Solid Waste Management in Naga City: Its Culture of Information Dissemination

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Abstract *– People suffer from serious pollution problems caused by the generation of large quantity of waste. Studies conducted that Solid Waste Management (SWM) showed minimal impacts to the community in some areas in the Philippines like Naga City. This paper evaluated the effectiveness on the implementation of SWM system in Naga City in terms of information dissemination. This also analyzed the awareness of the household heads on the programs and its level of priority by the Local Government Units (LGUs). The study adopted descriptive-evaluative design of mixed methods of research. Structured questionnaires, interviews and FGDs were used for data gathering to the selected respondents such as household heads, LGU's and SWM Office key persons of nine (9) Barangays and selected schools in Naga City, Philippines. Based on the findings of the study, households were "slightly aware" of different SW management programs, the City has "not given much priority" in informing the public on the different SWM programs; also, its implementation in terms of information and dissemination were "slightly effective." The results of these findings will help LGU, NGOs and other stakeholders in enhancing policies on SWM problems specifically, issues in terms of information dissemination. This will give rise to a better, more effective, sustainable and culturally acceptable SWM developmental plan that will alleviate City's problem on waste.*

Keywords *– waste, effectiveness, programs, management, dissemination*

INTRODUCTION

Industrialization always challenges the natural environment. By the year 2050, the world is expected to increase waste generation by 70 percent, from 2.01 billion tons of waste in 2016 to 3.40 billion tons of waste annually [1]. Solid Waste Management (SWM) has become one of the most pressing problems globally. But, there are no universal solutions applicable to every geographical and social context [2]. We, too, have to consider people's acceptability due to various beliefs and also the economic status of our country. Given the fact that, most high-income countries can afford to spend more to incorporate Reuse, Recycle and Reduce (3R) technologies, focusing on "Zero Waste" and/or "Zero Landfilling" which is certainly expensive for countries with weaker economies [3]. Industrialization always challenges the natural environment. By the year 2050, the world is expected to increase waste generation by 70 percent, from 2.01 billion tons of waste in 2016 to 3.40 billion tons of waste annually. The Republic Act 9003 of January 26, 2001 promotes national research and development programs for improved solid waste management and resource conservation techniques, more effective institutional arrangement and indigenous and improved methods of waste reduction, collection, separation and recovery. However, waste management campaigns must begin with the dissemination of information [4] to secure the public's health and necessary for proper management planning [5]. The involvement of all the stakeholders such as the waste generators, waste processors, government and non-governmental organizations and financing institutions is a key factor for the sustainable waste management [6].

Literatures have proven that sound SWM systems in every community can be associated with several factors: support system from the grassroots, resources of the government and the culture of information and dissemination. The absence of those factors is largely responsible for poor implementation of SWM in any community.

In the Philippines, the mentality towards cleanliness, the sense of responsibility towards properly managing waste, as well as public concerns like not separating waste for recycling are critically lacking [7]. Indeed, its sustainability for public awareness [8] must be addressed. Some local authorities tend to allocate their limited financial resources to SWM programs and projects because local government has limited financial capacity; other locally important projects such as infrastructure and the like were their main focus. A study conducted locally that most of the households rely on

local government's garbage collection and few of them religiously follow the recycling, composting and reusing practices. Despite city ordinance, still some of the households burn their waste and dump/throw in riverways [9]. This proves that despite the presence of RA 9003 about creating the necessary institutional mechanisms and appropriating funds for SWM programs, some SWM initiatives showed minimal impacts in some cities and provinces in the Philippines.

In Naga City, the Bicol River is seen to be polluted, largely resulted from SWM improper waste disposal of household specifically where houses are located near the river banks. Apart from that, poor drainage system in some areas during rainfall can make the low lying-communities of Naga City become flooded. Necessary intervention should be implemented to solve the problems for SWM before they will be "buried by their own waste". There is a 10-year comprehensive development plan initiated by the government aimed to revitalize the river until year 2020. The local government of Naga City has designed an 84-kilometer drainage system. This had addressed some problems on flooding. This adverse effect due to improper implementation of waste disposal is perceived as a perennial problem even by the National Government. The Barangay LGUs are expected to play major role in its implementation, but there was a major lapse in the awareness level of households which led to poor waste management practices. These observations helped us realized the importance of information dissemination as a strategy for sustainable waste management.

Nevertheless, this study hopes to provide guidance to LGUs and other stakeholders, in the implementation of SWM system not only in Naga City but also those with similar problems along recycling, collection and disposal. And consequently, the local government should examine safe, effective, sustainable and culturally acceptable waste management practices in some parts of the world. This will also enable the LGUs to enhance their SWM plans if there is a need to recreate the institutional mechanisms as well as imposed penalties for any violation of any of its provisions

OBJECTIVES OF THE STUDY

This paper evaluated the effectiveness of the implementation of SWM system in Naga City in terms of information dissemination. It analyzed the awareness of the household heads on the programs and its level of priority by LGUs. This also considered the effectiveness of SWM programs in terms of information dissemination. A proposed SW intervention should also be considered. Results will provide guidance in identifying safe, effective, sustainable and culturally acceptable waste management practices.

METHODS

Quantitative method of research and Descriptive-evaluative were employed in an attempt to assess the culture of information dissemination on SWM Programs in selected barangays in Naga City for the year 2018. Specifically, it determined the level of awareness of the household heads of the programs on the proper waste management; assessed the level of priority of the barangay officials in the implementation of the waste management programs; and evaluate the effectiveness of its implementation in terms of information dissemination. The research instrument data were gathered using a three-part structured questionnaire prepared in Mother Tongue language and subjected to pilot testing to ensure feasibility and content validity. The computed Cronbach's Alpha was 0.794 and was deemed acceptable according to a standard scale [10].

The first part aimed to collect the profiles of the household-respondents. The second part comprised several statements to assess the level of awareness on SWM Programs, using the 5-point likert scale metrics. Respondents were asked to choose series of response like "fully aware", "moderately aware", "slightly aware" and "not aware". For the second portion, the questions were focused on LGU's Level of Priority, options were follows: "Not a priority", "Low priority", "Somewhat priority" , "Moderate Priority", and "High priority". The third part of the questionnaire was focused on the Effectiveness of SWM programs in terms of information and dissemination, options were-"highly effective", "moderately effective", "somewhat effective", "slightly effective", "not effective".

The cluster sampling technique was utilized to facilitate the selection process. The respondents included in this study were 189 household heads of nine (9) selected barangays of Naga City. These were categorized as highly urbanized with 75 respondents from Dinaga, Penafrancia and San Francisco; moderately urbanized (30) like Concepcion, San Felipe and Bagumbayan and 46 respondents for Cararayan, Pacol and Carolina as low urbanized barangays in Naga City. To support the analysis and to compare information, interviews and Focus Group Discussions (FGDs) with key stakeholders like SWM Office (SWMO) officer and task force were also used to generate different ideas from them. These were conducted concurrently to validate quantitative results used as bases for generalization of research

outcomes; hence, mixed method of data collection was obtained. Review of related documents was also considered. Data gathered were statistically interpreted using frequency count and weighted mean.

RESULTS AND DISCUSSION

From the global perspective, the issue of waste management is becoming increasingly important. Given the increasing amount and diversifying content of waste, countries should seek out sustainable waste management options, which protect both local and global environment [11]. In Naga City, when Bicol River overflows, the incidence of flooding occurs throughout the City most especially the central business districts. These areas are extremely affected and at the same time the residents' lives are put at risk. Specific approaches are therefore required for designing adequate waste management systems [12]

According to SWM office, only five (5) of the 27 barangays in Naga City have such functional Materials Recovery Facility (MRF). This received mixed waste material for final sorting of the residual wastes and transferred to a sanitary landfill. Seven (7) barangays have MRF with mechanical problems and 10 barangays lack space for establishing adequate MRF. Although, the City Government intends to install MRF Equipment to some of the barangays soon; this is in compliance with the provisions of Republic Act 9003 or the Ecological SWM Act. Likewise, some residents complained from foul odor emanating from the city's garbage dumpsite. These hazardous and contaminated air from the garbage dumpsite create an obvious threat to human health.

The development of SWM information dissemination in Naga City is just about establishing a routine data collection on waste. There were approved policies on management of waste, but strict implementation should be pursued to make them effective [13]. This will support the issue on decision-making of the City's authorities on waste management.

Awareness on SWM Programs

SWM is a challenge for the cities' authorities in some developing countries mainly due to the uncontrolled generation of waste [14]. Nowadays, little participation was manifested coming from sectors such as the LGUs, other GOs, private and households. Their awareness on SWM Programs significantly contributes to its effectiveness. Also, Enhancing residents' SWM awareness was considered as the most effective method for it success. In this study (see Table1), SWM activities in the City such as prohibits burning garbage with (x=3.02), waste segregation(2.99), MRF (2.36) plastic for rice (2.27), sanitary landfill (2.58), no plastic policy(2.38), pera sa basura (2.68), waste water treatment (2.57), and regular rabuz/declogging (2.93), revealed that the community was willing to take part in SWM programs. However, respondents have "little knowledge" and they were "Slightly Aware" of it.

Gaining public support can facilitate policy implementation [15]. One of problems faced by the City government is on how to disseminate the knowledge of the SW programs at the grassroots level. The waste generators themselves have contributed big part to that particular problem, which is why they should be aware of it. And some SWM Office initiated waste reduction programs were not sustained because of some political issues, attitudes and lack of social acceptability among the residents.

As such, there is a need of public awareness on SMW programs and policies. For more active participation of the community in waste reduction, an urgency for more strategic planning for the local LGUs and SWM taskforce, stakeholders' awareness campaigns at the grass roots level should be regularly implemented taking into account their culture, attitudes and beliefs.

Table 1. Awareness on SWM Programs

Programs	Highly Urbanized Brgy.	Moderately Urbanized Brgy.	Low Urbanized Brgy.	Total Weighted Mean	Interpretation
Prohibits burning garbage	3.1	2.9	3.05	**3.02**	Moderately Aware
Waste segregation	3.1	2.8	3.06	**2.99**	Slightly Aware
Materials Recovery Facility (MRF)	2.1	2.4	2.58	**2.36**	Slightly Aware
Plastic for rice	2.1	2.3	2.4	**2.27**	Slightly Aware
Sanitary landfill	2.4	2.5	2.83	**2.58**	Slightly Aware
No plastic policy	2.3	2.4	2.44	**2.38**	Slightly Aware
Pera sa basura	2.6	2.5	2.93	**2.68**	Slightly Aware
Waste water treatment	2.6	2.4	2.72	**2.57**	Slightly Aware
Regular rabuz/declogging	2.8	2.9	3.03	**2.93**	Slightly Aware
Total				**2.64**	**Slightly Aware**

Table 2. Information dissemination's level of priority for SWM

Information Dissemination	Highly Urbanized	Moderately Urbanized	Low Urbanized	Total Weighted Mean	Interpretation
Seminars on SWM policies and programs	2.8	2.7	2.7	**2.73**	Low priority
Establishment of garbage collection system	2.7	2.9	3.2	**2.93**	Low priority
Total				**2.83**	**Low priority**

LGU's Level of Priority

Decision-making in terms of SWM problems often requires the different stakeholders such as government, municipalities, industries, experts, and/or general public to be involved [16].Therefore, access to information by the public is useful in changing positive attitudes and beliefs of the community. Table 2 shows that seminars on SWM with (2.73) and establishment of garbage collection system (2.93) or "Low priority". The average mean of 2.83, the City's information dissemination's level of priority of LGUs on SWM in Naga City, "Low priority." On this account, the Local Government Unit (LGU) through SWM Office should disseminate information at the grassroots level. Additionally, cost-saving waste reduction measures awareness campaign should also be strictly implemented to industrial and commercial centers that highlight the current issues and future directions of SWM of the city.

Surveys and interviews reflected that information dissemination for SWM has given "low priority" by the City LGUs. Although there have been efforts made through information campaigns which is done year round. But then, the strategies used by local authorities in the implementation of SWM programs were not sustained.

According to respondents, the major problems that hinder people to participate in the SW activities were the following: (a) lack of interest to attend SWM campaign; (b) inadequate time from the LGUs to monitor the activity; (c) luck of funds to create skilled workforce; (d) unsupported legal and regulatory frameworks and (e) not LGUs priority.

In compliance with Republic Act No. 9003, activities on segregation, recovery of recyclable materials at the barangay level were properly implemented. The City has maintained its cleanliness along the Commercial Area or Central Business District. But then, monitoring, evaluation and follow up activities for waste reduction could be the most important component of it sustainability. Also political responses undermines decision making on proper management of wastes [17]. We can also reduce waste generation if LGU, residents and stakeholders mutually cooperate.

Effectiveness of information dissemination

In most parts of the world the vision is to develop sustainable strategies towards zero waste. Although, it seems like wishful thinking, yet positive change can only be brought about by setting higher goals[18]. LGUs in Naga City have developed strategies by implementing different simple but holistic SWM Programs (see Table3). On the routine basis, the wastes generated by the different houses and other establishments are collected by the Naga City garbage collectors using garbage trucks and deposited in the City Dumpsite.

Naga City SWM board is always headed by the City Mayor himself. The board implements the SWM plans and programs for the different barangays. A monthly meeting with Kalinigan Warriors Officer (a barangay representative for SWM Board) was conducted to address problems and issues. Information dissemination was done through billboards, letters and other Education and Communication (IEC) materials. There were indeed lectures/trainings/ seminars done regularly. Different sectors from the community and industry were encouraged for the use of composting and recycling. Similarly, SW Deputies and taskforce were created to monitor activities at the same time promote recycling programs. Little has been achieved however, due to the lack of participation and lukewarm attitudes from the public [19]. And some programs implemented were "slightly effective" (see Table 3) due to the people's attitudes and beliefs and political will of the barangay officials. There was no strict implementation to the household members for segregation of waste, their apprehensions that if it will be strictly implemented, the constituents might be upset and this will affect their political career.

There were provisions in SWM but close monitoring was not fully implemented by the barangay taskforce. Similarly, according to interviews, seminars were conducted but only few attended for the reasons that some LGU officials only invited supporters, friends, relatives and neighborhoods.

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Table 3. Effectiveness of SWM programs terms of information and dissemination.

Programs	HU	MU	LU	WM	Interpretation
Prohibits burning garbage	3.1	2.8	2.7	2.87	Slightly Effective
Waste segregation	3.0	2.7	3.1	2.93	Slightly Effective
MRF	2.5	2.5	2.7	2.57	Slightly Effective
Plastic for rice	2.2	2.3	2.0	2.17	Slightly Effective
Sanitary landfill	2.2	2.3	2.7	2.40	Slightly Effective
No plastic policy	2.3	2.3	2.3	2.30	Slightly Effective
Pera sa basura	2.3	2.7	3.1	2.70	Slightly Effective
Waste water treatment	2.4	2.4	2.9	2.57	Slightly Effective
Regular rabuz/declogging	2.8	2.9	2.6	2.77	Slightly Effective
Total				**2.59**	**Slightly Effective**

The program is also not fully imposed due to "ningas cogon" attitude (enthusiastically starting things, but then quickly losing enthusiasm soon after), and lack of fund. If the volume of generated wastes in the barangays were reduced due its partial implementation of the policy, then there is really a need for its strict implementation until the current volume of wastes generated in the barangay level is further reduced. Setting up of material recovery facilities (MRF) in every barangay is one of the components for the reduction of waste. Some mandatory SWM policies were proved to be effective. But then, several inadequate financial resources, and poor governance often lead to poor solid waste management system.

Solid Waste Intervention Program

A. Program Title: SWM Technology Based Monitoring System

B. Target Community: Naga City

C. Target Beneficiaries: Household members and LGUs

D. Duration: 1 year Pilot Study

E. Objectives: The Solid Waste Intervention Program aims to establish integrated SWM technology based monitoring system for solid waste management activities in Naga City**.** Specifically, this will be able to:

a. determine the effectiveness integrated technology based system in sustaining SWM; and

b. encourage the community to implement integrated technology based system.

F. Implementation:

Project Components Overview

The overconsumption of non-recyclable resources in Naga City increases the volume of City's solid waste every day. The proposed system is developed to address environmental concerns associated with the variety of waste disposed. This represents a modern and systematic approach to solid waste management. This project uses the available ICTs and their application in SWM to facilitate the efficiently manage waste collection strategies. This would contribute to the solid waste collection optimization.

Description

This practically demonstrates how electronic engineering can contribute to improve cities' management systems… A waste collection providing the area trashcans with embedded sensors. This bin can read and transmit trash volume data over the Internet/Wireless Sensor Network. In comparison to a traditional waste collection approaches this data highlighted initiatives to contribute and develop a solution for SWM.

CONCLUSION AND RECOMMENDATION

The challenge for government authorities whether it is in local or national unit, is to prepare a well-designed solid waste management plan incorporating issues on information dissemination with its stakeholders down to the grassroots level. Aside from the common household practices such as burning of waste, burying some of them and no proper segregation of solid waste; still, households rely on garbage collection managed by the government. They believed that garbage collection and disposal is the responsibility of the government. Given the fact that, the city government promotes Reuse, Recycle and Reduce (3R) technologies, focusing on "Zero Waste" which is certainly part of its efficient information dissemination plan.

In recent days, Naga City Government sees waste as a potential resource. There were initiated and implemented waste reduction programs but unfortunately some of them were not sustained. Households were "slightly aware" on different SWM programs. SW Management authorities have not fully involved the household in the implementation of the SWM activities. It is therefore perceived by the local residents that the city government had "not given much

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priority" in the information dissemination of the SWM activities. As a result, information and dissemination was "slightly effective." Political issues, attitudes and lack of social acceptability among the residents are some reasons for these findings.

A more comprehensive waste management plan with well-designed strategies can be the first phase. Strict implementation of some mandatory policies will enhance its sustainability; its full implementation may require appropriate funding from LGUs. Trainings or seminars can be conducted at the grassroots level on the different SW programs. It is therefore suggested that the local units should allocate funds for training and seminars with active participation of different stakeholders but most importantly the households.

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