

Proper Waste Management of Households in Brgy. Atate, Palayan City, Nueva Ecija During the Pandemic: Problems and Recommendations

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Abstract: Solid wastes have increased tremendously during pandemic including healthcare, household wastes and etc. With improper waste management this could further spread the virus and other contagious diseases which can cause to latter catastrophe. The purpose of this study was to determine the proper waste management and practices that each household provide to utilize and control the waste generation in the community in accordance with the on-site waste management, off-site waste management and curb-side waste management. In addition to, the study provided and recommended action plan for households, community and for the local government unit to avoid and lessen the waste generation and practice proper waste segregation and disposal. The study used descriptive approach to illustrate the circumstances, evaluate the household waste management and practices and draw conclusions. The researchers surveyed 305 respondents out of the total population of 1,454 of Brgy. Atate, Palayan City, Nueva Ecija. The study utilized a random sampling technique and also used the Raosoft tool to determine the number of required participants needed for the study with 95% confidence level and 5% margin of error. The researcher gathered information through survey questionnaires to acquire data for the study. The validity and reliability of the questionnaires was test in a dry run and was assessed and developed. Statistical tools such as percentage, frequency distribution, weighted mean and thematic analysis was used with Colaizzi's Seven Steps Method. The study found out that households possess different waste management and practices of how they segregate and dispose their solid waste and also the findings said that the pandemic caused an increase in waste generation of personal protective equipment and solid waste due haul of basic commodities from panic buying incidents. As a result, the researchers proposed an action plan on how to deal, control, and manage solid wastes challenges with proper waste management.

Keywords: Household, Proper Waste Management, Covid 19-Pandemic

I. INTRODUCTION

Nowadays, waste management became a major problem around the world, principally because of the past issues and recently the effect of the pandemic. Waste management is arguably the most important municipal service and serves as a prerequisite for other municipal action. As the world hurtles toward its future and further generation of households and medical waste within the pandemic, the amount of municipal solid waste (MSW) continuously increases in a rapid rate. Poor waste disposal practices hamper the progress towards an integrated solid waste management in households. Knowledge of current practices and perception of household solid waste management is necessary for accurate decision making in the move towards a more sustainable approach.

The Department of Environment and Natural Resources (DENR) said that a series of environmental education lectures in a bid to raise public awareness and knowledge on some important pressing environmental issues, and solicit support to the protection and conservation of the environment. As the Republic Act No. 9003 or the Ecological Solid Waste Management Act of 2000 was meant to ensure the protection of public health and environment, while encouraging resource conservation and recovery, and public cooperation and responsibility promotes the provisions of formal devolution of waste management to local levels, the forced closure of illegal dumpsites and investment on facilities; and the reduction and proper treatment of solid wastes (Domingo and Manejar, 2021).

In addition to, providing the public as well as the leaders of our local government with the right information and educating them on the value and importance of our environment especially our rivers and mangrove ecosystems

including environmental laws are important ways, we can help save our environment. Also caring for the environment starts from understanding, and the local government is at the forefront of keeping a balance and sustainable ecosystem to make a community protected and resilient against disaster and calamity (Guevarra, 2021).

Household waste volumes may have appeared fairly consistent from year to year. In the midst of pandemic, many of the household members were unavailable to properly practice the proper waste management because of restrictions and other health related concerns. Sustainable waste management practices have become challenging due to our consumption behaviour and changing socioeconomic conditions influenced the experiences and practices of household waste management of people in a barangay. According to Bernardo (2008), households generated an average of 3.2 kg of solid waste per day, or 0.50 kg/capita/day. The types of wastes commonly generated are food/kitchen wastes, papers, PET bottles, metals, and cans, boxes/cartons, glass bottles, cellophane/plastics, and yard/garden wastes. Waste management can be sustainable in both businesses and homes if the right framework is implemented with further education and rising awareness about proper waste management.

The study observed the practices and perceptions of proper waste disposal and segregation of the respondents amidst the Covid-19 pandemic. Therefore, identifying the challenges and responses of each household in the said location extracts promotions for sustainable waste management is to reduce the amounts of natural resources consumed, reusing the materials taken from nature as much as it is possible, and creating as minimal waste as possible with due to all responsibilities to maintain sustainability for the benefit of our environment as well as future generations. A well-functioning sustainable waste management system should incorporate with the strategies and policies, focus on processes, embody adaptability and divert wastes from the disposal into more environmental oriented goals.

The main objectives of this study are the following:

1. How the demographic profile of the respondents in Brgy. Atate, Palayan City, Nueva Ecija may be described in terms of:
 - 1.1 Age
 - 1.2 Gender
 - 1.3 Total number of household members
 - 1.4 Income
 - 1.5 Educational Background
 - 1.6 Occupation
 - 1.7 Person(s) primarily responsible for household waste
2. How the proper waste management and disposal practices of the respondents during the pandemic may be analyzed in terms of:
 - 2.1 On-site Waste Management
 - 2.2 Off-Site Waste Management
 - 2.3 Curb-Side Waste Management
3. What are the challenges being encountered of household with waste management be analyzed in terms of:
 - 3.1 Local Waste Management
 - 3.2 Community Behavior and Cleanliness of Neighborhood
 - 3.3 Health Concerns
 - 3.4 Waste Infrastructure and Equipment
 - 3.5 Waste Management Education
4. What action plan may be proposed to address the challenges being encountered by the household respondents?

II. RELATED LITERATURE

Waste Management and Practices of Households

Each household take many steps to make their lifestyles more environmentally friendly, such as buying less, reusing and recycling household waste. Individuals sometimes make buying decisions that match their values, capacities and situations, like in this time of pandemic which additional medical protections and food storing. Household waste management encapsulates some of the practices describes their waste disposal, segregation and practices. Buying less reduces your family's ecological footprint. Reusing and recycling help too. However, there is more to sustainability than conserving resources. Working to preserve communities, support local economies, and provide employment opportunities for local residents also influence by local waste management system (Arcadia, 2017).

According to Viljoen et al (2021), on-site household waste management entails household composting, recycling, re-use, and burning or burying of waste in their yards. It refers to domestic way of managing, treating,

controlling and/or disposing household wastes. Off-site household waste management equates to disposal at a landfill or in public receptacles, donations, or delivery of separated recyclables to drop-off centres. Off-site waste/recyclables disposal also includes 'conventional' environmentally unfriendly waste disposal practices, such as open-burning and the dumping of waste in uncontrolled environments (for instance, on streets, in empty spaces, and on riverbanks). The latter practices pollute the environment, pose community health risks, and involve costly clean-ups of such sites by the local government. Curb-side household waste management includes curb-side disposal of mixed waste or separated/sorted recyclables of households for collection by the municipality and/or other recyclable collectors. After collection, the waste becomes the responsibility of the municipality or collector who can either recycle, landfill, or compost it.

Challenges experienced by Households with Waste Management

Based on the study of Raab et al (2021), the community's way to dispose of their household wastes is by burning it on their private property and/or collecting it at one side of their space while waiting for the local garbage collection managed by the municipalities, which most local government unit usually done to lift household wastes. Critical or unwanted events like calamities or the pandemic itself triggers the generation of waste at a high rate, decisions and emotions linked with the disposition of household items of impoverished consumers living styles and perceptions. The determinants of their behaviour, attitudes, and perceptions regarding their daily disposal routines of household possessions tend to implies. On the individual level, emotions influence the way of how people dispose of their personal belongings. Moreover, they significantly affect peoples' perceptions and reflections on their disposal behaviour and are significant factors for controlling the area resource management of waste.

Impact of the Pandemic in Proper Waste Disposal and Segregation

In this health crisis, medical personnel and the general population have used personal protective equipment (PPE) such as surgical or medical masks, non-medical face masks (including various forms of self-made or commercial masks of cloth, cotton or other textiles), face shields, aprons and gloves continuously, wearing masks when going out in public places. According to the press conference study of the Joint Prevention and Control Mechanism of the State Council of China found out that approximately 468.9 tons of medical wastes are generated every day in association with COVID-19. Medical waste scale had reached 12,740 tons approximately 60 days after people were first infected by coronavirus in that area. In particular, infectious waste generated by the COVID-19 outbreak has posed a major environmental and health concern in many countries (Sangkham, 2020).

According to the study of United Nations Environment Programme (2020), pandemic have significantly increased the amount of mixed waste, including infectious waste due to low levels of segregation at source, increased the amount of plastic waste (due to lockdowns, suspension of reusable items in stores, etc., lack of preparation on amount of household hazardous waste being generated, increased of littering, illegal dumping and open burning situations, suspension of recycling activities due to restrictions and protocols, mixing of infectious waste such as gloves, masks, tissues, and gauze with other wastes (exposure to transmission), discontinued provision of formal/informal waste management services, increased negative impacts, especially to informal sector (OSH, health risk, business opportunity loss, etc.), improper waste management services provided by local government unit during normal and hard times (vulnerability in collection services and landfill operation) and lack of awareness and education regarding on waste management.

Waste Management Policies and Regulations

To address the growing number of generated wastes and to put in place regulatory mechanisms, the country issued its umbrella waste management policy in 2001 through the Republic Act No. 9003, otherwise known as the Ecological Solid Waste Management Act. This legislation, in complementation with the RA 7160 or the Local Government Code, mandates local government units to serve as lead implementer and establishes the blueprint for national and subnational plans and initiatives on waste management. The frontline primacy of LGUs is recognized, with even global counterparts revealing apparent focus on municipal solid waste management, involving components on waste generation, collection and disposal (Themeleis, 2003 and Dong et al. 2003).

According to Domingo and Manejar (2021), if properly implemented, the provisions of Republic Act No. 9003 would have conveniently and strategically allowed for the imposition of systematic and structured remedies and approaches. In pre-pandemic, increased dynamism in local economies translated to increased consumption and waste generation among a majority of the country's cities and municipalities and during (and post) the COVID 19 pandemic, waste generation and management issues remain critical and a threat with projections pointing to more direct and serious consequences, but still positive outcomes with maximum efforts aims to achieve and gain environmental objectives and goals in realities.

III. RESEARCH METHOD

Research Design

The study used mixed quantitative-qualitative research to identify the statistics and an in-depth querying which helped the researchers be guided with analysis, interpretation and presentation of data gathered. Quantitative research encompasses broad methods that concerns systematic investigation of one social phenomenon. It involves measurement and assumes that the variables being studied can be measured, then to analyse the trends of data and its relation to vary the measurements made. Moreover, in quantitative research, measurements are made, analysis is applied and conclusions are drawn (Watson, 2014). On the other hand, Qualitative research is a type of naturalistic inquiry that tries to understand social phenomena in their natural setting. Since the researcher asked the respondents about the problems they have encountered, the researches believed that they could get a deeper analysis using this approach.

Research Locale

The study was conducted at Brgy. Atate, Palayan City, Nueva Ecija. The location was chosen because the area has the population growth rate of 4.42% as of May 2020 which will be useful for the research as it proposed vital material to determine how the continuous growth of households organizes and conducts their proper waste management and practices with the utilization of the local government unit.

Sample and Sampling Procedure

The study used the random sampling because every member of the total population has an equal chance of being included in the sample. Random sampling tend to fairly and just since it represents and don't favour a certain part of the total population (Khan Academy, 2008).

The researchers used Raosoft application to calculated number of respondents to needed to participate in the study. Raosoft InterForm is an advanced application developer for web surveys and forms that lets you create complex questionnaires needing extended logic statements, or very large questionnaires for the web, with large populations and/or large question sets (Raosoft, 2011).

The researchers conclude that each household will represent and give various distinction of perception about the proper waste management and their own practices and waste activities. Furthermore, considering the research objectives the respondents were included and provided information to determine the interventions on waste management amidst the pandemic circumstances. Lastly, the respondents contributed to the identification of challenges regarding the variables stated which emphasizes the importance waste management and its effects on each component of the research's section.

Data Collection

To collect data, the study used survey questionnaires. The survey questionnaires were prepared by the researchers and validate by the research adviser. In making the questionnaires, the researchers assures that the words used are easily understood by the respondents as it impact the kind and quality of information to be gathered from the respondents and all questions asked are relevant to the research objectives. The questionnaire was guided by the related studies and undergoes confirmation by the competent individuals for validation and the suggested opinions were included. The researchers shared the questionnaires to some professionals to rate the validity of it and then conducted a dry run to test the reliability of the formulated questionnaire and to help identify and improve some part of the survey questionnaires. The reliability coefficient of the instrument was tested and measured to check the internal consistency with the score of 0.9580, which means that the instrument has a good internal consistency. The validity of the research instrument was established by presenting the developed research instrument from the recommendations of the experts who rated the instrument with the weighted mean of 4.65 having the verbal interpretation of "Very Good". Before the distribution of the survey questionnaires, the researchers presented the developed questionnaire to the research adviser and obtain its final approval. With the use of Google Form the researchers managed to acquire and utilize the collection of data and obtain information needed for the study. The researchers summarize the gathered data and information from the respondents in order to generate and manage multiple responses needed for the study. The researchers evaluated the gathered data and gives interpretation to determine the relevance of the collected information which will identify the proper waste management and practices of the respondents and its challenges. Therefore, different analysis and interpretation was established.

Data Analysis Technique

The data gathered from the respondents was utilized. Statistical tools such as percentage, frequency distribution, weighted mean and thematic analysis was used with Colaizzi's Seven Steps Method. The interpretation of the gathered date was presented in a table form.

IV. RESULTS AND DISCUSSION**1. Demographic profile of the respondents in terms of:****1.1 Age****Table 3. Age**

Age	Frequency	Percentage
10 to 30 years old	273	90%
31 to 60 years old	26	8%
60 years old and up	6	2%
Total	305	100%

Table 3 shows that the majority or 273 (90%) of the respondents are in the age of 10 to 30 years old while 6 or 2% of the respondents are in their 60 years old and above. According to the majority of the respondents, the younger age group tends to do the waste disposal as it is their duty and responsibility to do so after the older part of the family. Based on the article of Bahraini (2020), it is important to teach the younger age group to practice the proper waste management because it stimuli their learning process and nurture their responsibility to acknowledge the importance and consequences to waste management.

1.2 Gender**Table 4. Gender**

Gender	Frequency	Percentage
Male	231	76%
Female	74	24%
Total	305	100%

Table 4 shows that 231 or 76% of the respondents are male while the female respondents are 74 or (24%). Based on the highest percentage of the respondents, male are more capable to perform hard work related to waste management as some of it requires strength and strong endurance like lifting etc. But according to The Ferrara et al. (2008), men and women generally had different perceptions about how frequently waste is disposed of, about the distance that must be travelled to dispose of waste, and about the time spent disposing of waste which all of these differences have implications of the implementation of the household waste practices to provide proper and satisfactory outcomes.

1.3 Total number of household members**Table 5. Total number of household members**

Total number of household members	Frequency	Percentage
1 to 3 members	46	15%
4 to 6 members	198	65%
7 to 9 members	61	20%
Total	305	100%

Table 5 shows that the most or 198 (65%) of the respondents have 4 to 6 household members while 46 or 15% says that they consists of 1 to 3 members per household. As some respondents said the lesser member per household have the smaller chance of producing more waste. Larger size of households drives larger consumption which is relatively the determinants of waste patterns as increasing members of household influence an increase of waste generation (Ferrara et al., 2008).

1.4 Income**Table 6. Income**

Income	Frequency	Percentage
P1 to P5,000	125	41%
P5,001 to P10,000	80	26%
P10,001 to P15,000	41	14%
P15,001 to P20,000	19	6%
P20,001 and up	40	13%
Total	305	100%

Table 6 shows that 125 or 47% of the respondents said the their monthly income is from the range of P1 to P5,000 and only 6% or 19 of the respondents have from P15,001 to P20,000. Some respondents said that they limit their buying practices and consumption in order to manage their income. According to the study of Herianto et al. (2019), income levels shows significant influence on households waste generation because the higher income level the higher increase of waste production, therefore the lower income level sort of predicts lower rate of waste production.

1.5 Educational Background

Table 7. Educational Background

Educational Background	Frequency	Percentage
Elementary Graduate	17	6%
High School Graduate	169	55%
College Graduate	105	34%
Vocational Graduate	14	5%
Total	305	100%

Table 7 shows that 169 (55%) of the respondents said they are high school graduate while 17 or 6% of them are elementary graduate. Some respondents says that educational attainment are not directly dictate what you can do or how can you perform the proper waste management, as long as you know the basic process and practices it can contribute to the overall management of households waste and/or local waste. As Fredrick et al. (2018) said, public meetings, use of mass media, community demonstrations and instruction to individual heads of households are the key strategies to be used to educate the communities regarding the proper waste management. It was concluded that public education is improving waste management in the community.

1.6 Occupation

Table 8. Occupation

Occupation	Frequency	Percentage	Occupation	Frequency	Percentage
1 Student	30	10%	12 Policeman	3	1%
2 Farmer	11	4%	13 Social Worker	3	1%
3 Teacher	12	4%	14 Housekeeper	4	1%
4 Housewife	70	22%	15 Mechanic	3	1%
5 Self-employed	35	11%	16 Call Center Agent	7	2%
6 Construction Worker	4	1%	17 Book Keeper	2	1%
7 Government Employee	15	5%	18 Caregiver	3	1%
8 Medical Technologist	1	1%	19 Computer Operator	4	1%
9 Online Seller	45	15%	20 HR Specialist	1	1%
10 Business Owner	30	10%	21 Vendor	15	5%
11 OFW	3	1%	Total	305	100%

Table 8 shows that 70 (22%) of the respondents are indicated as housewife. And 2 or 1% are indicated as medical technologist and HR specialist. Most respondents said that no matter what job you have, the important part is the household waste practices and how you manage it. There is no direct relationship between the respondents` occupation and the proper waste management. According to Jerie (2016), it is generally assumed that household waste generation contributes a significant proportion to the total waste stream generated in any environment.

1.7 Person(s) primarily responsible for household waste

Table 9: Person(s) primarily responsible for household waste

Person(s) primarily responsible for household waste	Frequency	Percentage
Mother/Wife	144	47%

Father/Husband	51	17%
Child/Children	40	13%
Grandmother	30	10%
Grandfather	12	4%
Caretaker	16	5%
Aunt	8	3%
Everyone in the Household	4	1%
Total	305	100%

Table 9 shows that 144 (47%) or most of the respondents said that the primary person responsible for household waste are their mother/wife and 4 or 1% of the respondents said that everyone in the household are responsible for waste disposal and segregation. Most of the respondents says that the mother or wife often do the disposal and segregation of household waste because they are the one who usually left in the house. In accordance with the study of GA Circular (2019), disposal and segregation behavior varies in gender in some ways, like women, they somehow identified themselves as proper disposers of waste and they tend to take impart to the awareness with respect to sorting and segregating each waste.

2. Proper waste management and disposal practices of the respondents in terms of:

2.1 On-site Waste Management

Table 10. On-site Waste Management

On-site Waste Management		Weighted Mean	Rank	Verbal Interpretation
1	The household avoids pile up of much waste to lessen the garbage spread.	3.63	1	Strongly Agree
2	The household performs reduce, reuse, and recycle of home wastes.	3.43	3	Strongly Agree
3	The household separates the biodegradable and non-biodegradable waste.	3.49	2	Strongly Agree
4	The household avoids burning of garbage especially plastics, etc.	3.42	4	Strongly Agree
5	The household buries toxic wastes and dead animals.	3.39	5	Strongly Agree
6	The household decomposes food wastes to be used as fertilizers.	3.34	6	Strongly Agree
On-site Waste Management		3.45		Strongly Agree

Table 10 shows that most of the respondents strongly agreed that the household avoids pile up of much waste to lessen the garbage spread with the weighted mean of 3.36 and the respondents also strongly agreed that the household decomposes food wastes to be used as fertilizers with the lowest weighted mean of 3.34.

The findings indicate that households are being aware that piling of waste in their home or backyard may eventually spread within the community. There are few tips to reduce pile up of household garbage like donating old clothes, reducing food waste, buy things with less packaging, recycle, decompose and etc. According to some respondents the best place to start making a difference is right in your own home. Learn how you can reduce, reuse, and recycle materials to decrease household waste. US Environmental Protection Agency (2022), every household in the community can do many activities to work together and reduce waste. Each of them can make a difference by reducing, reusing, and recycling materials throughout the communities and encourage their neighbors to do the same.

On the other hand, the findings also indicate that the household decomposes food wastes to be used as fertilizers. Decomposition and recycling of organic material is an effective and eco-friendly way of disposing of food waste. This way we can save the earth from the pollution caused by food waste and also do something productive. Few respondents said that they are doing the decomposing method of biodegradable waste to alternate it with the chemical fertilizer. Moreover, when a household does compost food waste it will keep these materials out of landfills where they take up much space and release methane, a potent greenhouse gas which in a larger scale also enriches soil, helping retain moisture and suppress plant diseases and pests, reduces the need for chemical fertilizers, encourages the production of beneficial bacteria and fungi that break down organic matter to create humus, a rich

nutrient-filled material and reduces methane emissions from landfills and lowers your carbon footprint (US Environmental Protection Agency, 2022).

2.2 Off-Site Waste Management

Table 11. Off-Site Waste Management

Off-site Waste Management		Weighted Mean	Rank	Verbal Interpretation
1	The collection of wastes has consistent schedules.	2.98	5	Agree
2	All waste drop-off points are being collected and left clean.	3.02	4	Agree
3	The local waste management concludes cleaning of waste caused by littering.	3.14	3	Agree
4	Landfills are enough to cover the community wastes.	3.17	1	Agree
5	The area does have waste receptacles and/or bins.	3.14	3	Agree
6	There are no illegal dumping cases within the community.	3.15	2	Agree
Off-site Waste Management		3.10		Agree

Table 11 shows that the most of the respondents agreed that landfills are enough to cover the community wastes with the highest weighted mean of 3.17 and the respondents also agreed that the collection of wastes has consistent schedules with the lowest weighted mean of 2.98.

The study demonstrates that emphasizes the importance of enough landfills for community waste because due to the increasing urbanization and population growth the more it requires more landfills. The more the population, the more the demand and the more the waste is being generated and dumped. Based on some respondents, as of today dumpsites and landfills are getting dense over time, so the government must do something and provide safe landfills. According to Hesperian Health Guides (2021), sanitary landfill can reduce harm from waste that has collected from every household and is safer than an open dumping site. In order for a landfill to benefit the whole community it must be built away from where people live, it is properly covered to prevent insects and other disease-carrying animals from breeding and strictly monitored by the local government.

In addition to, the study also finds out that the local collections of wastes are in consistent schedules. It indicates that believed that the local government is ensuring that household wastes are being collected in due time. According to the respondents, the collection of waste must not be compromised because without regular collection may results in some negative effects to the community. In line with the study of Lenkiewicz and Webster (2017), household waste should be collected often enough to easily handle the amounts of waste being produced. Collecting waste properly and transporting it safely and frequently enough means that it is less likely to attract animals and insects, smell bad, and spread disease. It is important to collect waste properly and efficiently to achieve a clean and safe environment.

2.3 Curb-Side Waste Management

Table 12. Curb-Side Waste Management

Curb-Side Waste Management		Weighted Mean	Rank	Verbal Interpretation
1	The pickup day and time of municipal trucks are clear and persistent.	2.99	5	Agree
2	The local government is in partnership with private waste facilities.	3.10	3	Agree
3	The household participates with the local waste management activities.	3.11	2	Agree
4	The household places and segregates different kinds of waste into different waste bags or bins.	3.24	1	Agree
5	The local waste management policies and regulations are being imposed in a proper manner.	3.10	3	Agree

6	The household and local government disposes mixed wastes properly.	3.09	4	Agree
Curb-Side Waste Management		3.10		Agree

Table 12 shows that the most of the respondents agreed that the household places and segregates different kinds of waste into different waste bags or bins with the weighted mean of 3.24 and the respondents also agreed that the pickup day and time of municipal trucks must be clear and persistent with the lowest weighted mean of 2.99.

The findings shows that sorting of waste makes it easier to understand how to reduce the general waste output, identifying items that can be reused and setting aside items that should be recycled. Beyond that, however, there's also a moral imperative to be responsible for how a household handle their waste like medical waste. It emphasizes that failing to segregate household waste properly means that it will end up mixed in landfills the same way it was mixed in your bins. As some respondents said, they tend not to segregate their waste because it end up mixing with other waste when it was pick up by waste collectors. Proper waste segregation plays a vital role in any business's ability to improve its recycling rate and achieve its zero to landfill goals. Effective segregation of wastes means that less waste goes to landfill which makes it cheaper and better for people and the environment. In particular, the important reasons for encouraging household to do waste segregation are; legal obligations, cost savings and protection of human health and the environment as hazardous wastes can cause long term health problems, so it is very important that they are disposed of correctly and safely and not mixed in with the normal waste (Environmental Monitoring Solutions, 2016).

However, the findings also suggest that schedule day and time of waste collections of municipal trucks must clear and persistent because planning and assessment of waste collection systems are crucial for the overall system efficiency and performance specially in this of pandemic that additional waste from medical purpose are being generated.. According to some respondents, schedules of waste collections are not always present in some times, so the bigger instance of dense in waste. Coad et al. (2011) assert that local waste collection strategy must be the main goal in a timely and economical manner, as much correctly separate waste as possible. Vehicle design and operational features are essential for ensuring efficiency in waste collection systems and of the potential roles of alternatives in order to ease the subsequent waste sorting and/or treatment stage with the aim to maximize re-use and recycling.

3. Challenges being encountered of household with waste management be analyzed in terms of:

3.1 Local Waste Management

Table 13. Local Waste Management

Local Waste Management		Frequency	Percentage	Ranking
1	No regular schedule of waste collection	143	47%	1
2	Irresponsible waste disposal and segregation	109	36%	2
3	Lack of LGU response and monitoring	53	17%	3
Total		305	100%	

Table 13 shows the challenges being encountered by the respondents based on the local waste management.

The findings showed that the ability to provide regular schedule of waste collection is the highest percentage among problems with 47%, it conveys that the respondents believed that dealing with this problem might help in reducing waste dense within the community. As some respondents said schedules of waste collection is something to be prioritize by the local government to avoid further spread of garbage.

Various hindrances regarding waste collection and management implementation also blocks the strategic waste management solutions like in sustainable waste collection system. This explains that not narrowing the role of the waste collection triggers the failure in management and practices which may results in much more challenges (Kshourad, 2017).

The findings also show that local government unit is lacking with their response and monitoring activities which the direction to achieve better waste management has been compromised with 17%. According to the respondents there is some negligence in the local waste management.

Local waste management projects does requires commitment and support from the LGU to basically implement the importance of RA No. 9003 because if the local government fails to perform the aspect of the law, the community will also fail in their management efforts and practices in handling household waste. To enable the municipal administrations to operate integrated waste management systems in a correct and economically efficient manner, they should be proceeding in giving their dedication and service to the community (Official Gazette, 2001).

3.2 Community Behavior and Cleanliness of Neighborhood

Table 14. Community Behavior and Cleanliness of Neighborhood

Community Behavior and Cleanliness of Neighborhood		Frequency	Percentage	Ranking
1	Lack of Discipline	105	34%	1
2	Irresponsible waste management	99	33%	3
3	Lack of knowledge about the proper waste management	101	33%	2
Total		305	100%	

Table 14 shows the challenges being encountered by the respondents based on the community behavior and cleanliness of neighborhood.

The study found that 105 or 34% of the respondents said that the lack of discipline and irresponsible waste management with 99 or 33% are one of the challenges the community faces with its behavior and cleanliness. It implies that the households and/or the community continue to throw their waste anywhere like creeks, canals, roadsides and the like irresponsibly. Many individuals still lack of discipline and can't be sustainably manage their waste. Based on some respondents, many of them just mix up any waste and then just put in somewhere, whether it will be picked up by the waste collectors or just be scrambled there.

According to Flores et al. (2017), one of the most common problems in the community is the discipline, improper and irresponsible waste management, which could affect the current living of the residents. Practices of the households in the community can deeply affect, not just our nature but also their health. Therefore, knowing the proper waste management is such a way to ensure the community to maintain the cleanliness.

3.3 Health Concerns

Table 15. Health Concerns

Health Concerns		Frequency	Percentage	Ranking
1	Pollution	96	32%	2
2	Spread of disease	209	68%	1
Total			100%	

Table 15 shows the challenges being encountered by the respondents based on the health concerns.

The research revealed that 209 or 68% of the respondents believed the spread of disease is the top challenges which respondents believed to affect the community health and safety. It says that improper waste disposal and segregation can create a ground zero for a disease that threatens the health of the community especially in this time of pandemic which is highly important to manage the medical waste well in order to avoid such effects. According to the respondents, the pandemic in doubled up the waste being generated in the community and medical protections such as masks are just being thrown anywhere which is very alarming that it may spread the virus and eventually when a calamity happens it will clogged to canals.

Based on the study of Gorilla Bins (2016), the ramifications of improperly disposing of wastes are getting immense throughout the year. Communities without safe garbage disposal measure are more susceptible to the spread of illness and untreated garbage often rummage through the community. Household doing their part in getting rid of waste properly can provide a more safe and healthy environment.

The research also revealed 96 or 32% of them said that pollution is also the challenge that sends awareness to the respondents as it can impact everyone. Pollution caused by poor management of waste can create serious environmental problems. Some respondents said that poor waste management will result in an unpleasant and often unsafe environment to live or work in.

Poorly managed waste often ends up in ponds, reservoirs, or drainage system which contaminates it. The refuse often blocks drainage channels, resulting in the ponding of water. These surface waters are often polluted with organic waste, breeding sites for mosquitoes and domestic flies. Soil, water and [air pollution](#) can all be a result of improper waste disposal and occurs when either of them becomes contaminated with hazardous materials. Not

only does this contribute to the creation of a greenhouse gas effects but also causes significant harm to marine and wildlife (Junk King, 2022).

3.4 Waste Infrastructure and Equipment

Table 16. Waste Infrastructure and Equipment

Waste Infrastructure and Equipment		Frequency	Percentage	Ranking
1	Lack of waste dumpsite	256	84%	1
2	Lack of garbage truck	49	16%	2
Total		305	100%	

Table 16 shows the challenges being encountered by the respondents based on the waste infrastructure and equipment.

The findings show that 256 or 84% of the respondents agreed that lacking of dumpsites is the highest challenge with the percentage of 84%. This challenge reflects to the initial solution of disposing the generated waste in the community by creating landfills and/or dumpsites which unfortunately gave rise to its own problems, as badly located sites have led to contamination of groundwater, infestation by vermin and a proliferation of wind-blown litter. Also the respondents added that land area for dumpsites are not enough as increasing pressures of population growth limits the available locations for the waste dumpsite.

According to Vasarhelyi (2021), the most pressing environmental concern regarding landfills is the waste congestions and the distance of it from the community because local government faces issue for locating secure landfill sites which aim to pose no threats to land, water and air pollution. Landfills help to keep our communities clean, but they also pose serious threats to the health of our environment and the community. Working towards living a minimum waste lifestyle will help to reduce the reliance on landfills, their impact on the environment, and their impact on human health and well-being.

The findings also show that 49 or 16% of the respondents believed that the local government lacks of garbage trucks to perform the strict schedule of waste collection. It means that this issue creates delay and interruptions in collecting waste; therefore it results to pile up of waste. According to few respondents, most of the garbage that haven't been collected will rot, smell and scattered all over the area.

Based on the article of Berondo (2008), lack of garbage trucks hampers the proper waste management and the implementation of related law. This also sends that the local government must put aside the political biases in order to provide waste equipment and trucks and support each barangay in raising awareness about how to properly manage the waste.

3.5 Waste Management Education

Table 17. Waste Management Education

Waste Management Education		Frequency	Percentage	Ranking
1	Lack of proper waste management education	105	34%	2
2	Lack of LGU initiative and campaigns	200	66%	1
Total		305	100%	

Table 17 shows the challenges being encountered by the respondents based on the waste management education.

The findings showed that 200 or 66% of the respondents said that the knowledge and awareness is important in educating the community because proper ways of waste disposal and segregation are already given but due in time people tend to forgot and neglect those ways, then conveys the inability to perform the proper waste management. According to some respondents, if every household will not embody the idea of it, it will not be effective and useful at all.

Environmental knowledge may impact the behavior and attitude of one individual, which will affect the overall sustainability in developing the waste management and approaches. For some instance, environmental awareness, and environmental knowledge are connected or communicated from teachers to students through formal education. But some respondents say that the performance still varies and influence the participation with the environmental issues (Ardoin et al., 2020).

The findings also shows that 105 or 34% of the respondents agreed that the local government unit doesn't always initiate campaigns about the proper waste management. It means that less awareness the less resilience to conquer the issues which can be promoted actively within the community to attract and emphasize its importance. According to the respondents, no follow up initiatives and campaign awareness about the proper waste management over a long time from the last one.

The application of good governance through active participation of various stakeholders, strong awareness campaigns and promotions and implementation of effective and appropriate strategies and approaches can promote the overall sustainability of proper waste management (Atienza, 2011).

4. Proposed Action Plan for Proper Waste Management of Households

The researchers utilized the gathered information to analyze and interpret the data in order to provide an action plan that will serve as a reference of the community to perform a proper waste management in Brgy. Atate, Palayan City, Nueva Ecija.

Based on the gathered information, the researchers presented the table to help improve and develop the waste handling strategies and household waste practices. The content of the action plan was based on the actual challenges encountered by the households. The respondents were also asked to share their various opinions/suggestions on how to solve or face those challenges being encountered by each household. With the shared possible solutions or actions of the respondents, the researchers summed up and conclude the idea and present this action plan that can be used or served as guidelines in solving or facing the challenges/issues being encountered by the community in all aspects of proper waste management.

Table 18: PROPOSED ACTION PLAN- PROPER WASTE MANAGEMENT

Area	Issues/Challenges /Concerns	Proposed Actions	Objectives	Brief Description of the Actions	Accountable Persons/Groups	Budget	Time Frame
Local Waste Management	No regular schedule of waste collection	Practice task-switching and overlap the objectives	To become flexible at multi-tasking and to provide productive time management	This action will help the local waste management to give clear direction in achieve well organized waste collection and intact collection system.	Local Government Unit	Php. 0.00	Based on its applicability; or as needed
Local Waste Management	Lack of LGU response and monitoring	Develop a clear waste management plan	To establish initiative plans for long term positive effects.	This action will help the local waste management clearly define their shared goals and promote systematic implementation.	Local Government Unit	Php. 0.00	Immediately once approved
Community Behavior and Cleanliness of	Lack of Discipline	Set goals and be mindful on the consequences of every	To become aware and control the determination to achieve	This action will drive the individual to clarify and prioritize specific goals.	Households or the Community	Php. 0.00	Based on its applicability; or as needed

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Neighborhood		action being done Include incentives for encouragement	those goals				
Community Behavior and Cleanliness of Neighborhood	Irresponsible waste management	Provide concrete awareness campaign about the proper waste management	To ensure the participation of every household and secure that households are consistently being informed	The actions will build a strong acknowledgement and broad understanding on proper waste management.	Households or the Community	Php. 0.00	Based on its applicability; or as needed
Health Concerns	Spread of disease	Implement and monitor the waste management plan	To utilize the waste disposal and segregation, therefore minimize the possible spread of potential infectious disease	This action will help the local waste management to monitor the present waste density and establish precautionary awareness for future problems.	Local Government Unit and Households or the Community	Php. 0.00	Immediately once applicable.
Health Concerns	Pollution	Provide reduce, reuse, recycle station and donation drives	To lessen the garbage or waste being thrown in the community landfills or dumpsites while doing humanitarian activities	This action will result a decreasing trend of waste density and help others who are in need.	Local Government Unit and Households or the Community	Php. 0.00	Immediately once approved.
Waste Management Infrastructure and Equipment	Lack of waste dumpsite	Embody avoidance and waste reduction	To ease the need of space for landfills or dumpsites and also to minimize waste generation	This action will help the community pursue safe and secure waste treatment and better waste management.	Local Government Unit and Households or the Community	Php. 0.00	Based on its applicability; or as needed

Waste Management Infrastructure and Equipment	Lack of garbage truck	Provide additional waste trucks	To improve waste collection system	This action will result into a more complex and productive management of waste collection.	Local Government Unit	Php. 0.00 (Depends on the LGU Budget)	Immediately once approved.
Waste Management Education	Lack of proper waste management education	Raise awareness and encourage practice of environmental sustainability	To motivate the individuals to perform and be responsible on their waste management	The action will benefit once perception and attitude towards the proper waste management and environmental sustainability.	Local Government Unit and Households or the Community	Php. 0.00	Based on its applicability; or as needed

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