# PLANNING AND IMPLEMENTATION OF INTEGRATED SOLID WASTE MANAGEMENT STRATEGIES AT LOCAL LEVEL:

# THE CASE OF CEBU CITY

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This study identified the following factors as critical for replication:

- Strong political commitment with a long term vision
- Enabling policy and regulatory framework
- Sufficient human and financial resources
- Enhancing community participation and awareness raising
- Extended partnerships and collaboration
- Effective monitoring and enforcement

## 1. INTRODUCTION

Since 2010, owing to the sustained and collaborative efforts of a wide range of local and international stakeholders, steady progress has been made in spearheading climate-friendly, community-based solid waste management approaches in Cebu City, Philippines. Thanks to the technical assistance of the Kitakyushu International Techno-Cooperative Association (KITA), Kitakyushu City, the Institute of Global Environmental Strategies (IGES) and the JPOWER Group/Jpec of Kitakyushu City with funds from the Japan Fund for Global Environment (JFGE), 2010-2013 and the Municipal Solid Waste Initiative (MSWI) of the Climate and Clean Air Coalition (CCAC), 2014-2017, Cebu City has successfully implemented a model project to mainstream integrated solid waste management (ISWM) planning at the local level, promoting the application of city-wide decentralized composting and recycling—with an emphasis on source separation and organic waste recovery— to divert and ultimately reduce the amount of municipal solid waste received by its local landfills. Although the city has encountered a number of implementation challenges, the strong commitment and determination of local authorities has been instrumental in institutionalizing and enabling these programs. This study summarizes the key activities carried out and major results/ benefits achieved over the course of the project. In addition, it provides some recommendations in the context of intended future actions.

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## 1.1. BACKGROUND

Cebu City, historically a small fishing village, has developed into one of the most urbanized areas of the Central Philippines. The city is part of Cebu Island, bounded by the Mandaue City in the north, Talisay City in the south, Mactan Channel in the east and the municipalities of Balamban and Toledo to the west (Figure 1). Occupying a total land area of 326.10 km$^2$, Cebu City is one of the largest growth centers in the Philippines, second only to Metro Manila, the country's capital. Due to its strategic location and easy access by air and sea transport, information and communication technology (ICT) and tourism are propellant sectors leading the city's economic growth. Cebu represents one of the major hubs for Business Process Outsourcing (BPO) in the Philippines and is ranked 7th worldwide in the "Top 100 BPO Destinations Report (2016)" [1].


Figure 1: Location of Cebu City in the Cebu Province

Cebu City's population as of 2015 was 923,000 inhabitants; increasing 6.5% since 2010, it represents the fifth most populated city in the country (Figure 2). However, because this figure rises to over one million during daytime hours due to the influx of local workers who commute from surrounding areas, Cebu is effectively the Philippines' second largest city. Divided into 80 barangays made up of 50 urban and 30 rural barangays, with approximately 85% of city inhabitants residing in the former, Cebu maintains an average population density of 2,204 persons per m$^2$. Accordingly, Cebu's urban zone comprises 24% of the city's total land area (78.09 km$^2$) and rural areas make up 76% (248.01 km$^2$). In terms of topography, coastal areas accounting for 15% of the city have a relatively flat terrain whereas 85% of the city have elevations ranging from 40 to 400 m above sea level [2].

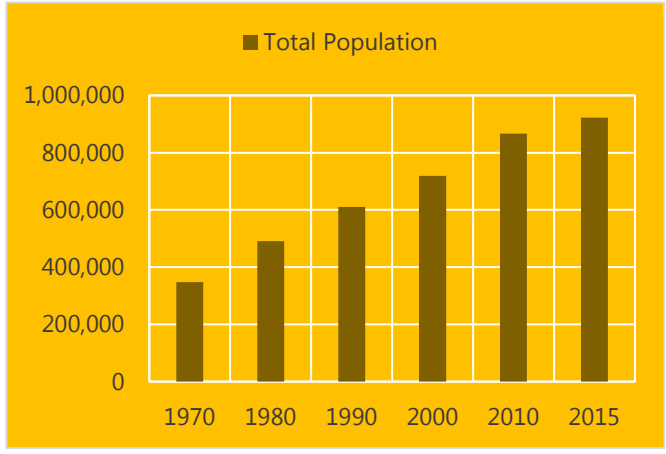


Figure 2: Total population and annual growth rate of Cebu City, Metro Cebu, Province and the Philippines

## 1.2. WASTE MANAGEMENT CONTEXT

Solid waste management is one of the most serious environmental, public health and political issues in the Philippines. According to the Republic Act 9003 (RA 9003), Municipal Solid Waste (MSW) produces by the city included a combination of domestic, commercial, institutional and industrial wastes and street sweepings.

The booming urban and economic expansion in the city have led to a steady rise in consumption and the resulting production of waste. In 1982, for example, the city generated roughly 212 tons/day of municipal waste, increasing to 420 tons/day by 2010. Although there is no accurate data available on waste generation in the city, present estimates suggest that Cebu produces about 630 tons of MSW per day in 2016, based on national calculations, which consider average per capita waste generation to comprise 500 grams/person in provincial capitals [3].

Waste collection in Cebu City is the responsibility of both city government and barangays. The Department of Public Services (DPS) is the principal office of Cebu City in charge of collecting waste from commercial and institutional establishments as well as households located along main access roads. DPS operates in three shifts over 24 hours making use of garbage and barangay trucks. Moreover, each barangay is responsible for collecting waste within their respective administrative units using their own vehicles or trucks provided by the city.

Two waste collection methods are generally practicing in Cebu City: the communal method, whereby common waste receptacles are strategically located in public

areas, as well as individual household collection carried out by garbage trucks. In addition, private waste collectors are in operation of collection from commercial establishments such as shopping malls. According to DPS, average waste collection of the city increased to 460 tons/day in 2015 (Figure 3) and maintains a coverage rate of 100%.

As shown in Figure 4, most of the MSW in Cebu City has been found to originate from households, accounting for about 54%; comparatively, commercial sources, such as businesses, public and private markets contribute 25%, while institutional sources such as government offices, educational and medical establishments account for about 21%. Figure 5 indicates that 67% of this waste is organic and biodegradable; 21% is recyclable (i.e., paper, plastic, metal, glass) with the remainder composed of hazardous and residual waste.

Located 10 kilometers south of Cebu City, the Inayawan Sanitary Landfill (ISL) represents the city's only final disposal site. Comprising 15 hectares, ISL was constructed in 1998 as part of the Metro Cebu Development Project (MCDP) with financial and technical support of the Japan International Cooperation Agency (JICA). However, due to the lack of adequate expertise in utilizing and maintaining the

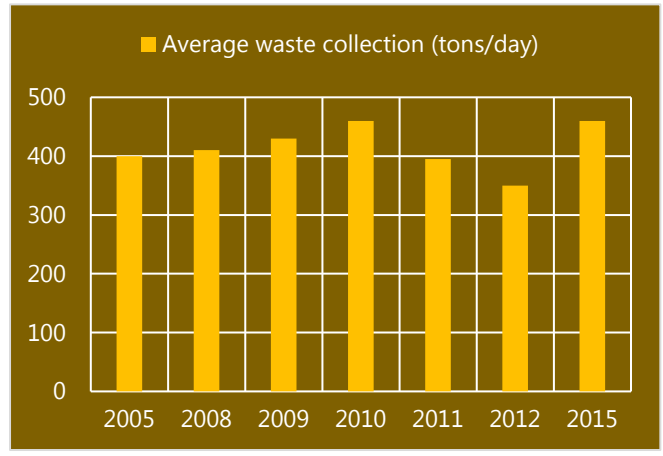


Figure 3: Average waste collection rates of Cebu City 2005-2015

landfill equipment and facilities, insufficient financial resources for operation and maintenance coupled with the increasing volume of waste being disposed in the landfill daily, Inayawan reached its maximum capacity in 2010 [4]. Finding a suitable relocation site has proven to be a difficult undertaking due to a lack of available land; a number of technical and political issues also delayed the landfill's ultimate closure. Faced with these circumstances, Cebu's work to identify sustainable waste management solutions has taken on an added urgency.

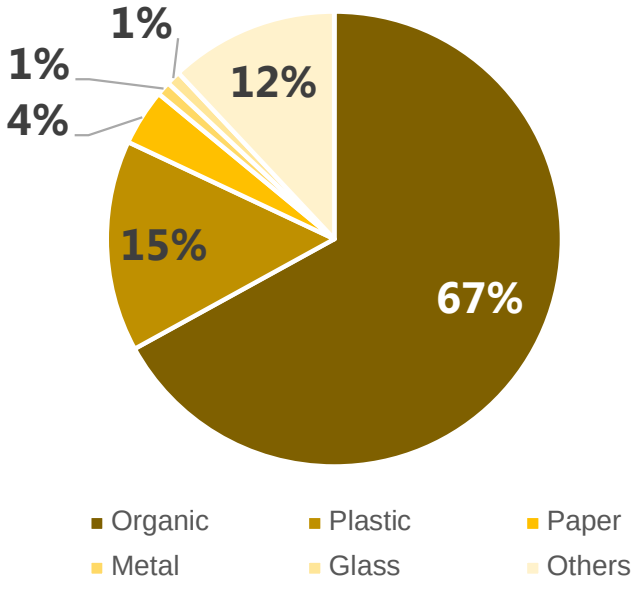


Figure 4: Summary of waste generated in each sector

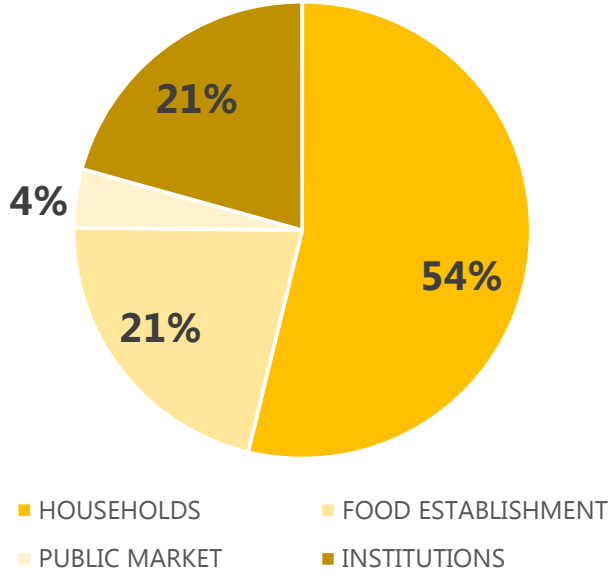


Figure 5: Waste composition and assessment of Cebu City

## 1.3. CITY-SPONSORED WASTE INITIATIVES

### Prior to 2010 – Carrying out regulatory mandate

In order to overcome growing economic, social and environmental problems associated with waste disposal, Cebu City has initiated a several legislative measures aiming to establish the regulatory mandate of RA 9003 at the Local Government Unit (LGU) level. This has resulted in a variety of innovative legal interventions (Table 1), which, by way of an integrated resource recovery approach, have brought demonstrated improvements to Cebu's MSWM system.

For instance, guided by City Ordinance No. 1361, which establishes a system of waste collection in the city and imposes corresponding fees, the Mayor formed a Cebu City Solid Waste Management Board (CCSWMB) tasked with advising and proposing necessary policy, legal and institutional actions to manage waste based on the principle of the 3Rs (Reduce, Reuse and Recycling). In line with City Ordinance No. 2017 dated 6 October 2004, one of the key mandates of the CCSWMB— headed by the Mayor with relevant representatives from other sectors— is to provide a long-term vision for waste management, including the development and implementation of solid waste management plans (SWMPs) to ensure the safe and sanitary management of MSW in Cebu. Under this purview, a Barangay Solid Waste Management Committee (BSWMC) was also formed to oversee the execution of SWMPs at the community level, including formulating specific actions such as coordinating separated waste collection, and establishing Material Recovery Facilities (MRF) and composting centers.

Similarly, with technical assistance of Fort Collins, Colorado, USA, a 10-year Plan for Solid Waste Reduction in Cebu City was drafted in 2005, supported by the Resource Cities Program of the International City/County Management Association. Under the Kitakyushu Initiative Network for a Clean Environment (2000/2010), initiated by Kitakyushu City and IGES, with assistance from the United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), Cebu City also set a landfill waste reduction target of 50% by 2015.

In addition, City Ordinance No. 2013 mandates garbage segregation at source according to four waste classifications: i) biodegradable or compostable wastes, ii) non-biodegradable wastes, iii) reusable or recyclables wastes and iv) bulky wastes, with penalties for violations. Following the adoption of a "No Segregation, No Collection Policy" resolution in April 2011 and the City Ordinance No. 2343, otherwise known as the "No Plastic Saturday Ordinance of the City of Cebu", the use of plastic shopping bags as primary packaging for goods in commercial establishments is prohibited every Saturday with corresponding penalties for noncompliance.

Table 1 provides specific information with regard to Cebu's local policies and bylaws on waste management.

Table 1: List of local policies and bylaws for waste management

| Ordinance | Date Passed | Purpose |
|---|---|---|
| **No. 1361** | October 6, 2004 | Established garbage collection system and imposed fees |
| **No. 2017** | October 6, 2004 | Creation of the Cebu City Solid Waste Management Board |
| **No. 2013** | November, 2004 | Mandating garbage segregation at source. Categorization of waste. Establishment of fines. |
| **No. 2234** | April 16, 2010 | Creation of the Cebu City Environmental and Natural Resources Office (CCENRO) |
| **No. 2243** | June 23, 2010 | Declaration of policy to preserve and protect the sources of life - the trees, soil and water - and to focus on sustainable development. Mandated the submission by business establishments of their respective Environmental Sustainability Action Plan (ESAP) when securing or renewing Business License or Mayor's Permit |
| **No. 2343** | December 12, 2012 | Prohibits the use of plastic shopping bags as primary packaging on Saturdays |
| **No. 2031** | November 10, 2014 | Declaration of adoption of a systematic, comprehensive and ecological solid waste management system |

## 2010-2012– Implementation of the pilot project to mainstream the RA 9003 at the barangay level

During the period of 2010 to 2012, the Kitakyushu International Techno-cooperative Association (KITA), Kitakyushu City and the Institute for Global Environmental Strategies (IGES) provided technical support to assist Cebu City in implementing the pilot project to mainstream the requirement of RA 9003 at the barangay level under the financial assistance of the Japan Fund for Global Environment. Following the adoption of a "No Segregation, No Collection Policy" resolution in April 2011, the city started a public awareness campaign aimed at educating citizens about source separation of biodegradable, non-biodegradable, recyclable and residual waste. The resolution is strictly enforced: repeat violators may face fines or, at maximum, imprisonment in line with City Ordinance No. 1361 and No. 2031. According to Ordinance 2031 authorized barangay officials, designated barangay residents, academic institutions, civic groups, community-based organizations (CBOs), NGOs and representatives from the private sector may represent the Mayor in apprehending any person or entity caught disobeying any provision of the law.

Cebu's Environmental and Sanitation Team (CESET) was also established and tasked with the authority to issue citation tickets to violators. CESET is also responsible for mobilizing squadrons of Barangay Environmental Officers (BEOs), who serve as information providers in their respective communities and work to monitor and enforce municipal policies, maintain proper waste collection, as well as assist in the implementation of MRF and waste composting schemes financed and supported by Cebu City. Using different communication channels, such as meetings, focus group discussions, and seminars, BEOs have become an important channel through which the Cebu City government can communicate and implement its policies on sustainable waste management to citizens at the barangay level (Figure 6).

Figure 6: Environmental Education Campaign. Photo: Authors, 2010/2011

The city also began offering appropriate financing for environmentally sound waste management at the barangay level. For instance, Cebu City has allocated upwards of PHP 20,000 from its annual municipal budget to support individual barangays with establishing recycling programs and composting centers. This budget can be used towards covering construction costs, purchasing required tools and equipment, and initiating community education programs as necessary. To this end, the city provides training opportunities for the barangay staff on composting practices and methods; a number of demonstration sites have also been set up with the assistance of BEO volunteers for this purpose.

Accordingly, with technical and financial assistance of Cebu City, model-composting projects have been set up in partnership with different stakeholders in selected barangays. For example, some barangays have established their own composting schemes, ranging from backyard, community-based, and business-led composting initiatives. These schemes are generally small in scale (less than one ton/day) and rely on segregated waste from the local community. In this context, Cebu City has also educated residents on the importance of source separation of waste and in collaboration with women's organizations, homeowners' associations and NGOs, have distributed composting baskets as a simple way of treating organic waste at households. Separated organic waste and recyclable materials are collected by the BEOs and transported to nearby composting and MRF facilities as well as junk shops for resale. As of 2012, about 58 of 80 barangays established MRF and composting programs with varying degrees of success. To further incentivize these activities, the City Government also instituted a budget for purchasing compost fertilizers at PHP 5/kg (US$ 0.1/kg) with a view towards greening the many parks and playgrounds located throughout the city.

Recognizing that the implementation of this waste program depends on the active participation and environmental awareness of communities, Cebu City initiated a series of annual competitions, including the "Best Environmental Barangay Award", which, in partnership with the private sector and local media, seeks to motivate and strengthen community participation in improving the neighborhood environment.

Cebu City has also developed strong networks with local groups and institutions. For instance, the City Government has launched a series of municipal-wide awareness raising campaigns with the involvement of

various community stakeholders including local NGOs, homeowner's associations, waste pickers, academic institutions, local enterprises and the media. In addition, two private ventures have established central waste treatment facilities near the Inayawan Landfill Site to address plastic and organic wastes. A plastic recycling facility managed by the Cebu Solid Waste Management Inc. treats upwards of 100 tons of MSW per day, while the company Bio Nutrient Waste Management Inc. operates a central composting plant to treat about 10–20 tons per day of organic waste collected from shopping malls and public markets in the city. Moreover, several private shopping malls are also closely involved in supporting community-recycling initiatives. Ayala Mall organized the Cebu Business Park and Neighboring Barangays Altruistic Alliance Inc. (CBPNBAAI) aimed at strengthening partnerships between business tenants and the surrounding barangays for the effective implementation of recycling: businesses in Ayala Mall sell their recyclables, which are in turn purchased and reused by local communities. Likewise, the mall SM City Cebu has designated every Saturday as Waste Market day, where barangay residents can buy or sell their recyclable materials.

Similarly, in order to further highlight the economic value of wastes, the Office of the Environmental Committee, together with assistance from the CESET and BEOs, supported women's organizations with initiating a weekly event focused on the purchase of recyclable waste. Under Cebu's "Cash from Trash program", local communities gather and transport recyclable materials to a designated collection site for sale: each barangay has been assigned a respective buyer, which utilizes seed money provided by the Cebu City Government for this purpose (Figure 7).

Figure 7: Composting and material recycling facilities in Barangay Apas. Photo: Authors, 2010/2011

# 2. KEY ACHIEVEMENTS AND BENEFITS

The pilot project helped to achieve a number of economic, environmental and social benefits as well as motivated political representatives and official staff of Cebu City to invest in further initiatives aimed at addressing waste management in more holistic and integrated manner [4], [5], [6], [7].

## 2.1. COST DETAILS AND ECONOMIC BENEFITS

In recent years, Cebu City has been subsidizing waste collection, transportation and disposal from its municipal budget at the annual cost of PHP 47 million (US$ 1 million). However, as these outlays do not include the cost of supervision, fuel and related expenses that are provided to barangays, this is likely an underestimated Figure 8. Funding for waste management in Cebu is largely based on the collection of service fees for waste collection that are incorporated into local real estate and business taxes. In addition, various financial options are available to support SWM operations. These include annual appropriations, fines, subsidies allocated from provincial and national government budgets, as well as grants from international development organizations and donor agencies.

For instance, as noted above, approximately PHP 1.5 million (US$ 0.3 million) of revenue has been generated by the City since penalties for waste management violations started to be enforced in March 2008. Approximately 50 percent of the associated fines are collected by the barangay and directed to municipal treasury, and 30 percent are absorbed by the barangay where the arrest is made; notably, the remaining amount of the fine is used to compensate the individual credited with successfully apprehending the guilty party.

Moreover, compost is sold commercially within barangays from PHP 10 (US$ 0.20) to PHP 15 (US$ 0.30). Composting schemes vary according to barangay but are widely operated by individual entrepreneurs, NGOs and cooperatives, all of which have identified organic waste treatment as a business opportunity with valuable end markets for their products among middle and high-income groups. Some entrepreneurs finance composting operations with revenues generated from the collection and sale of recyclable materials, whereas others serve as consultants for associations or companies looking to start their own composting activities. However, it should be noted that the local consumer market is mainly limited to the personal network of waste collectors and core members of composting associations.

Most barangay composting facilities are capable of managing as much as 15 tons of organic waste per month (500 kg/day) collected from nearby households and/or markets, which requires as many as 3-10 workers. However, it has been observed that some

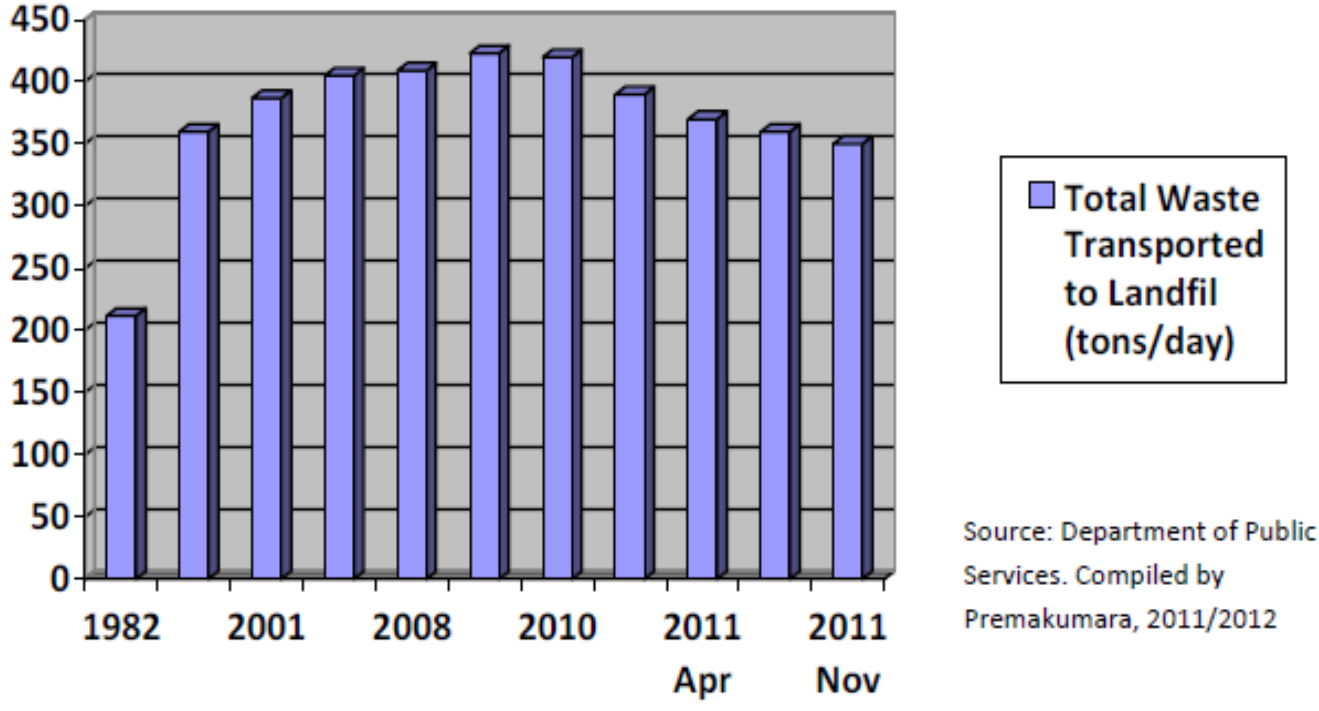


Figure 8: Total waste transported to landfill, 1982-2011

barangays pay upwards of PHP 40,000 per month for operations despite managing the same volume of organic waste per month (approximately 15 tons, employing about 10 workers). As such, current operational costs of many model-composting facilities are higher than the required landfill-tipping fee (PHP 10,500, compared to a tipping fee of 700 PHP per ton). On this basis, a rough cost-benefit analysis indicates that each compost facility should allocate at least 12,000 PHP for wages (3 workers earning a monthly payment of 4,000 PHP per person, producing of one ton of compost per day) in order to be cost effective.

Composting cooperatives, on the other hand, receive financial assistance from barangays as well as private ventures which cover the initial capital costs of setting up operations. These cooperatives make use of organic waste streams from local produce or flower markets as well as residual waste from neighboring businesses. The scale of these composting facilities varies between 1-2 tons per day; although different facilities implement their own marketing strategies, generally speaking final products are sold through existing fertilizer distribution companies.

Lastly, private companies involved in composting and recycling, such as Bio Nutrient Waste Management Inc. and Mansei Recycle Systems Co., Ltd work closely with Cebu City Government in sourcing inputs and marketing final products. In 2014, Bio Nutrient Waste Management Inc. established a formal contract with the city wherein DPS agreed to transport organic waste collected from local markets to the company's composting facilities on a daily basis; in exchange for managing this waste, the company received a tipping fee of 700 PHP (US$ 14.00) per ton. The company reported strong demand for their compost products from middle and large scale farmers in the Metro Cebu area, noting that operations of the plant under such conditions remained economically viable. On the other hand, Mansei Recycle System Co., Ltd. has been observed to process 5 tons of plastic waste every 8 hours (average of 250 tons per month), which, at the rate of 1 PHP per kilogram, is capable of generating as much as PHP 226,000 (approx. US$ 4500) of monthly revenue. Composting solid waste near to the source minimizes transportation costs, reduces the amount of waste sent to landfills, prolongs the life of landfills, and saves municipal costs for landfill management. As highlighted in Figure 8, due to the city's composting efforts, Cebu was able to achieve a 16 percent reduction of waste deposited at the Inayawan landfill in 2011, saving an estimated 17 million PHP (approx. US$ 342,000) annually in tipping fees.

## 2.2. ENVIRONMENTAL BENEFITS

The experiences of Cebu City demonstrate the clear advantages of resource recovery and recycling initiatives— how environmental conditions in residential areas can be improved by establishing appropriate waste collection and treatment, while at the same time enhancing environmental awareness among community residents. Decentralized composting and MRF together present locally-viable options for conserving energy and reducing pollution associated with industrial fertilizers and the extraction and production of virgin materials.

Accordingly, with over 50% of Cebu's municipal solid waste composed of organic materials, city-led composting programs have helped to reduce the volume of biodegradable waste at the sanitary landfill. In addition to prolonging the life of the landfill, these activities have helped the city to mitigate the


Figure 9: Composting facilities in Barangay Talamban and Luz. Photo: Authors, 2010/2011

generation of greenhouse gases and pollution associated with the transport and disposal of waste, such as carbon dioxide ($CO_2$), methane and black carbon. Addressing the generation of short-lived climate pollutants (SLCPs) associated with the waste sector has been a key aspect of Cebu City's involvement in the Climate and Clean Air Coalition's Municipal Solid Waste Initiative (CCAC-MSWI), wherein the city has conducted a rapid assessment of emissions, as well as prepared work plans targeting the reduction of SLCPs by way of waste separation at source, collection, recycling and composting, and final disposal (see below).

It is also important to highlight that Cebu's biodegradable waste is treated using widely available, environmentally friendly methods. The city utilizes both vermicomposting, employing special types of worms, including red worm, African night crawler and European crawler (recognized for their ability to multiply quickly and produce rich compost) as well as the windrow method with native microorganisms (popularly known as the "Takakura Method", because of its introduction by Koji Takakura, an expert from Kitakyushu City). Agricultural composting serves to sequester $CO_2$ into the soil, further underlining the importance of this practice in addressing climate change (Figure 9).

## 2.3. SOCIAL BENEFITS

The actions taken by Cebu City further illustrate the potential decentralized composting has for generating new job opportunities and income within local communities. For instance, as indicated in Table 2, composting and recycling activities in Barangay Luz— a successful model barangay in Cebu City— resulted in creating about 338 new jobs for poor residents in 2011, providing additional collective income equivalent to PHP 404,500 (approx. US$ 8,000) per month. Both male and female workers profit from waste-oriented business activities in Barangay Luz, with community members employed in the collection, sorting, composting and/or transport of waste [4], [5], [7].

Likewise, the recycling and composting facilities managed by Cebu Solid Waste Management Inc. and Bio Nutrient Waste Management Inc., respectively, have led to new job opportunities for over 150 people at the Inayawan Landfill Site. Beyond generating new employment options, however, Cebu's efforts have also played a contributing role towards improving the working conditions for a number of the city's waste pickers: Bio Nutrient Waste Management Inc. reports that 20-30 of its employees originally worked at the landfill site and were thereafter recruited to support operations of the company's composting facility.

In much the same way, several civil society organizations have implemented programs aimed at sensitizing local communities about income generating opportunities associated with waste recycling. For example, the foundation Lihok Pilipina has initiated a "Cash from Trash" campaign, coaching its members about ways to convert waste materials into homemade crafts to be sold in the market. The CBO Alyansa sa mga Lumulupyong Kabus Alang sa Pagpalambo ("Alliance of the Urban Poor for Development") has also supported business trainings focused on how recycled paper products can provide alternative livelihood options. These examples convey how, planned effectively, decentralized composting and recycling can facilitate space for community involvement, building alliances and partnerships, fostering livelihood opportunities whilst promoting sustainable development at the local level.

Aside from local collaboration, international partnerships have also enhanced Cebu City's MSWM programs and initiatives. These activities have informed city efforts to address new and emerging waste streams. For instance, working together with JICA and the Japanese firm NMD based in Kitakyushu, Cebu has instituted a policy requiring city residents to separate special wastes, including consumer electronics and other household hazardous items. The first policy of its kind in the Philippines, the initiative is currently being piloted in 6 participating barangays, and has been instrumental in the formation of a joint partnership involving NMD, Cebu City, and local partner Cebu Common Treatment Facility, Inc. (CCTFI) for the creation of a treatment facility for e-waste. CCTFI has also engaged with the Japanese firm Nomura Kohsan Co., Ltd., which is currently involved in treating mercury waste associated with the disposal of fluorescent lamps at the Inayawan landfill. In addition to these companies, the JICA-supported local enterprise Pollution Abatement Systems Specialist Inc. (PASSI) operates in close proximity to the landfill site where it is involved in managing the sorting and treatment of medical waste collected from Cebu City.

Table 2: Job opportunities created from composting and material recovery facilities in Barangay Luz, 2011. Source: Barangay Luz.

| | No of new job opportunities are created | Average monthly income in Peso | Total monthly income generated in Peso |
|---|---|---|---|
| *Direct Job opportunities at the composting facility and the material recovery facility* | | | |
| **West separation, collection and transport to the facility** | 15 | 1,500 (3,000yen) | 90,000 (180,000yen) |
| **Composting facility** | 6 | 6,000 (12,000yen) | 36,000 (72,000yen) |
| **Eco centre assistant** | 2 | 3,000 (6,000yen) | 6,000 (12,000yen) |
| *In-direst job opportunities created with the programme* | | | |
| **Collection of recyclable materials** | 40 | 1,500 (3,000yen) | 60,000 (120,000yen) |
| **Production of handicrafts from the recyclable materials** | 75 | 1,500-3,000 (3,000-6,000yen) | 112,500 (225,000yen) |
| **Household composting and making worms for selling** | 200 | 500-1,000 (1,000-2,000yen) | 100,000 (200,000yen) |
| **TOTAL** | 315 | | 404,500 (809,000yen) |

Cebu has also benefitted from collaboration with the Japanese city of Yokohama and its partners, contributing to improvements in the city's solid and wastewater management systems. In cooperation with JICA and the Yokohama-based Mansei Recycle Systems Co., Ltd., which provided finance, technology and other necessary assistance, Cebu City has implemented a project for converting plastic waste into refuse-derived fuel (RDF) for Cemex Philippines, Cebu's largest cement manufacturer. A PHP 15 million (approx. US$ 300,000) facility has been set up for this purpose, capable of recycling an average of 5 tons of plastic waste a day.

Likewise, together with JICA and AMCON Inc., a PHP 15 million wastewater treatment facility was also established in Cebu City. In addition to the provision of technology, AMCON has been a key partner in promoting Cebu's policy on septic waste management, which mandates compulsory discharge of septic waste every 3 years, in line with requirements of the Philippines' Clean Air Act. Waste holders pay PHP 900 (approx. US$18) per $3m^3$ for hauling and disposal of septic waste, whereupon it is directed to designated composting centers and utilized as an input in the composting process.

# 3. BARRIERS FACED AND WAYS THESE BARRIERS WERE ADDRESSED

Although Cebu City government has devoted considerable effort and investment towards redesigning its solid waste management system, it continues to face many challenges with securing public compliance, addressing constraints in human and financial resources, and ensuring overall policy consistency and coherence. In this regard, the Institute for Global Environmental Strategies (IGES), in partnership with the Climate and Clean Air Coalition's Municipal Solid Waste Initiative (CCAC-MSWI), assisted Cebu City with conducting its rapid city assessment and developing corresponding work plans based on a participatory approach. City plans for SLCP emissions reduction focused on the following actions: implementation of waste separation at source and collection; promotion of material recovery facilities (MRF) and composting (medium and large-scale); upgrading of the final disposal site to a sanitary landfill; and preparing a long-term plan for achieving zero landfill status. Stakeholder consultations identified a range of associated political, technical, and managerial bottlenecks preventing the city from achieving its fullest potential with regard to holistic waste management. Specific strategy and policy recommendations are provided below [3].

## 3.1. INSTITUTIONAL CHALLENGES

An independent evaluation of SWM in Cebu found that the City government is experiencing ongoing funding difficulties related to the hiring of waste management staff, as well as the procurement of necessary SWM facilities, technology and equipment. In addition, the City has also been beset by a number of bureaucratic obstacles that have hindered effective policy coordination and implementation. For instance, since being established in 2004 by its then Mayor, Cebu's Solid Waste Management Board (SWMB) has not operated on a continuous basis due to shifting political priorities of subsequent city administrations. This has delayed approval of Cebu's current 10-year SWM plan by the National Solid Waste Management Commission (NSWMC). Further, because the SWMB does not regularly convene, many barangays have encountered problems in developing a clear trajectory for SWM—especially among those that have yet to nominate their respective Barangay Solid Waste Management Committees (BSWMC).

The evaluation also noted challenges with regard to the limited understanding of barangay officials on RA 9003 implementation procedures. A number of barangays have been observed to not maintain adequate records on their waste generation and composition, for example, hampering the effective monitoring, evaluation and enforcement of SWM rules and regulations. Several barangays have received external technical assistance for formalizing their BWMCs and establishing regular meeting schedules in order to resolve such issues. This support has also been useful in terms of improving the quality of information, education, and communication (IEC) on good environmental practices at the barangay-level.

Similarly, some private sector actors have reported difficulties maintaining long-term waste management contracts with the Cebu City office. For instance, in line with the example raised above, the company Bio Nutrient Waste Management Inc. was ordered by Cebu City government to stop operating in the vicinity of the Inayawan landfill until the city determined a suitable location for an alternative final disposal site. The company has yet to renew its service provision agreement with the city, during which time Cebu has continued to transport waste to the landfill site (see below). Nevertheless, it is important to highlight that Cebu City finalized contracts with Pollution Abatement Systems Specialists Inc. (PASSI) for disposal of the city's medical waste, as well as the company Cebu Common Treatment Facilities, Inc. (CCTFI), working with its Japanese business partners Nippon Magnetic Dressings (NND) and Nomura Kohsan Co. Ltd., to treat hazardous and mercury containing wastes aimed at rehabilitating the Inayawan Landfill Site.

In line with the above, the following recommendations can be considered:

- Submit the city's 10-Year SWM plan consistent with the National Solid Waste Management Framework.
- Designate and assign a waste management coordination body with increased territorial responsibility, such as an area-wide organization, and/or consider expanding the scope and mandate of the Cebu Solid Waste Management Board (SWMB).
- Establish and strengthen the operation of BSWMCs, including by requiring the setting of clear waste reduction targets.
- Provide barangay staff with increased access to SWM seminars and workshops with a view to further

build their capacity and understanding of RA 9003.

- Organize regularly-scheduled awareness-raising seminars in barangays aimed at further promoting community participation in waste management

## 3.2. WASTE COLLECTION CHALLENGES

Cebu City has introduced a separate waste collection system, aimed at preventing mixed waste generation at source. The collection schedule comprises biodegradable waste every Monday, Wednesday, Friday and Saturday, and non-biodegradable waste and residuals every Tuesday, Thursday and Sunday, respectively. Waste collection is conducted from 5PM to 12AM for the first shift, and from 12AM to 7AM for the second shift. Some barangays have communicated that this system is not convenient on account of the long interim wait times between AM and PM shifts. On the other hand, certain private establishments such as fast food chains, selected restaurants, large hotels and shopping malls often pay private haulers to collect and dispose of their wastes, yet this is not routinely monitored by city authorities.

Overall, the system has proven difficult to implement due to financial constraints, and weak levels of public awareness and compliance. According to city data, waste collection coverage currently stands at 100%; however, it has been observed that uncollected garbage in many cases continues to pile up on city streets, in the interior of barangays, or is disposed in water bodies. A number of barangays continue to collect unsegregated waste, of which only a small percentage of recoverable waste is recycled or sold to junkshops.

Recommendations to improve Cebu's waste collection system include as follows:

- Maintain strict enforcement of separated waste collection within barangays in accordance with Cebu City's 'No Segregation, No Collection' policy.
- Coordinate waste collection routes and scheduling times in line with the needs of respective barangays.
- Conduct comprehensive community-based consultations to guide proper waste segregation practices at the household level.
- Issue a decree or order stipulating how waste collection is to be regulated and monitored in the private sector.

## 3.3. WASTE TREATMENT CHALLENGES

All barangays face similar issues with regard to the introduction of composting activities. Broadly speaking these challenges include (a) locating sufficient capital to start and scale-up barangay-model projects, (b) integrating into the city's overall MSWM system, whether due to lack of political leadership, strategic planning, or supportive financial, legal and institutional mechanisms, and (c) low levels of information/ awareness, knowledge and skills associated with establishing and managing composting facilities. Composting schemes sometimes also encounter difficulties resulting from poor cooperation between communities, barangay and city officials, scarcity of available land in suitable locations, periodic complaints from nearby residents, and a general lack of capacity and support from barangay staff.

Barangay-level Material Recovery Facilities (MRF) are likewise experiencing obstacles to effective service delivery, linked with financial limitations, data gaps (once again, attributed to poor knowledge among barangays on the major requirements of RA 9003, and the lack of skills to gather information) and challenges with mobilizing community support for waste separation. Consequently, a number of MRF sites have been found to be not fit for purpose, with some incurring a higher operational cost than what can be generated through revenue savings. It should also be noted that because many community residents rely on the recycling, buying and selling of waste as a source of income, MRFs may be potentially viewed as risk to livelihoods, which may in turn discourage the participation and cooperation of local actors.

Suggestions for enhancing waste treatment in Cebu City are listed below:

- Implement a training program targeting barangay workers responsible for managing composting facilities.
- Launch an incentive-based budget system for funding new barangay-level composting and MRF facilities and equipment, calculated on the basis of avoided cost achieved by respective barangays from landfill waste diversion.

- Conduct public consultations on the potential for clustering nearby barangays around centralized compost and MRF facilities.
- Establish a rebate system, facilitated by Cebu City's Agricultural Department, for purchasing compost produced by barangays and selling the compost to farmers in rural barangays.
- Ensure that waste separation in MRFs is conducted in accordance with the materials classifications of the commercial recycling market.
- Introduce new laws for the promotion of recycling/treatment of food waste, with a clear demarcation of stakeholder roles and responsibilities.

## 3.4. WASTE DISPOSAL CHALLENGES

Lacking the resources and expertise for its operation and maintenance, the Inayawan Sanitary Landfill (ISL) has effectively deteriorated into an open dump site. Established in 1998, ISL's lifespan was intended to be limited to seven years; to ensure its maximum longevity, the landfill was initially equipped with advanced treatment equipment including a mechanized sorting facility, incinerator, and biogas reactor for collecting sewage and leachate. However, each of these respective technologies encountered issues, ultimately resulting in the landfill's mismanagement. For instance, Cebu resorted to manual operations after its sorting facility began to malfunction, which had the unintended effect of drawing increasing numbers of informal waste pickers to the site. Operation of ISL's incinerator was terminated with the passage of the Philippines' Clean Air Act of 1999 (commonly referred to as Republic Act 8749), a law which explicitly prohibited the use of incineration as a method of waste treatment. Due to technical problems, ISL's biogas reactor was also closed— its leachate treatment pond in effect becoming an impounding basin— resulting in land and water pollution from the discharge of untreated leachate into surrounding areas. Toxicity analysis has confirmed high concentrations of TDS (Total Dissolved Solids) and TSS (Total Suspended Solids) in leachate and groundwater samples throughout the site, including evidence of heavy metal contamination, such as mercury.

These challenges, coupled with a limited availability of suitable land for waste disposal in the city's perimeter, have led to growing daily volumes of MSW being dumped onsite. Cebu City Government continues to manage the landfill using a compactor machine, despite being warned by the Department of Health (DOH) - Central Visayas that Inayawan poses a public health risk.

In view of this situation, Cebu's former Mayor issued an executive order in December 2011 for the landfill's partial closure with the aim of it being fully decommissioned by 2015. ISL was thereafter converted into a waste transfer station: solid waste collected from various parts of the city was brought to the site and manually sorted by as many as 300 waste pickers, after which the remaining waste was reloaded and transported to a private landfill facility located approximately 30 kilometers away in northern Cebu province, one of two sanitary landfill sites located in the Metro Cebu Area.

Nevertheless, Cebu's current City Council, directed by the present Mayor, ordered that ISL be reopened in June 2016 on account of excessive tipping fees at the new landfill facility (minimum of PHP 20 million per month), further questioning the legality of the arrangement in consideration of the absence of a formal contract between the private operator and the former Cebu City administration. This move was challenged by the Cebu City Councillor and Chair of the Environmental Committee, who launched a petition for a legal injunction aimed at preventing ISL from being recommissioned. In December 2016, Cebu City's Court of Appeals authorised the injunction, instructing the City to permanently cease and desist from dumping waste at the landfill and ruling that ISL was to remain closed to the public pending the site's full rehabilitation. To ensure strict compliance with the order, the Environmental Management Bureau of the Philippines' Department of Environment and Natural Resources (DENR-EMB) was directed to conduct regular monitoring of the site, until which time that ISL's rehabilitation was deemed to meet the Department's standards.

Accordingly, upgrading and restoration of the Inayawan landfill is urgently required in order to ensure the protection of public and environmental health: achieving this objective will necessitate stronger consensus and support of both major political parties represented in the Cebu City Council. Based on the above, the following actions are recommended:

- Terminate open dumping in Inayawan landfill and locate an alternative site for disposal of the city's waste without delay.
- Convert ISL into a controlled disposal site in line with RA 9003, which provides minimum criteria for

the establishment of controlled dumpsites.

- Implement appropriate measures for the environmentally sustainable closure and restoration of ISL.
- Construct a final disposal site with sanitary landfill standards as mandated by RA 9003, taking into consideration shared waste treatment and disposal facilities of neighboring barangays.
- Conduct a feasibility study on appropriate Waste-to-Energy technologies that comply with national laws and regulations, such as biogas and landfill gas utilisation.
- Establish sorting and treatment facilities for the effective management and disposal of medical and hazardous waste.

# 4. CONCLUSION/LESSONS LEARNT

The case of Cebu City illustrates how a combination of supportive policy, strong public outreach and community mobilisation efforts— guided by strategic and integrated planning, partnership and collaboration— can work effectively in reducing municipal solid waste through a decentralised approach, thereby driving sustainable benefits at the local level. As discussed, RA 9003 of the Philippines has been instrumental in providing a framework for Cebu's waste separation, composting and recycling initiatives: in addition to successfully diverting waste from the municipal landfill, these have supported viable income and livelihood opportunities, as well as contributed to the city's overall climate goals.

This underlines the importance of aligning national and subnational planning and strategies in order to better address waste issues at scale. However, it is clear that national policies must be accompanied by robust political leadership at the level of local government, not only with regard to establishing an enabling institutional framework, but also for maintaining the legislative momentum necessary for long term implementation of waste management. In this regard, policy formulation on waste issues can be understood as a bottom-up process, one which involves transmitting a range of views from different actors and stakeholders into analysis and decision-making. The example of Cebu also highlights that a certain degree of policy experimentation and trial and error is required for realising sustainable waste solutions.

Despite facing challenges, Cebu City's emphasis of waste separation at source, organic composting and materials recycling has succeeded in minimising transportation costs— facilitating a corresponding reduction of the amount of waste sent to final disposal— which in turn has reduced the amount of municipal budget required for the operation and management of the city's landfills. Cebu's joint ventures with Japanese enterprises and active participation in the Climate and Clean Air Coalition's Municipal Solid Waste Initiative (CCAC-MSWI) also reflect the city's acute understanding with regard to the differentiation of various waste streams and their collective impacts on the environment, especially in terms of land, water, air pollution, and the generation of greenhouse gases. Cebu City's planned rehabilitation of the Inayawan landfill will also bring further attention to the management of wastes from a holistic perspective.

Actions aimed at increasing the availability of waste technology, facilities and equipment will need to be complemented by further capacity building and the provision of adequate financing, including for example blended mechanisms and partnerships with the private sector.

Together with the application of economic incentives and the strict enforcement of existing laws and regulations, it is also important to consider how waste separation policies can be expanded to additional waste types, carefully documenting the cost savings and other public benefits that can be achieved by pursuing more integrated approaches to waste management. In this regard, continued community participation and collaboration with businesses, non-governmental organisations and development partners will be key to ensuring the successful implementation of Cebu's ongoing and future waste initiatives.

Figure 10: Composting activities help to build community and enhance environmental awareness. Photo: Authors, 2010/2011

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