Assessment of the Ten-Year Ecological Solid Waste Management Plan of Cebu City, Philippines

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Abstract

This study evaluated the ten-year Ecological Solid Waste Management Plan of Cebu City Local Government Unit in view of establishing a clear track of the city's goal to reduce the generation of municipal solid wastes and how the Cebu City laid out the Plan for implementation of an integrated "solid waste management" system. This research examined the "strengths, weaknesses, opportunities and threats" of the plan implementation. Findings revealed that Cebu City responded well to the challenge of solving its burgeoning garbage disposal problems. It has enacted several ordinances to strengthen policy implementation geared towards resolving the garbage and waste management besetting the city for several years now. The Cebu City government also enforce all villages to comply and adhere to the ten-year ecological waste plan, minimize their waste produce and recycle things whenever possible. It has also allocated funds in support of the solid waste management programs and operations. It is concluded that the initial implementation of the ten-year solid waste management plan was achieved rather at a slow pace. The implementers are not fully committed and disciplined aggravated by lack of manpower and personnel manning the garbage operations. There are political interventions which hamper the smooth implementation processes of the plan. The Cebu City should ensure and promote the rights of its constituents towards a healthy and balance environment.

Keywords: solid waste management, city ordinances, ecological solid waste management, solid waste management system

1.0 Introduction

Years have passed but the regulation of trash collection around Cebu City still remain a problem. Unpleasant odors, clogged canals, dumped junks are visible in many parts of the. People settled and established their communities. As they work for progress in their respective ways of livelihood,

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they also accumulate garbage. The various wastes that are produced every day underpinned the outputs of Cebu City's development activities happening round the clock. Two administrations have taken the seat of the city for the past decade. It seems that their ordinances have not solved the waste disposal problem, not counting those wastes coming from factories, hospitals and other big industries in the city. From its cityscape to its coastal shorelines (Padua, Abocejo and Mirasol, 2011), it is evident that the City has undertook plenty developmental projects and actions (Abocejo and Gubalane. 2013). As a highly industrialized city, there is a need for city residents to enjoy a clean and livable environment (Dela Serna, Ferrer and Abocejo, 2017). Ensuring cleanliness and sanitation do not only provide good health but also prevent other unwanted effects like street flooding when heavy rains pour around Cebu City.

Trashes around the city have doubled by volume for the past 10 years as business and industrial development have taken place in the City. And the garbage issue (Vivar, Salvador and Abocejo, 2015) continues to shadow the city's unprecedented economic boom and progress. The question here is: how come local government officials cannot make the city clean and free from stockpile of uncollected garage along many areas of the city reflective of their duties neglect over the waste disposal perennial problem?

As of 2015, Cebu City had a total population of 923,000 (Dickella, Hengesbaugh, Onogawa and Cabrera, 2017). If Cebu City continues to grow by an average of 1.21 percent of annual population for years 2010-2015, it is projected that the City will reach 1.3 million in the next decade. This growth will still be added with inter-regional migration specially from the new entrants to labor force as employment opportunities in Cebu City is higher than elsewhere in Central Visayas Region. The city is comprised of 80 villages distributed between the north district (46) and the south district (34). When it rains in the low-lying areas, the city easily gets flooded due clogged drainage canals from the thrown garbage (Vivar, Salvador and Abocejo, 2015). Consequently, the city flooding would cause heavy traffic in major flooded thoroughfares.

The Republic Act 9003 calls for all LGUs to take full responsibility over the "collection of non-recyclable garbage, solid and special wastes". RA 9003 also stipulates that each village unit takes the responsibility in collecting and segregating the "biodegradable, compostable, and reusable wastes" (Government of the Philippines, 2001). Furthermore, Philippine Republic Act 9003 (RA 9003), otherwise known as the "Ecological Solid Waste Management Act of 2000", stipulates that "waste management may be defined as the discipline associated with the control of storage, collection, transfer, transport, processing, and disposal of solid waste in accordance to the best principles of public health, economics, engineering, conservation and that is also responsive to public attitude."

A ten year "Ecological Solid Waste Management" (ESWM) plan has been crafted by the Cebu city LGU to establish a clear road map for reducing and managing the generated solid waste of the LGU (City of Cebu, 2017). This Plan wants to lay out ways on the appropriate operationalization of a comprehensive ESWM city-wide system. The implementation of the Plan will ensure the appropriate enforcement of the ESWM system from the years 2018 to 2027. Cebu City LGU commits to protect and sustain the implementation of RA 9003. In the formulation of the Plan, the city adapted a participatory planning approach. It covered revisiting the Plan, participation on the workshops by the personnel, conducting orientations and doing related studies. The three R's: Reduce, Reuse, and Recycle can be a start of something bigger. In this way, the citizens can save a lot. Energy should be conserved at all times (City of Cebu, 2017).

1.1 Study Objectives

This study assessed the ten-year "ecological solid waste management plan" (ESWMP) of Cebu City "local government unit" (LGU). Specifically, it examined (1) how the LGU enforces the implementation of the Plan through its enacted ordinances and environmental laws, (2) the conducted activities to ensure the use of waste to something useful, (3) the final disposal of wastes after they were collected in the transfer station, (4) the diversion of waste in accordance with the Plan, and (5) the strength, weaknesses, opportunities and threats of the Plan.

2.0 Literature Review

Rajput, Prasad and Chopra (2009) articulated six functional elements of identified initiatives relating to SWM from the generation of wastes to their final disposal. First is the "waste generation" where the wastes are grouped either to be thrown away or for disposal. Second is "waste handling and separation, storage and processing at the source". The authors further noted that these activities pertain to the "management of wastes until they are placed in storage containers for collection", in other words, "waste handling and sorting".

The system commences with the generation of waste by the household and commercial establishment (Figure 1). Then the wastes are deposited into onsite storage. The onsite storage gained popular importance due to "public health concerns and aesthetic desirability". In many commercial and residential areas, "makeshift containers and open ground storage" are used. Some households shoulder the cost of ground storage for solid wastes, while in some cases, they are managed by commercial and industrial establishments.

Next is the collection which includes the "gathering of solid wastes and recyclable wastes (Figure 1)". It also involves "transporting waste (after collection) to the site where the collection truck is unfilled". These wastes are placed accordingly in a material processing facility, a transport station, or landfill disposal site. Then comes the "sorting, processing and transformation of solid waste". This processes encompasses the "activities during the recovery of sorted materials and the processing the solid wastes". Sorting of mixed wastes are carried out at "materials recovery facility, transfer stations, combustion facilities, and disposal sites". Sorting is about the "separation of massive materials, separation of components by size using screen, manual separation of waste components and segregation of ferrous and non-ferrous metals".

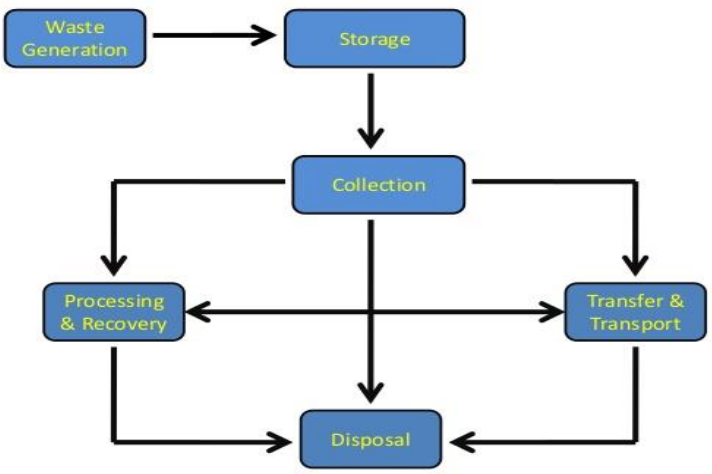

Figure 1. Interrelationship of functional elements in SWM system
Source of graph: Rajput, Prasad and Chopra, 2009.

"Waste processing" is done to "recover conversion and energy products". This is where the "organic fraction of municipal solid waste (MWS) can be transformed through a range of biological and thermal processes" (Figure 1). The biological method "most commonly used is actually aerobic composting", as the process where oxygen is required (Khatib, 2011). On the other

hand, the "most commonly used thermal process is incineration". A "variety of mechanical (i.e. shredding), thermal (i.e. incineration without recovery of energy) or chemical (i.e. encapsulation)" techniques may be used for the transformation.

The "transfer and transport functional element involves two steps". First is the "transfer of waste materials from the smaller collection vehicle to bigger transport truck" and (2) the eventual "transfer of the waste to a recycling or disposal site, usually over long distances". The transfer is normally performed at a transfer station. Basically, the first one is from household to waste vehicle and the second one is from the transport vehicle to the waste processing site. Finally, the "disposal of solid wastes". In reality, the fate of solid wastes is to be deposited in a land filled or a dumping site, whether "household waste collected and transported directly to a landfill site or residual materials from materials recovery plant".

Fine (2009) discussed the "strength, weaknesses, opportunities and threats (SWOT) analysis". This method of analysis lets organizations optimize their strengths, mitigate their weaknesses, exploit their opportunities and resolve their weaknesses. The SWOT speaks the reality of a particular study, situation or an event. It can help every researcher to find out what are the specific actions should be made relating to their study whether it should be followed or in some instances should be avoided.

Since this study is conducted to point out one of the unending issues and problems on solid waste management and on proper segregation, what are the actions that should be applied to prevent worsening, the fulfillment of solid waste management policy implementation and the specific schemes that Cebu City Government is going to create, the researchers made an action to revisit the effectiveness of the goals of the ten-year plan. The analysis will not literally serve that it should fully be followed however it will serve as a guide of every examiner to meet the goals of their research.

An important requisite for an effective SWM implementation is to ensure human health and safety which translates to assuring the safety to the working people and protect the general health of the public to prevent the spread of diseases (Khan and Samadder, 2014). Another prerequisite is that SWM must be economically and environmentally sustainable. Economically sustainable means that it must operate within affordable cost approved by the community (Abocejo, 2017). Environmentally sustainable indicates that SWM must minimize the environmental impacts of waste management. These two factors are difficult to curtail and a trade-off has to pave the way one or the other. The point is to establish a balance between these two requisites in reducing, whenever possible, the "entire environmental impacts of the waste management system" within a reasonable cost level.

There is a need to do an "integrated approach like dealing with all forms of solid waste materials and all sources of solid wastes to achieve economically and environmentally successful and sound waste management system". In economic and environmental terms, material specific and source specific approaches are less successful than the multi-material and multi-source management approach. Specific "wastes can be handled within such a system but in different streams".

The effectiveness of a SWM system covers one or more of the following options (Mazzanti and Zoboli, 2008). (a) "Waste collection and transportation. (b) Resource recovery through sorting and recycling i.e. recovery of materials (such as paper, glass, metals) etc. through separation. (c) Resource recovery through waste processing i.e. recovery of materials (such as compost) or recovery of energy through biological, thermal or other processes. (d) Waste transformation (without recovery of resources) i.e. reduction of volume, toxicity or other physical/chemical

properties of waste to make it suitable for final disposal. (e) Disposal on land i.e. environmentally safe and sustainable disposal in landfills".

Managing "solid waste has become one of the major environmental concerns" (Mazzanti and Zoboli, 2008). This is especially "true in urban areas where the population expand rapidly and the amount of produced wastes increase more than expected" (Srivastava, Ismail, Singh and Singh, 2015). Historically, SWM has received "less attention in policy and legislation except in part of the wider domain of environmental issues on utilization, protection and conservation, natural resource management and behavioral control" which negatively affect the environment (Rebullida, 2002).

The enactment of "Republic Act 9003, otherwise known as the Ecological Solid Waste Management Act of 2002", the LGUs were already taking responsibility of the SWM in the Philippines (Barloa, Lapie and De la Cruz, 2016). Ordinances are crafted and implemented to address this specific concerns on these issues. Brought about by the accelerated population growth, the continuous problem with regards to waste segregation also arises. The LGU has the obligation in the collection of "recycled, recyclable and non-biodegradable waste materials from material recovery facilities, to transport them to recycling centers and/or municipal material recovery facilities" (Gamaralalage, Hengesbaugh, Onogawa and Cabrera, 2017). Separated solid waste collection is scheduled per village.

The term "solid waste include all non-liquid wastes produced by human activity and a variety of solid waste materials resulting from the disaster", such as "general domestic garbage such as food waste, ash and packaging materials; human feces disposed of in garbage; emergency waste such as plastic water bottles and packaging from other emergency supplies; rubble resulting from the disaster; mud and slurry deposited by the natural disaster; and fallen trees and rocks obstructing transport and communications". Other specialized wastes, such as "hospital medical wastes and industrial hazardous wastes" must also be dealt with utmost urgency (World Health Organization, 2018). Waste management strategies are usually geared towards minimizing waste disposal through minimal generation, reuse and recycling.

Healey (2010) exposed the magnitude of the rising wastes epidemic, discussed household waste and recycling activities, and enumerated several tips about "how to reduce, reuse and recycle whose topics included green waste, plastics, glass, paper, metal and electronic waste". Soriano (1995) explained that the elements of sustainable development are the following. First is the integration of environment considerations in economic policy-making. Second is a commitment to social equity, and lastly, a reorientation of the term development to include qualitative improvement. The "International Institute for Sustainable Development [IISD]" (2017) articulated that "sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs." The development referred to the statement is about the development we can live with.

2.1 Policy Framework

The Cebu City prides itself in many with abundant natural resources, well-preserved historical buildings, devoted Cebuanos, top tourist destinations (Abocejo, 2015), modern infrastructures, center of trade in the Visayas and Mindanao archipelago, center of higher and advanced education with gleeful Sinulog festival, and uptrend urban development. Cebu City is still growing and expanding in many economic fronts, primarily in the manufacturing industry, the services sector (Arnado, Gogo and Abocejo, 2017) and the tourism sector making Cebu as one of the competitive cities (Abocejo, 2015) in the Philippines with continuous solid investment climate. Nonetheless,

Cebu City faces garbage collection problem with expanding population (Vivar, Salvador and Abocejo, 2015) contributing to accumulation of garbages everywhere.

The 1987 Philippine Constitution articulates the country's bases of related policies on SWM. Section 15 declares that the "State shall protect and promote the peoples' right to health and instill health consciousness". Section 16 specifies that "the State shall protect and advance the right of the people to a balanced and healthful ecology in accord with the rhythm and harmony of nature" (Government of the Philippines, 1987).

At the local level, Cebu City promulgated several ordinances for the betterment of the city. The local government cannot simply make these ordinances without the mandate of the national laws. Garbage collections are one of the struggles of the LGU on how to effectively implement it.

The Republic Act 7160 and it is in the Local Government Code that mandates for eco-governance to LGUs and local communities in managing their resources and the environment. Specifically, Sec. 16-17 of the Code outlined the specific powers and authorities of LGUs over environmental and natural resources management as a whole. Under RA 7160, the LGUs are given the power to create their respective environment and natural resources units or other structures to fulfill their environmental functions (Government of the Philippines, 1991). Pursuant to "RA 7160 and Republic Act 9003", the "Ecological Solid Waste Management (ESWM) Act 2000" has been created which stipulates the program focused on ESWM which mandates the desired "institutional mechanism", specifying certain prohibited acts.

One of ESWM salient features is the formation of the "National Solid Waste Management Commission, National Ecological Center, and LGU Solid Waste Management Boards", the formation of multi-purpose "Environmental Cooperatives or Associations" in every LGU and for "waste segregation, waste reduction and recycling programs". The RA 9003 provided the "legal framework for the systematic, comprehensive, and ecological solid waste management program" of the Philippines, which ensures the "protection of public health and the environment". It emphasizes the "need to create the necessary institutional mechanisms and incentives, and imposes penalties for acts in violation of any of its provisions" (Government of the Philippines. (2001).

There are several ordinances that the Cebu City Government has enacted pursuant to Republic Act of 9003. On is the City Ordinance No. 1361, enacted February 5, 1990 which establishes a "system of garbage collection, imposing fees thereof, and appropriating funds and for other related purposes". The EO No. 00-45, enacted October 6, 2003, created the "City Environmental Sanitation Enforcement Team" or CESET which serves as the "enforcement arm to implement punitive measures against violators of Cebu City Ordinance No. 2017 as amended and other Anti-Littering Laws". It was on October 6, 2004 that the City Ordinance 2017 was enacted, creating the "Cebu City Solid Waste Management Board" (SWMB) appropriating funds thereof (City of Cebu, 2004).

Another ordinance was enacted creating the "Cebu City Environment and Natural Resources Office" (CCENRO) and "providing for its tasks, functions, personnel, and appropriation called City Ordinance" No. 2234, enacted on April 16, 2010 (City of Cebu, 2010). City Ordinance No. 2031 was enacted on November 4, 2004 for the "implementation of solid waste segregation at source for providing penalties for violation and the creation of a special fund for incentives". An ordinance "regulating the use and sale of plastic shopping bags every Saturday of a week within the territorial jurisdiction of the City of Cebu and prescribing the penalties for violation" is under the City Ordinance No. 2243 enacted on December 12, 2012 (City of Cebu, 2012). Last 27 January 2016, the City Ordinance No. 2450 was enacted, an ordinance "providing for the management of special wastes in Cebu City, providing fees and imposing penalties for non-compliance".

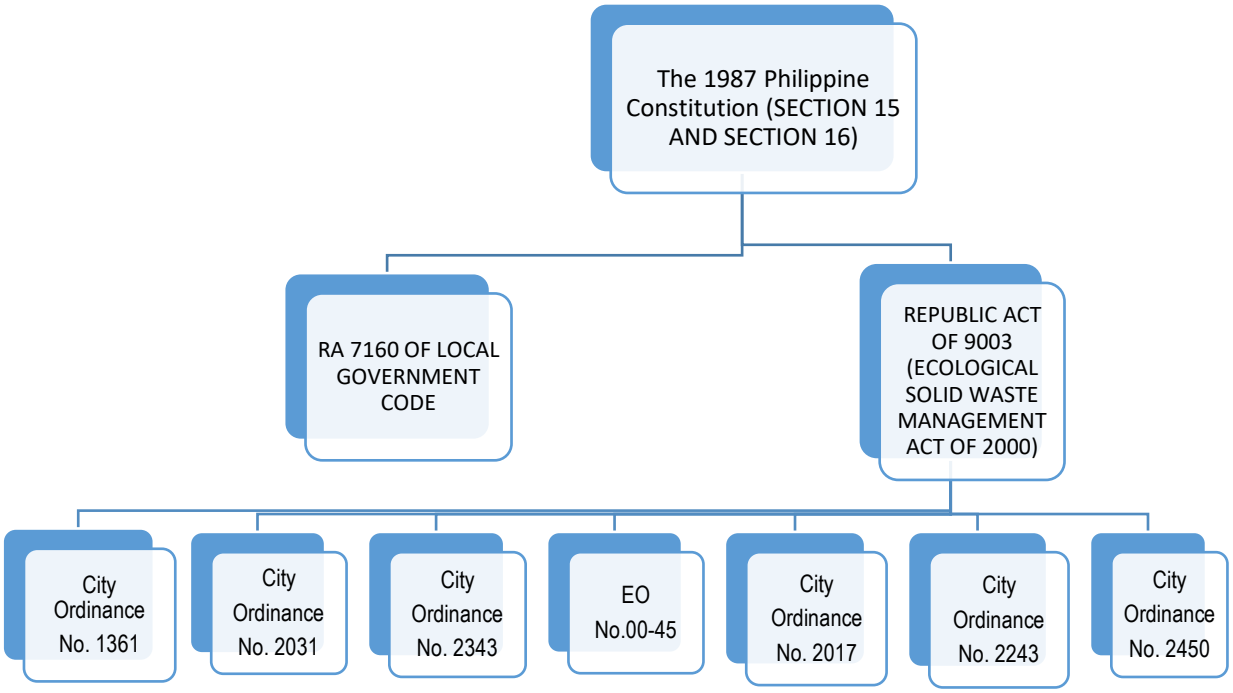

Figure 2. Cebu City ordinances and their bases of crafting and enactment

Data Source: Cebu City Environment and Natural Resources Office (CCENRO), 2017

The Ecology Centers provides "technical expertise, information, training and networking services for the implementation of the provisions of the Act". The SWMB is tasked to develop Cebu City's "10-Year SWM Plan" including its "implementation, adopt measures to promote and ensure the viability and effective implementation of solid waste management programs in the component villages, adopt specific revenue-generating measures to promote the viability of the SWM Plan, and develop specifics mechanics and guidelines for the implementation of the SWM Plan, and oversee implementation of the ordinance for the management of special wastes, among others".

The establishment of the CCENRO is carried out to "take charge over the information, research, planning, implementation, management, monitoring, enforcement and evaluation of programs, services, projects and activities pertaining to the environment, such as solid waste management". The CESET is created to "enforce the punitive measures and/or provisions of the Cebu City Anti-letting Ordinance and other environmental laws". The Barangay (or Village) Environmental Officers (BEOs) has deputized personnel to perform the functions of CESET at the village level. And lastly, the "Department of Public Services (DPS)", has its arm the "Garbage and Maintenance Services" as a section assigned in the collection, transporting and disposing solid wastes generated from the city's main thoroughfares and main roads (Cebu City ESWM Plan, 2018-2027).

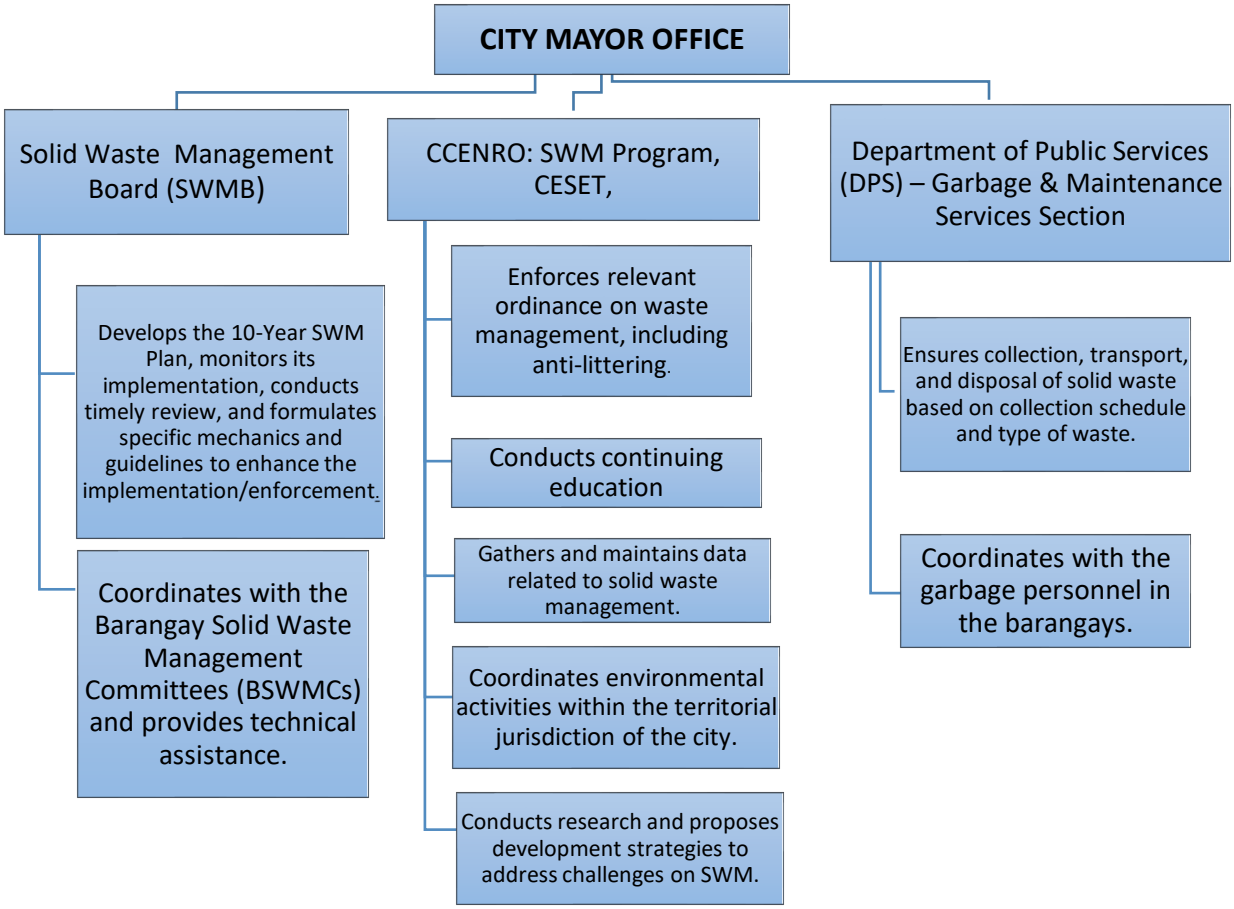

Figure 3. The devolution of powers from the Cebu City Government down to its committees

Data Source: Cebu City Environment and Natural Resources Office (CCENRO), 2017

In response, the Cebu City LGU conducts several activities like the "enforcement of no segregation and no collection policy to promote city-wide composting to sustain the information-education campaign", plastic waste material recycling system in Cebu for utilizing non-rigid plastic wastes, and intermediate processing facility in Inayawan landfill to "recycle existing plastic waste inside the Inayawan Sanitary landfill into plastic fluff fuel".

3.0 Research Methodology

The researchers gathered data on SWM from the LGU of Cebu City following proper protocol and procedures. The goals and objectives of the "Ten-year Ecological Solid Waste Management Plan" of the City government were appraised and reviewed. The efficiency of the initial implementation of the Plan was assessed. The researchers conducted interviews to heads of the different units with focus on the "Cebu City Environment Natural Resources Office" (CCENRO). Sampling technique was purposive since no need to randomized the interview respondents. Having access to the blueprint of the ten-year plan, the researchers, endeavored to critically analyzed the effectiveness of the entire place for the whole Cebu City. All gathered data were collated, presented by tables and were the primary bases for the analysis of findings which are delineated in the succeeding

discussions. Descriptive analyses of data are presented with qualitative significant statement presented as directly verbalized by the study respondents.

4.0 Results and Discussions

As reported, the population of Cebu City within the span of the ten-year ESWM plan will exceed a million mark from its 2015 count of 923,000, as projected based on the city's population annual growth rate of 1.21 percent (Philippine Statistics Authority, 2017). Garbage collection within Cebu City cannot not be done without facilities and equipment. The Cebu City LGU has a total of 54 trucks at present, with 37 units operational, 13 units under repair and four (4) units beyond economical repair (CCENRO, 2015). With a total of 37 functional trucks, only 783 personnel are working in Solid Waste Management to serve the 923 thousand Cebu City population, exhibiting a ratio of one truck per 24,945 people to be serves (1:24,945) and for every working personnel, there is 1,179 people to serve demonstrating a ratio of 1: 1,179 .

Table 1. Equipment for the collection and management of Cebu City wastes, data from CCENRO, 2015

Type of equipment = Truck; Capacity = 6 cubic meters each truck		
No. of Trucks	**Condition**	**Model**
23	• 16 units operations • 4 units under repair • 3 units beyond economical repair	FAW 6-wheeler DT CA 3071 PQ K2AE
5	• 4 units operational • 1 unit under repair	FAW 10-wheeler DT CA 3250 PGG K2L1 (old model)
8	• 5 units operational • 2 units under repair • 1 unit beyond economical repair	Foton Hurricane DT
10	• 5 units operational • 5 units under repair	Packer Trucks (Hin, isizu and Nissan)
1	• Operational	Hino FC (old model)
6	• 5 units operational • 1 unit under repair	FAW 10-wheeler DT CA 3250 PGG K2l1 (new model)
1	• Operational	Payloader (Changlin)
54	• 37 units operational • 13 units under repair • 4 units beyond economical repair	

The repair site for the garbage trucks is within the vicinity of the Cebu City Hall. However, the trucks cannot be put to work without the persons tasked to manage and monitor the implementation. The list of existing personnel is shown Table 2.

The Sanitary landfill in Inayawan village was the final disposal of Cebu City back then. It is just 10km north of Cebu City hall. The "Metro Cebu Development Project" initiated the landfill in the 1990s with fund assistance from "Japan International Cooperatin Agency or JICA". The start of operations was on September 1998. During the administration of Rama and the Cebu City Solid Waste Management board, the landfill is closed on January of 2012. They decided for the closure as to reason that after six years of operation the landfill had reach its capacity and ready for rehabilitation. It reopend last June 2016, for the reason of helping the City government of spending millions in throwing its trash to Consolacion. By October 2016, the DENR Secretary, Hon. Regina Paz Lopez, orders the closure of Inayawan Landfill. Becasue she saw that the garbage being dumped at the landfill reaced the sea. This all means that until now the Inayawan Sanitary Landfill is still closed. According to our sources the garbage that are being

collected in Cebu City will be weighed in Inayawan Landill and will be dumped to Consolacion landfill or Aloguinsan.

Table 2. List of Existing Personnel

Office	Division/ Section	Re-gular	Cas-ual	Job Or-der	Hono-rarium -based	To-tal	Worki ng in SWM
Depart-ment of Public Services DPS	Administrative Services	21	-			21	-
	Street Cleaning Services	69	99			168	168
	Garbage and Maintenance Services	25	313			338	338
	Street Lighting Services	12	8			20	-
	Artesian Wells Services	13	3			16	-
				38			38
C C E N R O	Administrative		3			3	3
	CESET		5			5	5
	BEO				220	220	220
	Environmental Sustainability Program			2		2	2
	Septage Program			5		5	5
	Plastics Recycling			5		5	5
					Total	**803**	**784**

According to local news, the opposition-led council disapproves the ordinance of allowing a private developer to construct a landfill in Binaliw village, Cebu City. A Cebu Councilor said there must be transparency and it was not accomplished. He argued that the landowner of the site complained that his property was quarried without permission. The contractor was about to make the area an open dumpsite. The contractor applied for a permit to put a Material Recovery Facility but it is actually for landfill. "Not only can we not use the Inayawan landfill, now we cannot develop a landfill to replace it. So where is the garbage supposed to go now? In light of this development, are you going to let the City acquire additional trucks? Or are you going to continue to make it difficult for the City to collect the garbage and let more Cebuanos suffer for the sake of your politics?" the present Cebu city mayor said.

Collection of all wastes from the 80 villages of Cebu City is currently in effect, while interior road networks in the villages are collected by village personnel. Main thoroughfares are assigned to the DPS. On unexpected events, DPS assumes the collection task if the village trucks could not collect waste in certain areas of the village because of bugged down trucks. As of August 2016, the total waste collection of the city has reached 18,756 tons for the whole month, or an average of 605 tons per day. Furthermore, private establishments like fast food chains and restaurants, hotels, and malls have contracted waste collection to private haulers. These private haulers get their respective final disposal sites for residuals.

Moreover, the Cebu City Government encourages compositing through the City Ordinance 2031 which advocates at minimizing wastes and properly segregating at source prior to solid wastes collection for the entire city of Cebu. Subsequently, City Ordinance 2343, titled "Regulation of use and sale of plastic shopping bags" was passed "to control the use of plastic shopping bags, at the same time, promote the use of re-usable bags all over Cebu City". This ordinance is supposed to be the catalyst for the removal of paper bags and fishnets that will help

to minimize plastic waste in the City. At some point, the Cebu City initiated the trash to cash program where collected residential e-wastes of would be bought by the SM Mall.

During September 28, 2016, the City Government has ordered the re-imposition of the "No Segregation, No Collection" policy in City Ordinance No. 2031. That is implemented by CESET, BEOs, and other personnel deputized by City Mayor Tomas R. Osmeña. Collection of all wastes from the 80 villages of Cebu City is currently in effect, while interior road networks in the villages are collected by village personnel. Main thoroughfares are assigned to the DPS. As of August 2016, the total waste collection of the city has reached 18,756 tons for the whole month, or an average of 605 tons per day. Here are the data on the total collected tons of trash per village. There processing facilities that are for composting are currently operating in 14 villages with bottle recycling in city's Septage Treatment Facility (STF), to lessen the generation of wastes.

Table 3. Inayawan Landfill Profile

Total lot area	15.41 has.
Dumping area	11.73 has.
Service area	3.68 has.
Estimated period to fill	7 years
Project started	1995
Operation started	Sept. 1, 1998

Table 4. Processing Facilities of Cebu City

Kind of Facility	Capacity	Purpose
Plastic Recycling Facility Inayawan Village	5 tons/day	Processing of plastic pluff for Production to alternative fuel for Cement Factories.
Glass Bottle Recycling Facility STP North Reclamation	2 ton/day	Production for Various material uses such as mix for cement to produce Eco bricks.
Composting Facility	1 ton/day	To Process Biowaste
Proposed MRF Facility	5 tons/day	To process biowaste for plastic depository – Segregated facility of all kinds of waste for recycling.

The CCENRO has focusing on Infotmation, Education and Comumu-nication or IEC campaigns and environmental cele-brations in the City. The following strategies for information, education and communication were formulated by the City's SWM Board and City CENRO, with the help and cooperation of CESET and the BEOs: (1) seminars and trainings on reduction and recovery strategies are conducted to village officials and workers; (2) promote Solid Waste Management and create awareness among the students on caring for mother earth, waste reduction and recovery strategies, benefits of doing composting and recycling, coordination with public and private schools are done through their supervisors, principals and teachers; and (3) promote the composting through vermi, Takakura and other available technologies, seminars and trainings were done through partnership with religious groups, Market vendors and traders, the professional and urban groups and homeowners asso ciation, youngsters and out of school youth, senior citizens and women's groups.

In response to the "enactment of RA 9003, the Cebu City LGU is able to raise awareness in managing its municipal solid waste based according to the principle of 3Rs (Reduce, Reuse and Recycle)" by crafting and implementing parallel city ordinances, some of which are briefly describe as follows.

4.1 Solid waste management regulations

The Cebu City LGU created various ordinances based on the requirements of RA 9003 to "strengthen the policy framework for implementing ecological solid waste management". City Ordinance No. 2450 provides the management of Special Wastes as approved last 27 January 2016 where it sanctions fees and penalties for non-compliant entities. "City Ordinance No. 2243", also known as the "Sustainable Development Ordinance of the City of Cebu", protects environmental sustainability and the "protection for future generations". Approved on 23 June 2010, it regulates the "use and sale of plastic shopping bags every Saturday of the week within the territorial jurisdiction of the city of Cebu and prescribes penalties for violations thereof".

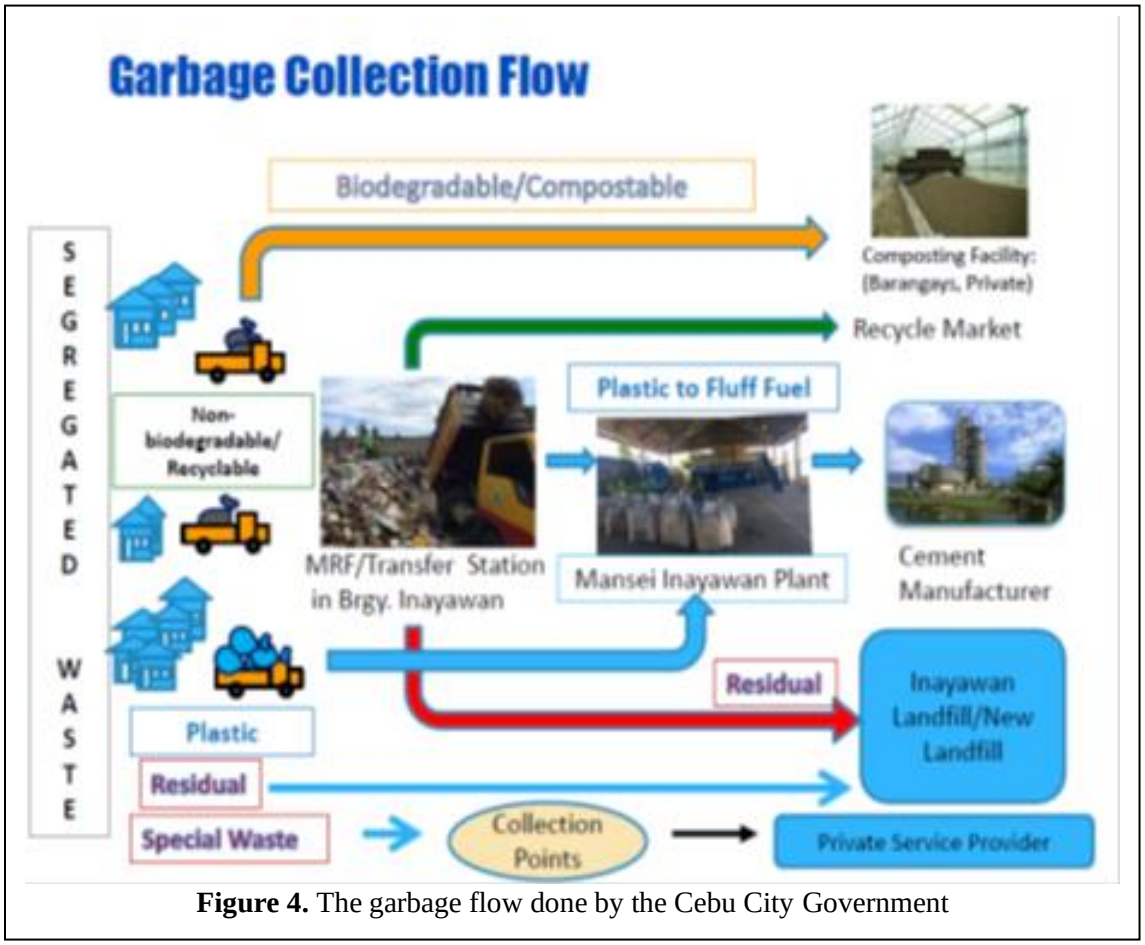

Figure 4. The garbage flow done by the Cebu City Government

Meanwhile, "City Ordinance No. 2031" mandates "solid waste segregation at the source by enforcing the No Segregation, No Collection" policy. It covers fines and the development of special reward funds. On the one hand, "City Ordinance No. 2017" calls for a "Cebu City Solid Waste Management Board" (SWMB) to be formed and appropriates funds for its operations. It "ensures the implementation and development of an integrated, robust and environmentally sustainable SWM policy" through the "participation of the government, the NGOs and the private sector". "City Ordinance No. 1361", as amended, sets out in detail of the waste management system, levies fees and expropriates funds and other similar purposes.

"Executive Order No. 00-45" which establishes the "City Environmental Sanitation Compliance Team" or CESET, is the implementing arm for corrective action against "Cebu City

Ordinance 1361 violators, as amended, and other anti-littering legislation". Executive Order No. 10-126 which amended Executive Order 00-45, creates the "Barangay (Village) Environmental Office" in each village "delegated with powers and functions of CESET". Cebu City has secured the services of Private Contractors to minimize maintenance cost, equipment, and personnel salary.

The City's temporary disposal plant is at Consolacion Sanitary Landfill Facility in Pulog, Consolacion and Aloguinsan Sanitary Landfill. Future Plan of the City to put up Waste to Energy facility in Inayawan Landfill would process 500 – 800 tons of garbage daily. To clarify things, Health wastes are those private hospitals & private clinics have their own system of Disposal and treatment, they hire a service provider to help them to properly manage this type of waste. With the assistance from the National Agencies; Department of Health and Environmental Management Bureau, each establishment are required to submit their Management Plan annually and other required compliances.

Since the City is conducting an IEC Program, its main purpose is to disseminate accurate information about how people from different sectors of the community could take part in taking care and sustaining a healthy environment. Targeted audiences will include village officials and workers, religious groups/ church members/ inter-faith sector, market vendors/ traders, students, homeowners' associations, youngsters and out-of-school youth/senior citizens and women's groups, and the police. The Solid Waste Management Board will make a cooperation with the academe by schools that will teach students and pupils on solid waste management practices. Each target audience was briefed regarding the "solid waste management practices depending on the age range and the type of community sector" (Ballados, 2010).

The Cebu City government, specifically the "Cebu City Environmental and Natural Office" carry the responsibility of implementing all SWM policies pursuant to Republic Act 9003 amidst of the issues and problems that challenge the implementing these ordinances. The Cebu City LGU and the CCENRO are tasked to plan for implementation strategy in view of reducing the amount of waste generated by the City.

Table 5. Private collection service shall be resorted to for the following types of waste

Type of Waste	Location	Collector	Location Where Waste Will be Taken
Residual Waste	Household, Commercial, Institutional	PAMOCOR	Concolacion, Aloguinsan
Special Waste	Household	Cebu Common Treatment Facility Inc.	Registered TSD Facility, White Road Brgy. Inayawan
Healthcare Waste	City's health care facilities	PASSI	Registered TSD Facility, White Road Brgy. Inayawan

Table 6. Targeted Audience

Target Participants	Key Messages
Village officials and workers	They are responsible for the implementation and regulation of RA 9003 and all the city ordinances pertaining to the environment as mentioned in Section V of the Plan. They are also tasked to penalize law violators. They are responsible for the operation of MRFs (if present) and the proper collection, storage, transportation and disposal of wastes in the village level. They disseminate information regarding the schedules of collection and the current state of the disposal site. They should also lead and monitor waste reduction practices and/or minimization programs done by sources through recycling and composting.
Religious groups/ Church members/ Inter-faith sector	They are responsible for disseminating waste reduction strategies as well as updates to concerned constituents, most likely to church-goers. They are also obliged to take part in doing waste reduction practices such as recycling and composting.
Market Vendors/ Traders	They are responsible for the solid waste segregation procedure. They are also responsible for marketing recyclables such as the 'Trash to Crafts' and the produced compost. They should also do their share in managing their own solid waste. Each should provide separate containers for every waste produced.
Pupils and students	They shall be equipped with proper and enough knowledge on how to take care of the environment, in general. They should also be taught of the proper segregation and disposal of wastes as well as the benefits of composting and recycling in school. They should be taught of water conservation methods. The earlier they are taught of the facets of proper waste management, the more knowledgeable they will be. Through their schools, they will be taught with proper waste identification, segregation and disposal.
Residents	They should make use of their time and resources through waste reduction practices such as recycling and composting and its benefits. They should know how to properly segregate wastes to reduce the volume of wastes disposed. They should also be knowledgeable of the proper collection schedules for separate types of wastes as well as the item price list of junkshops for profitable reasons.
Barangay (village) Environmental Officers (BEOs)	BEOs should be responsible for the dissemination of significant information to residents and other sectors at village level. They should also help in supervising the implementation of the plan in their respective villages. They are also tasked to issue tickets to violators of environmental policies implemented by the city.
Youngsters and Out-of-school youth/ Senior	They should have enough knowledge and should take part of taking care of the environment to avoid pollution. They should be well informed of the benefits as well as the how-to's of the recycling and composting programs. They should also practice reducing wastes through engaging in

Citizens and Women's Group	waste reduction programs. They should also know the proper solid waste segregation procedure.
Philippine National Police (PNP)	The PNP should also be knowledgeable of SWM and should take part in regulating and supervising SWM practices as well as penalizing violators.

4.2 Interview

The Researchers asked the Cebu City Agriculturist, the Executive Assistant III designated as Inayawan Landfill Manager, and Inayawan's Village Environment Officer about their points on the situation of the SWM in the city. And they gave reasons why the initial implementation of the ten-year plan' s goals has not yet fully achieved. It took time for the researchers to gather data from these people for some reasonable circumstances. Nonetheless, the interviews were pursued. The researchers chose these people, because they have adequate knowledge on the ten-year ecological plan and they are masters of their own fields, which means they have a enough and right experience. So these are the important points on the interviews.

Table 7. Plan Implementation Strategy

Opportunity	Solution	Outcome
• Reduce the amount of waste to landfill for the City of Cebu • Potential revenues through resource recovery • Improve environment • Levers for economic growth	• Set up the Project, consisting of public-private partnerships (PPPs) • for solid waste management, • covering collection, segregation, recovery, recycling • treatment and incinerations	• Enhance the livability of Cebu City • Achieve sustainable environmentally-sound management of wastes throughout their life cycle • Economic benefits from resource recovery and employment in formal sector

According to the Cebu City Agriculturist, the main reason why there is still rubbish materials around the city and not properly segregated because of the discipline of the people, notwithstanding that "we always have the campaign, giving hand-outs and we conducted fora". Manpower and the enforcement of the government have been identified as two of the reasons why it fails. He added that the politics affects the result of the implementation. Hon. Baclayon said "there must be coordination between the city government and the village units". He also noted that the ten-year plan of city government must be the model of every village to achieve a strong implementation on SWM.

The coordinator of the Village Environment Officers in Inayawan, manages her members to disseminate the information to the households of the village. But still, the people continue not to segregate their trash. She exposed that even though the Inayawan Landfill is closed. A transfer station is opened near the landfill owned by a private individual which is legal. There are 10 private players who allow their space to be a dumpsite for business and doesn't have a permit.

Table 8. "Strength, Weakness, Opportunities and Threats" (SWOT) analysis

Parameter	Strengths	Weaknesses	Opportunities	Threats
Diverting wastes from the disposal facility	• The wastes are away from the residents. • It prevents health problems.	• The final disposals are far from the city resulting to a costly collection. • Too much time spent in transporting the waste materials.	• It will yield to be a more organized environment. • There is a proper solid waste management	• Due to the long distance, people tend to dump their waste to the illegal dumpsites. • The reopening of the sectional part of Inayawan can attract more scavengers.
Strictly enforcing and monitoring the implementation of solid waste management laws	• The government has a concrete plan in terms of Solid Waste Management. • The government is doing their best in seeking alternatives for the reduction of waste disposal.	• The government fails to create sanitary landfill within the city. • Manpower of the government is not enough.	• People can feel the firmness of the teeth of the law. • The local government Unit can create specific ordinances basing from the national laws.	• The household failed to segregate their trash during collection because the government had its full implementation without proper education.
Adopting and promoting innovative and eco-friendly solid waste management technologies	• There are facilities to reduce the waste such as the composting and materials recovery facilities • The government initiates the making of environmental friendly materials such as Eco Bricks, chairs and more.	• Not all villages have catered the creation of the facilities. • The villages have insufficient funds and space for the establishment of the facilities.	• The programs become the tool in molding the skills of its constituents through trainings in making eco-friendly materials (eco bricks). • In terms of junking the plastic bottles, it then be converted to another form of useable materials.	• The initiatives turn out to be somehow a threat to the manufacturing companies. • People's thinking threatens the strategies because they believe that those in the market are better than those created through recyclable materials.

The Executive Assistant designated as Inayawan landfill Manager noted that the weigh bridge was again functional only recently. The City also rents five 10-wheelers truck since the units of the city are not functional anymore. For the final disposal of garbage since the landfill has been closed, the wastes are transferred into Aloguinsan and Consolacion after they have been weighed on the weigh bridge located in the sanitary landfill. The sanitary landfill began its work

on September 11, 1998 with the area of 15 hectares. Even if it has been stop from its operation last December 2017, the wastes disposed can still be recovered if it will be mined out. There are still a lot of recyclable wastes from it. If computed theoretically, 1 person disposes ¾ per day or 750 tons per day. But in actual computation, the garbage disposal each person is much lower because some garbages are thrown on rivers and others are left accumulated at home.

After the closure of the Inayawan landfill in 2012, Cebu City needed a place for the final disposal of its wastes. Its reopening to the public in 2016 saw the trash already reached the seashore so that the "Department of Environment and Natural Resources" (DENR) enforced its closure. The population of Cebu City is rising so as the rubbish materials. What is available in the City is only a transfer station. Consequently, it bears high cost in transporting the wastes from the transfer station to the sanitary landfill (final disposal). Aloguinsan and Consolacion are quite far from the city, approximately 49.1 km and 29.9 km away from Inayawan transfer station respectively. The ten-year plan aims to reduce the accumulation of garbage by 2020. Its first action is to divert waste from the disposal facility.

The local government is finding ways to have a disposal within its jurisdiction to diminish the expenses of the city. Village Binaliw is the proposed site for a new landfill. But because of non-compliance of the permit, it was disapproved by some councilors. Politics plays a major role in this goal. The Ten-year Ecological SWM plan is struggling on its initial implementation. Aside from that, people who reside near the Inayawan landfill make use of their lands as business for disposal of garbage of private establishments. The diversion of waste happens but it results to another problem which is the illegal creation of transfer stations.

The implementation of these ordinances is highly monitored. In order for Cebu City to have the assurance that these ordinances are properly overseen, the Cebu City government required all the sectors especially the villages to submit monthly reports to the "Cebu City Solid Waste Management Board" (CCSWMB) thereby keep track of the performance whether or not the measures are progressive, and at the same time to find out what are the issues and problems arise on SWM. The "Cebu City Environment and Natural Resources Office" (CCENRO) is task to take charge over the "information, research, planning, implementation, management, monitoring, enforcement, and evaluation of programs, services, projects, and activities pertaining to the environment". CCENRO is given the power to create environmental committees to easily enforce the ordinances to smaller areas.

In terms of the collection of wastes, the CESET and BEOs implemented to have the collection by schedule from Monday to Sunday. Furthermore, the BEOs have been trained to act as information providers in their villages and have the duty to enforce policies, track waste collection properly, assist with "the establishment of a Material Recovery Facility and manage composting systems". The local government of Cebu City upholds to the provisions of sections 15 and 16 provisions of the "1987 Philippine Constitution" to protect the ecology. It is doing its best to effectively enforce the solid waste management practices and policies. Several strategies, programs and activities are made and will soon happen with the full efforts of the government and their environmental task force.

The Cebu City government commands its villages under its ten-year ecological solid waste plan to have a composting facility or material recovery facility to reduce the production of waste within their locality. Not all 80 villages of Cebu City comply the request because of some factors such as: some urban villages have a problem in finding a space for the facility, and the material recovery facility is costly to produce. Moreover, a total of 14 villages have composting facility. Still not a half of the entire number of villages accomplishes the said requirement. The government

must allocate funds to create at least few MRFs to the villages so that the goal of reducing the wastes years from now will be attained. Several ways and activities are done to entice the locals to recycle things. The making of eco bricks give way the reduction of bottles and plastics. Although the LGU leads a competition on the making of eco bricks, but it is not enough because not all people know this. The efforts done by the government are there, it's just that it needs proper information dissemination. The 10-year plan must be given focused since from this program relies the future of the SWM of the Cebu City LGU.

5.0 Conclusion and Recommendations

Grounded on the study findings, it is concluded that the initial implementation of the ten-year plan is slowly achieved pending some aspects to be strongly imposed. The implementation lacks tangible discipline of the people, too much involvement of politics and insufficient workforce of garbage collectors and personnel. Arguably, the implementation of a systematic SWM proves that the LGUs are doing its best to comply the mandate of "Sections 15 and 16 of the 1987 Philippine Constitution". The City Government promulgates City Ordinances to ensure that its constituents obey the proper ways of waste disposal. However, in the actual scenario, the city villages lack concrete and tangible initiatives to support the plans of the Cebu City Government. In view of the ten-year ESWM Plan, the effects can't be felt now but sometime on 2020, it is expected that there's a reduction of wastes in the city. The goal of diverting wastes from disposal facility, to enforce and monitor the implementation of SWM laws, and to promote innovative and eco-friendly SWM technologies are aims to achieve the reduction of wastes. Arguably, the Cebu City Government centers its vision to empower stewards and stakeholders that nurture the environment through implementing an integrated SWM.

The researchers recommend the farther conduct of related researchers on the said blueprint. This study has not covered the entire phase of the integrated SWM Plan of the Cebu City government, did not check the goals if they have been attained under the period covered in the study. By year 2027, the plan is expected to be fulfilled and the problems on the SWM are minimized. Accordingly, future researches may evaluate the issues whether garbage problems have been solved or otherwise. SWM should be the utmost priority of every LGU.

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