Global J. Environ. Sci. Manage. 6(4): 441-456, Autumn 2020

Global Journal of Environmental Science and Management
(GJESM)

Homepage: https://www.gjesm.net/

ORIGINAL RESEARCH PAPER

Solid waste management beliefs and practices in rural households towards sustainable development and pro-environmental citizenship

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ARTICLE INFO

Article History:
Received 31 January 2020
Revised 25 March 2020
Accepted 26 April 2020

Keywords:
Household solid wastes
Pro-environmental citizenship
Reduce- reuse and recycle (3Rs)
Sustainable solid waste management program
Waste management beliefs and practices

ABSTRACT

This study examined the waste management beliefs and practices of selected households in a Philippine rural municipality. The sample used for this study involved rural families comprising of 332 households, which was drawn from the population using multistage cluster unequal allocation sampling technique. Descriptive statistics was used to analyze data gathered. Findings show that households encountered many problems when it comes to practicing traditional and modern ways of solid waste management. Moreover, it was revealed that participants were ill-informed about the various aspects of waste management, and that there was little reuse and recycling of waste materials among the households. In terms of the participants' solid waste management beliefs, their ratings yielded a $\bar{X}$ score of 1.08, which means that they generally have positive beliefs towards managing household wastes. When it comes to their practices, participants obtained a $\bar{X}$ score of 2.59, suggesting that the selected households apply, to certain degrees, various acceptable waste disposal measures. Nevertheless, they also demonstrated beliefs and practices that were not environment friendly. From these findings, this study proposed a plan of solid waste management activities for households, which was collaboratively assessed by local government authorities. The proposed plan was unanimously accepted by the evaluators, who approved of the intervention's wide-scale implementation in the province. A number of significant implications were offered in this study, such as conducting community workshops and campaigns for the effective management of solid wastes.

DOI: 10.22034/gjesm.2020.04.02

NUMBER OF REFERENCES	NUMBER OF FIGURES	NUMBER OF TABLES
63	2	6

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Note: Discussion period for this manuscript open until January 1, 2021 on GJESM website at the "Show Article.

INTRODUCTION

People's relationship with the environment, particularly the ways that they deal with wastes, had been studied even during the early times, when people had learned about measures in waste management and in reusing certain important raw materials. The ultimate goal of waste management was to prevent or to reduce the impact of waste materials on human health (Babaei *et al*., 2015) and social amenities (Abeliotis *et al*., 2014; Leblanc, 2019). Over the last thirty years however, the focus was redirected from simply prevention to reducing the environmental impact of waste and to recovering resources from waste materials through various treatments or technologies (Cappellini and Parsons, 2012; Cecere *et al.,* 2014; Reyes and Furto, 2013). The almost unmanageable generation of household wastes remains to be the major problem of governments from around the globe (Babaei *et al*., 2015; Dahlen and Lagerkvist, 2010; Karak *et al*., 2011). Based on the report of the Senate Economic Planning Office (SEPO), as cited in Mawis (2019), the Philippines waste generation consistently increased in number, from 37,427.46 tons per day in the year 2012 to 40,087.45 tons in the year 2016. As the world's population continues to expand over the years, irresponsible waste disposal among residents in urban or rural communities has become one of the most serious social issues that has affected not only public health but also the environment to a great extent (Brennan, 1999; Edjabou *et al*., 2016; Han *et al*., 2016; Najam *et al*., 2015) and, this is primarily resulting from rapid development and urbanization (Babaei *et al*., 2015; Limon and Villarino, 2020). Even developed countries greatly suffer from this social and environmental issue, and reports predict that there will come a time when garbage collection operations could not effectively manage wastes generated from households (Abdel-Shafy and Mansour, 2018; Limon and Villarino, 2020; Sharholy *et al*., 2007). It is without doubt that the disposal of solid wastes has reached serious proportions, and thus, requires the implementation of feasible and sustainable disposal management strategies. The best way in dealing with this issue is to avoid and minimize the generation of solid wastes. Hence, the conceptualization of waste management (Cecere *et al*., 2014; Farrelly and Tucker, 2014; Fahy and Davies, 2007; Koolivand, *et al*., 2014). Several processes, such as storage, collection and transportation, treatment and/or disposal, are involved in waste management (Abeliotis *et al*., 2014; Chalak *et al*., 2016; Dahlen and Lagerkvist, 2010; Fahy and Davies, 2007; Farrelly and Tucker, 2014). Another way of reducing the generation of waste is through recycling of used materials (Babaei *et al*., 2015; Ehrampoush and Baghiani Moghadam, 2005). With such definitions, people in the community are placed in a position where they play a vital role in the solid waste management (SWM), since they are involved in the generation, storage, collection, source separation, recycling and disposal of solid wastes. Without efficient and effective management of waste facilitated by the active participation of communities, problem on solid wastes will continue to threaten the environment and to cause health risks (Mallinson *et al*., 2016; Neff *et al*., 2015; Porpino *et al*., 2015). In order to manage the propose disposal of solid wastes, it is imperative to understand public concerns, preferences, beliefs and attitudes (Chung and Lo, 2004), and to educate and encourage citizens to practice household recycling processes (De Fao and De Gisi, 2010; Limon and Villarino, 2020). Since segregation of wastes strongly affects the successful implementation of waste management programs (Keramitsoglou and Tsagarakis, 2013; Krook *et al*., 2007; Limon and Villarino, 2020), there is a need to critically assess the participation of residents in these undertakings. A comprehensive assessment of factors influencing attitudes on SWM includes the beliefs and practices among members in a household. In this study, beliefs refer to the ideas, concepts, or perceptions of female participants regarding the ways that they manage solid wastes in their households, as based from their observations and day-to-day experiences. The term practices, on the other hand, is operationally defined in this study as common routines that households observe or perform in relation to waste management. A majority of the studies conducted on SWM has commonly focused on attitudes, actions, behaviors, and knowledge on its different aspects (Barr, 2007; Byrne and O'Regan, 2014; Pearson *et al*., 2012; Purcell and Magette, 2010). Enriching such a pool of literature on SWM, this study aims to understand the beliefs and practices of rural households in managing solid wastes, and grounded on this understanding, it seeks to assist the local government unit in developing sustainable strategies of SWM. A significant number of SWM researches

(Abeliotis, *et al*., 2014; Ferronato and Torreta, 2019; Minn *et al,* 2010; Pearson, *et al.*, 2012; Purcell and Magette, 2010; Yoada *et al.,* 2014) revealed that environmental education alone is not enough to mobilize people towards applying acceptable practices in SWM and caring for the environment, as evidenced by the increase in environmental degradation. Since this is the case, it becomes imperative to carry out an approach that would actually lead to desired results. Understanding peoples' beliefs and practices is key to developing appropriate interventions that would encourage households to demonstrate acceptable waste management behaviors. Developing countries, like the Philippines, focus mainly on executing cost-effective waste management practices in waste reduction, separation, and recycling (De Feo and De Gisi, 2010; Krook *et al*., 2007). While there have been many campaigns on waste management in the country the problem of waste still persists. For instance, it should be noted that in urban areas of the country, both low and high density areas have similar service provisions and educational campaigns on waste management although these areas expectedly respond to these measures differently—issues on waste being more of a problem in high rather than low density areas. Therefore, there is a need to recalibrate measures in promoting responsible environmental behavior through proper solid waste management in households, hence the implementation of this study. It is believed that the assumption that studying and understanding the SWM beliefs and practices of selected local rural households would pave the way towards the development of sustainable activities/ programs on SWM, that seek to capacitate the Local Government Unit (LGU) and local communities to establish acceptable waste management system. This study aimed to examine the SWM beliefs and practices of selected 332 households from a coastal, rural municipality called Currimao, located in the province of Ilocos Norte, Luzon Region.

Theoretical framework

Cognizant about the problems on solid waste disposal and management in the households of the selected community, people are still observed to be relatively unmindful on how their beliefs and practices contribute to waste generation and waste management issues. In order to attain a change in behavior among members of communities toward pro-environmental citizenship (Jenkins, 2006), they have to develop positive beliefs on waste management that would directly influence their practices in dealing with solid wastes produced in their homes. However, such a change in beliefs and practices requires the involvement of all stakeholders concerned with SWM, since in the process of implementing measures to reduce waste generation, there are SWM constraints (Ogawa, 2005), financial, technical, and institutional constraints, which should be overcome to achieve the intended outcome. The relationships between and among these essential variables mentioned are presented in Fig. 1.

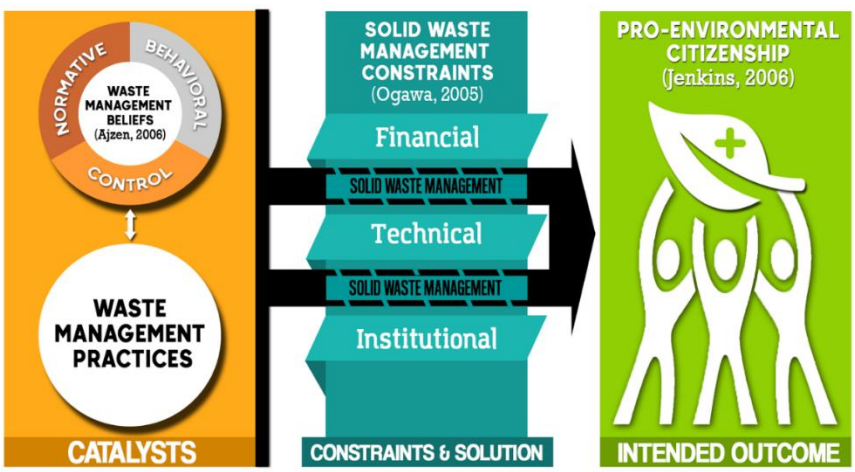

Fig. 1: Theoretical framework on solid waste management in rural households

Beliefs about waste management refer to the various perceptions that households adhere to when it comes to how they deal with the solid wastes that they generate. This belief can predict the potential SWM practices and behaviors that households demonstrate. Due to this relationship, beliefs and practices both play crucial roles in order to instill pro-environmental citizenship (Jenkins, 2006) among members of a particular community. This means that if an individual possesses positive beliefs on SWM, then he/she is most likely to perform or apply practices that reinforce the production of citizens that are environmentally aware. According to Ajzen (2006), the concept of belief is guided by the three kinds of belief:

1) *behavioral belief* (belief about the expected outcomes of the behavior and its assessment of these outcomes), 2) *normative belief* (belief about the customary expectations of others and impetus to conform to these expectations), and 3) *control belief* (belief about the existence of several factors that may enable or inhibit a performance of the behavior and the perceived influences of these factors). Although these three types of belief are very important in framing how households behave towards SWM, this study only focused on behavioral belief. This is the case because the researchers agreed that behavioral belief has a strong link between behavior and outcome; if the household members understand the potential ramifications of improper waste disposal to personal and public health, then they are more likely to strengthen their participation in measures that put a halt to such unacceptable practice, in order to attain the intended outcome. Certainly, understanding peoples' beliefs and practices is key to developing appropriate interventions in SWM. However, according to Ogawa (2005), there are challenges in SWM that need to overcome prior to the development and implementation of a SWM Program. He categorized these challenges into technical, financial, and institutional:

Technical constraints

In many developing countries, human resources at both the national and local levels are not sufficiently equipped with the technical expertise to conduct SWM planning and operation. A significant number of officers who are responsible for SWM in the local level have little or no technical training in SWM.

Financial constraints

Ogawa (2005) reported that SWM is given a very low priority in rural areas, except in capital and large cities. This results in very limited funds allotted to the SWM sector by the governments, which is the fundamental reason of not achieving the levels of services required for the protection of public health and environment. This problem is serious at the local government level in which the local taxation system proves to be insufficient, and this results in weak financial support for SWM.

Institutional Constraints

Ogawa (2005) explained further that several agencies at the national level are only partially engaged in efforts directed towards SWM, and that personnel in these agencies do not usually have clear roles or functions to fulfill. Additionally, there is no single agency or committee that is specifically designated to coordinate projects and activities on SWM. These challenges or constraints should be taken into account in conceptualizing and operationalizing SWM programs, especially in local, rural areas. When these are overcome, then SWM programs that are efficiently and effectively implemented could produce community members that possess environmental or ecological citizenship, which refers to the strong and deep connection between nature and humanity (Jenkins, 2006). Such a relationship goes beyond mere reciprocity, as it involves the creation of a value in relationship with nature beyond obligation (Light, 2003). Moreover, it encourages people to protect and conserve natural systems and resources in their immediate communities, rather than to optimize them for the purpose of obtaining short-term financial gains (Light, 2003). This study aimed to examine the SWM beliefs and practices of selected 332 households from a coastal, rural municipality called Currimao, located in the province of Ilocos Norte, Luzon Region. Specifically, the current study was conducted in the year 2019 to answer the following questions: 1) What are the problems encountered by selected households with regard to waste management? 2) What are the beliefs of selected households regarding waste management? 3) What are the practices of selected household regarding waste management in terms of: waste disposal, and waste recovery and processing? 4) What activities/programs should be proposed to improve the waste management practices of households?

MATERIALS AND METHODS

Study area

This study was conducted in a rural municipality, called Currimao (Fig. 2), which is located in the province of Ilocos Norte. This coastal municipality is situated at approximately 18° 1' North, 120° 29' East, in the island of Luzon, and has a total land area of 34.08 (13.12 square miles), which constitutes 0.98% of Ilocos Norte's total area (PhilAtlas, 2020). Based on the 2015 Census record, Currimao has a total population of 12,184. Containing 23 barangays, this municipality has an annual regular revenue of Php 83,006,081.22 for the fiscal year of 2016 (PhilAtlas, 2020). "Barangay" is a Filipino term for district or village, which may be subdivided into smaller areas called "sitio" or "purok." Such areas, usually present in rural areas, are territorial enclaves inside a barangay. The closest cities to Currimao are Batac, Laoag, and Vigan, whereas its nearest municipalities are Pinili, Badoc, Paoay, and San Nicolas (PhilAtlas, 2020). In this study area, classifications of waste generated by the households were a combination of: a) organic waste like fruits, flowers, kitchen waste, leaves, and vegetable; b) toxic waste such as animal waste, batteries, bulbs, chemicals, fertilizers, old medicines, paints, and spray cans; and c) recyclable waste that includes glass, metals, paper, and plastics. It has been observed in the coastal area that there are certain practices which have been instigated by the community people in terms of SWM. These include solid waste recycling but one of the problems is the lack of recycling facility and storage areas; also, people can have minimal earnings through selling bottles, plastics, cans, and other scraps to junkshops. In addition, waste materials are not thrown into bodies of water or on vacant lots instead they are placed on designated trash bins. Leftover foods are fed to household pets and or thrown into separate garbage containers. The use of toxic and hazardous materials or chemicals are also avoided; if ever these are used, they are discarded properly so as to avert environmental and health problems.

Research design

This study employed a descriptive survey design where a sample of 332 households was selected from the entire population of the said coastal municipality. Approximately, there are 12,184 people living in 2,437 households of Currimao. This survey was carried out in order to find out the occurring problems encountered by households in managing wastes, their beliefs on waste management, and their household waste management practices (e.g. waste disposal, recovery, and processing). Additionally, this study recommended some proposed activities

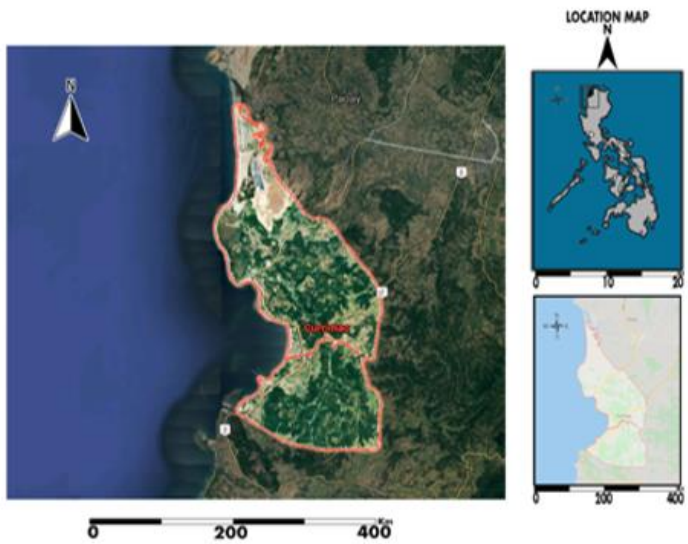

Fig. 2: Geographic location of the study area in Currimao, Ilocos Norte in Philippines

that could effectively and efficiently help households manage their solid wastes. Data gathered from the respondents were analyzed using descriptive statistics.

Data gathering procedure

Initially, the researchers requested permission from the municipal Mayor and the concerned Barangay Chairs to conduct the study in their area. Permission from the selected respondents in this study was also obtained. Once the requests were approved, copies of the questionnaires were distributed to the identified respondents. The questionnaires were administered on-the-spot and were collected by the researchers. This mechanism was employed to ensure 90 % to 100 % receipt of the questionnaires, and to identify unanswered items in the questionnaires. After questionnaires had been retrieved, the researchers went house to house in order to observe waste management practices employed in the selected households. This was conducted to triangulate the data gathered from the accomplished questionnaires. After completing the entire data gathering procedure, data was studied, tabulated, interpreted, and inferences were drawn based on the results.

Sample and sampling technique

Multi-staged cluster unequal allocation sampling method was utilized in order to select the 332 household-respondents from the municipality of Currimao. The 332 households were selected using Slovin's formula, out of the 2,437 households. The formula was used to calculate the number of samples considering the number of population and margin or error. The area was then divided into five main strata through the use of stratified sampling procedure. Thus, the researchers could achieve accuracy when it comes to the representativeness of the total population of rural households in the municipality. Therefore, North, South, East, Centro and West Zones were produced. From these five randomly selected communities serving as study units 332 households were selected for this study. All participating households were numbered by the researchers separately in each of the five zones; the researchers then used the numbers assigned to the families to prepare a table of random numbers for each zone, and randomly selected the 332 families. Since mothers were regarded as the ones largely accountable in performing the household chores, which include SWM, they served as the main respondents, representing their families or homes. They were asked to answer the survey questionnaires. Table 1 presents the socio-demographic profile of the respondents who participated in this study. It can be gleaned from the table that the respondents' ages range from 25 to 65 years old, which indicates that they are mature enough to provide credible judgment or evaluation about their household SWM beliefs and practices. Majority (147 or 44.27%) of the respondents are college graduates; 93 or 28.02% did not finish their college degree; 44 (13.25%) are high school graduates, while others have finished primary education and some did not finish high school. Most of them are employed in the nearby towns and barangays, and are living in a bungalow type of house.

Research instruments

Researcher-made survey questionnaires and observations were utilized to collect data from the respondents. These instruments enabled the researchers to answer the problems posted in this study. The researcher-developed survey questionnaire is divided into three parts. Part I asks for the background information about the respondents. This includes age, education, occupation, house type, and number of members in the household. Part II includes a 19-item checklist to find out the prevailing problems encountered by the selected households regarding SWM. The instrument also contains a 16-item scale to assess the beliefs of households on SWM. Here, the respondents were tasked to encircle the number: 1 – agree (A), 2 – disagree (D) that corresponds to their assessment in each item. Also, a 23-item scale that assesses their household beliefs on SWM and a 9-item scale, which focuses on the waste disposal and recovery and processing measures. The respondents rated their beliefs and practices with the corresponding descriptive interpretations: 1-Not practiced (NP); 2-Slightly practiced (SP); 3-Moderately practiced (MP); and 4-Fully practiced (FP). Part III of the survey questionnaire includes the suggested activities on SWM by the respondents. Before the actual survey, the researcher-made questionnaire was subjected to content and face validation carried out by professors from different universities in the Philippines. The comments and suggestions of the

Table 1: Socio-demographic profile of the respondents

		Frequency (*f*)	Percentage (%)
Age			
	30	26	07.83
	31- 40	116	34.94
	41- 50	138	41.57
	51- 60	45	13.54
	61	7	02.12
	Total	332	100.00
Sex			
	Male	0	00
	Female	332	100
	Total	332	100
Education			
	Primary	24	07.23
	HS level	24	07.23
	HS Graduate	44	13.25
	College level	93	28.02
	College graduate	147	44.27
	Total	332	100.00
Occupational Status			
	Unemployed	143	43.07
	Employed	189	56.93
	Total	332	100.00
House Type			
	Bungalow	193	58.13
	Two-storey	96	28.92
	Duplex	43	12.95
	Total	332	100.00

professors were considered and incorporated for the significant improvement of the instrument.

Data analysis

Descriptive statistics was used to analyze data derived from the questionnaires and observations made by the researchers. Frequency (*f*) counts and percentages (%) were utilized in order to describe the profile of the respondents. Mean ($\bar{X}$) was employed to analyze the results of survey questionnaires, which determine the beliefs and practices of the selected rural households. Frequency counts and percentages were used to address research question number 1. Data on the age, education, occupation, house type, and number of members in the household were presented in tabular format. From the frequency counts, percentages were used to make the presentation and interpretation of data more meaningful. The second and third research questions, which focus on the beliefs and practices of selected rural household, utilized the mean for analysis. In order for the respondents to assess their level of SWM practices and beliefs, a list of indicators was provided. When interpreting the mean and weighted mean of the respondents' answers, the researchers were guided by the following mode of scoring: 1.00 – 1.50 – Not practiced (NP); 1.51 – 2.50 – Slightly practiced (SP); 2.51 – 3.50 – Moderately practiced (MP); and 3.51 – 4.00 – Fully practiced (FP). As a way of addressing research question number four, the respondents were tasked to enumerate and describe at least three proposed activities that could help in properly managing household wastes. Through content analysis, the qualitative responses of the participants were reviewed multiple times and organized into themes, which is a consolidation of all their suggested activities. Such analysis enabled to researchers to come up with feasible and sustainable waste management strategies that could be employed in local communities.

RESULTS AND DISCUSSION

Problems encountered by the respondents

Problems relating to solid waste management (SWM) practices that are encountered by the

participating households are presented in Table 2. A majority of the respondents indicated that their major problems in managing household wastes are as; 1) insufficient recycling facility and storage areas; 2) public disinterest in SWM, and 3) lack of awareness among the people regarding the effects of SWM practices to their health and to the environment. This finding conforms to the study of Reyes and Furto (2013). In their study, the residents of Batangas City encountered problems in the implementation of SWM practices to a *Moderate level*, such as lack of awareness regarding the effects of SWM to health, lack of training on proper SWM practices, public indifference, increasing population and inadequate government policies. Other problems were encountered at a *Minimum level* and these include; 1) lack of interest or willingness of every household for change/transformation, and 2) non-operation of a good disposal facility. A study on solid waste management conducted by the Asian Development Bank (ADB, 2013) reported that in Bhaktapur, Nepal households have poor responses when it comes to efforts that encourage waste minimization. Common to these studies is the finding that the waste management workforce is too small to enable the municipalities to achieve their goals. In the rural municipality involved in this study, the local departments or offices did not comply favorably in attaining the objectives of existing waste management procedures, which leads to their unsuccessful implementation. In the same vein, the municipality of Bhaktapur charges a very nominal yearly fee for waste management. Thus, it does not have sufficient income count to fund the needed investment. The Municipality Tribhuvannagar likewise encountered poor response from its citizens when it comes to waste minimization initiatives due to shortage of waste management staffs and because of the the lack of authority among community development personnel to decide on financial and administrative matters and to implement enforcement efforts (ADB, 2013). Based on the findings of the said study, problems encountered are; 1) delayed schedules of collection; 2) disposal area are not strategically located; 3) noncompliance of the department or offices, and 4) 5S (sort, set in order, shine, standardize and sustain) / 3R (reduce, reuse and recycle) is not strictly implemented. The problems encountered by the respondents in relation to SWM practices imply technical constraint (Ogawa, 2005). Such type of constraint is manifested in the scarcity of recycling facility and equipment in the local community involved in this study; people do not show much interest when it comes to SWM and they lack awareness with regard to the effects of SWM practices to their health and to the environment. As mentioned in Ogawa (2005), a significant number of people who are accountable for SWM in the local level have little or no technical training in SWM.

Beliefs of rural households on waste management

In order to instill a pro-environmental behavior among members of communities, they should be able to develop positive beliefs on solid waste management (SWM). In this study, most of the respondents demonstrate positive beliefs on SWM since they have agreed to all the beliefs enumerated in the researcher-made instrument with a total mean rating of 1.08 (Table 3). One of the items was rated with *Disagreement*, which is waste prevention is not their responsibility. According to Ajzen (2006), possessing positive beliefs toward waste management encourages people to care about environmental cleanliness and to consistently apply measures that effectively manage wastes—if a person has a positive evaluation on the outcome, the belief to perform

Table 2: Household waste management problems encountered by the repondents

Problems encountered	Frequency (*f*)*	Rank
Insufficient recycling facility and storage areas	20	1.5
People's disinterest in solid waste management (SWM)	20	1.5
Lack of awareness among the people regarding the effects of solid waste management practices to their health and to the environment.	20	1.5
Inadequate SWM policies implemented by the government.	17	4.5
Lack of support demonstrated by local government officials.	17	4.5
Households are not willing to take action for change/transformation.	16	6.5
Available disposal facility is not effectively operating.	16	6.5

* Multiple responses

Table 3: Beliefs on the waste management of the respondents

Indicators		Mean	Interpretation
1.	Generation of household solid wastes is a major environmental concern.	1.08	Agree
2.	Improper waste management results in health risks to my family.	1.00	Agree
3.	Dumpsites are properly used as disposal areas for household solid wastes.	1.04	Agree
4.	The prevention of household wastes is not my responsibility.	2.00	Disagree
5.	The prevention of household wastes brings benefits to the society and to the environment.	1.00	Agree
6.	Lifestyle modification helps in reducing wastes generated in homes.	1.00	Agree
7.	Moderating consumption patterns contributes to waste reduction.	1.00	Agree
8.	Open burning of waste materials poses health and environmental risks.	1.04	Agree
9.	Reducing is an important concept in waste management.	1.00	Agree
10.	Reusing helps in the proper management of household wastes.	1.04	Agree
11.	Recycling contributes to the reduction and prevention of wastes.	1.04	Agree
12.	Burying wastes is a better option rather than burning them.	1.00	Agree
13.	Reusing of materials makes life more convenient.	1.00	Agree
14.	Waste prevention results in a better environment for present and future generations.	1.00	Agree
15.	Everybody is responsible in waste prevention and management.	1.00	Agree
16.	The government is mainly responsible in addressing solid waste problems and in ensuring that the environment is properly cared for.	1.04	Agree
Weighted mean		1.08	Agree

Legend:

Mean	*Interpretation*
1.00 – 1.50	Agree
1.51 – 2.00	Disagree

that certain behavior will be higher. The overall mean rating that the participants obtained only shows that they were aware of their responsibility to minimize the generation of solid wastes in their households. The same findings were reported in a Canadian study that indicated multiple relationships between food waste production and household shopping practices, food preparation behaviors, household waste management practices, and food-related attitudes, beliefs, and lifestyles (Parizeau *et al*., 2015). In the said study, respondents felt that individuals were responsible for reducing food waste, and have identified other actors, such as food manufacturers, stores, government, and farmers, as responsible for waste management. The importance of engaging the entire consumption chain in waste management in order to achieve favorable behavioral changes must be emphasized (Fami *et al*., 2019). A number of studies have concluded that sustainable SWM entails a holistic approach that involves a broad range of stakeholders (Caniato *et al*., 2015; Le *et al.,* 2018; McAllister, 2015), particularly the involvement of residents in communities (Salem *et al*., 2020).

The aforementioned finding also signifies that the respondents are practicing the traditional and modern way of treating or managing their household wastes. Based on Table 3, respondents properly dispose off their household wastes in dumpsites, and practice reducing of wastes through lifestyle modification and moderation of consumption pattern. Such findings in this study reinforces the fact that households in the selected municipality already have pre-knowledge about the impact of improper waste disposal on personal and public health. This prior schema largely influenced their positive beliefs about solid waste management. Additionally, they perceive that the generation of solid waste in household is one of the major environmental burdens, and that improper disposal and management of wastes bring problems to their families' health conditions. Certainly, among households, especially in areas with poor living conditions, there is fear of the negative consequences associated with improper household waste disposal, which include environmental pollution, unpleasant smells, and the proliferation of disease-causing insects (Salem *et al*., 2020).

Waste management practices

Table 4 shows the waste disposal practices of the respondents. All items yielded means ranging from 1.64 to 3.60 with slightly practiced to moderately practice as their descriptive interpretations. The

Table 4: Waste disposal practices of the respondents

Indicators	Mean	Interpretation
1. Waste materials are thrown into bodies of water or on vacant lots.	1.64	Slightly practiced
2. Through request process, waste disposal is made.	2.80	Moderately practiced
3. Waste materials are disposed following methods that are recommended by the government, such as source reduction.	3.12	Moderately practiced
4. Waste materials are disposed in accordance with acceptable methods advised by the government, such as recycling.	3.00	Moderately practiced
5. Waste materials are disposed based on methods advocated by the government, such as reusing.	2.96	Moderately practiced
6. Designated trash bins are used in the proper disposal of wastes.	3.56	Fully practiced
7. Household garbage is disposed through open burning.	2.80	Moderately practiced
8. Hazardous wastes are buried underground.	2.76	Moderately practiced
9. A schedule is followed in the disposal of wastes.	3.32	Moderately practiced
10. Leftovers are thrown into separate garbage containers.	2.12	Slightly practiced
11. Wastes are properly places in designated collection areas.	2.96	Moderately practiced
12. Food wastes are disposed in the compost pit/heap.	1.84	Slightly practiced
13. Waste segregation is properly performed.	2.56	Moderately practiced
14. Biodegradable disposable products are used in the household.	3.08	Moderately practiced
15. Refillable containers are used for packaging drinks.	3.36	Moderately practiced
16. Products with less packaging are the ones purchased for home consumption.	3.08	Moderately practiced
17. Recycling programs are assessed through conducting a cost/benefit analysis.	3.00	Moderately practiced
18. Bottles, plastics, cans and other scraps are sold to junkshops.	3.60	Fully practiced
19. Leftover foods are fed to household pets, such as dogs or cats.	3.56	Fully practiced
20. The use of toxic and hazardous materials or chemicals are avoided.	3.60	Fully practiced
21. Somebody is being paid to throw away garbage anywhere, as long as it is far from the household.	2.52	Moderately practiced
22. Infectious, chemical, and toxic wastes are disposed properly.	3.52	Fully practiced
23. Kitchen wastes, infectious wastes, chemical wastes, sharp wastes, toxic substances, medical wastes are disposed in marked high-density garbage bags.	3.16	Moderately practiced
Weighted mean	2.95	Moderately practiced

Legend:

Mean Rating	*Interpretation*
1.00 – 1.50	Not practiced (NP)
1.51 – 2.50	Slightly practiced (SP)
2.51 – 3.50	Moderately practiced (MP)
3.51 – 4.00	Fully practiced (FP)

weighted mean of 2.95, interpreted as moderately *practiced* suggests that the respondents are sensible and conscious enough about the waste disposal practices. This result demonstrated consistency between the disposal of wastes in the designated collection area and the non-disposal of waste materials into the municipality's bodies of water or vacant lots. This reveals how waste management system is being practiced by the household participants, in general. The residents slightly *practiced* the burying of hazardous wastes underground. They were not aware that these materials could create harmful effects, even though they were buried underground, but to a lesser extent only, as compared to when these materials, together with other forms of solid wastes, are exposed above the ground. It could be deduced that the residents lacked awareness on acceptable SWM practices, and that they are not familiar about the rationale behind performing such practices. With this outcome, it only shows that there is an institutional constraint. According to Ogawa (2005), institutional constraint happens when there is no single agency or committee that is specifically designated to coordinate projects and activities on SWM. In return, community people will not be aware and be educated with regard to SMW activities. However, if this constraint is put into consideration when planning SWM activities, projects, and programs, and this is overcome and efficiently and effectively implemented, this would

yield pro-environmental or ecological citizenship among community people. A study carried out in Ado-Ikiti in Nigeria by Momoh and Aladebeye (2010) showed the same results where the respondents applied unacceptable methods of solid waste disposal, such as dumping of waste in unauthorized sites and stream channels during the rainy season, and burning of wastes during the dry season. Similarly, in Batangas City, Philippines, Flores *et al*. (2017) reported that people in communities practice indiscriminate dumping wastes, brought about by the lack of dustbins or areas to collect wastes. Based on the Solid waste hierarchy designed by the Department of Environment and Natural Resources and National Waste Management Commission (DENR-NWMC, 2004), if people cannot avoid the generation of wastes, then they must try to reduce the volume of wastes that is generated. To reduce the volume of wastes, people should know how to reuse and recycle materials. If waste production is no longer avoidable then treatments, such as composting, could be done to curb the problem. In the study conducted by Ferronato and Torretta (2019), it was highlighted that avoiding the production of trash is an effective way of lessening waste problems in developing countries. The researchers believe that using materials that are environmental friendly, the community can definitely contribute in minimizing, and even in addressing the garbage problems of the Philippines. Results of this study also show that burning of garbage in every household is moderately practiced. People remain indifferent to the potential bad effects of the emitted smoke to the atmosphere, as well as the negative impacts of the particulates coming out from the burning garbage to public health. As Hickman (2000) clearly argued, one of the factors that contribute to solid waste problem is public indifference, where people do not simply care on the possible effects of improper SWM practices. Table 5 shows the effectiveness of the existing SWM practices in terms of recovery and processing. Based on the table, the respondents were aware in the recovery and processing of the wastes. This statement is attested by the composite mean of 3.06. Respondents usually practice 5s, full implementation of materials recovery facility, and 3Rs. These practices are ranked as first, second, and third, respectively. This means that SWM includes converting wastes into new reusable materials. Reyes and Furto (2010) found out through their study that residents of Batangas City, in general, moderately implement the SWM practices in their communities. The residents fully practiced feeding of leftover foods to pets. On the other hand, the selling of bottles, plastics, cans and other scraps to junkshops; avoiding the use of toxic and hazardous materials and chemicals; collection of garbage by municipal trucks; reuse of reusable materials; segregation of biodegradable from non-biodegradable wastes and acquisition of sanitary landfill are practiced to a moderate level.

Practices such as reducing waste generation, composting and recycling are slightly practiced. Considering the strong belief of the respondents

Table 5: Recovery and processing practices of rural households

Indicators		Mean	Interpretation
1.	Utilization of reusable materials	3.24	Moderately practiced
2.	Lessening/reducing of waste generation	3.24	Moderately practiced
3.	Recycling	3.00	Moderately practiced
4.	Sorting	3.36	Moderately practiced
5.	Setting in order	3.00	Moderately practiced
6.	Shining	2.56	Moderately practiced
7.	Standardizing	3.48	Moderately practiced
8.	Sustainability of practices	3.60	Moderately practiced
9.	Full implementation of Materials Recovery Facility (MRF)	2.04	Slightly practiced
Weighted mean		3.06	Moderately practiced

Legend:

Mean Rating	Interpretation
1.00 – 1.50	Not practiced (NP)
1.51 – 2.50	Slightly practiced (SP)
2.51 – 3.50	Moderately practiced (MP)
3.51 – 4.00	Fully practiced (FP)

towards their responsibilities in helping reduce waste generation in households, it is also interesting to note that majority of them are practicing contextualized measures of enabling food waste reduction in their homes. This signify that there is a direct relationship between positive beliefs on waste management and positive waste management practices in the households.

Proposed solid waste management activities for the households

Table 6 shows the suggested activities to be carried out by the identified barangay in order to properly manage solid wastes in the households. Although most of the respondents in the municipality of Currimao do not practice the "Arubayak Dalusak" (TAPAT Ko, LINIS Ko) [I shall clean my surroundings] activity, the

Table 6: Suggested waste management activities for the household

Activities	Objectives	Frequency	Persons involved	Allotted fund	Output
Arubayak Dalusak *(Tapat ko linis ko activity) [I shall clean my surroundings]*	Encourage everyone to be responsible enough in cleaning their surroundings	Everyday	Barangay officials and folks	None	Clean surroundings that provide fresh air for everyone
Seminar on household waste segregation	Instill the importance of having a clean environment Change their beliefs and practices for the betterment of the people living in the community Effectively and efficiently practice the reduction of wastes, if not zero waste	Twice a year/ as needed	Barangay officials, folks, Invite speakers, In cooperation of the local government unit *(LGU)*	US$ 500.00	Everyone in the community has knowledge on proper segregation of wastes, which could lessen the workload of the garbage collector Fast and efficient collection of household wastes
Anti-littering campaign	Gain knowledge on proper disposal of animal/human wastes Practice 3Rs for the benefit of the people of the community for personal use.	Everyday	Barangay officials, folks	None	Everyone will be aware that their wastes have to be properly disposed in designated areas Garbage is properly managed through an effective waste disposal system
Implementation of 3Rs • Seminar/training workshop • Production		*Training:* Twice a year/ as needed *Production:* as the need arises	Barangay officials, folks; Invite speaker for the training of the people in recycling; In cooperation of the LGU	US$ 1,000.00	A source of livelihood for the people, equipped and knowledgeable in 3Rs

participants suggested its continued implementation, but with strict monitoring from the authorities. Strategies, such as Clean and Green Campaign (CGC) could serve as an effective tool to communicate significant information about SWM programs (Ahmed and Ali, 2006; Chakrabarti *et al*., 2009; De Feo and De Gisi, 2010). Participants were also asked to provide brief objective for each SWM strategy that they proposed and how they could participate in them. It was found out that most of the participants support the SWM program. Although some of the participants were not aware of the potential ramifications of not practicing acceptable SWM procedures, a majority of them realized that such a measure is imperative in resolving social issues that result from the constant increase in volume of solid wastes. Another proposed activity is the conduct of a seminar on household waste segregation, which would engage all barangay folks to effectively and efficiently practice zero waste generation, if not to minimize them. This is one of the best strategies that must be done by the barangay officials and must be supported by the local government unit (Ahmed and Ali, 2006; Keramitsoglou and Tsagarakis, 2013). This would make them realize the importance of proper waste management in order to attain a clean and healthy environment. By knowing the benefits that they could obtain from practicing SWM, they would eventually support and consistently apply acceptable practices in SWM. Consequently, awareness and understanding of the different aspects concerning SWM would result in changes of belief and behavior among people (González-Torre and Adenso-Díaz, 2005; Grodzin´ska-Jurczak, 2003; Huang *et al*., 2006). Another activity would be implementation of the Antilittering Campaign, which will be initiated to prevent the generation of solid wastes that come from litters. Through this, people in communities will learn proper disposal of animal or human wastes. Additionally, this could lead to the efficient collection of garbage that will follow a regular schedule and a better system of waste disposal. Last activity that was proposed by the respondents is the (re)orientation about the 3Rs (Reduce, Reuse and Recycle) among people in communities (Byrne and O'Regan, 2014; Mancini *et al*., 2007; Kofoworola *et al*., 2005; Pearson *et al*., 2012; Refsgaard and Magnussen, 2009; Singhirunnusorn *et al*., 2012). The use of 3Rs effectively aids in SWM. There are many environmental benefits that can be derived from adhering to the principles of Reduce, Reuse, and Recycle. Executing this method helps in the prevention of greenhouse gas emissions, reduction of pollutants, conservation of resources and in lessening demand for the utilization of chemical treatments or technologies and landfill spaces (De *et al.,* 2016). Therefore, it is advisable that these activities or strategies be adopted and incorporated as part of the SWM program. It should be stressed that generation of solid wastes in household is a social issue and behavioral changes are needed throughout the entire consumption chain, starting from purchase planning and ending with food consumption (Fami *et al*., 2019). These strategies in SWM, as recommended by the participants, are considered sustainable as it largely acknowledges the critical role of informal sectors, such as people in the local community, in combination with practices that enhance waste management, government regulations, and supports of stakeholders (Pham Phu *et al.,* 2018). The strategic implementation of these strategies strikes a balance between environment, economy, and society, which consist the core of sustainable development (Pham Phu *et al.,* 2018).

There are systematic procedures that could be carried out in order to ensure the successful implementation of the proposed solid waste management activities specifically intended for households in the study area. Markgraf (2020) mentioned four steps that could be undertaken to optimize the operation of the SWM activities, namely: consultation, planning, execution, and evaluation. Consultation entails coordination with various local organizations and concerned authorities in order to solicit inputs that would help in the smooth flow of the implementation of the SWM activities. In such discussions, decisions should be anchored on the objectives and budgetary allocation of each activity or strategy. Consultation should continue in the planning phase where scheduling of the activity implementation, sources of fund for operation, people or authorities in charge, and concrete outputs from the activities are made clear and specific. The most critical phase is execution where the plans designed and developed are now put into action. Here, constant supervision and monitoring of work from assigned groups or individuals are crucial in the attainment of goals and objectives, as well as in the creation of expected, desired outputs. Finally, the evaluation phase examines the progress of the implementation by establishing connection between the goals or

objectives and the outputs that were completed. Apart from carefully looking at the outputs, the various processes in achieving them should also be taken into account by assessing how activities are implemented, what problems or challenges were encountered in the process of implementation, and how these were addressed by concerned authorities.

CONCLUSION

This study provided a comprehensive understanding of the beliefs and practices of rural households when it comes to SWM. The generation of solid wastes in the households is inevitable, and so it is imperative that families, together with government units and agencies, are made accountable in the successful implementation of waste management initiatives. Results showed that the participating households are ill-informed about the various aspects of waste management. It was also found out that minimal effort is done in reusing and recycling of waste materials among households. Participants also demonstrated beliefs and practices that are environmentally unacceptable or unfriendly. Consequently, these beliefs and practices have resulted in the careless disposal of wastes among people since strict monitoring and implementation of SWM has not been prioritized. Furthermore, this study revealed that households are generally prepared to play their vital role in waste management, but as the participants unanimously agreed, they could not manage on their own; they need the technical guidance and support of local government authorities. The willingness among the people to work together with one another and with the authorities could result in the effective and efficient operation of concerted activities directed towards SWM. Based on the conclusions generated from the findings, the following recommendations are suggested: 1) additional massive information dissemination campaign on SWM should be conducted to promote public awareness. Handbooks or handouts written in local languages could be developed, disseminated, and used as information and educational materials for households; 2) Material Recovery Facility (MRF) should be made available in every barangay and be made functional; 3) Local government units (LGUs) should formulate sustainable and contextualized SWM programs that would encourage and motivate the public to give their cooperation and full support; 4) LGUs should reach out and build partnerships with non-government organizations, private sectors, and civic organizations for additional support and resources; and 5) positive and/or negative reinforcements through awarding of incentives for those following SWM policies or giving penalties for those who do not conform to acceptable SWM practices can be executed.

AUTHOR CONTRIBUTIONS

M.R. Limon and N.C.T. Corales performed the conception and design of the study, acquisition of data, drafting the manuscript, revising the manuscript for significant intellectual content, and approval of the version of the manuscript to be published. J.P.C. Vallente performed analysis and interpretation of data, editing and revising the manuscript for significant intellectual content, approval of the version of the manuscript to be published.

ACKNOWLEDGEMENT

The authors express their gratitude to the respondents who come from the Municipality of Currimao, Ilocos Norte, for providing significant data and information that were greatly instrumental in the successful completion of this study.

CONFLICT OF INTEREST

The authors declare that there is no competing interest. In addition, ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy were completely observed by the authors.

ABBREVIATIONS

A	Agree
ADB	Asian Development Bank
B	Beliefs
CGC	Clean and Green Campaign
D	Disagree
DENR	Department of Environment and Natural Resources
f	Frequency
Fig	Figure
FP	Fully Practiced
HS	High school
LGU	Local Government Units
MRF	Material Recovery Facility
MP	Moderately Practiced
NWMC	National Waste Management Commission
NGOs	Non-Government Organizations
NP	Not Practiced
P	Practices

SEPO	Senate Economic Planning Office
SP	Slightly Practiced
SWM	Solid Waste Management
3Rs	Reduce, Reuse and Recycle
5S	Sort, Set in order, Shine, Standardize & Sustain
°	Degrees
‘	Minute
%	Percentage
$US	United States of America Dollar
$\bar{X}$	Mean

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HOW TO CITE THIS ARTICLE

Limon, M.R.; Vallente, J.P.C.; Corales, N.C.T., (2020). Solid waste management beliefs and practices in rural households towards sustainable development and pro-environmental citizenship. Global. J. Environ. Sci. Manage., 6(4): 441-456.

DOI: 10.22034/gjesm.2020.04.02

url: https://www.gjesm.net/article_39143.html