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Transforming Fragilities, Inc.

RESEARCH REPORT

INTEGRATED SOLID WASTE MANAGEMENT-CIRCULAR ECONOMY ADAPTATION FOR ALTERNATIVE PLASTIC WASTE SOLUTIONS IN COTABATO CITY, PHILIPPINES






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Transforming Fragilities, Inc.

Integrated Solid Waste Management-Circular Economy Adaptation for Alternative Plastic Waste Solutions in Cotabato City, Philippines: An Action Research

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World Vision

World Vision Development Foundation, Inc. (WVDFI) is a global Christian humanitarian organization devoted to improving the lives of children, their families, and their communities. In the Philippines, the organization has an operational presence in 29 area programmes with more than 56,000 registered children. WVDFI also has 60 Non-sponsorship Projects throughout the country. As a child-focused organization, WVDFI has reached 3.1 million children through child-focused programs, emergency response activities, and advocacy initiatives.

In Cotabato City, WVDFI hosted a peace conference on December 2, 2023 to push for creating safe spaces for children in the Mindanao region. Through its Climate Change Adaptation Project, WVDFI also held a climate change meet in Cotabato City to discuss solid waste management and raise awareness of the effects of climate change. Seven partner barangays in the city also received 26 sidecar-equipped bicycles and a briquetting machine along with the establishment of a Material Recovery Facility (MRF) in each partner barangay as part of this initiative.

Currently, WVDFI has worked closely with local government units and partner organizations in developing a Solid Waste Management Plan for Cotabato City.

Transforming Fragilities Inc. (TFI) is a Philippine NGO that focuses on research, monitoring, and evaluation (M&E), capability building, organizational development, and data-driven project management and implementation. Experts in peace and development, technical and management specialists, and cadres of provincial field researchers skilled in gathering qualitative and quantitative data all comprise the organization. They have come together to provide high-quality monitoring and evaluation, research and learning, capability development, organizational development support, and evidence-based project management and implementation with local and international development agencies, as well as programs that help transform fragile communities and situations in Mindanao and select provinces in Luzon and Viasayas.

Disclaimer: TFI strongly observes the Data Privacy Act of 2012, otherwise known as Republic Act No. 10173. All audio and visual media were taken with the consent of the individuals who appear in photos, videos, and audio recordings collected by TFI during the conduct of this assessment. TFI ensures that the identities of these individuals remain anonymous.

EXECUTIVE SUMMARY

Along with WVDFI's child-focused programs and peace initiatives around the world, World Vision Development Fund, Inc. (WVDFI) has also implemented a number of other programs in Cotabato City. Notable examples include a peace conference held on December 2, 2023 to call for creating safe spaces for children in the Mindanao region in collaboration with the local religious groups and a climate change summit which emphasizes the adaptation of solid waste management as a solution for the climate crisis.

Through WVDFI's solid waste management initiative, this project titled "Integrated Solid Waste Management-Circular Economy Adaptation for Alternative Plastic Waste Solutions in Cotabato City, Philippines", funded by the European Union through WVDFI, allowed Transforming Fragilities, Inc. (TFI) the opportunity to once again collaborate with local communities, LGUs, and other organizations of Cotabato City.

Cotabato City finds itself in a unique predicament as we have uncovered during the implementation of this project. A good portion of the city is below sea level, roughly 70%, making Cotabato City essentially a catch basin. This inherent geographical characteristic is compounded by the volatile political climate in the city that is common throughout the BARMM. Regardless, TFI remains optimistic due to the genuine appreciation and enthusiasm shown by the members of the participating sectors and partner organizations. We believe that any initiative that is backed by solid evidence will have a good chance of pushing through and hopefully this project will be one of the factors that will lead to the establishment of Cotabato City's own Sanitary Landfill (SLF) and other long-term projects that will address the solid waste problem of the city.

This research report represents the collaborative effort of TFI, the Cotabato City Environment and Natural Resources Office (CENRO), WVDFI, and its 15 partner barangays in Cotabato City over a six-month period. We hope that our recommendations will be considered and eventually applied in the near future to bring about long-term positive change in local perception and improvement in Cotabato City's capacity to manage solid waste.

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ACKNOWLEDGEMENT

This project implemented in Cotabato City, Philippines is the result of a collaborative effort between World Vision Development Foundation, Inc. Philippines and Transforming Fragilities, Inc. (TFI). This was made possible through the generous support of the European Union (EU). This project gave TFI the opportunity to work closely with members of the partner BLGUs, the Community Environment and Natural Resources Office of Cotabato City, members of the private sector, and the Cotabato City LGU.

Ms. Elsie S. Villanueva, Mr. Dennis A. Librado, and Mr. Jimmy L. Dalgan worked together to write this report, under supervision of Ms. Judith Joy Libarnes and Mr. Ahmed Harris R. Pangcoga of Transforming Fragilities, Inc. Statistics and Data Analysis were provided by Ms. Berlita Y. Disca and Ms. Irish Jane N. Calungsod.

The project management team would like to thank Mr. Renato Salas and the staff of World Vision Development Foundation, Inc. for their guidance and for overseeing the implementation of this project. The project management team would also like to thank Ms. Sophia S. Papandayan and Mr. Marlou A. Nacaytuna for their dedication and hard work in collecting primary data in the 15 partner barangays in Cotabato City.

TFI wishes to thank Engr. Crisanto Saavedra of CENRO whose office helped with facilitating and coordinating with the local BLGUs. We also wish to thank the officials and staff of the model cities' Sanitary Landfill and Material Recovery Facilities. Their support has proven invaluable in understanding the best practices of solid waste management.

And finally, we would also like to thank all the community members and community leaders who volunteered their time and effort to participate in this project, as well as BLGU officials, and members of the private sector. Their participation and insights made the implementation of this project possible.

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ABBREVIATIONS AND ACRONYMS

ALCAP	Alyansa sa mga Lumulupyong Kabus Alang sa Pagpalambo
BARMM	Bangsamoro Autonomous Region in Muslim Mindanao
BEDC	Bangsamoro Economic and Development Council
BLGU	Barangay Local Government Unit
BSWMC	Barangay Solid Waste Management Committee
CE	Circular Economy
CENRO	City Environment Natural Resources Office
CSO	Civil Society Organizations
CSWMB	City Solid Waste Management Board
DENR	Department of Environment and Natural Resources
ECC	Environmental Compliance Certificate
EMB	Environmental Management Bureau
EPR	Extended Producer Responsibility
EU	European Union
FGD	Focus Group Discussion
HUC	Highly Urbanized Cities
IEC	Information Education Campaign
IRA	Internal Revenue Allotment
ITDI-DOST	Industrial Technology and Development Institute of the Department of Science and Technology
KII	Key Informant Interview
LGU	Local Government Unit
MAFAR	Ministry of Agriculture, Fisheries and and Aquatic Resources
MBHTE	Ministry of Basic, Higher and Technical Education
MC	Memorandum Circular
M&E	Monitoring and Evaluation
MENRO	Municipal Environment Natural Resources Office
MHSD	Ministry of Human Settlement and Development
MILG	Ministry of Interior and Local Government
MIPA	Ministry of Indigenous People's Affair
MOA	Memorandum of Agreement
MOH	Ministry of Health
MOTC	Ministry of Transportation and Communication
MOST	Ministry of Science and Technology
MPW	Ministry of Public Works

MRF	Material Recovery Facility
MTIT	Ministry of Trade, Investments and Tourism
NCR	National Capital Region
NEA	Non-Environmentally Acceptable
NGO	Non-Government Organization
NSWMC	National Solid Waste Management Commission
OCM	Office of Chief Minister
PAYT	Pay as you throw
PHINLA	Philippines, Indonesia, Sri Lanka
PPA	Programs Projects and Activities
SLF	Sanitary Landfill
SUV	Service Utility Vehicle
SWM	Solid Waste Management
SWMP	Solid Waste Management Plan
TWC	Technical Working Committee
TFI	Transforming Fragilities, Inc.
VCA	Value Chain Analysis
WACS	Waste Analysis and Characterization Studies
WVDFI	World Vision Development Foundation, Inc

SECTION I: BACKGROUND AND RATIONALE

INTRODUCTION

Despite the passage of RA 9003 more than 20 years ago, waste management has continued to be an issue of concern. This is even more pronounced by a projection that annual solid waste generation will rise from 16.63 million metric tons in CY 2020 to 19.76 million metric tons in CY 2030 and 24.50 million tons in CY 2045 with the increase in population, rapid economic growth, and industrialization. Delays in the preparation and approval of LGUs' 10-yr SWM Plan, inadequate number of MRFs and SLFs to service all barangays and LGUs nationwide forced some LGUs to reopen or establish new illegal dumpsites.

For Cotabato City, solid waste disposal is geographically challenging since 70% of the city's area is below the sea level. In effect, the inherent geographical characteristic of the city poses challenges in adhering to allocating a site for final disposal of wastes as required under RA 9003. This makes it necessary to promote further the reduction of waste and tap into unexplored potential around circular waste initiatives.

World Vision Development Foundation, Inc. (WVDFI) (also known as World Vision Development Fund, Inc. in the Philippines) is implementing the project entitled, "Integrated Solid Waste Management-Circular Economy Adaptation for Alternative Plastic Waste Solutions in Cotabato City, Philippines." This project is funded by the European Union (EU). Circular economy (CE) practices in the Philippines are only generally visibly observed by large scale enterprises in the industries of fashion, food, plastics, and electronics. Only the passing of Republic Act 9003 (Ecological Solid Waste Management Act of 2000) remains to be the substantial related policy to CE in the Philippines. This law primarily provides the legal framework for a systematic, comprehensive, and ecological waste management program which resulted to the creation of the National Solid Waste Management Commission (NSWMC) and mandating the LGUs (provincial, municipal, and barangay levels) to develop 10-year SWM Plans, building of their local Material Recovery Facility (MRF), and final disposal facilities.

The package of interventions in this project recognizes and capacitates the substantial role of local CSOs as key stakeholders in the efforts of Cotabato City LGU to strengthen SWM for plastic wastes within the community and effectively promote CE initiatives to the public. Under the fragile context of the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM), of which Cotabato City is a part of, the innate nature of local CSOs to conduct service delivery to reach the marginalized sectors of society continues to be a vital aspect in the road to development.

The main objective of the Integrated Solid Waste Management project is to improve solid waste management (SWM) capacities of local government units (LGUs), civil society organizations (CSOs), and informal sectors by integrating best practices of the circular economy in Cotabato City through adherence to the legal framework set forth by Republic Act No. 9003 - "an act providing for an ecological solid waste management program, creating the necessary institutional mechanisms and incentives, declaring certain acts prohibited and providing penalties, appropriating funds therefor, and for other purposes". RA No. 9003 forms the legal basis of WVDFI's Integrated Solid Waste Management plan as mentioned above, and, as such, its objectives align with this law. Section 2 of this law entails the following policies:

1. Utilizing environmentally-sound methods that maximize the utilization of valuable resources and encourage resource conservation and recovery.
2. Ensuring the proper segregation, collection, transport, storage, treatment, and disposal of solid waste through the formulation and adoption of the best environmental practice in ecological waste management
3. Encouraging greater private sector participation in solid waste management
4. Strengthen the integration of ecological solid waste management and resource conservation and recovery topics into the academic curricula of formal and non-formal education to promote environmental awareness and action.

OBJECTIVES OF THE RESEARCH

This study aims to assess the solid waste management program implementation in Cotabato City. Specifically, it has the following objectives:

1. Document knowledge, perspectives, and practices on solid waste management in Cotabato City
2. Document knowledge, perspectives and practices of the community stakeholders in relation to solid waste diversion strategies of Cotabato City
3. Determine priority areas of concern on solid waste management and related areas Cotabato City as perceived by the Respondents
4. Benchmark and document solid waste management practices in the three (3) selected model cities/municipalities (General Santos City, Kidapawan City, and Surallah) in the SOCCSKSARGEN Region.

SIGNIFICANCE OF THE STUDY

The project entitled “Integrated Solid Waste Management " is intended to assist Cotabato City in improving its solid waste management program implementation with emphasis on integrating Circular Economy in its revised or updated SWM Plan. The research output will look at the best practice of selected LGU’s and shall provide recommendations for Cotabato City, WVDFI and the community stakeholders and private sectors.

Specifically, the recommendations will involve the following:

For Cotabato City LGU to measure the level of knowledge and awareness of the community on SWM program; identification of gaps in collection, transportation, disposal, and waste diversion strategies which will be used to update its existing SWM Plan.

For World Vision and CSOs/NGOs (SWM Programming) identification of gaps on existing interventions and potential additional interventions.

For Community Stakeholders and Private Sector identification of potential avenues for collaboration

SCOPE AND LIMITATION

This study covered 15 out of the 37 barangays of Cotabato City. These barangays were chosen as beneficiaries of the solid waste management intervention program of WVDFI in consultation with the City Environment and Natural Resources Office (CENRO) of Cotabato City . It covered both urban and rural barangays of the city. Respondents were barangays officials and staff and community residents.

ETHICAL CONSIDERATION

In conducting the research, the following principles and standards were observed:

1. The respondents were properly informed of the purpose of the research; their consent were properly sought
2. Confidentiality of the personal information as well the responses of the respondents was also observed.
3. Integrity of the primary data and information gathered was observed
4. Data and information gathered will be used for the purpose of this research and will be treated as an academic exercise

SECTION II: REVIEW OF LITERATURE AND RELATED STUDIES ON SOLID WASTE MANAGEMENT

FORMS, SOURCES, AND GENERATION OF SOLID WASTES

Solid Wastes: Forms and Sources

Waste is a necessary and residual outcome of human activities (Cheremisinoff, 2003; Michael-Agwuoke, 2012) and is categorized into three categories based on their physical states: solid, liquid, and gas, although certain features already exist in other nations (White et al., 1993). Solid wastes include municipal waste, biological waste, electronic trash, and hazardous garbage, both decomposable and non-putrescible materials (Basu, 2010; Kaseva & Gupta, 1996). Agricultural wastes are generated by animal raising, plant seeding, and milk production (Tchobanoglous, 1993), including animal feces and various crop remnants (Williams, 2005).

Since then, waste has been a global problem due to a significant rise in migration from rural to urban regions, hence a considerable increase in the garbage (Williams, 2005; Gutberlet, 2017). Due to an increased population, many countries have increased waste generation over time, such as the United States producing around 12% of worldwide municipal solid waste (Tiseo, 2021), and China has increased garbage rapidly to approximately 54 million tons of hazardous trash expected to be disposed of by 2021 (Liu et al., 2019). Japan produces about 42.7 million metric tons of garbage (Klein, 2021). Roughly 60 million tons of municipal solid trash are created, equating to more than 400 kg of refuse per citizen in Russia (IFC-World Bank, 2019), while Australia has a higher garbage generation rate than the average Western economy (Tomaras, 2020). India has increased waste generation due to urbanization, industrialization, and economic development, endangering the environment and public health (Kumar et al., 2017; Singh, 2020). Indonesia is projected to produce 150,000 tons daily by 2025 (World Bank, 2020).

According to RA 9003, the computation of estimated solid waste generation and projection in the Philippines is referred to by source, such as residential, market, commercial, industrial, construction/demolition, street waste, agricultural, agro-industrial, institutional, and other wastes. On the other hand, according to the NSWMC Framework, the primary source of waste comes from the household level and the institutional/commercial level. Based on the latest available data summarizing the composition of waste in the Philippines using the Waste Analysis and Characterization Studies (WACS), presented in Figure 1 are the sources of municipal solid wastes in the Philippines. Residential wastes form the majority of the waste at 56.7 percent, followed by commercial waste at 27.1 percent. The commercial waste was further classified as commercial market waste at 18.3 percent and other commercial waste at 8.8 percent. This was followed by institutional waste at 12.1 percent, and the least source of waste was industrial waste at 4.1 percent.

Figure 1. Solid Waste Management (SWM) System

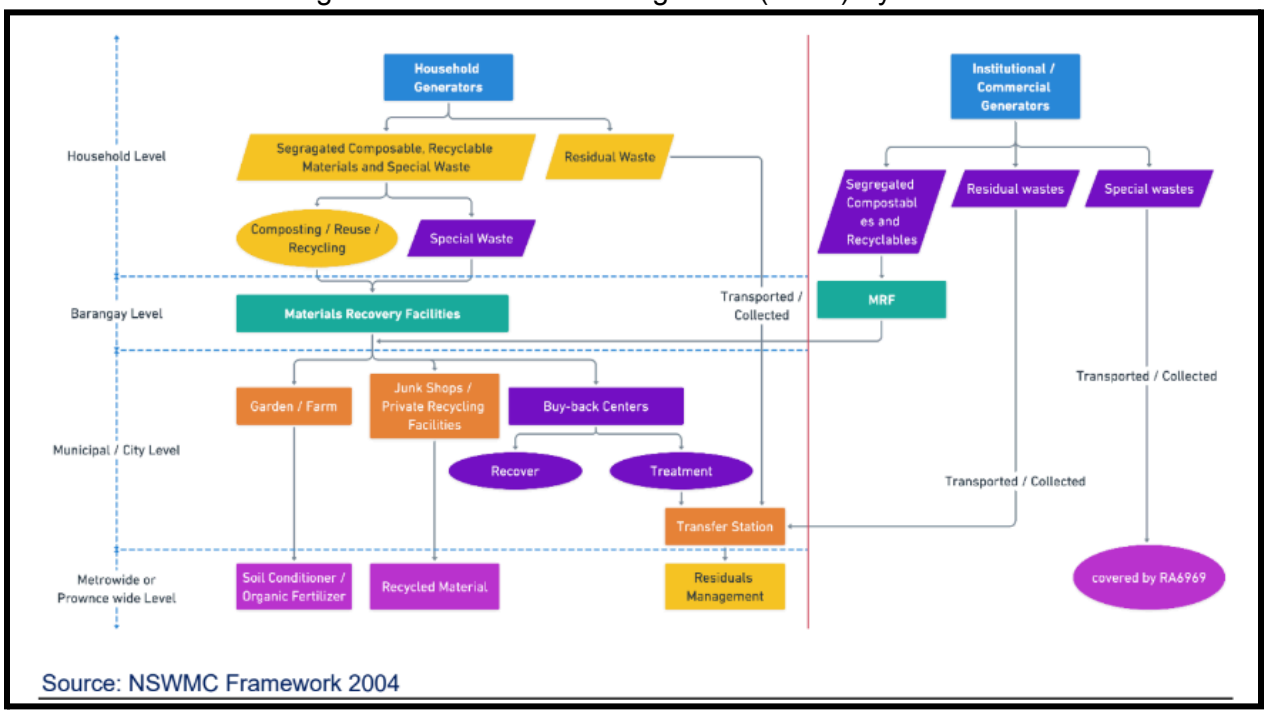
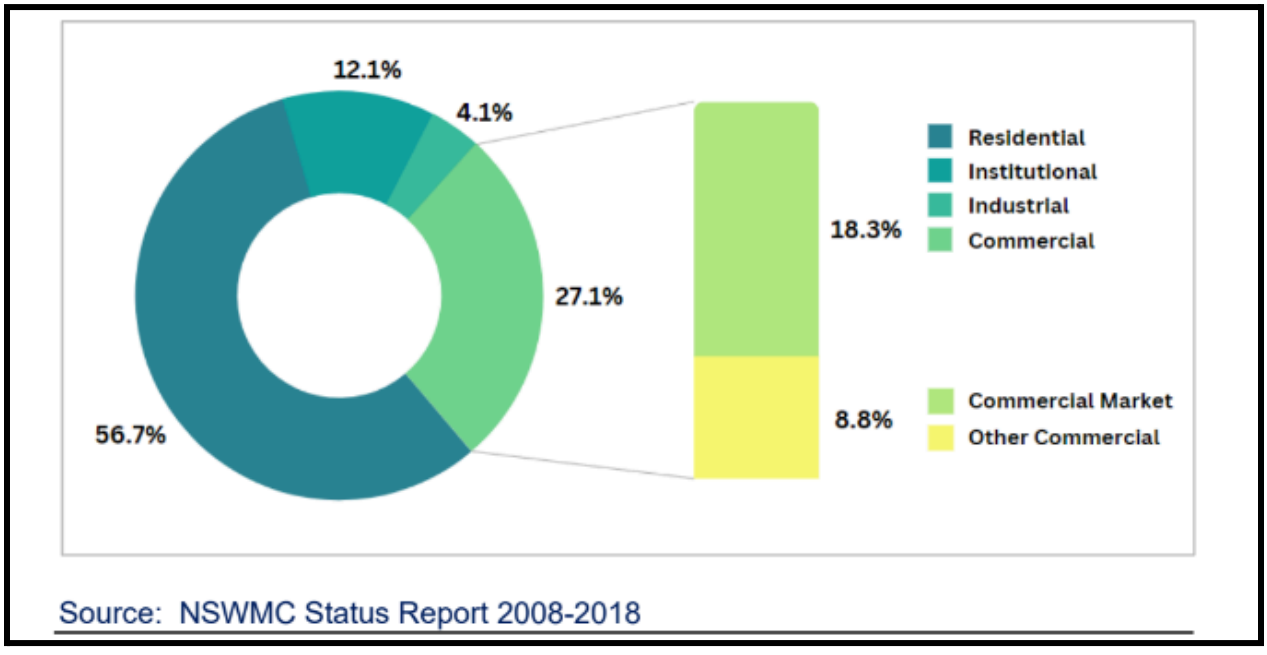


Figure 2. Percentage Distribution of Municipal Solid Wastes by Source from CY 2008 to 2013



As to the composition (see Figure 2), most were biodegradable wastes at 52.3 percent, followed by residual wastes at 18.0 percent. Special wastes comprise 1.9 percent of the waste composition, while the remaining 27.8 percent were accounted for as recyclable wastes. The recyclable wastes were broken down as follows: the majority comprises plastics at 10.6 percent,

followed by paper and cardboard at 8.7 percent. Although small in contribution, metals also composed the recyclables group at 4.2 percent, glass at 2.3 percent, textile at 1.6 percent, and leather and rubber at 0.4 percent.

Solid Waste Generation

Since the passage of RA 9003 more than 20 years ago, waste management has continued to be an issue of concern, made even more pronounced by a projection that annual solid waste generation will rise from 16.63 million metric tons in CY 2020 to 19.76 million metric tons in CY 2030 and 24.50 million tons in CY 2045 with the increase in population, rapid economic growth, and industrialization. Also, our audit found delays in the preparation and approval of LGUs' 10-yr SWM Plan, and the total number of MRFs and SLFs was inadequate to service all barangays and LGUs nationwide. As a result, a number of LGUs were also left with no other resort but to reopen or establish new illegal dumpsites.

One of the primary goals of RA 9003 is to reduce waste to benefit the environment and public health. Similarly, this is also in line with SDG Target 12.5, which aims to substantially reduce waste generation through prevention, reduction, recycling, and reuse. However, more than 20 years after the enactment of RA 9003, the municipal solid waste generated has been projected to increase from 9.07 million metric tons in CY 20006 to 16.63 million metric tons in CY 2020. Therefore, assuming a steady rate of waste generation, solid waste production shall continue to increase in future years, negating its goal of reducing waste.

By definition, waste generation is the act or process of producing solid waste. For every waste generated, there exist two pathways (see Table 1). A significant amount of the waste is aimed to be diverted through reuse, recycling, composting, and other resource recovery activities. The remaining waste not diverted must be safely disposed of in a final disposal facility.

Table 1: Waste Generation Formula

$Waste\ Generated\ =\ Waste\ Diverted\ +\ Waste\ Disposed\ (in\ tons)$

Source: New South Wales (NSW) Environment Protection Authority

On the other hand, for a specific economic area, the waste generated per capita is used to evaluate the intensity of waste generation in an area that has varying economic activities from another (see Table 2).

Table 2. Waste Generated per Capita

$$Waste\ Generated\ per\ Capita = \frac{Waste\ Generated}{Population}$$

Source: NSW Environment Protection Authority

To compute the previously mentioned projected waste generation, the DENR-EMB used the 2010 waste generation per capita as a base. The waste generation per capita for the Philippines is 0.4 kg/capita per day (weighted average). However, the distribution of waste generation differs from urban to rural. More waste was produced in densely populated cities and municipalities, which was traced to Metro Manila, the capital of the Philippines, with a rate of 0.61 kg/capita per day. Moreover, if other highly urbanized cities (HUCs) were included, the rate would increase to 0.69 kg/capita per day. On the other hand, compared to the urban areas, the rural areas produce significantly less waste, as shown, with a rate of 0.31 kg/capita per day (see Table 3).

Table 3: Philippines' Waste Generation per Capita

Scope/ Coverage	Sample size (as % of demographics)	Range	Weighted Average
		kg/ capita/ day	
PHILIPPINES (Nationwide)	79%	0.10-0.79	0.40
Metro Manila (NCR)	100%	0.27-1.00	0.61
Metro Manila and some HUCs	*Not available*	0.27-1.00	0.69
Other cities and provincial capitals (excluding NCR/HUCs)	*Not available*	0.29-0.64	0.50
All LGUs in the country, excluding Metro Manila	76%	0.10-0.71	0.34
Municipalities (cities and some capital towns excluded)	*Not available*	0.10-0.64	0.31

Source: DENR Data

Hence, using the 0.4kg/capita per day (weighted average) waste generation rate in the Philippines, the total estimated waste generation increased from CYs 2010 to 2020. From 13,481,326 metric tons in CY 2010, the volume has been projected by NSWMC to grow to 16,628,026 metric tons in CY 2020.

However, even the calculated waste generation per capita computed by the DENR-EMB was not fixed. In a 2012 paper, the World Bank also estimated that solid waste generation will double to 0.9 kg/capita per day by CY 2025, an increase of 400 grams of waste produced per person daily.

In Metro Manila alone, the estimated waste generation report from the MMDA shows that in CY 2015, the amount of waste estimated to be generated was 16,499,825.00 cubic meters. After five years, in CY 2020, it has increased to 22,003,784.58 cubic meters (see Table 4). Based on the six-year period from CYs 2015 to 2020, the total estimated waste generation grew by 33.36 percent, or at a rate of 5.56 percent annually.

Table 4. Metro Manila's Estimated Waste Generation Report

Scope/ Coverage	Sample size (as % of demographics)	Range	Weighted Average
		kg/ capita/ day	
PHILIPPINES (Nationwide)	79%	0.10-0.79	0.40
Metro Manila (NCR)	100%	0.27-1.00	0.61
Metro Manila and some HUCs	*Not available*	0.27-1.00	0.69
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All LGUs in the country, excluding Metro Manila	76%	0.10-0.71	0.34
Municipalities (cities and some capital towns excluded)	*Not available*	0.10-0.64	0.31

Source: DENR Data

Analyses of Solid Waste Management Policies and Issues

Waste generations by residents in the Philippines, especially in the urban areas, have accelerated recently due to the fast pace of industrialization, urbanization and population growth. Since incineration of solid waste is not allowed under Republic Act 9003 for the safety of human health and protection of environment, land filling and the 3 R's integrated waste

management method (Reduce, Reuse and Recycle) are the main types of SWM in the country. The law also requires the mandatory segregation at-source of solid waste into containers labeled as: *compostable, recyclable, non-recyclable, or special use.*

Collection of waste in the country is done by the City/Municipal Environment and Natural Resources Office, Department of Public Service, city administrator and engineering office or private haulers. Informal waste sector is also involved in the waste collection and storage in the country. They are the itinerant waste buyers, jumpers at collection trucks, garbage crew, and small and illegal junk shops.

About 35,580 tons of garbage is generated every day in the Philippines. On the average, each person in the country produces about 0.5 kg and 0.3 kg of garbage every day in the urban and rural areas, respectively. For Metro Manila, it is estimated that 8,636 tons of garbage is generated per day, i.e., 0.7 kg per person per day due to its more modernized lifestyle. The household is the major source of waste in the Philippines at 74%. Moreover, of the total solid waste generated from households, 95% can still be reused or recycled (43%), or turned into compost (52%). Only 5% is made up of residuals (4%) and special/hazardous waste (1%) that are no longer usable or biodegradable (JICA Waste Characterization Study, 1997).

Only 40-85% of the waste generated is collected nationwide, implying that 15-60% is improperly disposed of or littered. The maximum collection rate of 85% is recorded in Metro Manila. The uncollected garbage is, unfortunately, burned or dumped anywhere onto open areas, called open dumps, adding to the now polluted airshed and water body, and global warming in the country.

Waste Generation and Management in the Philippines

Depending on the income level, a Filipino citizen generates approximately .3 to .7 kilograms of garbage per day. For instance, 15 of the 17 LGUs (excluding Quezon and Caloocan City) of Metro Manila (MM) registered a 0.71 kg per capita waste generation rate in the second quarter of 2009 (NSWMC, 2009). Total waste generated nationwide in 2007 is 12.15 million tons with 23.54% or around 2.68 million tons of which came from MM; 2010 projections report that waste generated for the region is at 3.14 million tons (NSWMC, 2009).

Only roughly 720 tons of waste is recycled or composted per day in MM (Westfall & Allen, 2004). The remaining percentage is either hauled to dumpsites, dumped illegally on private land and water bodies, or openly burned. The composition of household wastes in MM with that of the Payatas Dumpsite in the region shows close percentages. The tons of waste being discarded in MM that have the potential for recycling include used paper, scrap metals, glass bottles, plastics, defective electronics, used batteries, used oil, and flour or rice sacks (Leo, n.d.) indicating numerous opportunities in which MM can benefit from the 3Rs.

As waste generation increases with respect to the growing population, the efficiency of service levels of waste collection in the metro is dropping. In addition, there are additional human health costs due to the improper handling and disposal of waste by entities like households, hospitals, and industrial factories (World Bank, 2001). As a response to the persisting problem of waste management, ESWMA was enacted. This law recognizes the importance of waste segregation at source, and the need to efficiently recover recyclable materials and dispose of

non-recoverable wastes with an end goal of preventing the emergence of health and environmental problems that may result from faulty waste recovery and disposal technologies. ESWMA also calls for the institutionalization of a national program that will manage the control, transfer, transport, processing, and disposal of solid waste in the country. Further, it aims for a waste diversion rate of 25% during the first three years of the Act and shall be increased every three years thereafter (UNCRD, et al., 2009; Aguinaldo, 2009).

Waste Generation Rates

Waste generation rates have been estimated based on consolidated data generated from waste analysis and characterization studies (WACS) presented in EMB regional reports and selected local 10-year Solid Waste Management (SWM) plans. Using 2010 as base year, Table 5 summarizes waste generation rates in the Philippines, Metro Manila, highly urbanized cities (HUCs), municipalities and other cities.

Scope / Coverage	Sample size (as % of demographics)	Range	Weighted Average
		kg/capita/day	
Metro Manila (NCR)	100%	0.55 – 0.79	0.69
Metro Manila and some highly urbanized cities (HUCs)	N/A	0.53 – 0.79	0.69
Other cities and provincial capitals (excluding NCR/HUCs)	N/A	0.29 – 0.64	0.50
PHILIPPINES (Nationwide)	**79%**	**0.10 – 0.79**	**0.40**
All LGUs in the country, excluding Metro Manila	76%	0.10 – 0.71	0.34
Municipalities (cities and some capital towns excluded)	N/A	0.10 – 0.64	0.31
Scope / Coverage	**Sample size (as % of demographics)**	**Range**	**Weighted Average**
		kg/capita/day	

Table 5. Synthesized waste generation rates in the Philippines for the base year 2010

In 2010, waste generation rates varied from as low as 0.10 kg/capita/day in the municipalities outside of Metro Manila to 0.79 kg/capita/day in Metro Manila and HUCs. The rates are dependent on household income, local economic activity and waste avoidance policies and incentives. The average per capita generation rate for the Philippines is 0.40 kg.

SOLID WASTE MANAGEMENT: APPROACHES, STRATEGIES AND ENABLING LAWS

Enabling Laws on Solid Waste Management

Republic Act 9003 otherwise known as Ecological Solid Waste Management Act of 2000 is an important law that aims to address environmental concerns and promote sustainable development in the country. The law provides a framework for government, industry and citizens to work together in protecting the environment. The law focuses on proper waste disposal and management, promoting the 3R approach - Reduce, Reuse, and Recycle - to minimize waste and pollution. Specifically, RA 9003 were designed with the following goals: 1) Protect public health and the environment, 2) Encourage resource conservation and recovery, 3) Promote greater public participation, 4) Encourage private sector participation, 5) Support research on technologies and techniques in SWM, and 6) Promote environmental awareness.
The law was actually the first law signed into law by then President Gloria Macapagal-Arroyo when she took over the presidency from Joseph Estrada through the EDSA 2. Last January 26, the law is now 23 years old. Its passage was probably hastened by the Payatas Dump Site Disaster that happened in July 2000 killing hundreds of people.

According to the report delivered by then DENR Secretary Riy Cimatu in 2021, a total of 335 open dump sites had been closed since 2017. DENR believes that the development will spur Filipinos' behavioral change towards proper solid waste management. NSWMC Resolution No. 1428, Series of 2021 declares Plastic Straw and Coffee Stirrer as Non-Environmentally Acceptable Products or NEAP. But the environmental advocacy groups are lambasting this as not a laudable accomplishment since it identifies only 2 products as NEAP.

Zero Waste Recycling Movement of the Philippines Foundation, Inc. in its article published last January 19 had questioned the implementation of the law especially on sections 20, 29, 56, 60 and 63. Section 29 mandates the preparation of the NEAP list one year upon the effectiveness of RA 9003, of which the DENR through the NSWMC Resolution No. 1428 identifies only 2 products as NEAP. Plastic Straw and Coffee Stirrers are still commercially available and have not been banned by the national government. On the other hand Section 56 of the law mandated the Department of Education to integrate environmental concerns in the school curricula at all levels and with particular emphasis on the theory and practice of waste management principles like waste minimization, specifically on resource conservation and recovery, segregation at source, reduction, recycling, reuse and composting. Nowadays, many schools struggle with the disposal of their solid waste, especially non-compostable waste.

The Commission on Audit (COA) in its report published by ABS-CBN news last May 11 states that the solid waste management program seemed to have not achieved its goals since its implementation 20 years ago due to the steady increase in waste generation, frail enforcement and compliance with the law, inconsistent implementation, reduced capacity of MRF for diversion causing the waste volume in landfills to exceed capacity and shorten serviceable lifespans, and delays in SWM plans preparation and approval. COA auditors also reported that of the 245 operational sanitary landfills it only caters to 478 or 29.25 percent out of 1,634 LGU’s; that due to the limitation in disposal facilities, the operation of the illegal dumpsites could not be avoided in some LGUs," it said.

Also, the COA, noted that DENR had "successfully reduced" the number of illegal dumpsites from 1,232 in 2009, they were reported reduced to zero in 2021. Unfortunately, the COA's validation showed not all dumpsites were closed. Lastly, COA auditors noted that "While LGUs strived to comply with the mandated waste diversion, results from available data showed that actual waste diversion is still far from targets.

Following are the laws related to solid waste and environmental management and protection:

Republic Act No. 11898 or the Extended Producer Responsibility Act of 2022 had strengthened RA 9003 by mandating major producers of pollutants to develop mechanisms to retrieve the waste generated by their products. It also amended Section 4 of RA 9003 reducing the numbers of NSWMC to 13 members.

Complementing RA 9003 is Republic Act No. 6969 (Toxic Substances and Hazardous and Nuclear Waste Act of 1990). The act calls for the regulation of and restriction on the importation, manufacture, processing, sale, distribution, use and disposal of chemical substances and mixtures that pose risk and/or injury to health and to the natural environment. Republic Act No. 7160 or the Local Government Code of 1991, the act devolved and decentralized certain powers to various local governments units. Specifically section 17 of the law mandated the cities, municipalities and barangays to provide services related to enforcement of laws and cleanliness and sanitation, solid waste management, and other basic social services.

Republic Act No. 8749 (Clean Air Act of 1999) directs all government agencies to adopt the integrated air quality framework as a blueprint for compliance. Among its salient provisions are the “polluters must pay” principle, and the prohibition of the use of the incineration method, which is defined as the burning of municipal, biomedical and hazardous waste or the process, which emits poisonous and toxic fumes. The act further mandates LGUs to promote, encourage, and implement segregation, recycling and composting within their jurisdiction. It also required the phasing out of incinerators by July 2003.

Republic Act No. 9275 (Philippine Clean Water Act of 2004) is an act which provides for the protection, preservation, revival of quality of fresh, brackish and marine waters of the country to pursue economic growth.

In 2008, the country passed the Environmental Awareness and Education Act of 2008 (RA 9512). The act promotes environmental awareness through environmental education and integrates environmental education in the school curricula at all levels: public or private, barangay daycare and pre-school, and non-formal, vocational, and indigenous learning.

The act promotes the development, utilization and commercialization of renewable energy and for other purposes refers to Republic Act 9513 (Renewable Energy Act of 2008). Section 30 of RA 9513 provides for the use of “waste to energy” technology subject to requirements of RAs 9003 and 8749 (Clean Air Act). Specifically, waste to energy technology refers to “systems which convert biodegradable material such as but not limited to animal manure or agricultural waste, into useful energy processes such as: anaerobic digestion, fermentation, and gasification, among others, subject to the provisions of the Clean Air Act of 1999 and the Ecological Solid Waste Management Act of 2000”.

Presidential Decree No. 856 (Code of Sanitation of the Philippines) prescribes sanitation requirements for hospitals, markets, ports, airports, vessels, aircraft, food establishments, buildings, and other establishments. Refuse collection and disposal systems in cities and municipalities are described in Chapter XVIII of the law.

Presidential Decree No. 1586 (Environmental Impact Assessment Law) which was approved on June 11, 1978 establishes and institutionalizes an environmental impact system where projects to be undertaken would be reconciled with the requirements of environmental quality. This requires proponents of critical projects and projects located in critical areas to secure an environmental compliance certificate (ECC) from the President or his duly authorized representative. The inclusion of the construction of Sanitary Landfills (SLF) as a critical project was done later.

The passage of the Philippine Disaster Risk Reduction and Management Act of 2010 was crafted in relation to the Climate Change program. The law supports the 3 R's of SWM in promoting to consumers avoidance of using the disposable and unnecessary products in order to avoid or reduce the solid wastes generated by households, commercials, institutional, industries and all levels of stakeholders.

The Seal of Good Local Governance Act of 2019 (Republic Act 11292 includes among its criteria, compliance with the minimum standards of RA 9003, MRFs or partnerships with facilities, access to a sanitary landfill or alternative technology, a SWM board, and instituting policies and programs to promote environmental protection. These laws and local ordinances provide the legal basis, funds, and incentives for LGUs to participate in the project.

A Technical Working Committee (TWC) was created to work on the phasing out of non-environmentally acceptable (NEA) products and packaging materials. The TWC has established four product categories that are subjected for evaluation, namely: plastics, construction materials, baby products and electronics. Through the Industrial Technology and Development Institute of the Department of Science and Technology (ITDI-DOST), the NSWMC TWC conducted a study to determine the non-environmental acceptability of products or packaging material and life cycle assessment of the products to be listed as non-environmentally acceptable products (NEAP). This is NSWMC Resolution 9 - Under NSWMC Resolution 9 of 2006.

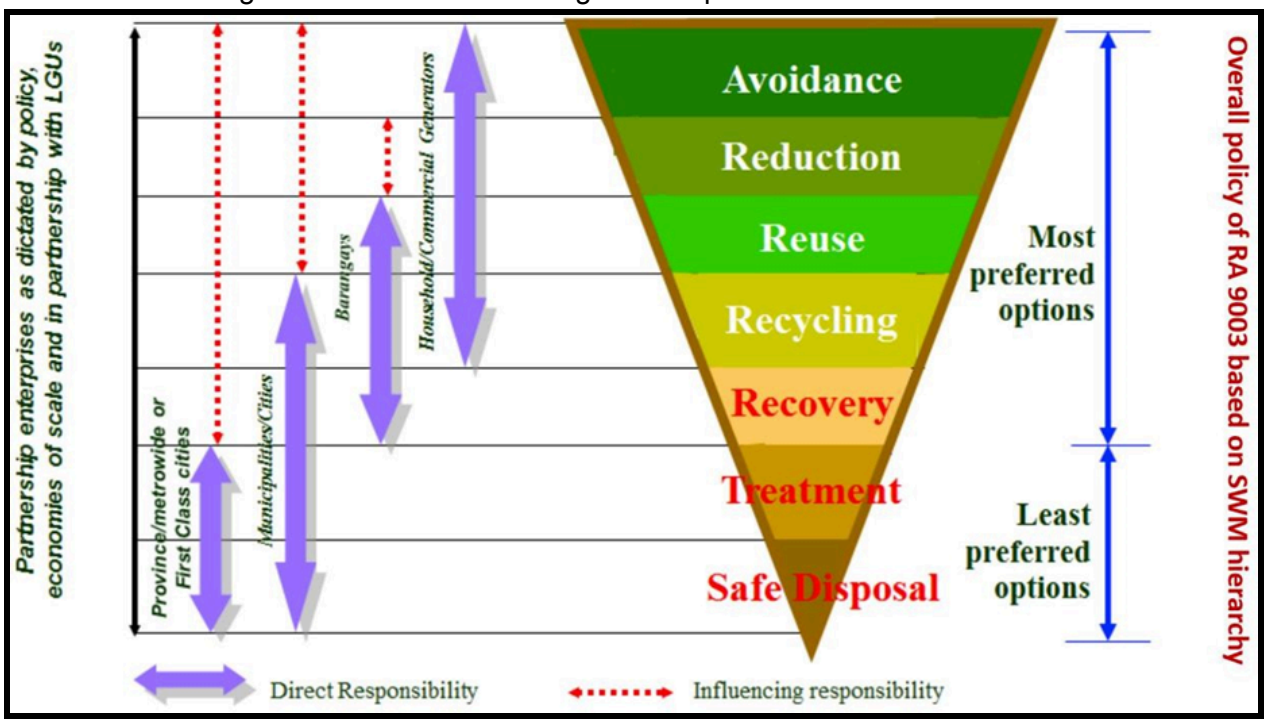
Since 2018, approximately 316 LGUs have passed ordinances banning or regulating the sale and use of plastic bags and polystyrene foams due to their perceived role in the clogging of waterways, increased flooding, and polluting water. Among these LGUs are the cities of Muntinlupa, Quezon, and Pasig in Metro Manila.

Approaches and Strategies on Solid Waste Management

It was not until the passage of RA 9003 that an in-depth waste characterization study was adopted to guide management mechanisms. Initially, the policies that shaped the SWM system of the Philippines were scattered across different components. The first baseline policy, Presidential Decree No. 825 in 1975, was centered on penalizing littering. This was followed by the devolution of waste disposal to municipalities through DENR Administrative Order No. 1998-49, and a constitution of the Presidential Task Force on Waste Management through

Memorandum Circular (MC) No. 1988-39A. Regulations for landfill site identification were issued next in line with the former DAO. The complete and systemic approach needed to tackle waste management was passed during the advent of the 21st century, with the strong addendum of ecological aspect, possibly facilitated by international commitments to climate change mitigation. This declaration, together with the Local Government Code, mandated for the devolution of segregation and collection of residential solid waste to the barangay level while special and hazardous wastes were to the municipal/city LGUs. Another significant mandate was the forced closure of all pre-existing dumpsites and transitioning them into sanitary landfills (SLF) within five years of the law's passage. The law also required the establishment of a solid waste management board that would oversee the carrying out of the solid waste management plan. As of 2015, there were 1,305 SWMPs submitted to the National Solid Waste Management Commission (NSWMC), however, there seemed to be a disparity between the volume of submitted plans and the approved ones. The backlogs were rooted from missing components and non-compliance of requirements, resulting in a staggering progress of approval. The figure below showed the hierarchy of SWM tactical options as embodied in RA 9003. Waste avoidance, reduction, reuse and recycling were preferred over eventual treatment and disposal. It was also evident that the most preferred options were best carried out at the level of waste generators. In this case, interventions seemed to best start at the level of households and commercial establishments.

Figure 1. Solid Waste Management Options based on RA 9003



In addition to the waste hierarchy, there are a number of other strategies that can be used to effectively manage solid waste. These include:

- Waste audits: Waste audits are a way to identify the types and quantities of waste that are being generated. This information can be used to develop targeted waste management strategies.
- Public education: Public education is essential for promoting waste reduction, reuse, and recycling.
- Extended producer responsibility (EPR): EPR is a policy approach that makes producers responsible for the entire lifecycle of their products, including the collection and disposal of waste.
- Pay-as-you-throw (PAYT): PAYT programs charge residents a fee for the amount of waste they generate. This can encourage waste reduction and recycling.

Strategies and Model Program - The Case of Cebu City

Cebu City has introduced several innovative programs and strategies in order to improve its SWM system. These strategic programs include information and education campaigns (IEC), cash from trash projects, composting from organic waste, and local and international partnership in implementing SWM programs.

Information and Education Campaigns (IEC)

The Cebu City Government, especially the office of the environmental committee has recognized that the success of the SWM program largely depended on the level of awareness among its citizens and constituents to ensure their active participation. The environmental committee carries out various information and education campaigns aiming at making citizens understand the need to comply with the laws and ordinances as its main objective. A system of BEOs was established recruiting at least five volunteers from each barangay based on the community leadership elements to serve as the main initiator to start these education campaigns. The IEC activities in the barangays were complemented with recycling programs at schools, which are aimed at increasing the level of awareness and participation among students.

Kwarta sa Basura (Cash from Trash) Program

Highlighting the economic value of the waste, the office of the environmental committee in assistance of CESET and BEOs organized the women's organizations to conduct a "Buying day" for the recyclables. This program is called Cash from Trash Program. A selected day in a week, members gather recyclables and bring them to the collection site for sale. Every barangay was assigned with a buyer of recyclable materials, which was given with seed money by the Cebu City Government.

Promotion of Composting

While over 50% of municipal waste includes organic materials, composting programs have been implemented to avert the volume of organic wastes being disposed of to the sanitary landfill.

The model composting facilities have been established at different levels. At the household level, composting baskets are distributed to make composting using the household waste.

Financial and Incentives

The City Government has introduced several supportive financial measures to encourage the barangay efforts in establishing recycling and composting programmes. The annual municipal budget, equal to 20,000 Peso (400 US$) for each barangay is allocated based on the demand driven approach. This budget can be used for covering the construction costs of MRF and composting, acquiring necessary equipment and community education programmes.

Cooperation with local and international agencies

As the largest city in the region, Cebu City has developed a strong environmental linkage and networking among different groups and institutions from both local and international. Local universities such as the Southwestern University, University of Cebu and St. Theresa College have implemented initiatives on having in-house solid waste management programs that include IECs among its students. St. Theresa College implements a school-wide SWM program particularly in integrating environmental concerns in its curriculum and instruction. It has established a model composting facility to demonstrate the practical process in making composting. A local NGO called Lihok Filipina, a network of Filipino women, implemented information campaigns and education programs in Cebu City related to SWM programs at the household level. They organized housewives to participate in a “Cash from Trash " program that produced homemade crafts that are sold in the market. Another NGO called Alyansa sa mga Lumulupyong Kabus Alang sa Pagpalambo (ALCAP) or Alliance of the Urban Poor for Development, a people’s organization participated in by the wives of the Cebu port workers also engaged their free time into producing and selling paper products to generate additional income for the family.

Solid Waste Management Initiatives in BARMM

To address the mounting issues on solid waste management in BARMM, the Sub-committee on Regional Solid Waste Management created its technical working group on October 12, 2021 to provide technical support in the formulation, update, review and recommendation of the solid waste management plans of local government units within BARMM. Comprising the SCRSWM-TWG are the Ministry of Environment, Natural Resources and Energy (MENRE) as the chairperson, Ministry of Interior and Local Governance (MILG) as vice-chairperson, and member agencies including the Ministries of Science and Technology (MOST), Public Works (MPW), Health (MOH); Trade, Investment and Tourism (MTIT), Agriculture, Fishery and Agrarian Reform (MAFAR), Indigenous People Affairs (MIPA), Transportation and Communication (MOTC), Human Settlement and Development (MHSD), Basic, Higher and Technical Education (MBHTE), Bangsamoro Darul-Ifta’, Office of the Chief Minister (OCM), and BPDA as the technical secretariat.

Furthermore, the SCRSWM is a sub-committee of the Regional Land Use Committee (RLUCom) under Bangsamoro Economic and Development Council (BEDC), mandated to provide support in the implementation of the Republic Act No. 9003 or the Ecological Waste Management Act of 2000. The Enhanced 12-Point Priority Agenda adopted by the BTA, agenda

1 and 8 which focused on the functionality of LGU's and building resilient communities to human induced and natural disasters supports the mandate of SCRSWM of providing technical assistance to LGU's in the review and approval of the SWM plans.

The BARMM is currently in the process of developing a comprehensive regional solid waste management plan. The Ministry of Environment, Natural Resources and Energy (MENRE) acknowledges the challenges of solid waste management in the region. A Sub-Committee on Regional Solid Waste Management (SCRSWM) was formed. Capacity building activities were conducted for SCRSWM members to enhance their knowledge on waste management and planning.

The goal is to create a plan that adheres to Republic Act 9003, or the Ecological Solid Waste Management Act of 2000. While there isn't a finalized regional plan yet, these initiatives show a positive step towards a more sustainable waste management system in BARMM. Recently, the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM) celebrated another milestone in its environmental management efforts with the inauguration of its 7th sanitary landfill in the region, located in Datu Paglas, Maguindanao del Sur. The event took place on June 4, 2024 marking a significant advancement in the region's commitment to sustainable waste management and coinciding with the celebration of Environmental Month this June.

IN FOCUS: SOLID WASTE MANAGEMENT PLAN (SWMP) OF COTABATO CITY

The development of **Cotabato City 10-Year Ecological Solid Waste Management Plan, 2018-2027** started in 2014 with the technical and financial assistance from EcoGov and ACF International. Under the plan it developed a vision statement in solid waste management as "**A clean, healthy, Environment-friendly and economically stable Cotabato City by year 2027**". Facing Illana Bay to the west and bounded by Rio Grande de Mindanao on the north, and located in the lowest portion of Maguindanao Province, 70% of the city's total land area is below sea level that can easily be inundated. The waste problem in the city is significantly contributing to the vicious cycle of flooding. With its location, the city plays a vital role in keeping these water bodies as a lifeline for those that depend on it for survival.

Cotabato City generates a large volume of solid wastes estimated at more than 108,610.25 kgs/day. With the current annual growth rate of 1.8%, the demand for goods and services increases in parallel to the escalation of solid wastes that inevitably comes with it. The upsurge in waste generation could also be attributed to the changing lifestyles, eating habits, and change in living standards. It could not be taken out of the equation the impact of the growing population, coupled with the rise in economic activities, transport facilities and agricultural production due to increasing demand.

The plan recognizes realities within Cotabato City. The first being that the volume of waste generated is mounting due to a number of reasons but to some degree, waste can be viewed as a resource, not just mere unwanted byproducts of human activities. Secondly, at present, waste segregation at source is hardly practiced by major waste generators, including the Public Market. Most schools have started to practice composting at source and significant waste diversion activities have been initiated at the City-wide level. Lastly, the City-LGU conducted massive behavior change communication involving a lot of processes such as trainings', focus group discussions and barangay briefings among others but these initial efforts were not

sustained. It contributed in one way or another to the limited enforcement of SWM policies including the management of the Biniruan Residual Containment Facility.

Prior to the creation of the City Environment and Natural Resources Office (CENRO) in 2016 through City Ordinance No. 4417, Series of 2016, the Office on General Services handles the solid waste management of the city. With its creation it provides the needed boost for the solid waste management system to take off. It induces the initiatives on garbage collection services and social preparation. Based on interviews with some city officials, some challenges in Ecological Solid Waste Management Plan implementation are recognized such as, but not limited to:

- Institutionalization of proper waste segregation, recycling and disposal in every family or household;
- Establishing discipline among communities associated with the best interest of public health, economic development, conservation and other social considerations;
- Solid waste management initiatives among city officials, barangay leaders and the populace; and
- Occurrence of natural and man-made obstacles.

In the Waste Analysis and Characterization Study (WACS) conducted in 2017 as part of the planning process reveals major findings enumerated below:

- Per capita waste generation is computed at 0.35 kg/day.
- In the City's collection area, composed of 29 out of 37 barangays, total waste generation is approximately 82.8 tons/day where:
- 62.7% are biodegradable;
- 18% are recyclable;
- 10% are potential residual waste;
- 9% are residual waste; and
- 0.30% are special waste.
- Total potential waste for diversion is 90.7%, including biodegradable (62.7%), recyclable (18%) waste and potential residual (10%) .
- Major waste generators are households, food establishments and institutions.

Within the whole City, total waste generation is calculated at approximately 108,610.25 kgs/day wherein the percentages for biodegradable, recyclable, residuals and special wastes are almost the same with the current collection area. By 2027, the City's total waste generation is projected at 166,914.11 kgs/day.

The waste generation per capita from 2018-2027 is presumed to increase by 0.01kg/year. It is supported by the assumption that the defined programs on source reduction, diversion and recycling will be successfully implemented. Coupled with these is the hope for the development of sanitary landfill. The successful negotiation for the Sanitary Landfill Facility(SLF) is expected to give the much-needed boost that may reinforce Solid Waste Management (SWM) initiatives and may trigger the dynamic surge of economic activities that will contribute to the solution of improper solid waste disposal.

The Key Result Areas of SWM are highlighted in the goals set by the City-LGU, to wit:

- Cluster with the adjacent municipalities of Maguindanao Province for the establishment of a progressive sanitary landfill by 2020;
- Realization of 60% waste reduction at the 1st year of plan implementation based on the volume of waste currently generated, and 90% or more by the end 2027;
- Initial construction of central MRF by 2020 with complete segregation and composting area with material recovery efficiency of 85% by the end of 2020;
- All barangays have functional MRFs by 2019;
- Complete and operational SWM organizational structure by the end 2018;
- Improve the segregated collection efficiency by 60% in the 1st year of plan implementation and 80% at the end of 2019;
- Increase the participation of non-government and private sectors by 25% in the ESWM Plan monitoring and implementation by 2018 onwards; 90% by 2027;
- Enhance the behavior change communication activities on proper SWM, 90% by 2027;
- Annual increase of revenues by 10% from MRF operations, 100% by 2027;
- Increase by 60% the participation of all sectors in waste diversion through reduction, reuse, and recycling activities;
- Develop, expand and sustain markets for recyclable wastes in support to waste diversion efforts and ensure that 80% of diverted materials are returned to the economic mainstream;
- Improve by 90% SWM internal processes that uphold good governance principles through gender-sensitive communication, capacity-building, linkages with various key SWM players and effective use of technology;
- Improve by 60% the enforcement of the “No Segregation, No Collection” policy; 100% by 2027;
- Enforcement of mandatory composting of biodegradable materials in all MRFs within the 37 barangays; 100% by 2027;
- Properly close and rehabilitate the existing disposal facility (RCA) by 2020;
- Inclusion of 8 barangays not formerly included in the city’s waste collection service by the year 2019; and
- Adoption of the City’s 10-year Ecological Solid Waste Management (ESWM) by 2018.

The implementation strategy adopted in this plan is anchored on the six functional elements of solid waste management, namely; 1) waste generation, 2) storage, 3) collection, 4) transport, 5) processing and recovery, and 6) disposal. The implementation will be supported by intensive behavior change communication/IEC campaigns. The CENRO as lead Department, will synchronize all activities in close coordination with the City Solid Waste Management Board (CSWMB) and the Barangay Solid Waste Management Committee (BSWMC).

To achieve the stated objectives of the plan, the following activities will be undertaken:

1. Information dissemination on the concept of “Re-use, Reduce and Recycle” will be vigorously pursued. This could be undertaken through house to house visits, focus group discussions, seminars and conferences, and the use of tri-media;
2. Establishment of a business enterprise that could advance the declaration of the community to practice waste segregation and diversion at source, and recycling;
3. Develop and implement programs that will motivate barangay officials to support SWM initiatives;

4. Encourage the community to maintain cleanliness in their barangay or “purok” through participation with SWM related contests;
5. Solid waste system will be implemented based on the defined strategies for waste reduction at source to disposal;
6. Construction and/or operationalization of the city MRF and all barangay MRFs; and
7. Development of project proposals for fund sourcing.

The 10-year ESWM Plan requires a huge amount of investment. The total cost of PhP 578,670,250 excluding possible expenditures for SLF, is focused on the following;1) Garbage collection, transport and disposal; 2) Maintenance of the current disposal facility; 3) Personal services; 4) Procurement/maintenance of vehicles and heavy equipment; 5) Construction of Central MRF and other support facilities; and 6) SWM program implementation. It will be supported by: 6.1) Intensive IEC/Behavior change communication; 6.2) Capability building for barangay officials, enforcers and support personnel; 6.3) Solid waste management system; and 6.4) Program Management and Administrative support services.

The major sources of funds for the implementation of the ESWMP will be coming from the City’s Internal Revenue Allotment (IRA). Other potential sources of revenues will be derived from the following; a) fines, fees and penalties, b) Garbage collection fees, c) environmental management fees, d) sale of soil enhancer, and e) grants and donations. These activities will be supported by legislative action.

Monitoring and Evaluation activities of the plan will focus on the periodic assessment of efficiency and effectiveness of IEC/behavior change communication, enforcement of SWM related laws, and barangay compliance based on identified performance indicators for each type of SWM operations. In support, waste analysis and characterization study will be conducted periodically to keep the City ENR Office abreast of the real situation on waste generation, collection and disposal. This will help the CENRO, including the members of the City’s SWM Board, to come up with pertinent decisions in solving arising issues. Also, it will help the M & E team calculate the volume of recyclables and biodegradables, and recommend alternative measures, if needed.

The City’s Ecological SWM Plan (2018-2027) provides the overall framework for the solid waste management program in the next 10 years as the city of Cotabato aspires to fully comply with the mandatory provisions of Ecological Solid Waste Management Act of 2000 (RA 9003). The Plan envisions to promote discipline in a way that matches the best interest of public health, environmental protection, economic development, capability building and other social considerations of the City-LGU.

SECTION III: RESEARCH METHODOLOGY

APPROACH AND METHODOLOGY

This research will be implemented by TFI, taking the role of a research manager. ISWM experts with research experience will be engaged to provide technical leads in this study. Seasoned field data collectors (quantitative and qualitative) will also be engaged in this research.
The whole research duration was four (4) months.

ANALYTICAL FRAMEWORK

To try to understand how the city and barangay local governments of Cotabato City implements its integrated solid waste management program, as well as determine existing or potential waste reduction practices, this study will use PHINLA or Philippines, Indonesia, and Sri Lanka Model on livelihood for poverty affected population through a multi-sectoral established and monitored waste management system. The conceptual issues of this study will include the SWM practices to mitigate its impact on environmental and socio economic development, the perception of the people about SWM, and assess the impact of solid waste management, particularly on waste reduction, on the environment and sustainable development. Furthermore, the study focuses on SWM not only as a government responsibility. It should also be done by every individual, since the waste is produced by households. These issues therefore serve as part of the conceptual framework for the Research on Integrated Solid Waste Management and Waste Reduction Measures in Cotabato City.

TFI will endeavor to show the link between SWM, environmental conservation and Sustainable Development. TFI will also put effort to show how the development of a growing economy and population generates Solid Waste which causes environmental pollution and degradation. Waste segregation, recycling and composting can be used as a method for SWM with legal structure, awareness rising, attitude change, synergy between authority and the community to mitigate these impacts on the environment. As such, integrated sustainable solid waste management provides the ground for environmental conservation. In this way, the development process could improve socio economic development; while the waste management will keep the environmental preservation lasting with sustainable development in the end.

SAMPLING FRAMEWORK

In determining the ideal sample size with a desired level of precision, desired confidence level, and the estimated proportion of the attribute present in the population, the Cochran Formula was used in the community survey. The Cochran Formula is appropriate in situations with large populations. It is used to determine the ideal sample size with a desired level of precision, desired confidence level, and the estimated proportion of the attribute present in the population. The formula is:

$$n=(z^2\ pq)/e^2$$

Where n is the sample, z is the value in the normal table with 95% confidence level, z=1.96, p is the estimated proportion of an attribute that is present in the population, q=1-p, and e is the margin of error with e=0.05. With these values, we can derive a sample size of 384. This is the sample size randomly chosen based on the total population of Cotabato City.

RESEARCH TOOLS

Survey

The survey will be administered to the identified households in the 15 barangays of the city. Survey questionnaire will be written in English and to the extent possible as needed, will be translated verbally in the local Maguindanaon language. This is to ensure a more comprehensive reach of respondents. The results of this survey will be encoded in English as the tool/questionnaire. The quantitative survey will be consolidated using KoboToolBox Digital data collection. The consolidated quantitative data will be visualized using Power BI.

Key Informant Interview (KII)

TFI will conduct at least 30 KIIs in Cotabato City from 15 barangays. Key informants will be officials who have direct knowledge and engagement with solid waste management of their barangays. KIIs will also be done with officials managing SWM in model LGUs with operating landfills (General Santos City, Surallah, Kidapawan City). The KII will work on how solid waste is being managed and determine entry points for waste diversion.

Focus-Group Discussion (FGD)

TFI will conduct FGDs with members of the barangay/community waste management teams/implementers to generate consensus regarding their strategies on implementing and enforcing solid waste management.

SECTION IV: DISCUSSION OF KEY RESULTS

PROFILE OF THE RESPONDENTS AND KEY INFORMANTS OF THE STUDY

Fifteen (15) barangays of the city were covered in the study. Ninety four percent (94%) of which are urban and the rest are rural barangays. Specifically, there were 389 respondents to the survey. There was equal distribution of respondents (both male and female). The highest number of respondents are in Rosary Heights IX with 31 respondents (7.79%) and Poblacion Mother with 27 (6.49%). The lowest number of respondents was in Rosary Heights VII.

Fifty three percent (53%) were heads of the household while forty-seven percent (47%) were not. For heads of the households, 74.3% have monthly incomes Php12,000 or less while the rest have incomes above Php12,000. In terms of educational attainment of the head of the household , 34.5% have attained college or higher degree; 35% have reached secondary level; 27.2% have reached elementary level;1% have gained knowledge from Madrasah and 2.4% are illiterate.

On the other hand, nine (9) key informants were subjected for an in-depth interview to gather additional data and information to support the results of the survey.

Table 6. List of Partner Barangays identified by WVDFI

Bagua	Tamontaka	Población
• Barangay Mother Bagua • Barangay Bagua 1 • Barangay Bagua 2	• Mother Barangay Tamontaka • Barangay Tamontaka III	• Barangay Mother Población • Barangay Poblacion V • Barangay Poblacion VII • Barangay Poblacion VIII
Kalanganan	Rosary Heights	
• Mother Barangay Kalanganan	• Barangay Rosary Heights III • Barangay Rosary Heights VII • Barangay Rosary Heights IX	• Barangay Rosary Heights X • Barangay Rosary Heights XI

KEY FINDINGS OF THE STUDY

Knowledge, Perspectives, and Practices on Solid Waste Management in Cotabato City

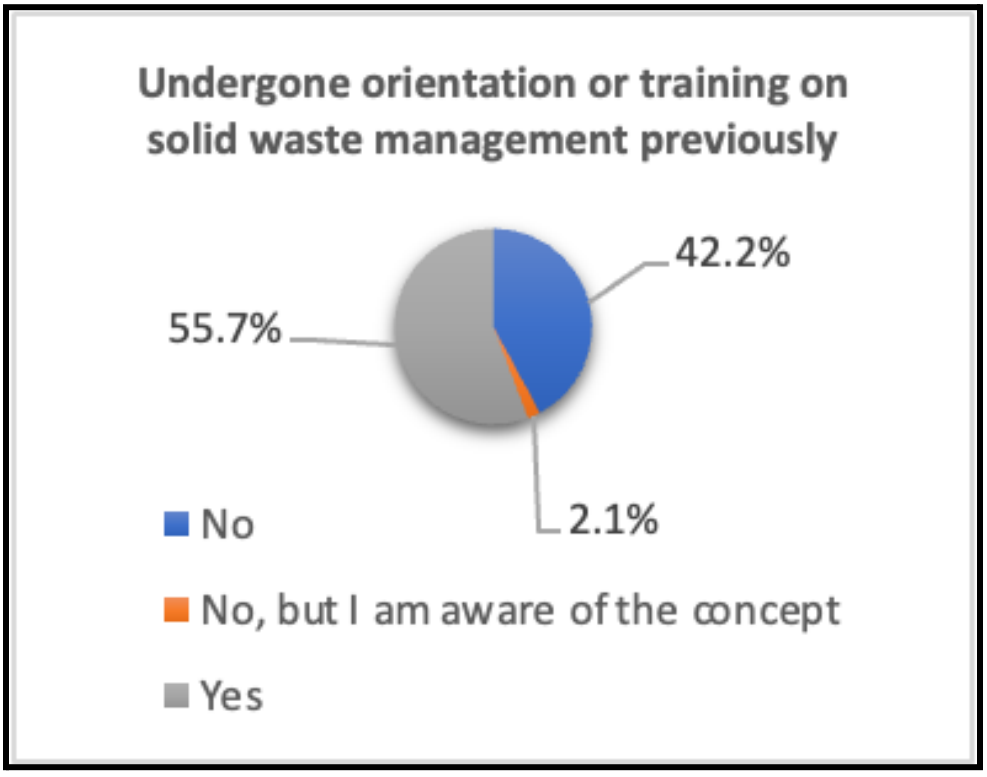
1. On Knowledge of the Respondents on Solid Waste Management

On the knowledge about different types of wastes; 97.2% of the respondents said they are aware of the different types of wastes. Likewise, 96.7% are also aware about the negative effects of wastes to the environment. In fact,they unanimously agreed that wastes can pollute the environment if not properly disposed of.

During the discussions with the respondents, they considered solid waste as a major issue that needs to be addressed in their respective barangays. Although, they cannot say whether they share the same perspective with the Barangay Local Government Unit (BLGU).

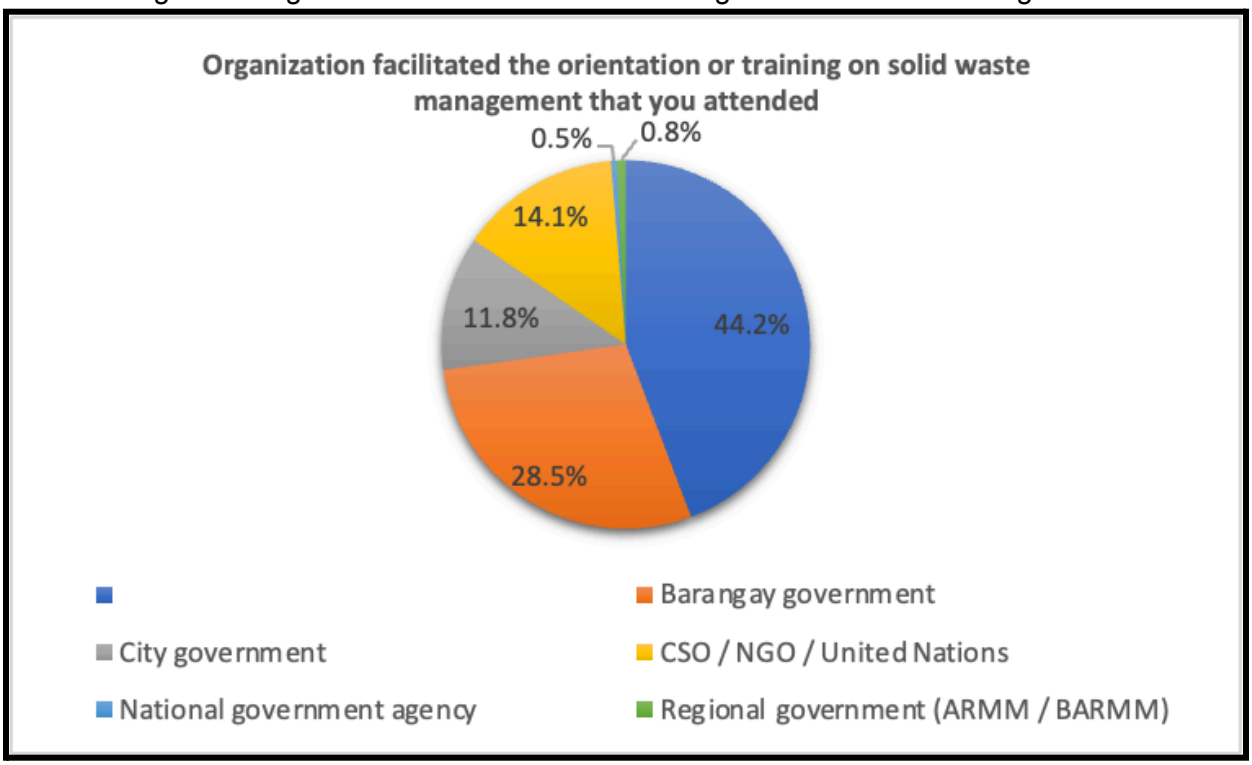
In terms of training/orientation on solid waste management; 55.8% of the respondents have attended; 42.2% have not attended while 2.1 have not attended but are aware of the concept (see Figure 4). However, of the 55.8% who have attended training/orientation on solid waste management, the majority of them have attended the training in the last 10 years or more. This has an implication as to the level of retention in terms of their knowledge and understanding on the proper waste segregation.

Figure 4. Percentage of Respondents who have undergone Training on Solid Waste Management



When asked who are the organizations (both government,non-government and even private sector) that have facilitated the conduct of the training/orientation, the respondents have enumerated the following, to wit: 1) the City Government of Cotabato; 2) the Regional Government - Bangsamoro Autonomous Region for Muslim Mindanao (BARMM); 3) National government agencies such as Department of Environment and Natural Resources (DENR), 4) Non-government/civil society organizations. This is on top of the orientations conducted by the Barangays Local Government Unit (BLGUs) which serve as the frontline in the implementation of the solid waste management program in their respective barangays. Figure 5 shows the responses during the survey conducted.

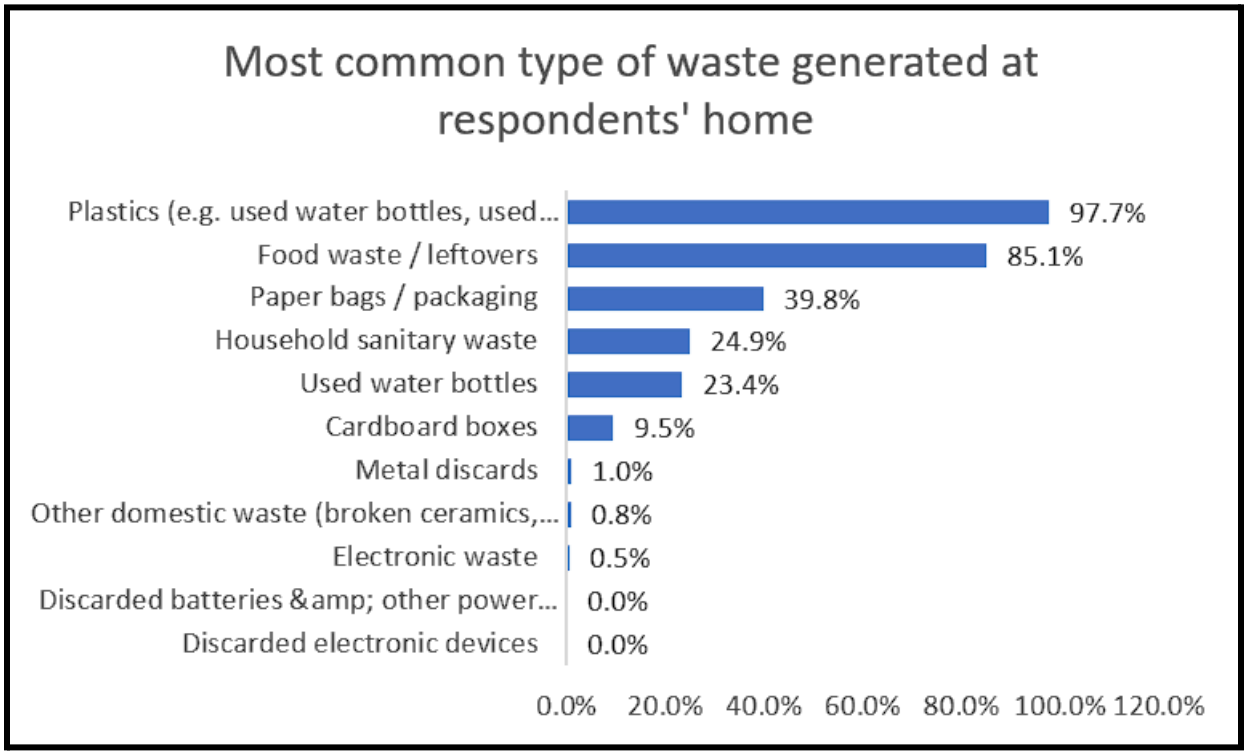
Figure 5. Organization that Facilitated Training on Solid Waste Management



2. Solid Waste Generation at the Source

The households are the primary generators of various types of solid wastes. Figure 6 below shows the most common types of wastes generated at the household level. On top of the list are the various types of plastics, food waste/leftovers, paper bags/packaging materials, and household sanitary wastes, among others. However, the households seldom generate discarded electronic devices, batteries and lamps, and power storage devices; other domestic wastes such as broken ceramics and glasses as well as metal discards.

Figure 6. Wastes Generated at Home

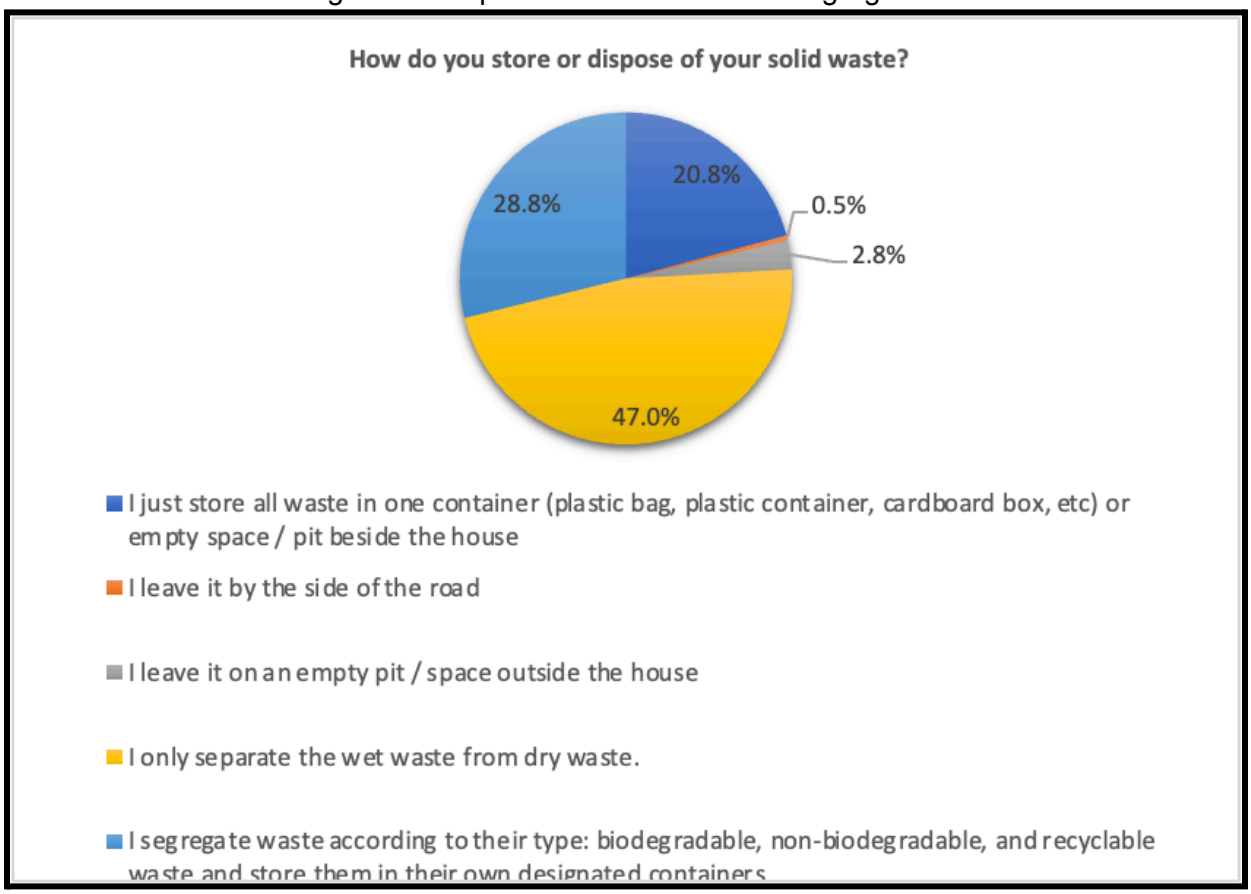


According to the respondents, they want to dispose of the above wastes on a daily basis as they are being generated. However, except for the food wastes/leftovers, the respondents would still be willing to store for another day those solid wastes which can still be stored like plastics, metals and others .

3. <u>On Specific Knowledge and Practices of the Respondents on Proper Waste Segregation</u>

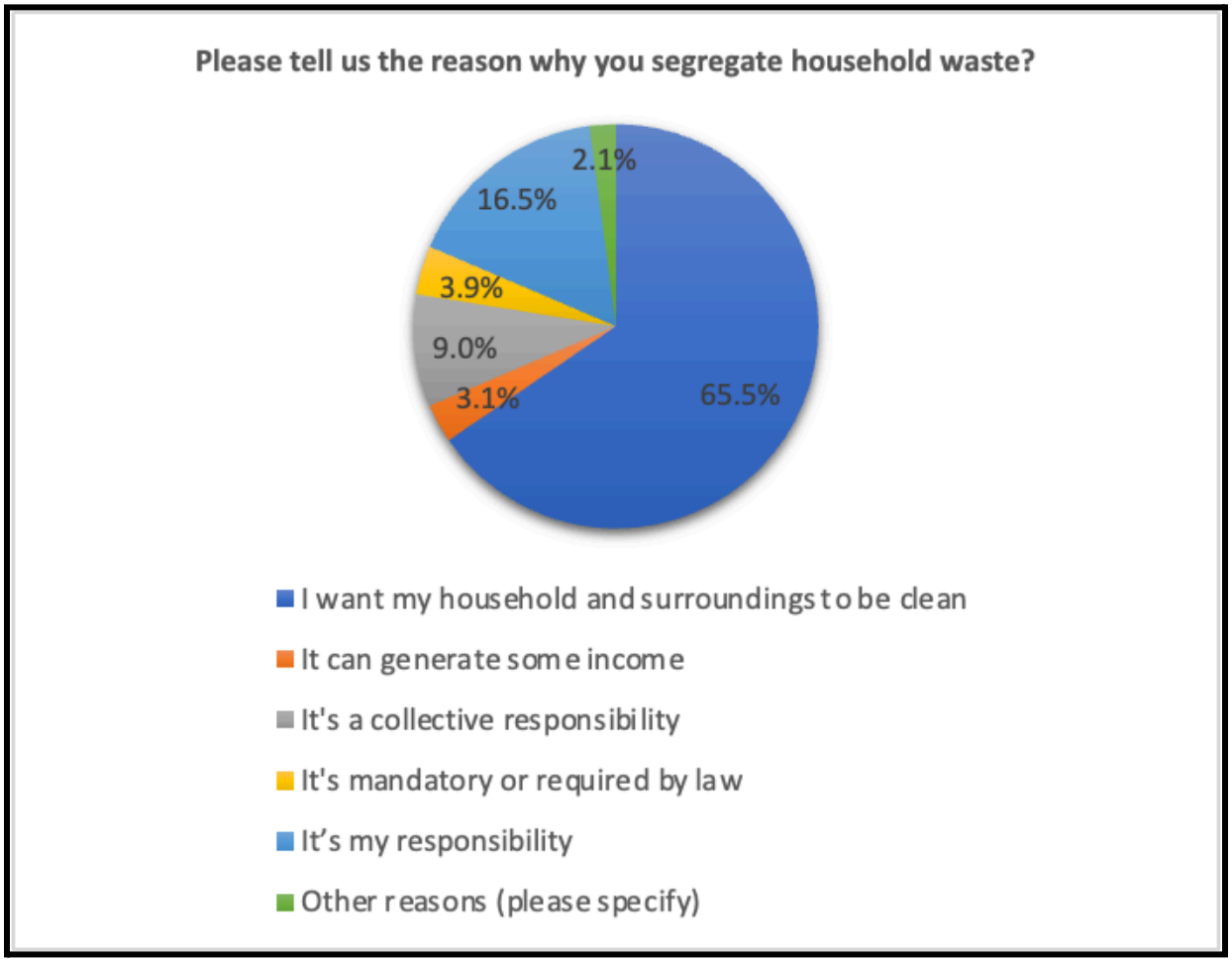
Ninety-five percent (95%) of the respondents said they are knowledgeable on how to properly segregate their wastes. However, when asked specifically how they are storing their respective wastes, their responses are varied (see Figure 7): almost half (47%) of the respondents do not follow the proper segregation and storage of waste as they are just segregating dry wastes from wet wastes; 21% of the respondents are not practicing segregation since they are just storing their wastes in one container or area; among the respondents, only 29% are properly segregating their wastes according to different types as provided in Republic Act 9003 , or the Ecological Solid Waste Management Act of the the Philippines. These results imply that knowledge gained during the training/orientation on solid waste management was not properly cascaded or disseminated at the household level where wastes are mostly generated. Majority of respondents are only aware of biodegradable and nonbiodegradable waste. As such, there is a disconnect/mismatch between awareness and implementation of proper waste segregation. Another possible reason could be that since the said orientation/training was attended years ago, households and other waste generators were not able to put into practice the proper way of segregating wastes, hence, still the problems on solid waste management of the city persist.

Figure 7. Responses on Solid Waste Segregation



When asked for the reasons why they want to segregate their respective wastes, the households narrated the following: 85.5% want their households and surroundings to be clean; 16.5% said that it is their responsibility being also a waste generator; 9% said it is a collective responsibility of the community; 3.9% said it is required by law; and 3.1% said it is a source of income. As can be perceived by the results, it can be noted that only few have realized the potential of wastes as a source of income.

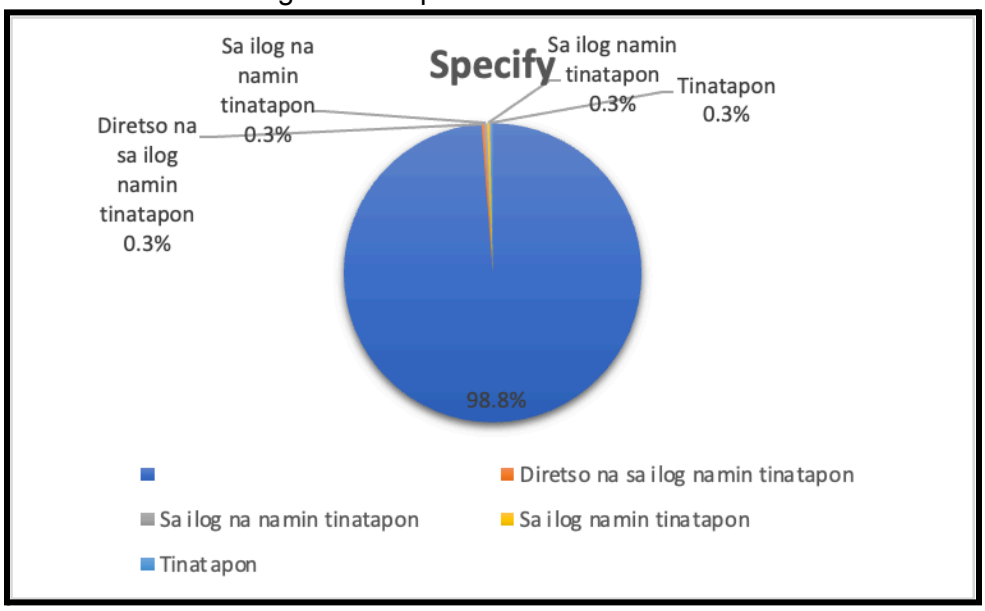
Figure 7. Reasons for Segregating Wastes



4. <u>On the Knowledge, Perspective, and Practices about Waste Disposal</u>

Almost 94% of the respondents also narrated that once trash containers/bins are full, they stored excess wastes in a bag such as plastic bags, discarded grocery bags, used rice sacks and others, which mostly are unsegregated wastes. Worse, when asked specifically where they are disposing of their excess trash, an overwhelming 100% of the respondents narrated that they threw their wastes in the river/along the riverbanks. During the validation workshop, it was argued that maybe there is a need to qualify that only those residents near the riverbanks can be considered as those throwing their wastes along the riverbanks. However, there were participants who further argued that even those barangays that are not situated along the riverbanks bring and throw their wastes in the area.

Figure 8. Disposal of Excess Wastes

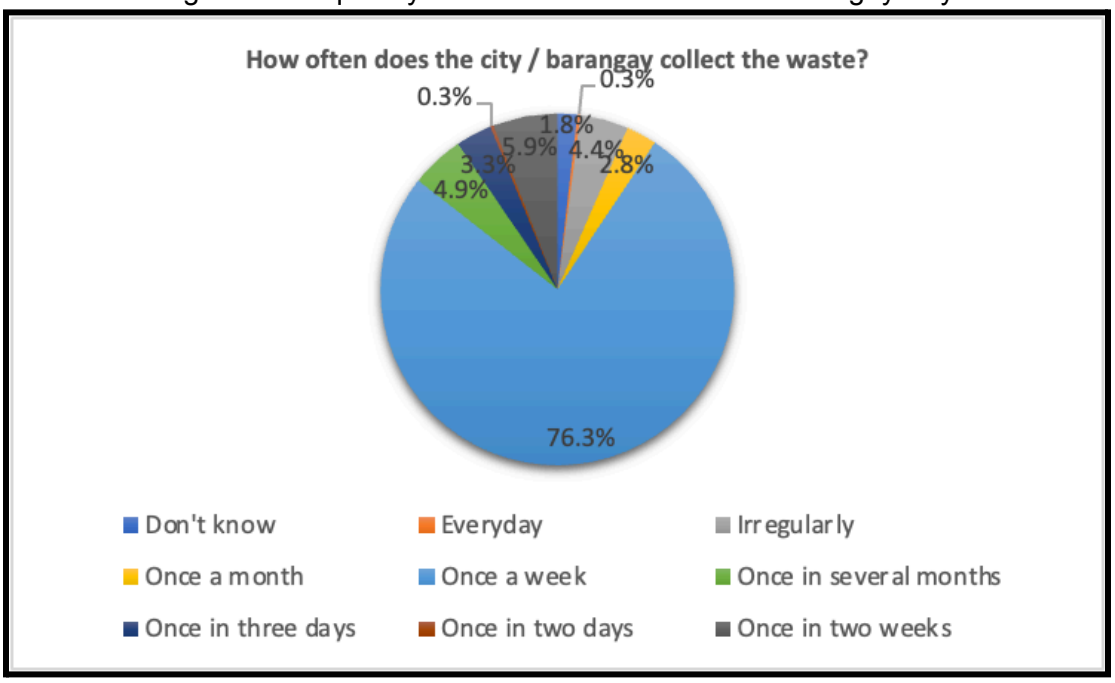


Likewise, 93.3 % are also aware about the negative effects of wastes to the environment. They unanimously agreed that wastes can pollute the environment if not properly disposed of. According to them, some of the reasons why wastes are not properly disposed include: 1) There is no compost pit or material recovery facility (MRF) in the barangay, wastes are disposed anywhere and this creates a nuisance (21.9%); 2) Wastes are left around the trashcan or trash bag (10.3%); 3) Wastes are left in the drainage (15.7%); 4) Wastes are left on the side of the road (9.5%); and 5) Wastes are not collected regularly (36%). As noted, the top reason that wastes are not properly disposed of is due to lack of a regular collection schedule. The lack of compost pit and MRF in the barangay also contributed much to the situation.

When asked about how much a household spends to dispose of solid wastes, 85% said they do incur any cost in terms of waste disposal while the remaining 15% have incurred costs ranging from Php100.00 to Php500.00 per month. However, it can be noted that they are not paying the barangay or the city, rather this is paid to the informal collectors (Payong-Payong drivers and even some children in the community) who are regularly collecting wastes from individual households for a fee. This scenario is a common occurrence in the various barangays of the city.

When it comes to the frequency of waste disposal, 52.6% of the respondents said they usually dispose their garbage on a daily basis, 22.4% said once every 3 days, 18% said they disposed their garbage irregularly depending on the volume generated, 6.7% said garbage is collected every 2 days and 0.3% said they have no idea of the schedule of waste disposal of their respective households. With this frequency of waste disposal of the household, the respondents were also asked if this matches the frequency of collection of the barangay or city. Based on the figure below, more than 75% of the respondents agreed that the barangay or city collects waste on a weekly basis; 5.9% said there is no definite schedule (irregular); others said once a month or once in several months. Based on the narratives of the participants during sharing sessions, collection schedules vary by barangay which is mainly dependent on the availability of collection trucks/vehicles.

Figure 9. Frequency of Waste Collection of the Barangay/City

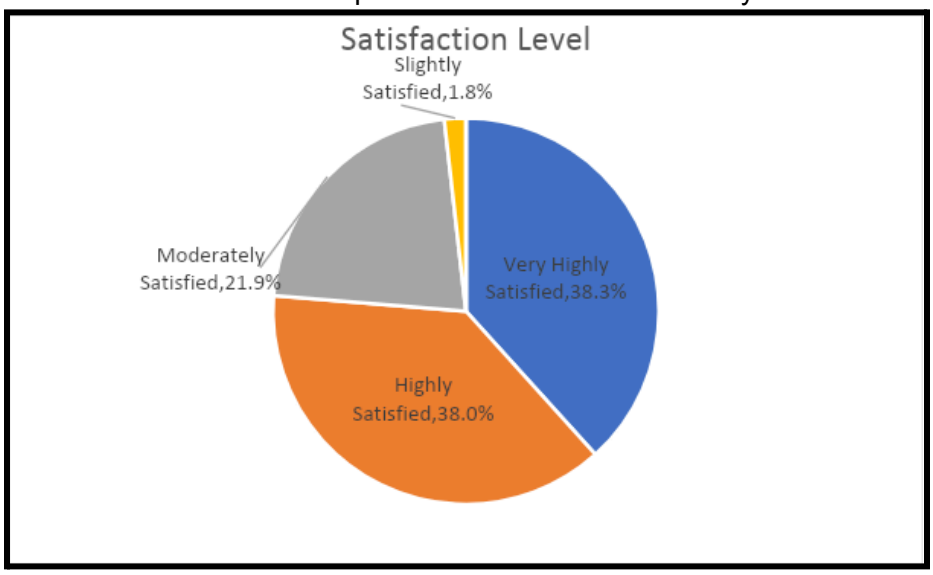


It can be noted that the frequency of disposal of the households, definitely, did not match with the frequency of collection, hence, contributed much to the problem of solid waste in the city. Moreover, further discussion also revealed that despite waste being segregated at the household level occasionally, the waste is still collected as a whole. There is inconsistency in IEC and implementation of the policy - IEC on the need for segregation of wastes but during the collection or there is a relatively strong IEC activities conducted by the BLGU's however, it is not reflected in the actual action of the CLGU in collecting the solid waste.

Further, it was also narrated by the respondents that only 2-3 barangays of the city have their garbage trucks for collection. Others are using other types of vehicles to be used in collecting. It was also observed that people in SUVs have been noticed to dispose-off of their garbage indiscriminately. This is aggravated by some informal garbage collectors who are also indiscriminately disposing of their garbage wherever possible.

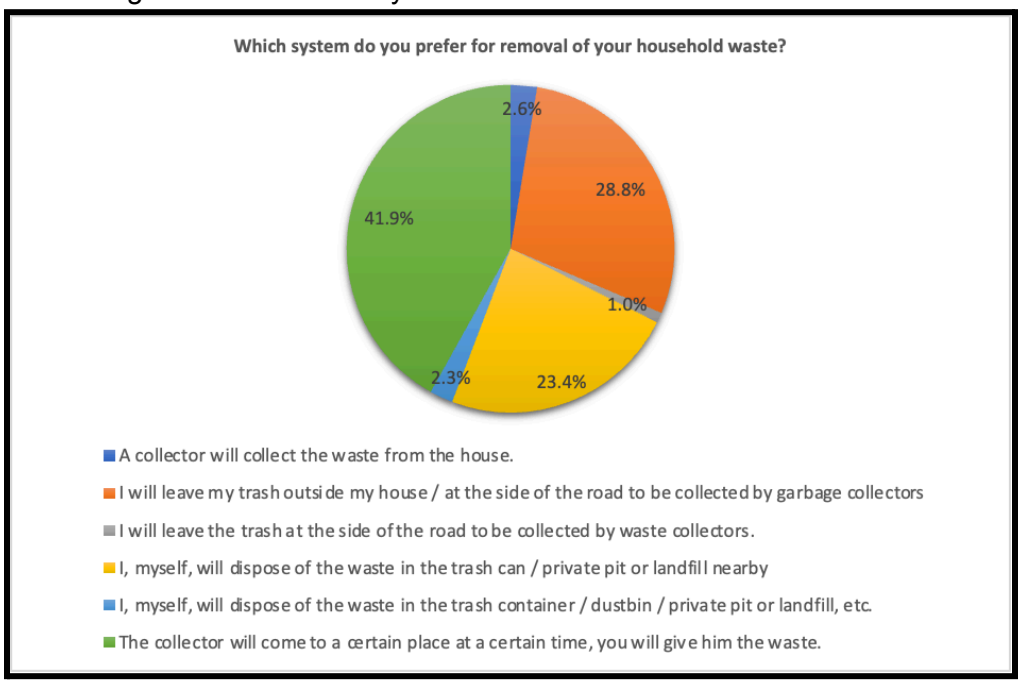
However, the above observation is not reflected in the satisfaction level of the respondents of the study. Figure 10 shows the satisfaction level of the present removal/collection system of the city. The results show that 38.3% and 38% are very highly satisfied and highly satisfied with the collection system implemented by the city, respectively. Only 21.9% and 1.8% are moderately and slightly satisfied with the system. During the validation workshop, it was further clarified by the respondents that their responses on the satisfaction level is based more on the response of the barangay when they have a problem on the presence of the waste in the locality and not primarily on the system of the solid waste collection.

Figure 10. Satisfaction Level of the present Removal/Collection System of Cotabato City



The respondents were also asked what will be their preferred system of collection. The results yielded three (3) major options on how to collect wastes from the households: 50% suggested that there would be a specific time and location when and where they could bring their respectives wastes to be disposed; 28.8% preferred to leave their wastes outside of their respective homes or at the side of the road to be collected by the collectors while 23.4 preferred to dispose their waste in the trash container/dustbin/private pit/landfill nearby.

Figure 11. Preferred System of Collection of Household Waste



5. On the establishment of Sanitary Landfill for Cotabato City

Cotabato City still uses its old dumpsite since the city has no sanitary landfill yet. To address the issue of open dumpsites and to further improve solid waste management implementation in Cotabato City, a proposed Sanitary Landfill is to be established in Tamontaka III, Cotabato City. However, there are some issues surrounding the said plan of the city. This include the following:

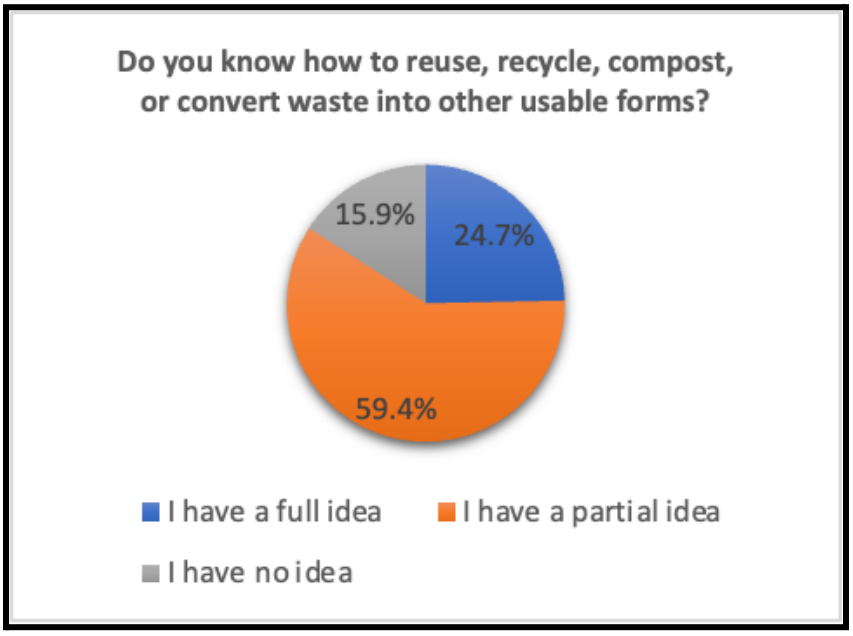
- Barangay Chairman of Tamontaka III opposes the establishment of the proposed sanitary landfill in the barangay
- Tamontaka III is not suitable as it is a swampy/low lying area. It is said that Tamontaka 5 is more suitable because it is more elevated.

Knowledge, Perspectives and Practices on the various Solid Waste Diversion Strategies for Cotabato City

1. On the knowledge about different diversion strategies

Figure 12 below the degree of knowledge of the respondents on the various waste diversion segregation such as re-using, recycling, composting and others. Based on the results, most of the respondents (59.4%) have only a partial idea about these waste diversion strategies while 16% have no idea at all. It can be further noted that only 24.7% of the total number of respondents have complete knowledge which only represents a quarter of the total number of respondents. This can be reflective of the actual practices of the population in the city.

Figure 12. Responses on the knowledge in Waste Diversion Strategies



2. On the Willingness to Segregate and Sell as A waste Diversion Strategy

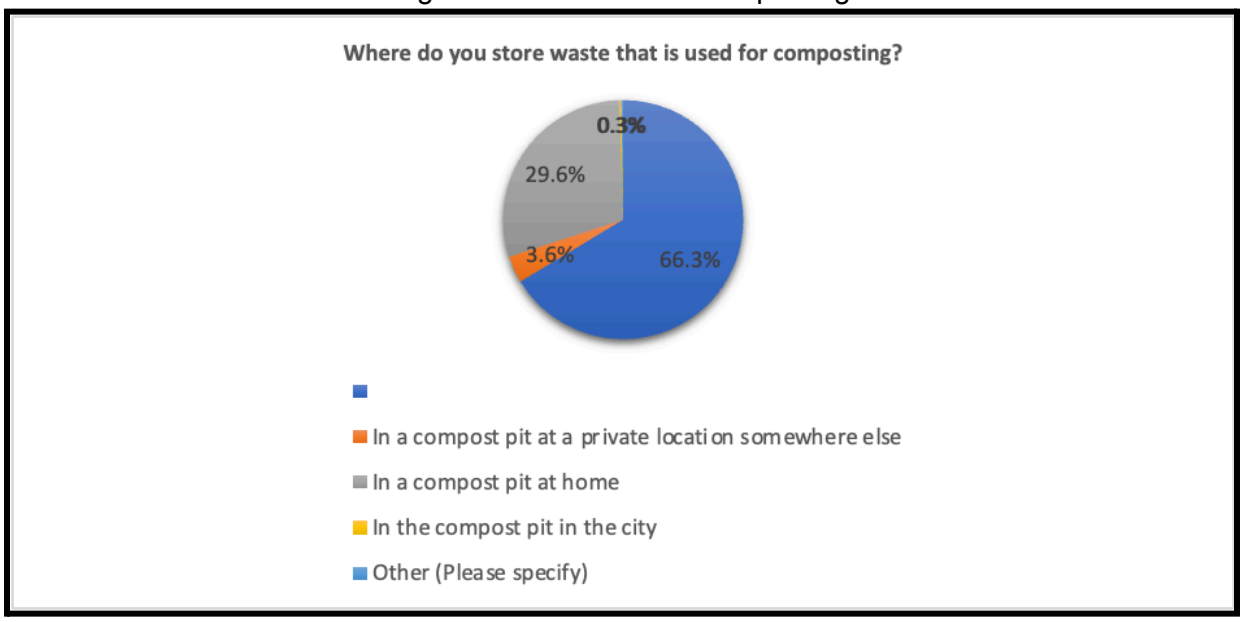
The household-respondents are willing to properly segregate according to different types. They are also more than willing to segregate those wastes that can be sold and serve as a source of income. These wastes include but not limited to the following: cardboard boxes; metal dicards;

discarded electronic devices; paper bags/packaging materials; plastics such as empty plastic bottles, cups, other types of plastics; all other types of wastes that can still be recycled, re-use, or re-purpose for other uses.

3. On the use of Composting Techniques as a Waste Diversion Strategy

One of the ways to lessen the accumulation of wastes is to separate biodegradables such as food wastes and leftovers and convert them into organic fertilizers to be used for agriculture. When asked if they are familiar with composting techniques as one of the waste diversion strategies, 72% of the respondents are familiar while the rest are not. The results of the study also indicated that the main areas where they store the biodegradable wastes and perform composting activities are the schools (66.3%) located in the various barangays while the respective homes (29.6%) are only secondary locations for composting.

Figure 13. Location for Composting



4. On the Appropriate Waste Diversion Strategies for Cotabato City

Table 7. Appropriate Waste Diversion Strategies for Cotabato City

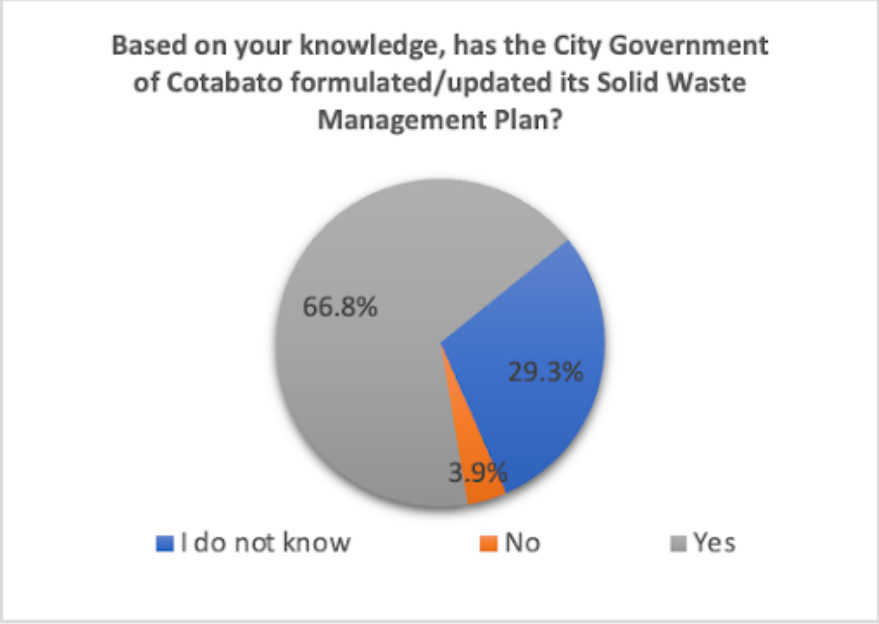
Waste Diversion Strategies	f	%
Recycling	385	99.0%
Reuse waste in the same or other steps of the production process. Selling waste to a third party	187	48.1%
Biological treatments	8	2.1%
Thermal treatment.	2	0.5%
Return waste to supplier of original materials.	2	0.5%

Based on the results of the study, recycling and reusing are the most appropriate waste diversion strategies for Cotabato City. Most common types of wastes that can be recycled and reused include but are not limited to plastics such as empty plastic bottles, cups, and other types of plastics . In addition, it was also agreed during the validation workshop that composting could also be done to divert biodegradable wastes such as food waste/leftovers and others.

5. As to the knowledge of the Respondents on the Updated Solid Waste Management Plan of Cotabato City

Almost 67% of the respondents said that they are aware of the Solid Waste Management Plan (SWMP); 29.3% said they have no idea; and 3.9% said that they do not know anything about the said plan.

Figure 14. On the Knowledge about Updated SWM Plan



The respondents were also asked whether they are aware of the Programs, Projects, and Activities (PPAs) that the City Government is currently implementing relative to SWM. Among these are the following: clean-up drives, coastal clean up and tree planting initiatives. Although, there are discussions surfacing about circular economy, concrete initiatives on this aspect are yet to be implemented.

Priority Projects for Cotabato City as perceived by the Respondents

When asked about what are the priority projects in the barangay, the results of the study show the following projects ranked by priority: 1) Solid Waste Management; 2) Sanitation; 3) Drainage; 4) Water Supply. Solid waste management, sanitation, and drainage are the top 3 priorities of the respondents to be given with interventions by the government. These three areas are interrelated with one another. Addressing the problem of solid waste and maintaining proper sanitation in all the barangays of the city will also address clogging of drainage and at the same time improve wastewater flow.

SWM Case Studies in Model Cities/Municipalities (Surallah, Kidapawan City and General Santos City)

Benchmarking activities were done to the three (3) identified Local Government Units specifically General Santos City, Kidapawan City and the Municipality of Surallah to gather information about their respective solid waste management program implementation. Below are some of the information gathered during the visit:

1. Basic Knowledge

1.1 General Santos City

- The residents of the city have a high level of awareness on proper waste segregation due to the IEC activities of the Solid Waste Enforcement Education Team (SWEET) of Waste Management Office (WMO). SWEET is an education and enforcement team in one.
- The city based on its SWM Plan has a clear schedule of collections and mechanisms of disposal of the garbage. Residents were aware when to put their specific type of garbage outside of the residents for collection.
- Some residents were complaining that sometimes the WMO waste collectors were collecting unsegregated waste.

1.2 Kidapawan City

- Majority of the people of the city are greatly aware about waste segregation and disposal as it was taught in school, and widely practiced.
- Kidapawan City ENRO used IEC materials, trash bins in public places, and utilized tri media (radio programs, Social media) in disseminating information regarding schedule of collections.

1.3. Municipality of Surallah

- Almost all the residents are properly oriented and very aware on how to properly segregate wastes by types
- They are also aware where to properly dispose their wastes; there are waste bins available in identified designated areas
- During visitation in the various barangays, staff from MENRO are not only enforcing but at the same time doing the continuous IEC/orientation to remind community residents of the proper waste segregation and disposal. This can be one of the good practices of the LGU that can be replicated by other LGUs

2. Waste Generation

2.1 General Santos City

- The Cell No. 1 of the 62 hectares SLF of General Santos City is already beyond its intended design and capacity but is still being actively used. This signifies that the waste production in the city is still increasing.
- General Santos City aside from being the center of commerce of Region 12 hosts several large hospitals and specialty clinics, generating large amounts of highly infectious medical waste.

2.2. Kidapawan City

- The trend shows that there is a monthly 10% increase in volume of waste output based on the 2022 and 2023 reading.

2.3. Municipality of Surallah

- The SLF in Surallah is a cluster facility accommodating at least 6 LGU's plus a number of large businesses who dispose of their solid waste in the municipality's SLF. In some period in the past, the SLF also accommodated the solid waste of the City of Koronadal.
- Given the increase in the waste generators from the above LGUs, it is also expected more residual wastes to be brought to the SLF

3. Collection

3.1. General Santos City

- The city and its constituent barangays had clear demarcation of responsibility. The city's WMO collectors focus on major thoroughfares and commercial areas while BLGU's were responsible in collecting and transporting waste from other areas of the barangay.
- For the WMO garbage collectors, there is a clear collection schedule for its coverage areas for residents to put their garbage in designated areas for pick-up. Residents were not allowed to put out their garbage before and after the designated schedule.
- Aside from the MWO, some offices of the LGU were also responsible in collecting solid waste within their area of jurisdiction namely the Administrators Office for the General Santos City Public Market and the General Services Office for the City Hall Compound.

3.2 Kidapawan City

- The city government is strictly implementing the “No segregation, No collection policy system in waste collection.

3.3. Municipality of Surallah

- For residual wastes, it is collected by the barangay and directly delivered to the Sanitary Landfill. While offices and establishments are collected by MENRO
- There is a pickup point for the central business and establishments where the collectors will collect it from there daily.

4. Intermediate Collection Points

4.1. General Santos City

- The City’s Public Market has its own ICP from where its waste was being collected and brought to SLF.

4.2. Kidapawan City

- The public places such as plazas, market, and roadsides are cleaned daily by the street sweepers and regularly collected. In the case of the central business, collection was done twice a day.

4.3 Municipality of Surallah

- There is a pick up points for the central business district and establishments where the collectors will collect it from there on a daily basis

5. Transportation

5.1. General Santos City

- Some BLGU’s in the city have more vehicles dedicated to waste transport as compared to that of the city.
- The city has some accredited private haulers transporting mostly the solid waste of some big commercial and industrial companies. While some companies like that of malls had their own transportation equipment.

5.2 Kidapawan City

- City ENRO is well funded by the city government for transportation of garbage. They have 8 trucks, 1 new dump truck and 2 compactors.

5.3 Municipality of Surallah

- There are garbage trucks designated to gather wastes from designated pick up points

6. Disposal

6.1 General Santos City

- The SLF of General Santos City is very large and is currently on the process of establishing its cell # 2 and 3.
- Some garbage truck entering the SLF of General Santos City were unsegregated and we noticed that they were allowed to directly dump their garbage directly to the disposal area or to cell # 1.
- Treated medical waste by AGM was being disposed of within the city's SLF.

6.2. Kidapawan City

- Kidapawan has a well-established landfill and reserved area for expansion.
- They also have a MOA with the Tacurong treatment facility and Maya Med will pick up the healthcare wastes and deliver them to South Cotabato.

6.3. Municipality of Surallah

- For biodegradable wastes, they are being brought to the Central MRF at the ecopark for conversion to organic fertilizers
- Recyclable wastes such as plastics such as empty bottles as well as glass bottles are also recycled as fence or shredded to be used in making bricks and cements at the CMRF inside the ecopark
- Residual wastes are directly brought to the sanitary landfill
- As observed during the visit, wastes in the SLF has no sludges

7. Waste Reduction, Reuse, Recycling and Diversion

7.1. General Santos City

- The design of the SLF of Gensan where the sorting area and the recycling facility given by UNIDO make sense, unfortunately the functionality of the recycling facility is questionable given the situation of the items inside and the lack of new recycled materials.

7.2 Kidapawan City

- Kidapawan City ENRO itself has its own recycling and composting facility. And this is operating daily (vermicomposting, hollow blocks and bricks).

7.3 Municipality of Surallah

- Surallah has one of the best waste segregation practices. They are strictly implementing "No segregation, No collection policy"
- Also notable is the lack of seepage of waste water

8. Private Sector and Community Stakeholders Participation

8.1 General Santos City

- General Santos City is quite fortunate to have sizable private establishments capable of contracting private organizations for the transportation and disposal of its solid waste but this private participation had been limited to large enterprises

only.
- The city has one company dedicated on treating medical waste prior to its disposal in the SLF

8.2 Kidapawan City
- Effective SWM leads to a healthy environment. Effective policy implementation influences people to change their behaviors and actively participate.
- Efficient solid waste management through the participation of all the stakeholders is notable having received awards for consecutive years.

8.3 Municipality of Surallah
- As noted, there is a active community participation when it comes to solid waste management as evidenced by the willingness of most of the residents to practice proper waste segregation and disposal

SECTION V: CONCLUSIONS AND RECOMMENDATIONS

With the above findings of the study, the following are the conclusions and proposed recommendations:

CONCLUSIONS

1. In terms of knowledge and awareness, there is a gap/disconnect between the knowledge gained by the community residents in terms of segregation and disposal and that of the provisions in RA 9003. This can be attributed to two factors: 1) trainings attended on solid waste management by the respondents were conducted more than 10 years ago, hence, the degree of retention is very slim; and 2) cascading/EIC of information on proper waste segregation and disposal was not properly done at the household level.

2. In terms of collection and disposal, there is a mismatch between the frequency of disposal of the households and the frequency of collection by the barangay or city. This due to insufficient transportation facilities of the BLGU/CLGU and at the same time the lack of sanitary landfill of the city. Hence, there is a need to harmonize collection and disposal schedules to lessen visibility and prevalence of wastes scattered in the various areas of the city. It is also a pressing concern for the city to establish its own sanitary landfill. Availability and accessibility of MRFs is also a major concern in the barangays.

3. On the knowledge and practice of various waste diversion strategies such as re-using, recycling, composting and other waste reduction strategies, it can be observed that most of the respondents have limited knowledge or are not so keen about these waste diversion strategies; hence, actual practice is not prevalent in the city.

RECOMMENDATIONS

Addressed to Cotabato City LGU

1. In terms of Knowledge and Awareness, there should be a full-blast/intensified campaigns to induce social behavioral change with regards to solid waste management; in the same manner, this should also be done for the IECs on proper waste segregation and disposal at the community and household levels. Considering the prevailing culture in the city with regards to solid waste disposal, it is highly recommended that during the IEC activities, the presence of high profile officials will be made available (for select locations only) to encourage those using the SUV's to properly dispose of their garbage.

2. In terms of collection and disposal, the following are suggested:
   - Look at the best practices of Surallah to incorporate to Cotabato SWM e.g. strict enforcement of the policy that no compostable materials will be thrown in the SLF.
   - Harmonization of the system, both barangay and city - scheduling, pickup points, segregation, etc.
   - Encourage large businesses to collect and transport their own solid waste
   - Develop mechanism to increase the number of MRF's available per barangay making it more accessible to most if not all residents and its maintenance maybe by those organizations/individuals/businesses engage into waste diversion, reduction and recycling
   - Considering the willingness of many residents of the city to pay for the disposal of their waste, the city LGU can provide capacity building assistance to barangay LGU's to develop their SWM Plan providing mechanism for the barangay to turn waste collection into income generating activity (bringing into practice the whole concept of Circular Economy)
   - Make a cluster facility with Parang or DOS and acquire additional dump trucks to meet logistical requirements; a MOA could be forged relative to this endeavor
   - Work out for grants or provide financial grants to barangay LGU's for them to buy vehicles for the transportation of the waste they collected.
   - In terms of disposal, the model developed by General Santos City in its development plan for the SLF can be replicated by Cotabato City in planning for its SLF i.e. The recycling facility will be established inside the SLF to facilitate the maximization of waste diversion and maybe considering the inefficiency of the government on this, the recycling facility can be operated by the private sector through a MOA with the city government.

3. On waste diversion/reduction strategies such as re-using, recycling, composting and other strategies, development of incentives and benefits for the private sector who are willing to engage into waste diversion, reduction, and recycling involving both financial and non-monetary incentives. Including the provision of capacity building assistance to grassroot level CSO's engage into different aspects of solid waste management.

4. The existing 10 year SWM Plan of Cotabato City, on page 7 it stated about the periodic assessment of efficiency and effectiveness of IEC/behavior change communication, enforcement of SWM related laws, and barangay compliance based on identified

performance indicators for each type of SWM operations; but during the project activities no mentioned were made that such assessment were conducted. The conduct of assessment as mentioned in the plan must be conducted to determine what accomplishments were made after more than 5 years after the approval of the plan.

Addressed to World Vision and CSOs/NGOs (SWM Programming)

1. A study on the gender roles and responsibilities with regards to SWM can be one of the research areas which need to be investigated.
2. Additional interventions in terms of provision of MRFs and other physical and logistics needs of the city can be part of the continuing program of WVDFI
3. A Research on the health risks and other harmful effects of the open dumpsite

Addressed to Community Stakeholders and Private Sector

1. Engage as partners of the BLGU/CLGU in SWM implementation
2. Make SWM a priority in Cotabato City in any engagement with the government or NGOs
3. Develop and engage into a sustainable business model based on circular economy to help the government address the problems associated with SWM
4. For private sector to train cotabato organizations in feasibility studies and partner with them for potential profit generation from solid waste