RESEARCH ARTICLE

Solid Waste Management (SWM) practices in selected areas of Zamboanga Del Sur: Evaluating its implementation

Lina T. Codilla[1], Mary Jocelyn V. Battung[2], Nanette D. Bilbao[3], Ma. Carissa C. Molanda[3], Starr Clyde L. Sebial[3], Janet D. Barrera[3*]

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This study aimed to evaluate the implementation of Solid Waste Management (SWM) practices in selected areas of Zamboanga del Sur, Philippines, to uphold the Ecological Solid Waste Management (ESWM) Act of 2000, known as RA 9003. A total of 500 participants, composed of local barangay officials (barangay captain, barangay kagawad, treasurer, and secretary), business sectors, and those with knowledge in SWM implementation represented from each Purok were involved in the study. The descriptive-comparative design was used with the questionnaire checklist as the primary data-gathering tool. An internal reliability test was done on the same set of questionnaires using the Cronbach alpha coefficient. Weighted average mean, Chi-square, and mean square contingency coefficient tests (Phi coefficient) were utilized to ensure accurate analysis and interpretation of the data gathered. The study's findings disclosed that the Solid Waste Management (SWM) practices are moderately implemented in the two municipalities of the Said Province. Due to its moderate implementation, the result further revealed that the Dumingag and Margosatubig populace still experienced ailments but a minimal percentage from 38% as the highest down to 5%. Furthermore, the hypothesis test showed that the assessment on the implementation of SWM practices of the barangay local officials, business sectors, and program implementers and their observations regarding environmental and health effects significantly differed.

Key Words: *Solid Waste Management (SWM); Evaluation; Margosatubig; Dumingag; Non-biodegradable wastes*

INTRODUCTION

Solid waste management has become a global perennial problem accumulated through society's domestic and industrial waste [1]. The global waste management outlook estimated that total solid waste in 2010, from households, commerce, industry, and construction, was 7 to 10 billion (109) tons; around 2 billion tons was municipal solid waste [2]. Solid Waste Management is defined as the discipline associated with the control of generation, storage, collection, transfer and transport, processing, and disposal of solid wastes in a manner that is in accord with the best principles of public health, economics, engineering, conservation, aesthetics, and other environmental considerations, and that is also responsive to public attitudes.

With the increasing concerns both in the global and local context, the Philippine government had undertaken actions for the enhancement of its management and operation of solid waste through the enactment of laws, rules, regulations, orders, and memoranda on the environment, as well as resolutions and ordinances made by local government units [3]. One of the many initiatives of the government was the approval of Republic Act 9003 during President Gloria Macapagal-Arroyo, otherwise known as the Ecological Solid Waste Management (ESWM) Act of 2000, declaring the policy of the government to "adopt a systematic, comprehensive, and ecological solid waste management program".

For 19 years of its enactment, the solid waste problem is drastically increasing in volume as the number in population escalates with about 46% or about nine billion increase in worldwide population from 2005 to 2050 [4]. With the escalating solid waste problem, the national government narrowed the monitoring of RA 9003 implementation at the municipal level through a local government unit where each municipality must submit a 10-year SWM plan. Section 16 mandates all local government SWM plan to be consistent with the National Solid Waste Management Framework.

In this vein, the current research was conducted to evaluate the implementation of Solid Waste Management (SWM) practices of selected areas of Zamboanga del Sur. Moreover, the study's findings intended to bring about commendations for possible ordinance enhancement in implementing SWM in the Province of Zamboanga del Sur. Specifically, the study determined the differences in the level of implementation of SWM among the two selected areas of the province and the effects of SWM implementation practices on the environment and health of the constituents. This study is concerned with implementing the Solid Waste Management (SWM) Practices of the selected areas of Zamboanga del Sur. It also evaluated the observed environmental and health effects of the constituents. Specifically, this study endeavored to answer the following queries:

- To determine the implementation level of SWM practices in the selected areas of the province.
- To find out if there are significant differences in the implementation level of SWM practices between the location of the participants.
- To ascertain the observed environmental and health effects of the implementation of SWM practices.
- To determine the significant differences in observed environmental effects of the implementation of SWM.
- To find out the significant relationship between the location of participants and their observed environmental effects of implementation of solid waste management practices.
- To determine the significant differences in the observed health effects on the implementation of SWM practices when participants are grouped according to the household.
- To find out the significant relationship between the location of respondents and their observed health effects on the implementation of SWM.
- To identify the predetermined problems encountered by the participants in the implementation of SWM practices.

[1]*Department of Agriculture, Forestry and Environmental Sciences, JH Cerilles State College, San Miguel, Zamboanga del Sur, Philippines*

[2]*Department of Agriculture, Western Mindanao State University, Pagadian, Zamboanga del Sur, Philippines*

[3]*Department of Teacher Education, JH Cerilles State College, San Miguel, Zamboanga del Sur, Philippines*

Correspondence: *Janet D. Barrera, Department of Teacher Education, JH Cerilles State College, San Miguel, Zamboanga del Sur, Philippines; E-mail: janetlarabarrera0430@gmail.com*

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MATERIALS AND METHODS

Research design

The descriptive-comparative and correlational design was used. A survey was undertaken by the researchers using a questionnaire as the primary tool to gather the information needed to answer the specific questions and the main problem of the study.

Research setting

The study was conducted in the two municipalities of Zamboanga del Sur, the top municipality that fully implemented solid waste management. Dumingag for district I and Margosatubig for district II. Each municipality included ten (10) barangays, five of which are from lowland areas, and five are upland regions accessible to transportation available in the municipality.

Participants

This study involved 500 constituents of the selected barangays in Margosatubig (250) and Dumingag (250) as the participants. The participants are barangay local officials (barangay captain, barangay kagawad, treasurer and secretary), business sectors, and households with sufficient knowledge in the implementation of solid waste management represented from each barangay purok.

Statistical treatment of data

The weighted average mean, *Chi-square*, and mean square contingency coefficient test (Phi coefficient) were the statistical tools employed by the researchers in analyzing the gathered data.

RESULTS AND DISCUSSION

Implementation level of Solid Waste Management (SWM) practices

Table 1 shows the level of implementation of Solid Waste Management (SWM) practices in the two municipalities of Zamboanga del Sur. The participants' mean responses range from 1.79 to 3.52 on the predetermined statements clustered to slightly implemented and fully implemented on solid waste management practices for both groups of participants. The highest mean obtained is 3.52 relates to segregating of biodegradable from non-biodegradable wastes. Also, the participants fully implemented the "No Littering Policy" with a weighted average mean of 3.32 and composting of biodegradable materials, 3.31. The result indicates a high level of implementation for both groups of participants on the three practices in both municipalities. On the other hand, the lowest mean for both groups is item 2; 1.79, "Collecting wastes by the garbage truck." is slightly implemented, implying a low level of implementation. The study result supports similar perceptions of the respondents from the study of Nguyen and Tan irregular and inadequate garbage trucks; Boadi and Kuitunen [5] over 80 percent of the population do not have home collection services. Consequently, the overall mean of 2.76 attests that SWM practices are moderately implemented in the two municipalities of Zamboanga del Sur. The standard deviation of 1.23 suggests significant variability in the participants' responses. The study results are parallel to Furto and Reyes's [6] findings. They affirmed the segregation of biodegradable from non-biodegradable wastes is moderately implemented, while improper solid waste management such as burying hazardous wastes underground is slightly practiced.

TABLE 1
Descriptive levels of implementation on solid wastes management practices

Statements	WAM		Descriptions
Segregating of biodegradable from non-biodegradable wastes	3.52	0.79	FI
Collecting wastes by the garbage truck	1.79	1.2	SI
Recycling of reusable materials	2.76	1.09	MI
Composting of biodegradable materials	3.31	0.94	FI
Practicing of "No Littering Policy"	3.32	1.01	FI
Wearing of protective gears of the collectors	1.96	1.17	SI
Selling of recycled materials	2.16	1.14	SI
Avoiding burn of garbage in every household	2.86	1.1	MI
Avoiding dump garbage of garbage anywhere far from their residence	3	1.19	MI
Burying hazardous wastes underground	2.89	1.26	MI
Overall mean	2.76	1.23	MI

Note: Rating scale: Fully Implemented (FI) (4) 3.26-4.00 (High); Moderately Implemented (MI) (3) 2.51-3.25 (Average); Slightly Implemented (SI) (2) 1.76-2.50, (Low); Poorly Implemented (PI) (1) 1.00-1.75, (Very Low)

Tests for significant difference on the implementation level of SWM practices between the location of the participants

With a significance level of 0.000, the computed value is 4.439 is greater than the critical value of 3.481, as reflected in Table 2. The result is significant at a p-value of 0.000. A small p-value (typically less than or equal to 0.05) indicates strong evidence against the null hypothesis. Therefore, there is enough evidence to reject the null hypothesis.

TABLE 2
Tests for significant difference on the level of implementation of solid waste management practices between the location of the participants

Indicators	Mean	Mann-Whitney U	Decision
Location of respondents and implementation	24093 Wilcoxon W		
(Dumingag Margosatubig)	2.84 2.67	55468 4.439	Reject

Note: There is no significant difference in the level of implementation of the solid waste management practices between the location of the participants.
Degree of freedom: 1, Critical value: 3.481, Significant at 0.000

The result confirms that a significant difference exists in the level of implementation of the solid waste management practices between the location of the respondents. This implies that Dumingag and Margosatubig have different levels of implementation on solid waste management practices. The study's finding is substantiated by Furto and Reyes [6] that different communities in the city differ in implementing solid waste management practices. It is also revealed that the residents encountered problems in implementing solid waste management such as non-operation of a suitable disposal facility, irresponsible government officials, rapid urbanization, and inefficient collection of garbage to a minimum level only.

Observed environmental effects of the implementation of SWM practices

The environmental effects on the implementation of SWM practices observed by the participants in the two municipalities of Zamboanga del Sur are revealed in Table 3. The top five environmental effects observed by the participants from both municipalities during the implementation of SWM practices are:

- Clean and orderly surroundings.
- Fresh air and cold wind.
- Clean water supply that is safe for drinking.
- Fertile soil suitable for a variety of crops.
- Clean rivers where one may safely take a bath and wash clothes.

The result positively impacts the constituents' lives in the two municipalities when SWM practices are strictly implemented in their respective locality. The finding of the current study support Furto and Reyes [6] study where most of the residents observed the sound effects of proper solid waste management such as clean and orderly surroundings, epidemic-free and no recorded case of mental instability due to mercury instead of the harmful effects of improper solid waste management to the environment and the health of the people. On the other hand, the least observed environmental effects during the implementation of SWM practices are the death of aquatic animals, presence of water pollution, air pollution, the occurrence of floods in the area, and the presence of pests and insects. The result connotes detrimental impacts to each one in the municipality without proper implementation of SWM practices.

TABLE 3
Descriptive levels of observed environmental effects on the implementation of solid waste management practices

Effects	Frequency	Percentage
Presence of air pollution	126	25.2
Clean and orderly surroundings	475	95
Fresh air and cold wind	474	94.8
Fertile soil suitable for a variety of crops	400	80
Clean water supply that is safe for drinking	429	85.8
Clean rivers where one may safely take a bath and wash clothes	228	45.6
The occurrence of the flood in the area	111	22.2
Presence of water pollution	83	16.6
Death of aquatic animals	29	5.8
Presence of pests and insects	166	33.2

Observed health effects on the implementation of Solid Waste Management (SWM) practices

Table 4 discloses the observed health effects during the full implementation of Solid Waste Management (SWM) practices in Dumingag and Margosatubig. As shown in the Table 4, 193 or 38.60 percent experienced respiratory diseases like colds, cough, bronchitis, pneumonia, and tuberculosis; 94 or 18.80 percent got skin diseases/allergies; 93 or 18.60 percent suffered from cases of bacterial infection like diarrhea; 86 or 17.20 percent endured cases of dengue, typhoid fever, and malaria; and 69 or 13.80 percent, headaches, and dizziness due to smoke from burning garbage. Thirty-six percent of the 500 participants suffered common ailments like low resistance to infection, sore eyes or eye irritations,

aggravating pre-existing heart and lung disease, cases of multiple intestinal parasites (ex. Cholera and amoebiasis), and issues of hepatitis.

The result indicates that Dumingag and Margosatubig still experienced ailments during the implementation of SWM practices but in a minimal percentage from 38% as the highest percentage to 5% only; this further tells that 72% of the constituents are free from ailments during the implementation of SWM. According to Mother Earth Foundation [7], "People are the problem; therefore, people are also the solution." Participation and cooperation of the different sectors of society are deemed necessary [6]. As Vivar et al. [8] stated, solid waste management is a human obligation to fulfill. The inefficiency and failure to sustain proper solid waste management are societal, environmental, economic, and political.

TABLE 4
Descriptive levels of observed health effects on the implementation of Solid Waste Management (SWM) practices to the health of the constituents

Effects	Frequency	Percentage
Cases of multiple intestinal parasites (ex. Cholera and amoebiasis)	26	5.2
Cases of dengue, typhoid fever, and malaria	86	17.2
Cases of hepatitis	21	4.2
Cases of bacterial infection (ex. Diarrhea)	93	18.6
Respiratory diseases like colds, cough, bronchitis, pneumonia, and tuberculosis	193	38.6
Low resistance to infection	58	11.6
Headaches and dizziness due to smoke from burning garbage	69	13.8
Skin diseases/allergies	94	18.8
Sore eyes or eye irritations	34	6.8
Aggravating pre-existing heart and lung disease	42	8.4

Differences among observed environmental effects on the implementation of solid waste management practices

The test statistics reveal that the phi coefficients (-0.16, -0.26, and -0.42) were significant at a 0.00 probability value. The result indicates that the participants from Dumingag and Margosatubig significantly differed in their observations regarding the environmental effects of solid waste management practices. The respondents have different observations regarding soil fertility suitable for various crops, floods in the area, and pests and insects. The differences in the observations of the participants regarding environmental effects of solid waste management practices may be attributed to various factors like location, population, and possibly to the community's income, as affirmed in the study of Furto and Reyes [6]. The fertility of soil suitable for various crops may depend on participants' topography. Flood in the area may be associated with its location. Lastly, pests and insects may be seen depending on the population and possible income of the community or sector. Because densely inhabited areas generate more solid waste, their SWM methods differ from those in sparsely populated areas. The community's income may influence SWM practices since a higher-income community may provide better storage facilities and enable more waste management initiatives than a low-income community.

With regards to parameters related to air and water pollution (*i.e.*, presence of air pollution, having a clean and orderly surrounding with fresh air and cold wind, clean and safe for drinking water supply, presence of clean rivers safe for bathing and cleaning clothes, water pollution and death of aquatic animals), the data suggest that Dumingag and Margosatubig participants have the same level of perceptions on their environment. The result implies a common understanding of the three groups of participants regarding the effects mentioned above of SWM implementation on the environment. The shared awareness of the community is cognizant of the municipalities' implementation of SWM (Table 5).

TABLE 5
Differences among observed environmental effects on the implementation of solid waste management practices on mean square contingency coefficient test (Phi coefficient)

	Dumingag	Margos	φ	p-value
Presence of air pollution	71	55	-0.07	0.10
Clean and orderly surroundings	241	233	-0.07	0.11
Fresh air and cold wind	241	233	-0.07	0.11
Fertile soil suitable for a variety of crops	216	184	-0.16*	0.00
Clean water supply that is safe for drinking	216	214	-0.01	0.80
Clean rivers where one may safely take a bath and wash clothes	115	113	-0.01	0.86

The occurrence of the flood in the area	82	29	-0.26*	0.00
Presence of water pollution	37	46	0.05	0.28
Death of aquatic animals	15	14	-0.01	0.85
Presence of pests, insects	132	34	-0.42*	0.00

Note: *significant at 0.05 level

H_{04}: There is no significant difference among the observed environmental effects on implementing solid waste management practices when grouped according to the type of participants.

Tests for significant relationship between the location of participants and their observed environmental effects on the implementation of solid waste management practices

The computed values of 2.716; 2.597; 0.066 are lower than the critical value of 3.841 with 1 degree of freedom at 0.000 probability value, which leads to acceptance of the null hypothesis. Presence of air pollution, 2.716; clean and orderly surroundings 2.597; fresh air and cold wind, 2.597; clean water supply that is safe for drinking, 0.066; clean rivers where one may safely take a bath and wash clothes, 0.032; presence of water pollution, 1.170; and death of aquatic animals 0.037 reveal no association between the location of participants. The result on the location of respondents and observed environmental effects confirm the claim of Ziraba, Haregu, and Mberu [9] that the impact of solid waste on health is dependent on many factors (aside from considering human location), others include the type of trash, the duration of exposure, the population exposed, and the availability of prevention and mitigation treatments. Moreover, the literature on the health effects of solid waste exposure are still inconclusive because of the following causes: Difficulties encountered in accurately determining exposure, controlling for confounders, accounting for duration of exposure, and inability to follow up on those exposed to determine outcomes that do not manifest in the short term.

On the other hand, the computed values of 86.610 (presence of pest and insects), 32.527 (occurrence of the flood in the area); and 12.800 (fertile soil suitable for a variety of crops) exceed the critical value of 3.841 with 1 degree of freedom at 0.000 probability value, which leads to rejection of the null hypothesis. Thus, there is sufficient evidence that the three predetermined environmental effects on the implementation of Solid Waste Management practices have a significant relationship with the location of participants. The results imply that the observed presence of flies, occurrence of flood in the area, and fertile soil for has direct environmental effects on the participants' location (Table 6).

TABLE 6
Tests for significant relationship between the location of participants and their observed environmental effects on the implementation of solid waste management practices

Indicators	*Chi-square* value	Significant at	Decision
Location of the respondents and observed environmental effects in terms of:			
Presence of air pollution	2.716	0.099	Accept Ho.
Clean and orderly surroundings	2.597	0.107	Accept Ho.
Fresh air and cold wind	2.597	0.107	Accept Ho.
Fertile soil suitable for a variety of crops	12.8	0	Reject Ho.
Clean water supply that is safe for drinking	0.066	0.797	Accept Ho.
Clean rivers where one may safely take a bath and wash clothes	0.032	0.857	Accept Ho.
The occurrence of the flood in the area	32.527	0	Reject Ho.
Presence of water pollution	1.17	0.279	Accept Ho.
Death of aquatic animals	0.037	0.848	Accept Ho.
Presence of pest and insects	86.61	0	Reject Ho.

Note: H_{03}: There is no significant relationship between the location of participants and their observed environmental effects of implementation of solid waste management practices.

Degrees of freedom: 1, Critical value: 3.841

Tests of significant difference in the health effects on the implementation of SWM practices

The computed value of chi-square of 5.276 is lesser than the critical value of 5.99; this suggests the non-rejection of the null hypothesis. This implies no significant difference between the groups of respondents' observed health effects of the implementation of solid waste management practices.

The groups of respondents, household participants, business participants, or LGU participants, have the same observations that among the health problems before implementing solid waste management practices are respiratory diseases such as colds, cough, bronchitis, pneumonia, and tuberculosis. There were also significant causes of skin diseases and allergies and bacterial infection and dengue cases, typhoid fever, and malaria.

These are inevitable if the community lacks awareness of the proper and safe practices and management of solid wastes. According to Boadi and

Kuitunen [5], improper handling of different types of wastes creates potential risks to the community's health. This is so because solid waste chemicals and other liquid components mix with the soil and air particles, causing pollution to land and air. The concentration of minerals and metals may also flow and mix with bodies of water which serve as potential sources of potable water among households. Vegetation may also be affected, posing health risks among the community as chemicals from wastes discharge to drainage and sewerage systems which are also sources of the watering system to plants and vegetation (Table 7).

TABLE 7

Significant difference in the health effects on the implementation of swm practices when respondents are grouped according to household

Indicators	*Chi-square* value	Significant at	Decision
Health effects and household groups	5.276	0.072	Accept Ho

Note: H_{06}: There is no significant difference in the observed health effects of the implementation of solid waste management practices when respondents are grouped according to the household.

Degrees of freedom: 2, Critical value: 5.99

Tests for significant relationship between the location of respondents and their observed health effects on the implementation of SWM

Comparing the computed values of *Chi-square* with that of the critical value at one degree of freedom, it appears that the values 27.188, 72.986, 17.553, 18.918, 12.623, and 10.397 are more significant than the critical value of 3.841 at one degree of freedom. Hence, rejection of the null hypotheses.

There is a significant relationship between the respondents from Dumingag and Margosatubig on their observed health problems before implementing solid wastes management practices. These health problems include dengue cases, typhoid fever, and malaria; respiratory diseases like colds, cough, bronchitis, pneumonia, and tuberculosis; low resistance to infection; skin diseases and allergies; and sore eyes or eye irritations; and aggravating pre-existing heart and lung diseases.

The differences in their perceptions, especially with the observed incidents, may be attributed to several factors, one of which is the level of management of solid waste practices of the community. These two municipalities may have different levels of support by the local government units in the implementation of the solid wastes management, encouraging and constant monitoring among the population by the community leaders and local government unit and the political will of the people to maintain and positively interact with mandates and regulations pertaining to proper disposal and segregation of different types of wastes (Table 8).

TABLE 8

Tests for significant relationship between the location of respondents and their observed health effects on the implementation of SWM

Indicators	*Chi-Square* value	Significant at	Decision
Location of the respondents and observed health effects in terms of:			
Cases of multiple intestinal parasites (ex. Cholera, and amoebiasis)	4.057	0.044	Do not reject Ho.
Cases of dengue, typhoid fever and malaria	27.188	0	Reject Ho.
Cases of hepatitis	2.436	0.119	Do not reject Ho.
Cases of bacterial infection (ex. Diarrhea)	3.818	0.051	Do not reject Ho.
Respiratory diseases like colds, cough, bronchitis, pneumonia, and tuberculosis	72.986	0	Reject Ho.
Low resistance to infection	17.553	0	Reject Ho.
Headaches and dizziness due to smoke from burning garbage	1.362	0.243	Do not reject Ho.
Skin diseases/allergies	18.918	0	Reject Ho.
Sore eyes or eye irritation	12.623	0	Reject Ho.
Aggravating pre-existing heart and lung disease	10.397	0.001	Reject Ho.

Note: H_{05}: There is no significant relationship between the location of participants and their observed health effects on the implementation of solid waste management practices.

Level of the problems encountered by the constituents in the implementation of Solid Waste Management (SWM)

The descriptive level of the problems encountered by the constituents in the implementation of Solid Waste Management (SWM) is revealed in Table 8.

As shown in the table, "Inefficient collection of garbage" obtained an average weighted value of 2.86, considered a less severe problem by the constituents of Dumingag and Margosatubig. This implies that the two municipalities comply with the Ecological Solid Waste Management (ESWM) Act of 2000, emphasizing the efficient collection, proper transfer, and transport of wastes by city/municipality. However, as revealed in Table 1, SWM practices were moderately implemented in the said two municipalities. In Furto M and Reyes's [6] study, the residents encountered problems in implementing solid waste management such as non-operation of a suitable disposal facility, irresponsible government officials, rapid urbanization, and inefficient collection of minimum garbage level only. They further stated that different communities in the city differ in implementing solid waste management practices. However, garbage collection and disposal is inevitably the government's responsibility, as claimed by the respondents of Bernardo [10].

The rest of the predetermined problems were classified as least serious problems (1.70-2.27), namely: Number of the household members, Inadequate government policies, Public indifference (Public do not care), non-operational of a proper disposal facility, lack of awareness about SWM,

lack of orientation inappropriate solid waste management practices, and lack of compost pit. Among the least serious problems met by the participants, "Rapid urbanization" obtained the lowest average weighted value of 1.70, which proves that in Dumingag and Margosatubig municipalities, there were very few commercial establishments. A similar result is manifested in Gequinto [11], which indicates a great extent of implementation of solid waste management [12-18].

The preceding result signifies that the predetermined problems met by the constituents were the least severe problems [19-23]. This is a manifestation that the LGU's in the Municipalities of Dumingag and Margosatubig have the political will to innovatively comply with their approved 10-year SWM Plan according to RA 9003 (Table 9) [24-26].

TABLE 9

Descriptive level of the problems encountered by the constituents in the implementation of Solid Waste Management (SWM)

Statements	Average weighted value	Standard deviation	Descriptions
Number of the household members/ employees	1.91	1.16	LstS
Inadequate government policies	2.03	1.16	LstS
Public indifference (Public do not care)	2.27	1.31	LstS
Inefficient collection of garbage	2.86	1.61	LS
Rapid urbanization (ex. Many commercial establishments are developed)	1.7	1.08	LstS
Non-operational of a proper disposal facility	2.15	1.22	LstS
Lack of awareness about SWM	2.08	1.27	LstS
Lack of orientation in proper solid waste management practices	2.12	1.23	LstS
Lack of compost pit	2.12	1.37	LstS
Overall mean	2.14	1.31	LstS

Note: Rating scale (5) 4.51-5.00, Very Serious (VS); (4) 3.51-4.50, Serious (S); (3) 2.51-3.50, Less Serious (LS); (2) 1.51-2.50, Least serious (LstS); (1) 1.00-1.50, Not a Problem (NP)

CONCLUSIONS

The study results explicate a moderate implementation of Solid Waste Management (SWM) in the two municipalities of Zamboanga del Sur: Dumingag and Margosatubig. Due to moderate implementation of the two municipalities, constituents still experienced ailments in a minimal percentage of 38% as the highest down to 5%. Additionally, encountered slight problems in the implementation of RA 9003, particularly the LGUs' inefficiency of garbage collection in both municipalities are perceived as slightly implemented. Moreover, the test of hypotheses showed that the evaluation of the implementation of SWM practices of the barangay local officials, business sectors, and program implementers and their observations regarding environmental and health effects significantly differed.

Hence, it is recommended that the LGUs of Dumingag and Margosatubig will revisit their garbage collection system, and wearing of protective gears by the collectors to attain zero percent free from any diseases in their respective locality. Similar study may be conducted to include SWM implementors within the province of Zamboanga del Sur. Based from the results of the study, JHCSC may design an extension project to all groups of participants involved in the two municipalities to fully implement SWM practices. Despite few shortcomings in the implementation of RA 9003, the LGUs of Dumingag and Margosatubig is commended in their active efforts to execute the law and their respective ordinances.

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