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A PARTICIPATORY FRAMEWORK FOR SUSTAINABLE PUBLIC MARKET WASTE MANAGEMENT AND STAKEHOLDER DYNAMICS IN POBLACION PAMPLONA, NEGROS ORIENTAL

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ABSTRACT

Solid waste management (SWM) in public markets is a critical issue due to the high volume of waste generated daily and its impact on sanitation and environmental sustainability. Despite existing policies, gaps persist between stakeholders' awareness and their actual waste management practices, highlighting the need to examine how these are implemented. This study aimed to assess the level of awareness, extent of practices, and perceived challenges of SWM among vendors, buyers, and market personnel, and to determine relationships and differences based on their profile and type. The respondents of the study were the 110 market stake holders (47 vendors, 13 market personnel, and 50 buyers). The researcher utilized the descriptive–correlational method, used a self-made questionnaire and analyzed using weighted mean, Spearman rank correlation, Fisher Exact test, and Kruskal Wallis Test. Results revealed that respondents were very aware of SWM particularly on waste segregation policies; however, practices were only often observed with lower engagement in community-based actions. Challenges were also often observed especially improper waste mixing by others, weak enforcement and monitoring, and limited stakeholder coordination. No significant relationship was found between demographic profile and SWM perceptions, but significant differences existed in awareness and perceived challenges when grouped by respondent type. The study concludes that while awareness is high, effective SWM requires stronger enforcement, improved facilities, and enhanced stakeholder collaboration. These findings support the implementation of a strategic participatory SWM framework and provide a basis for future research and policy development.

Keywords: *solid waste management, public market's stakeholders' awareness, practices, challenges*

INTRODUCTION

Solid waste management has become a major environmental concern in many developing countries due to the increasing volume of waste generated from daily human activities, Ferronato and Torretta (2019). Improper waste handling contributes to environmental pollution, sanitation problems, and increased risks of disease transmission, Abubakar et al. (2022). Public markets, in particular, are among the primary sources of solid waste because of the continuous exchange of goods, especially food products, packaging materials, and other market commodities, Tendero (2023). Effective solid waste management in these areas is therefore essential to maintain cleanliness, protect public health, and promote environmental sustainability. These conditions directly undermine Sustainable Development Goal (SDG) 3: Good Health and Well-Being and SDG 11: Sustainable Cities and Communities, which emphasize reducing health risks from pollution and promoting sustainable urban environments.

In the Philippines, local government units are mandated to implement proper waste management practices under Republic Act 9003, also known as the Ecological Solid Waste Management Act of 2000. This law emphasizes waste segregation, recycling, proper disposal, and community participation in managing solid waste, DENR (2020). However, despite the implementation of policies and programs, many public markets still experience problems related to improper waste disposal, lack of awareness, limited coordination among stakeholders, and negative attitudes toward waste management practices, Yukalang et al. (2017). The effectiveness of solid waste management largely depends on the level of awareness, participation, and cooperation among these stakeholders. Despite the importance of proper waste management, many markets continue to face challenges in implementing effective systems due to limited resources, inadequate facilities, and varying levels of awareness among stakeholders, Debrah et al. (2021). Identifying these challenges and examining the relationships between stakeholders' characteristics, awareness, and practices can provide valuable insights that may help improve waste management strategies.

Therefore, this study examined the solid waste management awareness, practices, and challenges among vendors, buyers, and market officials in the local market. Specifically, it sought to determine the socio-demographic characteristics of the stakeholders, assess their level of awareness regarding solid waste management, identify the challenges they encounter, and analyze the relationships and differences among these variables. The findings of this study may contribute to the development of improved waste management programs and policies that promote environmental responsibility and sustainable practices within the market community.

The primary output of this study served as the basis for crafting a Strategic Participatory Solid Waste Management (SWM) Plan for the Poblacion, Pamplona Public Market. This strategic plan operationalized the study findings by clearly defining

stakeholder roles—market vendors, market personnel and market buyers in the shared responsibility for waste segregation, recycling, composting, and proper disposal. Through these participatory mechanisms, the plan aimed to strengthen compliance, improve market sanitation, and contribute to the localized achievement of Sustainable Development Goals (SDGs) 3, 11, and 12.

Research Questions

This study aimed to determine the socio-demographic characteristics, levels of awareness, practices, and challenges related to solid waste management (SWM) among vendors, buyers, and market officials in the local market, and to examine the relationships and differences among these groups with respect to their SWM awareness, practices, and encountered challenges.

Specifically, this study sought to answer the following questions:

1. What is the Socio-Demographic Profile of the vendor Beneficiaries in term of the following?
   1.1 age
   1.2 sex
   1.3 highest educational attainment
   1.4 product sold
   1.5 years vending
2. What is the Socio-Demographic Profile of the buyers Beneficiaries in term of the following?
   2.1 age
   2.2 sex
   2.3 highest educational attainment
   2.4 frequency of visit
   2.5 types of purchases
3. What is the Socio-Demographic Profile of the government employees' beneficiaries in terms of the following?
   3.1 age
   3.2 sex
   3.3 highest educational attainment
   3.4 position
   3.5 role
   3.6 years in service
4. What are the respondents perceived Solid Waste Management Practices in the Public Market in terms of:
   4.1 level of awareness?
   4.2 level of observed practices?
   4.3 extent of challenges observed?

5. Is there a significant relationship between the respondents age, sex, and educational attainment and their perceived Solid Waste Management Practices in the Public Market in terms of:
   5.1 level of awareness?
   5.2 level of observed practices?
   5.3 extent of challenges observed?
6. Is there a significant difference in the respondents' perceptions of solid waste management practices in the public market when they are grouped according to their type (vendors, buyers, and government employees)?

METHODOLOGY

Research design. The research utilized a descriptive - correlational survey design to examine the level of awareness, challenges encountered, and solid waste management practices among market stakeholders. The descriptive approach was used to systematically determined the socio-demographic characteristics of respondents and describe the existing conditions related to solid waste management in terms of awareness, challenges, and practices among vendors, buyers, and market officials. The comparative method, specifically the ex-post facto or causal-comparative approach, was used in this study to determine whether significant differences existed among these groups in terms of their level of awareness, challenges encountered, and solid waste management practices. The study examined existing conditions and compared the responses of different groups to identify variations in their perceptions and behaviors related to solid waste management. The comparison of the groups helped identify patterns and possible factors influencing solid waste management practices among stakeholders.

Research environment. The study was conducted at, Pamplona Public Market at Barangay Poblacion, Municipality of Pamplona, Negros Oriental, Philippines. The market served as a central venue for daily commercial activities where different stakeholders such as vendors, buyers, and market officials interacted regularly. The Poblacion Pamplona Public Market was selected as the research locale because it represented a typical public market environment where solid waste was generated daily from various activities such as the selling of fresh produce, meat, fish, cooked food, and other goods. The presence of different stakeholder groups provided an appropriate setting for examining their level of awareness, challenges encountered, and solid waste management practices. The diverse population of vendors, buyers, and market officials enabled the researcher to assess differences and relationships among these groups regarding their awareness, challenges, and practices in solid waste management.

Research respondents. The respondents of the study were the randomly market stakeholders of Poblacion Pamplona Public Market, specifically vendors, buyers, and market personnel. Using the Slovin's Formula with a 5% margin of error, out of the 55 total population of the market vendors, only 47 of the vendors were considered as part of

the study. Out of the 15 total population of the public market personnel, only 13 were considered as part of the study and 50 buyers were selected using convenience sampling.

Category	Population	Sample Size
Market Vendors	55	47
Public Market Personnel	15	13
Buyers	50	50
	120	**110**

In identifying sample respondents, the stratified random sampling technique was applied wherein market stakeholders from each stratum was randomly selected in proportion to their actual population size within the market to ensure proportional representation from each subgroup, allowing valid comparison of waste management practices across different stakeholders. Selected Buyers were surveyed using convenience sampling through on-site intercepts. Respondents were approached after completing their transactions, and a structured questionnaire was administered to assess their awareness and waste disposal behaviors. Participation was voluntary, and informed consent was obtained prior to data collection.

Research instruments. Researcher-made questionnaire was used to collect data from market vendors, buyers, and market personnel regarding their awareness, challenges, and practices in solid waste management (SWM). The questionnaire was divided into four sections:

Part I –Socio-Demographic Profile. This section collected background information about the respondents age, gender, educational level, and role in the market. Part II – Level of Awareness on Solid Waste Management. This part evaluated the respondents' knowledge and understanding of proper SWM practices, such as waste segregation, disposal procedures, coordination among stakeholders, and attitudes toward waste management. Part III – Challenges Encountered in Solid Waste Management. This section identified the obstacles respondents faced in implementing proper SWM practices. Items focused on issues such as lack of information, limited availability of waste bins, and insufficient enforcement of policies. Part IV – Solid Waste Management Practices. This section examined the respondents' actual waste management practices, including segregation, proper disposal, cooperation with other stakeholders, and efforts to reduce waste. The researchers also read articles and publications regarding solid waste management in public markets and the community and integrated significant items into the questionnaire.

The questionnaire was presented to the environmental science experts to assess its content validity and ensure that all items were aligned with the study's specific research problems. The researcher incorporated the experts' feedback, revisions, and recommendations to improve the clarity and relevance of the questionnaire items.

Furthermore, the researcher conducted a pilot study at Amlan public market Negros Oriental to ensure item reliability. There were 15 selected stakeholders who served as the respondents. The Cronbach's Apha Coefficient test identified the reliability of each item. This test would check if multiple-question Likert's scale surveys are reliable and would tell how closely related a set of test items are as a group. The test was treated and analyzed to verify the internal consistency reliability of the items. Generally, a score of 0.70 alpha value is "acceptable". The results revealed the Cronbach's Alpha Coefficients: 0.862. This figure indicated that the items in every variable are reliable.

Research procedure. After the design hearing, all suggestions and revisions recommended by the panel members were carefully integrated by the researcher. A formal request letter to conduct the study was submitted to the Municipal Mayor through the Market Administrator of the Poblacion Pamplona Public Market. Upon approval, the researcher presented the signed request to the concerned market stakeholders. During the distribution of the questionnaires, the researcher clearly explained the purpose and significance of the study to the respondents. The completed questionnaires were collected immediately after they were answered.

Subsequently, the data gathered were tallied, analyzed, and interpreted using MS Excel software.

Statistical Treatment of the Data. The tools used by the researcher in analysing the data are the following:

Weighted mean. This was used in getting the extent of market stakeholders' awareness, challenges and practices on waste management in the market.

Spearman Rank Correlation Coefficient. This was utilized to identify the relationship between the (a) awareness, challenges and practices encountered by the market stakeholders on waste management: (b) profile (for vendors: age, sex, highest educational attainment, products sold and years of vending), (for market officials: age, sex, highest educational attainment, position, role and years in service) and (for buyers: age, sex, highest educational attainment, frequency of visits, and types of purchases). This test was selected since one of the data was measured in ordinal scale.

Fisher's Exact Test. This was utilized for the analysis of relationships between variables. This test was used to determine whether there is a significant relationship between the respondents' demographic profile (such as age, sex, and years of experience) and their level of awareness and practices in solid waste management. A level of significance of 0.05 was used as the basis for decision-making. If the computed p-value is less than 0.05, the null hypothesis is rejected, indicating a significant relationship between variables. If the p-value is greater than 0.05, the null hypothesis is accepted, indicating no significant relationship.

Kruskal–Wallis Test. This was used to determine the differences among groups of respondents (vendors, buyers, and market official). It allows the researcher to assess

whether there are statistically significant differences in the median scores of three or more independent groups.

Scope of the study. This study focused on assessing the solid waste management (SWM) in Poblacion Pamplona Public Market, specifically examining the level of awareness, extent of practices, and perceived challenges among vendors, buyers, and market officials. It also determined the relationship between respondents' profile (age, sex, and educational attainment) and their perceptions of SWM, as well as the differences when grouped according to respondent type.

The study employed a descriptive–correlational research design. Data were collected through a survey method using a self-made questionnaire administered to selected respondents, including vendors, buyers, and market officials. The questionnaire gathered information on respondents' demographic profile, awareness, practices, and perceived challenges related to SWM. Responses were analyzed using appropriate statistical tools to interpret the data.

Limitations of the study. This study is subject to several limitations beyond the control of the researcher. The data were based on self-reported responses from vendors, buyers, and market personnel, which may be prone to bias or inaccuracies due to personal perceptions and possible socially desirable answers. The respondents were limited to market officials, vendors and buyers who were present during the data collection period. Suppliers and sales agents were not included as they are not consistently present within the market environment and are not directly involved in daily on-site waste management practices and also because of their unpredictable schedules and irregular presence in the market, making it difficult for the researcher to determine and access them during the data collection period which may not fully represent the entire population of market stakeholders.

Furthermore, the study relied solely on a survey questionnaire as the method of data collection. Other methods such as direct observation, interviews, or actual measurement of waste generation were not utilized due to time and resource constraints, which could have provided more comprehensive and objective data. Lastly, the study focused only on the level of awareness, extent of practices, and perceived challenges of solid waste management and did not consider other factors that may influence SWM implementation.

RESULTS

Demographic Profile of Vendor Respondents

Table 1.1

Frequency distribution of Age of the vendor respondents

Age	Counts	% of Total	Cumulative %
18-24	8	17	17
25-34	16	34	51.1
35-44	7	14.9	66
65 and Older	5	10.6	76.6
55- 64	5	10.6	87.2
45-54	6	12.8	100

Table 1.2

Frequency distribution of Sex of the vendor respondents

Sex	Counts	% of Total	Cumulative %
Female	34	72.3	72.3
Male	13	27.7	100

Table 1.3

Frequencies of Educational Attainment of the vendor respondents

Highest Educational Attainment	Counts	% of Total	Cumulative %
College Graduate	3	6.38	6.38
College Level	4	8.51	14.89
Elementary Graduate	12	25.53	40.43
Elementary Level	3	6.38	46.81
High School Graduate	23	48.94	95.74
No Formal Education	1	2.13	97.87
Post Graduate	1	2.13	100

Table 1.4

Frequency distribution of the Types of Products Sold by the vendor respondents

Types of Products Sold	Counts	% of Total	Cumulative %
Fresh Produce	11	23.4	23.4
Processed/Cooked Food	5	10.64	34.04
Dry Goods/ Groceries	6	12.77	46.81
Meat/Poultry/Fish	14	29.79	76.6
Non-Food Items	11	23.4	100

Table 1.5

Frequency of Years the vendor respondents are vending

Years Vending	Counts	% of Total	Cumulative %
Less than 5 years	22	46.8	46.8
6-10 Years	17	36.2	83
11-15 Years	4	8.5	91.5
21-25 Years	2	4.3	95.7
26-30 Years	1	2.1	97.9
31 and above	1	2.1	100

Demographic Profile of the buyer respondents

Table 2.1

Frequency distribution of Age of the buyer respondents

Age	Counts	% of Total	Cumulative %
18-24	17	34	34
25-34	15	30	64
35-44	6	12	76
45-54	6	12	88
55- 64	2	4	92
65 or Older	4	8	100

Table 2.2

Frequency distribution of Sex of the buyer respondents

Sex	Counts	% of Total	Cumulative %
Female	24	48	48
Male	26	52	100

Table 2.3

Frequency of Educational Attainment of the buyer respondents

Educational Attainment	Counts	% of Total	Cumulative %
College Level	21	42	42
College Graduate	10	20	62
High School Graduate	9	18	80
Elementary Graduate	5	10	90
Elementary Level	3	6	96
Post Graduate	2	4	100

Table 2.4

Frequency distribution of the buyer respondents to visit the market

Frequency of Market Visit	Counts	% of Total	Cumulative %
2-3 times a week	22	44	44
Daily	9	18	62
Weekly	12	24	86
Less than weekly	7	14	100

Table 2.5

Distribution of the types of purchase of the buyer respondents

Purchases	Counts	% of Total	Cumulative %
Household Consumption	46	92	92
Small Business/Resale	4	8	100

Demographic Profile of the government employees

Table 3.1
Frequency distribution of Age of government employee respondents

Age	Counts	% of Total	Cumulative %
25-34	1	7.7	7.7
35-44	4	30.8	38.5
45-54	4	30.8	69.2
55- 64	4	30.8	100

Table 3.2
Frequency distribution of Sex of the government employee respondents

Sex	Counts	% of Total	Cumulative %
Male	8	61.50%	61.50%
Female	5	38.50%	100.00%

Table 3.3
Frequency distribution of Highest Educational Attainment of the government employee respondents

Educational Attainment	Counts	% of Total	Cumulative %
High School Graduate	3	23.08	23.08
College Graduate	4	30.77	53.85
Elementary Graduate	4	30.77	84.62
College Level	2	15.38	100

Table 3.4
Position Distribution of the government employee respondents

Position	Counts	% of Total	Cumulative %
SWM/Environmental Officer	9	69.2	69.2
Security/Enforcement	2	15.4	84.6
Collector/Enumerator	1	7.7	92.3
Market Supervisor Market	1	7.7	100

Table 3.5
Frequency distribution of Duties and Responsibilities of the government employee respondents

Duties	Counts	% of Total	Cumulative %
Sanitation and Maintenance Personnel	9	69.23	69.23
Security	2	15.38	84.62
Revenue Collection SWM	1	7.69	92.31
Policy Formulation/Planning	1	7.69	100

Table 3.6
Frequency distribution of the Years of Service of the government employee respondents

Years of Service	Counts	% of Total	Cumulative %
16-20 Years	1	7.69	7.69
11-15 Years	5	38.46	46.15
Less than 1 year	4	30.77	76.92
6-10 Years	2	15.38	92.31
1-5 Years	1	7.69	100.00

The respondents perceived Solid Waste Management Practices in the Public Market in terms of:

Table 4.1
Level of Awareness of the respondents towards the Solid Waste Management in the Public Market

Criteria	$\bar{x}$	VD	SD	Rank
I know which market wastes are Biodegradable (e.g., food scraps, spoiled produce).	3.65	Very Aware	0.71	2
I am familiar with the market's specific waste sorting policy/color coded bins.	3.66	Very Aware	0.61	1
I am familiar with the market's specific waste sorting policy/color coded bins.	3.28	Very Aware	0.96	8

I am aware that dumping unsorted waste directly into the market's main bins/collection areas is improper.	3.61	Very Aware	0.72	3
I know that burning waste within or near the market is prohibited.	3.55	Very Aware	0.79	6
I know that the SWM program requires cooperation between vendors, buyers, and market officials.	3.26	Very Aware	0.89	9
I know that the SWM program requires cooperation between vendors, buyers, and market officials.	3.30	Very Aware	0.88	7
I believe that proper SWM is important for the market's sanitation and reputation.	3.60	Very Aware	0.70	4.5
I believe my personal efforts in SWM can make a difference in the market.	3.60	Very Aware	0.65	4.5
Grand	**3.50**	**Very Aware**		

Table 4.2
Extent of Solid Waste Management (SWM) Practices in the Public Market as Perceived by the respondents.

Criteria	$\bar{x}$	VD	SD	Rank
I separate my waste into biodegradable and non-biodegradable containers at the source (stall/point of purchase).	3.29	Always Practiced	1.01	2
I segregate my recyclable materials (e.g., clean plastic, paper) from other non-biodegradable waste.	3.20	Often Practiced	0.99	3
I avoid throwing mixed or unsorted waste directly into unsegregated collection areas.	3.11	Often Practiced	1.09	4

I place residual (non-recyclable, non-biodegradable) waste in designated final disposal bins.	3.05	Often Practiced	1.04	5
I proactively offer suggestions or feedback on SWM to market officials or management.	2.51	Often Practiced	1.18	7
I remind others (co-vendors/buyers/clients) to properly dispose of their waste when I see improper disposal.	2.47	Rarely Practiced	1.22	8
I encourage the reduction of waste generation (e.g., reusing bags, avoiding single-use).	2.59	Often Practiced	1.15	6
I consider SWM as a personal commitment and responsibility, not just an obligation.	3.36	Always Practiced	0.90	1
Grand	**2.95**	**Often Practiced**		

Table 4.3
Extent of the Observed Challenges of implementation of the Solid Wastes Management in the Public Market as perceived by the respondents

Criteria	$\bar{x}$	VD	SD	Rank
Lack of clear and consistent information on how to sort specific types of waste (mixed plastic).	2.86	Often Observed	1.02	6
Limited time to properly sort waste due to market demand/buyers' schedules.	2.76	Often Observed	1.00	8
Insufficient number of labeled, segregated waste bins in convenient locations.	2.95	Often Observed	1.04	4
Other people (vendors/buyers/staff) mix waste, making my own sorting useless.	3.23	Often Observed	0.93	1

Lack of regular meetings or dialogues among market officials, vendors and buyers on SWM.	2.96	Often Observed	1.00	3
Weak enforcement or monitoring by market officials regarding SWM rules.	3.21	Often Observed	3.02	2
The perception that SWM is solely the responsibility of market officials/sanitation workers.	2.92	Often Observed	0.98	5
Resistance to change or unwillingness of some people to adopt new SWM practices.	2.85	Often Observed	0.99	7
Grand	**2.97**	**Often Observed**		

Significant relationship between the respondents age, sex, and educational attainment and their perceived Solid Waste Management Practices in the Public Market

Table 5.1
Relationship between the respondent's profile and their perceived level of awareness of implementation of SWM in the public market

Profile	Test Type	Value	P-value
Age	Fisher's Exact Test		0.306
Sex	Fisher's Exact Test		0.868
Educational Attainment	Fisher's Exact Test		0.542

Table 5.2
Relationship between the respondent's profile and their perceived level of observed SWM practices in the public market

Profile	Test Type	Value	P-value
Age	Fisher's Exact Test		0.512
Sex	Fisher's Exact Test		0.074
Educational Attainment	Fisher's Exact Test		0.06

Table 5.3
Relationship between the respondent's profile and their perceived observed challenges in the implementation of SWM practices in the public market

Profile	Test Type	Value	P-value
Age	Fisher's Exact Test		201

Sex	Fisher's Exact Test	0.517
Educational Attainment	Fisher's Exact Test	0.688

Table 6.1
Significant difference between the SWM practices in the public market perceptions of the respondents when group according to their type (vendors, buyers, and government employees)

Perception	χ^2	df	p
Level of Awareness	8.3	2	0.016*
Level of Practices	3.55	2	0.169
Extent of Challenges	24.98	2	<.001*

**Significant at P = < 0.05*

DISCUSSION

As presented in Table 1.1, results showed that the distribution of vendors by age, it is clear that the majority of vendor respondents were aged 25–34 years (34%), followed by 18–24 years (17%), while middle-aged groups (35–54) showed moderate representation, and older vendors (55 years and above) comprise a smaller proportion. Solid waste management practices in the public market are largely influenced by a younger, economically active workforce, suggesting that interventions, trainings, and awareness programs may be more effective if tailored toward younger vendors while still accommodating the needs of older participants. Konstantinidou et al. (2024) emphasized that age and waste management behavior shows that age is an important socio-demographic factor influencing environmental practices. In a systematic review of citizens' attitudes and practices toward waste reduction, separation, and recycling, the authors highlighted that age significantly affects people's knowledge, attitudes, and behaviors related to recycling and waste management.

Different age groups show different levels of awareness and engagement in waste practices, suggesting that tailored interventions may be needed to improve overall participation across age cohorts. This may imply that vendors are predominantly young adults in their most productive years. In the study of Guerrero et al. (2013), they found out the dominance of younger vendors may have significant implications for the adoption of environmental management practices. Similarly, Yap et al. (2022) emphasized that younger persons are more likely to adopt new knowledge, technologies, and behavior change interventions, including waste management practices such as waste segregation and recycling. It is further known that age is a critical variable in environmental awareness and participation in waste management activities, in which younger persons are more adaptable to environmental policies and educational interventions Saseanu et al. (2019). However, the presence of older vendors is significant and calls for inclusive waste management interventions that accommodate different levels of physical ability, traditional practices, and resistance to change.

Table 1.2 presented the frequency distribution of sex among vendor respondents indicates that the majority are female (72.3%), while males account for only 27.7%. This suggests that solid waste management practices in the public market are predominantly influenced by female vendors**,** indicating that programs, policies, and interventions should be gender-responsive, with strong consideration of women's roles and participation in waste management activities. UNEP (2023), in a study on gender and waste management, pointed out the central role of vendors in daily waste handling, this gender distribution has important implications for solid waste management (SWM) practices, as female vendors are likely responsible for much of the segregation, waste picking, sweeping, disposal, and general waste management within the market. Recent study underscores that women often play a pivotal role in waste management, particularly in informal and community-based settings. Studies show that female participation positively influences waste handling, recycling, and compliance with SWM practices, due to their consistent engagement and responsibility in daily operations S.O and H.O 2024).

These findings are likewise evident in the study of Obulesu and Sujatha (2024), that women's involvement is crucial for the success and sustainability of SWM initiatives, as they often drive behavioral change and can encourage cooperative practices among peers. Further supporting this, Asteria and Haryanto (2021) highlighted that the predominance of female vendors suggests that SWM programs, policies, and interventions should be gender-responsive, recognizing women's contributions and leveraging their central role. Practical applications include targeted training, leadership opportunities in waste committees, and participatory initiatives that empower women to lead community-wide environmental efforts, Cabias et al. (2024). Gender-sensitive approaches in SWM have been shown to enhance compliance, program effectiveness, and sustainability, particularly in markets where women are the main participants in waste handling, Cimene et al. (2024). By acknowledging and supporting women's key role in waste management, public market authorities can improve SWM outcomes, foster peer accountability, and strengthen the overall environmental performance of the market.

Table 1.3 shows the distribution of educational attainment among vendor respondents shows that the majority are high school graduates (48.94%)**,** followed by elementary graduates (25.53%). Only a small proportion of vendors have reached college level or higher (14.89%), and very few have no formal education (2.13%). This indicates that most vendors possess basic to moderate educational backgrounds, which has important implications for the design and implementation of solid waste management (SWM) practices in the public market. In the study of Meyer (2015) and Bedural (2018) emphasized that educational attainment significantly affects individuals' comprehension, adoption, and compliance with environmental practices, including waste management. Individuals with lower levels of formal education may have limited exposure to technical knowledge, making it essential to deliver information in clear and accessible formats. This may imply that vendors are more responsive to straightforward, experience-based learning approaches rather than complex or highly technical instructions.

In the study of Tayco et al. (2025), Romero and Paulin (2024), it was found that simplified communication strategies such as visual aids, demonstrations, and step-by-

step instructions are more effective in promoting proper waste management behaviors among populations with limited educational backgrounds. Similarly, Conti et al. (2024) and Das et al. (2025) highlighted that pictorial signage and hands-on training significantly improve compliance with waste segregation and disposal practices, particularly in market and urban settings. These findings indicate that educational interventions should be designed to match the comprehension levels of the target population to ensure effectiveness.

It is further supported by UNEP (2021) that tailoring SWM programs to the literacy level of stakeholders enhances participation, reduces errors in waste segregation, and promotes sustainable environmental practices. Clear policies, accessible instructions, and inclusive training approaches enable vendors regardless of educational background to actively engage in proper waste management. However, the presence of vendors with higher education levels also provides an opportunity to reinforce leadership roles and peer learning within the market community, supporting the overall effectiveness and sustainability of SWM initiatives. Solid waste management practices should be designed using simple, clear, and practical approaches, as most vendors have basic to moderate educational backgrounds, ensuring that instructions and policies are easily understood and effectively implemented.

Table 1.4 revealed the distribution of vendors according to the type of products sold shows that the largest group of vendor respondents are those selling meat, poultry, and fish (29.79%), followed by fresh produce and non-food items (23.4% each). Smaller proportions are involved in dry goods/groceries (12.77%) and processed or cooked food (10.64%). This indicates that a significant portion of vendors are engaged in selling perishable and organic products, which are major contributors to waste generation in public markets.

Solid waste management (SWM) practices in the public market are influenced by the type of goods sold by vendors, as food-based and wet market activities tend to generate large volumes of organic and biodegradable waste, while non-food vendors produce more non-biodegradable and recyclable materials. Lucchetta et al. (2023) and Al-Gheethi et al. (2021) emphasized that wet markets, particularly those selling meat, fish, and vegetables, are major sources of organic waste due to the nature of their products. These wastes are highly biodegradable and decompose rapidly, which can result in foul odors, pest infestations, and potential health risks if not properly managed. This may imply that vendors engaged in food-related activities require more frequent waste collection and stricter waste handling practices.In the study of Kaza et al. (2018) and UNEP (2021), it was found that organic waste from market sources is highly putrescible and requires proper segregation, timely collection, and appropriate treatment methods such as composting to prevent environmental and public health issues. Similarly, Ncube et al. (2021) highlighted that vendors selling dry goods and non-food items contribute significantly to non-biodegradable waste streams, including plastics, paper, and packaging materials, which require recycling and proper disposal systems. These findings indicate that different types of vendors generate distinct waste streams that must be managed using appropriate and targeted strategies.

It is further supported by Guerrero et al. (2013) that integrated SWM systems that consider waste composition and source-specific generation are more effective in managing diverse waste streams in market environments. Tailoring waste management approaches based on the type of products sold enhances efficiency, promotes proper segregation, and reduces environmental impacts. However, the coexistence of various vendor types within the market also calls for a comprehensive and coordinated SWM system that can address both organic and non-biodegradable wastes, ensuring overall cleanliness, sustainability, and compliance among all vendors. Solid waste management practices should be tailored according to the type of products sold, particularly focusing on proper handling and disposal of organic waste from meat and fresh produce, while also addressing packaging and non-biodegradable waste from other product categories.

The data exposed in table 1.5 showed that the distribution of years in vending shows that nearly half of the respondents have been vending for less than 5 years (46.8%), followed by those with 6–10 years of experience (36.2%), while only a small proportion have more than 10 years of experience. This indicates that the majority of vendors are relatively new or moderately experienced, suggesting the need for continuous orientation, training, and monitoring to establish proper waste management habits early in their vending experience.

This result is significant in understanding solid waste management practices, as length of experience can influence familiarity with market rules, habits, and compliance behavior. The findings of Guerrero, Maas, and Hogland (2013), Agamuthu and Barasarathi (2020) are in agreement to the results of the current study when they emphasized that that newer vendors may still be in the process of learning and adapting to established waste management systems, making them more receptive to training and behavioral interventions. Further supporting this, UNEP (2021) and Das et al. (2025) highlighted that consistent exposure and experience over time help reinforce proper waste management behaviors. Repeated engagement with waste segregation and disposal practices strengthens habits and improves compliance, suggesting that long-term participation contributes to more sustainable environmental practices. Their findings indicate that both learning and habit formation are essential components in achieving effective SWM implementation. They also pointed out that continuous orientation, training, and monitoring are essential, particularly for newly established vendors. Early intervention allows vendors to adopt proper waste segregation, disposal practices, and environmental responsibility from the beginning of their market participation, leading to long-term compliance. At the same time, more experienced vendors can be utilized as role models or peer educators, promoting knowledge sharing and reinforcing good practices among newer vendors, ultimately contributing to a more effective and sustainable waste management system.

The age distribution of buyer respondents, as presented in Table 2.1, reveals that the largest group belongs to the 18–24 age category (34%), followed by those aged 25–34 years (30%), while relatively fewer respondents fall within the older age groups. This finding suggests that public market buyers are predominantly young adults, representing an active and highly engaged consumer segment in market activities. The dominance of

younger buyers indicates a dynamic consumer base that is more likely to influence purchasing patterns and waste generation behaviors within the market environment.

This age pattern is significant in understanding solid waste management (SWM) behavior, as younger individuals are generally more receptive to environmental awareness, innovation, and behavior change initiatives. The findings of this study align with the research conducted by Ágoston et al. (2024) examined age differences and profiles in pro-environmental behavior and eco- emotions. Their study revealed that younger age groups tend to demonstrate greater openness to sustainability-related practices due to their exposure to modern education and environmental discourse. Similarly, Konstantinidou et al. (2024) found that younger consumers are more adaptable to sustainable behaviors such as waste segregation, reduction of plastic use, and participation in recycling programs.

Moreover, consumer behavior plays a critical role in waste generation, particularly in public markets where buyers contribute significantly to packaging waste, food waste, and improper disposal practices. Kaza et al. (2018) and UNEP (2021) emphasized that consumption patterns directly influence the volume and type of waste generated in urban and market settings. Since younger buyers dominate the market population, targeted awareness campaigns and behavioral interventions can be effectively directed toward this group. Strategies such as promoting reusable bags, proper waste disposal, and participation in segregation programs are more likely to succeed when aligned with the attitudes and responsiveness of younger consumers Konstantinidou et al. (2024).

Similar study of Alvarado et al. (2025) suggest that the effectiveness of SWM initiatives in the public market can be enhanced by focusing on the dominant young adult consumer group. By designing age-appropriate awareness programs and encouraging responsible consumption behaviors, market authorities can reduce waste generation and improve compliance with proper waste management practices. At the same time, inclusive strategies should still be considered to engage older consumers, ensuring a comprehensive and sustainable approach to solid waste management.

The table 2.2 presented the sex distribution of buyer respondents is nearly equal, with males comprising 52% and females 48% indicating a balanced participation of both sexes in public market activities. This suggests that waste generation and disposal behaviors in the market are influenced by both male and female buyers, making gender an important but non-dominant factor in shaping solid waste management (SWM) practices. Solid waste management practices should be designed to be inclusive of both sexes, as both male and female buyers equally contribute to waste generation and can play significant roles in proper waste management.

This finding is consistent with studies indicating that both men and women actively contribute to waste generation in public and commercial spaces, particularly through purchasing behavior, packaging use, and disposal practices. Zhao et al. (2021) stressed that both men and women actively contribute to waste generation in public and commercial spaces through purchasing behavior, packaging use, and disposal practices.

This implies that targeting both male and female buyers in SWM initiatives can improve compliance and participation across the market population.

In the study of Isenhour (2009), it was found that inclusive and behavior-based approaches, such as promoting proper waste disposal, encouraging reusable materials, and providing accessible waste facilities, are more effective when they engage participants of both sexes. Their findings indicate that gender-inclusive interventions can foster equal participation and shared responsibility in waste management, leading to better environmental outcomes. Similarly, Cimene et al. (2024) research in urban and market settings suggests that addressing the behaviors and needs of both male and female consumers strengthens the overall effectiveness of SWM programs and enhances adoption of sustainable practices. However, despite the balanced representation of sexes among buyers, SWM interventions must recognize potential differences in attitudes, habits, and engagement levels. By designing policies, awareness campaigns, and facilities that are inclusive of both men and women, market authorities can reduce waste mismanagement, increase participation in segregation and recycling programs, and promote a more sustainable and environmentally responsible market environment.

Shown in table 2.3 is the data on the educational profile of buyer respondents reveals that the majority have reached college level (42%), followed by college graduates (20%) and high school graduates (18%), while fewer respondents have only elementary-level education. This indicates that most buyers possess relatively higher educational attainment, suggesting a population that is more likely to understand and engage with structured solid waste management (SWM) programs. Solid waste management practices can incorporate more advanced and information- driven strategies, as most buyers have relatively higher educational attainment, which may support better understanding and participation in waste management initiatives.

The current results are evident in the study of Konstantinidou et al. (2024) which emphasizes that education level proved to be a decisive factor, as citizens with higher educational levels possessed greater knowledge regarding recycling and, at the same time, had more environmentally conscious awareness about environmental problems. Similarly, Russell (2025) pointed out that education enhances individuals' capacity to process environmental messages and participate in waste reduction initiatives, making them more responsive to policies and campaigns.

Furthermore, Bation and Pudan, (2024) highlights that information-driven and knowledge-based interventions are particularly effective among educated populations, as they can better comprehend the environmental and social impacts of improper waste management. This suggests that strategies such as awareness campaigns, signage, digital information dissemination, and participatory programs can be successfully implemented among buyers in the public market.

Table 2.4 presents the data on the frequency of market visits among buyer respondents indicates that the majority of buyer respondents visit the market 2–3 times a week (44%), followed by weekly visitors (24%) and daily visitors (18%), while fewer

respondents visit less than weekly (14%). This suggests that a large proportion of buyers are regular or frequent market-goers, contributing consistently to market activities and, consequently, to waste generation. Solid waste management practices should focus on frequent market-goers, as their regular visits contribute significantly to waste generation, making them key targets for consistent waste reduction and proper disposal initiatives.

This result affirms the statement of Hassan (2025), Dodds and Holmes (2016) that habitual consumer behavior plays a critical role in shaping waste generation and disposal practices, where frequent buyers tend to develop consistent habits—either positive or negative—regarding waste management. Cachero-Martínez and Vázquez-Casielles, (2018) emphasized the regular market visits are more likely to respond to continuous awareness campaigns, nudges, and facility improvements, such as accessible waste bins, segregation systems, and incentives for waste reduction. Their repeated engagement also makes them key contributors to establishing social norms and peer influence within the market environment.

These findings underscore the SWM programs should prioritize frequent market visitors, particularly those who come multiple times a week or daily, by implementing consistent and visible waste management strategies. These may include educational signage, promotion of reusable materials, and proper waste disposal systems.

Table 2.5 exposed the data of the distribution of buyers according to type of purchase reveals that the vast majority purchase for household consumption (92%), while only a small proportion engage in small business or resale activities (8%). This indicates that most transactions in the public market are driven by everyday household needs, making households the primary source of waste generation associated with market activities.

Solid waste management practices should prioritize household-related waste, as the majority of purchases contribute to everyday domestic waste, while also considering the impact of small-scale resale activities. This finding aligns with the study of Suthar and Singh (2015) showing that households are the main contributors to municipal solid waste, particularly through daily consumption of food, packaging materials, and other essential goods. Similarly, Dehghani and Karri (2021) further explain that household-related activities generate significant amounts of organic waste (e.g., food scraps) and plastic packaging, which are key components of urban waste streams. As stressed by Casonato et al. (2023) increased household consumption has been linked to higher levels of food waste and plastic waste, highlighting the need for improved waste reduction and management strategies at the consumer level. Moreover, (Sustainability Directory, 2025) emphasizes that consumer purchasing behavior directly influences waste generation patterns, especially in food consumption and packaging use.

The findings from Table 3.1 indicate that the age distribution of government employee respondents shows that the majority fall within the 35–64 age range, with each group (35–44, 45–54, and 55–64) comprising 30.8%, while only a small proportion belong to the 25–34 age group (7.7%). This indicates that most government personnel involved

in the public market are middle-aged to older adults, suggesting a workforce with substantial professional experience. Solid waste management practices in the public market may rely on experienced government employees, suggesting that policy implementation and monitoring benefit from mature and experienced personnel.

This finding is supported by recent literature emphasizing that effective SWM systems depend heavily on governance capacity and experienced personnel, particularly in planning, monitoring, and enforcement. For instance, the World Bank (2025) highlights that strong institutional support and experienced local government staff are critical in ensuring the success of municipal waste management programs, especially in developing countries transitioning toward sustainable and circular waste systems.

Moreover, studies of Domingo et al. (2021) highlighted that local government units (LGUs) play a central role in implementing SWM policies such as Republic Act 9003 in the Philippines, where proper enforcement and monitoring require knowledgeable and skilled personnel. Experienced employees are more capable of ensuring compliance, coordinating stakeholders, and addressing operational challenges in waste management systems. Kaza et al. (2018) emphasizes that local governance plays a decisive role in improving waste management outcomes, particularly when supported by competent and experienced public officials who understand both policy and community dynamics.

Table 3.2, results show that male government employees comprise the majority are males (61.5%), while females account for 38.5%, indicating a male-dominated workforce in the implementation of solid waste management (SWM) in the public market. This gender distribution suggests that decision-making and enforcement roles may be more influenced by male personnel, which can shape how waste management policies and practices are carried out. Solid waste management practices may be influenced more by male government employees, highlighting the need to ensure gender-inclusive participation in policy enforcement and decision- making.

The result of this study is supported by Recent studies that have emphasized Gender-inclusive approaches improve the efficiency and sustainability of waste management systems. Studies show that such policies enhance community participation, job performance, and the overall effectiveness of solid waste management programs, UNEP (2019) and World Bank (2025a). At the same time, research shows that women play a significant role in waste segregation, recycling, and household-level waste management, even if they are less represented in formal government roles, Cabias et al. (2024). In addition, evidence suggests that excluding women from environmental decision-making may limit the success of waste management programs, as diverse perspectives are essential for addressing complex environmental issues. Gender-responsive governance has been shown to improve policy outcomes and increase stakeholder engagement in SWM initiatives, UNEP (2019). Although male employees dominate SWM roles, it is important to promote gender-inclusive participation in policy enforcement and decision-making. Encouraging balanced representation can lead to more effective, participatory, and sustainable waste management practices.

The findings indicated in table 3.3 revealed that government employee respondents have diverse educational backgrounds, with college graduates and elementary graduates each comprising 30.77%, followed by high school graduates (23.08%) and those with college-level education (15.38%). This variation suggests that differences in educational attainment may influence understanding, interpretation, and implementation of solid waste management (SWM) policies, particularly in technical and procedural aspects of waste handling. Solid waste management practices should be communicated in clear, simple, and accessible ways to accommodate employees with diverse educational backgrounds.

Studies emphasize that educational level plays a significant role in shaping environmental awareness, knowledge, and compliance with SWM practices. Individuals with higher educational attainment are generally more likely to understand environmental policies and adopt proper waste management behaviors, while those with lower educational backgrounds may require simplified instructions and continuous training to ensure effective participation Konstantinidou et al. (2024). In addition, Cabias et al. (2024) highlights that capacity-building and continuous training are essential in institutions where employees have varied educational levels, especially for contractual or non-regular staff who may have limited exposure to formal training programs. Providing accessible and inclusive communication strategies has been shown to improve compliance, consistency, and overall effectiveness of SWM implementation.

The findings underscore that SWM should be designed using clear, simple, and practical approaches, supported by regular training and orientation. Ensuring that all employees regardless of educational attainment or employment status fully understand policies will help achieve consistent and effective waste management practices in the public market.

Table 3.4 revealed that the majority of government employee respondents are SWM/Environmental Officers (69.2%), followed by Security/Enforcement personnel (15.4%), while only a few serve as Collectors/Enumerators and Market Supervisors (7.7% each). This indicates that solid waste management (SWM) efforts in the public market are largely driven by specialized environmental personnel, who are primarily play a central role in policy implementation, monitoring, and coordination within the public market. The result of this study is supported by Recent studies Kaza et al. (2018) emphasized that dedicated SWM officers play a crucial role in ensuring the effectiveness of waste management systems, particularly in local government settings. Their responsibilities include policy implementation, supervision of waste collection, and coordination among stakeholders, which are essential for maintaining efficient and sustainable waste management practices. Similarly, Espiritu (2024), Vermudo and Bonita (2025) highlights that multi- sectoral collaboration among different roles such as enforcement personnel, collectors, and supervisors are necessary for successful SWM implementation. While environmental officers lead the process, the support of enforcement staff and operational workers ensures compliance, proper waste handling, and continuous service delivery. The dominance of SWM/Environmental Officers are key drivers of policy implementation, monitoring, and coordination in the public market. Strengthening their capacity, while also

enhancing collaboration with other personnel, can improve the overall effectiveness and sustainability of SWM practices, World Bank Group (2025).

As presented in table 3.5, the findings shows that the majority of government employee respondents are assigned to sanitation and maintenance duties (69.23%), followed by security roles (15.38%), while only a small number are involved in revenue collection related to SWM (7.69%) and policy formulation or planning (7.69%). This indicates that solid waste management (SWM) in the Pamplona public market is largely focused on operational activities, particularly waste collection, cleaning, and maintenance, rather than on strategic planning and policy development. As stipulated by Rashed (2025), in his study titled “Sustainable solid waste management in the context of environmental governance” found that operational personnel, such as sanitation workers, play a critical role in maintaining cleanliness and ensuring the day-to-day implementation of waste management systems. However, the limited number of personnel engaged in planning and policy-making may affect the long-term sustainability, monitoring, and improvement of SWM programs, as strategic direction and evaluation are equally important components of effective waste management. In addition, research highlights that a well-functioning SWM system requires coordination among different roles, including operational staff, enforcement personnel, and planners.

A study by Dela Peña et al. (2024) in Baguio City found that effective implementation of SWM practices depends not only on awareness but also on the coordinated efforts of different actors such as business owners, local authorities, and waste handlers. Their findings emphasize that compliance with waste regulations improves when responsibilities are clearly distributed and supported by enforcement mechanisms. Similarly, Espino et al. (2025) found that the policy is impartial, but there is a lack of enforcement workforce and effort, challenges in maintaining sanitary landfills, a lack of cooperation from barangays, and inadequate segregation at source, as identified by the participants as the key experiences and critical observations on solid waste management in Davao City. Hence, they inferred essential policies to change, system reformation, and strategies to overcome challenges, which include the establishment of deputized enforcers in barangay, scheduled collection of garbage, cooperation of barangay on segregation, collaboration with waste management companies and other recycling facilities or Public and Private Partnership (PPP), and sense of responsibility and accountability should be grappled by the residents. In conclusion, the participants’ postulations indicated that local government policies on community-based solid waste management in Davao City remain inadequate and outdated, emphasizing the need for enforcement and policy amendments. Ultimately, an in-depth investigation into the participants lived experiences on solid waste management was successful.

Other studies emphasize the critical role of enforcement personnel, particularly environmental health officers and regulatory authorities, in ensuring compliance with solid waste management (SWM) policies. According to World Health Organization (2018) environmental health officers are tasked with monitoring sanitation standards, conducting inspections, and enforcing regulations to prevent environmental and public health risks. Their presence ensures that waste management practices adhere to established legal

and environmental standards. Similarly, UNEP (2019) highlights that effective enforcement mechanisms significantly improve compliance with waste segregation and disposal policies. Regulatory personnel play a crucial role in identifying violations, issuing penalties, and promoting accountability among stakeholders, which strengthens overall SWM systems.

The dominance of sanitation and maintenance personnel suggests that SWM efforts are strong in implementation but may need strengthening in planning, policy development, and resource management. Enhancing the involvement of personnel in strategic roles can improve the effectiveness, coordination, and sustainability of waste management practices.

Shown in table 3.6, most government employee respondents have 11–15 years of service (38.46%) and less than 1 year of service (30.77%), while fewer employees have 1–10 years (23.07%) or 16–20 years (7.69%) of service. This indicates solid waste management practices benefit from a mix of experienced and new employees, suggesting that institutional knowledge from long-serving staff can be combined with fresh perspectives from newer personnel to improve implementation and innovation. According to Wilson and Rodic (2015), effective SWM systems rely heavily on human resources and institutional capacity, emphasizing that experienced personnel contribute to continuity, operational stability, and knowledge retention, while new staff bring updated skills and adaptive thinking necessary for improving waste management practices. Similarly, Guerrero et al. (2013) highlighted that one of the key factors influencing successful SWM systems is the competence and diversity of personnel involved. Their study noted that experienced workers provide practical knowledge of local systems and long-term practices, whereas newer employees contribute fresh perspectives, technological awareness, and openness to change, which are essential for innovation and system improvement.

Results in table 4.1 revealed that respondents are generally very aware of solid waste management in the public market, with the highest awareness in knowing the market's specific waste sorting policy/color-coded bins (VD 3.66) and the lowest in understanding that the SWM program requires cooperation between vendors, buyers, and market officials (VD 3.26). Overall, the grand mean is 3.50, indicating a very aware level. The high level of awareness suggests that respondents are knowledgeable about proper waste handling and policies, which can facilitate the successful implementation of SWM programs. However, continued emphasis on cooperative efforts among all stakeholders may further strengthen compliance and effectiveness. The highest level of awareness in knowing the market's waste sorting policy and color-coded bins (VD 3.66) suggests that respondents are well-informed about proper waste segregation systems. This implies that effective information dissemination and the presence of visible waste management facilities (such as labeled bins) play a crucial role in enhancing awareness and guiding appropriate waste. Research indicates that increasing public awareness through education and consistent policy enforcement leads to improved solid waste segregation and handling among market stakeholders Ramos E. (2025). Similarly, Bagastyo et al. (2023) and Castilla et al. (2024) found that although most respondents

have high knowledge and awareness, their attitudes show low participation in waste segregation and recycling. Conducting regular education/training in waste management and providing additional recycling facilities, rewards, and incentives were suggested.

The study of Carale et al. (2025) confirm that clear policies, proper labeling, and accessible infrastructure significantly improve compliance with waste segregation practices. However, the relatively lower awareness in understanding that SWM requires cooperation among vendors, buyers, and market officials (VD 3.26) points to a gap in recognizing the importance of collective responsibility. This may suggest that respondents tend to perceive waste management primarily as an individual obligation rather than a shared responsibility among stakeholders. This observation is supported by the study of Rashed (2025) indicating that although awareness of rules may be high, understanding of collaborative roles and stakeholder integration often remains limited, which can affect the effectiveness of implementation. The implication of these findings is that while respondents demonstrate strong knowledge of SWM policies and practices, there is a need to further enhance awareness of cooperative and participatory approaches. Molina and Catan (2021) argue that involving local communities in waste management programs leads to positive changes in attitudes and behaviors toward solid waste management. The authors state that community engagement fosters a sense of ownership over local environmental issues, encouraging active participation in recycling initiatives or proper disposal practices.

Effective waste management systems depend not only on individual knowledge but also on active collaboration, coordination, and shared accountability among stakeholders. Recent studies highlight that multi-stakeholder participation improves compliance, efficiency, and sustainability of SWM programs, particularly in public and urban settings UNEP (2021). Therefore, reinforcing the importance of collective action and stakeholder cooperation can further strengthen the effectiveness of SWM implementation in the public market.

Results showed in table 4.2 that respondents generally often practice solid waste management in the public market (grand mean 2.95). The highest-rated practices are considering SWM as a personal responsibility (VD 3.36) and separating waste at the source (VD 3.29). The lowest-rated practices include reminding others to dispose of waste properly (VD 2.47) and offering suggestions to market officials (VD 2.51). This implies that while respondents demonstrate a good level of personal SWM practices, engagement in community-wide or cooperative actions (like advising others or giving feedback) is limited. Strengthening collective participation and peer accountability could improve overall waste management effectiveness in the market.

This finding supports the study of Guerrero et al. (2013) showing that individual attitudes and responsibility are key predictors of environmental behavior, particularly in waste management, other studies also confirm that behavioral factors such as knowledge, attitudes, and perceived control influence market waste practices, including segregation and proper disposal Cheng (2020). However, the lower ratings in reminding others to dispose of waste properly and offering suggestions to market officials indicate

limited participation in collective or community-based actions. This may imply that while respondents manage their own waste, they are less involved in influencing others or engaging in decision-making processes. This is consistent with findings that community participation remains a major challenge in SWM systems, particularly in developing countries. Guerrero et al. (2013) highlight that lack of stakeholder involvement and coordination weakens the effectiveness of waste management systems, emphasizing the need for broader participation and partnership

Furthermore, effective SWM requires not only individual compliance but also collective action and cooperation among stakeholders. Research shows that integrated and participatory approaches improve the sustainability and success of waste management programs, especially in urban and developing contexts. Therefore, while personal practices are evident among respondents, the limited engagement in participatory behaviors highlights the need to strengthen community-based initiatives, peer involvement, and stakeholder collaboration to improve overall waste management effectiveness.

Table 4.3 displays that respondents perceive the challenges in implementing solid waste management in the public market as often observed (grand mean 2.97). The most significant challenges include other people mixing waste (VD 3.23), weak enforcement or monitoring by market officials (VD 3.21), and lack of regular dialogues on SWM (VD 2.96). Less observed challenges include limited time for sorting (VD 2.76) and lack of clear sorting information (VD 2.86). These challenges suggest that although respondents are knowledgeable and aware of SWM policies, behavioral issues among vendors and buyers and insufficient institutional support hinder effective implementation. Despite respondents being very aware of the solid waste management program in the market, its effective implementation is hindered by behavioral issues among vendors and buyers, as well as weak institutional support. Strengthening enforcement, providing clear and consistent guidance, and fostering cooperation through regular meetings and stakeholder engagement could help overcome these challenges and improve overall compliance and sustainability of the SWM program.

These findings are similar with the result of the study conducted by Rodni et al. (2025), Raghu and Rodrigues (2021) highlighting that behavioral non- compliance, social norms, and inadequate supervision are major barriers to effective waste management, particularly in public markets and urban settings. A study by Dizon and Despojo (2024) investigated the problems and practices in solid waste management (SWM) among students at home. The researchers found that the main challenges in implementing SWM were low awareness of proper waste disposal, poor coordination among household members, and insufficient sorting practices. Similar to the public market scenario, behavioral issues and lack of institutional support hindered effective SWM implementation. The study emphasizes that education, regular guidance, and active participation of all stakeholders are critical to improving compliance and fostering sustainable waste management practices. Research also emphasizes that institutional weaknesses, including poor enforcement, monitoring, and coordination, reduce the efficiency and sustainability of SWM programs.

Furthermore, the lack of regular dialogues and stakeholder engagement reflects limited collaborative practices, which are critical for sustaining compliance and promoting shared responsibility Jade et al. (2024). The implication of these findings is that while respondents demonstrate awareness and willingness to comply, the effectiveness of SWM in the public market is constrained by behavioral, institutional, and systemic barriers. Addressing these challenges requires strengthened enforcement, clear and consistent guidance, and structured stakeholder engagement, such as regular meetings, workshops, and feedback mechanisms, Tendero, E. J. (2023). Studies confirm that multi-stakeholder participation and collaborative governance improve compliance, efficiency, and sustainability of waste management programs, particularly in contexts with diverse stakeholders like public markets. Implementing these strategies can enhance adherence to SWM policies and strengthen the overall effectiveness and sustainability of waste management in the market.

Table 5.1 showed the analysis indicates that there is no significant relationship between the respondents' profile (age, sex, educational attainment) and their perceived level of awareness of SWM implementation, as all p-values are greater than 0.05 (Age 0.306, Sex 0.868, Educational Attainment 0.542). These results suggest that demographic characteristics do not significantly influence awareness of SWM policies and practices among market stakeholders. Awareness of SWM in the public market appears to be independent of demographic factors, suggesting that information campaigns and training can target all vendors and buyers equally, without needing to tailor by age, sex, or education level. This finding aligns with recent studies showing that awareness of waste management practices can be widely distributed across demographic groups, particularly when information is effectively disseminated through market signage, training, and public campaigns. Similarly, Akbar et al. (2024) research in urban and peri-urban markets has shown that age, gender, or formal education often do not significantly predict knowledge of waste segregation or compliance behaviors, emphasizing the importance of universal awareness campaigns rather than targeted interventions.

In the study of Jeremias (2021) conducted a study examining the relationship between socio-demographic characteristics and environmental knowledge, awareness, and perception on solid waste management (SWM) practices among households in selected urban barangays in Sorsogon City, Philippines. The study revealed no significant relationship between levels of environmental awareness and actual SWM practices, indicating that demographic factors such as age, educational attainment, and household income did not strongly affect how households practiced SWM in this context.

The findings underscore that SWM awareness initiatives do not need to be tailored based on demographic characteristics. Market authorities and program implementers can design inclusive information campaigns, training sessions, and workshops that reach all vendors and buyers equally, ensuring that all stakeholders understand the waste management policies, segregation procedures, and environmental responsibilities.

Similarly, study by Dizon and Despojo (2024) examined problems and practices in SWM among students at home. They found that although respondents were aware of SWM policies, behavioral issues such as improper segregation and irregular disposal hindered effective implementation. The study highlights that awareness alone is insufficient; active engagement, enforcement, and guidance are essential to translate awareness into consistent practice.

Table 5.2 showed the analysis indicates that there is no significant relationship between the respondents' profile (age, sex, educational attainment) and their perceived level of observed SWM practices, as all p-values are greater than 0.05 (Age 0.512, Sex 0.074, Educational Attainment 0.06). These results suggest that the extent to which SWM practices are observed is not influenced by demographic characteristics of the respondents. The extent of SWM practices observed by respondents is independent of demographic factors, indicating that efforts to improve or monitor SWM can be applied broadly across all age groups, sexes, and educational levels without the need for demographic-specific strategies.

This finding is consistent with recent studies demonstrating that demographic factors often do not significantly predict SWM behaviors when appropriate infrastructure, information campaigns, and monitoring mechanisms are in place, World Bank (2025b) and Leknoi et al. (2024). Furthermore, research shows that social norms, peer influence, and access to facilities are stronger determinants of waste management behavior than age, sex, or educational attainment. Similarly, institutional support, enforcement, and availability of proper waste management systems significantly affect compliance and adoption of SWM practices, reinforcing the idea that systemic and policy drivers outweigh demographic differences, World Bank Group (2025). The implication of this finding is that interventions to improve SWM practices—such as training, monitoring, awareness campaigns, signage, and stakeholder engagement—can be applied broadly across all demographic groups. There is no need for age-, sex-, or education-specific strategies. A broad-based approach ensures consistent adherence to proper waste practices, enhances compliance across all market stakeholders, and strengthens the overall sustainability and effectiveness of the SWM program, UNEP (2021).

Table 5.3 presented the analysis indicates that there is no significant relationship between the respondents' profile (age, sex, educational attainment) and their perceived observed challenges in the implementation of SWM practices, as all p-values are greater than 0.05 (Age 0.201, Sex 0.517, Educational Attainment 0.688). These results suggest that perceptions of barriers or challenges in SWM implementation are independent of demographic characteristics, meaning that all stakeholders—regardless of age, gender, or educational background—experience and perceive challenges similarly. Perceptions of challenges in SWM implementation are not influenced by demographic factors, suggesting that interventions to address these challenges can be applied universally to all vendors, buyers, and stakeholders regardless of age, sex, or educational background.

Recent studies reinforce this finding, emphasizing that systemic, behavioral, and institutional factors tend to shape perceived challenges more than individual demographic

characteristics. Nerida and Dela (2025) pointed out that lack of enforcement, limited infrastructure, social norms, and weak stakeholder engagement are often cited as the main barriers to effective SWM, independent of personal demographic factors. (Cabias et al. (2024) examined community engagement in waste management in Hugpa, Biliran, Philippines. Their study focused on assessing residents' solid waste management practices, including segregation, recycling, and disposal, as well as the initiatives led by the barangay council. Results revealed that while community members moderately practiced SWM, challenges such as inconsistent enforcement, limited participation, and lack of coordinated activities were present. Importantly, these challenges were universally experienced across demographic groups, indicating that age, sex, or educational background did not significantly affect how individuals perceived or faced barriers in SWM. The study emphasizes the need for inclusive community programs, stronger institutional support, and collaborative strategies to address SWM challenges effectively.

Similarly, research in urban markets and developing countries indicates that perceived challenges such as improper waste disposal, non-compliance by peers, and insufficient monitoring are experienced broadly across demographic groups, highlighting the need for universal interventions rather than targeted demographic strategies Ferronato and Torretta (2019). The finding underscores that policies and interventions to address challenges in SWM can be applied universally, targeting all vendors, buyers, and stakeholders equally. Approaches such as strengthening enforcement, improving infrastructure, conducting regular training and stakeholder meetings, and promoting social accountability can benefit the entire market population, ensuring more effective and sustainable implementation of SWM practices.

The results presented in table 6.1 indicates that there is a significant difference in the level of awareness ($p = 0.016$) and extent of challenges ($p < 0.001$) of SWM practices among respondents when grouped by type (vendors, buyers, and government employees). No significant difference is observed in the level of practices ($p = 0.169$). These findings suggest that although respondents exhibit relatively similar behavioral practices, their levels of awareness and perceptions of implementation challenges vary significantly depending on their roles within the public market system. Awareness and perception of challenges vary depending on the respondent type, suggesting that interventions and support for SWM should be tailored to the specific roles of vendors, buyers, and government employees, while overall practices are relatively consistent across groups.

A study by Menon and Palackal (2020) highlighted those various stakeholders in municipal solid waste management including government officials, service providers, and community representatives possess different levels of awareness and perceptions toward waste management issues due to the nature of their responsibilities. Despite these differences in awareness and perceptions, all stakeholder groups participated in the overall waste management system, demonstrating that practices can remain consistent even when awareness differs. Similarly, research conducted by Jeremias and Fellizar (2021) in Sorsogon City, Philippines, revealed that while households may have varying levels of awareness about SWM policies, the perceived obstacles and challenges were

experienced similarly across demographic groups, suggesting that interventions can be applied broadly but may require targeted strategies to address role-specific gaps in knowledge and perception. In addition, Cabias, De Paz, Datiles, and Siat (2024) emphasized the importance of community engagement and inclusive approaches in addressing SWM challenges. Their study in Biliran, Philippines, showed that while residents face. Common challenges such as inconsistent enforcement and limited participation, the level of awareness and perception of these challenges differed depending on their involvement in the waste management system.

This underscores the need for role-specific interventions and education programs to enhance SWM awareness and effectively address challenges among vendors, buyers, and government employees. The study conducted by Reddy (2024) in the analysis of SWM awareness across different stakeholder groups (locals, community leaders, and municipal representatives) showed variation in levels of awareness and understanding based on roles and engagement with waste management initiatives. While some groups demonstrated high awareness and engagement, others showed lower awareness or dissatisfaction with available services. These differences point toward the need for role-specific approaches in SWM education and engagement strategies, rather than one-size-fits-all interventions, which echoes your study's conclusion that interventions should be tailored to distinct stakeholder roles.

Furthermore, Jolosi Mukena et al. (2024), research into household solid waste management in Windhoek, Namibia found that even when awareness is comparatively high across a community, the actual practices and perceived barriers differ depending on individual circumstances and stakeholder roles, such as access to facilities, enforcement perception, and regulatory context. While this study focused on household frameworks rather than formal market roles, its findings similarly demonstrate that attitudes, awareness, and perceptions of challenges are not uniform, necessitating contextualized interventions that consider these role-based differences. The findings are likewise evident on the study of Joseph (2006), highlights that effective solid waste management requires coordinated involvement from different groups residents, private waste handlers, and government bodies each with distinct perceptions and priorities, which often leads to variations in awareness and perceived challenges.

The evidence suggests that tailored interventions, training, and support programs for each stakeholder group are essential to improve compliance, awareness, and the overall effectiveness of solid waste management in public markets.

Conclusions

The findings indicate that solid waste management (SWM) in Poblacion, Pamplona public market is characterized by high awareness but only moderate implementation, influenced more by behavioral and institutional factors than by demographic characteristics.

First, respondents demonstrate a very high level of awareness of SWM practices, indicating that knowledge of waste segregation, policies, and proper disposal is well established. However, this awareness does not fully translate into action, this gap can be attributed to several institutional and systemic factors identified in the study. One major factor is the lack of institutional reinforcement, particularly weak enforcement, limited monitoring, and absence of consistent penalties, which reduces accountability among stakeholders. Additionally, inadequate infrastructure, such as insufficient or poorly maintained waste segregation facilities, limits the ability of stakeholders to practice what they know.

Second, while individuals show strong personal responsibility in waste management, participation in collective or community-based actions remains limited. These factors suggest that awareness alone is insufficient unless supported by strong institutional systems, proper facilities, and active stakeholder collaboration.

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Third, the implementation of SWM is hindered by commonly observed challenges, particularly improper behavior of others (e.g., mixing waste), weak enforcement, and lack of coordination among stakeholders. These factors reduce the effectiveness of otherwise adequate awareness and individual practices.

Fourth, the results confirm that age, sex, and educational attainment do not significantly influence awareness, practices, or perceived challenges, indicating that SWM concerns are uniform across different demographic groups. However, significant differences exist when respondents are grouped by type (vendors, buyers, and government employees), particularly in awareness and perception of challenges, reflecting their differing roles and experiences in the market.

This study strengthens the implementation of Republic Act 9003 by demonstrating that while awareness of solid waste management is high, proper practices remain inconsistent due to weak enforcement, limited infrastructure, and inadequate stakeholder coordination. These findings highlight the need for stronger Local Government Unit (LGU) enforcement, improved facilities, and participatory approaches to ensure compliance at the community level. Furthermore, the study supports the achievement of SDG 3 by promoting proper waste management practices that reduce health risks associated with improper waste disposal. SDG 11 by supporting cleaner, safer, and more sustainable public market environments and SDG 12 by encouraging waste reduction, segregation, and responsible disposal behaviors.

Recommendations

Based on the findings and conclusions drawn, the following are hereby recommended to improve solid waste management (SWM) in the public market:

1. Public market authorities should strengthen enforcement and monitoring of SWM policies, as weak enforcement and improper waste disposal behaviors were

identified as major challenges. Regular inspections and consistent implementation of rules can help improve compliance.

2. There is also a need to enhance stakeholder cooperation by conducting regular meetings, orientations, and awareness campaigns for vendors, buyers, and government employees.
3. To support proper practices, market management should provide adequate and clearly labeled waste segregation facilities, ensuring that bins are accessible and sufficient for different types of waste. This will help address issues related to improper waste mixing.
4. Continuous training and information dissemination should be implemented using simple and practical approaches, considering that practices are consistent across demographic groups but vary by role.
5. Efforts should focus on encouraging community involvement and accountability, such as motivating individuals to remind others and actively participate in SWM initiatives, to strengthen overall implementation and sustainability.

Compliance with Ethical Standards

In accordance with established ethical principles, prior approval was obtained from the University Research Office's Ethical Committee before the commencement of the study. The researchers strictly observed all relevant ethical guidelines and protocols throughout the research process. All information gathered was handled with utmost confidentiality. To ensure the protection of participants, their identities were kept anonymous and were not disclosed at any stage, including during data collection, analysis, and presentation of findings. These measures were implemented to uphold the confidentiality and anonymity of all respondents.

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