original and second entries. Followed by the computation of its frequency and percentage, mean, and standard deviation through the use of Jamai software.

3.3. Scoring Guidelines

The scale is use to score the responses on the disposal of plastic by the respondents. The responses in the questionnaire were measured using a four-point scale, including: Very High, High, Low, and Very Low, all for both behaviors and perceptions. The scale was put together to measure awareness, knowledge, practices, management involvement, and values formation in connection to plastic waste disposal. It provides a clear understanding of how behaviors are demonstrated.

Table 2 Scoring Scale of Plastic Waste Disposal Behavior

Scale	Range	Responses	Qualifying Statement	Meaning
4	3.90-4.00	Always	Very High	Indicates that the behaviour or attitude is consistently demonstrated. Respondents exhibit strong environmental responsibility and regularly engage in proper plastic waste management practices.
3	3.41-3.89	Often	High	Reflects frequent demonstration of the behaviour. Respondents are generally compliant with waste disposal guidelines and show positive environmental awareness and habits.
2	2.60-3.40	Seldom	Low	Suggests occasional or inconsistent demonstration of the behaviour. Respondents show partial awareness or participation but lack regular practice.
1	1.00-2.59	Never	Very Low	Denotes minimal or no demonstration of the behaviour. Respondents may be unaware of proper practices or do not engage in responsible plastic waste disposal.

3.4. Ethical Consideration

Ethical questions take the stage in this study on plastic disposal in Malaybalay City. Making sure every respondent preserves identity and privacy comes first for the researcher. Every respondent received informed consent, highlighting that participation is optional and they are free to stop at any moment without running afoul of rules. To prevent particular responder identifying, data were anonymized; findings were reported broadly. These guidelines help to protect respondents' privacy, encourage honest and open responses, and preserve study integrity.

4. Results and Discussion

4.1. Problem 1. What is the demographic profile of the respondents?

The demographic profiles of the 109 respondents are shown in Table 3. Age, sex, education, occupation, earnings and place where people live give important clues about their behavior to plastic waste. The profile provides the basis for understanding how these aspects influence awareness, knowledge, practices, management and values in solid waste management.

Table 3 Distribution of Respondents According to Demographic Profile. (n=109)

Demographic Profile	Frequency (f)	Percentage (%)
Age		
18-24 years old	18	16.50
25-44 years old	51	46.80
45-59 years old	40	36.70
Sex		
Female	77	70.60
Male	32	29.40
Educational Attainment		
No Formal Education (ALS/TESDA)	2	1.80
Elementary Level/Elementary Graduate	7	6.40
High School Level/High School Graduate	37	33.90
College Level/College Graduate	58	53.20
Post Graduate	5	4.60
Occupation		
Public Sector Employees	32	29.40
Business Owners	44	40.40
Private Sector Employees	33	30.20
Monthly Income		
₱10,957 and below	64	58.70
₱10,958 - ₱21,194	23	21.10
₱21,195 - ₱43,828	19	17.40
₱43,829 - ₱76,669	2	1.80
₱131,485 - ₱219,140	1	0.90
Place of Residence		
Población District	54	49.54
Highway District	55	50.46

Table 3 summarizes the demographic profile of the 109 respondents. Most (46.80%) are aged 25–44, representing working-age adults who are actively involved in household and community decisions, making them more likely to influence waste disposal practices. Females dominate the sample (70.60%), reflecting their traditional role as primary household waste managers and key participants in sustainable practices. Over half (53.20%) are college graduates, likely due to the presence of higher education institutions in Malaybalay City, which enhances awareness and critical

thinking toward environmental behavior. Business owners make up the largest occupational group (40.40%), indicating strong entrepreneurial activity where packaging and retail contribute to plastic waste but also offer opportunities for promoting eco-friendly practices. Economically, 58.70% earn ₱10,957 or below, placing them in the lower-income bracket and highlighting their vulnerability to the effects of poor waste management. Residentially, respondents are almost evenly split between the Población District (49.54%) and Highway District (50.46%), providing balanced insights into urban and peripheral barangays and their access to waste services.

Problem 2. How do the respondents rate their disposal of plastics aligned to the policies such as RA9003 and City Ordinance 962?

To understand the respondents' behavior on plastic waste disposal, the study assessed awareness, knowledge, practices, management, and values formation. Table 4 shows the respondents' understanding of plastic waste disposal. The survey checks how much they are informed about local rules, the harm caused by plastic waste and how important proper disposal is to them. This way, we see if the community has the necessary facts about current environmental topics.

Table 4 Awareness on Plastic Waste Disposal

Statements	$\bar{x}$	**SD**	**Interpretation**
I think it is important to practice waste segregation including plastic in the city.	3.81	0.552	High
I am aware of the importance of disposing of plastic in its proper place.	3.83	0.536	High
The obligation of keeping and cleaning the city free of plastics is the responsibility of all its constituents.	3.83	0.448	High
I will feel disturbed if I see people who dispose of their plastic waste anywhere or burn it.	3.59	0.683	High
The city needs to exercise the policies and fines/penalties for the people who are not disciplined in disposing or properly using their plastic waste.	3.69	0.588	High
The disposal of plastics is not a major problem in the City of Malaybalay.	3.33	0.708	Low
The City Government of Malaybalay has taken actions/efforts to mitigate improper plastic disposal.	3.57	0.629	High
I understand the penalties outlined in Malaybalay City Ordinance No. 962 for improper plastic disposal and burning.	3.67	0.653	High
I am aware of the waste reduction and management goals outlined in RA 9003.	3.68	0.575	High
I am aware that there are materials recovery facilities (MRFs) or designated waste collection points in Malaybalay City, as mandated by RA 9003 and City Ordinance 962.	3.56	0.686	High
I am aware of any local initiatives, programs or policies aimed at reducing/diverting plastic waste generation in Malaybalay City in line with SDG 11.	3.48	0.688	High
I am aware of the existence of Malaybalay City Ordinance 962, Series of 2020, the Solid Waste Integrated Management Ordinance of Malaybalay City.	3.55	0.673	High
I am aware of the importance of segregating plastic waste to improve recycling efforts, promote waste diversion and extend the lifespan of the landfill.	3.75	0.626	High
I am aware of any programs in the city or barangay that encourage proper plastic disposal, recycling, reduction, and diversion.	3.61	0.667	High
I understand the connection between proper plastic disposal and creating a cleaner, safer urban environment.	3.83	0.462	High
I am aware of the availability of recycling facilities or drop-off points for plastics in my area.	3.45	0.726	High
I understand the role of Malaybalay City Ordinance No. 962 in managing plastic waste disposal, volume reduction, and its penalties for non-compliance.	3.59	0.581	High

I am familiar with the location of material recovery facilities (MRFs), junkshops, or recycling centers in my community where plastic waste can be properly processed.	3.52	0.675	High
Overall	3.63	0.381	High

Table 4 shows that the respondents' overall awareness regarding plastic waste disposal ($\bar{x}$= 3.63, SD=0.381) falls under the category "High" and the responses show low variance, this shows a shared understanding of awareness on the importance of proper plastic waste disposal. This result reflects the effectiveness of ongoing educational campaigns and environmental awareness programs led by the local government such as Malaybalay City Ordinance No. 962, Series of 2020 and Forest Regeneration Workshops. Additionally, 57.80% of respondents reported that they are highly aware on plastic waste guidelines most of the time, suggesting habitual compliance with local environmental policies. Awareness plays a crucial role in shaping sustainable practices, especially when supported by institutional programs and grassroots environmental initiatives [5].

Respondents in Malaybalay City showed high awareness which may be attributed to the city's special local efforts. The presence of Malaybalay City Ordinance No. 962 which serves as the city's comprehensive solid waste management framework, has helped the city community familiarity with plastic waste disposal. The ordinance promotes segregation waste at the source, bans burning, and requires local education on sustainable waste practices. The ordinance has encouraged households to include environmental thinking in their regular activities [5]. As well, the city supports Forest Regeneration Workshops and runs community environmental campaigns in each barangay, encouraging both waste reduction and the care of nature. With these activities mainly managed by the City Environment and Natural Resources Office (CENRO), people often become more aware of how to care for the environment. The Población District has seen an increase in awareness due to easy access to information, signs, and visible law enforcement. Lastly, awareness among the population may also be reinforced by religious, cultural, and educational institutions such as Bukidnon State University, San Isidro College, Mindanao Arts, and Technological Institute which incorporate environmental themes in their outreach and community extension programs. This multi-sectoral approach ensures that knowledge about waste and sustainability becomes embedded in daily discourse and practice [6,7].

Table 5 outlines how well the respondents understand how to manage plastic waste. The test assesses their awareness of segregation, recycling methods, and greater effects plastic has on the environment. The table shows the mental factors that support their behavior with the environment.

Table 5 Knowledge on Plastic Waste Management

Statements	**Mean**	**SD**	**Interpretation**
Burning of plastic wastes can release toxic substances to air, water, and soils.	3.72	0.708	High
I am familiar of which types of plastics can be recycled.	3.62	0.558	High
I am familiar of which types of plastics can be properly disposed.	3.72	0.595	High
I know that the decomposition rate of plastics is too long.	3.64	0.601	High
I know that the decomposition of plastics has long-term impact on the environment and human health.	3.68	0.575	High
I know the proper procedures for segregating biodegradable waste.	3.72	0.529	High
I know the proper procedures for segregating non-biodegradable waste.	3.73	0.603	High
I know the proper procedures for segregating recyclable plastic waste.	3.75	0.530	High
Overall	3.70	0.400	High

Table 5 shows a high knowledge ($\bar{x}$=3.70, SD=0.400) and shows a low variability, indicating that respondents demonstrate an understanding of plastic waste issues. Relevant practices and information are highly understood. The majority of the respondents suggest that most individuals are aware of key concepts, such as segregation, the consequences of improper disposal, and the significance of recycling. However, certain technical aspects—like familiarity with specific waste ordinances, drop-off facilities, or long-term environmental impacts—may not be fully internalized or regularly applied in daily decision-making. This nuance is crucial because knowledge alone does not

always lead to behavioral change [6], and even high levels of awareness must be complemented by strong values and practical implementation to ensure lasting environmental impact.

Barangay meetings, posters, special school activities and the local recycling effort have all helped Malaybalay achieve its goal of raising awareness among students and citizens. People taking part provide evidence that they are familiar with segregation rules, environmental issues caused by plastics, and the legislation of government, indicating that deep knowledge is common. The city is complying with RA 9003 (Ecological Solid Waste Management Act) by making public information drives a continuous practice. Malaybalay reviews these actions: maintaining MRFs and giving direction on how to separate waste—which helps others learn and understand these rules.

Table 6 outlines what respondents actually do with their household waste, for example, they separate trash, reuse some goods and follow city waste management policies. With these data, we can measure if individuals use what they know about plastic waste consistently.

Table 6 Practices on Plastic Waste Disposal

Statements	**Mean**	**SD**	**Interpretation**
I do not burn plastics as a way of disposing of it.	2.92	1.12	Low
I do not throw my plastic waste in any garbage bin.	2.79	1.25	Low
I separate plastic when disposing of garbage.	3.70	0.616	High
I consider 3R (Reduce, Reuse, Recycle) before disposing of plastic waste.	3.61	0.592	High
I collect plastic packaging bottles to take to the waste bank or trash bins.	3.15	0.931	Low
I am practicing recycling to reduce plastic waste at home.	3.39	0.679	Low
I separate plastic materials from biodegradable and non-recyclable waste to facilitate proper recycling and disposal.	3.61	0.561	High
I feel guilty when I throw plastic anywhere.	3.61	0.720	High
I participate voluntarily in proper plastic disposal-related awareness campaigns.	3.00	0.719	Low
I recycle plastic containers and packaging instead of throwing them in the garbage bin.	3.32	0.719	Low
I segregate household plastic waste before disposal to facilitate efficient collection and recycling by garbage collectors and recycling personnel.	3.58	0.582	High
Instead of disposing, I consider converting my plastic waste into useful products.	3.06	0.842	Low
I ensure the proper storage, handling, and disposal of plastic wastes.	3.48	0.740	High
I provide separate and appropriate bins for each type of waste, especially plastic waste.	3.52	0.765	High
I provide a composting facility like compost pit, composting bins, and other composting systems for the compostable waste.	3.19	0.844	Low
Overall	3.33	0.394	Low

Table 6 shows a low adherence to proper plastic waste disposal practices an overall ($\bar{x}$=3.33, SD=0.394) and shows low variance in the responses, indicating that respondents generally apply proper disposal methods in their daily lives and routines, although proper disposal is frequent, it is not yet deeply consistent enough reflects the presence of lapses in practice due to lack of access to waste disposal facilities and convenience. While 54.10% of respondents rarely practiced proper disposal methods reflects a misalignment between knowledge and practices. This emphasizes the importance of reinforcing not only awareness but also habit-building and infrastructural support. Interventions such as visible enforcement of plastic regulations and consistent community clean-ups are necessary to move from occasional to habitual sustainable waste practices. Enabling environments and community accountability, awareness may remain theoretical rather than transformative. Respondents are generally aware of segregation, environmental risks, and related legal frameworks on plastic waste management [6]. This is attributed to the influence of local ordinances such

as Malaybalay City Ordinance No. 962, which institutionalizes proper solid waste segregation, mandates education campaigns, and prescribes penalties for non-compliance. The ordinance, aligned with RA 9003, provides a structured knowledge base for the public.

Table 7 shows behaviors related to waste management, covering involvement in programs, availability of collection systems, and activities done at the barangay level. The table records the level of participation by respondents in both official and homemade waste systems.

Table 7 Management on Plastic Waste Disposal

Statements	Mean	SD	Interpretation
The frequency of the plastic waste collection system in my neighborhood is adequate.	3.19	0.844	Low
The government is actively tackling plastic waste management and regulation through policies and regulations.	3.36	0.714	Low
The City Government of Malaybalay is effective and efficient in the collection of residual solid waste, including plastics.	3.41	0.683	High
There are collection points in areas wherein house-to-house collection is not viable.	3.31	0.676	Low
Collection points are managed and maintained in a sanitary manner.	3.42	0.711	High
Any vehicle is not allowed to transport mixed solid wastes.	2.67	1.07	Low
Burning of plastic waste is prohibited in the city.	3.27	0.997	Low
The city provides sufficient infrastructure, such as material recovery facilities (MRFs) and sanitary landfill to support proper plastic waste disposal.	3.27	0.777	Low
Information and education campaigns on proper plastic disposal and its regulation are regularly conducted by the local government.	3.28	0.771	Low
The penalties for improper plastic disposal and burning are strictly enforced by the authorities.	3.47	0.752	High
Overall	3.27	0.485	Low

Table 7 shows adherence to low management practices concerning plastic waste disposal ($\bar{x}$=3.27, SD=0.485) and shows low variance in the responses, this suggests that while some management practices are occasionally implemented, they are not consistently present across the population as several areas in the barangay missed the collection of plastic waste or the garbage truck that collects it did not come on schedule. This also indicates that engagement in these management practices varies among respondents, due to differences in access to disposal facilities, awareness of local ordinances, or household-level waste management capacity. These results emphasized the need for more structured and accessible waste management systems supported by community education and LGU-enforced policies to ensure more consistent practice across all sectors. Without strong institutional support and practical infrastructure, management-related behaviors often remain irregular and limited in impact [6]. A reason for this behavior gap is that respondents feel enforcement is not strict enough. As cited in the study's field data, there have been documented cases where business owners were apprehended for non-compliance, while individual residents were rarely penalized. This has led to a perception that enforcement is selective, allowing individuals to continue improper practices with minimal risk of consequence. It also seems that people may struggle to act on the policies suggested to them.

Table 8 focuses on how important personal discipline, caring for the environment and acting sustainably are when it comes to handling plastic waste. They help us understand what encourages or obstructs the long-term development of early childhood behavior.

Table 8 Values Formation on Plastic Waste Disposal

Statements	Mean	SD	Interpretation
I do not throw my plastic waste in the river when my trash bins are full or because it is the simplest method of disposal.	3.36	1.08	Low
I do not litter my plastic waste in public places if there are no trash bins around.	3.10	1.16	Low
I segregate my waste especially plastic even if there are no laws, rules, and regulations being implemented.	3.46	0.752	High
I bring my plastic waste in the collection area.	3.37	0.846	Low
I recycle plastic waste even if I can afford to buy new things.	3.13	0.829	Low
I avoid using single-use plastics, even if they are more convenient than reusable alternatives.	3.07	0.930	Low
I encourage others, including family and friends, to practice proper plastic disposal.	3.38	0.803	Low
I actively participate in community initiatives aimed at reducing plastic waste, even if I am not required to do so.	3.21	0.759	Low
I feel a sense of responsibility to minimize my plastic waste to protect the environment for future generations.	3.48	0.675	High
Overall	3.27	0.485	Low

Table 8 shows the low values formation ($\bar{x}$=3.28, SD=0.485). This indicates that while some indicators of environmental value formation are present, these values are not yet consistently demonstrated across the population. The low standard deviation shows that most respondents share a similar level of engagement, reflecting a common tendency to deprioritize values-based action in favor of more immediate or practical concerns. This finding aligns with Miguel et al. (2024), who observed that values formation develops more slowly than awareness or knowledge, as it requires sustained reinforcement through education, social norms, and institutional modeling. Similarly, it was emphasized that without structured value integration in both community and household settings, individuals may struggle to internalize long-term environmental responsibility [6]. People involved in the survey reported they have limited engagement in organized waste efforts, barangay projects, or routinely join clean-up efforts. This situation ties in with the city's uneven implementation of Ordinance No. 962, since there is a big difference in the way each barangay involves its community and the annual information drive by CENRO might still not be enough to sustain regular community participation. While the policy is in place, its localized enforcement mechanisms and support systems are weak, particularly for residential areas. Furthermore, thinking that business owners are solely responsible for compliance makes people believe their efforts in waste management are not accountable. This action shows that the policy does not always have its intended effect in practice, highlighting the need for more inclusive and proactive implementation strategies.

Problem 3. What is the respondents' actual practices in terms of recycling and disposal?

Table 9 shows the types of plastic products most frequently dumped and recycled, as mentioned by the respondents. When you look at the table, you see which things people throw away or keep which reflects the everyday behavior of using plastics in the household.

Table 9 Disposal and Recycling of Plastic Products. (n=109)

Plastic Products	**Disposal**		**Recycling**		**Both**	
	f	%	f	%	f	%
Plastic bottles (e.g., water, soda, and juice bottles)	15	13.76	84	77.06	10	9.17
Food containers (e.g., takeaway containers, yogurt cups)	37	33.94	62	56.88	10	9.17
Wrappers (e.g., snack, candy, and chip wrappers)	68	62.38	33	30.27	8	7.33
Plastic bags (e.g., grocery bags, produce bags)	33	30.27	63	57.79	13	11.92
Resealable bags (e.g., Ziplock bags)	26	23.85	75	68.8	8	7.33
Shampoo, conditioner, and lotion bottles	61	55.96	40	36.69	8	7.33
Toothpaste tubes	74	67.88	31	28.44	4	3.66
Straws	43	39.44	54	49.54	12	11.00
Disposable utensils (e.g., spoons, forks, knives)	46	42.20	41	37.61	22	20.18
Disposable plates and cups	60	55.04	38	34.86	11	10.09
Cling wrap or plastic film	69	63.30	31	28.44	9	8.25
Detergent bottles, cleaning solution containers	44	40.36	59	54.12	6	5.50
Basin, plastic drums	19	17.43	82	75.22	8	7.33

Table 9 shows which plastic items are most often thrown away and recycled by participants. The largest group of items disposed of was sachet wrappers and plastic bags (94.50%). It proves that the major use of single-use plastics for regular household items continue, as is seen in the nation's total plastic consumption. The fact that they are easy to find and cheap makes people use them more, while rarely using them again, so they end up forming a large part of local waste. Meanwhile, respondents least disposed of plastic bottles (63.30%). Such results imply that bottles end up being used or recycled more since they are strong and valuable which demonstrates that more people are noticing how recyclable plastics could be beneficial economically [8].

The most recycled was plastic bottles (78.90%). Due to its recyclability, a good market price, and desirability for collectors cause these items to be found in both homes and junkshops. The idea that households increase recycling rate when they can see value in a material or sell it makes plastic bottles a popular option [7]. However, recycling of toothpaste tubes and sachet wrappers (15.60%) is low since their materials are mixed that are harder to process and their recycled value is low. Among the things often found in both landfills and recycling centers, plastic bottles show up even though they are not the most commonly disposed of item, their high recycling rate suggests that both their distribution and reuse are frequent. Still, toothpaste tubes turned out to be the most commonly thrown away and least commonly recycled option which suggests that many do not care enough to separate or recycle them. It is of concern because small, layered plastics tend to be missed during cleanup and can hurt the environment for a long time.

It is clear from this gap that translating understanding into consistent environmental actions is difficult which is why the Malaybalay City Ordinance No. 962 encourages proper waste disposal and prevents unnecessary dumping and burning of plastics. Still, the results suggest that barangays and communities need to improve their involvement in making the ordinance successful. These results point to the key aims of Sustainable Development Goal 11 (SDG 11) which aims to achieve inclusive, safe, resilient, sustainable cities. To hit the target, countries need to properly handle plastic waste, but this study finds that gaps in behavior, failing to value the problem, and inconsistent access to waste infrastructure hinder progress.

5. Conclusion

The demographic characteristics of the respondents reflect a population that is largely young to middle-aged, female-dominated, and relatively well-educated. This suggests that waste management practices in Malaybalay City are potentially shaped by women and working-age adults who are active in household and economic activities. The dominance of business owners and low-income earners also indicates that plastic waste behaviors may be influenced

by both entrepreneurial operations and resource constraints. A large portion of respondents came from Barangay Casi sang, which reflects higher accessibility or population density in the area. This shows the need for interventions that take into account the specific waste management infrastructure, challenges, and participation in each barangay, rather than assuming uniform conditions across the city.

Respondents exhibit a better awareness and knowledge regarding plastic waste disposal, which reflects the success of educational campaigns and widespread dissemination of environmental information. However, this knowledge does not fully translate into consistent practice, management behaviors, or deeply internalized values, which remain in the "Low" category. This gap between knowing and doing suggests that while respondents understand proper disposal methods, barriers such as habit, infrastructure limitations, or lack of motivation may hinder full compliance. Notably, respondents still practice segregation even without legal mandates, reflecting a foundational sense of environmental responsibility that can be strengthened with further support and reinforcement.

Most plastics thrown away were sachet wrappers and plastic bags, but plastic bottles which were less frequently disposed of, were still the most recycled, possibly because recycling systems make them simple to reuse. However, recycling tubes and sachet packaging is not popular, as they are often difficult to process because they are made of many different layers and are not greatly valued. Both plastic bottles and toothpaste tubes are widely found in garbage and recycling streams, but plastic bottles are much more likely to be recovered while toothpaste tubes are almost never recycled. It means better ways are required to manage difficult-to-recycle plastics and improved support for their recovery.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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