Ecological Solid Waste Management Practices of Households in the City Of Baguio: Basis for an Advocacy Program towards Climate Change Mitigation

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***Abstract*—** The study was conducted to assess the level of awareness and extent of implementation of the Ecological Social Waste Management (ESWM) as provided for in Republic Act 9003 of 2000 among households in Baguio City as a basis for the formulation of an advocacy program. The study made used of the descriptive-evaluative survey using a questionnaire. Data gathered were subjected to statistical analysis using Pearson Correlation and ANOVA. Results of the study showed that the household participants were very much aware on the features of R.A. 9003. Results showed that educational attainment and monthly household income are significantly related to the awareness level and to the extent of implementation of the ESWM. The level of awareness of the people affects the level of implementation. Hence, an advocacy program categorized into three (3) key result areas namely: Education, Trainings, and Benefits is proposed to be implemented and adapted by the local government units and the community.

Keywords-ecological solid waste management

I. Introduction

The Philippines is now facing the very real impacts of climate change, which threaten to undermine the development prospects and exacerbate the vulnerability of the poorer communities. With projected changes in precipitation, temperature, intensity of tropical cyclones and frequency of extreme weather events, considerable efforts would be required to prepare the Philippines in dealing with the impacts of climate change on the different climate-sensitive sectors. Adaptation will be an integral part of the response to the threats of climate change (Servando, 2011).

Baguio City, the coldest city and a famous tourist spot in the Philippines is not left out in this condition. Baguio City's population pressure continues to push developments into high risk areas exposing people to greater physical risk. Rapid population growth and economic activities have contributed immensely to the solid waste being generated in the city. With the city population that has grown coupled with the increasing number of students and tourists, increased in the solid waste generation are inevitable. Thus, the city crafted the Baguio City Ecological Solid Waste Management Plan for 2007-2016 in response to the challenge of effectively and sustainably managing the city's increasing solid waste while being consistent with the requirements of the Ecological Solid Waste Management (ESWM) Act of 2000 otherwise known as Republic Act 9003.

This study aimed to determine the level of awareness and extent of implementation of the Ecological Solid Waste Management (ESWM) practices consistent with R.A. 9003 among households in Baguio City towards climate change mitigation.

Specifically, the study determined the following:

1. The level of awareness of the household participants on solid waste management;
2. The relationship between the demographic profile of participants and the level of awareness on Ecological Solid Waste Management;
3. The difference on the level of awareness on solid waste management practices between and among the five selected barangays in Baguio City;
4. The extent of implementation of the Ecological Solid Waste Management (ESWM) among households in Baguio City;
5. The relationship between the demographic profile of the participants and the extent of implementation of Ecological Solid Waste Management;
6. The difference on the extent of implementation of solid waste management practices between and among the five (5) selected barangays in Baguio City;
7. The relationship between the level of awareness and extent of implementation of solid waste management practices among the household participants in Baguio City;
8. Based on the results of the study, what advocacy program on solid waste management towards climate change mitigation can be proposed.

II. Methodology

Research Design

The study used the descriptive-evaluative survey method to determine the current ESWM practices of households in Baguio City. It used a researcher-designed survey instrument that established the level of awareness of the respondents-households on R.A. 9003; their level of awareness and extent of implementation of solid waste management

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practices; government-initiatives and supportive solid waste management policies.

Respondents and Sampling Method

A probability sampling was done in order to ensure an equal chance of representation of the population to be included in the sample. Specifically, households coming from the five barangays identified with the most tourist destinations in the city were chosen. The five barangays identified were Asin Road, Legarda-Burnham-Kisad, Dominican Hill, Mines View Park, and Pacdal. Proportional allocation was used to determine the sample size for every barangay considering that the number of households in each barangay is not equal. Sample size was derived from each barangay using the Slovin formula, which is as follows:

$$n = \frac{N}{(1+Ne^2)}$$

Where: n= the sample size
N= the population size
e= the desired margin of error

Statistical Treatment of Data

Pearson Product Moment Correlation Coefficient or Pearson r was used to determine the relationship between the level of awareness and level of implementation of solid waste management practices; the relationship between the socio-demographic profile and the level of awareness of solid waste management practices; and the relationship between the socio-demographic profile with extent of implementation of solid waste management practices among households in Baguio City. Analysis of Variance was used to compare result means of the responses of households from the five barangays covered in the study to determine possible differences in the level of awareness and extent of implementation of solid waste management practices.

III. Results And Discussion

Level of Awareness on the Ecological Solid Waste Management (ESWM) Among Households in Baguio City

On the level of awareness of the households in Baguio City on the Ecological Solid Waste Management (ESWM) which is about the Reduce, Re-use, and Recycle program, the respondents claimed that they are very much aware of all the government's advocacy on solid waste management. The highest mean rating, 2.63, was on Recycle. This implies that the people know that recycling recyclable materials would help not only in managing solid waste but also in lessening expenses in buying new ones. The second highest mean is on government practices (2.61). Among the indicators, mandatory solid waste segregation (Biodegradable & Non-biodegradable) was given the highest mean of 2.84, followed by strict schedule for garbage collection (2.76). This is an indication that the households know their responsibilities particularly on the waste segregation.

Relationship between the Socio-demographic Profile of Participants and the Level of Awareness of Ecological Solid Waste Management (ESWM)

Table 1 presents the correlation coefficients for the relationship between the socio-demographic of respondents and their level of awareness of the EWSM. There is a weak correlation between age and level of awareness. This means that age does not really affect the level of awareness of the solid waste management, that is, whatever age a person is, he/she is aware of the rules and regulations on managing solid waste. Educational attainment and monthly household income are significantly related to awareness level; however, the correlation is weak. This means that these two variables affect the awareness level of the respondents but only to a little extent.

TABLE I
CORRELATION BETWEEN THE SOCIO-DEMOGRAPHIC PROFILE OF RESPONDENTS AND THE LEVEL OF AWARENESS

Socio-demographic Profile of Respondents	Awareness	
	r Value	Degree of Correlation
Age	0.02	Slight
Highest educational Attainment	0.126**	Slight
Monthly Household Income	0.199**	Weak

** Significant at 0.01

Comparison on the Level of Awareness on ESWM among the Barangays

Table 2 shows the comparison of the level of awareness according to barangay. It is shown that Mines view residents have the highest level of awareness of the ESWM while residents of Asin Road have the lowest. There are significant differences among the barangays as validated by the ANOVA result wherein the computed value of 50.984 is higher than the tabular value, 2.386 at the 5% level of significance. Thus, the residents of the identified barangays vary in their level of awareness. The reason of differences may be due to the presence of institution that may help strengthen the ESWM in the barangays considering that barangays: Mines View, Dominican Hill, Pacdal, and Burnham-Legarda-Kisad are situated in the Central Business District (CBD) area where academe, business establishments, and government offices are situated unlike Asin Road Barangay with only small-scale handicraft businesses. The contribution of the establishments in the CBD in the awareness of the community is a major factor for these differences. Also, major Baguio attractions could be found likely in the four barangays cited earlier so city government has close monitoring for the maintenance of these areas since these are prime tourist destinations.

TABLE II
SUMMARY OF THE LEVEL OF AWARENESS ON ESWM ACCORDING TO BARANGAY

Barangay	Sub Mean	Descriptive Rating
Mines View	2.76	VMA
Dominican Hill	2.70	VMA
Pacdal	2.59	VMA
Burnham-Legarda-Kisad	2.57	VMA
Asin Road	2.27	MA

$F_{computed}$ = 50.984 $F_{.05}$ = 2.386 Significant

Extent of Implementation of the Ecological Solid Waste Management

Households in Baguio City perceived that the ESWM was highly implemented, in general (Table 3). The highest mean rating, 2.53, was given to the government practices. This means that the City government has been seriously implementing the practices as stipulated in the ESWM. This is commendable; if the people see that the government is really implementing, then they are motivated to follow the rules and regulations regarding solid waste management, not to mention that they fear the punishment if they violate.

As to recycling, papers, electronic materials, glassware obtained the highest mean ratings. With regards to lengthening the life of an item (re-use), the respondents gave lower ratings to the following practices: a) go online to find new or gently used second hand products; and b) check out garage sales, thrift stores, and consignment shops for clothing and other everyday items. These were indicated to have been moderately implemented. These imply that the people are maybe too busy and have no time checking online or to go around looking for garage sales. It could also mean that they do not have the necessary skill or facility to search online. However, the use of old decors for yearly events (e,g, Christmas decors), the use of the old towels and t-shirts for dust cloths and the use of cloth/reusable bags when shopping are among the top three practices most implemented by households

In reducing solid waste, the highest mean is on the use of cloth towels and sponges in kitchens rather than paper towels. This would lessen throw-away since cloth could be washed and re-used. The second highest mean rating is on the use of water filter to purify tap water instead of buying bottled water. This would lessen the waste of plastic bottles.

With the estimated city waste generated from household sources of 43% amounting to about 123,373 kg/day comprising an average of 26% recyclable, recycling of household wastes among city residents would reduce waste generated by about 32,000 kg/day.

The separation of biodegradable wastes from the non-biodegradable is also vital in reducing the actual waste being brought to sanitary landfills. Data from the waste characterization of city wastes showed that an average of 40% is biodegradable. This would translate to more than 49 tons of household wastes per day that could be composted and be used as fertilizers. This would greatly reduce the wastes being brought to nearby sanitary landfills.

The overall mean for the extent of implementation of ESWM of 2.46 implies that the reduction of solid waste (reduce), lengthening the life of an item (re-use), reprocessing of an item (recycle), and government initiatives are perceived to be highly implemented in the barangays by the residents.

TABLE III
EXTENT OF IMPLEMENTATION OF THE ECOLOGICAL SOLID WASTE MANAGEMENT

A. REDUCE (Reduction of solid waste)	WD	VD
1. Ban the use of expanded polystyrene in the household ("Styrofoam")	2.35	HI
2. Avoid products with excess packaging and eliminate individually wrapped items	2.36	HI
3. Buy bulk supplies when possible	2.38	HI
4. Use cloth towels and sponges in kitchens rather than paper towels	2.51	HI
5. Use water filter to purify tap water instead of buying bottled water	2.44	HI
6. Bring a reusable water bottle, preferably aluminum rather than plastic, with you when traveling or at work	2.45	HI
7. Borrow from libraries instead of buying personal books and movies.	2.35	HI
8. Wear clothes that do not need to be dry-cleaned.	2.38	HI
9. Invest in high-quality, long-lasting products.	2.40	HI
10. Keep your cell phones, computers, and other electronics as long as possible.	2.40	HI
Sub-mean	2.40	HI
B. RE-USE (Lengthening the life of an item)		M
1. Go online to find new or gently used second hand products.	2.22	I
2. Check out garage sales, thrift stores, and consignment shops for clothing and other everyday items.	2.28	M I
3. Reuse old decors for yearly events (eg. Christmas decors).	2.52	HI
4. Exchanging goods and services for other goods and services (eg. Swapping).	2.37	HI
5. Use cloth/reusable bags when you shop (eg. Eco-bags).	2.48	HI
6. Use old towels and tee shirts for dust cloths and shop rags.	2.52	HI
7. Donate unused food from your household function or business to a shelter.	2.39	HI
8. Reuse paper around the home as scrap paper or packing material.	2.49	HI
9. Reuse food containers as garbage bins/receptacles	2.47	HI
10. Compost food wastes	2.41	HI
Sub-mean	2.41	HI
C. RECYCLE (Reprocessing of an item)		
1. Recycle electronics responsibly.	2.51	HI
2. Recycle papers (eg. Art materials)	2.52	HI
3. Buy recycled products (eg. Plasticwares)	2.47	HI
4. Sell furniture at garage sales or in auctions.	2.40	HI
5. Reuse glass whenever possible (eg. Vase).	2.50	HI
6. Sell unused bottles for recycling	2.54	HI
Sub-mean	2.49	HI
D. GOVERNMENT POLICIES AND INITIATIVES		
1. Mandatory solid waste segregation (Biodegradable & Non-biodegradable)	2.77	HI
2. Strict schedule for garbage collection	2.68	HI
3. Separate schedule for biodegradable and non-biodegradable collection	2.53	HI
4. Presence of policies, rules, and regulations on solid waste management	2.36	HI
5. Information, Education, and Communication on solid waste management	2.33	HI
Sub-mean	2.53	HI
Overall Mean	2.46	HI

Level of Implementation
1:00 - 1.66 Not Implemented (NI)
1.67 - 2.32 Moderately Implemented (MI)
2.33- 3.00 Highly Implemented (HI)

Relationship between the Socio-Demographic Profile of Participants and the Extent of Implementation of Ecological Solid Waste Management (ESWM)

There is no correlation between age and extent of implementation of the ESWM (Table 4). This means that age is not a factor to determine the level of implementation; young or old comply or implement the program. Educational attainment and monthly household income are significantly related to extent of implementation of the ESWM; however, the correlation is weak ($r= 0.117$, $p <0.01$; $r=0.273$, $p<0.01$). This means that these two variables affect the extent of implementation of the ESWM but only to a little extent. Results of the study of Agwu (2012) also showed a positive and significant association between social class and solid waste management practices.

This shows that residents who understand the benefits of ecological solid waste management to the community and to the environment tends to implement these practices. The results of the study may also imply that city residents who have better opportunities in life have more chances of implementing the solid waste management practices.

TABLE IV
CORRELATION BETWEEN THE SOCIO-DEMOGRAPHIC PROFILE AND THE EXTENT OF IMPLEMENTATION OF ESWM

Socio-demographic Profile of Respondents	Implementation		Interpretation
	Correlation coefficient(r value)	Strength of correlation	
Age	0.008	No correlation	NS
Highest Educational Attainment	0.117**	Slight	S
Monthly Household Income	0.273**	Weak	S

** Significant at 0.01

Relationship between the Level of Awareness and Extent of Implementation of the Ecological Solid Waste Management

There is a direct, moderate and significant correlation between the level of awareness and extent of implementation of the ESWM ($r= 0.446$, $p<0.01$) (Table 5). This means that the level of awareness of the people affects the level of implementation. It is inferred that the more aware the people are, the greater is the extent of implementing the program. This result is supported by previous studies in other countries. Similar result was shown by the study of Agwu (2012) in Port-Harcourt, Nigeria who documented relationship between the level of awareness and practices of solid waste management among city residents. Findings of Hughford and Tomera (1986) as cited by Desa et al. (2009) also suggested that the level of consistency between environmental attitudes and behaviour is affected by a person's knowledge and awareness.

These results imply that better understanding of the principle of ecological solid waste management is necessary in achieving solid waste reduction, reuse and recycling for sustainable solid waste management.

TABLE V
CORRELATION MATRIX FOR THE RELATIONSHIP BETWEEN THE LEVEL OF AWARENESS AND EXTENT OF IMPLEMENTATION OF THE ESWM

		Awareness	Implementation
Awareness	Pearson Correlation	1	.446(**)
	Sig. (2-tailed)	.	.000
	N	669	669
Implementation	Pearson Correlation	.446(**)	1
	Sig. (2-tailed)	.000	.
	N	669	669

** Correlation is significant at the 0.01 level (2-tailed).

IV. RECOMMENDATIONS

In the light of the findings, the following recommendations are hereby proposed:

1. Although most of the household respondents are very much aware on solid waste management and perceived that they are highly implementing most of these practices, continues advocacy on the adaption of these solid waste management practices is recommended especially in barangays with lower level of implementation.

2. The local government units particularly at the barangay level should conduct more information, education and communication (IEC) campaign, trainings, fora, seminar and they like focused on proper waste management and its benefits, consequences of climate change among others targeting the members of the lower socio-economic level of the community who may have limited access to information.

3. More information, education and communication (IEC) materials regarding proper solid waste management should be developed. These materials should be easily understood and may be written in the vernacular.

4. Monitoring and strict implementation of national and local policies such as the city and barangay ordinances on solid waste management especially among barangays with lower level of implementation. Incentive or reward systems maybe develop by the local government units as a motivation for the barangay officials and households to implement these policies on solid waste management.

5. Distribution of waste receptacles properly labelled and color coded for immediate waste segregation in the areas most visited by tourists. Although not a part of this study, it was observed that solid wastes pile up anywhere in these areas. A penalty for littering and not disposing of waste properly in the city may also be imposed.

6. Encourage consumer research. Consumers must purchase wisely. Know which companies produce safe and environmentally sustainable products specifically electronic gadgets.

7. Recommend the piloting and evaluation of the advocacy program being proposed to include the following key result areas:

a. Education
b. Trainings
c. Benefits

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