A Study of Policy Implementation and Community Participation in the Municipal Solid Waste Management in the Philippines

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Abstract

Municipal solid waste (MSW) management has become one of the most pressing environmental concerns of the Philippines at present. Several measures have been implemented to circumvent this issue, including waste management policies stipulated in the Ecological Solid Waste Management Act of 2001. However, the implementation of these policies even at the barangay level has always been a challenge. Hence, this study assessed the compliance of selected barangays in Cebu City, Philippines, specifically to the integrated solid waste management plan based on the 3R's (reduce, reuse, and recycle). A descriptive quantitative method was utilized in this study. There were 1523 residents and 30 Barangay Environment Officials identified as respondents based on Slovin's sampling method at a 95% confidence level. The results revealed that there is less extent of compliance in almost all of the SWM policies such as segregation, composting, recycling, incentives, and public information. There is a moderate extent of compliance in terms of collection and transport of solid waste and enforcement of penalties and fines. However, there is non-compliance in terms of facilities for final disposal. Furthermore, the results suggested that effective measures for recycling and composting should be undertaken to encourage higher participation among residents of the barangay. The presence of effective, functional, and marketable materials resource facilities and convenient drop-off locations for recyclable materials ensure final sorting according to its type for composting and recycling.

Keywords: Solid waste management; Policy implementation; Municipal waste; Household waste; Compliance

Introduction

The most pressing concern among urban areas in the Asian countries is the tangible environmental issues on air and water pollution such as illegal dumping, uncontrolled dumpsites, unsegregated wastes, and clogged waterways. These issues stem from poor solid waste management practices which have become a consequence of fast economic growth, industriali-zation, and rising population with increasing income and better lifestyle [1]. In 2016, about 1,200 million tons of municipal solid wastes or MSW's (e.g. plastics, papers, glass, metal, and food) were generated in Asia and the Pacific and this is expected to further increase in the following years. It is projected that the generation of these waste materials will continue to surge until its universal peak as far as 2100 [2–3]. MSW's are identified to be coming from the household, commercial, industrial (due to con-struction and demolition), agricultural, institu-tional, and a combination of any of the waste sources. In most cases, household and commercial wastes cannot be distinguished and are categorized together as urban wastes [4].

This global issue will persist unless relevant and forceful sustainability measures are being implemented [2]. These measures can involve strict implementation and enforcement of solid waste management (SWM) policies on a com-munity level, which requires the active involve-ment of community and waste management stakeholders to ensure successful results [5–6]. At present, SWM policies have become a vital component for institutions and governments that should be able to put all of these elements in place – segregation, collection, transport, materials recovery, treatment, and disposal [7]. For many developing countries, the 3R's (reduce, reuse, recycle) strategy is the ultimate choice, amongst many, as far as SWM policies are con-cerned with the aim of minimizing the volume of MSW's [8]. Unfortunately, the enforcement and implementation of SWM policies and stra-tegies are still a challenge in many developing countries [9], including the Philippines.

Suitable benchmark metrics help a community to measure its success in the provision of solid waste management facilities, to provide decision-making input on goals for inadequate funds available for infrastructure enhancements, and to track changes over time. The Integrated Solid Waste Management (ISWM) agenda differentiates three scopes for investigation of solid waste management: the physical classification and its technological mechanisms, sustainability features (social, institutional, political, financial, eco-nomic, environmental, and technical), and the various clusters of stakeholders involved. The physical aspects such as safety of public health which is dependent on a sound waste collection facility; environmental defense specifically during waste treatment and disposal; and resource value, the '3Rs' – reduce, reuse, recycle. Secondly, are the governance aspects. It conveys an effective system, with the stakeholders indirectly included allowing them to assist and gain, both as users and providers of service. This also dealt with the assessment of sound and proactive policies. The financial sustainability, the third aspect, ensures that solid waste management facilities and ac-tions are practical and reasonable. Unfortunately, actual data on costs, specifically on expenses per tons of waste managed by the organization, were usually either non-existent or uncertain [10]. With the existing metrics being discussed in the literature, this study finds these indicators relevant to be evaluated as to implementation and com-pliance, to serve as a guide for the policymakers on the enhancement of the existing policies and guidelines. Further, the need to evaluate additional metrics such that of penalties and rewards, will serve as check-and-balance metrics for an effi-cient and effective SWM.

The urban areas in the Philippines, for example, Metro Manila, have always serious issues regarding the management of MSW's because of the high population density and

consumption rates, as well as the concentration of packaged goods, some of which are made with raw materials that are toxic and non-biodegradable [11]. In 2016, urban areas in the country generate over 40,000 t d^{-1} of solid waste with an average per capita of waste generated at 0.40 kg d^{-1} [12]. These wastes are produced from households (73%), commercial institutions, and industries (26%), and healthcare facilities (1%) [11]. To enforce MSW management, RA 9003 (Ecological Solid Waste Management Act) was enacted in 2000, which authorized local government units (LGU's) to institutionalize methodological, all-inclusive, and environmentally sound MSW management plans [13]. The RA 9003 of the republic facilitates the idea that waste is a resource that can be retrieved. The act offers the most favored choices for solid waste management with source reduction and minimization of waste generated at source and resource recovery, recycling, and reuse of waste [14]. This act supports a paradigm that waste can be recycled as a resource. The most common options for solid waste management in RA 9003 are the reduction and minimization of waste generated at source and resource recovery, recycle and reuse of waste. In the first three years of the act, the statutory mandated quotas for solid waste disposal were set at 25% waste disposal and raised every three years afterward. It further directs the conception of the Solid Waste Management Board (SWMB) beginning from the national, provincial, city/ municipal, down to the barangay level. The barangay, similar to a village, is the lowest political and administrative level in the Philippines. The institutional mechanism of the law is the establishment of the National Solid Waste Management Commission (NSWMC). The law also identifies stakeholders that have an interest in good waste management, thus having significant contribution and participation. This is presented in Supplementary Material (SM) 1 with their roles as prescribed by the law. The

recognition of stakeholders is very important in managing their participation and engagement in various waste management activities [15–16].

The current waste management scheme equally outlines the roles of the city or municipal government and the barangays in instigating waste diversion as shown in Figure 1.

RA 9003 aims of creating an integrated SWM system; hence it mandates the provision of material recovery facilities (MRFs) in all barangays that are in line with the reduction, reuse, recycle scheme. Moreover, LGUs adopt sanitary landfills instead of illegal burning or open dumping. However, landfills have been reaching their maximum capacity and so necessary measures are proposed. As an example, Cebu City which is one of the highly urbanized centers in the central Philippines set a landfill waste reduction of 50% for the year 2015 [11]. Some notable efforts of reducing landfill disposal are the establishment of the city's composting schemes, extending from backyard, community-based, and business-led composting initiatives. These arrangements are usually on small scale (less than 1 t d^{-1}) and depend on segregated waste from the local community. Moreover, City Ordinance No. 2013 (Mandating garbage segregation at source. Categorization of waste. Establishment of fines) orders garbage segregation at source according to four waste classifications: 1) biodegradable or compostable wastes, 2) non-biodegradable wastes, 3) reusable or recyclables wastes and 4) bulky wastes, with penalties for violations. Following the adoption, in April 2011 of the resolution 'No Segregation, No Collection Scheme' and City Ordinance No. 2343, better known as the 'No Plastic Saturday Ordinance of the City of Cebu,' the use of plastic shopping bags as primary packaging for products in commercial establishments is banned for non-compliance every Saturday with appropriate penalties [18]. However, the MSW management implementation of LGUs in the Philippines is still very limited even with the thorough

reform introduced in the creation of RA 9003 [11]. The LGU's primary responsibility is the implementation and enforcement of the provisions in the law in their area of jurisdictions. Hence, it is then thought that waste segregation and collection should be enforced at the barangay level specifically for biodegradable, compostable, and reusable wastes. It is further expected that the barangay will ensure 100% collection coverage of the waste from residential, commercial, industrial, and agricultural sources.

The study aimed to assess the current SWM practices of the barangay residents as community participants and the level of barangay implementation of the SWM policy to determine compliance and degree of participation as mandated in the RA 9003 in terms of waste segregation, collection and transport, recycling and composting practices and programs, incentives and implementation of the penalties and fines as well as public education and information to solid waste management plans and programs of the barangay. Other solid waste management studies focused on gaps limited in the management of wastes [19], however, research works both on policy implementation and stakeholder or community participation are understudied. Management of solid waste is regarded as one of the main issues that have to be dealt with daily to control the rapid increase of wastes generated by people passing through towns and cities. Thus, the activities involving waste management are decided upon and carried out by the different stakeholders including the government and the individuals populating the city [20]. The government is the one who is mainly responsible for waste minimization and implementing waste management [21]. The term

"responsible units" refers to the local government units responsible for implementing ways for waste minimization such as recycling and composting and almost all of the responsible units which represent about 99% of the population of a state receive state-funded grants for a portion of the costs of operating the local waste minimization programs [22]. Although the programs conducted by the government are for the common good, this may not be successful without the help of the public. A study emphasized the importance of public participation which unfortunately receives very little attention [23]. A plethora of researches has stipulated that participation, attitude, and behavior are important elements in the success of solid waste management programs in every society [24]. The attitude and awareness of people affect every stage in the solid waste management process - from household waste storage to waste segregation, recycling, collection, and waste disposal [25]. The habit, attitude towards target, punishment, and rewards are factors affecting human attitude [26]. Attitude can positively be affected through building awareness campaigns and projects, and education that informs people about their responsibility as waste contributors and informs the negative effects of improper waste management in the environment and public health. To prolong and uphold a waste management system, participation of the community is a prerequisite even by simply storing wastes in a proper way and time and segregating recyclables from other wastes. Thus, the conceptualization, formulation and implementation of waste management must require the understanding and analysis of the beliefs, behavior, and attitude of community individuals [27].
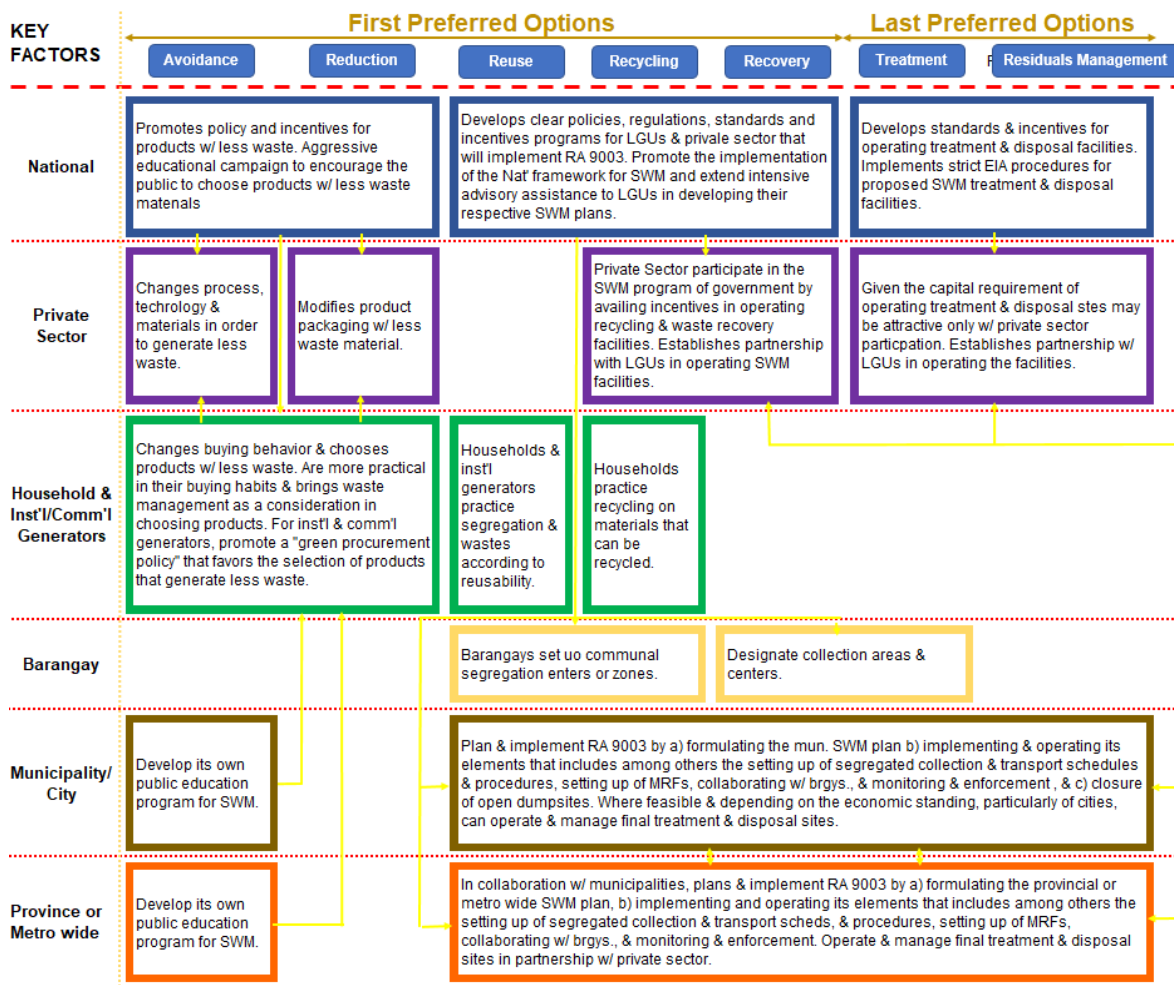
Figure 1 Level of governance in Philippine solid waste management [17].

The target level for both barangay residents and implementers are 100% compliance with the mandate of the Act whose indicators are manifested in the SWM components being assessed in this study. These indicators include the segregation of wastes, collection, and transport, reuse and recycle programs, composting, incentives, public information, and information, penalties, and fines. The legislation describes segregation as a solid waste management method by separating multiple waste stream products to facilitate resource recovery and reuse and decrease the volume of waste to be collected and disposed of. The law further directs that Material Recovery Facilities (MRFs) shall be set in every barangay or cluster of barangays. The MRF comprises a solid waste transfer station or sorting station, a drop-off center, a composting facility, and a recycling facility. MRFs assist to reduce the volume of wastes to be disposed of primarily through recycling, composting, and residual treatment. The waste management act outlines collection of waste as the policy of removing solid waste from the source or a shared storage point. The law additionally orders the use of separate collection vehicles, schedules, and/or separate trucks or haulers for specific types of wastes. The vehicles used for solid waste processing and transport have sufficient compartments to allow the effective handling of segregated waste during transit. LGUs are mainly accountable for the collection of solid wastes. Waste segregation and collection are carried out primarily for biodegradable/ compostable and reusable/recyclable waste at the barangay level.

Materials and methods
1) Research location

Cebu City is located in the Central Eastern part of Cebu Island, bounded in the North by Mandaue City and in the South by Talisay City, and Mactan Channel in the East and municipality of Balamban and Toledo in the West. Figure 2 shows the location map of the study area.

At present, Cebu is the second-largest city next to Metro Manila, the country's capital. Because of its strategic location and ease of access by air and sea transport, industries like tourism and information and communication technology, Cebu City has become a notable urban city with 50 out of 80 barangays considered urban [28]. The city produces about 500 t of MSW per day or a total of 182, 500 t a^{-1} [18]. Due to the rapid urban and economic growth in the city, the daily MSW generation has increased almost double from 212 t in 1982 to 500 t in 2010. However, it was estimated that only 315 t d^{-1} of MSW or 114, 500 t a^{-1} of MSW per year ends up being dumped into the sanitary landfill. According to the city officials, the rest is recycled by the formal and informal sectors.

While there is no exact data on actual per capita waste generation in the city, it was estimated that each of the Cebu City residents generates about 500 g d^{-1} of MSW. Cebu City is yet to perfect the implementation of its segregated garbage collection system. Barangay residents continue to mix biodegradable with their non-biodegradable wastes. According to city data, MSW collection coverage is 100%. However, in some instances, uncollected garbage is left to pile up on city streets, in the interior of barangays, and even left floating on water bodies because of the lack of garbage trucks that will bring these to the city's transfer station at the landfill. In this event, the conduct of this study is seen as relevant.

Four barangays were selected in the study namely Guadalupe, San Nicolas, Talamban, and Lahug. Barangays Guadalupe and San Nicolas were dubbed as violators of RA 9003 in the city last 2014. These barangays were charged for improper waste disposal and the garbage policy such as the "No-segregation, No-collection" policy is not implemented. On the other hand, Talamban and Lahug are two of the populated barangays with no record of SWM violations.
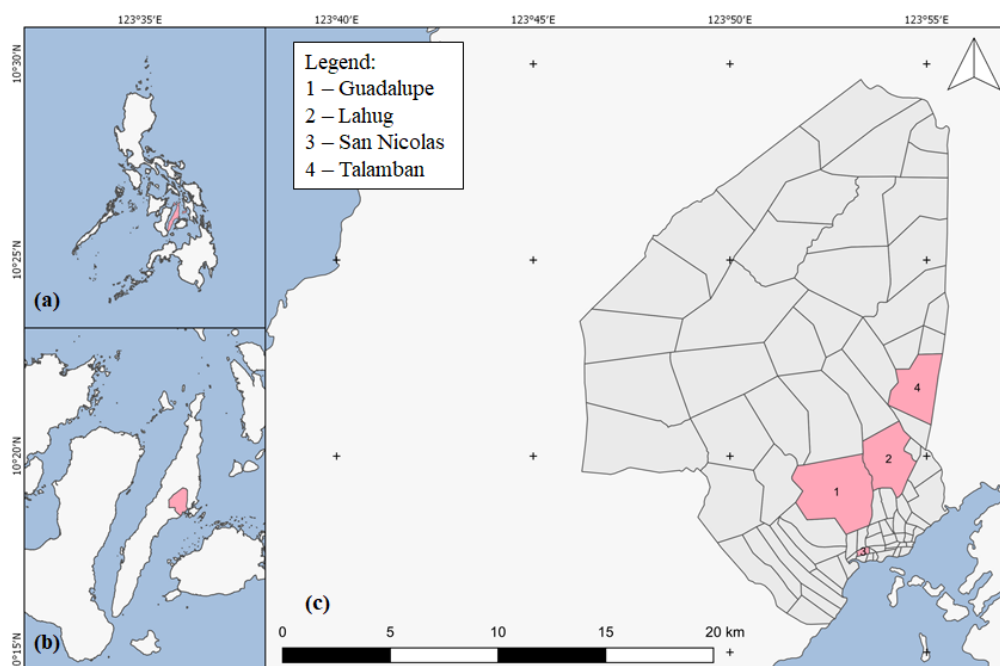

Figure 2 Map of the Philippines showing (a) Cebu Province; (b) Cebu City; and (c) location of four barangays.

2) Methods

The total number of sample population per barangay was identified using Slovin's formula with a 95% confidence level which resulted as follows: 382 for Guadalupe; 380 for San Nicolas and Talamban and 381 for Lahug. The formula for Slovin's is shown in Eq. 1 in which n is the sample or portion of the population that participated in this study, N is the total population under study and e represents the error margin.

$$n = \frac{N}{(1+N \cdot e^2)} \qquad \text{(Eq. 1)}$$

The total number of respondents was 1,523. Thirty (30) Barangay Environmental Officers (BEO) and staff were also interviewed in this study. These BEOs are tasked with implementing and monitoring government provisions. A descriptive quantitative method was used in which survey questionnaires served as the primary tool of data gathering supplemented with unstructured interviews.

Two sets of survey questionnaires were employed with a retrieval rate of 95% for Guadalupe and Talamban and 99% for San Nicolas and Lahug. The first set evaluated the solid waste management practices of the selected barangay residents or the waste generators. The questionnaires assessed compliance in RA 9003. The second set of questionnaires evaluated the extent of compliance of the Barangay Environmental Officers (BEO) to RA 9003. The respondents were assigned to answer the questions that are answerable by a 4-point scale. Table 1 showed the scale used with the corresponding quantitative and qualitative values. Weighted mean was used to calculate the gathered data for each indicator. The weighted mean was used to determine the level of compliance for both sets of respondents.

Results and discussion
1) Scenarios of solid waste management practices

The activities included in SWM practices in Cebu City include (1) segregation of waste, (2) collection and transport of solid waste, (3) recycling programs, (4) composting, (5) incentives, (6) penalties and fines, (7) public education and information as well as (8) facilities for final disposal. SM 2 and SM 3 further show the detailed result showing the weighted and composite means of each criterion as evaluated by the residents and the barangay health workers.

Table 1 The rating scale used by the respondents

Scale	Residents		Barangay Environmental Officers	
	Description	Implication	Description	Implication
4	All the time	If practiced in all cases; 7 d in a week	Great extent	If complied in all cases; 76–100% complied
3	Most of the time	If practiced in the majority of the cases; done 4–6 d in a week	Moderate extent	If complied in the majority of the cases; 51–75% complied
2	On rare occasion	If practiced in some of the cases; done 1–3 d in a week	Less extent	If complied in some of the cases; 1–50% complied
1	Not at all	If not practiced at all; none at all	Not complied	If not complied at all; zero compliance

In SM 2, it is shown that the majority of the variables being assessed are done most of the time. However, looking into the details, there are specific areas that are performed on an occasional basis. These among others are the unavailability of garbage truck covers, the utilization of the MRFs, and the giving out of incentives for good performing households as far as SWM practice is concerned. The majority of the least performed aspects dealt with budget consideration and technical know-how. This can be linked to the result of the assessment of the BEOs. SM 3 presented the assessment result of the BEOs as far as implementation is concerned at the barangay level. The garbage trucks provided by the barangays in the initial stage of implementation are substandard. It does not conform to the minimum requirements set. Moreover, the absence of MRFs in the barangays is the core reason why residents did not utilize it at all. In some barangays, based on the observation done in this study, the MRFs are present but it did not conform to the design specifications of a good and functional MRFs. It can be well noted in the result that funding for SWM programs is insufficient at the barangay level. From the perspective of the BEO, there are low funds allocated for solid waste management from the city government. There is a huge reduction in the budget which affects the materials needed in solid waste management as well as manpower whose work is to ensure these tasks. Budget allocation at the time the research was conducted was affected by the transition of LGU officials which the officials call political biases.

2) Status of waste segregation

The results of the implementation of waste segregation in the four barangays of Cebu City, Philippines are shown in Figure 3. Segregation of wastes among the barangays is done most of the time with an overall weighted mean of 3.06. Among the barangays, Lahug and Talamban practiced segregation of waste all the time because

these barangays implement strict segregation while Guadalupe and San Nicolas segregate waste on rare occasions because of time constraints in segregating and the unavailability of segregation bins provided in the locality. In the actual observation done, residents did not segregate their waste all the time because of the lack of garbage bins available in their areas. There are some garbage bins personally provided by residents but are only limited thus, these hinder them from segregating waste according to types. Further, cultural and behavioral norms are also observed to be a culprit of this scenario.
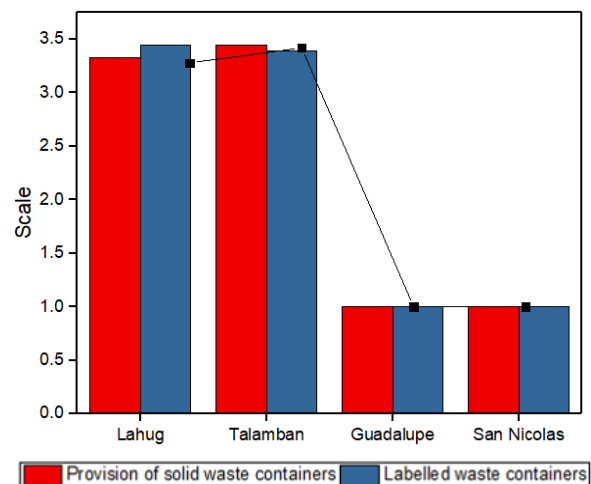

Figure 3 Status of waste segregation implementation by policy implementers in selected barangays of Cebu City, Philippines assessed by residents.

It can be noted that local barangays implement waste segregation with less extent having an average weighted mean of 2.17. Both barangay Guadalupe and San Nicolas did not provide separate containers for each type of waste in every household as mandated in RA 9003. Therefore, the segregation of wastes at its initial stage of implementation in the barangay level has not complied. This result coincides with the study in which social behaviors between urban areas tend to become a barrier to waste segregation at source [19]. This indicates that there is a need to include measures of behavioral

changes among citizens as an aspect of MSW management policies. These among others the voluntary participation of the house-holds in the waste segregation drive even with the absence of garbage bins provided by the barangays.

3) Status of collection and transport of waste

The results for the collection and transport of solid wastes are shown in Figure 4. This aspect is specified into three indicators: (1) provision of personal protective equipment or PPE; (2) on-time collection of waste; and (3) condition of garbage collection trucks, i.e. provision of covers and odor control. Generally, the collection and transport of waste in each of the barangays are done most of the time and to a moderate extent. In terms of wearing PPE in handling solid wastes and on-time collection of garbage, these indicators are found to be done most of the time with a weighted mean of 2.75 and 2.74, respectively. Garbage collectors and other personnel are provided with personal protective equipment to protect them from hazards of handling wastes and the necessary training with regards to proper handling of waste. However, it was revealed that garbage trucks being used in the collection do not have covers in some areas, thus foul odor can be sensed around the community. Also, the collection efficiency of MSW's in some barangays is low because of inconsistency in the collection system. It has been observed that the collection is only observed in areas where there is road access for garbage trucks to route. Uncollected waste often lies outside the designated bins in most of the urban areas due to inappropriate design, capacity, location, and poor attitude of the community towards using bins. It is observed that the uncollected waste is generally burnt in open areas or on the streets. Furthermore, results revealed that there is no separate garbage truck or vehicle used for a specific type of waste. Nonetheless, most of the time though, the observance of a definite schedule for garbage collection indicating the day and

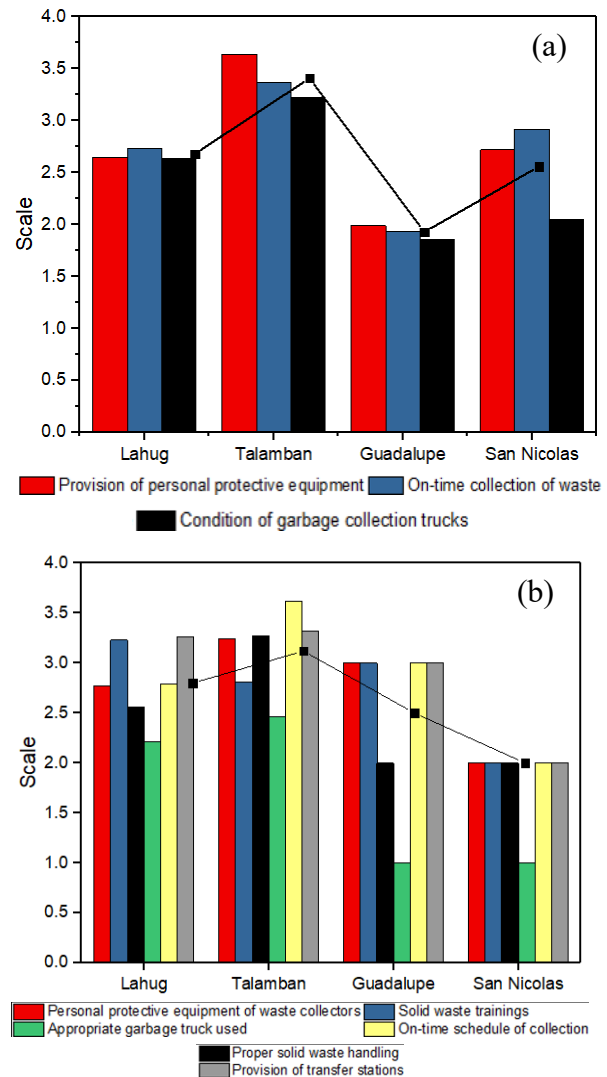time the garbage truck at the particular vicinity to collect garbage is mostly observed.

Figure 4 Status of collection and transport of waste in selected barangays of Cebu City, Philippines as assessed by (a) residents and (b) barangay environmental officers.

4) Status of 3R programs

Recycling as a waste management practice shows promise as it enables valorization of MSW's that are deemed recyclables and at the same time provide job opportunities among participating stakeholders [32]. Recycling programs at home as shown in Figure 5 are practiced by Lahug and Talamban most of the time while Guadalupe and San Nicolas only practiced recycling occasionally.
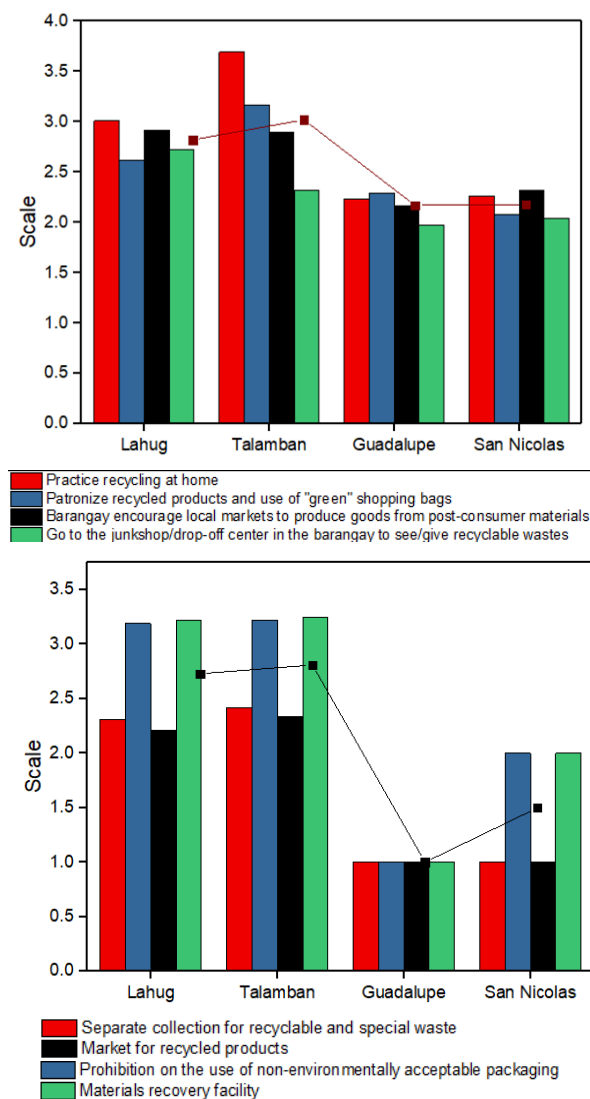
Figure 5 Status of recycling programs in selected barangays of Cebu City, Philippines as assessed by (a) residents and (b) barangay environmental officers.

Patronizing recycled products and using environmentally friendly and reusable shopping bags are done most of the time with an overall weighted mean of 2.54 for the four barangays. However, barangays Talamban, Guadalupe, and San Nicolas rarely sell their recyclable wastes in the junk shops due to the low exchange value of the wastes being sold and the absence of nearby junk shops as claimed by the residents. This further means that the residents of these three barangays have not efficiently utilized the materials resource facilities (MRF's) that are

provided. The presence of MRFs in the barangay is implemented in some cases only with an average mean of 2.37. This means that the MRF is not fully utilized by the residents as it is intended to be. The MRFs supposedly functions as a sorting facility. When this waste is sorted, they can be sold to junkshops for reuse or recycling while the biodegradables are processed into composts.

Generally, the recycling program of Cebu City as assessed by the barangay officials is practiced to a less extent with a mean of 2.01. The result shows that there is no separate collection system or convenient drop-off locations for recyclable materials and particularly for separated toxic components of the waste stream like dry cell batteries and tires to ensure that they are not incinerated or disposed of in the landfill. In the BEO interview, officers do not accept batteries, broken bulbs, and other toxic wastes in the collection. The prohibition on the use of non-environmentally acceptable packaging is practiced to a less extent. Also, there is no market opportunity for recycled products and no encouragement to local makers to produce goods from post-consumer materials. Thus, the motivational aspect at the household level in the recycling advocacy has not complied.

5) Status of composting

In terms of composting, residents of Talamban practice composting at their respective homes all the time which can be seen in Figure 6. On the contrary, Guadalupe and San Nicolas revealed that composting is rarely practiced because of issues on the technical capability of the residents. There is no composting training done at the barangay level, as well as there are inadequate spaces in the barangays for such waste minimization programs to take place. Composting is a method that is found to apply to the biodegradable component of MSW. Barangay environmental officers' promotion of composting

of organic wastes by making compost from kitchen and garden wastes is practiced to a less extent. Households in barangays Lahug and Talamban practiced composting at home to a moderate extent while barangays Guadalupe and San Nicolas do not apply to compost their waste. Based on observation and further investigation is done, lack of space in their backyards and no education and training on the composting techniques and methods are the identified factors for not complying. These results agree in

which the application of this method is still a challenge in developing countries due to various factors, in which the most dominant is odor generation [17]. Composting should be implemented in parallel with waste segregation at the source.
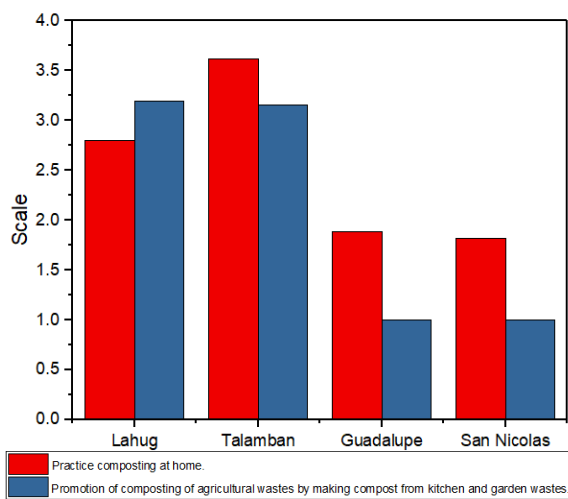

Figure 6 Status of composting in selected barangays of Cebu City, Philippines as assessed by residents and barangay environmental officers.

6) Status of public education and information

Information provided by the respondents as far as public information and education is concerned revealed that awareness activities about the solid waste management program are conducted. Among the seven SWM practices, public information and education are highly implemented with an average weighted mean of 3.11 which can be seen in Figure 7.
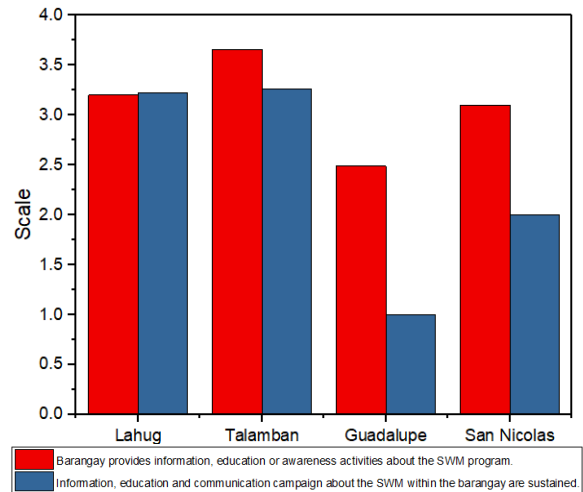

Figure 7 Status of public education and information in selected barangays of Cebu City, Philippines as assessed by residents and barangay environmental officers.

This means that the government is exerting efforts to disseminate the goals and objectives of the environmental campaign. However, it should also be well noted that the respondents' responses demonstrated irregularity in this area since barangay Guadalupe falls under the "on rare occasion" category. This further entails that there is still inconsistency in the implementation of this awareness program and can be concluded that education and training seminars may not be disseminated fairly well to the residents.

A previous study highlights that the Cebu City Government, especially the Office of the Environmental Committee has recognized that the implementation of the SWM program depends on the level of environmental awareness among its community to ensure their active participation [8]. A system was established by recruiting at least five volunteers from each barangay with community-leadership elements, known as BEOs, to serve as the main initiator of these education campaigns. For this reason, BEOs have become an important medium through which the Cebu City government can communicate its policies to citizens at the barangay level.

7) Status of final disposal

The implementation of SWM practice in terms of facilities for final disposal among select barangays has not complied at all with an average weighted mean of 1.67. Figure 8 shows the result.

During the interview, the barangay official said that the local government unit of Cebu City has not converted the open dumps into controlled dumps as to prohibit the use of open dumps for solid wastes. Controlled dumpsites do not have adequate soil cover for sanitary landfill of non-biodegradable and non-recyclable wastes. This shows that dumpsite operators are not able to provide adequate supervision of sufficient qualified personnel to ensure proper operation of the site in compliance with all applicable laws, regulations, permit conditions, and other requirements. Insufficient funds allocated for the modernization of facilities are one of the main reasons for non-compliance in the barangay level as revealed by the respondents.
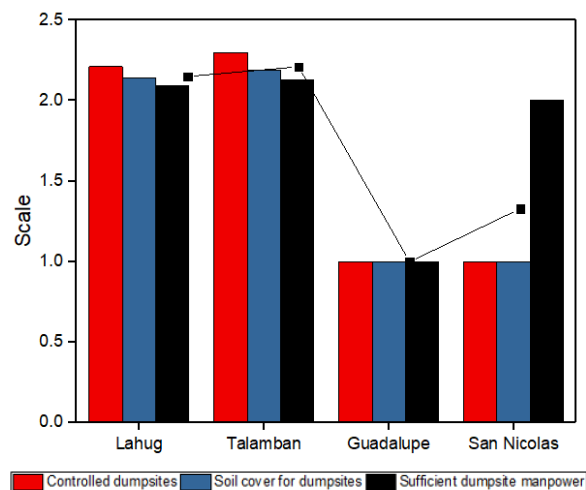

Figure 8 Status of final disposal in selected barangays of Cebu City, Philippines as assessed by barangay environmental officers.

8) Status of incentives, penalties, and fines

At the barangay level, the recycling initiatives implemented by the city government primarily aimed at encouraging solid waste segregation at its source with fines for violations

and supporting the development of a special fund for incentives are partially preserved. The results of which are presented in Figure 9.
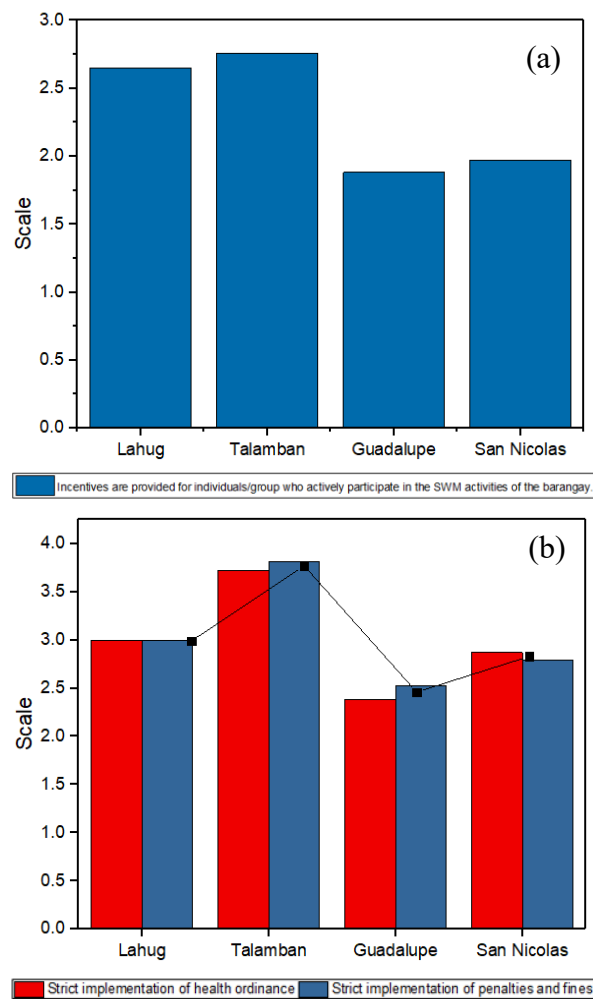

Figure 9 Status of incentives, penalties, and fines in selected barangays of Cebu City, Philippines as assessed by (a) residents and (b) barangay environmental officers.

The implementation of incentives as a waste management practice in barangays is found to be on rare occasions with an average weighted mean of 2.31. Incentive scheme for individuals or group who enthusiastically participates in the solid waste management activities of the barangay is less implemented since most of the respondents rated it as not at all implemented in the barangay level. This is one of the substantial reasons why the implementation of RA 9003 is insufficiently administered. With no incentive

given in place for those active individuals, dedication and drive will die down. The necessity of paying more attention to intrinsic and extrinsic factors is important. This has become an important attribute to warrant sustainable waste management [30].

Generally, incentive schemes are practiced to a less extent among the selected barangays. For best implementers of RA 9003, these are practiced to a moderate extent while some barangays did not give rewards or incentives to those individuals or groups who have undertaken outstanding techniques, projects, or technologies related to re-use, recycling, and reduction of solid waste. However, the imposition of penalties and fines to violating individuals are practiced to a moderate extent. It can be concluded based on the findings that the Cebu Environmental Sanitation and Enforcement Team (CESET) have exerted efforts in the enforcement of this policy.

9) Other developing countries issues of ineffective waste management policy

Similar to the Philippines, some developing countries in Asia had its bout of challenges as far as waste policy implementation is concerned. In China, many citizens cannot effectively and correctly separate different kinds of solid wastes. The participation of citizens in source separation needs to be improved in some regions and the absence of a waste composting facility is identified. Further, poor data management and ineffective methods towards informal waste management activities cause formally implemented waste management measures to be ineffective [33]. Meanwhile, Malaysia has identified that poor governance in the ground, lack of commitment among stakeholders, poor monitoring and policy enforcement as well as the neglect of social dimension's participation in the policymaking and feedbacking are the primary causes of the low success rate of its waste policy [34]. Vietnam's no clear-cut com-

petence in solid waste management for certain authorities causes overlapping of responsibilities, thus, accountability among the various authorities regarding solid waste management is difficult. In Indonesia, there are still constraints in the success of its policy because public awareness and community participation are still lacking and public knowledge about waste management is very limited [35]. Thailand's technical issues on waste management are considered to be the top contributing factor for its unavailing policy implementation. Such technical issues include having no sufficient number of garbage trucks and the ineffective and inefficient waste collection system on frequency and routes and the lack of establishment of a recycling and composting facility [36].

Conclusions

Municipal solid waste (MSW) management has become one of the most pressing environmental concerns of the Philippines at present. The research gap of analyzing the relations of non-compliance for both policy implementers and the community are looked into. The result of the study provides general direction for the further development of the county's solid waste management system in the future by analyzing the underlying reasons for ineffective solid waste management policies.

The findings of this study showed that despite the city's efforts to implement effective compliance with the provisions of RA 9003, the selected barangays have not fully implemented the law. Sufficient fund allocation is crucial to the full compliance of the RA. Facilities for final disposal is considered necessary since implementers have not controlled the dumpsites that include the adequacy of soil cover or sanitary landfill for non-biodegradable. The prohibition of using open dumps for solid waste is not followed due to the lack of barangay environment officials.

Thus, effective measures for recycling and composting should be undertaken to encourage higher participation among residents of the barangay. The presence of effective, functional, and marketable MRF and convenient drop off locations for recyclable materials will ensure final sorting according to its type for composting and recycling. Door - to - door waste collection service as per the law is also highly recommended. Incentives, penalties, and fines should be implemented and given so that residents will be motivated to reduce their waste and recycle more.

The requirements of the legislation would necessitate environmentally sustainable approaches to improve resource use and facilitate the conservation and recovery of resources; established strategies and targets for the avoidance and volume reduction of solid waste by steps to minimize source and waste minimization; guarantee proper segregation, collection, transport, storage, treatment and disposal of solid waste. The implementation of the legislation puts a larger responsibility on the local government units to find forms and means to enhance the local level of solid waste management. The local government units need to provide leadership and persistence at the municipality and barangay levels to ensure that waste avoidance and mitigation are in operation. In encouraging compliance with solid waste management rules and regulations, local ordinances that provide a framework for the successful enforcement of national legislation are essential. As a support tool, awareness and education campaigns should be conducted in connection with the issuance of the decree.

The Philippine state of policy implementation is not far from the issues at hand confronted by the neighboring developing countries. It is imperative therefore that solid waste management policies be strictly implemented and enforced to ensure a high level of compliance. The stakeholders' participation needs to be considered to take into account fundamental reasons for non-compliance and arrive at a viable solution to achieve the utmost cooperation as far as solid waste management practices at the household level are concerned. This could be done by a stakeholder and policymaker forum and discussion where each party can share sentiments and suggestions on how to come up with a sound solid waste management plan.

Acknowledgment

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