REGIONAL WORKSHOP

Measuring and Mitigating short-lived climate pollutants from the municipal solid waste sector

2-4 APRIL 2018,
BACOLOD CITY, PHILIPPINES

This report is prepared and submitted by IGES to CCAC-MSWI

1. Summary

1.1. Introduction

Carbon dioxide (CO_2), a primary driver of climate change, is responsible for more than half of the total current warming impact of human-caused emissions[1]. Emitted CO_2 remains in the atmosphere for hundreds of years, absorbing heat that contributes to a warming effect even after initial CO_2 concentrations start falling. Taking this into consideration, mitigation efforts solely focused on CO_2 will not be effective for slowing climate change in the near term, and need to be complemented by other measures addressing other potent greenhouse gases (GHG).

It is therefore crucial that mitigation strategies also focus on the reduction of short-lived climate pollutants (SLCPs), including methane (CH_4), tropospheric ozone (O_3) hydrofluorocarbons (HFCs), black carbon (BC), among others, which are responsible for as much as half of global warming not caused by CO_2 and possess atmospheric lifetimes of less than 20 years.

Cities are on the front-line in reducing emissions from the solid waste sector. Municipal solid waste (MSW) landfills comprise the third largest source of global anthropogenic methane emissions[2], and open burning of garbage and incomplete combustion of fossil fuels from waste trucks emit black carbon and other air toxins as well as GHG[3].

---

[1] EESI (2013): Short-Lived Climate Pollutants: Why are they important, Environment and Energy Study Institute (EESI), Washington DC, http://www.eesi.org/files/FactSheet_SLCP_020113.pdf

[2] United Nations Climate Change (2015): Mitigating SLCPs from Municipal Solid Waste Sector, https://unfccc.int/news/mitigating-slcps-from-the-municipal-solid-waste-sector

[3] EESI (2013): Landfill Methane, Environment and Energy Study Institute (EESI), Washington DC, http://www.eesi.org/files/FactSheet_Landfill-Methane_042613.pdf

National and sub-national authorities across the Asia-Pacific region face a number of challenges with reducing SLCP emissions from the MSW sector. These challenges include improper waste management (i.e., separation, collection and treatment), open burning of bio-waste and increasing amounts of waste being inadequately disposed in open dumpsites.

In this context, the Climate and Clean Air Coalition (CCAC) established the Initiative "Mitigating Short-Lived Climate Pollutants from the Municipal Solid Waste Sector (MSW Initiative)". The overarching goal of MSW Initiative is to foster partnerships, political will and technical capacity that directly support cities to take action on methane and black carbon reduction and management. One key aspect of this work is the provision of capacity building for national and local governments aimed at promoting the sharing of best practices, supporting strategy planning and encouraging city-to-city mentoring on effective measurement and mitigation of SLCPs.

IGES has been actively involved in the MSW Initiative since 2012, during which time it has engaged with a number of cities across the region with the provision of technical assistance and guidance on climate-friendly waste management practices and approaches. In addition to carrying out trainings towards the preparation of relevant action and work plans for reducing SLCPs, contributions have also included the development of an SLCP quantification tool designed to assist public authorities with conducting a rapid assessment of emissions, and inform improved decision making on the identification of alternative waste management options that will lead to the reduction of SLCP emissions.

Following these activities, IGES, in cooperation with the Philippine's Department of Environment and Natural Resources (DENR) and National Solid Waste Management Commission (NSWMC), organized a regional workshop from 2-4 April 2018 focused

on the use and operationalization of the SLCP quantification tool during the planning and implementation of the climate friendly waste management work plans. This report documents the proceedings of the workshop, which was designed to raise awareness, facilitate dialogue and promote knowledge sharing on effective SLCP mitigation actions in the MSW sector, with a view towards fostering a network of engaged actors from across the Asia-Pacific region.

A total of nine cities from across the region (Thailand, Myanmar, Cambodia, Indonesia and Philippines), as well as one Philippines' province, attended the workshop, which over the course of three days featured active participation from municipal governments, DENR, and IGES. Workshop discussion focused on understanding drivers of SLCP emissions generated by MSW, impacts and effects of SLCPs, ways to calculate SLCP emissions potentials, and available strategies for mitigating SLCPs in the municipal waste sector in view of policy, technology and finance issues. A site visit was also conducted to observe good practices associated with MSW management and encourage the documentation of options for future SLCP mitigation in future city action plans.

1.2. Objectives

The main objectives of this regional workshop are:

- To raise awareness about municipal solid waste management (MSWM) and its role in achieving the global climate and Sustainable Development Goals (SDG) agenda, including actions at the national and local government levels;
- To provide an overview of the work of CCAC-MSW Initiative, aimed at encouraging peer-to-peer learning among regional cities on SLCP mitigation strategies in the municipal solid waste sector;

- To facilitate knowledge sharing across the region on good practices related to climate smart waste management, discussing options for aligning activities with long-term development efforts; and
- To provide training on the MSW Initiative SLCP Emissions Quantification Tool (EQT) and Rapid City Assessment Tool. These tools will be used to support the development of relevant city-level action and work plans that indicate concrete pilot actions for SLCP/GHG reductions.

1.3. Expected Outcomes

The main expected outcomes of the workshop included an enhanced understanding about effective strategies and interventions for mitigating SLCPs across different stages of municipal solid waste management, with an initial calculation of potential SLCP reduction targets that can be reflected in future City Action Plans. In addition, the workshop provided a venue for identifying opportunities for city-to-city cooperation between regional stakeholders involved in waste management with the aim to build a network and community of practice.

1.4. Follow-Up Activities

The workshop will be followed up by a series of webinars in 2018 that will further elaborate on the use of the EQT, providing technical assistance towards the development of city-level action and work plans that outline measurable SLCP mitigation interventions under CCAC-MSW Initiative. A final regional workshop aimed at discussing main outcomes and lessons learned from these exercises is also planned for the end of 2018.

2. Proceedings

2.1. DAY 1: 2nd APRIL 2018

Opening Session

Welcome Message: Hon. Eveilo "Bing" Leonardia, Mayor, Bacolod City

The Bacolod City Mayor provided opening remarks, expressing his great privilege to host the event, noting the importance of environmental and climate change issues both at the local and global levels. The Mayor thanked all participants and wished the workshop success, adding that he hoped the city is conducive to the learning of all those concerned and that the outputs of the meeting contribute to a healthier and greener planet.

Keynote Address: Mr. Crispian N. Lao, Commissioner and Vice-Chair, National Solid Waste Management Commission (NSWMC)

Mr. Lao welcomed all participants and international partners to the workshop. He noted that in the Philippines, economic growth is associated with an increase in social and environmental challenges faced both by national and local authorities,

including the improper management of solid waste, a contributing factor to climate change. Mr. Lao outlined the main objectives of the workshop, which are to raise awareness on MSW and its role in mitigating SLCPs, to encourage learning through sharing of strategies and best practices in SLCPs mitigation and measurement, and to encourage cooperation in achieving these goals over the long term. Mr. Lao closed by stating the Philippine national government is ready and willing to support local and international partners in this effort.

Workshop Introduction: Dr. Premakumara Jagath Dickella Gamaralalage, Senior Researcher/ Program Manager, IGES

After acknowledging the support provided by local and national Philippines partners and highlighting the leading role the country is playing in the CCAC partnership, Dr. Premakumara then proceeded to provide background on how SLCPs are linked to waste management in view of the expected outcomes of the workshop. Noting that BC, CH_4, and HFCs have yet to be fully factored into Intergovernmental Panel on Climate Change (IPCC) metrics, he indicated that the scientific community is increasingly citing the importance of SLCPs in effectively addressing climate change, as well as recognizing the associated co-benefits for public health and ecosystems. The two primary entry points for mitigating SLCPs in the waste sector include both fuel combustion from transport along with open burning, both of which contribute to BC emissions, together with final disposal—a main driver of methane emissions. As the waste sector comprises the third largest source of GHG emissions and waste is primarily generated in cities, it is incumbent on concerned municipal stakeholders to examine the full life cycle of waste management.

Further, Dr. Premakumara elaborated that most countries, including the Philippines, have set emissions reduction targets as set out by their Nationally Determined

Contributions (NDCs), and emphasized that reducing SLCPs can also help achieve the Sustainable Development Goals (SDGs). Dr. Premakumara summed up by highlighting the role that IGES plays in supporting policymakers and practitioners involved in CCAC-MSW Initiative, especially with regard to data collection, formulation of action plans, planning of scenarios, and implementation of actions: notable examples include Phitsanulok in Thailand, Battambang in Cambodia, Surabaya in Indonesia, Rayong and Map Ta Phut in Thailand, and Cebu City in the Philippines. Lastly, he explained that the MSW Initiative has an emission calculations tool to measure GHG and BC emissions, developed by IGES for the MSW Initiative, which would be explained in detail over the course of the workshop. In so doing, the workshop will help to facilitate information exchange between regional cities, with IGES supporting continued training and capacity building aimed at promoting city-to-city learning over the longer term.

Session 2: MSWM and its role in achieving the global climate and SDG agenda

Overview of Current MSWM Practices in the Philippines and Efforts to Align with National and Subnational Policies, Strategies, and Actions on Climate and SDGs: Mr. Rolando Abad, Jr., Climate Change Division, Department of Environment and Natural Resources (DENR)

Mr. Abad explained that the Philippine's Ecological Solid Waste Management Act (Republic Act 9003) was passed in 2000. It mandates segregation at source, achieving waste diversion of at least 25%, closure of dumpsites, and proper management of residual wastes. Further, the country's Climate Change Act was passed in 2009.

Supporting policies include Executive Order No. 174, series of 2014, which mandates the institutionalization and sustainability of a GHG accounting and reporting system. For example, the Environmental Management Bureau (EMB) is mandated to lead the development of the inventory for the solid waste, wastewater, and industrial processes and product use sectors. The National Climate Change Commission (CCC) is the overall coordinating body, consolidates the reports, and is responsible for formulating the country's Intended/Nationally Determined Contribution (NDC) as well as support related initiatives. The Philippines submitted its INDC on October 2015 and is now in the process of preparing and deciding upon the main activities under its NDC.

Solid waste management activities proposed under the NDC presently under development are based on a 2014 study conducted by the United Nations Development Programme (UNDP) as part of its Low Emissions Capacity Building

initiative in the Philippines (LECB-Phils). Nationally Appropriate Mitigation Action (NAMA) options for the waste sector include:

- Scale up of the application of methane recovery technology
- Waste to energy conversion of residual wastes
- Improvement of solid waste diversion
- Diversion of organic wastes for composting
- Segregation of plastics, metals, and paper for recycling
- Improvement of waste collection and disposal
- Optimization of SW collection routing schemes
- Closure of open and controlled dumpsites
- Use of eco-efficient / methane oxidizing soil cover

Overview of Current MSWM Practices and Institutional Setup in the Philippines: Ms. Liz Silva, NSWMC

Ms. Silva outlined the provisions of RA 9003, which include the establishment of an institutional support mechanism necessary to implement effectively the law. Solid waste management functions are distributed among national, regional and local government entities and the participation of relevant stakeholders is highly encouraged. RA 9003 through the creation of the NSWMC provides national level oversight and policy formulation. RA 9003 has also brought about the formation of a National Ecology Centre (NEC) under the Commission to provide capacity-building services on SWM. Regional Ecology Centres (RECs) further support the NEC.

The NSWMC is chaired by the DENR Secretary and co-chaired by a representative from the private sector. DENR's Environmental Management Bureau (EMB) provides secretariat support to the NSWMC, which is headed by an executive director nominated by Commission members and appointed by the chairperson. Under RA 9003, the NSWMC was established with fourteen (14) members from the government sector and three (3) members from the private sector, each of which have different roles and mandates.

Ms. Silva explained that Section 10 of RA 9003 states that the local government units (LGUs) are primarily responsible for the implementation and enforcement of the provisions of the Act within their respective jurisdictions. LGUs comprise of 81 provinces, 145 cities and 1,489 municipalities, and 42,000 barangays nationwide. Barangays are the smallest political subdivision in the Philippines. Municipalities and cities are composed of many barangays. Under this purview, RA 9003 mandates that segregation and collection of solid waste is to be conducted by LGUs, specifically at the barangay level for biodegradable and recyclable wastes; the collection of non-recyclable materials and special wastes is under the remit of the municipality.

Implementation of Waste Management Policies: The Case Study of Bacolod City: Mr. Rommel Palalon, Bacolod City Environment and Natural Resource Office (ENRO)

Mr. Rommel Palalon, representing Bacolod City's ENRO, thereafter presented on city-level actions taken to scale up and improve waste management practices within Bacolod City.

Bacolod City is the largest and highly urbanized city in the Province of Negros Occidental. It has 61 barangays (villages) and has a total area of 16,145 hectares. Population in 2015 was 561,875 and with an annual growth rate of 1.79%. Pre-implementation activities undertaken for improving waste management in Bacolod included the reconstitution of the City Solid Waste Management Board (CSWMB) as well as various departments of the city government. Similarly, Bacolod implemented information, education and communication (IEC) activities to raise awareness about proper waste management practices among city residents. As the previous

administration had not strictly implemented waste segregation, a "no segregation, no collection" policy was reinforced. Since carrying out these interventions, 50 Material Recovery Facilities (MRFs) have been constructed. National legislation on waste management, namely Republic Act 9003 (RA 9003) is enforced by the City Legal Office (CLO) and trainings have been conducted targeting community units (i.e., barangays), schools, waste vehicle drivers as well as street sweepers. The city has also made efforts to benchmark composting methods being carried out by the barangays.

The City of Bacolod has constructed a sanitary landfill facility. Built on April 20, 2012, the facility has already been formally transferred to the city by the contractor. In addition, all nine open dumpsites previous located at various locations throughout the city have already been closed, including the 4.5-hectare dumpsite in Barangay Felisa, which is presently being rehabilitated through a phased approach. 2.5 hectares already have soil cover. Other closure and rehabilitation activities include monitoring wells, leachate treatment ponds, compacting, and land stabilization. Lastly, Mr. Palalon indicated that Bacolod has also introduced a comprehensive Solid Waste Enhancement Program (SWEP) whereby the city collects garbage fees from local commercial establishments of which 50 percent is allocated towards financing barangay initiatives (approximately PhP 2 million per barangay).

Question & Answer (Open Forum)

- Ms. Maryani Yanti, Jambi City, Indonesia requested more details on the punishment for those who violate RA 9003 and how the city apprehends those who transgress the law.

- Bacolod City has ordinances against littering and illegal dumping. First offense is PhP 500 or community service, with more strict penalties for repeated offenses. The city has also established an enforcement team, who routinely monitor the city with a view to clamp down on illegal dumping.

- Mr. Willy Irawan, Medan City, Indonesia asked more clarifications on the strong points of RA 9003. Is it outreach or enforcement method? Is the "no segregation, no collection" policy driven by government or by the community itself?
  - RA 9003, or the Ecological Solid Waste Management Act of 2000, stipulates the respective responsibilities of the national, regional, and LGUs. LGUs are responsible for segregation, collection, processing and disposal. One distinct provision of the law is minimization of wastes, including recycling and composting of wastes. The law also provides for the mandatory closure of dumpsites and the use of more environmentally acceptable means of disposing residual wastes. LGUs have the responsibility of passing ordinances and implementing the local laws.
  - As far as effective implementation, as of last December, Bacolod City had to relaunch its segregation/collection program due to challenges involved with carrying out the law. Over the past three years, Bacolod City had to explain to 61 barangays that waste should be separated accordingly. Ultimately, any genuine solution must address the culture of over consumption and disposal.

Sustainability Assessment of MSWM Systems via Life Cycle Assessment (LCA), Dr. Nirmala Menikpura, IGES Fellow

Dr. Menikpura started her lecture by explaining that the EQT is based on a standard LCA methodology. LCA is not a new concept and has often been used as a tool in the

environmental sector for assessing resource depletion and climate change. LCA can be applied to understand the environmental impacts associated with a product and/or service at all stages of their life cycle – from extraction of resources, through the production and use of the product, reuse, recycling or final disposal. Steps involved with conducting LCA include goal and scope definition (e.g., setting a boundary), inventory analysis (e.g., quantification of all inputs and outputs), impact-assessment (e.g., climate impacts, land conversion, acidification potential, toxicity), and interpretation of results (e.g., to apply in decision-making processes).

Dr. Menikpura then went on to describe the conceptual framework for LCA in further detail. LCA starts with an assessment of raw materials extraction, processing, manufacturing distribution, use of the product, and disposal or possible recovery. Analysis of these stages can include an evaluation of environmental interventions (raw material extraction; emissions in air, water and soil; physical modification of natural area such as land use conversion, noise, etc.); intermediate assessment, and end-point impacts. Taken together, a multidimensional sustainability assessment based on LCA should consider actions that are economically viable; environmentally beneficial, and lead to measurable improvements in quality of life. Using LCA to examine waste management potentials such as recycling can be taken as an example.

For instance, it is clear that MSWM becomes progressively more complex with an increase of waste volumes. Most developing Asian countries practice open burning and non-engineered landfilling as their primary means of disposal. Emissions include CH_4, Ammonia (NH_3) and Hydrogen Sulfide (H_2S) (both contributors to acid rain), as well as Volatile Organic Compounds (VOCs) and heavy metals, posing health issues to local communities.

Similarly, GHGs and SLCPs are emitted at each step of the waste management process. In waste collection, combustion of fuel releases CO_2 and BC. Operational activities emit CO_2, CH_4, BC and disposal emits large amounts of CH_4.

Integrated SWM stands as the most promising practical solution to achieve more sustainable SWM for all waste media, including solid, liquids and gases. All types of recycling stand to yield reductions in resource and energy consumption as compared to virgin production; likewise, mitigation via resource recovery from waste shows remarkable potential compared to baseline scenarios.

Dr. Menikpura closed her presentation by discussing some of the challenges and opportunities associated with applying LCA to SWM. Challenges include the high amount of data required, which requires human and associated financial resources in which to collect and process. On the other hand, there are also a number of identified opportunities, such as the potential to contribute to a country's national sustainable development agenda, and improving research capacities such as through the establishment of a national life cycle database, among others.

Introductions by Regional Participant Cities

This session allocated time for participating cities to share information on their specific waste management context, focusing on the following aspects:

- City background
- Current waste management system
- Good practices and innovations
- Identified priorities for future waste management

- Waste management challenges

Mr. Phorpminea Hing, Deputy Governor, Kampong Chhnang Municipality, Cambodia

Kampong Chhnang Municipality is located in Kampong Chhnang Province, in central Cambodia, approximately 91 km. from the capital city of Phnom Penh. Waste management in Cambodia is defined at the national level, based on Sub decree No. 113 S.E., which classifies waste as "items, materials or products generated from daily activities that do not contain toxins or hazardous substances". Likewise, urban solid waste refers to solid waste generated strictly from business activities or services absent of toxins or hazardous substances; hazardous waste on the other hand concerns solid, liquid, gaseous, or other harmful substances that pose a risk of damage to humans or the natural environment. In general, solid waste management is not sufficiently practiced in Cambodia for several reasons: a lack of public concern about waste

management, infrequent and limited waste collection services, and a general dissatisfaction with existing services. In Kampong Chhnan, a service agreement with a private contractor for conducting collection, transport and disposal was only formalized within this year.

Waste management typically is either collected at the household level and transported to the local landfill or illegally disposed of at various locations around the city. Valuable recyclable materials are retrieved by waste pickers at the landfill site or are purchased by scrap dealers, who in turn resell them to recycling firms that market them to international foreign buyers outside of the country. Main challenges concerning waste management in Kampong Chhnang include the absence of source segregation, limited public participation in waste management such as fee payment, limited capacities of waste collectors, and lack of effective law enforcement capacities to apprehend

violators, among others. In line with these challenges, the city has outlined several priorities for waste management including construction of a final disposal site following technical standards, raising public awareness about good practices especially source segregation, as well as supporting an enabling environment for encouraging investment into the sector.

Ms. Mariani Yanti, Ph.D, Head of Environmental Department, Jambi City, Indonesia

Jambi City, located on the Indonesian island of Sumatra, covers 169.53 km^2, comprising 0.38% of Jambi Province in total. The current population is 734,000 residents with a growth rate of roughly 3 percent. Jambi City is divided into 11 sub districts and consists of 62 villages. The city faces a number of environmental issues and challenges including high population growth, decreasing availability of food, water and housing due to higher populations, declining quality of natural resources, and vulnerability to climate change. At the same time, the city has implemented several waste minimization and resource recovery initiatives over the years. Examples include the introduction of composting facilities, the conversion of the local dumpsite to an integrated resource recovery centre, including a sanitary landfill with landfill gas capture/waste-to-energy capabilities, as well as the institution of waste banks in all sub districts and schools. Main challenges for the city in terms of waste management include financial limitations, human resource constraints, and low public awareness

about the need to carry forward waste management initiatives over the long term. Future priorities for the city involve further reducing waste generation rates, increasing waste collection rates, and implementing waste separation at source.

Mr. Willy Irawan, Head of Sub-Division for Environment and Spatial Planning, Medan City, Indonesia

Medan City occupies 265, 210 km^2, making up approximately 3.6 percent of the total area of North Sumatra. In 2017, the city was estimated to host roughly 2.7 million people with a waste ratio of 0.6 kg. per capita, which equals to 1,286 tons per day of waste. Medan City has solid waste service coverage of about 80 percent, though with total waste generation increasing the local landfill is anticipated to soon exceed its capacity. 71 percent of the landfill is currently occupied.

In terms of good practices, the city has established several waste transfer stations, waste banks and composting sites to promote greater separation of waste. Presently the main challenges faced by the city in terms of waste management involve fostering behavior change around 3R (reduce-reuse-recycle) practices, as well as building public-private partnerships in the waste sector. Future priorities for the city include the formulation of an integrated waste management policy with a focus on increasing waste recovery rates, optimizing annual budgeting and expenses for waste management, upgrading the city's final disposal site to a controlled landfill, and implementing waste-to-energy.

Mr. Zaw Lwin, Assistant Director, Pollution Control and Cleansing Department, Nay Pyi Taw, Myanmar

Nay Pyi Taw is the capital and administrative center of Myanmar, located 393 km. north of Yangon and 303 km. south of Mandalay. The city is growing due to increasing population and affluence, reinforced by continuous internal migration of rural residents to the city and its new satellite towns.

In addition to the country's recently launched national waste management strategy, Myanmar's Agenda 21 strategy focuses on solid waste management as one of its primary objectives. Key activities of this program include improving baseline data and information on waste, enhancing the national and local level management and regulatory systems concerning waste, delivering information and education initiatives on waste, formulating guidelines on waste collection, recycling, treatment and disposal, as well as promoting public private partnerships in the waste sector.

Nay Pyi Taw Development Committee is the principal agency responsible for planning, development, provision of infrastructure and operation of municipal services, including water supply, sanitation, waste management and other services. Currently solid waste generation in Nay Pyi Taw is estimated to approximate 160 tons per day. The city utilizes 73 collection vehicles and employs 300 laborers on a daily basis, using the bell ringing method to alert local residents when waste collection is being conducted. On-call waste collection is also implemented for commercial enterprises as well as public offices. Solid waste is collected from households and transported to three final disposal sites depending on the respective township, whereas hazardous waste generated from hospitals is separately collected, incinerated and disposed in accordance with respective clinical waste plans. In addition to developing plans to make use of vermiculture composting aimed at reducing the volume of organic waste generated from markets, the city also is in the final stages of developing a strategy for the safe management of healthcare waste with support and cooperation of the Ministry of Health.

Major issues and constraints facing the city in terms of solid waste include lack of source separation; uncontrolled dumping, with current landfill sites not following technical and hygienic specifications; lack of adequate equipment and human resources for waste management; low public awareness about waste issues; and insufficient enforcement of solid waste regulations. In this regard the main priorities for the city in terms of solid waste management is to institute a source separation system while at the same time encouraging overall reductions in the generation of municipal waste.

Ms. Jiraporn Pumwiset, Sanitation Technical Officer, Nonthaburi City, Thailand

Nonthaburi City is located in Nonthaburi Province, directly northwest of Bangkok. It occupies an area of 38.9 km^2, and hosts a population of approximately 255,571 inhabitants, or 148,575 households. The city estimates that 310 tonnes of solid waste are collected on a daily basis from households, schools, and commercial establishments, either by house-to-house collection or from the use of community containers, which is thereafter disposed in the city's sanitary landfill. Similarly, Nonthaburi has recently established a composting center, where approximately 144 tonnes of organic waste collected from markets, in addition to garden waste from households, is sent daily. The city estimates that 1.86 tonnes of hospital waste is incinerated per day; 10.47 tonnes of hazardous commercial waste per year is directed to a secure final disposal site.

Taken together, the city identifies several good practices with regard to its delivery of municipal waste management, including separation at source of organic and hazardous waste; its ongoing composting practices; the designation of hazardous waste collection points; and the operation of a sanitary landfill as a centralized final disposal site. Key priorities for the city include continued efforts to reduce waste generation rates, while also increasing waste recovery; implementation of waste separation at source; the establishment of waste transfer stations; and the need to optimize waste collection services by indicating dates for pickup of different waste types. In this context, the city also faces a number of challenges, such as low public awareness and compliance with waste laws and regulations; issues of enforcement; data gaps; inefficient waste collection and other attendant infrastructural problems; as well as health risks due to poor waste management.

Mr. Arthur Batomalaque, City Environment and Natural Resource Officer, City of San Carlos, Philippines

The City of San Carlos is located in Northern Negros Island, and with a land area of 45,150 hectares, it comprises a population of approximately 132,536 inhabitants. Made up by 18 barangays, waste generation is estimated to be 19 tons per day. The city practices an integrated ecological management approach, which encompasses forest and water resource management, coastal, marine and fisheries management, together with climate change and disaster risk reduction efforts, under what it labels its "Highlands to Ocean Approach" (H2O). H2O includes a specific component focused on solid waste

management, wherein the city has implemented several initiatives aimed at changing the behavior of its resident with regard to waste, including through information, education and communications campaigns, incentives and awards, in addition to participatory monitoring and evaluation through the establishment of a community enforcement team. San Carlos has also upgraded its final disposal facility, establishing a MRF together with a composting center, among other actions. Doing so has led to the achievement of many notable milestones, such as achieving a waste diversion rate of 67 percent in 2016. After conducting a community led GHG accounting exercise, San Carlos presently estimates that its municipal waste sector has already achieved carbon neutrality.

Ms. Ferdinand Bautista, Municipal Environment and Natural Resource Officer, Municipality of Maragusan, Philippines

The Municipality of Margusan occupies a total land area of 54,745 hectares and hosts a population of 60,842 inhabitants. Margusan comprises 24 barangays of which 21 have regular waste collection services. The city's current solid waste management system classifies waste into four types, which include recyclables, non-recyclables, compostable, and special waste. Recyclables with market value are regularly collected by junkshops for resale; the city also makes use of a MRF that assists in improving the efficiency of waste operations. Good practices reported by the city include waste separation at source conducted at the household level; residents are also actively involved in waste separation activities and Margusan reports high levels of community participation in terms of depositing wastes at the local MRF.

In addition, the city also reports using low emissions vehicles for waste collection. Local industries and backyard composting, as well as urban gardening is prevalent throughout the city, actively promote recycling. Future priorities with regard to waste management include continued efforts to reduce waste generation rates, and increase waste recovery rates; further actions to upscale urban gardening practices with a view to optimize backyard composting activities; establishment of more MRFs throughout the city, as well as upgrading of recycling facilities; and ultimately the opening of a sanitary landfill within the city. Accordingly, Margusan is working to address several waste management issues, such open dumping and burning of waste in selected areas, which contributes to pollution and contamination of local resources; the need to improve existing waste infrastructure, such as MRFs, and upgrade recycling facilities; associated budget constraints; and data gaps constraining its monitoring efforts.

Ms. Elbie Baculanag, Provincial Environment and Natural Resource Officer, Province of South Cotabato, Philippines

With an estimated population of 801,354 inhabitants, the Province of South Cotabato comprises a land area of 370,590 hectares and encompasses 11 municipalities with 199 barangays made up of 165,151 households. The Provincial office maintains comprehensive data on current daily waste generation rates for all municipalities, which includes associated information for residential, commercial, institutional, industrial, and agro-industrial sectors. All municipalities in South Cotabato Province operate final disposal facilities, ranging from sanitary to controlled dumpsites. Furthermore, a number of municipalities have developed their own 10 year integrated solid waste management plans, in line with the South Cotabato 2015-2024 SWM Plan Framework, which sets out key criteria for implementation.

Good practices include competitions for identifying the cleanest and greenest LGUs. Future priorities for the province range from lobbying efforts to establish and/or enhance the authority local-level ENROs for all municipalities; strengthening local bodies such as technical working groups at the provincial, municipal and barangay levels; continued enforcement of existing waste laws and regulations; further collaboration with other agencies and private sector leaders; scaling up actions to reduce waste generation rates and increase waste recovery rates; expanding the system of incentives and rewards recognizing proper waste management in line with current activities; continued provision of technical assistance for updating municipal waste plans, as well as technical and financial support for both the adoption of advanced waste treatment technologies and the clustering of common final disposal sites. In this regard, the Province faces a number of challenges, such as compliance issues with existing waste legislation; the need to enhance waste treatment activities including final disposal; as well as improving data collection and management for further updating municipal waste management plans.

Discussion and Identification of Key Challenges, Good Practices and Lessons Learned from City Presentations, Matthew Hengesbaugh, IGES Policy Researcher

Summarizing the case study presentations, Mr. Hengesbaugh provided an overview of the common waste management challenges identified by all cities in attendance. These included:

- Behavioral**:** low public awareness and participation, increasing consumption
- Technical: lack of source separation, infrequent collection services, inadequate human resources, data gaps

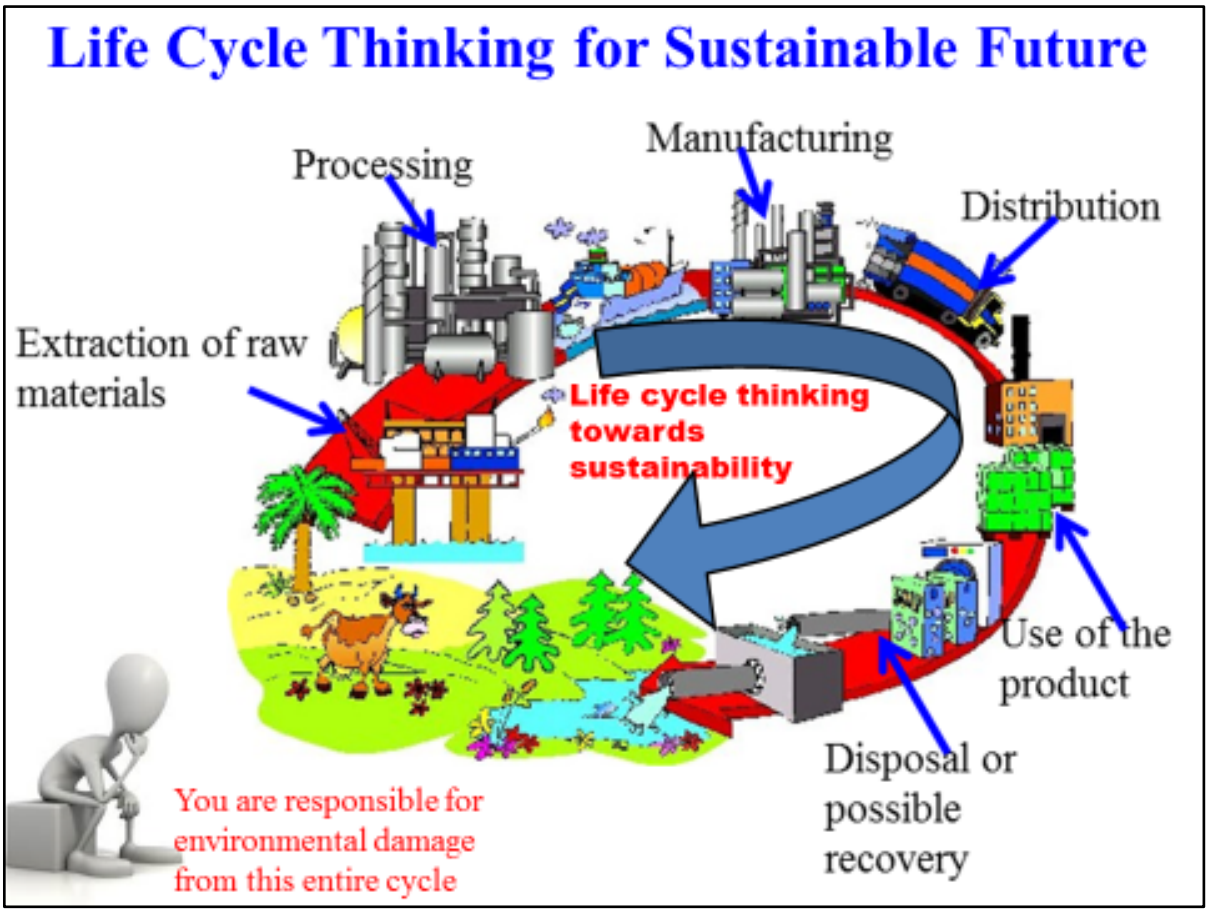
- Financial: budget constraints
- Policy: unsystematic coordination/coherence between national and subnational authorities
- Infrastructural: absence of appropriate technologies for waste treatment/disposal, overcapacity of final disposal sites
- Legal: weak enforcement of policies and regulations
- Health: public health risks
- Environmental: air/water pollution, climate change

Moreover, Mr. Hengesbaugh highlighted a number of good practices shared between many of the cities in attendance, such as policy prioritization and introduction of specific regulations on waste management; community consultations and participatory evaluation of waste operations; public campaigns, including but not limited to information and education initiatives, and other interventions such as waste separation activities (i.e., waste banks); the establishment of waste treatment and

recycling centers (composting, MRFs, waste to energy), and infrastructure development, including landfill rehabilitation and upgrading of existing sites.

Mr. Hengesbaugh closed his presentation with a discussion about some of the main lessons learned so far: namely, waste management presents both opportunities and challenges for socioeconomic development; that community participation, education and public awareness campaigns remain critical to success; and that both domestic and international partnerships are often prerequisite for building capacity and mobilizing resources.

Introduction to EQT and Its Application for MSWM Decision Making, Dr. Nirmala Menikpura, IGES Fellow



In this session, Dr. Menikpura introduced the EQT and its interface. The EQT is comprised of a series of worksheets designed in such a way to account for the full life cycle of materials across all stages of waste management. As such, the EQT allows users to undertake a rapid assessment of GHGs and SLCPs to establish a baseline and assess alternative waste management solutions. Accordingly, it serves as a method for quantifying emissions, a means for guiding decision-making on waste management options, and a monitoring tool for assessing progress made on mitigation efforts.

Dr. Menikpura then proceeded to provide step-by-step guidance on how to enter data and obtain results on preferred waste treatment options, explaining input data requirements which allow users to select either country/location specific emissions factors or default values (e.g. grid emission factors, calorific values of the fuel, efficiencies of gas and electricity recovery, emission factors for avoided chemical fertilizer production). In this way, SLCPs and GHGs emissions from individual treatment method are then disaggregated for each pollutant and presented per pollutant, per tonne of waste, with avoided virgin materials potential also displayed. The end result is a summary of SLCPs and GHG emissions from business as usual practices compared with alternative waste management scenarios in both table and graphs format. Participants were requested to test the EQT by inputting waste management data from their respective cities, and to bring any questions or issues to the workshop for the lecture on the following day.

2.2. DAY 2: 3rd APRIL 2018

Session 3: Awareness Raising and Capacity Building on SLCP Quantification

Highlights of Day 1, Dr. Rajeev Singh, IGES Policy Researcher

Dr. Singh opened the Day 2 with a summary of the previous day's lecture on main features of the EQT. Explaining that LCA and EQT are techniques for assessing the environmental impacts associated with product and services at all stages of their life cycle (from cradle to grave), Mr. Singh underlined how such an approach can help inform decision making on waste management by providing an analysis of environmental, social, and economic risks and benefits. Mr. Singh proceeded to

outline the objective of the workshop for Day 2, including a detailed introduction to how EQT can be applied to decision making on waste management, presentations by participant cities on their specific waste data and how challenges with SLCP quantification can be addressed, and further training on the EQT methodology and operation using said data.

Continuation of Technical Lecture 2: Introduction to EQT and its Application for MSWM Decision Making, Dr. Nirmala Menikpura, IGES Fellow

Dr. Menikpura continued the previous day's lecture, fielding participant's questions and concerns on their efforts to utilize the EQT by inputting respective city waste data. This gives first-hand training for the participants on how to use the EQT using their own city's data.

Session 4: Discussion on Data Analysis and EQT Methodology

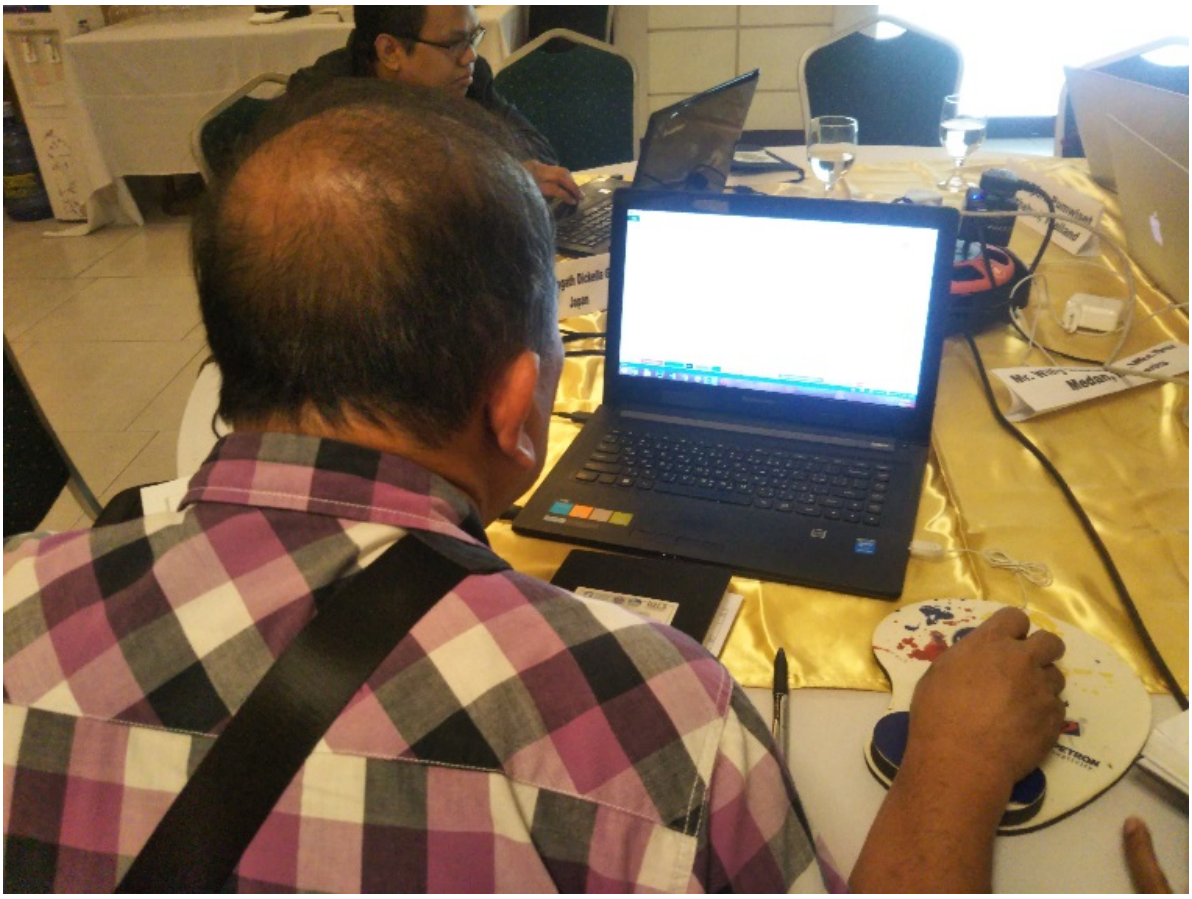
Presentations by Participant Cities on Waste Data

In this session participants presented information on available waste data from their respective cities, noting gaps and challenges associated with the quantification of SLCP emissions. Guidelines for this exercise were circulated prior to the workshop, requesting participants to provide the following information:

- Waste generation rate
- Current waste composition
- Waste collection rate
- Transportation data
- Recycling/intermediate treatment data
- Final disposal data

- Data for scenario preparation

Accordingly, this data was used for purposes of inputting into the EQT, with participants guided on how to calculate SLCP mitigation scenarios appropriate to their own context.



Discussions on Strategic Actions to Reduce SLCPs from MSWM at Local Level

This final session was designed to allow time for participants to conduct group work aimed at summarizing key actions and lessons learned from the workshop. Participants were organized into several groups and were requested to list information on 1) main challenges concerning the mitigation of SLCPs and utilization of the EQT; 2) proposed measures to address said challenges; and 3) technical support required for future implementation. Main concerns raised include the limited financial and

technical resources available to conduct a proper waste analysis and characterization study, especially with regard to open burning and waste collection, recycling and disposal operations. These issues are especially problematic, given that in most cities waste is not separated at source and is handled by the informal sector; this in turn complicates data collection efforts. In addition to infrastructure gaps, identifying effective ways to promote behaviour change with regard to waste management was also listed as a challenge.

In order to address SLCPs in the waste sector, participants highlighted the need to upgrade existing treatment and disposal facilities (composting, landfill, etc.); provide incentives and disincentives for waste diversion, as well as expand waste collection coverage and service areas; strengthen enforcement and/or issue new policies, regulations and related legislation on waste; improve community participation in waste management and monitoring processes including by conducting targeted information, education and outreach campaigns; and build capacity of respective national and local authorities tasked with overseeing waste management, most especially for data collection.

Participants also discussed a number of areas where continued technical support will be required to scale-up actions to address SLCPs in the waste sector, both from IGES and national authorities. These included data collection and the provision of standardized guidelines for waste characterization; coaching and mentoring on the EQT, including through a training-of-trainers approach; technical and financial feasibility studies on alternative waste management options; as well as the need for exchange visits and/or additional knowledge sharing forums to observe best practices.

Wrap Up and Way Forward

Dr. Premakumara closed the workshop, thanking participants for their valued contributions and extending appreciation both to Bacolod City and DENR for hosting and coordinating the workshop. Dr. Premakumara then outlined next steps with regard to CCAC-MSW Initiative activities. Participant cities were encouraged to continue to compile data on waste management, which could be further inputted into the EQT during subsequent webinar training sessions in the coming months. Results from these exercises will be used to inform the development of future city action and work plans specifying options for SLCP mitigation in the waste sector based on an analysis of scenarios conducted using the EQT. A final workshop will be held towards the end of 2018 to highlight the main outcomes of these efforts.

Finally, a prepared statement from Hon. Emmanuel de Guzman, Secretary of the National Climate Change Commission of the Philippines, was delivered.

2.3. DAY 3: 4th APRIL 2018

Session 5: Field Visit to San Carlos CITY

Day 3 was allocated for site visit to San Carlos City, one of the environmental model cities in the Philippines. A second-class city in Negros Island with a population of 45,000 is a recipient of many accolades from both in the Philippines and abroad for its environmental leadership in achieving over 65% of waste reduction targets through introduction of low-costs, appropriate and sustainable waste management practices since 2005. Like many other cities in the Philippines and else, waste management was one of the key environmental, social and political issues faced by the city council. However, this situation has been gradually improved with the introduction of new waste management system in 2005, which included a waste separation at source, extending waste collection coverage, elimination of illegal dumping and burning, increased 3Rs (reduce, reuse and recycle), information and education campaign and eco-center for waste treatment and sanitary landfill. The city also closed the former open dumpsite and turned it into a green open space. All these activities helped in improving the waste management and reduced the GHGs and SLCPs.

During the site visits, participants were introduced to the Mayor of San Carlos at the local city office who delivered a lecture on the main factors of success behind the city's environmental efforts, including waste management. Following an organized tour of the San Carlos solar plant—the largest of its kind in the Philippines, with a total capacity 45 megawatts (MW) and carbon mitigation potential of approximately 66,590 tonnes— participants thereafter made visits to the city's centralized Material Recovery Facility (MRF), sanitary landfill, leachate treatment plant and community composting site.

Participants have a meeting with the Mayor of San Carlos City

Visit to sanitary landfill site in the San Carlos with material recovery facilities

Group photograph near biogas plant in San Carlos city

ANNEX 1: WORKSHOP PROGRAM

Time	Topics	Presenter
Day 1: 2nd April 2018		
09:00 – 10:00	Registration	
Session 1: Opening Ceremony		
10:00– 10:15	Welcome Message from Bacolod City	Hon. Evelio "Bing" Leonardia Mayor Bacolod City
10:15– 10:30 **10:30– 10:45**	Keynote Messages 1. Department of Environment and Natural Resources (DENR) 2. National Solid Waste Management Commission	Atty. Juan Miguel T. Cuna Undersecretary for Environment and Field Operations – Luzon DENR Mr. Crispian N. Lao Commissioner and Vice Chair
10:45 – 11:00	Coffee Break	
11:00 – 11:30	Introduction to workshop	Mr. Eligio T.Ildefonso OIC- Executive Director Secretariat NSWMC and Chief of Solid Waste Management Division, DENR
11:30 – 11:45	Remarks by CCAC/IGES	Dr. Premakumara Jagath Dickella Gamaralalage Program Manager CCET-IGES
11:45 – 12:00	Group Photo	

12:00 – 13:00	Lunch Break	
Session 2: MSWM and its role in achieving the global climate and SDG agenda		
13:00 – 13:30	Technical Lecture 1: Introduction to Life Cycle Assessment (LCA) and its application for MSW management and its co-benefits	Dr. Nirmala Menikpura, IGES Fellow (via Skype)
13:00 – 14:00	Overview of current MSWM practices in the Philippines and efforts to align with national and subntational policies, strategies and actions on climate and SDGs	Mr. Albert A. Magalang, Chief of Climate Change Division, Environmental Management Bureau , DENR
14:00 – 14:30	The role of local government units (LGUs) in implementing the national policies –on waste: case study of Bacolod	City of Bacolod
14:30 – 14:45	Discussion and Q & A	Facilitated by IGES (Facilitator: Matthew Hengesbaugh)
14:45 – 15:00	Coffee Break	
15:00 – 16:45	Introductions by regional participant cities (brief explanation on waste management issues, challenges and good practices (5-7 minutes)	All Invited cities
16:45 – 17:00	Discussion and identification of key challenges, good practices and lessons learned from city presentations	Facilitated by IGES (Facilitator: Matthew Hengesbaugh)
17:00 – 17:30	Technical Lecture 2: Introduction to EQT and its application for MSWM decision making (Assignments)	Dr. Nirmala Menikpura, IGES Fellow (via Skype)
18:00 – 19:30	Welcome Dinner	Facilitated by NSWMC, DENR

Day 2: 3rd April 2018		
Time	**Topics**	**Presenter**
08:00 – 09:00	Registration	
Session 3 Awareness Raising and Capacity Building on SLCP Quantification		
09:00 – 09:10	Brainstorming on previous day learning	Facilitated by IGES (Facilitator: Rajeev Singh)
09:15 – 09:45	Continuation of Technical Lecture 2: Introduction to EQT and its application for MSWM decision making	Dr. Nirmala Menikpura, IGES Fellow (via Skype)
09:45 – 10:00	Discussion and Q & A	Facilitated by IGES (Facilitator: Premakumara)
10:00 – 10:15	Coffee Break	
10:15 – 11:45	Presentations by participant cities *(City waste data and discussion of challenges for SLCP emissions quantification)*	All Invited Cities
11:45 – 12:00	Discussion and Q & A	Facilitated by IGES (Facilitator: Premakumara)
12:00 – 13:00	Lunch	
Session 4: Discussion on data analysis and EQT methodology		
13:00 – 14:30	Training on EQT methodology and operation (Use of city data for calculating scenarios)	Assistance from Dr. Nirmala Menikpura (via Skype)
14:30 – 14:45	Discussions on results and findings	Rajeev Singh will facilitate with assistance from Dr. Nirmala Menikpura (via Skype)

14:45 – 15:00	Coffee Break	
15:00 – 17:00	Discussions on strategic actions to reduce SLCPs from MSWM at local level	Facilitated by IGES (Facilitators : Premakumara & Matthew Hengesbaugh)
17:00-17:15 **17:15-17:30**	Wrap up and Way Forward Closing Remarks	CCAC-IGES Hon. Emmanuel de Guzman Secretary Climate Change Commission
Day 3: 4th April		
Session 5: Field visit to San Carlos city		
06:45 – 09:00	Leaving from Hotel to San Carlos	San Carlos City and DENR
09:00 – 12:00	Field Trip	San Carlos City and DENR
12:00 – 13:00	Lunch	
13:00 – 14:00	Field Trip	San Carlos City and DENR
14:00 – 16:00	Arrive to Bacolod	San Carlos City and DENR
16:00 – 17:00	Arrive to Airport	Hotel

ANNEX 2: LIST OF CITIEES PARTICIPATED

	Name	City /Country	Position
1	Ms. Ferdinand Bautista	Municipality of Maragusan, Philippines	Municipal Environment and Natural Resource Officer
2	Mr. Eduardo DL. Tiongson	Municipality of Solano, Philippines	Chair, Committee on Environment and Climate Change, Sanguniang Pan Lalawigan
3	Mr. Arthur Batomalaque	City of San Carlos, Philippines	City Environment and Natural Resource Officer
4	Ms. Elbie Baculanag	Province of South Cotabato, Philippines	Provincial Environment and Natural Resource Officer
5	Mr. Maximino Sillo	Bacolod City, Philippines	Head of ENRO
6	Mr. Phorpminea Hing	Kampong Chhnang City, Cambodia	Deputy Governor
7	Ms. Mariani Yanti, Ph.D	Jambi City, Indonesia	Head of Environmental Department
8	Mr. Willy Irawan	Medan City, Indonesia	Head of Sub-Division for Environment and Spatial Planning
9	Mr. Zaw Lwin	Nay Pyi Taw City, Myanmar	Assistant Director
10	Ms. Jiraporn Pumwiset	Nonthaburi City, Thailand	Sanitation Technical Officer

KAMPONG CHHNANG CITY, CAMBODIA

ខេត្តកំពង់ឆ្នាំង

KAMPONG CHHNANG PROVINCE

Overview of Kampong Chhnang Province

A. Geography

Kampong Chhnang province is widely known for its terracotta pottery. English Translation of Kampong : Port, Chhnang: clay port.

The province Kampong Chhnang is located at the heart of Cambodia. It's bordering Kampong Thom to the North, Kampong Cham to the East, Kampong Speu and Kandal to the South and Pursat to the West. This province is just 91 km from Phnom Penh (Capital of Cambodia)

1	Land	5 521
2	Municipality/ District	8
3	Commune/ Sangkat	70
4	Village	569
5	Families	125 685
6	Population	545 650
7	Female	283 614

KAMPONG CHHNANG MUNICIPALITY

Kampong Chhnang is one of the municipality of 8 (7 district and 1 municipality). About 40% of the population is traders, the main livelihood sector in Kampong Chhnang. Besides, there are other businesses such as agricultural, handicraft and other civil servants and armed forces.

6

No	DESCRIPTINO	TOTAL
ន	LAND	4665 hecta
ខ	SANGKAT	4
ភ	VILLAGES	26
ជ	POPULATION	42734
ឌ	FEMALE	20807
ឯ	DENSITY	857/1KM^2

❖Kampong Chhnang Boundary :

NORTH: KAMPONGLENG

SOUTH-WEST: ROLEAPHAR

EAST: CHULKIRI

6

Overview of the urban solid waste management

Based on Subdecree No. 113 S.E.

- **Waste** refers to the items, materials, or products created from the people's daily activities that do not contain toxins or hazardous substances.
- **Urban solid waste** refers to the solid waste created from the business activities or services that do not contain toxins or hazardous substances.
- **Hazardous waste** refers to the solid, liquid, gas, radioactivity substances, explosives, inflammable substances, pathogenic …. substances that damage human, animals, plants, and the environment.

7

Overview of the urban solid waste management

There is no proper solid waste management and hygiene in villages because

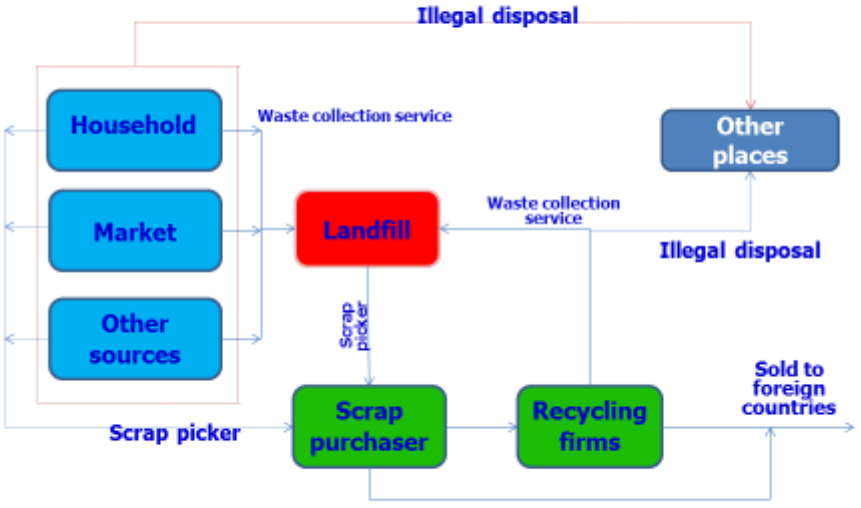
- all of them are not concerned with solid waste management;
- there is only limited waste collection, and this does not come not on time, only 3 or 4 times a week. They are also careless with collecting and trash falls down on the street;
- most of the people are not satisfied with waste collecting services;

8

- sometimes when the garbage falls on the street they do not pick it up and it causes bad smell
- Private company or contractor sign contract with the city administration to collect and transport waste (This year)
- Waste collection services have not covered all parts of the cities/districts
- The collection, storage and transport of waste do not conform to the required technical standard
- [illegible] cal

9

Mechanism for management of urban solid wastes in Cambodia (Kampong Chhnang)



10

Priority Vision: Solid Waste

- Build the standard landfill with proper distance
- The company is advised to collect waste in a timely manner
- Raise people's awareness of the waste collection service
- Raise people's awareness of the proper storage of waste
- Advise how to separate waste and ensure investment
- Advise people to provide waste collection service at all houses
- Advise the company to sufficiently transport waste and recycle waste
- Provide investors with enabling environment
- It leads to competition among companies

12

3. Challenges of urban solid waste management

- The wastes are not separated at the source before being disposed at the land fills
- Limited participation of the people and service fee payment
- The time for waste release is not specifically determined
- Waste collection and transport service provider are not sufficiently capable
- There are few waste collection contractors in city (1 year contract)
- The municipality is preparing landfills and landfill management techniques
- Limited law enforcement

13

Waste Generation

Indicator	Unit
Total waste generation	14Tonnes/day (Legal collected)
Garbage Collection	24.5%
Burning	83.00%
Compost pit with cover	1.1%
Compost pit without cover	1.1%
Recycling	2.1%
Bury	3.2%
Amount of generated waste scattered dumping	21.2

Waste Composition

Estimation of current waste composition in your city based on latest information and identification of any data gaps. For example:

Category	Percentage
Food waste	80.46
Textile	1.26
Metal	7.7
Paper	2.1
Plastic	3.3
Leather/rubber	0
Bottle and Glass	0.7
Others	

Transportation

Brief explanation about waste transportation in your city and identification of any data gaps. For example:

Indicator	Unit
Amount of waste collected by the city/municipality	24%
Amount of waste collected by informal sector (mainly the recyclables)	76%
Type of truck used	OPEN TRUCK
Capacity of trucks	4 Tonnes/trip
Type of fuel used	GASOLINE
Approximate distance from collection point to final disposal site	12Km.

Recycling and Organic Waste Treatment

Brief explanation about recycling/organic waste treatment in your city and identification of any data gaps. For example:

Indicator	Unit
Recyclables	
Composition of recyclables	Paper and cardboard (%) N/A Plastic (%) Aluminium (%) Metal/Steel (%) Glass (%)
Organic waste	
Amount of organic waste use for composting	Don't have .
Amount of organic waste use for anaerobic digestion	Don't have

Final Disposal

Brief explanation about final disposal in your city and identification of any data gaps. For example:

Indicator	Unit
Specification of landfill/open dumps	Approximate height Availability of landfill cover Management practices, etc.
Landfill 1	
Landfill 2	
Landfill 3	

Final Disposal

findings:

1. participants identified their most common waste disposal practices as: (1) burning; (2) throwing into the river; (3) selling in the market; and (4) burying.

2. Shop owner participants also identified (1) burning; and (2) throwing into the river as their most common disposal behaviors. The farmers and those residing in the floating village, more often than not, dispose of their waste directly into the river and also burn whatever is flammable.

3. Participants in the general for residents claimed to dispose their waste by (1) burning in locations close to their home; (2) throwing waste under their house; (3) taking this to "the waste location in the market".

4. Floating Village stated that they dispose of their waste by throwing it into the river during the rainy season and burning it in the dry season. They are not covered by waste collection services

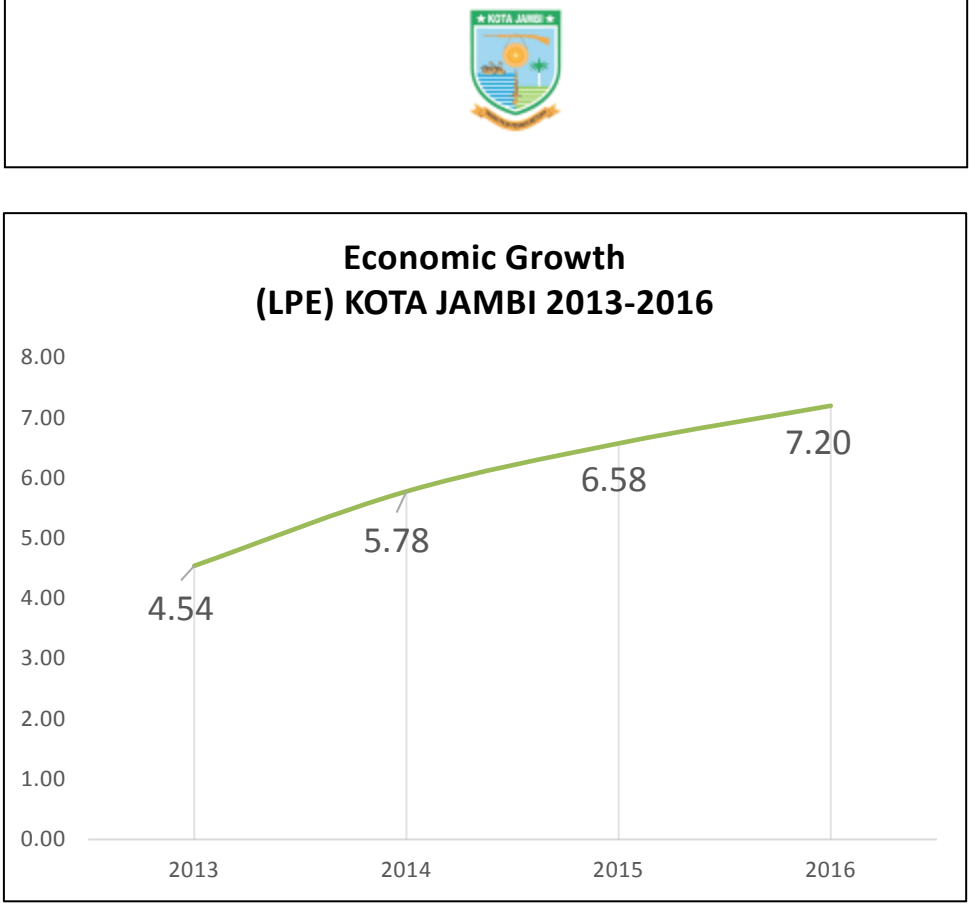
JAMBI CITY, INDONESIA

Jambi City, Indonesia

Overview of Municipal Solid Waste Practices

First Regional Training Workshop
Measuring and Mitigating Short Lived Climate Pollutants from the Municipal Solid Waste Sector

2 April 2018



WASTE REDUCTION

Household Composting

OPTIMALIZATION WASTE TEMPORARY COLLECTION (TPST 3R) REGIONAL SCALE

OPTIMALIZATION COMPOSTING TPA TALANG GULO

WASTE MANAGEMENT IN EVERY TRADITIONAL MARKET

COMPOSTING FACILITIES

WASTE BANK

Mayoral instruction 1123/BLH/2014, 3 Desember 2014, waste bank in every subdistrict

Waste Bank in Schools Mayoral Instruction 660/736/BLH/2014 : 9 July 2014 .

Bank Sampah Sekolah

Development Policies and Actions with Local Initiatives

72 Waste Bank

BANTAR Villages

Gotong Royong
(Working Together)

Million Bio Pori

Open Dumping
Before 1997

Methane extraction and
composting

Semi Controlled Landfill

Sanitary Landfill 2018

BEFORE IN PROGRESS

GROUND BREAKING

LAND CLEARING

LAYING DOWN THE BASE

IN PROGRESS

IN PROGRESS

Indirect co-benefits of Resource Recovery in Jambi

- Economic growth
  - Employment and income opportunities
- Social
  - Provide safer work environment for waste pickers with safer working conditions and improvements in public health and environmental protection
  - Solidify teamwork in the community
  - Cost savings (flood protection, healthcare, city cleaning, etc.)
  - Education: increased know-how and awareness of solid waste management, promotion of sustainable consumption patterns

Indirect co-benefits of Resource Recovery in Jambi

- Environmental
  - > 50% per cent of municipal solid waste is organic material. This waste is currently sent to landfills and dumps, where it contributes 70 to 100 million metric tons of greenhouse gas emissions every year.
  - Responsible for 10% reduction of landfill waste.
  - Reduces pollution to air, land and water.
  - Prolongs and saves landfill space as well as transport costs.

MAIN CHALLENGES

- Financial limitation
- Human resources capacities
- Lack of Community awareness

COMMITMENT

Future Priorities

- Reduce waste generation rates
- Increase waste recovery rates
- Increase the collection rate
- Implement waste separation at source
- Establishment of material recovery facility (MRF) and composting facility
- Sanitary Landfill

Waste Generation

Indicator	Unit
Total waste generation	1,874 M^3/day
Amount of generated waste openly burned	Na %
Amount of generated waste scattered dumping	10 %

Waste Composition

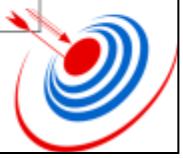
	COMPONENT	PERCENTAGE WASTE (%)
1	Organic	55
2	Inorganic	45
	Plastic	15
	Glass	2
	Steel	1
	Paper	15
	Textil	5
	Rubber	2
	Others	5
	Total	100

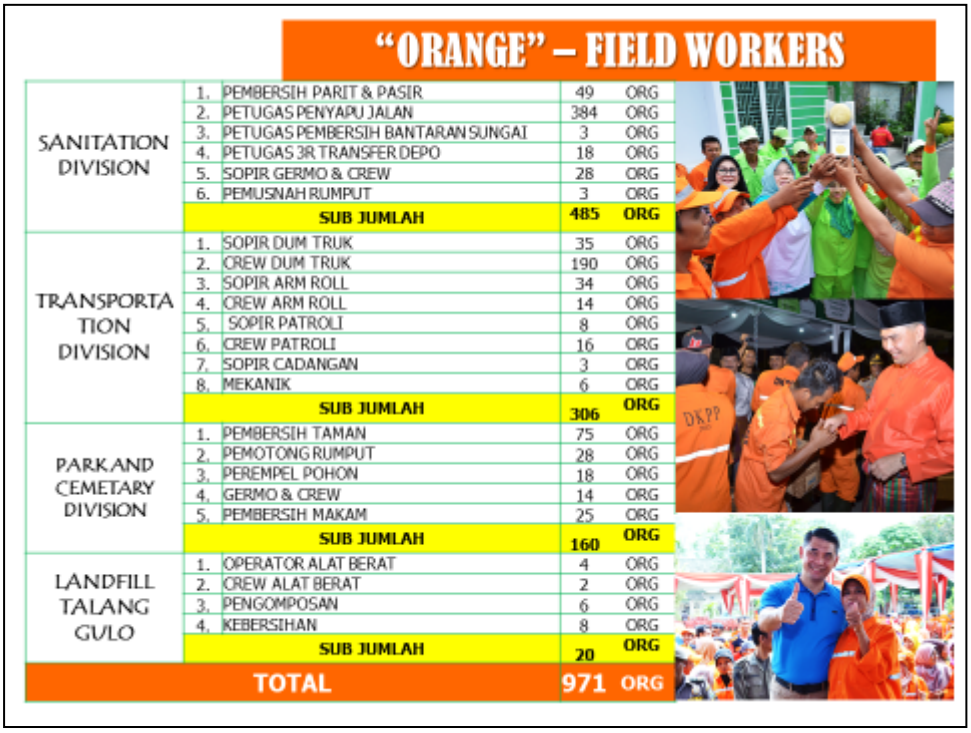
* KfW

- **Waste Production** **1,874 M^3/day**
- **Collected & transferred to Landfill 61.67 %**

Waste Collection

TARGET and realization of waste collection		
Year	**TARGET**	**Realization**
2014	62 %	64,83% (realisasi)
2015	65 %	65,46% (realisasi)
2016	70 %	69,20% (realisasi)
2017	**75 %**	**on progress**
2018	80 %	Optimalization of waste to resource: **Waste to Energy** and **Waste to Resource**





"ORANGE" – FIELD WORKERS

SANITATION DIVISION	1.	PEMBERSIH PARIT & PASIR	49	ORG
	2.	PETUGAS PENYAPU JALAN	384	ORG
	3.	PETUGAS PEMBERSIH BANTARAN SUNGAI	3	ORG
	4.	PETUGAS 3R TRANSFER DEPO	18	ORG
	5.	SOPIR GERMO & CREW	28	ORG
	6.	PEMUSNAH RUMPUT	3	ORG
		SUB JUMLAH	**485**	**ORG**
TRANSPORTATION DIVISION	1.	SOPIR DUM TRUK	35	ORG
	2.	CREW DUM TRUK	190	ORG
	3.	SOPIR ARM ROLL	34	ORG
	4.	CREW ARM ROLL	14	ORG
	5.	SOPIR PATROLI	8	ORG
	6.	CREW PATROLI	16	ORG
	7.	SOPIR CADANGAN	3	ORG
	8.	MEKANIK	6	ORG
		SUB JUMLAH	**306**	**ORG**
PARK AND CEMETARY DIVISION	1.	PEMBERSIH TAMAN	75	ORG
	2.	PEMOTONG RUMPUT	28	ORG
	3.	PEREMPEL POHON	18	ORG
	4.	GERMO & CREW	14	ORG
	5.	PEMBERSIH MAKAM	25	ORG
		SUB JUMLAH	**160**	**ORG**
LANDFILL TALANG GULO	1.	OPERATOR ALAT BERAT	4	ORG
	2.	CREW ALAT BERAT	2	ORG
	3.	PENGOMPOSAN	6	ORG
	4.	KEBERSIHAN	8	ORG
		SUB JUMLAH	**20**	**ORG**
TOTAL			**971**	**ORG**

Recycling and Organic Waste Treatment

Talang Gulo Landfill

Indicator	Unit
Recyclables	
From scavengers	7.158 kg/day
Organic waste	
Food for fish and Cattle From scanvengers in the landfill Composting Composting Production	 1.300 kg/day 10 M^3/day 110 kg/day
Amount of organic waste use for anaerobic digestion	2 Tonnes/day

Final Disposal

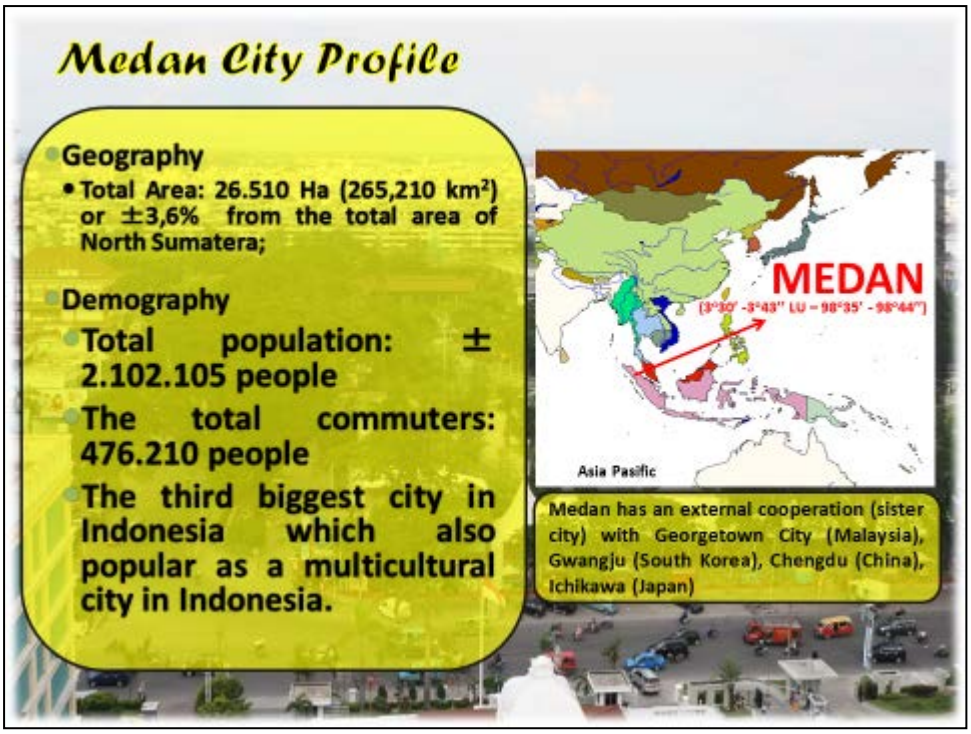
Talang Gulo Landfill

Indicator	Unit
Specification of landfill/open dumps	
Landfill 1 (existing)	10 Ha
Landfill 2(sanitary landfill)	21.3Ha
Amount of waste	1.026 M^3/day

Data for Scenario Preparation

Name of the technology/treatment methods	Amount of waste treated (tonnes/day)	Type of fossil fuel use for operation (e.g. diesel, gasoline)	Amount of fossil fuel use for operation (L/day)	Amount of grid electricity (KWh/day) [Hint: daily requirement can be calculated from monthly usage and total tonnes of waste treated]	Type and amount of resource recovered (if any)
Landfill (without gas recovery)	354.681 M3/day	Diesel fuel	Diesel requirement for waste compaction at the landfill site 108 L/day	Electricity is not required	No methan measurement equipment yet, est: 2 M^3/hour methan production Chanelling to 50 Household
Composting	110 kg/day	---	---	---	---
Anaerobic digestion	2	---	---	---	---
Incineration	NA	---	---	---	---

MEDAN CITY, INDONESIA



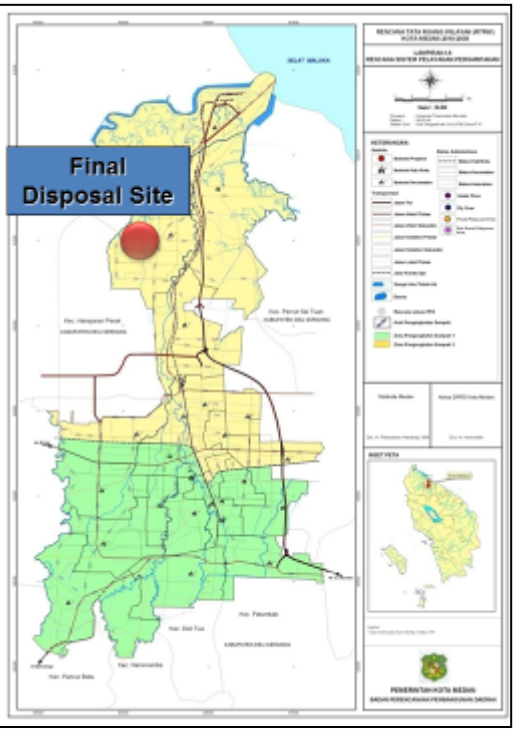
BASE LINE DATA FOR SOLID WASTE IN MEDAN CITY

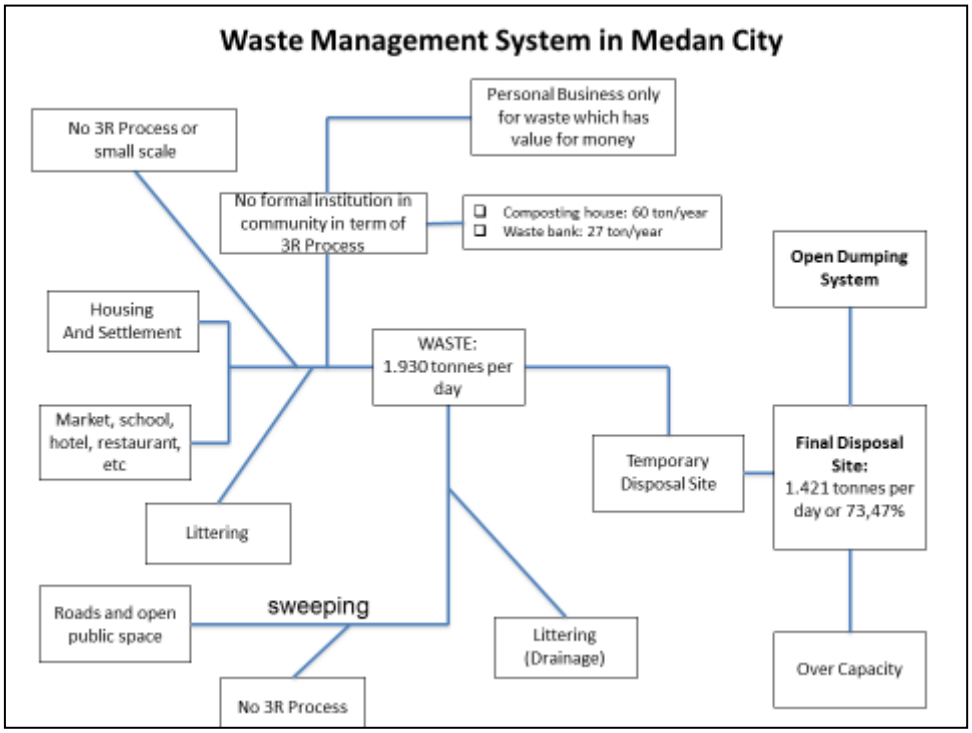
The population of Medan City in 2017 is estimated to be ± 2.7 million people and the ratio of waste/person/day is 2.5 liters equivalent to the average waste weight of 0.6 kg/person, the total solid waste of Medan City is 5,358 m^3/day or 1,286 ton/day. While the solid waste served is only 80% or 4,286 m^3/day. This condition if not addressed soon will worsen the condition of final disposal site.

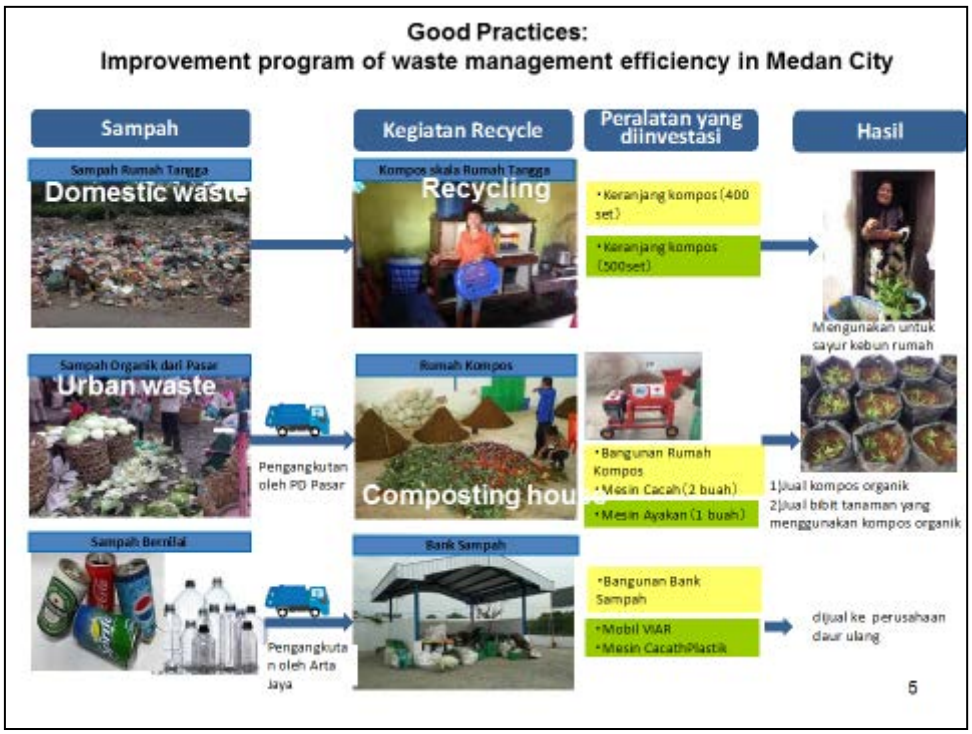
The increasing of total waste in Medan cold be caused by some aspects:

- ❑The amount of commuters cotinuously increase.
- ❑The growth of urbanization in large scale.
- ❑The exchange of consumption pattern, it might be caused by the increasing of welfare level.
- ❑The increasing of instant foods which also generate the production of platic, bin, boxes, etc.

- ❑ The total area of final disposal site is 14 hectares which has been occupied 10 hectares or 71%. In this condition, Medan city can only count to this site only in the next 5 years.
- ❑ Open dumping system, toward controlled landfill.
- ❑ The production of H_2S (Hydrogen Sulfide) may cause bad impact to the environment.




Waste Management System in Medan City
No 3R Process or small scale
Personal Business only for waste which has value for money
No formal institution in community in term of 3R Process
Composting house: 60 ton/year
Waste bank: 27 ton/year
Open Dumping System
Housing And Settlement
WASTE: 1.930 tonnes per day
Market, school, hotel, restaurant, etc
Temporary Disposal Site
Final Disposal Site: 1.421 tonnes per day or 73,47%
Littering
Roads and open public space
sweeping
Littering (Drainage)
Over Capacity
No 3R Process


Good Practices:
Improvement program of waste management efficiency in Medan City
Sampah
Kegiatan Recycle
Peralatan yang diinvestasi
Hasil
Sampah Rumah Tangga
Domestic waste
Kompos skala Rumah Tangga
Recycling
•Keranjang kompos (400 set)
•Keranjang kompos (500set)
Mengunakan untuk sayur kebun rumah
Sampah Organik dari Pasar
Urban waste
Pengangkutan oleh PD Pasar
Rumah Kompos
Composting hou
•Bangunan Rumah Kompos
•Mesin Cacah (2 buah)
•Mesin Ayakan (1 buah)
1)Jual kompos organik
2)Jual bibit tanaman yang menggunakan kompos organik
Sampah Bernilai
Pengangkutan oleh Arta Jaya
Bank Sampah
•Bangunan Bank Sampah
•Mobil VIAR
•Mesin CacahPlastik
dijual ke perusahaan daur ulang
5

Good Practices:
Improvement program of waste management efficiency in Medan City
Composting House and Waste Banks

To reduce the production of waste and to promote recycling process

Composting House

The total amount of Organic Waste in Medan

60 Ton/year

Waste Bank

The total amount of Valuable waste in Medan

27 Ton/year

Improvement program of waste management efficien in Medan City Capacity Building

Peningkatan SDM

10 orang

Pengelola sampah mengikuti i training ke Kitakyushu.
・Sekretaris（1orang）
・BLH（6 orang）
・Dinas Kebersihan（1orang）
・NGO（2orang）
 setelah kembali ke Indoensia, menjadi key-person dalam proyek ini.

10 orang

Yang menegani pengelolan sampah dalam pemerintahan/ NGO/ masyarakat mendapat ilmu pengelolaan sampah melalui kegiatan proyek ini.

Kuesioner dibagikan kepada **20 orang** untuk mengevaluasi tingkat penyerapan pengetahuan teknologi

Improvement program of waste management efficiency in Medan City Replication

Future Priorities

- Formulating the policy for solid waste management based on waste characteristic in term of implementing ISWM (Integrated Solid Waste Management).
- Optimizing the annual budgeting and expenses for solid waste program.
- Developing a proper system for final disposal site: control landfill.
- Increase waste recovery rates
- Waste to energy.

Main Challenges

- Behavioral change.

To implement 3R from household which automatically increase the level of services.

- Public private partnership in solid waste management.

The assumption of total waste per day is 1.700 tons, it can be transform to energy 7 MW - 67 MW.

Waste Generation

Indicator	Unit
Total waste generation	1.930 Tons/day
Amount of generated waste openly burned	%
Amount of generated waste scattered dumping	%
The amount of transports waste to Final Disposal Site	1.421 tons /day or 73,47%

Waste Composition

Category	Percentage
Food waste (organics)	62,90%
Plastics	13,75%
Paper	13,22%
Textile	3,26%
Leather/rubber	0,54%
Glass	0,95%
Metal (aluminum + steel)	0,34%
Others	5,04%

Transportation

Brief explanation about waste transportation in your city and identification of any data gaps. For example:

Indicator	Unit
Amount of waste collected by the city/municipality	73,47%
Amount of waste collected by informal sector (mainly the recyclables)	NA
Type of truck used	Arm Roll Trucks (24 units), Tipper Trucks (196 units)
Capacity of trucks	6,6 tons/truck
Type of fuel used	Solar
Approximate distance from collection point to final disposal site	14 Km.

Recycling and Organic Waste Treatment

Brief explanation about recycling/organic waste treatment in your city and identification of any data gaps. For example:

Indicator	Unit
Recyclables	
Composition of recyclables	Paper and cardboard (%) Plastic (%) Aluminium (%) Metal/Steel (%) Glass (%)
Waste Banks	27 tons/year
Organic waste	
Amount of organic waste use for composting	60 tons/year
Amount of organic waste use for anaerobic digestion	Tonnes/day

Final Disposal

Brief explanation about final disposal in your city and identification of any data gaps. For example:

Indicator	Unit
Specification of landfill/open dumps	Approximate height Availability of landfill cover Management practices, etc.
Landfill 1	
Landfill 2	
Landfill 3	

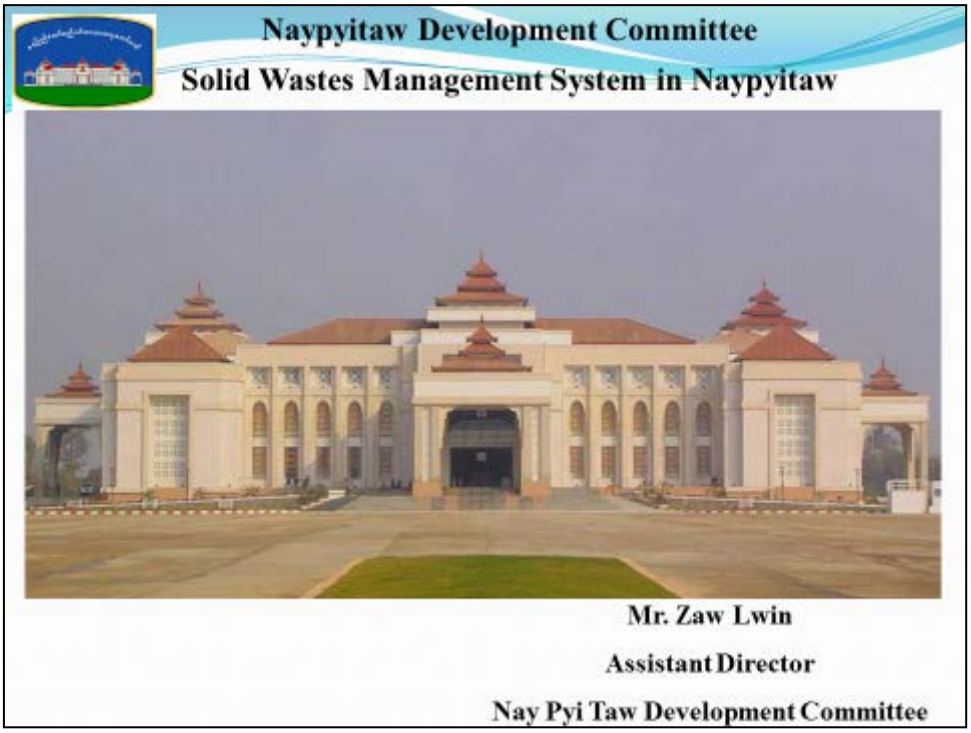
- **The total area of final disposal site is 14 hectares which has been occupied 10 hectares or 71%. In this condition, Medan city can only count to this site only in the next 5 years.**

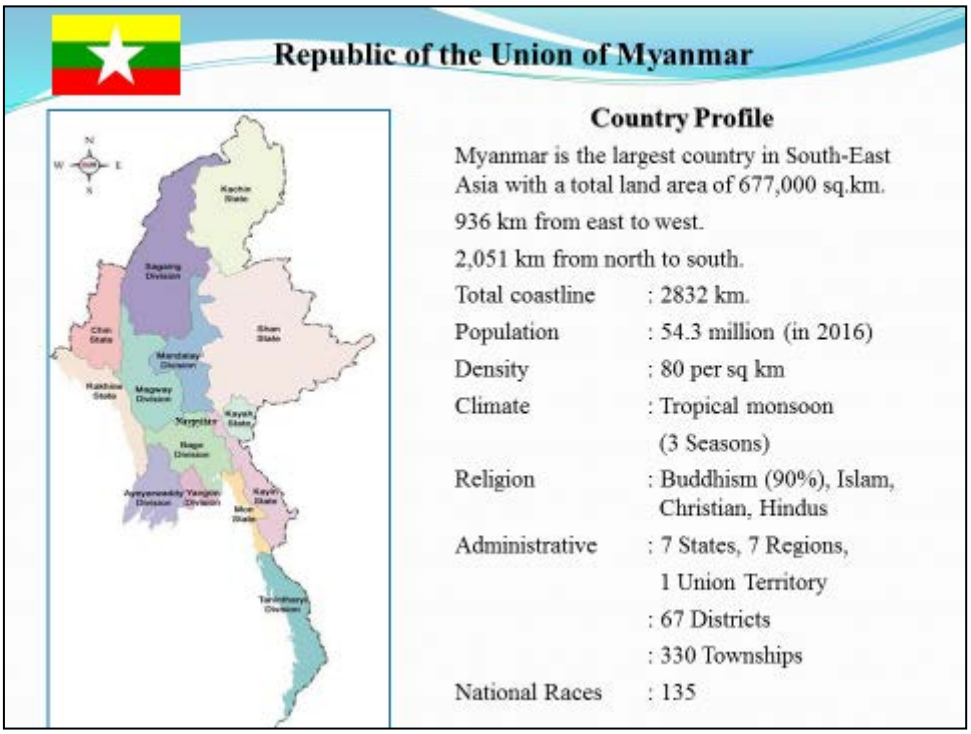
Data for Scenario Preparation

Brief explanation about waste technologies/treatment methods in your city and identification of any data gaps. For example:

Name of the technology/treatment methods	Amount of waste treated (tonnes/day)	Type of fossil fuel use for operation (e.g. diesel, gasoline)	Amount of fossil fuel use for operation (L/day)	Amount of grid electricity (KWh/day) [Hint: daily requirement can be calculated from monthly usage and total tonnes of waste treated]	Type and amount of resource recovered (if any)
Waste to energy	1.700 tons/day	Diesel fuel	-	-	-

NAY PYI TAW, MYANMAR

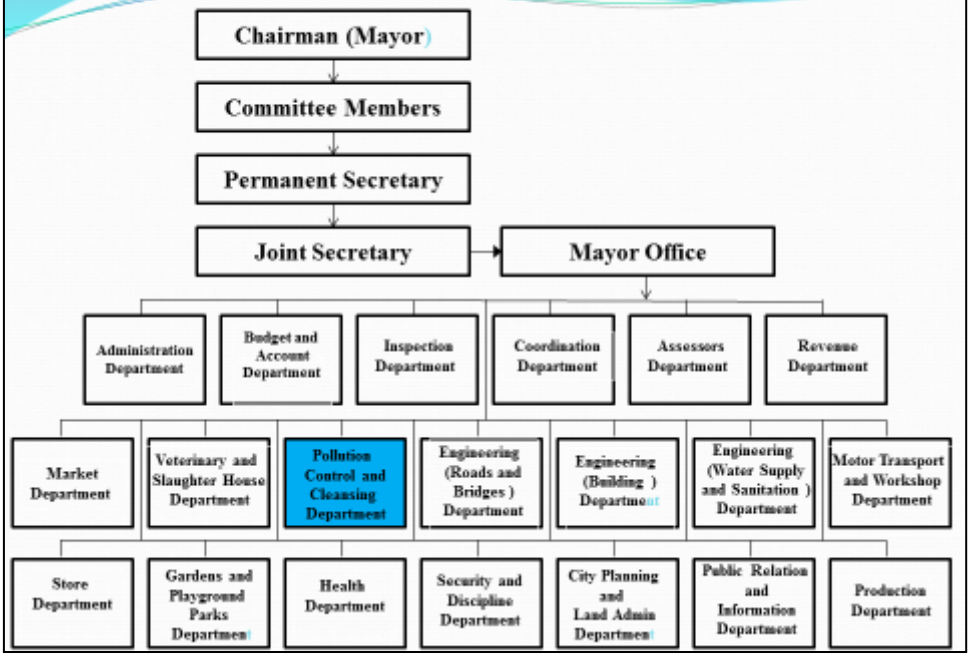


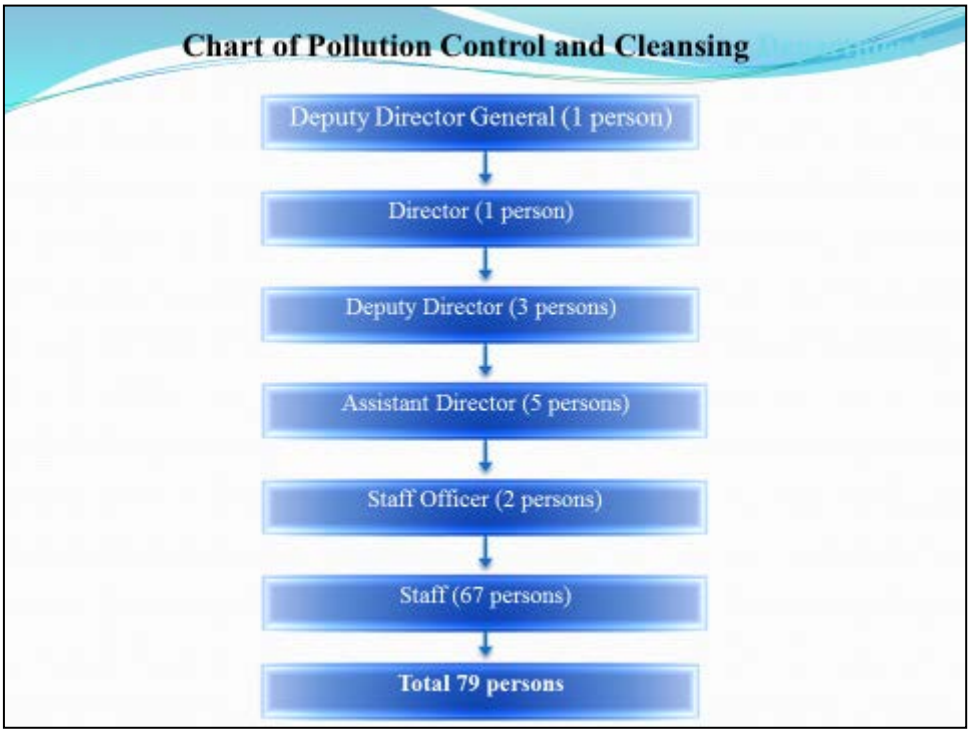


Location of Naypyitaw

- An Administrative city of Union of Myanmar.
- Located between North latitude 19° 18' and 20° 25' East longitude 95° 25' and 96° 45'.
- Located 393 km in the north of Yangon and 303 km in the south of Mandalay.
- Center of Government is situated in Zabyuthiri township, Union Territory.
- Consists of eight Townships, such as Zabyuthiri, Zeyarthiri, Oattarathiri, Dekhinathiri, Pobbathiri, Pyinmana, Lewe and Tatkone townships which covers total area of 7054.37 square km.
- Total population of these eight townships is about 1 million in 2016.

Organization Chart of Naypyitaw





3 Divisions in PCCD

1. **Cleansing Division**
   - Carrying out the sanitation works (Waste Collection, Waste Transportation, Disposed to Final Disposal Site)
     186 labours in total

2. **Pollution Control Division**
   - Carrying out the conservation of environmental issues
   - Carrying out the funerary matters
     (Final Disposal Site, Cemeteries, Composting, Recycling)
     3 Disposal Sites & 3 Cemeteries

3. **Office Administration and Motor Transport Division**
   - Carrying out the waste collection and transportation works
     60 Vehicles in total

Types of Vehicles

Road Sweeper

Collection Vehicle

Bull Dozer

Collection Vehicle

Collection Vehicle

Excavator

Types of Vehicles

Grass Mower

Sepical Hearse

Extra Cab

Tipper

Lifan

Dongfang

Existing Solid Waste Management

1. Using basically labour force
2. Bell ringing method
3. Limited collection of market wastes and other wastes
4. On call system
5. Limited collection of hospital wastes and clinic wastes
6. Collection method of indiscriminate disposal wastes
7. Transported and disposed directly to three disposal sites



Solid waste generated in the city is estimated about 160 tons per day.

Hospital and clinic wastes are separately collected and properly disposed to incinerate and submerge in deep wells.

PCCD also collects commercial wastes in on call system.

Bell Ringing Method

In the ringing system, a solid waste collection truck with one or two worker for handling waste moves along a predetermined route, at regular hours in making its daily rounds of collection and disposal.

At the signal of the bell, the residents bring their waste containers to the vehicle.

The handing workers load the waste on to the vehicle.

When the truck is full, it takes of to the dumping site.


Limited collection of market wastes

Decay easily wastes from markets, vegetables pieces are collected separately and generated to reuse the natural fertilizer by earthworm breed system.

On Call System

Hotels, Supermarkets, Restaurants, Companies, Cinemas, Government Organization and offices pay the renting fees the collection vehicles fixed by our department when they need to collect the garbage separately.

Limited collection of Hospital wastes and Clinical wastes

In Naypyitaw area, wastes are transported from hospitals and clinics by paying the fees for collection.

Hospital and Clinical Waste Collection

Hospital and clinical wastes are separately collected and properly disposed to incinerate and submerge in deep wells.

Collection Method of Indiscriminate Disposal Wastes

Residents of staff housing and wards discards the garbage on the sites of the streets why they cannot dispose for vary reasons when the collection vehicles come those where.

For this conditions, responsible citizens inform to department, inspection by responsible officers from Pollution Control and Cleansing Department, so that we are collecting the indiscriminate disposal wastes once a week within housing and wards.

Market Waste to Fertilizer

Earthworm Husbandary

Waste Compactor

Used to Agriculture

List of Cleansing Labours and Waste Collection Vehicles

(in Nay Pyi Taw area)

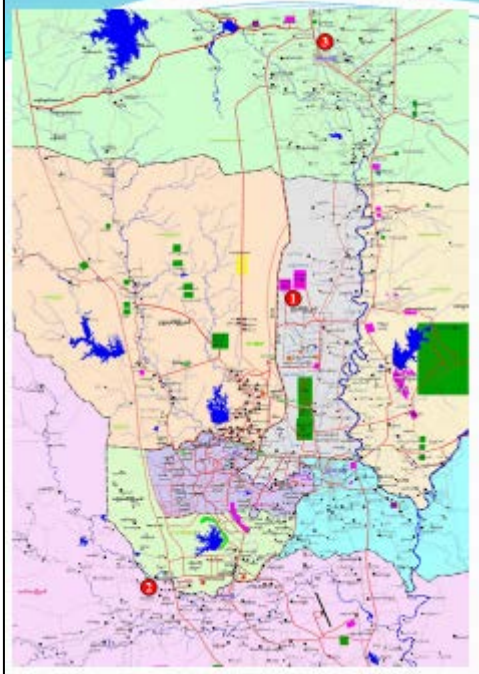
Cleansing Labours

- Cleansing labour have 340 persons

Waste Collection Vehicles

- Waste collection vehicles have 74 pcs
- Solid waste generation is estimated at about (197) tons per day.

Location of Disposal Site (in Naypyitaw Area)



1. **Disposal Site No. 1**, Pobbathiri Township.
   - Six Townships (Zabyuthiri , Dekhinathiri, Pobbathiri, Ottarathiri, Zayarthiri and Pyinmana Townships)
   - about 137 tons per day
2. **Disposal Site No. 2**, near Sankalay Old Cemetery, Lewe Township.
   - One Township
   - about 35 tons per day
3. **Disposal Site No. 3**, Tatkone Old Cemetery, Tatkone Township.
   - One Township
   - about 25 tons per day

Final Disposal Site






Challenges of Solid Waste Management in Nay Pyi Taw

- Insufficient budgers, workers and modernized truck
- Direct Health Hazard
- Lack of the facilities
- Lack of the cooperation and awarness of public in SWMs
- Weakness to follow the Rules and Regulations of SWMs
- Labour Intensive
- No Waste Segregation System
- No Landfill system

The first step toward solving the SWM problem in Naypyitaw

Segregation and systematically discharged on solid wastes ;
- Public awareness and participation on solid wastes segregation.
- Free distribution of garbage plastics bags (green, blue) during awareness period.
- Implementation of separate discharge system of solid wastes.

-**Organic wastes (wet)** : Organic wastes (wet) is separately discharge in area of cemetery for educing volume and easily decay into natural fertilizer.

-**Miscellaneous Wastes (dry)** : Materials for reuse and recycle are selected from (dry) miscellaneous wastes by labour force. That wastes are sold to resources recycle business for the labour fees. After selection, non-useful materials from miscellaneous wastes are incinerated by incineration plant.

- To get successful results in the field pollution control and waste management, there is an urgent need for cooperation and coordination among the region and international organizations.

Conclusion

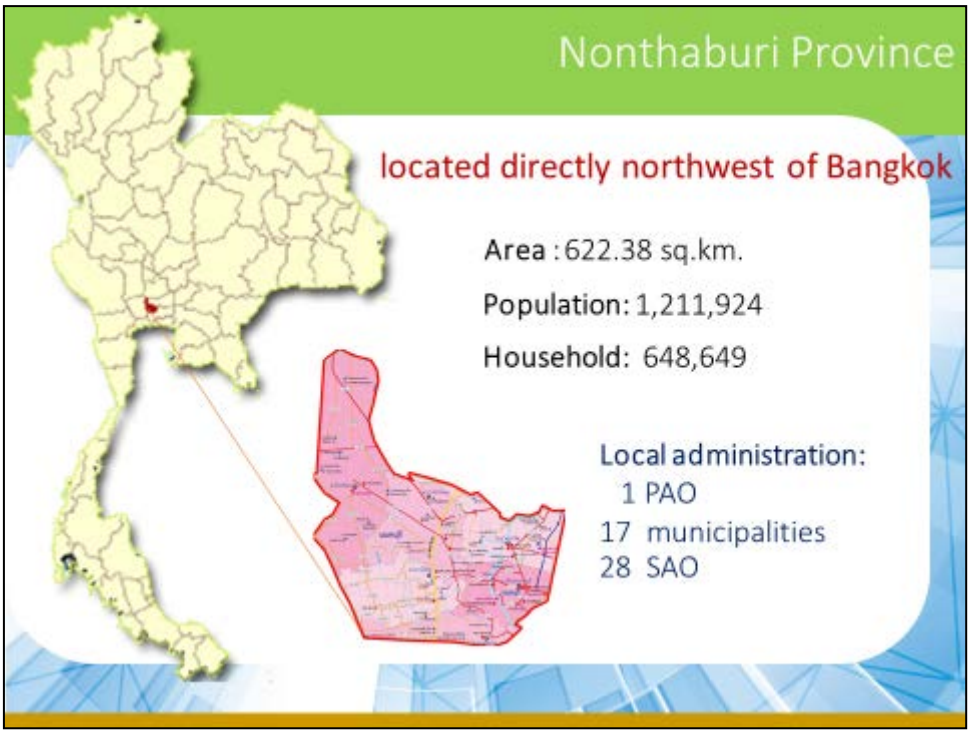
NPTDC is principal agency responsible for operation of municipal services in city and is carrying out works for sanitation, tidiness, pleasantness, beautifying, greening and liveliness in NPT.

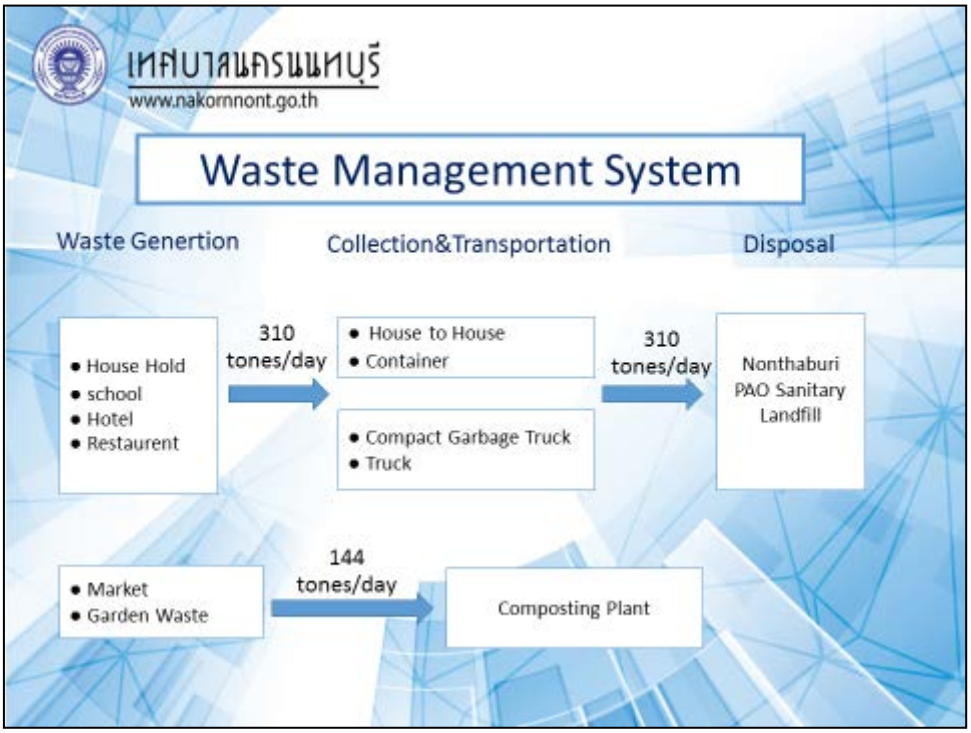
Moreover, it has also frame works for the successful projects and intends to directly improve the living standards of the people in NPT.

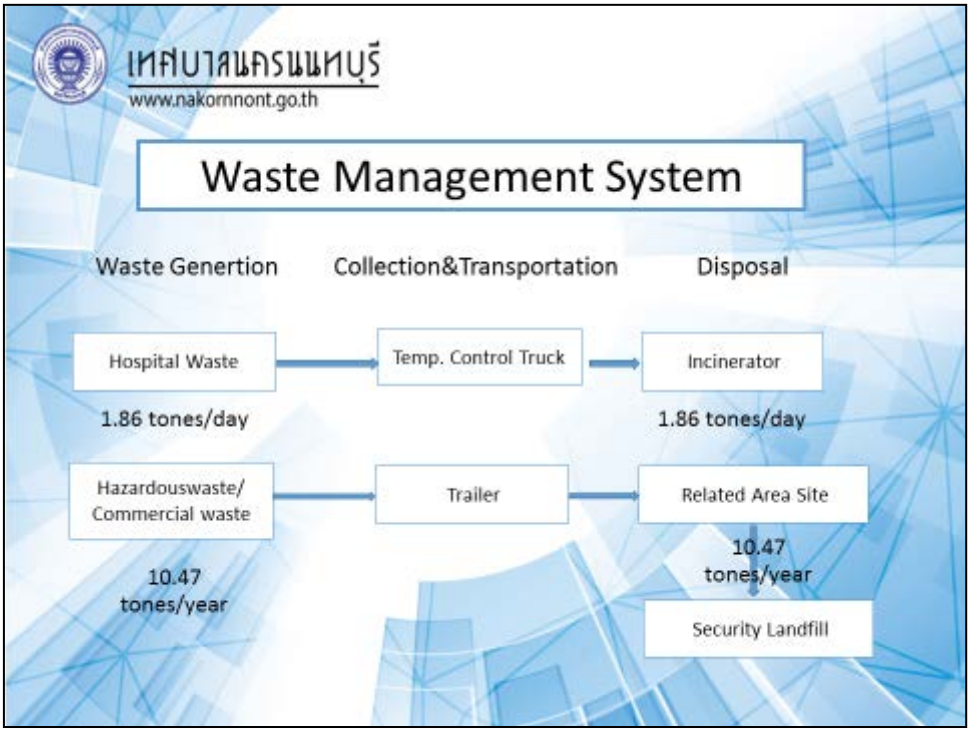
To get successful results in the field pollution control and waste management, there is an urgent need for cooperation and coordination among the region and international organizations.

Thank you for your kind attention

NONTHABURI CITY, THAILAND



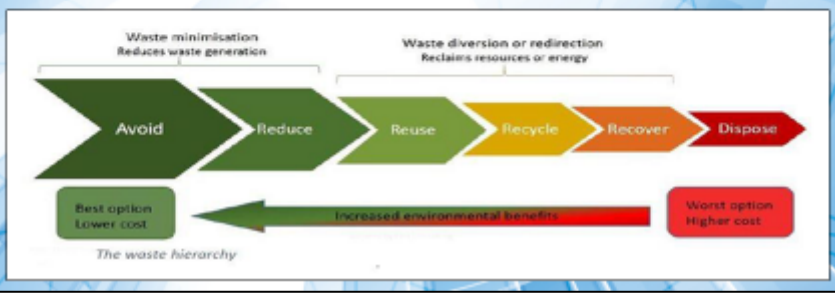

เทศบาลนครนนทบุรี
www.nakornnont.go.th
Waste Management System
Waste Genertion
Collection&Transportation
Disposal
• House Hold
• school
• Hotel
• Restaurent
310 tones/day
• House to House
• Container
• Compact Garbage Truck
• Truck
310 tones/day
Nonthaburi PAO Sanitary Landfill
• Market
• Garden Waste
144 tones/day
Composting Plant


เทศบาลนครนนทบุรี
www.nakornnont.go.th
Waste Management System
Waste Genertion
Collection&Transportation
Disposal
Hospital Waste
1.86 tones/day
Temp. Control Truck
Incinerator
1.86 tones/day
Hazardouswaste/ Commercial waste
10.47 tones/year
Trailer
Related Area Site
10.47 tones/year
Security Landfill

เทศบาลนครนนทบุรี
www.nakornnont.go.th

Good Practices

- Collection (*Separation at source ; municipal, organic, hazardous,hospital*)
- Composting (*vegetable from market, garden waste*)
- Hazardous Waste Collection Point *(Community,School,office)*
- Final disposal *(Sanitary Landfill ; Central Disposal)*



The waste hierarchy

เทศบาลนครนนทบุรี
www.nakornnont.go.th

Hazardous Waste Collecting System







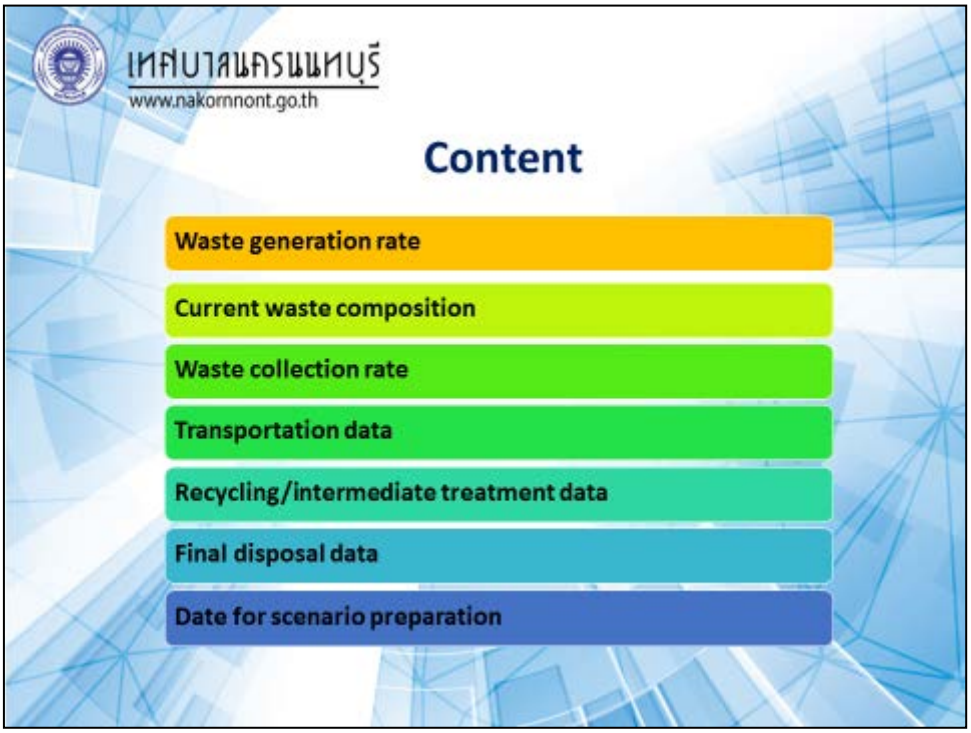

เทศบาลนครนนทบุรี
www.nakornnont.go.th
Composting Plant

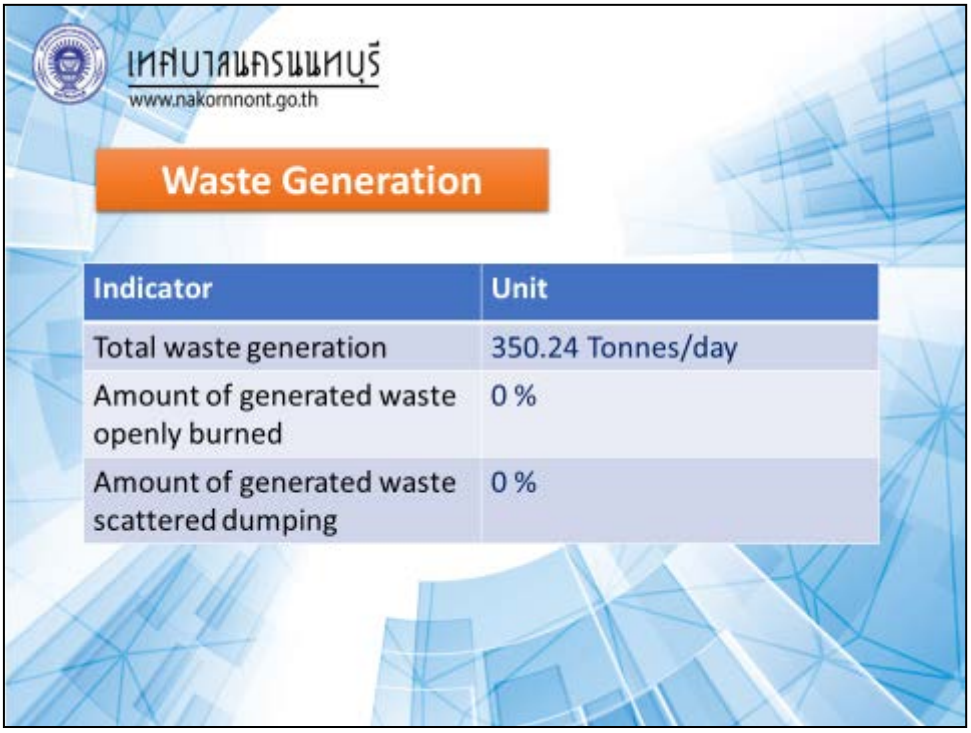

เทศบาลนครนนทบุรี
www.nakornnont.go.th
Future Priorities
• Reduce waste generation rates
• Increase waste recovery rates
• Implement waste separation at source
• Establish waste transfer stations
• Set the date of waste collection type

เทศบาลนครนนทบุรี
www.nakornnont.go.th

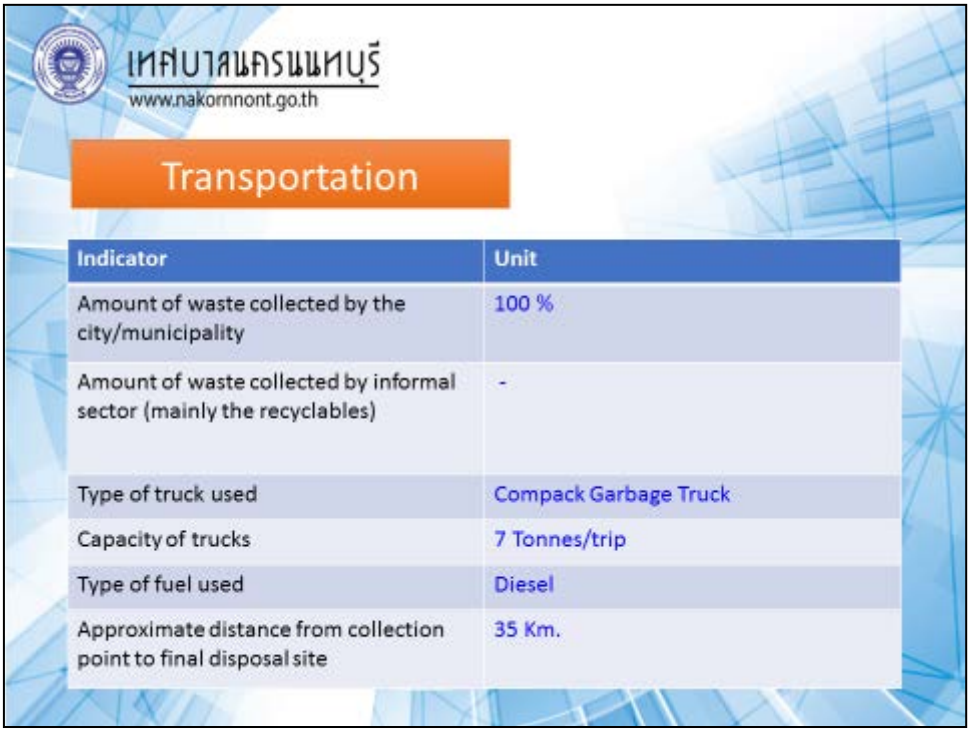
Main Challenges

- Behavioral *(Low public awareness, compliance issues)*
- Infrastructural *(Inefficient waste segregation, collection and transportation, land space availability)*
- Public health *(Health hazards and risks)*
- Technical (*Data gaps, etc.*)
- Law Enforcement
- Increase tipping fee

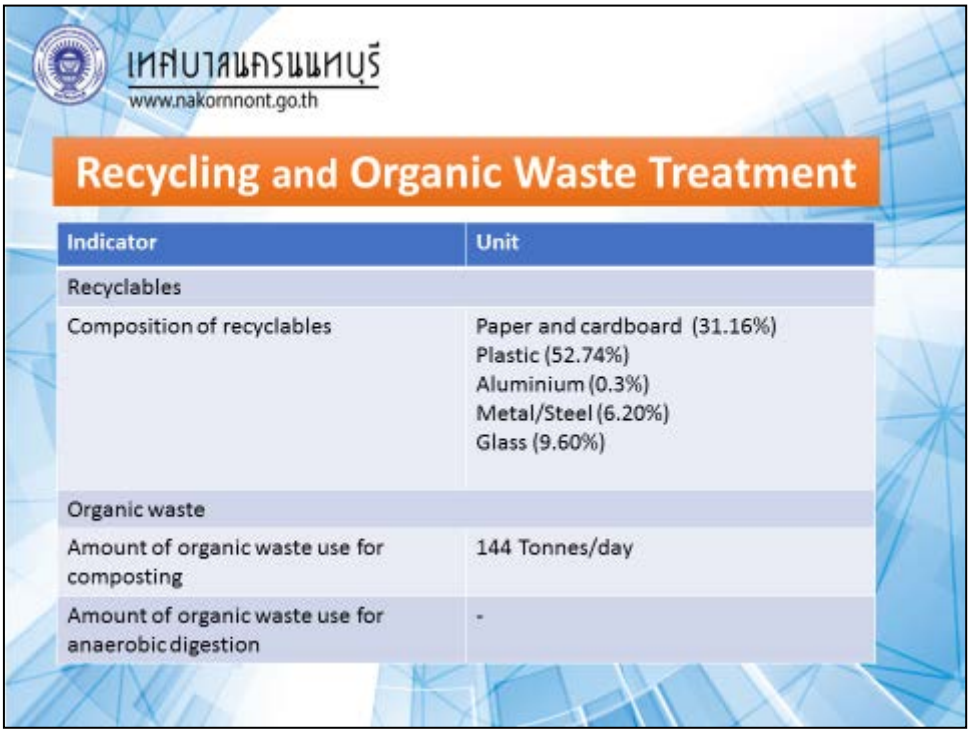

เทศบาลนครนนทบุรี
www.nakornnont.go.th
Content
Waste generation rate
Current waste composition
Waste collection rate
Transportation data
Recycling/intermediate treatment data
Final disposal data
Date for scenario preparation


เทศบาลนครนนทบุรี
www.nakornnont.go.th
Waste Generation
Indicator
Unit
Total waste generation
350.24 Tonnes/day
Amount of generated waste openly burned
0 %
Amount of generated waste scattered dumping
0 %

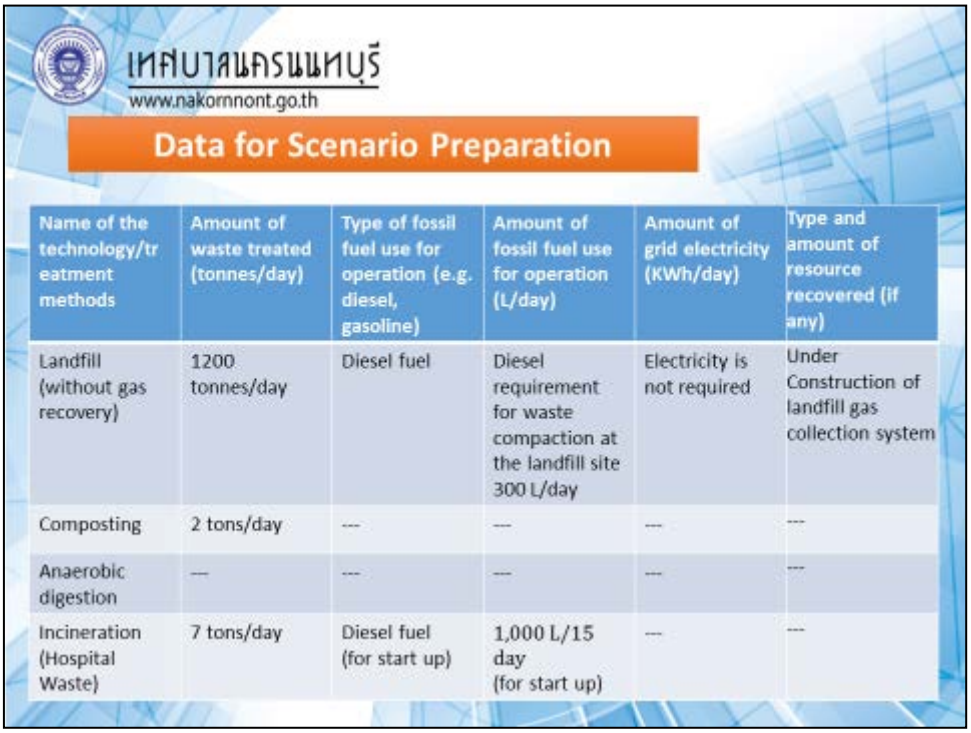
Category	Percentage
Food waste	40.55
Garden waste	-
Plastics	23.19
Paper	5.51
Textile	5.17
Leather/rubber	1.76
Glass	7.41
Metal (aluminum + steel)	5.34
Nappies/diapers (disposable)	-
Wood	0.95
Hazardous waste	0.34
Others	9.68



Indicator	Unit
Amount of waste collected by the city/municipality	100 %
Amount of waste collected by informal sector (mainly the recyclables)	-
Type of truck used	Compack Garbage Truck
Capacity of trucks	7 Tonnes/trip
Type of fuel used	Diesel
Approximate distance from collection point to final disposal site	35 Km.

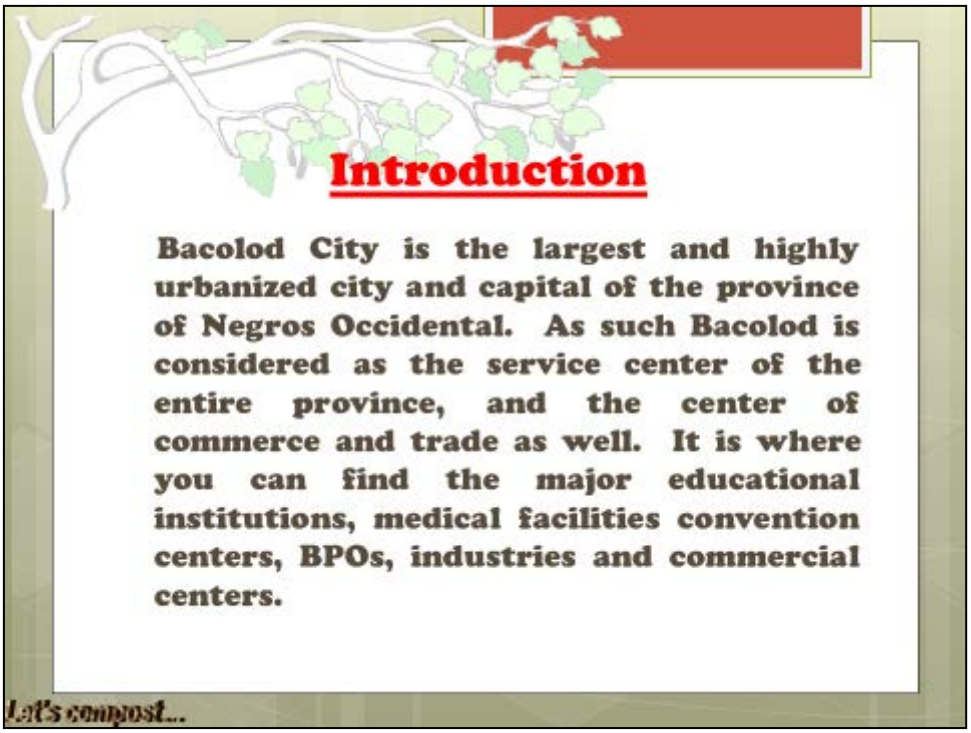

เทศบาลนครนนทบุรี
www.nakornnont.go.th
Recycling and Organic Waste Treatment
Indicator
Unit
Recyclables
Composition of recyclables
Paper and cardboard (31.16%)
Plastic (52.74%)
Aluminium (0.3%)
Metal/Steel (6.20%)
Glass (9.60%)
Organic waste
Amount of organic waste use for composting
144 Tonnes/day
Amount of organic waste use for anaerobic digestion
-

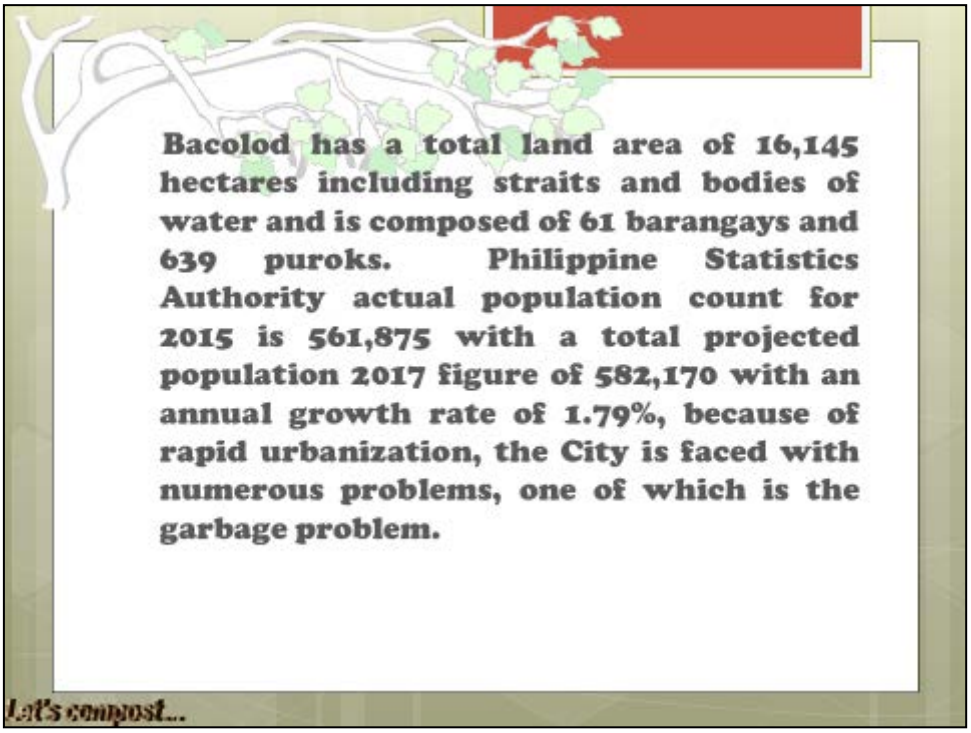

เทศบาลนครนนทบุรี
www.nakornnont.go.th
Final Disposal
Indicator
Unit
Sanitary Landfill
Nonthaburi PAO Sanitary Landfill
(central disposal of Nonthaburi Province)

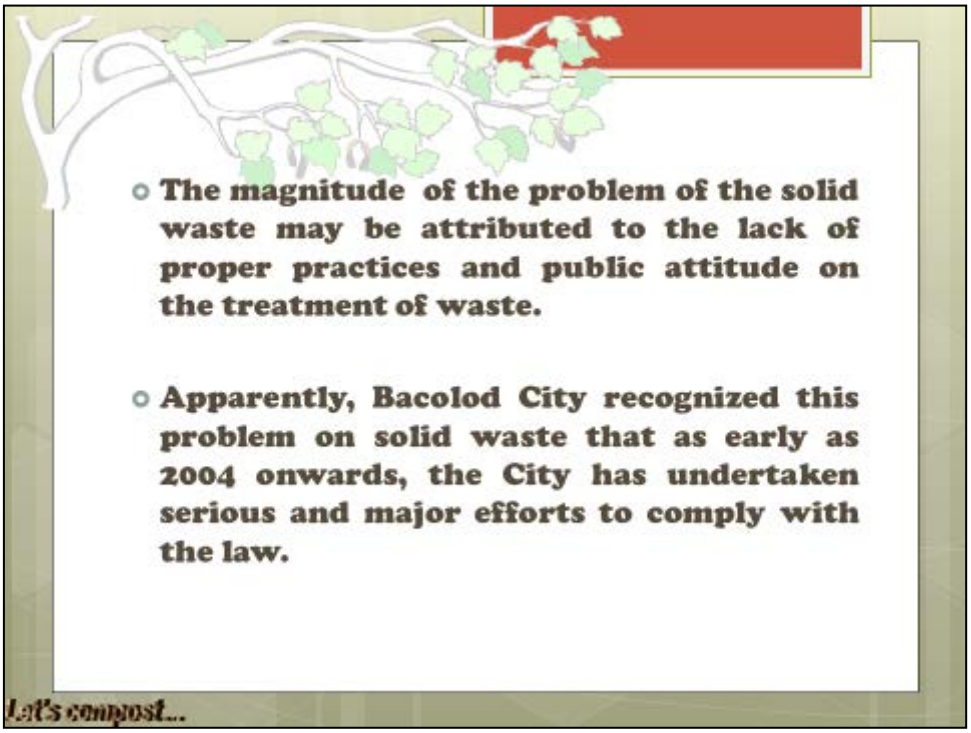


Name of the technology/treatment methods	Amount of waste treated (tonnes/day)	Type of fossil fuel use for operation (e.g. diesel, gasoline)	Amount of fossil fuel use for operation (L/day)	Amount of grid electricity (KWh/day)	Type and amount of resource recovered (if any)
Landfill (without gas recovery)	1200 tonnes/day	Diesel fuel	Diesel requirement for waste compaction at the landfill site 300 L/day	Electricity is not required	Under Construction of landfill gas collection system
Composting	2 tons/day	---	---	---	---
Anaerobic digestion	---	---	---	---	---
Incineration (Hospital Waste)	7 tons/day	Diesel fuel (for start up)	1,000 L/15 day (for start up)	---	---

CITY OF BACOLOD, PHILIPPINES



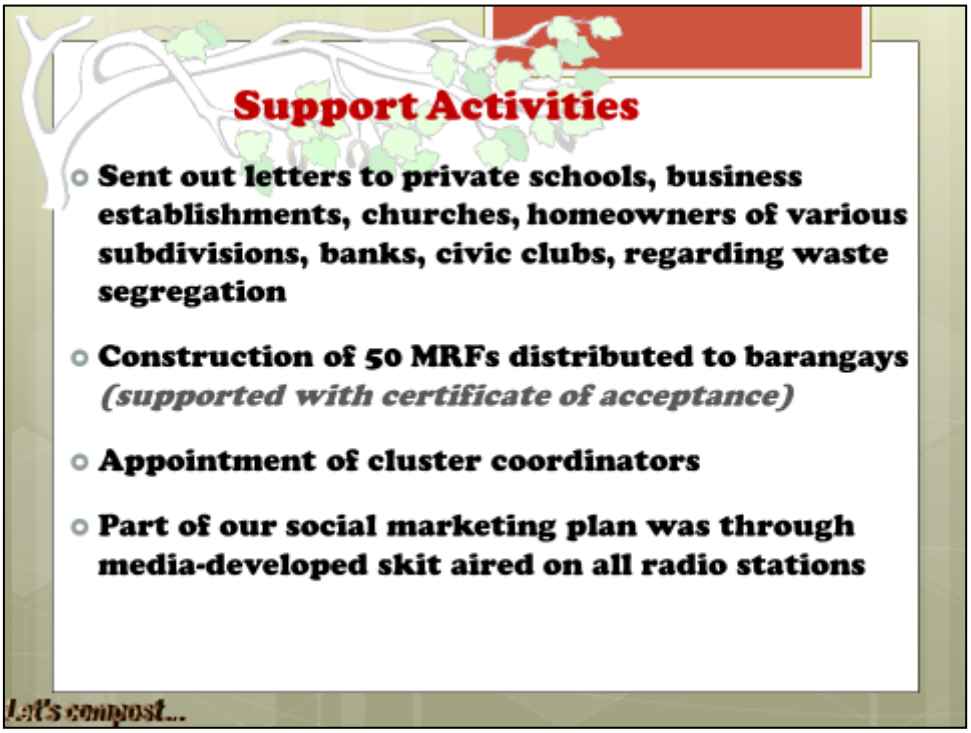



The magnitude of the problem of the solid waste may be attributed to the lack of proper practices and public attitude on the treatment of waste.
Apparently, Bacolod City recognized this problem on solid waste that as early as 2004 onwards, the City has undertaken serious and major efforts to comply with the law.
Let's compost...


Pre-Implementation Activities
Organization of Core Group - City Mayor's Office(CMO), Environment & Natural Resources Office(ENRO), City Engineer's Office(CEO), Department of Public Services(DPS), City Planning & Development Office(CPDO)
Reconstitution and convening of Solid Waste Management(SWM) Board
Organization of Pool of facilitators, trainers and resource persons for Information & Education Campaign(IEC) on RA 9003
Preparation of IEC materials
Let's compost...


Pre-Implementation Activities
Conduct Series of orientations on RA 9003:
Barangay Captains
Barangay Officials Purok Presidents
Garbage Collectors/street cleaners
Barangay Health Workers
Barangay Nutrition Scholars
Day Care & Child Development Workers
Sanitary Inspectors
City Student Scholars
City Government Employees
Market Vendors
Trisikad Associations and Officials
Media
Summer Jobbers
Let's compost...


Planning Workshops with Barangay Captains
Conducted IEC among barangay constituents
Conducted consultations with constituents regarding: collection schedule, pick-up points, enforcement, MRF, composting site
Workshop with barangays in preparation for "No Segregation, No Collection Policy"
Let's compost...


Support Activities
Sent out letters to private schools, business establishments, churches, homeowners of various subdivisions, banks, civic clubs, regarding waste segregation
Construction of 50 MRFs distributed to barangays (supported with certificate of acceptance)
Appointment of cluster coordinators
Part of our social marketing plan was through media-developed skit aired on all radio stations
Let's compost...

MONITORING ACTIVITIES

- Conducted Focused Group Discussion to 61 barangays on the following concerns:
  1. collection system
  2. use of MRF
  3. enforcement
  4. signages/pick-up points

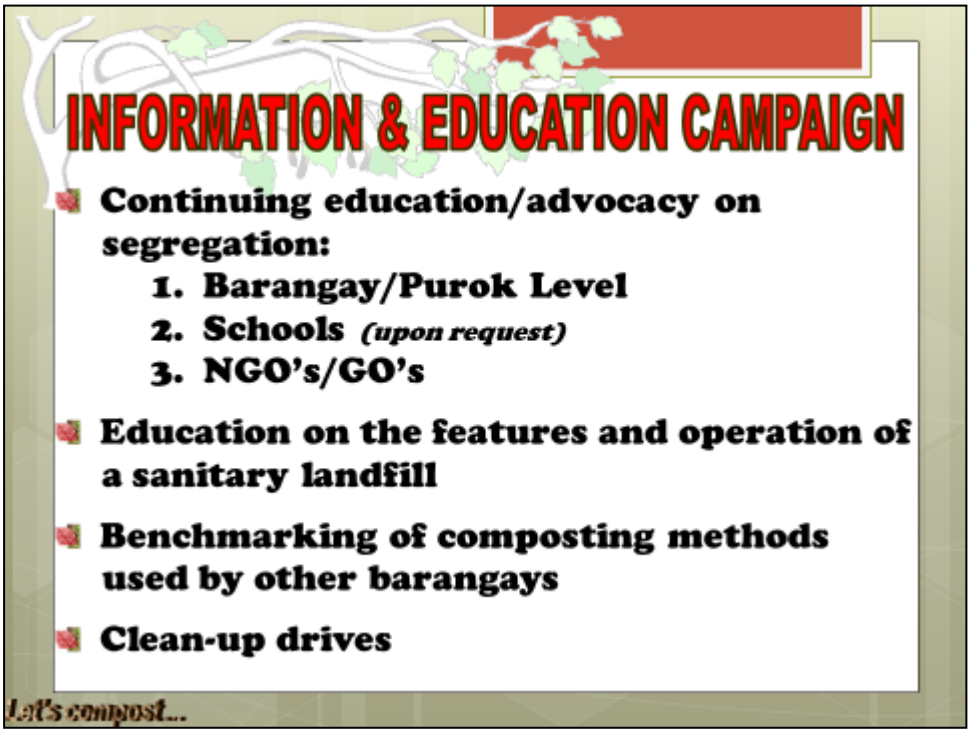
- Assessment of present collection modes and initiate changes to suit the needs of barangays
- Meetings with enforcement team, drivers, street cleaners

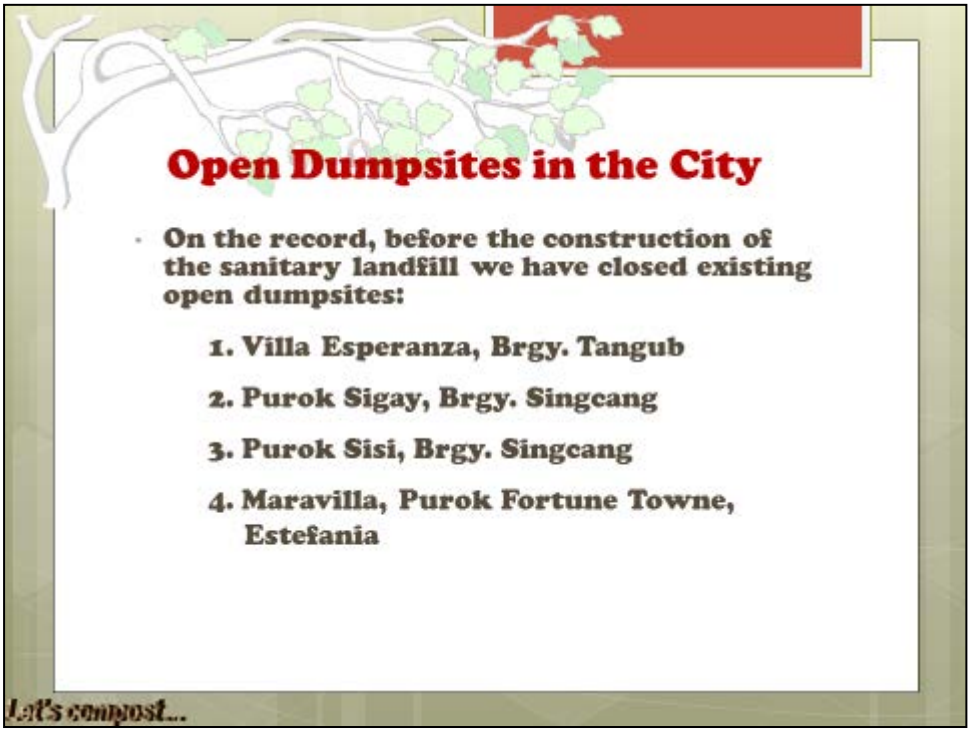
Let's compost...

Support Activities

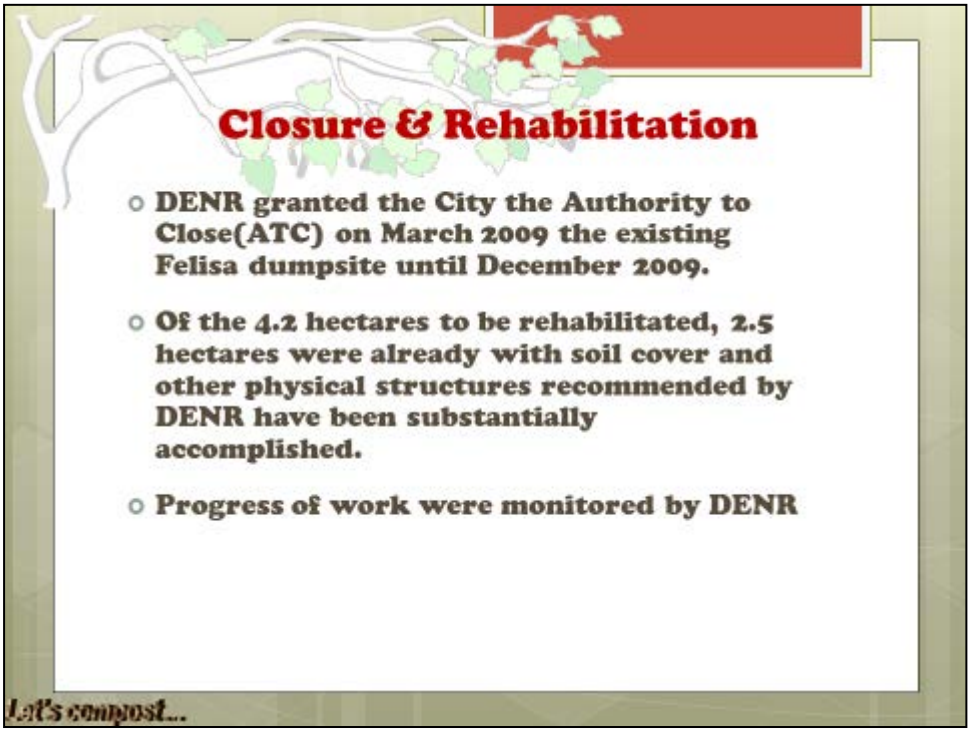
- Monitoring of RA 9003 Enforcement by City Legal Office(CLO) on violations committed
- Formulated a feed backing mechanism through meetings with barangays, dump truck drivers and DPS Personnel
- Actual visits to barangays by cluster coordinators
- Held General Assemblies of Liga ng mga Barangay with Department of Environment & Natural Resources(DENR), Environmental Management Bureau(EMB) and City Environment & Natural Resources Office(CENRO)to discuss sanctions on non-compliance
- Schools were requested to include RA 9003 in their lesson plans

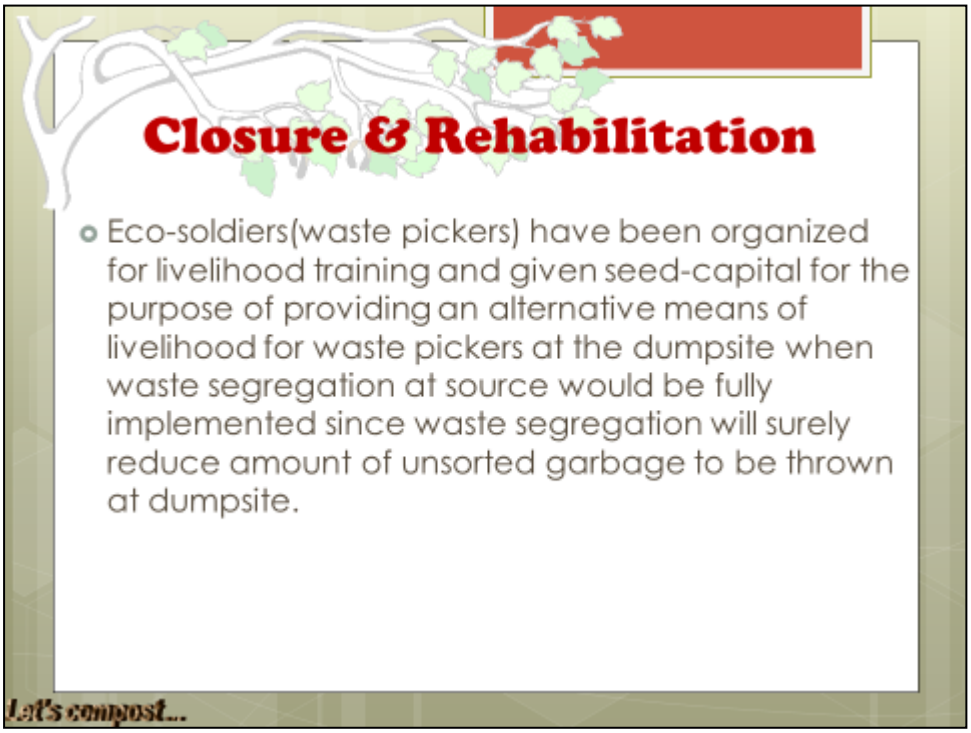
Let's compost...

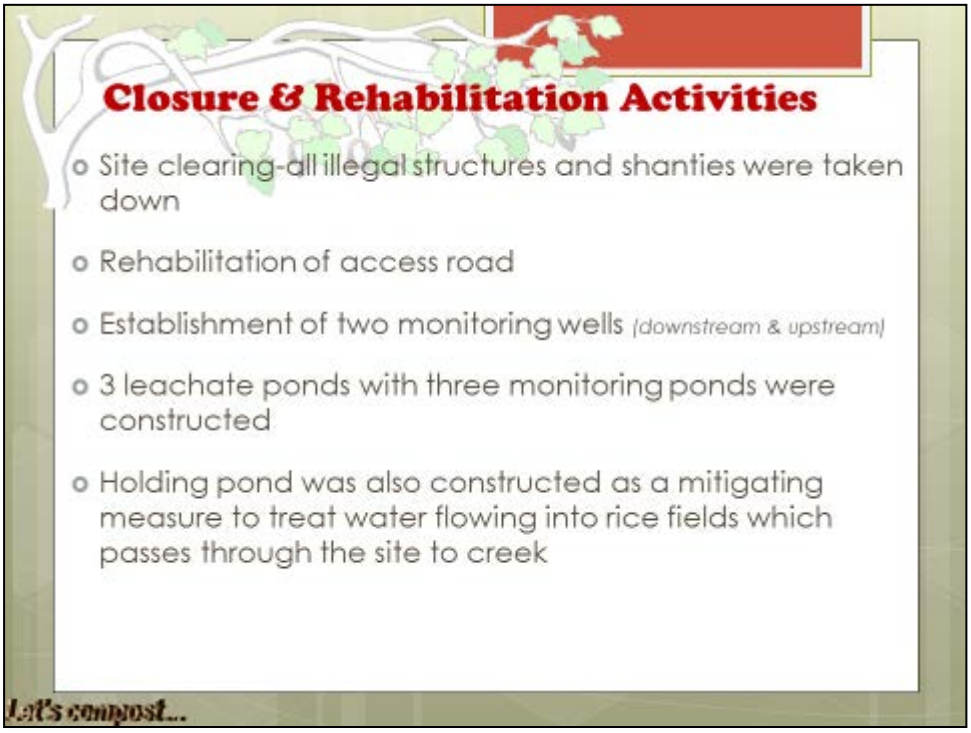

INFORMATION & EDUCATION CAMPAIGN
Continuing education/advocacy on segregation:
1. Barangay/Purok Level
2. Schools (upon request)
3. NGO's/GO's
Education on the features and operation of a sanitary landfill
Benchmarking of composting methods used by other barangays
Clean-up drives
Let's compost...


Open Dumpsites in the City
On the record, before the construction of the sanitary landfill we have closed existing open dumpsites:
1. Villa Esperanza, Brgy. Tangub
2. Purok Sigay, Brgy. Singcang
3. Purok Sisi, Brgy. Singcang
4. Maravilla, Purok Fortune Towne, Estefania
Let's compost...


5. Javelosa-Cabansag, Purok Tonggoy, Brgy. Mandalagan
6. Dinsay-Purok Tango, Brgy. Mandalagan
7. Anglo Dumpsite, Brgy. Mandalagan
8. Rabadilla Dumpsite, Brgy. Mandalagan
9. Lopez Purok Tonggoy, Brgy. Mandalagan
Let's compost...


Closure & Rehabilitation
DENR granted the City the Authority to Close(ATC) on March 2009 the existing Felisa dumpsite until December 2009.
Of the 4.2 hectares to be rehabilitated, 2.5 hectares were already with soil cover and other physical structures recommended by DENR have been substantially accomplished.
Progress of work were monitored by DENR
Let's compost...


Closure & Rehabilitation
Eco-soldiers(waste pickers) have been organized for livelihood training and given seed-capital for the purpose of providing an alternative means of livelihood for waste pickers at the dumpsite when waste segregation at source would be fully implemented since waste segregation will surely reduce amount of unsorted garbage to be thrown at dumpsite.
Let's compost...

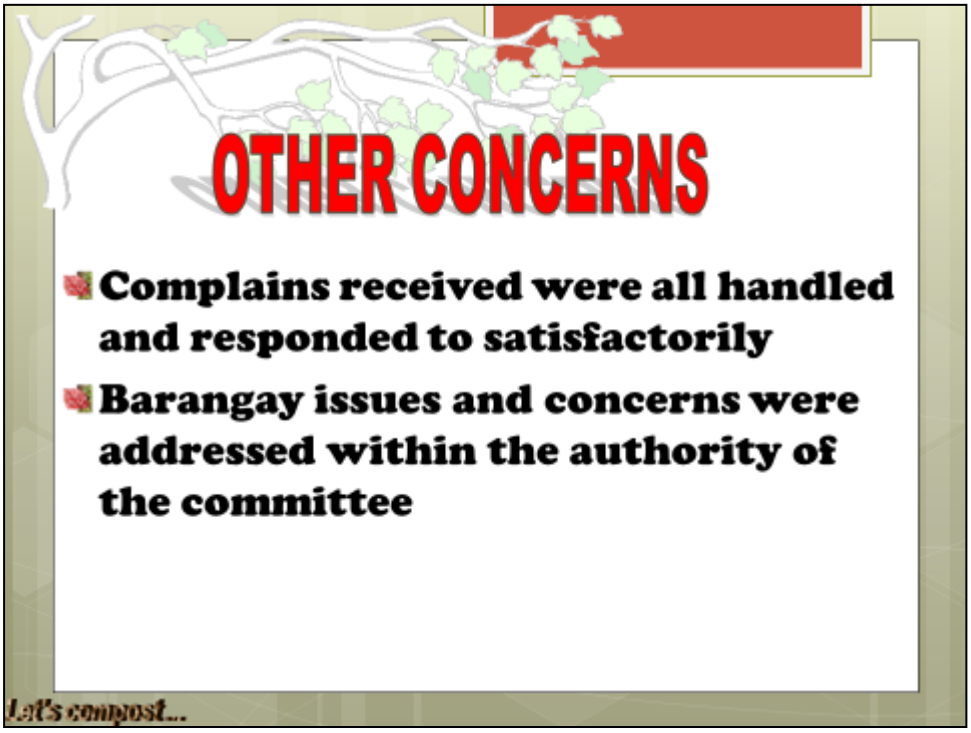

Closure & Rehabilitation Activities
Site clearing-all illegal structures and shanties were taken down
Rehabilitation of access road
Establishment of two monitoring wells (downstream & upstream)
3 leachate ponds with three monitoring ponds were constructed
Holding pond was also constructed as a mitigating measure to treat water flowing into rice fields which passes through the site to creek
Let's compost...

Closure & Rehabilitation Activities

- Construction of perimeter fence
- Installation of gas vents
- Establishment of green belts
- Application of soil cover and final soil cover and vegetation
- Compacting and sloping stabilization for phase 2
- Enzyme spray loaded garbage to mitigate odor
- Closure was done on a phase by phase scheme until construction of SLF

Let's compost...


SOLID WASTE ENHANCEMENT PROGRAM (SWEP)
Meeting with the Solid Waste Coordinating Team
City wide clean-up per barangay
Assessment & preparation of new collection schedule
Review on status of implementation
Pilot test in selected barangays
Monitoring & evaluation
Enhance implementation of "`No segregation, No Collection Policy"
Let's compost...


OTHER CONCERNS
Complains received were all handled and responded to satisfactorily
Barangay issues and concerns were addressed within the authority of the committee
Let's compost...

Sanitary Landfill

- A long term solution to the current disposal problem .

Steps:

- Site selection
- Regional Development Council(RDC) and City Development Council(CDC) passed a resolution for the construction of Sanitary Landfill(SLF)
- Conducted community consultation for social acceptability, Environmental Compliance Certificate(ECC) for protection of natural resources, geological suitability
- Amidst all political challenges, the SLF was constructed

Let's compost...

Bacolod Sanitary Landfill

The Landfill was officially turned over last April 20, 2012.

The City started using SLF as final disposal of residual wastes while the remaining phase of the Felisa dump site was being rehabilitated.

Let's compost...

SLF Turn-over Ceremony
April 20, 2012


Cover Story

Sanitary Landfill Project


Weekly

Let's compost...

Bacolod Sanitary Landfill

Let's compost...


Bacolod Sanitary Landfill
Let's compost...


Bacolod Sanitary Landfill
Let's compost...

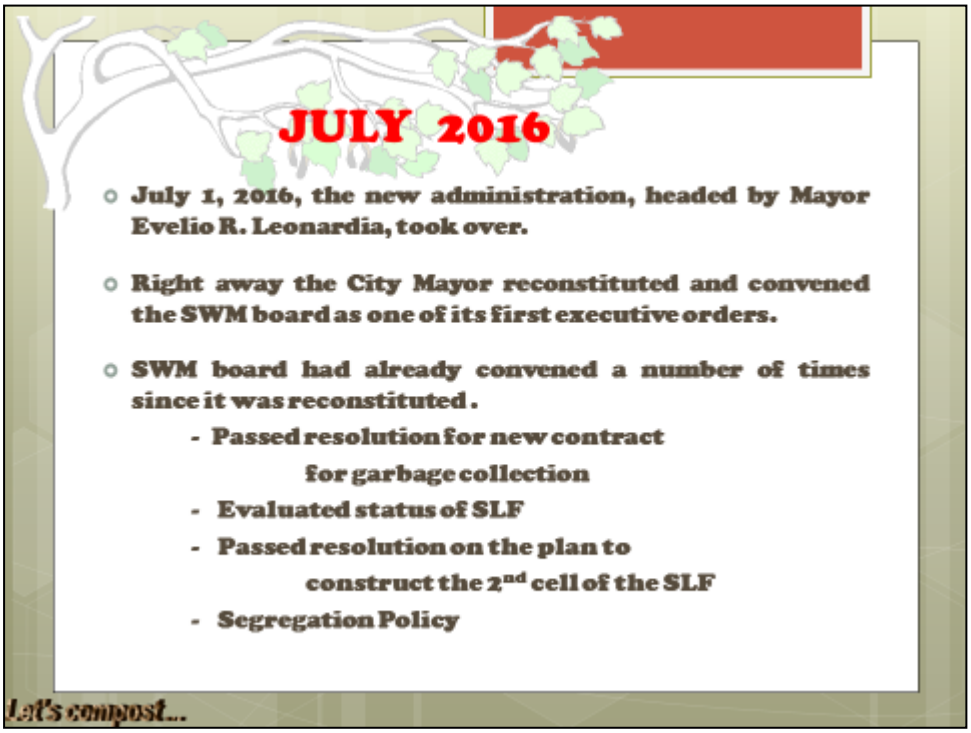
Bacolod Sanitary Landfill

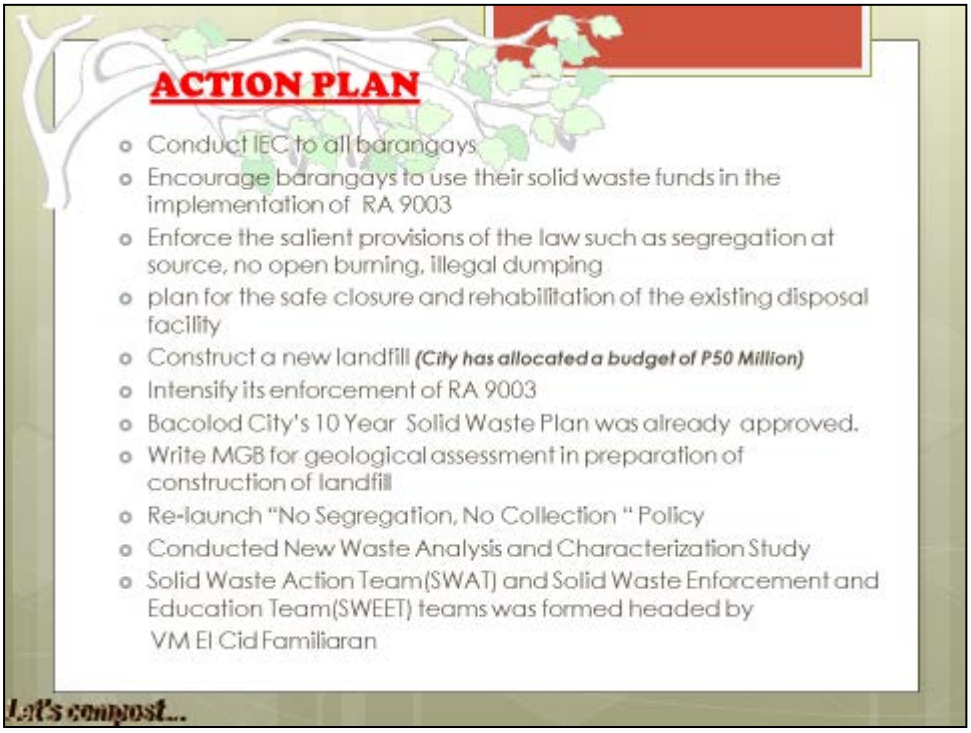
Let's compost...

2013

- **Middle of this year, Mayor Evelio R. Leonardia was on his final term of his 9 years of leading the city and handing the city to the next administration with all the projects in high progress especially the New Sanitary Landfill.**
- **Unfortunately, the 2013-2016 administration failed to properly operate the SLF and changed the whole vision of the SLF which resulted to the improper utilization of the facility.**

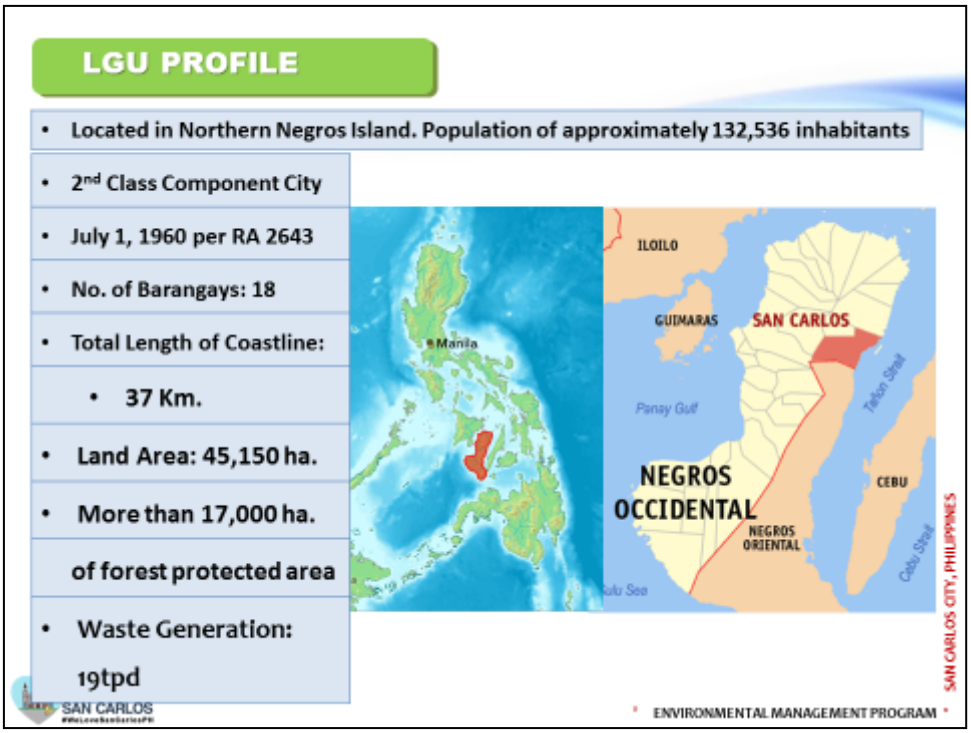
Let's compost...


JULY 2016
July 1, 2016, the new administration, headed by Mayor Evelio R. Leonardia, took over.
Right away the City Mayor reconstituted and convened the SWM board as one of its first executive orders.
SWM board had already convened a number of times since it was reconstituted.
- Passed resolution for new contract for garbage collection
- Evaluated status of SLF
- Passed resolution on the plan to construct the 2nd cell of the SLF
- Segregation Policy
Let's compost...


ACTION PLAN
Conduct IEC to all barangays
Encourage barangays to use their solid waste funds in the implementation of RA 9003
Enforce the salient provisions of the law such as segregation at source, no open burning, illegal dumping
plan for the safe closure and rehabilitation of the existing disposal facility
Construct a new landfill (City has allocated a budget of P50 Million)
Intensify its enforcement of RA 9003
Bacolod City's 10 Year Solid Waste Plan was already approved.
Write MGB for geological assessment in preparation of construction of landfill
Re-launch "No Segregation, No Collection " Policy
Conducted New Waste Analysis and Characterization Study
Solid Waste Action Team(SWAT) and Solid Waste Enforcement and Education Team(SWEET) teams was formed headed by VM El Cid Familiaran
Let's compost...


Bacolod City is committed to comply with the provisions of R.A. 9003, otherwise known as Ecological Solid Waste Management Act.
While we recognize the problems and challenges that exists and must be hurdled, we shall endeavor to seek the guidance and support of the DENR and Environmental Advocates.
We shall continue to strategize and seek the cooperation and participation in this crusade to protect the environment.
Thank you.
Let's compost...

CITY OF SAN CARLOS, PHILIPPINES



Arts, Culture and Heritage

TOURIST ATTRACTIONS

San Carlos Borromeo Cathedral – this Gothic, Byzantine and Romanesque design cathedral became a parish in 1895 during the term of Fr. Pedro Chivite, OAR. It became a diocese on February 10, 1998

Remains of the First Modern Sugar Central in the Country –The San Carlos Milling Company was built in 1907.

The Ruins - Broce Ancestral House was built in 1934. Formerly the "Old Municipal Hall". It was used as a Japanese Garrison during World War II.

Pano-olan Pottery – center of pottery industry of San Carlos City. Can be found along the highway going to Dumaguete City.

The Pedicab – an environmental friendly vehicle which helps in the reduction of the city's CO2 emission

WE LOVE SAN CARLOS
#WeLoveSanCarlosPH

SAN CARLOS CITY, PHILIPPINES

ENVIRONMENTAL MANAGEMENT PROGRAM

Arts, Culture and Heritage

TOURIST ATTRACTIONS

Body Painting

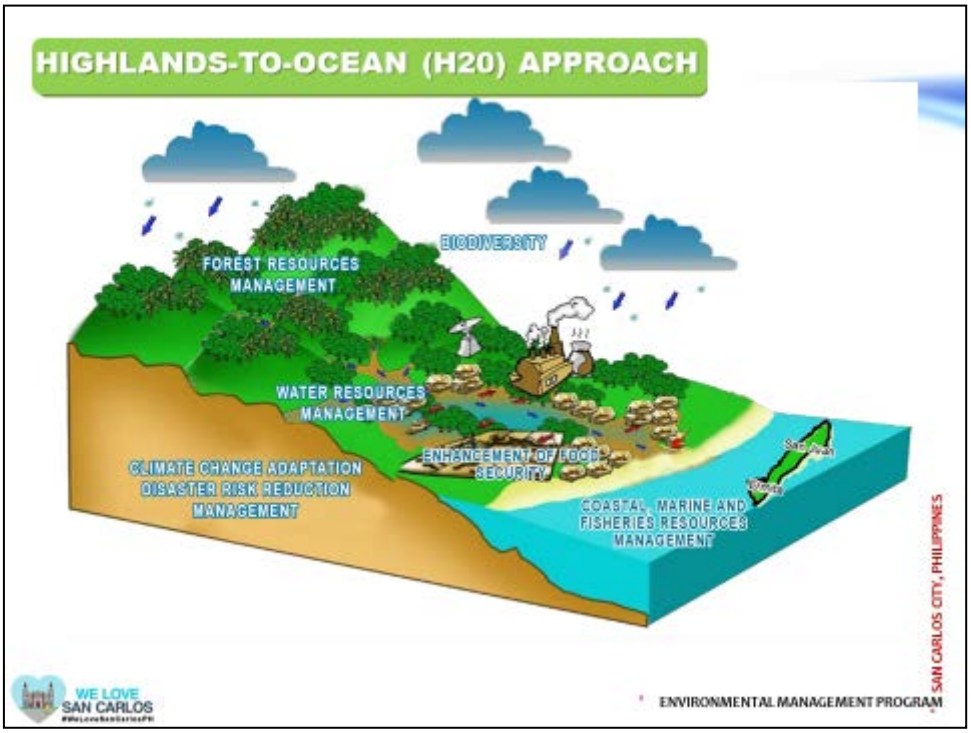
Pintaflores Festival –Culminated by Street dancing and Ritual Competition from various contingents of the city and other places. They're all painted with flowers on their bodies, and dancing with the rhythmic beats. Held annually on Nov. 3-5 in time with the celebration of Negros Day and the feast of St. Charles Borromeo, patron saint of the city.

Aerial Dance

WE LOVE SAN CARLOS
#WeLoveSanCarlosPH

SAN CARLOS CITY, PHILIPPINES

ENVIRONMENTAL MANAGEMENT PROGRAM


HIGHLANDS-TO-OCEAN (H20) APPROACH
BIODIVERSITY
FOREST RESOURCES MANAGEMENT
WATER RESOURCES MANAGEMENT
ENHANCEMENT OF FOOD SECURITY
CLIMATE CHANGE ADAPTATION
DISASTER RISK REDUCTION
MANAGEMENT
COASTAL, MARINE AND FISHERIES RESOURCES MANAGEMENT
WE LOVE SAN CARLOS
ENVIRONMENTAL MANAGEMENT PROGRAM
SAN CARLOS CITY, PHILIPPINES


SOLID WASTE MANAGEMENT
Lifestyle Change Program
Year I - 2003
An Ecological Solid Waste Management (ESWM) Information Education & Communication Campaign for the Urban Areas
Year II - 2004
An ESWM Information Education & Communication Campaign for the Lowland and Upland Rural Areas and Lowland Urban Areas
Year III - 2005
An Integrated SWM Information, Education & Communication Campaign - Monitoring and Evaluation of the Implementation of R.A. 9003 by all Barangays
Year IV - 2006
Participative Formulation and Installation of a Monitoring & Evaluation System, Policies and Procedures for a Sustainable ESWM Program
Campaign Materials
House-to-House Campaign
WE LOVE SAN CARLOS
#WeLoveSanCarlosPH
ENVIRONMENTAL MANAGEMENT PROGRAM
SAN CARLOS CITY, PHILIPPINES


SOLID WASTE MANAGEMENT
Lifestyle Change Project
• Incentives and Awards
Every Sunday is
NO PLASTIC DAY
For Public Market
(Fish and Meat Section)
Starting August, 2013
Environment First!
Say No to Plastic Bags
reduce • reduce • reduce
"No Plastic Day" Campaign
San Carlos City
Green City
NO To Plastic Bags
YES To Reusable Recyclable Bags
BYOB
"Bag / Bayong"
City Ordinance No. 14-53, Series of 2014
Search for Sustainable & Eco-Friendly School Contest
WE LOVE SAN CARLOS
SAN CARLOS CITY, PHILIPPINES
ENVIRONMENTAL MANAGEMENT PROGRAM


SOLID WASTE MANAGEMENT
Lifestyle Change Project
NO SEGREGATION
NO COLLECTION
REDUCE REUSE
RECYCLE COMPOST
NO SEGREGATION, NO COLLECTION POLICY
LAIN LAINON
DILI
KOLEKTAHON
SAN CARLOS CITY, PHILIPPINES
ENVIRONMENTAL MANAGEMENT PROGRAM

SOLID WASTE MANAGEMENT

Final Disposal Facility

Eco-Center Area = 5 Hectares
Vital Facilities:
1. Material Recovery Facility (MRF)
2. Sanitary Landfill (SLF)
3. Leachate Treatment Facility
4. Composting Facility

Initial Cell = 6,600 sq.m.




WE LOVE SAN CARLOS
#WeLoveSanCarlosPH

Eco-Center

SAN CARLOS CITY, PHILIPPINES

ENVIRONMENTAL MANAGEMENT PROGRAM

SOLID WASTE MANAGEMENT

Final Disposal Facility

- Eco-Center

Materials Recovery Facility




Sanitary Landfill


Wastewater Treatment Facility

WE LOVE SAN CARLOS

SAN CARLOS CITY, PHILIPPINES

ENVIRONMENTAL MANAGEMENT PROGRAM


SOLID WASTE MANAGEMENT
Eco-Center Operation
• Bio Processing
WE LOVE SAN CARLOS
ENVIRONMENTAL MANAGEMENT PROGRAM
SAN CARLOS CITY, PHILIPPINES


SOLID WASTE MANAGEMENT
Eco-Center Operation
Non-Bio Processing
WE LOVE SAN CARLOS
ENVIRONMENTAL MANAGEMENT PROGRAM
SAN CARLOS CITY, PHILIPPINES

HOLCIM CEMENT PARTNERSHIP



Waste materials baled at the Eco-Center



Hauling of waste materials for delivery to SCC Port

SAN CARLOS CITY, PHILIPPINES

WE LOVE SAN CARLOS

ENVIRONMENTAL MANAGEMENT PROGRAM

SOLID WASTE MANAGEMENT

Eco-Center Operation

- Waste Minimization and Increased Waste Diversion

SAN CARLOS CITY, PHILIPPINES

WE LOVE SAN CARLOS

ENVIRONMENTAL MANAGEMENT PROGRAM

SOLID WASTE MANAGEMENT

Eco-Center Operation

RECORDED INCOME AS OF DEC. 2017

RECYCLABLES	-	1,712,547.75
COMPOST (sold)	-	
COMPOST (given for free to gov't projects)		
Natural Compost	-	
Vermicast	-	
CASH AWARDS / GRANTS	-	1,320,000.00
	TOTAL	3,032,547.75

As Tourist Attraction

- Total No, of Visitors as of December 2017: 8,027

WE LOVE SAN CARLOS

SAN CARLOS CITY, PHILIPPINES

ENVIRONMENTAL MANAGEMENT PROGRAM

SOLID WASTE MANAGEMENT

Final Closure of Old Dumpsite

- The Former

- Spreading and Compaction of 45 cm thick Liner

- Covering of 15cm Garden Soil & Installation of Gas Vents

- Construction of Earth Bunk

WE LOVE SAN CARLOS

SAN CARLOS CITY, PHILIPPINES

ENVIRONMENTAL MANAGEMENT PROGRAM

SOLID WASTE MANAGEMENT

Final Closure of Old Dumpsite

WE LOVE SAN CARLOS

SAN CARLOS CITY, PHILIPPINES

ENVIRONMENTAL MANAGEMENT PROGRAM

CREATION OF LAW ENFORCEMENT TEAM (LET)

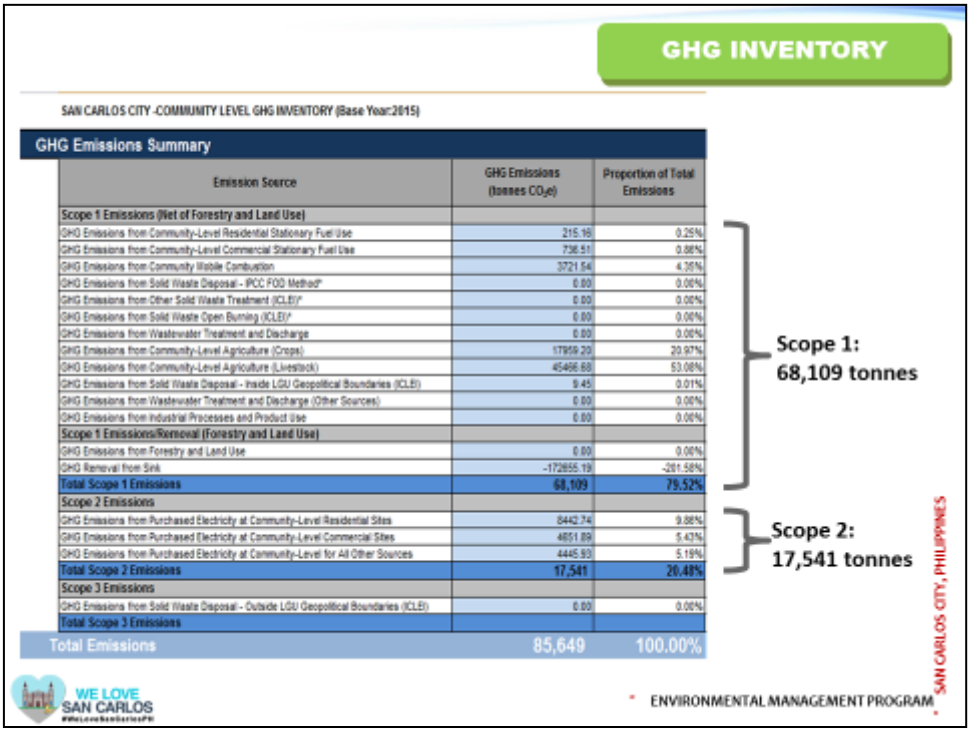
LET Lakbay Aral at Bago City
April 24, 2014

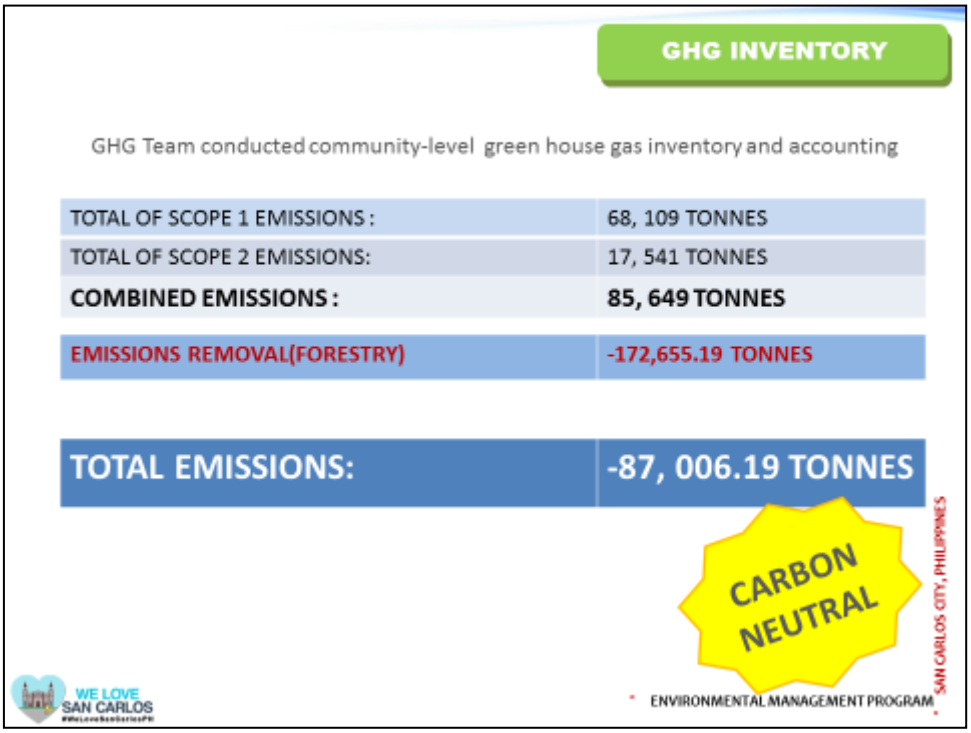
WE LOVE SAN CARLOS

SAN CARLOS CITY, PHILIPPINES

ENVIRONMENTAL MANAGEMENT PROGRAM


ENFORCEMENT
Charcoal Confiscated
14-53 Day & Night Enforcement
CRM Apprehension
WE LOVE SAN CARLOS
SAN CARLOS CITY, PHILIPPINES
ENVIRONMENTAL MANAGEMENT PROGRAM


GHG INVENTORY
SAN CARLOS CITY -COMMUNITY LEVEL GHG INVENTORY (Base Year:2015)
GHG Emissions Summary
Emission Source
GHG Emissions (tonnes CO_2e)
Proportion of Total Emissions
Scope 1 Emissions (Net of Forestry and Land Use)
GHG Emissions from Community-Level Residential Stationary Fuel Use 215.16 0.25%
GHG Emissions from Community-Level Commercial Stationary Fuel Use 736.51 0.86%
GHG Emissions from Community Mobile Combustion 3721.54 4.35%
GHG Emissions from Solid Waste Disposal - IPCC FOD Method* 0.00 0.00%
GHG Emissions from Other Solid Waste Treatment (ICLEI)* 0.00 0.00%
GHG Emissions from Solid Waste Open Burning (ICLEI)* 0.00 0.00%
GHG Emissions from Wastewater Treatment and Discharge 0.00 0.00%
GHG Emissions from Community-Level Agriculture (Crops) 17959.20 20.97%
GHG Emissions from Community-Level Agriculture (Livestock) 45466.68 53.08%
GHG Emissions from Solid Waste Disposal - Inside LGU Geopolitical Boundaries (ICLEI) 9.45 0.01%
GHG Emissions from Wastewater Treatment and Discharge (Other Sources) 0.00 0.00%
GHG Emissions from Industrial Processes and Product Use 0.00 0.00%
Scope 1 Emissions/Removal (Forestry and Land Use)
GHG Emissions from Forestry and Land Use 0.00 0.00%
GHG Removal from Sink -172855.19 -201.58%
Total Scope 1 Emissions 68,109 79.52%
Scope 2 Emissions
GHG Emissions from Purchased Electricity at Community-Level Residential Sites 8442.74 9.86%
GHG Emissions from Purchased Electricity at Community-Level Commercial Sites 4651.89 5.43%
GHG Emissions from Purchased Electricity at Community-Level for All Other Sources 4445.93 5.19%
Total Scope 2 Emissions 17,541 20.48%
Scope 3 Emissions
GHG Emissions from Solid Waste Disposal - Outside LGU Geopolitical Boundaries (ICLEI) 0.00 0.00%
Total Scope 3 Emissions
Total Emissions 85,649 100.00%
Scope 1: 68,109 tonnes
Scope 2: 17,541 tonnes
WE LOVE SAN CARLOS
SAN CARLOS CITY, PHILIPPINES
ENVIRONMENTAL MANAGEMENT PROGRAM


GHG INVENTORY
GHG Team conducted community-level green house gas inventory and accounting
TOTAL OF SCOPE 1 EMISSIONS :
68, 109 TONNES
TOTAL OF SCOPE 2 EMISSIONS:
17, 541 TONNES
COMBINED EMISSIONS :
85, 649 TONNES
EMISSIONS REMOVAL(FORESTRY)
-172,655.19 TONNES
TOTAL EMISSIONS:
-87, 006.19 TONNES
CARBON NEUTRAL
WE LOVE SAN CARLOS
ENVIRONMENTAL MANAGEMENT PROGRAM
SAN CARLOS CITY, PHILIPPINES

ESWM PLAN BENCHMARKS VS. TARGETS

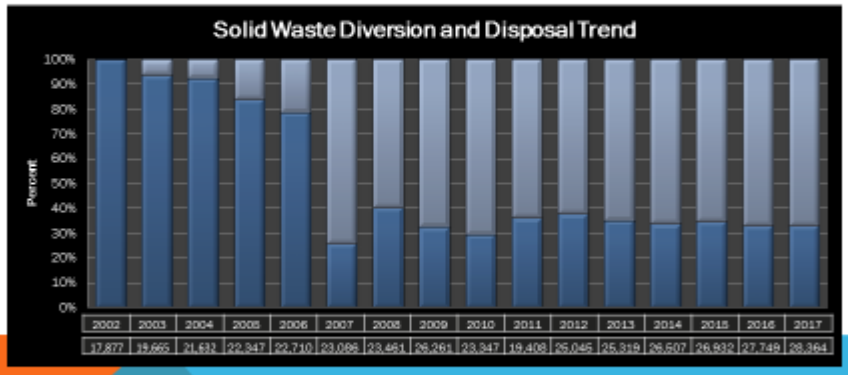
WASTE GENERATION PER SECTOR				
SECTOR	kgs/day	kgs/year	tons/year	%
Residential	38,951.95	14,217,461.75	14,217.46	77.25
Market	7,029.00	2,565,585	2,565.59	13.94
Institutional	2,354.76	859,487.40	859.49	4.67
Hospital	2,087.52	761,944.80	761.94	4.14
TOTAL	50,423.23	**18,404,478.95**	**18,404.48**	**100**

Note: Per Capita Waste Generation as of **2015 WACS** **0.37 kgs/day**

WASTE CLASSIFICATION

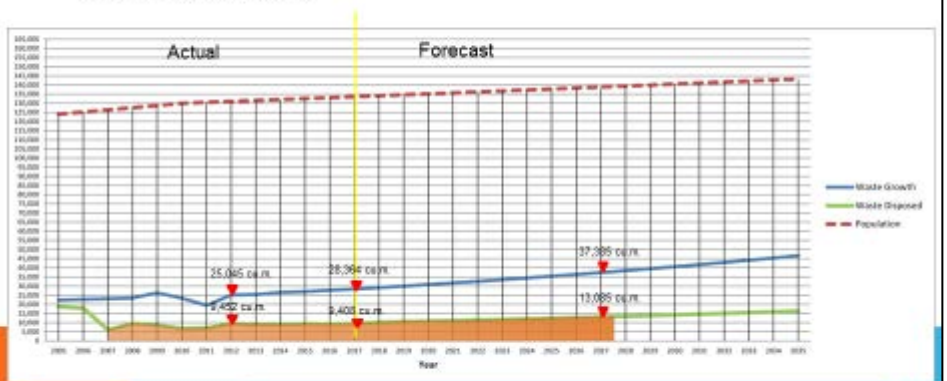
CLASSIFICATION	Generation (kgs/day)	Percentage (%)
Biodegradable	29,916.10	59.33%
Recyclable	3,519.54	6.98%
Residual	14,577.36	28.91%
Special	2,410.23	4.78%
TOTAL	50,423.23	**100%**

SOLID WASTE COLLECTION AND DISPOSAL



PROJECTIONS

- For San Carlos City only



- it is estimated that the 1st cell landfill capacity of 215,615.30 cu.m. would last up to twenty years and six months (20.50 yrs) given the 35% disposal

WASTE DELIVERED FROM OTHER LGUS

NEIGHBORING LGU'S WASTE DELIVERY MATRIX AS OF 2017

	LGU'S	JANUARY	FEBRUARY	MARCH	APRIL	MAY	JUNE	JULY	AUGUST	SEPTEMBER	OCTOBER	NOVEMBER	DECEMBER	TOTAL NO. OF DELIVERIES	TOTAL VOLUME (CU.M.)
1	CALATRAVA		√ √ √		√	√		√ √ √			√ √			10	134.10
2	TOBOSO	√				√								2	27.72
3	ESCALANTE								√			√	√	3	17.28
4	DON SALVADOR										√	√		2	8.73
5	VALLEHERMOSO													0	0
	TOTAL													17	187.83

MUNICIPALITY OF SOLANO, PHILIPPINES

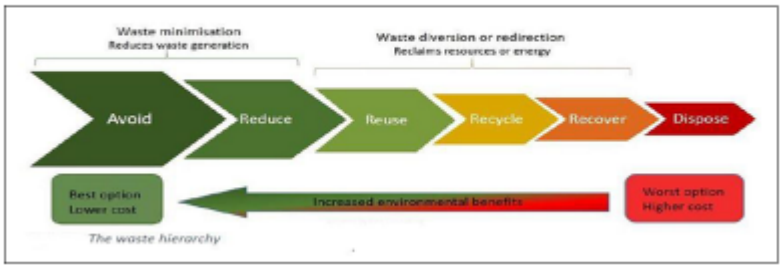
Background

Brief explanation about your city's geography and administration in relation to waste management.

Good Practices

Brief explanation of any identified good practices and/or innovations with regard to your Municipality's waste management system. For example:

- Collection (*Separation at source, etc.*)
- Transportation (*Low emissions vehicles, etc.*)
- Recycling (*High recycling rates, etc.*)
- Composting (*Established compost market, etc.*)
- Waste to energy (*High energy conversion rate, etc.*)
- Final disposal (*Landfill gas capture, etc.*)



The waste hierarchy

Future Priorities

Brief explanation of identified waste management priorities of your Municipality. For example:

- Reduce waste generation rates
- Increase waste recovery rates
- Implement waste separation at source
- Establishment of material recovery facility (MRF) and composting facility
- Upgrade waste transfer stations and final disposal site (sanitary landfill)

Main Challenges

Brief explanation of the major waste management challenges to be tackled by your Municipality. For example:

- **Behavioral** *(Low public awareness, compliance issues, etc.)*
- **Infrastructural** *(Inefficient waste segregation, collection and transportation, land space availability, etc.)*
- **Public health** *(Health hazards and risks, etc.)*
- **Institutional** (*Outdated laws and regulations, etc.)*
- **Financial** *(Budget constraints, etc.*)
- **Technical** (*Data gaps, etc.*)
- **Environmental** *(Pollution and contamination, etc.)*

Waste Generation

Brief explanation about total waste generation in your city and identification of any data gaps. For example:

Indicator	Unit
Total waste generation	7.25 Tonnes/day
Amount of generated waste openly burned	%
Amount of generated waste scattered dumping	%

Waste Composition

Estimation of current waste composition in your municipality based on latest information and identification of any data gaps. For example:

Category	Percentage
Food waste	
Garden waste	
Plastics	17.01%
Paper	13.5%
Textile	
Leather/rubber	
Glass	
Metal (aluminum + steel)	31.51
Nappies/diapers (disposable)	
Wood	
Hazardous waste	
Others	

Transportation

Brief explanation about waste transportation in your municipality and identification of any data gaps. For example:

Indicator	Unit
Amount of waste collected by the city/municipality	%
Amount of waste collected by informal sector (mainly the recyclables)	%
Type of truck used	Garbage compactor
Capacity of trucks	5 Tonnes/trip
Type of fuel used	Diesel
Approximate distance from collection point to final disposal site	7 Kms.

Recycling and Organic Waste Treatment

Brief explanation about recycling/organic waste treatment in your city and identification of any data gaps. For example:

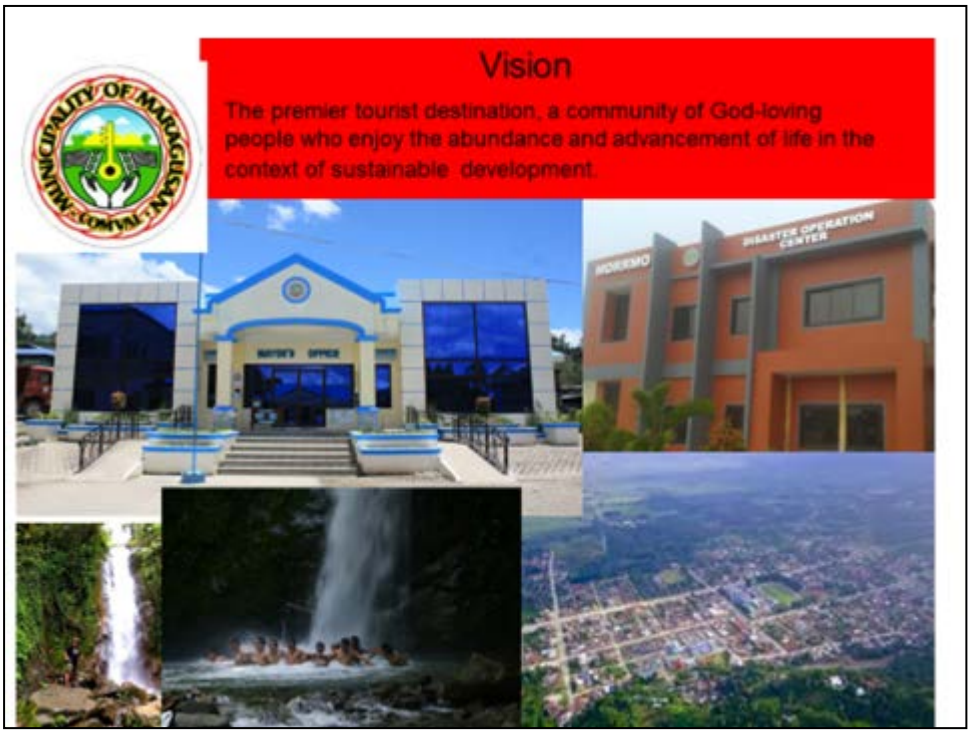
Indicator	Unit
Recyclables	
Composition of recyclables	Paper and cardboard 33.55% Plastic 17.01% Aluminium 16.03% Metal/Steel15.48% Glass (%)
Organic waste	
Amount of organic waste use for composting	1,87 Tonnes/day
Amount of organic waste use for anaerobic digestion	Tonnes/day

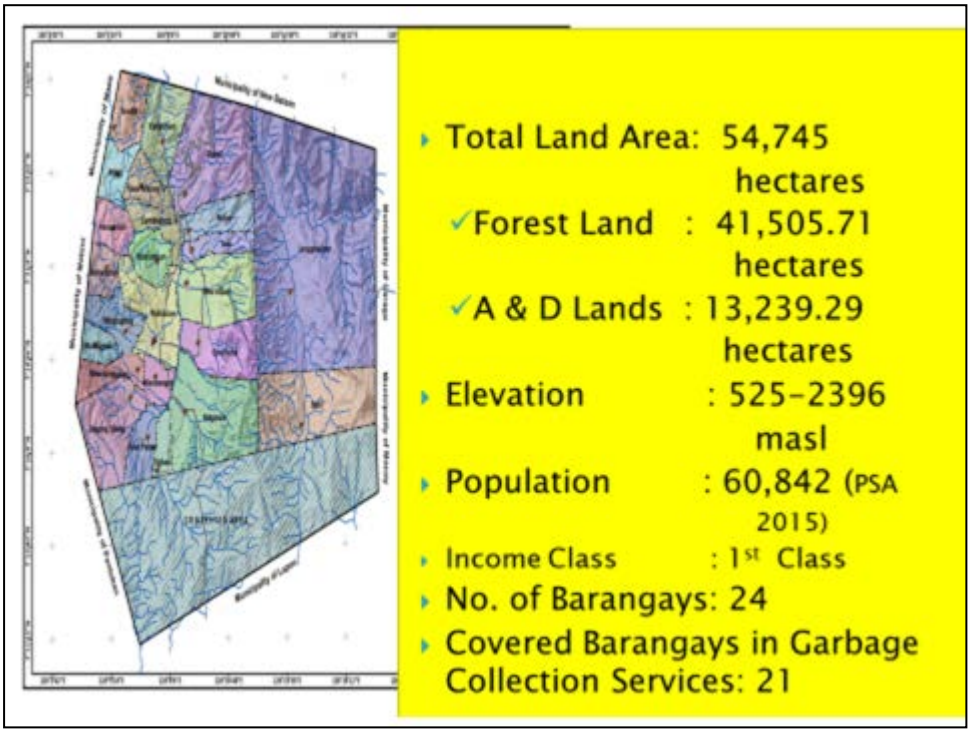
Final Disposal

Brief explanation about final disposal in your city and identification of any data gaps. For example:

Indicator	Unit
Specification of landfill/open dumps	Approximate height 6 meters Category 1 Soil covering much available Periodic soil covering
Landfill 1	
Landfill 2	
Landfill 3	

MUNICIPALITY OF MARAGUSAN, PHILIPPINES





Good Practices

- **Collection**

-Separation at source, Self Deposit of Wastes to MRF, Establishment and Operationalization of MRF in every Purok

- **Transportation**

-Low emissions vehicles

- **Recycling**

Highly Promoted in every Industries

- **Composting**

-Backyard Composting and Urban Gardening

Future Priorities

- Reduce waste generation rates
- Increase waste recovery rates
- Popularize Urban Gardening as a Mechanism to sustain Backyard Composting
- Establishment of material recovery facility (MRF) in all puroks
- Upgrade Recycling Facilities in ESWM Park
- Establishment and Operationalization of a Sanitary Landfill Level 1

Main Challenges

- **Behavioral**

-Littering and Isolated burning incidence of waste plastics

- **Infrastructural**

-Improvement of MRF and upgrading of Recycling Facilities

- **Financial**

-Budget constraints

- **Technical**

-Data gaps

- **Environmental**

-Pollution and contamination

Waste Generation

Brief explanation about total waste generation in your city and identification of any data gaps. For example:

Indicator	Unit
Total waste generation	10.93 Tonnes/day
Amount of generated waste openly burned	5 %
Amount of generated waste scattered dumping	3 %

Waste Composition

Category	Percentage
Food waste	**55 .0%**
Garden waste	14.3 %
Plastics	11 %
Paper	5.5 %
Textile	4 %
Leather/rubber	3.5 %
Glass	1.2 %
Metal (aluminum + steel)	0.5 %
Nappies/Diapers	1.0 %
Wood	1.0 %
Hazardous waste/others	3.0 %

Transportation

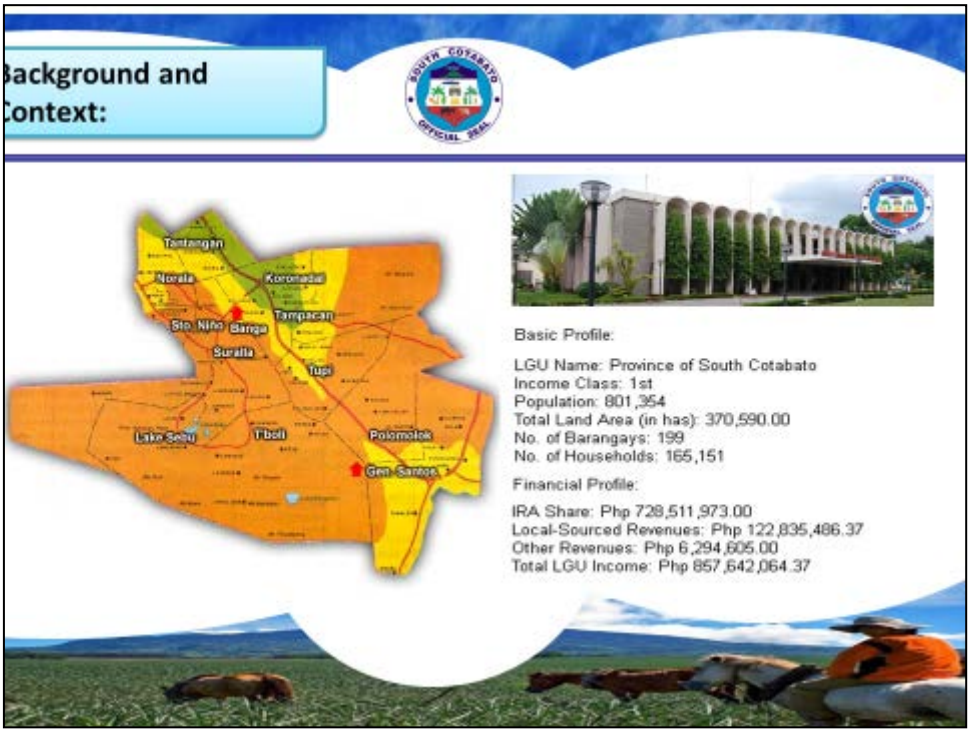
Indicator	Unit
Amount of waste collected by the city/municipality	16.34 %
Amount of waste collected by informal sector (mainly the recyclables)	0.37 %
Type of truck used	Garbage Compactor Truck
Capacity of trucks	0.65 Ton/trip
Type of fuel used	Diesel
Approximate distance from collection point to final disposal site	1-21 kms

Recycling and Organic Waste Treatment

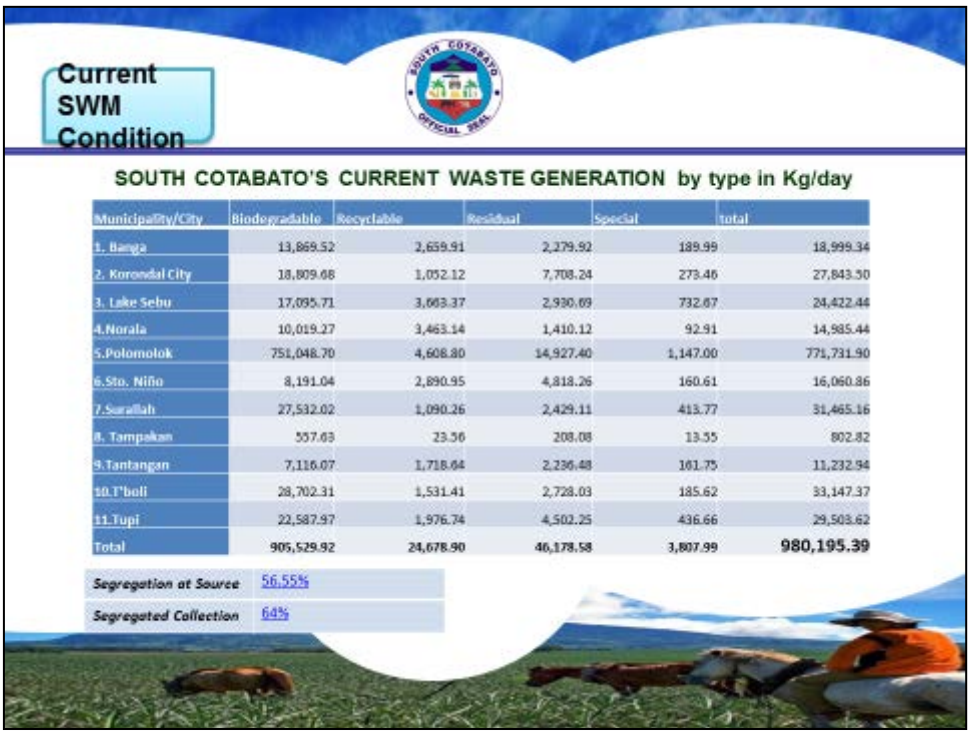
Brief explanation about recycling/organic waste treatment in your city and identification of any data gaps. For example:

Indicator	Unit
Recyclables	
Composition of recyclables	Paper and cardboard (%) Plastic (%) Aluminium (%) Metal/Steel (%) Glass (%)
Organic waste	
Amount of organic waste use for composting	0.36 Ton/day

PROVINCE OF SOUTH CATOBATO, PHILIPPINES




Current SWM Condition
SOUTH COTABATO'S CURRENT WASTE GENERATION /SECTOR IN KG/DAY
Waste Generation by Sector/Source
Municipality/City | Residential | Commercial | Institutional | Industrial | Agro-Industrial | total
1. Banga | 17,265.96 | 1,299.37 | 208.01 | 226 | | 18,999.34
2. Koronadal City | 5394.4 | 20,082.50 | 875.3 | 1491.3 | | 27,843.50
3. Lake Sebu | 18,267.90 | 3,663.40 | 2,491.14 | | | 24,422.44
4.Norala | 12,906.96 | 1,528.51 | 518.50 | 31.47 | | 14,985.44
5.Polomolok | 54,989.00 | 8,915.60 | 3,588.70 | 37,460.30 | 666,778.30 | 771,731.90
6.Sto. Niño | 14,700.73 | 811.85 | 442.54 | 105.74 | | 16,060.86
7.Surallah | 24,857.48 | 1,645.63 | 755.16 | 4,206.89 | | 31,465.16
8. Tampakan | 470.7 | 217.32 | 35.4 | 79.4 | | 802.82
9.Tantangan | 9,756.75 | 685.07 | 525.6 | 265.52 | | 11,232.94
10.T'boli | 31,701.60 | 599.07 | 646.6 | 200.1 | | 33,147.37
11.Tupi | 25,286.58 | 177.01 | 135.71 | 1,404.32 | 2,500.00 | 29,503.62
Total | 215,598.06 | 39,625.33 | 10,222.66 | 45,471.04 | 669,278.3 | 980,195.39


Current SWM Condition
SOUTH COTABATO'S CURRENT WASTE GENERATION by type in Kg/day
Municipality/City | Biodegradable | Recyclable | Residual | Special | total
1. Banga | 13,869.52 | 2,659.91 | 2,279.92 | 189.99 | 18,999.34
2. Koronadal City | 18,809.68 | 1,052.12 | 7,708.24 | 273.46 | 27,843.50
3. Lake Sebu | 17,095.71 | 3,663.37 | 2,930.69 | 732.67 | 24,422.44
4.Norala | 10,019.27 | 3,463.14 | 1,410.12 | 92.91 | 14,985.44
5.Polomolok | 751,048.70 | 4,608.80 | 14,927.40 | 1,147.00 | 771,731.90
6.Sto. Niño | 8,191.04 | 2,890.95 | 4,818.26 | 160.61 | 16,060.86
7.Surallah | 27,532.02 | 1,090.26 | 2,429.11 | 413.77 | 31,465.16
8. Tampakan | 557.63 | 23.56 | 208.08 | 13.55 | 802.82
9.Tantangan | 7,116.07 | 1,718.64 | 2,236.48 | 161.75 | 11,232.94
10.T'boli | 28,702.31 | 1,531.41 | 2,728.03 | 185.62 | 33,147.37
11.Tupi | 22,587.97 | 1,976.74 | 4,502.25 | 436.66 | 29,503.62
Total | 905,529.92 | 24,678.90 | 46,178.58 | 3,807.99 | 980,195.39
Segregation at Source | 56.55%
Segregated Collection | 64%

Current SWM Condition

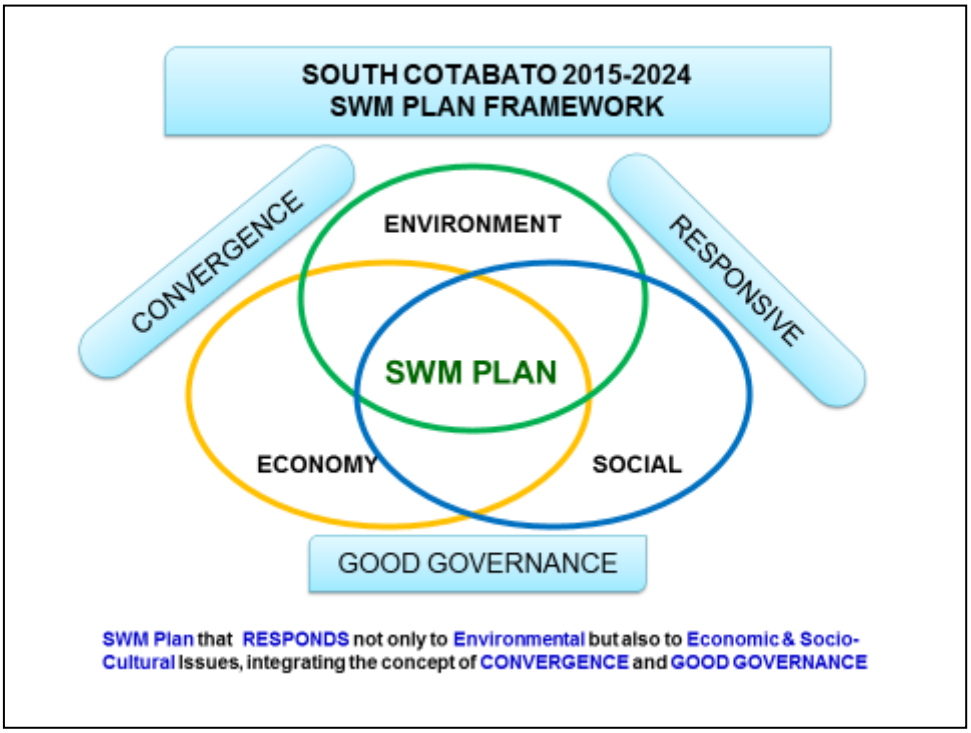
SOLID WASTE MANAGEMENT FACILITIES

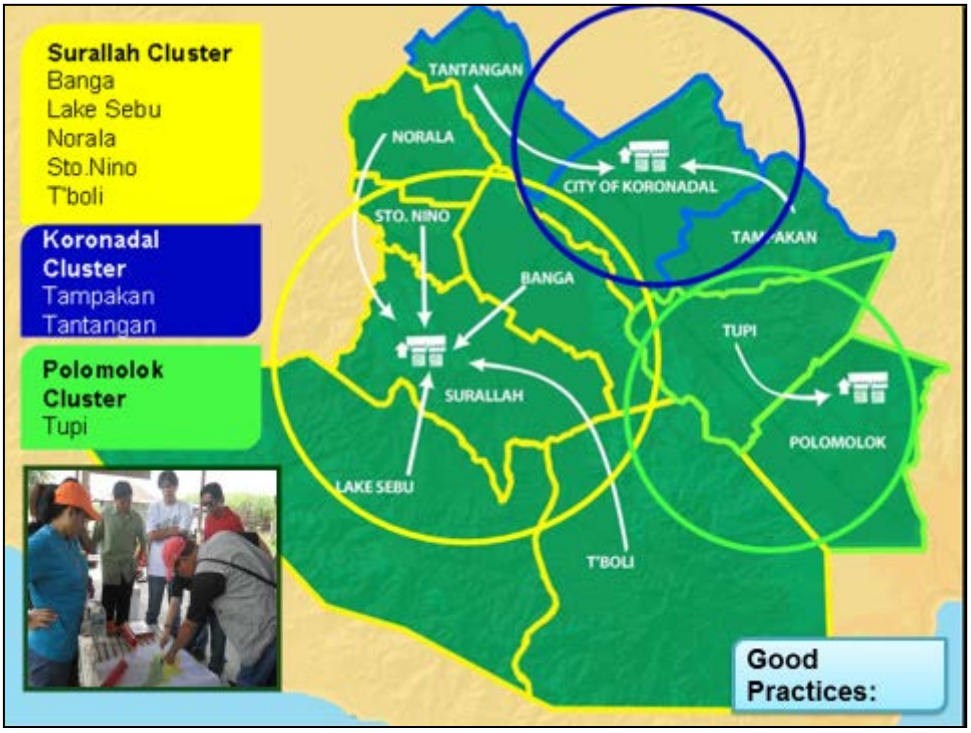
Municipality/City	Final Disposal (SLF, Open Dump, Controlled Dump, Alternative Technology	No. of Scavengers
1. Banga	Cluster Sanitary Landfill	None
2. Koronadal	Controlled Dump (CDF) with Alternative Technology	89
3. Lake Sebu	Cluster Sanitary Landfill	None
4. Norala	Cluster Sanitary Landfill	None
5. Polomolok	Sanitary Landfill	40
6. Sto. Niño	Cluster Sanitary Landfill	None
7. Surallah	Cluster Sanitary Landfill	None
8. Tampakan	Alternative Technology (pending MOA with Polomolok SLF)	None
9. Tantangan	Cluster Sanitary Landfill	None
10. T'boli	Cluster Sanitary Landfill	None
11. Tupi	Sanitary Landfill (MOA with Polomolok)	None

No. of MRFs	No. of Composting Facilities	No. of Junkshops
249	49	56

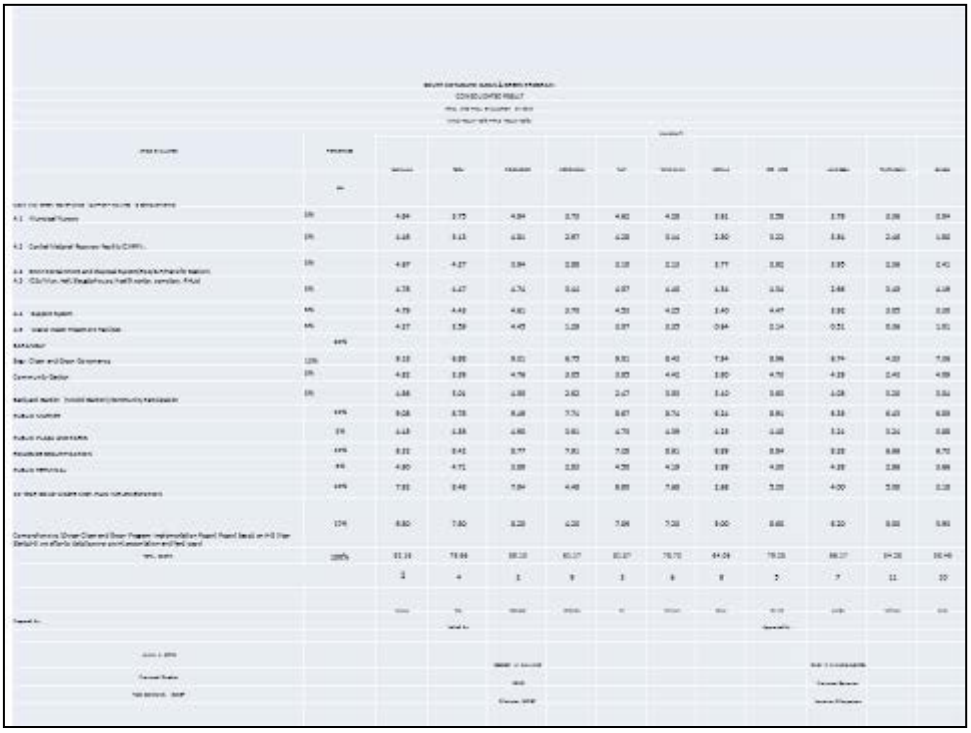
Present SWM Initiatives:

MUNICIPAL 10 YEAR INTEGRATED SOLID WASTE MANAGEMENT PLANS


SOUTH COTABATO 2015-2024
SWM PLAN FRAMEWORK
CONVERGENCE
ENVIRONMENT
RESPONSIVE
SWM PLAN
ECONOMY
SOCIAL
GOOD GOVERNANCE
SWM Plan that RESPONDS not only to Environmental but also to Economic & Socio-Cultural Issues, integrating the concept of CONVERGENCE and GOOD GOVERNANCE


Surallah Cluster
Banga
Lake Sebu
Norala
Sto.Nino
T'boli
Koronadal Cluster
Tampakan
Tantangan
Polomolok Cluster
Tupi
TANTANGAN
NORALA
CITY OF KORONADAL
STO. NINO
BANGA
TUPI
SURALLAH
POLOMOLOK
LAKE SEBU
T'BOLI
Good Practices:


SEARCH FOR THE CLEANEST AND GREENEST LGU
Good Practices:
NURSERY



od
ctices:

Now Operational – Health Care Waste Treatment Facility with Policy Support

Ordinance No. 06 series of 2016-South Cotabato Health Care Waste Management Ordinance – provides regulation on the handling, transport, storage, treatment and disposal of healthcare wastes generated by health care providers operating within the province

Future Priorities:

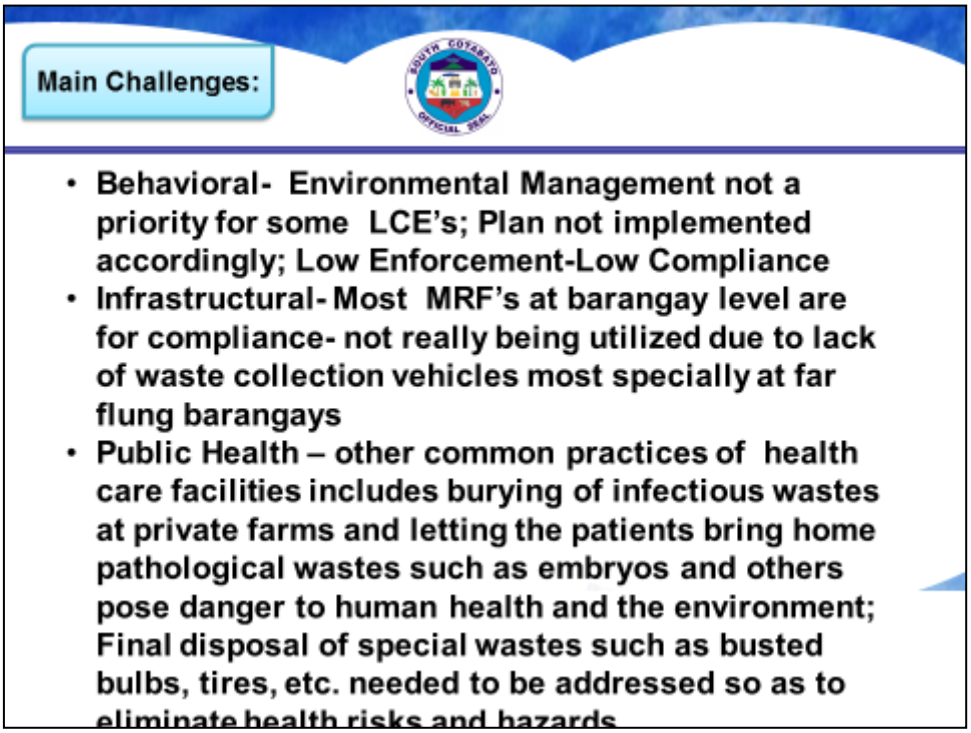
- Lobby for the creation/strengthening of Municipal Environment and Natural Resources Officer (MENRO) to all component municipalities;
- Strengthening of ESWM Board/Technical Working Group both in the Provincial and Municipal levels including barangay committees;
- Enforcement of pertinent laws and ordinances relative to solid waste management in coordination with MLGUs and concerned agencies;

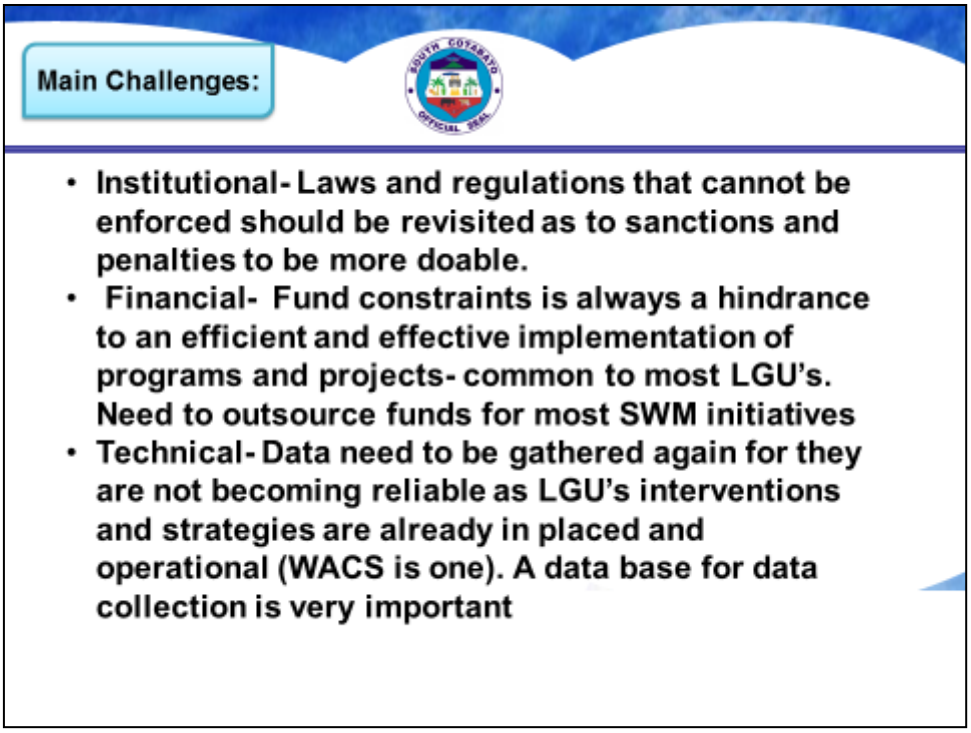
Future Priorities:

- Networking/linkaging with other concerned agencies, private sectors and funding institutions;
- Operationalization of the South Cotabato IEC Eco Caravan to decrease waste generation rates and increase waste recovery rates by reaching out far flung barangays, schools and communities;
- Sustain incentives and rewards system through competitions/contests such as Cleanest and Greenest Municipalities, ESWM Best Practices Contest in Schools and Offices;
- Provision of technical assistance to City/MLGUs in the updating of 10 Yr MSWM Plan- Conduct another Waste Assessment Characterization Study per LGU as start up

Future Priorities:

- Adoption of matured technologies on recycling of plastics and compostables. Waste to Energy as renewal Source is also in the priority list.
- Continuous Provision of technical assistance and financial support/counterpart in the clustering of MLGUs in the establishment /operationalization of Common Sanitary Landfill.
- Implementation of EO 2016-018 otherwise known as an Order Declaring the Provincial Capitol Compound, the Provincial offices situated therein and all other offices and facilities within the jurisdiction of the Provincial Government of South Cotabato as "GREEN AND HEALTHY CAPITOL".


Main Challenges:
• Behavioral- Environmental Management not a priority for some LCE's; Plan not implemented accordingly; Low Enforcement-Low Compliance
• Infrastructural- Most MRF's at barangay level are for compliance- not really being utilized due to lack of waste collection vehicles most specially at far flung barangays
• Public Health – other common practices of health care facilities includes burying of infectious wastes at private farms and letting the patients bring home pathological wastes such as embryos and others pose danger to human health and the environment; Final disposal of special wastes such as busted bulbs, tires, etc. needed to be addressed so as to


Main Challenges:
• Institutional- Laws and regulations that cannot be enforced should be revisited as to sanctions and penalties to be more doable.
• Financial- Fund constraints is always a hindrance to an efficient and effective implementation of programs and projects- common to most LGU's. Need to outsource funds for most SWM initiatives
• Technical- Data need to be gathered again for they are not becoming reliable as LGU's interventions and strategies are already in placed and operational (WACS is one). A data base for data collection is very important

Data for Scenario Preparation

Brief explanation about waste technologies/treatment methods in your municipality and identification of any data gaps. For example:

Name of the technology/treatment methods	Amount of waste treated (tonnes/day)	Type of fossil fuel use for operation (e.g. diesel, gasoline)	Amount of fossil fuel use for operation (L/day)	Amount of grid electricity (KWh/day) [Hint: daily requirement can be calculated from monthly usage and total tonnes of waste treated]	Type and amount of resource recovered (if any)
Landfill (without gas recovery)	3000 tonnes/day	Diesel fuel	Diesel requirement for waste compaction at the landfill site 67 L/day	Electricity is not required	No landfill gas collection system
Composting	---	---	---	---	---
Anaerobic digestion	---	---	---	---	---
Incineration	---	---	---	---	---

Waste Generation

Indicator	Unit
Total Waste Generation	43.44 Tonnes/day
Amount of generated waste openly burned	2.50%
Amount of generated waste scattered dumping	1.5%

Waste Composition

Category	Percentage
Food Waste	0.77
Garden Waste	28.70
Plastics	26.51
Paper	6.20
Textile	5.14
Leathher/Rubber	3.85
Glass	7.06
Metal(Aluminum + Steel)	5.40
Nappies/diapers(disposable)	7.24
Wood	7.19
Hazardous Waste	1.24

Transportation

Indicator	Unit
Amount of waste collected by the city/municipality	89.61%
Amount of waste collected by informal sector(mainly the recyclables)	6.39%
Type of truck used	Dump ruck, compactor
Capacity of trucks	1.76 Tonnes/trip-residual 4.80 tonnes/trip-compostable
Type of fuel used	Diesel and gasolinr
Approximate distance from collection point to final disposal site	Km.10

Recycling and Organic Waste Treatment

Indicator	Unit
Composition of recyclables	Paper and cardboard 13.71(%) Plastic 58.70(%) Aluminum 5.12(%) Metal/steel 6.83 (%) Glass 15.64(%)
Amount of organic waste used for composting	26.61Tonnes/day
Amount of organic waste use for anaerobic digestion	20Tonnes/day

Final Disposal

Indicator	Unit
Specification of landfill/open dumps	Approximate height Availability of landfill cover Management Practices, etc.
Polomolok Category I SLF	10 m. total max. height regularly with soil covering dump, spread to cover -practice of landfilling