

Republic of the Philippines Department of Environment and Natural Resources Environmental Management Bureau National Solid Waste Management Commission

National Solid Waste Management Status Report (2008 – 2014)



December 2015

Preface

The Environmental Management Bureau (EMB) of the Department of Environment and Natural Resources is mandated to prepare environmental status reports. The latest report focuses on the brown environment in which certain core issues such as the status and management of air and water quality and the assessment and management of solid wastes, toxic chemicals and hazardous wastes in the country are discussed. Other major concerns include Environmental Assessment, multilateral environmental Impact agreements, environmental education, pollution adjudication, among others.

The EMB-DENR is preparing the National State of the Brown Environment report (NSoBER) covering the last seven years: 2008-2014. During these years, sectoral reports had been written – on air quality, water quality and solid waste; and other environmental concerns and issues. However, these had not been consolidated and integrated into a single, national report. The Environmental Education and Information Division (EEID) of the EMB-DENR, with the concerned sectoral offices of the EMB have continued the process of collecting, archiving, sorting and organizing them for retrieval and use in report preparation.

The preparation of the NSoBER is a vital function for EMB-DENR. Nevertheless, the cross-cutting and multi-dimensional nature of the environment necessitates a great deal of coordination with other government agencies, academe, civil society and the private sector.

The NSoBER 2008-2014 covers areas of concern, as follows:

Areas of Concern:

- 1) Air Quality
- 2) Water Quality
- 3) Solid Wastes
- 4) Toxic Chemicals and Hazardous Wastes
- 5) Environmental Impact Assessment
- 6) Compliance to Multilateral Environmental Agreements
- 7) Environmental Education
- 8) Environmental Administration
 - Pollution Adjudication

Parts of this report will soon be released as drafts to be commented on by agencies, institutions and individuals concerned. For this purpose, the draft National Solid Waste Management Status Repor is hereby presented.

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SOLID WASTES

1. Solid Waste Conditions

1.1 Sources and composition of municipal solid waste (MSW)

The amount, composition and sources of solid wastes generated can be statistically determined through the conduct of waste analysis and characterization studies (WACS).

1.1.1 <u>Sources of municipal solid waste</u>

Information on the sources of MSW was provided by a number of EMB Regional Offices in addition to data from submitted SWM plans. The available information from 2008 to 2013 was synthesized and summarized in **Figure 1.**

MSW comes from residential, commercial, institutional and industrial sources. Residential waste constitutes the bulk (56.7%) of MSW and includes kitchen scraps, yard waste, paper and cardboards, glass bottles, plastic containers and sando bags, foils, soiled tissues and diapers, and special wastes such as containers of household cleaning agents, batteries and waste electrical and electronic equipment (WEEE).

Commercial sources which include commercial establishments and public or private markets contribute 27.1% of which, in some regions, about two- thirds of commercial wastes come from the latter. Institutional sources such as government offices, educational and medical institutions account for about 12.1% while the remaining 4.1% are waste coming from the industrial or manufacturing sector.



Figure 1. Sources of municipal solid waste in the Philippines, 2008-2013



Based on available information from Regional State of the Brown Environment reports and various WACS data, the typical composition of MSW in the Philippines is shown in **Figure 2**.



Figure 2. Composition of municipal solid waste in the Philippines, 2008-2013

Biodegradable wastes comprise about half (52.31%) of MSW although primary data suggest that figures can range from 30% to as much as 78%. Typical bio-waste consists of kitchen or food waste and yard or garden waste. From the available information, it could be estimated that 86.2% of compostable waste comes from food scraps while 13.8% are leaves and twigs.

Recyclable wastes account for almost a third (27.78%) of MSW with an estimated range of 4.1% to 53.3%. Plastic packaging materials comprise around 38% of this waste fraction and followed by paper and cardboard waste, which contributes about 31%. The remaining 31% is made up of metals, glass, textile, leather and rubber.

Special wastes which consist of household healthcare waste, waste electrical and electronic equipment (WEEE), bulky waste and other hazardous materials contribute a measly 1.93% with values ranging from negligible up to 9.2%.

Finally, residuals have been found to make up 17.98% of generated MSW. Most LGUs present this data as a combination of disposable wastes as well as inert materials, which comprise about 12% of the residual waste.

1.2 Waste Generation Rates

Waste generation rates have been estimated based on consolidated data generated from waste analysis and characterization studies (WACS) presented in EMB regional reports and selected local 10-year Solid Waste Management (SWM) plans. Using 2010 as base year, Table 1 summarizes waste generation rates in the Philippines, Metro Manila, highly urbanized cities (HUCs), municipalities and other cities.

Table 1. Synthesized waste generation rates in the Philippines for the
base year 2010

Scope / Coverage	Sample size (as % of	Range	Weighted Average
	demographics)	kg/ca	apita/day
Metro Manila (NCR)	100%	0.55 - 0.79	0.69
Metro Manila and some highly urbanized cities (HUCs)	N/A	0.53 – 0.79	0.69
Other cities and provincial capitals (excluding	N/A	0.29 - 0.64	0.50

Scope / Coverage	Sample size (as % of demographics)	Range kg/ca	Weighted Average apita/day
NCR/HUCs)			
PHILIPPINES (Nationwide)	79%	0.10 - 0.79	0.40
All LGUs in the country, excluding Metro Manila	76%	0.10 - 0.71	0.34
Municipalities (cities and some capital towns excluded)	N/A	0.10 - 0.64	0.31

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

1.3 Waste Projection

Based on the per capita rate of 0.40 and annual projected population, the amount of waste generated yearly in the entire Philippines and Metro Manila in terms of tonnage can be seen in **Figure 3**.



Figure 3. Projected waste generation 2008-2020 (metric tons per year)

The figure shows that the yearly amount of waste in the country is expected to increase from 13.48 million tons in 2010 to 14.66 million tons in 2014 to 16.63 million tons in 2020. On the other hand, Metro Manila's waste generation continues to increase as it contributes 22.2%, 24.5% and 26.7% to the country's solid waste in the years 2010, 2014 and 2020, respectively.

2. Solid Waste Impacts on Health and the Environment

Improper solid waste management practices can have a number of environmental and health impacts. The adverse impacts and their causes are shown in **Figure 4**. As discussed earlier, municipal solid wastes come from residential, institutional, commercial, and industrial sources. Other sources include illegal dumps, street sweepings and litter and rubbish from roads, open spaces and water bodies. People who live near or within dumpsites are vulnerable to various diseases. Leachate from solid waste can contaminate groundwater tables and surface waters. Insects and pests in open dumpsites are disease vectors. Methane gases from dumpsites can affect the health of exposed populations and contribute to global warming. Coastal and marine litter affects aesthetics, causes pollution, and harms marine organisms. Improperly managed solid wastes also can result in increased flooding and destruction of infrastructures due to clogged waterways.



Figure 4. Solid waste exposure pathway

The disease pathway associated with the poor handling of solid waste becomes manifest usually through direct exposure of humans and the pollution of surface water and groundwater due to leachate from open dumps. The World Health Organization and the World Bank estimate that approximately 88% of diarrhea cases worldwide can be attributed to poor water quality, sanitation, and hygiene. (**See Table 2**). In the same manner, poor water quality, sanitation, and hygiene cause 100% of cholera cases, 100% of helminthiasis cases, 50% of hepatitis cases, and 50% of typhoid and paratyphoid fever cases.

Table 2.	Fraction	of Disease	Cases Attribut	able to V	Nater,	Sanitation and
			Hygiene			

Disease	Attributable Fraction	Source
Diarrhea	88%	WHO
Helminthiasis	100%	WHO
Typhoid & Paratyphoid	50%	WB
Cholera	100%	Widely accepted
Hepatitis A	50%	WB

Sources: WHO, Preventing Disease Through Healthy Environments, 2006; World Bank, Philippine Environment Monitor 2006: Environmental Health.

However, there is no established information on the proportion of disease incidence in **Table 2** that can be attributed solely to solid waste pollution. A study made on the cost sharing framework for solid waste management in 2010 has assumed that the proportion of the municipal population within the vicinity of open dumpsites is the population with the highest risk of contracting diseases. If the leachate from dumpsites affect the groundwater and domestic water supply, then the population at risk might be even greater.

Thus, the potential population at risk was estimated based on the population of potentially affected barangays surrounding open dumpsites. Using a sample of open dumpsites, it is estimated that an average of 27% of the municipal population might be at risk from water borne diseases due to open dumpsites. Hence, it can be assumed to be the same proportion of diarrhea cases solely attributable to solid waste pollution.

Morbidity or illness due to acute diarrhea has economic cost that includes costs of hospitalization, medical costs and foregone income due to reduced workdays.

There are other environmental costs associated with improperly disposed municipal solid wastes. These include pollution of surface and marine waters that could deplete fish and other marine resources, damages to infrastructures from worsened flooding incidence due to clogged waterways, increased cost of dredging and coastal cleanups and loss of aesthetic value.

3. Ecological Solid Waste Management: Status of Implementation of RA 9003

3.1 Avoidance, Reduction and Reuse

SWM implementation follows a hierarchy of options as illustrated by an inverted triangle in **Figure 5**. The most preferred option is waste avoidance and reduction where the ultimate goal is to reduce the amount of materials entering the waste stream. Apart from avoidance, achieving this goal involves product reuse, increased product durability, reduced material use in production and decreased consumption. Behavioral change is deemed necessary in the exercise of this option as lifestyle demands often favor convenience over conservation with minimal regard for long-term environmental consequences.



Figure 5. Overall policy of RA 9003 based on waste management hierarchy

There are now various initiatives towards waste reduction such as 'green procurement'. eco-labeling, identification of non-environmentally acceptable products and implementation of 3Rs.

Executive Order (EO) No. 301 was issued in 2004 establishing a "Green Procurement Program" (GPP) for the executive branch of government. The EO also provides for a systematic and comprehensive National Eco-Labeling Program (NELP) necessary to support a "green procurement" policy in both government and the general public. The GPP is an approach to procurement in which environmental impacts are taken into account in purchasing decisions. Environmentally responsible initiatives include switch to electronic submission of purchase requests, reduction of materials and energy usage, greening the supply chain and patronage of eco-labeled products.

The NSWMC is mandated under RA 9003 to prepare and update a list of *non-environmentally acceptable products* (NEAP) to be prohibited according to a schedule and as long as NEAP alternatives cost no more than 10% of the cost of disposable products. However, no product has yet been determined as non-environmentally acceptable (NEA). Through NSWMC Resolution 9, a Technical Working Committee (TWC) was created to work on the phasing out of NEA products and packaging materials. The TWC has established four product categories that will be subjected for evaluation, namely: plastics, construction materials, baby products and electronics.

The NSWMC TWC through the Industrial Technology and Development Institute of the Department of Science and Technology (ITDI-DOST) conducted a study to determine the non-environmental acceptability of products or packaging material and life cycle assessment (LCA) of the products to be listed as non-environmentally acceptable products (NEAP). A third party was engaged to conduct the study to look into applying appropriate assessment tools to come up with a scientific basis on classifying certain material as non-environmentally acceptable which shall cover plastic carrier bags and foam polystyrene. One of the findings shows that Reusable Bags (Non-Woven PP) have the least impact among the options evaluated.

A growing list of LGUs have passed ordinances banning or regulating the sale and use of plastic bags and polystyrene foams due to their perceived role in the clogging of waterways, increased flooding and water pollution. Among these LGUs are the cities of Muntinlupa, Quezon and Pasig in Metro Manila and the municipalities of Los Banos, Laguna, Burgos, Ilocos Sur and San Marcos, Isabela. In response, the plastics industry have undertaken voluntary measures such as in-store recovery programs with selected supermarkets and the introduction of oxo-biodegradable plastic bags.

Shopping mall giants Shoemart (SM) Group, Ayala Foundation and Robinson's Supermarket continually promote the reuse, reduction and recycling (3R) of waste through their eco-shopping bag program and their monthly waste markets and recyclers' fairs nationwide. Other malls, supermarkets, fast food chains and commercial shops also have their own SWM programs. Unilever Philippines' "Project Eliminate" enabled their plant and offices to reduce trash by 50% while Nestlé Philippines' "Waste to Resource" project enabled the composting of coffee grounds. Coca-cola Bottlers Philippines' "Give a Can, Give a Hope" program works with Tahanang Walang Hagdanan as a partner and beneficiary in recycling.

The Industrial Waste Exchange Program (IWEP) is managed by the Philippine Business for the Environment (PBE), which acts a clearinghouse and matching agent for waste generators and buyers. The EcoIndex in Region IV-A organizes regular Resource Recovery Events (RRE) that allows waste generators to bring in their recyclables/waste products to invited recyclers and waste users. At the regional level, EMB's main partner in environmental education and recycling promotion are the Pollution Control Association of the Philippines (PCAPI) and other local stakeholders.

3.2 Segregation at Source

In cases where segregation at source and segregated storage are not practiced by households, communities and businesses, most solid wastes end up as "mixed garbage". This may be due to limited awareness, appreciation and discipline on the part of the citizenry, lack of incentives and enforcement ordinances on the part of the government, or inadequate support facilities in place to receive pre-segregated materials. To address this problem, some LGUs provide segregated waste containers and implement color codes to aid in the easy identification of segregated bins. In 2013, the NSWMC had already approved Resolution No. 60 to provide recommendatory measures for mandatory solid waste segregation at source, segregated collection and recovery to guide waste generator on onsite separation and support the LGUs in implementing `no-segregation, no-collection' campaigns.

Some LGUs have strictly enforced segregation at source coupled with segregated collection, through a "no segregation, no collection" ordinance and the operation of MRFs. The DENR's Environment and Natural Resources Management Project (ENRMP) aimed at identifying and selecting LGUs with promising initiatives and regularly monitoring its compliance and performance. Compliance of this select group of 128 LGUs on the mandatory segregation at source ranges from 53% to 100% based on validations conducted by NSWMC Secretariat

3.3 Segregated Collection

Collection is the act of removing solid waste from the source or from a communal storage point. It is regarded as potentially the most expensive of the functional elements of SWM.

RA 9003 requires segregated collection by the LGUs. Waste segregation and collection are to be conducted at the barangay level specifically for biodegradable and recyclable wastes while disposal and collection of nonrecyclable/residual and special wastes are the responsibility of the city or municipality.

Waste collection techniques include 1) door-to door – where waste materials are collected in every house within a target area to recover recyclables to be sold to junkshops and biodegradables either for use as animal feeds or for composting and 2) block or communal – which utilizes MRFs in barangays that are within or near the targeted collection area.

Solid waste collection in the country has environmental, social, economic and political implications. For example, people have the tendency to link uncollected garbage and dirty surroundings to the performance of local officials. Collection is usually done by an LGU department such as the General Services Office, Engineering Office, Environment and Sanitation Office or the Department of Public Services. Many LGUs also outsource waste collection to private contractors.

There is a growing number of cities and municipalities that are implementing 'no segregation, no collection' policies leading to more responsible attitudes and behavior towards the environment and greater efficiency in the delivery of SWM services. However, many LGUs still practice mixed waste collection – a backward step that produces the opposite effect.

As reported by 128 ENRMP pilot sites, compliance to segregated collection ranges from 43% to 100%. Outside of ENRP, however, very few regions and LGUs gather information on segregated waste collection rates.

It is estimated that waste collection coverage in the LGUs may vary from 30% to more than 99%. Urban centers register higher coverages and frequencies compared to rural areas. Nevertheless, some LGUs devise ways to still extend service to the rural and upland communities by making special arrangements such as the adoption of satellite accumulation areas or residuals containment areas.

Reasons identified for waste collection inefficiencies are:

- poor labor management and supervision
- more workers on the roles than needed
- inadequate cooperation from the citizenry with collection schedules and methods
- inappropriate type and size of collection vehicles
- non-rational routes for collection service
- failure to optimize vehicle productivity by selecting the appropriate crew size and shift duration
- inadequate communal container capacity at the communal collection points
- long vehicle down times from poor equipment maintenance and repair
- long haulage times to disposal sites coupled with lack of transfer stations
- harsh driving conditions at disposal sites cause vehicle and tire damage

3.4 Recovery and processing

3.4.1 Materials Recovery Facility (MRF)

RA 9003 mandates the establishment of a Materials Recovery Facility (MRF) in every barangay or cluster of barangays in barangay-owned, leased land or any suitable open space designated by the barangay. The MRF shall be designed to receive, sort, process and store compostable and recyclable material efficiently and in an environmentally sound manner. Any resulting residual waste shall be transferred to a proper disposal facility.

MRFs are also being established in schools, malls, and other commercial establishments. There are also mobile and gravity-driven, centralized MRFs. A number of LGUs also engage local junkshops to serve as their MRFs. Through Memorandum of Agreements (MOAs) and following the guidelines on MRF establishment, junk dealers become part of the formal SWM system of the LGU. **Figures 6-8** show the different types and designs of MRFs.



Figure 6. Low-cost MRFs in the Philippines



The NSWMC has reported the number of MRFs for the years 2008 to 2014. **Table 3** shows the number of MRFs and the number of barangays served by MRFs during those years. From the table, it can be observed that there was a huge increase in the number of barangays served from 2,701 in 2008 to 10,327 in 2014.

	Year						
Number	2008	2009	2010	2011	2012	2013	2014
Number of MRFs in the Philippines	2,438	6,141	6,958	7,329	7,713	8,486	8,656
Number of Barangays/ LGUs served by MRFs	2,701	6,744	7,938	8,323	8,843	9,624	10,327

Table 3. Number of MRFs reported to NSWMC from 2008 to 2014

Source: NSWMC

Figure 9 also shows the number of MRFs per region from 2008 to 2014. Data show that Region XI had the most number of MRFs (1,246) in 2014. Region I had 1009 MRFs while NCR and Region VIII had 943 and 882 MRFs, respectively. Aside from ARMM with only 19 reported MRFs, lower numbers of MRFs are posted in Regions IV-B, XII and CAR with only less than 200 MRFs each.



Figure 9. Number of MRFs per region 2008-2014

3.4.2 <u>Composting</u>

Under RA 9003, composting is regarded as a means to meet the mandatory waste diversion requirements. It is the biological of biodegradable waste under decomposition solid controlled predominantly aerobic conditions to a state that is sufficiently stable for nuisance-free storage and handling and is satisfactorily matured for safe use in agriculture. It can either be a component of an MRF or established as a standalone processing facility. The law also provides for an inventory of markets for compost and guidelines for compost quality.

Typical small-scale composting in the Philippines is done in compost pits, tire towers, coconut shell stack, bottomless bins, clay pots and plastic sacks. Meanwhile, large-scale composting is done in windrows (by turning,

passive aeration, active aeration and static piles), in-vessel (e.g., agitated beds, composting silos and rotating drum bioreactors), and through vermi- or worm composting.

The different types of composting techniques used by LGUs, national government agencies, private farms and cooperatives in the Philippines are shown in **Figures 10-13**. It is estimated that composting could reduce the weight of organic waste by 50% or more and vermicomposting by 70-80%, the latter capable of turning biodegradables into a high-quality vermicompost product.



Figure 10. Tire composters at the city hall compounds of Tacloban (L) and San Carlos, Negros Occidental (C), and in Dumaguete City, Oriental Negros



Figure 11. Rotating drum composters at Barangay Sun Valley, Parańaque City (L), in the Heritage City of Vigan, Ilocos Sur (C) and in Santiago City, Isabela (R)



Figure 12. Vermicomposting facilities at EMB-RO 8 in Palo, Leyte (L), Buro-buro Springs Farm in Talisay City, Negros Occidental (C) and at the Ormoc City Eco-Center, Leyte (R)



Figure 13. Other techniques such as the coconut shell stack and can composting in Barangay Olaycon, Monkayo, Compostela Valley (L), Bokashi composting at Buro-buro Springs Farm (C) and Takakura composting in Bago City, Negros Occidental (R)

3.4.3 <u>Recycling</u>

The important role of recycling in achieving the mandatory waste diversion requirements is recognized under RA 9003. This law offers guidelines on the establishment and operation of buy-back centers and MRFs and provides for an inventory of markets and eco-labelling of recyclables. Recycling may either be a component of an MRF or established as a stand-alone processing facility.

Recyclables, particularly those with high commercial value such as paper, scrap metals and plastics are typically sold to junk dealers, consolidators and recyclers. The accumulated recyclables from MRFs are delivered to junkshops. In many cases, either the semi-formal or informal waste collectors or even the generators themselves bring the sellable materials to junkshops or at designated areas during recyclables collection events.

The recovered materials that are sold to local junkshops pass through a business chain of middlemen and wholesaler for use by the industry sector, mainly outside the Philippines. However, there are local commercial recyclers that utilize such materials to produce recycled products such as paper/cardboard and recycled aluminum – at a larger scale.

Based on a 2008 study by NSWMC and JICA, primary waste collectors could divert significant amount of recyclables from the waste stream as shown in **Table 4**.

Recyclable Material	Primary Collector	Metro Manila	Metro Cebu	Southern Mindanao
Paper	Street Collectors	3.18	3.59	2.45
	Collection Workers	21.83	1.81	0.62
	Disposal Site Scavengers	22.01	8.21	12.86
Aluminum	Street Collectors	0.76	0.35	0.40
	Collection Workers	0.78	0.13	0.02
	Disposal Site Scavengers	2.50	0.05	1.79
Other Metals	Street Collectors	1.39	5.04	14.76
	Collection Workers	12.35	0.94	0.64
	Disposal Site Scavengers	16.75	6.34	13.75
Plastic	Street Collectors	1.63	3.94	3.50
	Collection Workers	9.79	0.50	0.63
	Disposal Site Scavengers	20.32	4.48	25.00
Glass	Street Collectors	0.85	0.58	6.65
	Collection Workers	6.58	0.26	0.94
	Disposal Site Scavengers	9.96	0.32	49.64

Table 4. Collection of Recyclable Materials by Primary Collectors(unit: kg/capita/day)

Source: JICA Study, 2008

Some LGUs have started recognizing the important contribution of informal and semi-formal sectors in diverting wastes away from disposal sites and have explored ways of partnering with them.

In most regions, LGUs find that there are available markets for recyclable materials except for those with low economic value. For the latter, they had to seek alternatives to recycling these materials into marketable and innovative products such as bags, slippers, fashion accessories, decorative items, furniture and fixtures, ropes, mats, tiles, upholsteries and various crafts and accessories.

Figures 14-17 show the various ways recyclables are utilized.



Figure 14. Waste Market Fair organized in Davao City and the Waste2Cash Market Programs held in Naga City, Camarines Sur (L) and Legazpi City, Albay (R)



Figure 15. Trust International Paper Company in Bulacan and Dasmarinas Paper Mills in Cavite recycle paper and cardboard (L) while Coca-Cola Bottlers, Philippines partners with Tahanang Walang Hagdanan to convert post-consumer aluminum waste into wheelchairs.



Figure 16. Fashion accessories produced from the recycling of waste materials in Agusan del Sur, Aurora, Leyte, Southern Leyte and Samar



Figure 17. Various recycled materials for personal and home use as produced in San Luis, Pampanga (L) at Clark, Capas, Tarlac (C) and SPU, Dumaguete City (R)

3.5 Disposal

Waste disposal refers to the discharge, deposit, dumping, spilling, leaking or placing of any solid waste into or in any land while disposal sites refer to areas where solid waste is finally discharged and deposited. It is regarded as the least preferred method of managing solid waste although it plays an important role in dealing with residual waste.

Almost all solid wastes ended up at dumpsites before the passage of RA 9003. Dumpsites are raw, open spaces designated as local disposal areas that lack engineering measures and pollution control systems. These are often located close to ravines, gullies, seashore, bodies of water and other open spaces and usually become inaccessible during heavy rains.

The law mandates the closure and rehabilitation of all dumpsites and their replacement with sanitary landfills (SLFs). SLFs are disposal facilities with impermeable liners to prevent liquid discharges from polluting ground and surface waters. It should also have a gas management system to reduce risks of burning or explosion, a regular soil cover to minimize odor, and other environmental protection features

3.5.1 Open and controlled dumpsites

RA 9003 prohibits the establishment and operation of open dumps or any practice or disposal involving the use of open dumps. Open dumps, however, were allowed to be converted into controlled dumps only until 2006 as a temporary and remedial measure. Nevertheless, controlled dumps which were required to meet basic waste management guidelines should have been phased out in 2006 in favor of sanitary landfills. The legally mandated transition was not fully realized as many open and controlled dumps are still currently in operation.

Figure 18 indicates that the number of open dumpsites in the country has decreased by 283 only over the past seven years from 806 in 2008 to 523 in 2014. These dumps might have either been completely closed or converted into controlled facilities.

Meanwhile, the number of controlled dumps has only slightly decreased over time. It could be attributable to the LGUs' inability to put up, or have access to, sanitary landfills. In very few cases, some controlled dumps might have reverted to being operated as open dumps while some have indeed undergone closure.



Figure 18. Number of dumpsites still existing from 2008 to 2014

Figure 19 shows the number and proportion of open and controlled dumpsites in every region of the country in 2014. The data show that Regions VII, I and V had the most number of dumpsites. NCR had no reported dumpsite while Region IV-B and ARMM had fewer remaining dumpsites with less than 10 dumpsites each.



igure 19. Number of open and controlled dumpsites in 2014 per region

3.5.2 Sanitary landfills

A sanitary landfill (SLF) refers to a waste disposal site designed, constructed, operated and maintained in a manner that exerts engineering control over significant potential environmental impacts arising from the development and operation of the facility. Prior to 2004, the country had only four sanitary landfills - located in Capas, Tarlac, Inayawan, Cebu City, San Mateo, Rizal and Carmona, Cavite.

Sections 40 to 42 of RA 9003 provides for the criteria in site selection, establishment and operation of SLFs. Specifically, Section 41 stipulates the minimum requirements for the establishment of SLFs: a landfill liner system, leachate collection and treatment, gas control recovery system, groundwater monitoring wells, a daily cover during operations and final cap over the completely filled landfill, and a closure and post-closure maintenance procedure.

The traditional material used to render landfill cells impervious to water seepage is high-density polyethylene (HDPE) plastic material. However, with the pioneering efforts in Bais City, it was found that compacted bentonite clay or clay-spiked host soil may be used as alternative liner material as long as it passes the permeability requirements for a landfill liner.

In 2005, the NSWMC issued a Resolution No. 06 on the guidelines for establishing categorized SLFs, which was later adopted at DAO 2006-10 and supplemented by the 'Technical guidebook on solid wastes disposal design, operation and management'. The guidelines still mandate the use of the relatively expensive HDPE for bigger SLFs but the minimum requirements of clay liners for smaller landfills facilitated the compliance of smaller municipalities.



Figure 20. Number of operating SLFs and SLFs under construction from 2008 to 2014

Figure 20, the number of SLFs doubled within a four-year period from 2008 to 2012 but the number nearly doubled within a span of only two years from 2012 to 2014. The increase was attributed to the completion of a number of small SLFs in Regions I, IVA, XI and other regions, as shown in **Figure 21**.



Figure 21. Number of operational sanitary landfills from 2008 to 2014, per region

Table 5 also shows the location of operating SLFs in the country in 2014. There were also 51 SLFs with ECCs that were undergoing construction by the end of 2014. These may soon be added to the existing landfills in the country. The regional distribution of landfills in 2014, both operational and under construction, is shown in **Figure 22**.

No.	Region	PROVINCE	LGU_Name	Location
1	1	Ilocos Norte	Bacarra	Brgy. Durepes Pungto
2	1	Ilocos Norte	Piddig	Brgy Abucay
3	1	Ilocos Norte	Banna (Espiritu)	Brgy Bangsar
4	1	Ilocos Norte	Vintar	Brgy Parparoroc (14 Ester)
5	1	Ilocos Norte	Nueva Era	Brgy Poblacion
6	1	Ilocos Sur	Candon City	Brgy Balingaoan
7	1	Ilocos Sur	Narvacan	Brgy Dasay

Table 5. Operational Sanitary Landfills and their Location, 2014

No.	Region	PROVINCE	LGU_Name	Location
8	1	La Union	Naguilian	Brgy Cabaritan Norte
9	1	La Union	Bangar	Brgy Cadapli
10	1	La Union	Balaoan	Brgy Calumbayan
11	1	La Union	Rosario	Brgy Inabaan Norte
12	1	La Union	San Fernando City (Capital)	Brgy Mameltac
13	1	La Union	Agoo	Brgy San Agustin Norte
14	1	La Union	Sudipen	Brgy Seng-ngat
15	1	La Union	Luna	Brgy Suroc Norte
16	1	Pangasinan	Bolinao	Brgy Balingasay
17	1	Pangasinan	Urdaneta City	Brgy Catablan
18	1	Pangasinan	Bayambang	Brgy Telbang
19	2	Cagayan	Lal-lo	Brgy Cagoran
20	2	Cagayan	Gonzaga	Sitio Sta Maria, Brgy Pateng
21	2	Nueva Vizcaya	Bayombong (Capital)	Boundary of Brgy Upper Magsaysay and Upper Busilac
22	2	Nueva Vizcaya	Solano	Brgy Concepion
23	2	Nueva Vizcaya	Aritao	Brgy Kirang
24	2	Nueva Vizcaya	Bagabag	Sitio Tapaya, Brgy Baretbet
25	3	Aurora	Maria Aurora	Brgy San Joanquin
26	3	Aurora	Dipaculao	Brgy Toytoyan
27	3	Bataan	Mariveles	Phil Eco Zone BEZ,Brgy Malayo & Brgy Maligaya & Basoco
28	3	Bataan	Abucay	Sitio Macao, Brgy Capitangan
29	3	Bataan	Limay	Sitio Mamala, Brgy St Francis I
30	3	Bulacan	San Jose del Monte City	Alejandro Waste Mgt. Inc., Brgy Minuyan
31	3	Bulacan	Norzagaray	Sitio Coral, Brgy Matictic
32	3	Bulacan	Norzagaray	Wacuman Inc., Sitio Tiakad, Brgy San Mateo
33	3	Nueva Ecija	Santa Rosa	Brgy Mapalad
34	3	Nueva Ecija	Palayan City (Capital)	EcoSci Corp., Brgy Atate
35	3	Tarlac	Capas	Metro Clark Waste Mgt. Corp., Sub-zone Kalangitan, Clark Special Economic Zone
36	4a	Batangas	Bauan	Bauan SWM, Inc., Brgy Malindig
37	4a	Batangas	Cuenca	Brgy 8, Poblacion
38	4a	Batangas	Taysan	Brgy Piña
39	4a	Batangas	Alitagtag	Brgy San Juan
40	4a	Batangas	Batangas City (Capital)	Waste Garde - Brgy San Jose Sico
41	4a	Cavite	Imus City	Coldwell

No.	Region	PROVINCE	LGU_Name	Location
				Environmental Care Corp., Brgy Pasong Buaya I
42	4a	Cavite	Trece Martines City (Capital)	TMC Integrated SWM Corp., Brgy De Ocampo
43	4a	Laguna	Calamba City	Brgy Bubuyan (Suri Waste Management)
44	4a	Laguna	San Pedro	Brgy San Antonio (Pilotage SLF - Site 1)
45	4a	Laguna	San Pablo City	Brgy Sto Nino
46	4a	Laguna	Kalayaan	Sitio San Isidro, Brgy Longos
47	4a	Quezon	Mauban	Brgy Lual Barrio
48	4a	Quezon	Infanta	Brgy Magsaysay
49	4a	Quezon	General Nakar	Sitio Pinagtaywanan, Brgy Anoling
50	4a	Rizal	Morong	BEST(IPM), Brgy San Guillermo
51	4a	Rizal	San Mateo	ISWIMS - Brgy Pintong Bukawe (New Site)
52	4a	Rizal	Rodriguez (Montalban)	Sitio Lukutan, Brgy San Isidro (Rizal Provincial)
53	4b	Oriental Mindoro	Calapan City (Capital)	Sitio Dalig, Brgy Batalino
54	4b	Palawan	Bataraza	Brgy Rio Tuba
55	4b	Palawan	Puerto Princesa City (Capital)	Brgy Sta Lourdes
56	4b	Palawan	El Nido (Baciut)	Brgy Villa Libertad
57	4b	Palawan	Quezon	Sitio Metropal, Brgy Malatgao
58	5	Albay	Legaspi City (Capital)	Brgy Banquerohan
59	6	Aklan	Malay	Brgy Kabulihan
60	6	Negros Occidental	Sipalay City	Brgy Canabalan
61	6	Negros Occidental	Bago City	Brgy Ma-ao
62	6	Negros Occidental	Sagay City	Brgy Paraiso
63	6	Negros Occidental	San Carlos City	So. Mabuni, Brgy Guadalupe
64	7	Cebu	Cebu City (Capital)	Brgy Inayawan
65	7	Cebu	Dalaguete	Brgy Tapon
66	7	Cebu	Asturias	Sitio Libaong, Brgy San Isidro
67	7	Cebu	Talisay City	Sitio Tapul, Brgy Maghaway
68	7	Negros Oriental	Bais City	Brgy Cambanjao
69	7	Negros Oriental	Bayawan City (Tulong)	Brgy Maninihon
70	8	Leyte	Ormoc City	Brgy Green Valley
71	8	Samar	Calbayog City	Brgy Dinagan (Gadgarin)
72	10	Bukidnon	Damulog	Sitio Narugaran, Brgy

No.	Region	PROVINCE	LGU_Name	Location			
				Росоросо			
73	10	Camiguin	Mambajao (Capital)	Brgy Benhaan			
74	11	Davao del Norte	Tagum City (Capital)	Purok Sta Cruz, Brgy Nueva; Brgy San Agustin			
75	11	Davao del Norte	Talaingod	Sitio Tibi-tibi, Brgy Sto Nino			
76	11	Davao del Sur	Davao City	Brgy New Carmen, Tugbok Dist.			
77	11	Davao Oriental	Mati City (Capital)	Sitio Tagbobolo, Brgy Sainz			
78	12	South Cotabato	Surallah	Brgy Colongolo			
79	12	South Cotabato	Polomolok	Brgy Kinilis			
80	12	Sultan Kudarat	Tacurong City	Brgy Upper Katungal			
81	13	Surigao del Norte	Surigao City (Capital)	Brgy Cagniog			
82	CAR	Benguet	La Trinidad (Capital)	Brgy Alno			
83	CAR	Ifugao	Lamut	Sitio Nabangan, Brgy Payawan			
84	NCR	Metro Manila	Navotas City	Brgy Tanza (New site) - PhilEco			
85	NCR	Metro Manila	Quezon City	IPM, Urban II, Brgy Payatas			
86	ARMM	Lanao del Sur	Wao	Brgy Katutungan			
Source: NSWMC							

Source: NSWMC



Figure 22. Number of SLFs (Operational and Under Construction) in 2014, per region

Clustered landfills

Clustering is an option in which small LGUs can pool their resources into setting up a common solid waste disposal facility. It also enables them to attain large economies of scale and reduce the cost per unit of solid waste

disposal. The main constraints, however, are finding a host LGU and the social acceptability of the proposed facility.

Forms of clustering in the Philippines include private sector-led ventures that offer their landfills where LGUs dispose their residual waste upon payment of tipping fees. There also LGUs that host a facility that serve neighboring municipalities for a fee.

Inter-municipal clustering has been successful in the province of South Cotabato. The establishment of a common Category 2 SLF at Barangay Colongulo, Surallah, South Cotabato (**Figure 23**) in 2011 was financially supported by the provincial government with technical assistance from DENR and USAID. The facility is now being shared among the municipalities of Surallah, Norala, T'boli, Banga, Sto. Nino and Lake Sebu. Earlier, in 2008, a Category 1 SLF was established in Barangay Kinilis, Polomolok as a result of the partnership between the LGU and Dole Philippines, Inc. The facility also serves neighboring municipalities.



Figure 23. Clustered sanitary landfill in Surallah, South Cotabato

3.6 Local Solid Waste Management Plans

RA 9003 requires the preparation of 10-year SWM plans by provinces, cities and municipalities consistent with the national SWM Framework. These plans shall include all the components identified in the law

The plans are subject to annual review and updating by the provincial, city or municipal SWM boards. All plans must be approved by the NSWMC. An annotated outline has been prepared by the NSWMC to guide the LGUs on the specific components of the plans as well as to facilitate the review and approval of the plans submitted to NSWMC.

3.6.1 Submitted SWM Plans

Table 6 shows the number of local SWM Plans submitted to the EMB (Central and Regional Offices).

	Year						
	2008	2009	2010	2011	2012	2013	2014
Local SWM Plans submitted to NSWMC	268	295	335	342	417	566	844

Table 6. Number of 10-year SWM Plans submitted to NSWMCfrom 2008 to 2014

Source: NSWMC

Disaggregated data on the number of submitted plans per region from 2008 to 2014 are shown in **Figure 24**.



Figure 24. Number of SWM Plans Submitted in 2008-2014, by Region

Figure 25 also shows the percentage of LGUs with submitted plans as of 2014. In 2014, 96% of LGUs in Region XI have already submitted their 10-year SWM Plans. This is followed by CAR (75%), Region 1 (74%), Region 12 (72%) and NCR (71%). There are 6 regions that had less than 50% compliance.



3.6.2 Approved SWM Plans

All local government SWM Plans shall be subjected to the review and approval of the NSWMC. As of June 2015, a total of 93 local SWM plans have been officially approved by the NSWMC as shown in **Table 7**.

Region	LGU	Province	Resolution Number
3	Maria Aurora	Aurora	41 series of 2010
CAR	Tineg	Abra	41 series of 2010
4A	Sampaloc	Quezon	41 series of 2010
2	Solano	Nueva Vizcaya	41 series of 2010
1	Sta. Cruz	Ilocos Sur	41 series of 2010
9	Zamboanga City	Zamboanga City	41 series of 2010
6	Malay (Boracay Island)	Aklan	41 series of 2010
12	Tacurong City	Sultan Kudarat	49 series of 2010
8	Calbayog City	Samar	49 series of 2010
9	Buug	Zamboanga Sibugay	49 series of 2010
9	Guipos	Zamboanga del Sur	49 series of 2010
9	Ipil	Zamboanga Sibugay	49 series of 2010
9	Midsalip	Zamboanga del Sur	49 series of 2010
4A	Sta. Rosa	Laguna	49 series of 2010
6	Jamindan	capiz	49 series of 2010
7	Naga City	Cebu	49 series of 2010
6	Sagay City	Negros Occidental	49 series of 2010
6	Silay City	Negros Occidental	49 series of 2010
NCR	Quezon City	Metro Manila	49 series of 2010
2	Gonzaga	Cagayan	49 series of 2010
9	Margosatubig	Zamboanga del Sur	55 series of 2013
9	Salug	Zamboanga del Norte	55 series of 2013
9	Dipolog City	Zamboanga del Norte	55 series of 2013
8	Maasin City	Leyte	55 series of 2013
6	Jordan	Guimaras	55 series of 2013
2	Кауара	Nueva Vizcaya	55 series of 2013
ARMM	Wao	Lanao del Sur	55 series of 2013
6	Talisay City	Negros Occidental	55 series of 2013
6	Cadiz	Negros Occidental	55 series of 2013
6	Calatrava	Negros Occidental	55 series of 2013

Table 7. List of approved local 10-year Solid WasteManagement Plans as of June 2015

6	Cauayan	Negros Occidental	55 series of 2013
6	Hinigaran	Negros Occidental	55 series of 2013
6	San Enrique	Negros Occidental	55 series of 2013
6		Negros Occidental	55 series of 2013
11	Mati	Davao del Norte	55 series of 2013
6	Numancia	Aklan	55 series of 2013
10	Quezon	Bukidnon	55 series of 2013
12	Alabel	Sarangani	62 series of 2013
11	Maragusan	Compsotela Valley	67 series of 2013
11	Monkayo	Compsotela Valley	67 series of 2013
2	Baggao	Cagayan	81 series of 2014
2	Allacapan	Cagayan	81 series of 2014
2	Lal-lo	Cagayan	81 series of 2014
2	Quirino	Isabela	81 series of 2014
4A	Teresa	Rizal	93 series of 2014
4A	Sariaya	Quezon	93 series of 2014
4A	Kalayaan	Laguna	93 series of 2014
4A	Los Baños	Laguna	93 series of 2014
4A	Sta. Cruz	Laguna	93 series of 2014
4A	Nagcarlan	Laguna	93 series of 2014
11	Nabunturan	Compostela Valley	99 series of 2014
11	Pantukan	Compostela Valley	100 series of 2014
11	Compostela	Compostela Valley	101 series of 2014
11	New Bataan	Compostela Valley	102 series of 2014
11	Laak	Compostela Valley	104 series of 2014
11	Mabini	Compostela Valley	105 series of 2014
11	Масо	Compostela Valley	106 series of 2014
11	Mawab	Compostela Valley	107 series of 2014
11	Montevista	Compostela Valley	108 series of 2014
11		Compostela Valley	109 series of 2014
1	Bacarra	Ilocos Norte	110 series of 2014
4A	Bacoor City	Cavite	111 series of 2014
4A	Calauan	Laguna	115 series of 2015

3	Victoria	Tarlac	116 series of 2015
6	Bacolod City	Negros Occidental	118 series of 2015
6	Manapla	Negros Occidental	119 series of 2015
6	La Carlota City	Negros Occidental	120 series of 2015
6	Hinobaan	Negros Occidental	121 series of 2015
6	Enrique B. Magalona	Negros Occidental	122 series of 2015
6	Bago City	Negros Occidental	123 series of 2015
2	Bambang	Nueva Vizcaya	124 series of 2015
NCR	Parañaque City	NCR	125 series of 2015
NCR	Valenzuela City	NCR	127 series of 2015
2	Solana	Cagayan	128 series of 2015
3	San Jose City	Nueva Ecija	129 series of 2015
4A	Malvar	Batangas	130 series of 2015
4A	Luisiana	Laguna	131 series of 2015
4A	Carmona	Cavite	132 series of 2015
11	Caraga	Davao Oriental	135 series of 2015
11	Sulop	Davao del Sur	136 series of 2015
11	Matanao	Davao del Sur	137 series of 2015
3	Pilar	Bataan	138 series of 2015
3	Maria Aurora	Aurora	139 series of 2015
NCR	San Juan	Metro Manila	140 series of 2015
3	La Paz	Tarlac	141 series of 2015
CARAGA	Trento	Agusan del Sur	142 series of 2015
2	Roxas	Isabela	144 series of 2015
1	Rosario	La Union	145 series of 2015
11	Panabo	Davao del Norte	146 series of 2015
3	Mabalacat	Pampanga	147 series of 2015
11	Island Garden City of Samal	Davao del Norte	148 series of 2015
3	Dinalupihan	Bataan	149 series of 2015
4B	Concepcion	Romblon	150 series of 2015

Source: NSWMC

4. Legal and Institutional Framework

4.1 Legislations and Policies

Over the last 16 years (1999 to 2014), the Philippines has endeavored to improve its management and operation of solid waste through several national laws, rules, regulations, orders, and memoranda on environment, including resolutions and ordinances issued by local government units.

4.1.1 The Ecological Solid Waste Management Act (RA 9003)

In 2001, Republic Act 9003 (RA 9003), otherwise known as the Ecological Solid Waste Management Act of 2000, was enacted into law declaring the policy of the government to "adopt a systematic, comprehensive, and ecological solid waste management program" in the country.

The ecological solid waste management (ESWM) policy is based on the management of waste in the following hierarchy:

- Source reduction (avoidance) and minimization of waste generated at source
- Reuse, recycling and resource recovery of wastes at the barangay level
- Efficient collection, proper transfer, and transport of wastes by city/municipality
- Efficient management of residuals and of final disposal sites and/or any other related technologies for the destruction/reuse of residuals

Provided in RA 9003 and its IRR are mandates and schedules of implementation to be undertaken by provincial, city/municipal, and barangay governments within their jurisdiction. The most important of these include:

- Creation of a Solid Waste Management (SWM) Board (city/municipal and provincial levels)
- Creation of a SWM Committee (barangay level)
- Submission of a 10-year SWM Plan (city/municipal levels)
- Establishment of Materials Recovery Facilities (MRF) per barangay or cluster of barangays and city/municipal centralized MRF
- Closure of open dumpsites and conversion into controlled dumpsites by 2004 (city/municipal levels)
- Banning of controlled dumpsites by 2006 (city/municipal levels)

4.1.2 Other SWM-related laws and policies

There are also relevant laws enacted at the national level that affect the implementation of RA 9003. These are summarized as follows:

• Republic Act No. 6969 (Toxic Substances and Hazardous and Nuclear Waste Act of 1990). The act calls for the regulation of and

restriction on the importation, manufacture, processing, sale, distribution, use and disposal of chemical substances and mixtures that pose risk and/or injury to health and to the natural environment.

- Republic Act No. 7160 (Local Government Code (LGC) of 1991). The act devolved certain powers to the local governments units, including enforcement of laws and cleanliness and sanitation, solid waste management, and other environmental matters.
- Republic Act No. 8749 (Clean Air Act of 1999). The act directs all government agencies to adopt the integrated air quality framework as a blueprint for compliance. Among its salient provisions are the "polluters must pay" principle, and the prohibition of the use of the incineration method, which is defined as the burning of municipal, biomedical and hazardous waste or the process, which emits poisonous and toxic fumes. The act further mandates LGUs to promote, encourage, and implement segregation, recycling and composting within their jurisdiction. It also required the phasing out of incinerators by July 2003.
- Republic Act No. 9275 (Philippine Clean Water Act of 2004). The act provides for the protection, preservation, revival of quality of fresh, brackish and marine waters of the country to pursue economic growth.
- Republic Act No. 9512 (Environmental Awareness and Education Act of 2008). The act promotes environmental awareness through environmental education. It integrates environmental education in the school curricula at all levels, public or private, barangay day care and pre-school, and non-formal, vocational, and indigenous learning.
- Republic Act 9513 (Renewable Energy Act of 2008). The act promotes the development, utilization and commercialization of renewable energy and for other purposes.

Section 30 of RA 9513 provides for the use of "waste to energy" technology subject to requirements of RAs 9003 and 8749 (Clean Air Act). Specifically, waste to energy technology refers to "systems which convert biodegradable material such as but not limited to animal manure or agricultural waste, into useful energy processes such as: anaerobic digestion, fermentation, and gasification, among others, subject to the provisions of the Clean Air Act of 1999 and the Ecological Solid Waste Management Act of 2000".

 Republic Act (RA) 9729 (Climate Change Act of 2009). The act declares as a Philippine policy the adoption of the ultimate objective of the UNFCC convention, which is the stabilization of greenhouse gas concentration in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

- Presidential Decree No. 856 (Code of Sanitation of the Philippines). The decree prescribes sanitation requirements for hospitals, markets, ports, airports, vessels, aircraft, food establishments, buildings, and other establishments. Refuse collection and disposal system in cities and municipalities are described in Chapter XVIII of the law.
- Presidential Decree No. 1586 (Environmental Impact Assessment Law). Approved on June 11, 1978, the law establishes and institutionalizes an environmental impact system where projects to be undertaken would be reconciled with the requirements of environmental quality. This requires proponents of critical projects and projects located in critical areas to secure an environmental compliance certificate (ECC) from the President or his duly authorized representative. The inclusion of the construction of Sanitary Landfills (SLF) as a critical project was done later.
- Presidential Decree No. 1160. The law vests authority in Barangay Captains (Barangay Chairmen) to enforce pollution and environmental control laws. It also deputizes the Barangay Councilman and Barangay Zone Chairman as peace officers.
- Executive Order (EO) No. 774. Issued on December 26, 2008 the order calls for the reorganization of the Presidential Task Force on Climate Change (PTFCC), headed by the President, with all cabinet members as members of the Task Force. EO 774 created 13 Task Groups that included solid waste management.
- The Philippine Disaster Risk Reduction and Management Act of 2010. In relation to Climate Change program, the law supports the 3 R's of SWM in promoting to consumers avoidance of using the disposable and unnecessary products in order to avoid or reduce the solid wastes generated by households, commercials, institutional, industries and all levels of stakeholders.

Of significance also are several national policy frameworks that support solid waste management in the country, namely:

• National Solid Waste Management Framework (NSWMF) (2004)

As provided for under RA 9003, the NSWMF outlines the preferred approach to support the adoption of a systematic, comprehensive and ecological solid waste management program. It focuses on the waste management hierarchy that emphasizes waste avoidance and minimization through reuse, recycling, composting and resource recovery.

 National Framework Strategy on Climate Change (NFSCC): Chapter 8: Mitigation pillar on waste management (2010-2022) Pursuant to RA 9729 (Climate Change Act of 2009), the Climate Change Commission passed NFSCC, which finds the waste sector as the third largest GHG emitter. In response to this, NFSCC identifies SWM as among the six (6) priority sectors with strategic priorities:

- a. Enhanced implementation of RA 9003
- b. Promotion of best practices in waste management, involving all categories of waste
- c. Strengthen the advocacy of proper waste management as a tool towards better communicating and mobilizing the public to address climate change
- The Philippine Development Plan (2011-2016) Chapter 9: Sustainable and climate-resilient environment and natural resources; Chapter 10: Accelerating infrastructure development.

The Plan's infrastructure development program ensures equitable access to infrastructure services. The government aims to accelerate the provision of safe, efficient, reliable, cost-effective, and sustainable infrastructure. Under its 'infrastructure' component, the PDP aims to increase the percentage of the number of LGUs served by SLFs to 7.76% by 2016.

Meanwhile, the PDP's environmental protection program mitigates the demands arising from development, population expansion, poor environmental protection and climate change, through integrated approaches. Targets by 2016 include an increase in waste diversion rate by 50% through reuse, recycling and composting and other resource recovery activities; closure and rehabilitation of all existing dumpsites; and full operationalization of National/Regional Ecology Centers.

• The Philippine National Solid Waste Management Strategy (NSWMS) (2012-2016)

In relation to the NSWMCF, a National Solid Waste Management Strategy (NSWMS) was developed through a consultative process. The NSWMS has the following components:

- a) bridging policy gaps and harmonizing policies;
- b) capacity development, social marketing and advocacy;
- c) sustainable SWM financing mechanisms;
- d) creating economic opportunities;
- e) support for knowledge management on technology, innovation and research;
- f) organizational development and enhancing inter-agency collaboration;
- g) compliance monitoring, enforcement and recognition, and;

h) cross cutting issues on good governance, caring for vulnerable groups and disaster and climate change risks through SWM.

As the overarching law governing ecological SWM implementation in the Philippines, RA 9003 mandates all LGUs to cease using dumpsites as final repository for solid wastes. Along with the closure and rehabilitation of existing dumps, LGUs would have to put up sanitary landfills as the legitimate mode of disposal.

Various national environmental legislations also require wastewater or leachate control measures to prevent surface and groundwater contamination as well as proper gas management systems to reduce greenhouse gas (GHG) emissions and occupational health and safety risks. At the same time, RA 9003 requires the diversion of at least 25% of waste away from disposal facilities, which can be done through the establishment of composting and materials recovery facilities (MRF).

4.1.3 <u>NSWMC resolutions and corresponding administrative orders</u>

Since 2002, the NSWMC has passed supplementary guidelines in the form of NSWMC Resolutions to enhance the understanding of RA 9003 provisions. Some of these have been further detailed as DENR Administrative Orders (DAO). **Table 8** shows some key resolutions and guidelines that were issued from 2002 to 2013.

Table 8.	List of selected NSWMC Resolutions and corresponding
	Administrative Orders (AO)

Reso. No. (Year)	NSWMC Resolution Title	DENR Department AO (DAO) or Joint AO(JAO)	Brief Description
1 (2002)	Delegation of Certain Functions of the NSWMC Chairman to the DENR Regional Executive Directors and Prescribing Appropriate Clearances for Solid Waste Management Facilities		Functions are delegated to the DENR- REDs in coordination with EMB ROs and MGB to expedite the survey of existing open dumpsites through its PENRO and CENRO, supervise immediate phasing out of all existing open dumpsites, visitorial and enforcement powers, site assessment of proposed controlled disposal facilities and SLFs and to provide technical assistance to LGUs

Reso.	NSWMC Resolution	DENR Department	Priof Description
(Year)	Title	AO (DAO) or Joint AO(JAO)	Brier Description
5 (2005) 50 (2010) 56 (2013)	Adoption of the Guidelines on the Closure and Rehabilitation of Disposal Facilities, including the Adoption of the NSWMC Guidebook on Dumpsite Closure per Reso. No. 50, as amended under Reso. No. 56.	DAO 2006-09: Guidelines on dumpsite closure and rehabilitation	"General Guidelines in the Closure and Rehabilitation of Open Dumpsites and Controlled Dump Facilities". An amendment to the guidelines includes the sections 4.2 and 5.2 of DAO 2006-09 wherein EMB ROs shall no longer issue Authority to Close (ATC) since it is no longer consistent with Section 37 of RA 9003.
6 (2005) 50 (2010)	AdoptionoftheGuidelinesonCategorizedDisposalFacilities, including theAdoption of the NSWMCGuidebookonSLFEstablishmentperNo. 50.	DAO 2006-10: Guidelines on categorized sanitary landfills	The supplemental guideline offers options for LGUs that generate net residual wastes of less than 75 tons daily to use low-permeability clay liners as an alternative to more expensive synthetic ones, including all the conditional environmental protection requirements per SLF category.
8 (2006)3 9 (2009) 50 (2010) 70 (2013)8 0 (2014)	Guidelines on the Review and Approval of the 10- year SWM Plans of Local Government Units, as amended by Reso Nos. 39 and 80, including the Adoption of the NSWMC Guidebook on SWM Planning per Reso. No. 50.		The NSWMC is empowered by RA 9003 to review and approve submitted 10- year SWM Plans. Instead of an NSWMC Technical Working Committee (TWC), endorsement shall be done by the NSWMC Technical Working Group (TWG). Resolution No. 70 prescribes deadlines on the submission of 10-year SWM Plans.
9 (2006) 19 (2009) 20 (2009)	Phasing Out of Non- environmentally acceptable products and packaging materials (NEAPP)		As per Section 29 of RA 9003, the NSWMC shall, after public notice and hearing, prepare a list of non- environmentally acceptable products as defined in the Act that shall be prohibited according to schedule.
15 (2009) 16 (2009)7 8 (2014)	Creating a NSWMC Technical Working Group (NSWMC-TWG), as amended with governing rules under Reso No. 78		Composition and function of the TWG, including permanent representatives of each NSWMC member agency. The TWG shall convene to discuss issues and proposed policies and work programs for consideration and approval by the Commission.
17 (2009) 76 (2014)	Adopting the Three (3)- Strike Policy, including Reso No. 76 on barangays		DENR and DILG will issue parallel guidelines relative to the implementation of the 3-strike policy for non-complying LGUs.

Reso. No. (Year)	NSWMC Resolution Title	DENR Department AO (DAO) or Joint AO(JAO)	Brief Description
35 (2009)	Adopting the Guidelines on Deputation of Solid Waste Management Officers		The NSWMC shall adopt the modified guidelines and procedure in the deputation of SWM including a training module which an individual person will undergo to be considered as deputized SWM Officers.
36 (2009)	Adopting the Criteria for Accreditation of an Individual and Member of an Organization as SWM Experts		Rule V(I) of the IRR of the RA 9003 states that the NEC shall facilitate training and education in integrated ecological SWM through, among others: the development of an accreditation and certification system for the conduct and holding of SWM training programs.
41 (2010) 49 (2010) 5 5 (2013) 6 2 (2013) 67 (2013)	Approving the Ten Year Solid Waste Management Plans of Local Government Units		A total of 40 Local SWM Plans have been approved, to wit, Resolution No. 41 (7 Plans), No. 49 (13 Plans), No. 55 (17 Plans), No. 62 (1 Plan), and No. 67 (2 Plans).
47 (2010) 48 (2010)	Adopting the National Framework Plan of the Informal Sector in Solid Waste Management, including the creation of a Multi-Sectoral Committee (MSC) for the IWS		The Framework Plan shall empower the informal waste sector that is recognized as partner of the public and private institutions, organizations and corporations in the promotion and implementation of the 3Rs of ecological SWM in the Philippines with the end view of alleviating poverty.
51 (2010)	Resolution Adopting the National Ecology Center (NEC) and Regional Ecology Centers (RECs) Operational Guidelines		RA 9003 mandates the creation of National and Regional Ecology Centers (NEC/RECs) to assist LGUs in implementing RA 9003. Specifically, the RECs are requested to serve as a platform for public participation from all sectors and for all aspects related to SWM as well as a center for information, knowledge transfer, data processing and networking services.

Reso.	NSWMC Resolution	DENR Department	
No. (Year)	Title	AO (DAO) or Joint AO(JAO)	Brief Description
57 (2013)	Resolution Creating a Philippine Methane Partnership Technical Working Group (PMP- TWG)		Philippine Methane Partnership (PMP) is a counterpart of Global Methane Initiative (GMI) for government agencies and stakeholders in relation to production, recovery and uses of methane from agricultural wastes and landfill. The resolution creates a TWG composed of qualified representative of various agencies that shall prepare the work programs and other preparatory documents.
59 (2013)	Adopting the National Solid Waste Management Strategy (2012-2016)		The NSWMS sets the development path for the Philippine SWM sector in the upcoming years and contains detailed activities for NSWMC and other concerned organizations to materialize RA 9003 provisions.
60 (2013)	Guidelines for Mandatory Solid Waste Segregation at Source, Segregated Collection and Recovery		The resolution provided specific guidelines on proper solid waste handling in public and private places particularly on the implementation of segregation at source, segregated collection and setting up of a recycling program.
63 (2013) 66 (2013) 71 (2013)	Resolution 63 on the Institutionalization of the NSWMC and the Offices Created Under it, i.e., the Secretariat and the National Ecology Center. Resolution 66 Designates the Chief of the EMB Solid Waste Management Division as OIC- Executive Director of the NSWMC Secretariat		The resolution provided for the creation and institutionalization of plantilla position for the NSWMC Secretariat and NEC to effectively achieve the mandated functions and efficient performance of the said offices.
64 (2013)	Adoption of Modified Guidelines on Site Identification Criteria and Suitability Assessment for Sanitary Landfills		The resolution provides guidelines on SLF siting criteria and assessment procedure that are consistent with Sections 40 and 48 of RA 9003 and DAO 98-50.

Reso. No. (Year)	NSWMC Resolution Title	DENR Department AO (DAO) or Joint AO(JAO)	Brief Description
65 (2013)7 3 (2013)	Resolution No. 65 Provides for Conditional Approval of the Ten Year Solid Waste Management Plans of Local Government Units; as amended by Resolution No. 73.		Based on a Supreme Court hearing on the Continuing Mandamus, this resolution provided for conditional approval to Local SWM Plans submitted to the NSWMCS up to July 2013, provided that additional information required should be submitted on or before February 28, 2014.
68 (2013)	Adoption of the Guidelines on the Clustering of LGUs on Common ESWM System		Section 44 of RA 9003 mandates LGUs "to [cluster] for purposes of jointly addressing common solid waste management problems and/or establishing common waste disposal facilities.
69 (2013)	Resolution on the Nationwide Implementation Appropriate ESWM System for Home Owners Association (HOAs), Public Markets and Commercial Establishments and the Ecosavers Program for Public Schools		Resolution to replicate and implement nationwide the establishment of an appropriate ESWM based on progress with objectives nearly achieved through the projects of the NSWMCS with the HOAs, Public Markets and Commercial Establishments and Ecosavers Program for Public Schools.
72 (2013)	Resolution Endorsing the Declaration of every month of January as Zero Waste Management Month in the Philippines		Declared that every month of January, instead of July in remembrance of the Payatas tragedy, as the Zero Waste Management Month to coincide with the enactment of the Ecological Solid Waste Management Act of 2000 and to synchronize celebration among national government agencies, schools, society, organization, business and other sectors.
75 (2014)	Resolution for the establishment /development of the 10- storey National Ecology Center Pursuant to RA 9003		
76 (2014)	Resolution Adopting the Enforcement Policy for the Barangays		
77 (2014)	Governing Rules and Regulations of the		Rule IV Section 5 of the Implementing Rules and Regulations

Reso. No. (Year)	NSWMC Resolution Title	DENR Department AO (DAO) or	Brief Description
	National Solid Waste Management Commission (NSWMC)		provides that the Commission shall formulate its governing rules that will define its conduct of business in carrying out the functions
78 (2014)	Governing Rules and Regulations of the National Solid Waste Management Commission-Technical Working Group (NSWMC- TWG)		The NSWMC-TWG was created through Resolution No. 15 series 2009. During the NSWMC meeting held on March 27, 2014 it was agreed that the NSWMC- TWG shall define its conduct of business in carrying out functions.
79 (2014}	Amending Resolution No. 26 series of 2009, Changing the Term Ecology Park or Eco-Park to Ecological Solid Waste Management Park or Eco-SWM Park and Providing Clarifications on its Use		Amended are paragraph No. 3, be amended to read: "LGUs find it hard to comply with the requirements of Section 37 of RA 9003 and of the DENR DAO 2003-30 or the IRR of PD 1586, Establishing the Philippine Environmental Impact Statement System, NSWMC Resolution No. 2005- 06, Adoption of Guidelines on Categorized Disposal Facilities"
			Paragraph 5 be amended to read: " the Eco-SWM Park is a site for environmental advocacy with showcase of best SWM practices (including crafts from wastes) and activities that will enhance the balance of the ecological system and may be part of an integrated SWM facility with a central materials recovery facility (MRF) with processing of biodegradable and recyclable materials, storage of special wastes, and temporary Residuals Containment Area (RCA) for segregated wastes to be used as alternative fuels and raw materials (AFR) for co-processing facilities, use of technologies developed or verified by the DOST, or other technologies that may be developed"
			Paragraph 6 be amended to read: " That an Eco-SWM Park is not an option for waste disposal, does not replace a sanitary landfill and cannot be used to extend the operation of open and controlled dumps"
			to include the following additional clauses to read: "the Site Selection and Operation of an Eco-SWM Park shall conform to the Guidelines set by the DENR"

Reso.		DENR	
No.	Title	AO (DAO) or	Brief Description
(real)		Joint AO(JAO)	
			and
			That the title of Ecology Park or Eco- Park be amended to read: Ecological Solid Waste Management Park or Eco- SWM Park to identify it among other "Eco-Park" projects in the country
80 (2014)	Amending Resolution No. 39, Guidelines on the Review and Approval of the 10-year Solid Waste Management Plans of Local Government Units (LGUs)		The amended resolution is to include the following provision" Providing that a representative from the LGU from which the plan emanated may be invited to present the contents of their plan following a prescribed template" The LGU may be invited to defend their plans to the TWG if in case there are questions that needs further clarification.
82 (2014)	Resolution Adopting the NSWM Comprehensive Plan as basis for Budget Proposal		This was developed in line with the NSWM Strategy which was adopted through NSWMC resolution Number 59 series of 2013 and was presented to the NSWM-TWG meeting on June 5, 2014. The objective of the NSWM Comprehensive Plan is to increase the country's waste diversion rate from 34% in 2010 to 50% by 2016.
83 (2014)	Resolution supporting the programs of NSWMC submitted to NEDA INFRACOM for Public Investment in CY 2015		This was developed in line with the letter from NEDA to DENR Secretary dated May 13, 2014 soliciting for additional proposal for Public Investment. To contribute to achieve the objectives of the PDP 2011-2016 particularly on sustainable and Climate Resilient Environment and Natural Resources through increased waste diversion rate, increase in collection coverage and increase coverage of SWM facilities
84 (2014)	Resolution in Adopting the Implementing Guidelines of the National Ecosavers Program		To promote environmental awareness especially in SWM through Public Elementary and Secondary Schools.
85 (2014)	Resolution creating a Multi-Agency Sub-Group (MASG) to develop the guidelines on the Waste		The MASG on WACS was created to develop a standardized Waste Analysis and Characterization Study (WACS) guidelines to be utilized by the LGUs. Members are: MMDA, DENR-EMB, Page 1.46

Reso. No. (Year)	NSWMC Resolution Title	DENR Department AO (DAO) or	Brief Description
(1001)	Analysis and Characterization Study (WACS) and Computation of Waste Diversion	Joint AO(JAO)	DOST-ITID, DOH-EOHO and representative from Non Government Organization (NGO)
86 (2014)	Resolution creating a Multi-Agency Sub-Group (MASG) to develop the guidelines on Composting, Compost Quality and Market Development (CCQMD)		The MASG for CCQMD was created to develop the guidelines on composting, compost quality and market development. Members are DA-BSWM as Chairman, DENR-EMB, DILG-BLGS, DOST-ITDI, DOH-EOHO, DTI-BOI, GO and Liga ng mga Barangay
89 (2014)	Resolution providing Final Notice to Local Government Units for the Submission of the Ten Year Solid Waste Management Plan		Resolution authorizing the NSWMCS to issue Final Notice to LGU.
90 (2014)	Resolution creating a Multi-Agency Sub-Group (MASG) to develop the guidelines on the establishment and operation of best available Waste to Energy (WTE) Technologies for the Country		The MASG on Waste to Energy was created to develop the guidelines on the establishment and operation of best available WTE technologies for the Country. Members are DILG-BLGS, DENR-EMB, DOST-ITDI, DOE, DTI-BOI, DA-BAI,DOH-EOHO, DPWH, MMDA, Climate Change Commission and Recycling Industry
91 (2014)	Resolution creating a Multi-Agency Sub-Group to develop/adopt Solid Waste Management Training Modules and Formulate a Training/Accreditation/Ce rtification System for SWM Practitioners and Experts		The MASG was created to formulate/develop/review SWM training modules prepared by the Commission Secretariat or it's Consultants as well as the training and accreditation system for SWM practitioners. Members are TESDA as Chairman, DENR, DILG,MMDA, DA, DOST, DPWH, Recycling Industry and NGOS.
92 (2014)	Resolution Creating a Sub-Group to prepare the Communications Plan and the Vision and Mission for NSWMC		The subgroup was created to develop and prepare Communications Plan and the Vision/Mission of the NSMWC. Members are PIA as head and NSWMC Secretariat.
96 (2014)	Resolution Authorizing the Presiding Officer of the NSWMC September		Authoring the Presiding Officer and Vice Chair of the NSWMC to sign resolutions approved in 2013 in behalf

Reso. No. (Year)	NSWMC Resolution Title	DENR Department AO (DAO) or Joint AO(JAO)	Brief Description
	30, 2014 Meeting to sign and attest on behalf of the Chairman the Resolutions Approved in 2010-2013		of the Chairman.
103 (2014)	Resolution Granting the request for extension of the Submission of Ten Year Solid Waste Management Plans to Local Government granted with Conditional Approval		The NSWMCS to issue letter granting the extension of conditional approval of Plans to the LGUs only until March 31, 2015, otherwise, LGUs are no longer covered by the said approval
112 (2014)	Resolution Creating a Multi-Agency (MASG) on Recognition and Awards		To review incentives scheme for effective solid waste management, for purposes of ensuring relevance and efficiency in achieving the objectives of the Act
113 (2014)	Resolution Granting the request for extension of the Submission of Ten Year Solid Waste Management Plans to Local Government Units with Final Notice		The NSWMC during its October 28, 2014 meeting granted the NSWMCS to issue the grant for extension until January 31, 2015 for LGUs who were given Final Notices and submitted formal requests.

Source: NSWMC

Not included in the list above are resolutions such as those that are applicable to specific localities. The complete list of NSWMC Resolutions (CY 2000 -2015) can be downloaded at <u>http.www.emb.gov.ph/nswmc</u> or available at the Office of National Solid Waste Management Commission Secretariat located at 2nd Flr, HRDS Bldg., DENR Compound, Visayas Ave., Quezon City.

4.2 Institutional Arrangements

Among the provisions of RA 9003 is the establishment of an institutional support mechanism necessary to effectively implement the law. Solid waste management functions are distributed among national, regional and local government entities wherein the participation of relevant stakeholders is highly encouraged.

4.2.1 National and regional levels

National level oversight and policy formulation is provided by Sections 4-6 of RA 9003 through the creation of the NSWMC. RA 9003 also creates a National Ecology Center (NEC) under the Commission to provide capacity building services on SWM. The NEC is to be supported by Regional Ecology

Centers (RECs) as mandated under Rule V, Section 1 of DAO 2001-34, which is the implementing rules and regulations (IRR) of RA 9003.

The National Solid Waste Management Commission (NSWMC)

The NSWMC is chaired by the DENR Secretary and co-chaired by a representative from the private sector. The DENR-EMB provides secretariat support to the NSWMC, which is headed by an executive director who is nominated by Commission members and appointed by the chairperson.

Under Section 4 of RA 9003, the NSWMC was established with fourteen (14) members from the government sector and three (3) members from the private sector, who have different roles and mandates. The following agencies and organizations are members of the NSWMC:

- Department of Environment and Natural Resources (DENR),
- Department of Health (DOH),
- Department of Agriculture (DA),
- Metro Manila Development Authority (MMDA),
- Department of Science and Technology (DOST),
- Department of Interior and Local Government (DILG),
- Department of Public Works and Highways (DPWH),
- Department of Trade and Industry (DTI),
- Technical Education and Skills Development Authority (TESDA),
- Philippine Information Authority (PIA),
- League of Cities in the Philippines (LCP),
- League of Municipalities in the Philippines (LMP),
- League of Provinces in the Philippines (LPP),
- Liga ng mga Barangay (LnB),
- Non-Government Organization (NGO),
- Recycling Industry,
- Manufacturing and Packaging Industry.

The National Ecology Center (NEC) and the Regional Ecology Centers (RECs)

Section 7 of RA 9003 requires the establishment of a NEC under the Commission, which shall be headed by the Director of the EMB. The NEC shall provide consulting, information, training, and networking services necessary in implementing the Act.

Rule V, Section 1 of DAO 2001-34 also mandates the establishment of RECs, which shall be headed by the EMB Regional Directors in their *ex officio* capacities. The RECs shall maintain a multi-sectoral, multi-disciplinary pool of experts, including those from the academe, business and industry; inventors, practicing professionals, youth, women; and

other concerned sectors, who shall be screened according to qualifications set by the Commission.

The IRR stipulates that the NEC and the RECs shall make accessible to the general public all related information generated, collected, recorded, and stored, as well as data for solid waste management plans, the National Framework, the National Status Report, and all other relevant information necessary for ecological SWM.

4.2.2 Local government level

RA 7160 stipulates that basic services and facilities shall be provided by the LGUs. The services include the provision of solid waste disposal system or environmental management system and services or facilities related to general hygiene and sanitation.

Section 10 of RA 9003 reiterates these RA 7160 provisions that the LGUs shall be primarily responsible for the implementation and enforcement of the provisions of this Act within their respective jurisdictions. Segregation and collection of solid waste shall be conducted at the barangay level specifically for biodegradable and recyclable wastes, provided that the collection of non-recyclable materials and special wastes shall be the responsibility of the municipality or city.

Provincial Solid Waste Management Boards

Section 11 of RA 9003 requires the establishment of Provincial Solid Waste Management Boards (SWMBs). Among its principal functions are: to develop a Provincial SWM Plan from the submitted SWM Plans of the city/municipal SWMBs and ensure that these complement each other; oversee the implementation of the Provincial SWM plans and provide necessary logistical and operational support to its component LGUs; and allow for the clustering of LGUs for the solution of common solid waste management problems.

City and Municipal Solid Waste Management Boards

Section 12 of RA 9003 requires the establishment of city or municipal SWMBs, which shall prepare, submit and implement a plan for the safe and sanitary management of solid wastes generated in areas under its geographic and political coverage.

Table 9 shows the number of provincial, city and municipal SWMBs that have been created and active in 2010 as well as the status of barangay solid waste management committees (SWMCs) in the Philippines. Usually, the most tangible indication if a SWMB or SWMC has been created is the issued executive order, memorandum or any legal instrument that identifies the members and specifies the roles of each representative. A board or a committee is deemed active when it has produced a local SWM Plan or at least meets regularly within the calendar year to plan, deliberates and issues policies, and monitors the implementation of SWM Plans. Figure 26 shows the percentage of compliance of LGUs nationwide.

Perion	Provincial SWM Boards			City/Municipal SWM Boards			Barangay SWM Committees		
Region	Р	Created	Active	C/M	Created	Active	В	Created	Active
NCR									No
	1*	1	1	17	17	17	1706	1509	data
CAR	6	6	6	77	77	77	1176	1174	1174
I									No
	4	4	4	125	9	9	3265	No data	data
II	5	4	3	93	64	49	2311	917	473
III									No
	7	7	3	130	130	34	3102	No data	data
IV-A	5	5	5	142	123	86	4011	3247	678
IV-B	5	5	5	73	73	35	1458	1457	575
V	6	6	6	114	57	57	3471	177	161
VI	6	6	1	133	123	97	4051	4039	30
VII	4	4	4	132	No data	5	3003	No data	15
VIII	6	3	3	143	95	52	4390	928	262
IX	3	3	3	72	60	50	1904	1300	850
Х			No			No			No
	5	3	data	93	5	data	2022	48	data
XI	4	4	3	49	46	28	1162	1152	806
XII						No			No
	4	4	3	50	44	data	1195	886	data
XIII	5	5	5	73	73	18	1311	1310	420
ARMM			No			No			No
	5	No data	data	118	No data	data	2490	No data	data
TOTAL	81	70	55	1634	902	520	42028	15461	4270
Source: NSWMC									

Table 9. Number of created and active LGU SWM boards and committees in 2010 per region

Source: NSWMC

* In the case of NCR, Metro Manila acts as PSWMB.



Figure 26. Percentage of LGUs with Created and Active SWM Boards/Committees in 2010

5. Other Issues

5.1 Informal Waste Sector

Considered as the most vulnerable group in municipal solid waste management, the informal waste sector (IWS) consists mainly of waste pickers in dumpsites and communal waste collection points, informal waste collectors, itinerant waste buyers, small junkshop dealers, "jumpers" (those who jump into collection trucks to recover recyclables), and paleros (garbage trucks crew). Communities who live within or near the SWM facilities are likewise considered vulnerable.

There are thousands of informal waste workers, among them women, children and elderly, who depend on informal waste collection due to poverty and lack of livelihood and education. They are subject to livelihood insecurity, unsafe working conditions and health hazards. Yet, LGUs acknowledge that their work has contributed to savings in waste collection and disposal.

In May 2009, the NSWMC, with support from UNEP and development partners, prepared the National Framework Plan for the Informal Sector in Solid Waste Management, which recognizes their important contribution and hence formulated a holistic plan for their development. LGUs have yet to develop and implement their plans for this sector.

5.2 Special Waste Management

Special waste, which consists of healthcare waste, waste electrical and electronic equipment (WEEE) and other hazardous materials, accounts for about 1.93% of municipal solid waste.

A large portion of WEEE is either disposed along with the waste stream or recovered through a haphazard recovery process resulting to resource loss and exposure of workers to health hazards.

The DENR-EMB's Hazardous Waste Section has finalized its revised procedural manual on hazardous waste management and proposes that certain hazardous components of any waste stream be properly handled according to RA 6969 policies. This will be discussed further in the section on hazardous waste.

5.3 Climate Change: Mitigation and Adaptation

Poor waste management practices such as open burning, dumping in creeks and water bodies, as well as non-segregation of waste result in greenhouse gas (GHG) emissions. Landfilling of biodegradables wastes and continued operation of open and controlled dumpsites lead to the release of GHGs. Thus, waste prevention, recycling and composting are effective ways to mitigate climate change.

Similarly, waste management systems and infrastructures may also be prone to disasters. Climate change causes extreme rainfall in some areas and effects can be compounded by uncollected waste, exposing the dangers of mismanaged garbage. This results in massive flooding that cause damages to properties and human lives.

Thus, there is a continuous need to clean up, declog and dredge waterways and climate-proofing infrastructure and waste management facilities in particular.

6. Regional Best Practices and Lessons Learned

Region 4A

Creative waste recycling practices have been demonstrated by LGUs and academic institutions across Region 4A:

 Basuranihan – coined from basura (waste) and bayanihan (cooperative effort) – involves individuals or groups who register with the ENRO of Sta. Rosa, Laguna to bring recyclable waste materials during the monthly Basuranihan Day. The recyclables are sold to a selected junkshop where points are earned at the same time. The points are used to redeem items and qualify the participants for the top three prizes at yearend.

- Tuition fees of several deserving students in Laguna Bel Air School in Sta. Rosa have been subsidized from the selling of PET bottles collected and dropped into large bins within the campus.
- Eco-Bank project in Calatagan, Batangas was initiated by the LGU in 2010 for all public and private schools. It is being implemented by the Calatagan Ecosavers School Association to raise funds through the selling of recyclable materials. The funds are used to support environmental activities and other school programs.
- The Institute of Silang, Cavite has been using recyclable materials to set up a Scholarship "Thrash Fund". The peso value of the recyclables is recorded in the parents/students' "thrash card" and the accumulated peso value is deducted from the tuition fees of students.

Diaper composting in Malvar, Batangas began in 2013 to reduce the volume of diapers at the landfill. There are three (3) compost pits where soiled diapers are placed and composted using vermiworms. Vermicasts are distributed free to neighboring towns.

Region 5

Magarao, Camarines Sur was declared lone winner in the 4th to 6th class municipality category in the first Zero Basura Olympics (ZBO) in 2008. ZBO is a nationwide contest to promote the most innovative and effective approaches in managing solid wastes.

The Plastic for Rice program is jointly undertaken by Legazpi City, EMB Region 5 and local junkshop operators to enable people to exchange recyclable wastes for rice or money. Recyclables include paper, bottles, scrap iron, aluminum and special waste such as broken appliances.

Region 6

The Negros Occidental Provincial Solid Waste Management Board exemplified steadfast financial and technical support to the component municipality SWM Boards. This includes regular quarterly meetings with mayors or their representatives to address concerns and issues related to the implementation of SWM programs and the scheduled monitoring of compliance with RA 9003. Consequently, the province had the highest number of LGUs that submitted SWM plans.

Region 7

An alternative waste management program with emphasis on decentralized composting and resource recovery system at source has been scaled-up throughout Cebu City. It features:

- Adoption and strict enforcement of a "no segregation no collection policy" in 2011.
- Recruitment and deployment of Barangay Environmental Officers (BEO) to act as information providers, enforce municipal policies, monitor proper waste collection, assist in establishing MRFs and manage the composting schemes.
- Provision of financial and technical assistance by the city to establish MRFs and composting centers in barangays.
- Strengthened partnership between the city and other stakeholders such as the Women's Network, homeowners associations, local NGOs, waste pickers, academic institutions, private entrepreneurs and the media. Additionally, a series of awareness campaigns was organized with these stakeholders covering all municipalities.
- Promotion of composting schemes at different scales or levels such as households, neighborhoods, barangays, small-scale private businesses and enterprises and institutions.
- Distribution of composting baskets to individual households for the conversion of organic waste into compost used to grow vegetables and herbal plants in their home gardens. The dissemination of composting know-how and follow-up visits are done by the BEOs.
- Barangay composting schemes that are small in scale (less than one ton per day). Compost is produced using fast-reproducing types of worms such as redworms, African nightcrawler and European crawler; and/or windrow method using native microorganisms. The compost product is either sold or used for the greening of the neighborhood.
- Enterprise-based waste management in which individual entrepreneurs, NGOs and cooperatives in barangays have turned composting and recycling into business ventures. Composting at this level depended on pure organic waste streams such as waste from vegetable, fruit and flower markets and organic waste from business establishments rather than households.

Bayawan City has established the Bayawan City Waste Management Center, a 21-hectare complex of facilities that include the sanitary landfill, a central material recovery facility, composting facility and a treatment facility for sludge from septic tanks. The LGU is also implementing a "no segregation no collection" policy coupled with the adoption of the sticker system leading to a significant decrease in the volume of daily waste collected.

Region 9

Provincial SWM Boards have been established in all 3 provinces and 82 percent of cities and municipalities have their own SWM Boards. Ninety nine percent (99%) of cities and municipalities have completed their 10-year SWM plans with the assistance of EMB Region 9 and submitted them to the NSWMC for approval.

Region 11

All municipalities in the region have created their SWM Boards. Likewise, all municipalities have established their MRFs. Segregation of wastes has been advocated by all LGUs, some of which had started implementing a "no segregation, no collection" policy.

Lower income municipalities are converting their controlled dumpsites into ecological parks instead of sanitary landfills as a cost-effective measure.

Region 12

The municipality of Surallah, South Cotabato has established the first successful LGU-initiated clustered SLF in the country. The Category 2 SLF, which was completed in 2011, serves the 7 municipalities of Surallah, Norala, T'boli, Banga, Sto. Nino and Lake Sebu. The facility is financially supported by the South Cotabato provincial government with technical assiatance from EMB, MGB and USAID. This successful undertaking has been gaining recognition and multiple awards.

Surallah has a model Ecopark and set up MRFs with composting facilities at the MENRO office, public market and all barangay centers.

The Category 1 SLF in Polomolok, South Cotabato, which was completed in 2008, was a product of partnership between Polomolok LGU and Dole Philippines. It also serves neighboring municipalities. Polomolok also has a 4-hectare central MRF with 48 twin vermin-beds and recycling shops for waste packaging materials operated by a barangay women's organization. MRFs are present in most of the schools, hospitals, industries and barangay halls.

National Capital Region

Marikina

In the last quarter of the year 2014, the City Government of Marikina began the Food Waste Truck Program. Through the implementation of the Program, kitchen wastes are being collected from restaurants and food stalls, and are being converted into fertilizers to be used for the City's urban garden.

Further, since the year 2004, the City has also been implementing the Eco-savers Program in the City's elementary and secondary schools to raise environmental awareness among children and youth through their active involvement in the recyclable trading activity. The activity is one of the strategies employed by the City to support its goal to implement segregation at source.

Business establishment owners are also mandated to attend an annual Waste Management Seminar as a prerequisite to the issuance of business permits.

Quezon City

Given its land area and population, Quezon City is known as one of the most challenged cities in terms of solid waste management. Although this is the case, the Quezon City Government has advanced its strategies to meet the standards set by RA 9003.

Quezon City implements a "No Segregation, No Collection" Policy, wherein the collection of biodegradable and non-biodegradable wastes is done in separate days every week. Recyclable trading activities such as Ecosavers Program in schools and Waste Market in malls are also being conducted to increase the City's waste diversion rate from final disposal to the Payatas Sanitary Landfill.

Given also that the City Government has contracted private haulers for the collection of solid wastes, the said private haulers are also instructed to incorporate Information, Education and Communication campaign on proper solid waste management during their regular operations in households where the policy is not being strictly followed. This way, the residents are given the right information on how they can improve their waste disposal within their respective homes.

Makati

Since the year 2003, the Makati City has been implementing its Solid Waste Management Code which was enacted through Ordinance No. 2003-095. Various strategies on solid waste reduction were included in the Code, wherein the main objective is to increase the waste diversion rate of the City.

Like other cities in Metro Manila, the City also has its own version of a Plastic Ban Ordinance, as well as prohibition on the use of styrofoam and other non-biodegradable packaging materials. To ensure that the said laws are being complied with, a Plastic Monitoring Task Force was also created. Its main task is to monitor the implementation of the said laws in all business establishments within Makati.

Recyclable trading activities namely the *Baratilyo ng Basura sa Barangay* and *Weekend Waste Market*, are also being regularly held to provide additional income for constituents while at the same time, to increase the City's solid waste diversion rate.

The City Government conducts regular seminars to update the knowledge of its barangays with regards to the implementation of the Solid Waste Management Code.

Muntinlupa

The City Government of Muntinlupa has been implementing the Eco-Waste Management Ordinance since the year 1999, which mandates households, business establishments and other stakeholders to practice waste segregation at source. Muntinlupa also continues to implement the plastic ban, which is the first of its kind in Metro Manila.

The City Government is also active in the annual celebration of the Live Green Conference, a competition among the City's youth which provides a venue for the expression of environmental perceptions through art. The event aims to increase the awareness of the youth not only on proper solid waste management, but also on the other environmental concerns which the City endeavors to address.

Taguig City

Taguig City implements *Brigada Eskwela* before the opening of classes in public elementary and secondary schools. The activity does not only aim to conduct massive clean-up operations, but to also emphasize the importance of harmony and unity among students, parents, teachers, and other school personnel in maintaining the cleanliness of school premises.

The City is also focused on decreasing dengue cases through the implementation of *4 o'clock Habit*, during which time clean-up and drainage declogging operations are done. Communities are encouraged to maintain cleanliness of their surroundings through proper disposal of wastes and regular clean-up in their respective households.

7. Challenges and Recommendations

Many Regional State of the Brown Environment (RSoBE) Reports presented a number of concerns that were raised by the LGUs and local stakeholders. Table **10** shows the tabulated synthesis of the list of issues, challenges and recommendations related to SWM implementation.

Table 10.	Challenges and Recommendations on SWM
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CHALLENGES	RECOMMENDATIONS	
Policy-making, Planning and Financing Systems		
Absence of city/municipal ordinances adopting RA 9003; Outdated ordinances; Unimplemented	Review existing ordinances on SWM and adopt RA 9003 into a comprehensive or "omnibus" SWM ordinance, including segregation, segregated collection, material recovery, safe disposal, financing components, etc.	
ordinances.	Integrate into the ordinance a provision for (a) making the general public/implementers aware of the ordinance and for (b) creating a monitoring/enforcement system/office to ensure strict implementation.	
Absence of 10-Year SWM	Formulate 10-Year SWM Plan involving all	

CHALLENGES	RECOMMENDATIONS
Plan (and those who do have activities that are not realistic or sustainable)	stakeholders during the process. Design the 10-Year Plan to be more dynamic and responsive to current/future needs; Keep it updated.
Policies which do not have budget appropriations, or with budget but difficult to tap by implementers, end up not being implemented.	Integrate SWM budget into annual funds for approval of city/municipal councils and/or in barangay AIPs. Pass ordinances and establish separate account within the general funds of the city/municipality/barangay dedicated for SWM collection of fees, etc.
Limited budget for SWM or financially unsustainable SWM setup; Lack of ordinance in implementing and enforcing reasonable waste user's fee systems to businesses general public; Very low waste fees collected from business and commercial establishments during renewal of business permits and none from households.	Barangays may work with cities/municipalities and cities/municipalities may tap the resources of the province. If initial capital investment cannot be met in a year's budget, prepare financial feasibility and apply for loans from development banks. To enable cost-recovery of expenditures related to regular SWM operations: (a) undertake SWM full- cost accounting, (b) conduct social acceptability of waste fees, (c) pass an ordinance enabling the collection of reasonable SWM fees from businesses and households, (d) outline an administrative and auditing system in collecting and tapping the separate SWM fund for SWM activities (e) Another option is to charge higher fees for un-segregated as compared to segregated waste to encourage segregation and material recovery.
Political, Administrative,	Organizational and Institutional Dynamics
Inactive city/municipal SWM Board (although most city/municipal SWMBs were already formed). Most members do not know their exact roles/functions, or have limited knowledge or appreciation of RA 9003 and SWM strategies.	Re-activate or re-organize local SWMBs with support from local chief executives; Some local SWMBs just need a kick-off after every political transition. SWMBs need coordinator/secretariat/TWG to facilitate policy making and monitoring of activities, ensure regular board meetings. Conduct/organize comprehensive orientation seminar for SWMBs and regular trainings thereafter.
Inactive Barangay SWM Committees (BSWMC). Most barangay captains and BSWMC members are unaware of their roles/functions, or have limited knowledge or	City/municipality to assist barangays in formulating their SWM plans, in capacity building of barangay officials and establishing city/municipality- barangay support systems. Encourage the barangays to have their own SWM focal person, preferable technical/appointive

CHALLENGES	RECOMMENDATIONS		
appreciation of RA 9003 and SWM.	officer.		
Absence of city/municipal SWM TWG (which is supposed to implement policies produced by Boards); TWG members usually include department heads who already have multiple functions.	Local chief executives/mayors should issue a Special Order creating the SWM TWG assigning the group to be the one responsible for implementing and enforcing the policies and plans crafted by the SWMB. Certain members of SWM TWG may also be members of the SWMB for more direct communication.		
Absence of dedicated City/Municipal ENRO or dedicated SWM Coordinator at local level;	For cities, pass an ordinance creating the City ENRO office with plantilla positions, regular budget, etc. Municipalities may need to become more creative		
In case of municipalities, they may be restricted by personnel services expenditure of only up to 45% of the total budget such that creation of MENRO is usually disallowed by DBM	about at least designating a MENRO in the meantime that Section 484 of the Local Government Code (RA 7160) has not yet been amended; Local government leagues may lobby for making the City/municipal ENRO office mandatory and not just an optional appointive office.		
Political affiliations and	Pilot and establish institutional, operational and		
dynamics are major factors influencing the possibility and sustainability of clustering SLFs	financial model for inter-municipal clustering for SLFs, as safeguard for political differences and sustainability amidst political transitions.		
Limited or unstructured external support assistance for LGUs	Organize, institutionalize and strengthen the REC to be spearheaded by EMB/DENR. REC members may include DOST, PNP, DOH, DILG, DPWH, NGO, Academe, etc.		
	Organize SWM Summits, LGU Sharing Forum, Mentoring and Twinning Programs, Model LGUs, Knowledge Management etc.		
Segregation, Segregation, Collection, Recycling/Recovery, Public/Private Participation			
Limited awareness of communities and the general public on waste segregation and on recycling/recovery/compo sting technologies	Launch IEC drives and creative social marketing programs, which are reinforced by a system in place and consistent public policies. Strategies could include barangay outreach programs, use of billboards, barangay sessions/assembly, etc. Infuse values formation among households in the importance and practice of segregating waste. IEC/Social marketing campaigns should encompass		

CHALLENGES	RECOMMENDATIONS
	all target groups, i.e., elected and appointive officials at city/municipal/brgy. levels, communities, stakeholders, business sector, religious sector, education sector, workers in the SWM sector, junkshops, NGOs, informal sector, women, youth, etc. Support NGOs/cooperatives in recycling-related
	livelihood programs and encourage the public in green purchasing.
Lack of or inconsistent public policies on promoting segregation; Un-segregated collection of already segregated waste	Put up practical (simple and easy-to-practice), sustainable (cost-effective or self-sustaining) and consistent (e.g., uniform color-coding for bins; setting of collection/pickup times/schedule during the day/week; regular and reliable public practices) segregation system. Empower and involve barangay officials and stakeholders.
	Establish incentive and penalty systems to encourage the public to segregate
	Put up segregated collection systems, e.g., compartmentalized trucks or scheduled collection for recyclables, biodegradables and residuals;
	Prohibit mixing of already segregated wastes.
Lack of or unconsolidated data on markets for	Empower and involve barangay officials and stakeholders.
recyclable materials	Leverage or create waste markets
	Establish directory of collectors, junkshops and buyers of recyclable materials and service providers, through the RECs
Absence of or limited equipment and infrastructure for (1)	Install segregated waste bins or allocate banks/curbs at critical areas within the city/municipality.
supporting segregation by the public and (2)	Put up MRFs preferably in each barangay or cluster if there are presently no junkshops.
improving coverage of collection	If waste buyers, consolidators or junkshops are available and active in the area, empower them, train them on RA 9003 and help them upgrade into MRFs to collaborate with LGUs.
Coverage of waste collection is usually limited to town centers or	Empower and involve barangay officials and stakeholders especially in identifying alternative options for far-flung areas.
urban barangays. Residents of unserved areas end up dumping their garbage and	Encourage backyard composting or rapid agricultural waste composting as options.

CHALLENGES	RECOMMENDATIONS	
agricultural residues in rivers or burning them.		
Safe Disposal: Dumpsite Closure and Rehabilitation/ Sanitary Landfill Establishment		
Absence of Closure Plan and lack of implementation of the closure and rehabilitation of open dumpsites. Usually, closure of dumpsites is less prioritized as compared to establishing SLFs.	Provide technical assistance / trainings for LGUs to prepare Closure and/or Rehabilitation Plan for adoption of Council and for submission to EMB Assistance to LGUs in actual implementation of the Closure Plan, and monitoring of the progress of activities. Encourage LGUs to present plans for dumpsite closure while applying for Environmental Compliance Certificate (ECC) for their SLFs.	
Various problems encountered by LGUs in identification, site selection and acquisition of sanitary landfill sites: unavailability of site, unsuitability of site based on MGB assessment/findings, incomplete submission of ECC-requirements by LGUs, public opposition	 Training for LGUs in identifying potentially suitable sites, screening the sites according to absolute, exclusion and conditional criteria. For LGUs located entirely on an environmentally and geologically-sensitive areas, there is no choice but to arrange clustering with LGUs having suitable sites. Assist LGUs in preparing for site development of SLF. Encourage LGUs to undertake social acceptability programs whether mandatory for the issuance of ECC or not. 	