Chapter 8

Study on 3R Policy and Waste Exchange in the Philippines

Lisa C. Antonio
Philippine Business for Environment

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Chapter 8. Study on 3R Policy and Waste Exchange in the Philippines

Lisa C. ANTONIO
Philippine Business for Environment

Executive Summary

The Philippines as a nation is implementing various 3R (reduce, reuse, recycle) programs and activities to reduce both the traditional waste such as paper, plastic, scrap metal, kitchen waste; and the second-generation/ non–-traditional type of waste (e.g. those which require special handling, and therefore different policy options) from households and industries. This report discusses measures undertaken in the past ten years, including updates on the national policies on solid waste management, the recently emerging industry waste management approaches and the recycling programs, including waste exchange, and offers some recommendations for scaling up.

A Filipino generates between 0.3–0.7 kg of garbage daily, and the annual generation by households was estimated at 10 million tons, with an expected rise by 40% by the end of the decade. Much of the waste is concentrated in the urbanized areas. In Metro Manila, more than fifty percent of waste collected is organic/ biodegradable, and forty four percent is recyclable. This implies that with proper waste management, only about six percent of the city's waste needs to be specially treated or disposed.

Waste from the waste generators (households, industries, commercial establishments) are either self–-disposed, discharged (illegally or through legitimate waste collectors such as junk shops, eco-aides and municipal collection crews), or sent for recycling (either through waste dealers/ consolidators who in turn bring them to the recycling industries or export these to foreign buyers). Despite increases in the recycling rate, the use of domestically available recyclable resources is still largely limited.

Through the Republic Act (RA) 9003, otherwise known as the Ecological Solid Waste Management (ESWM) Act of 2000, the National Solid Waste Management Commission (NSWMC) was established under the Office of the President, and designated the local government units (LGUs) as the lead implementers. RA 9003 also mandated the creation of the Solid Waste Management (SWM) boards nationwide to develop and implement solid waste management plans. The Act also mandated the establishment of materials recovery facilities (MRFs) in all *barangays*[1]/ villages, as support systems for waste diversion from the landfill; segregation at source; segregated collection; a prohibition against the use of open dumps for solid waste; a shift to the use of sanitary landfills; and a twenty five percent diversion of their solid wastes from waste disposal facilities through reuse, recycling, composting. There are now 2,312 existing MRFs covering about twenty percent of the total *barangays*; and a total of twenty four existing sanitary landfills nationwide, with twenty one more under construction in the next two years (Source: NSWMC).

[1] Barangay is a smallest political unit in the Philippines

RA 9003 also calls for the implementation of a national recycling program, whose components are to include requirements for eco-labeling; environmentally preferable purchasing; and identification of non-environmentally acceptable products and packaging (NEAPP). As a result, the Philippines launched its eco-label, Green Choice Philippines in 2003. Criteria have already been developed for thirty four product categories and the ecolabel has thus far been awarded to twelve products, namely two detergent powder brands (PRIDE and SURF), one detergent bar brand (PRIDE) , five cement brands (Rizal Super Blended Cement, Island Portland Cement, Palitada King Masonry Cement, APO Pozzolan Cement, APO Premium cement), one Natural infill material, X – TEC fully synthetic engine oil, AGIP Extra HTS Engine Oil and AGIP Diesel Sigma Plus Engine Oil. The Green Choice Philippines Seal of Approval is owned by the Philippine government through the Department of Trade and Industry and the Department of Environment and Natural Resources, and is administered by the Philippine Center for Environmental Protection and Sustainable Development, Inc., an environmental non – government organization. (www.pcepsd.org.ph)

The Executive Order (EO) 301 issued in March 2004, requires the executive departments to establish their "Green Procurement Programs", although only little has been done in this area. In January 2009, the President issued EO 774, re-organizing the Presidential Task Force on Climate Change and designating herself as the overall "Chief ." This significantly states that the offices of the Task Force members comprised of the different Cabinet Secretaries, have to "immediately practice proper solid waste management". The EO also sets aside every Friday of the week for the President to "devote five (5) hours to concerns and initiatives for environmental security" (Section 1).

The challenges of the garbage crisis, the renewed policy emphasis and initiatives have encouraged the development and adoption of different waste management approaches and technologies. At the community level, this includes household and municipal composting through efforts of progressive LGUs and non-government organizations (NGOs) like the Recycling Movement of the Philippines and the Metro Manila *Linis Ganda* Foundation. The Department of Science and Technology (DOST) has also been at the forefront of developing technologies for managing biodegradable waste, recyclable materials and the residuals. Many industry groups/ associations have adopted solid waste management as priority areas for their members, to help companies design and implement waste reduction programs that also reduce their operational costs. New business opportunities have resulted in more environment service providers for treating special and hazardous materials such as fluorescent lamps and bulbs, sludge, and contaminated waste. However, there is still much room for expansion here, and treatment costs are not always within the reach of smaller companies, especially those in the regions outside of Metro Manila.

Waste Exchange is one option for managing residual wastes. In the Philippines, the PBE (Philippine Business for the Environment) manages the Industry Waste Exchange Program (IWEP). It operates as an Information Clearinghouse that matches waste generators and waste buyers, and promotes resource recovery through orientation sessions, company in–house seminars, environmental exhibit/ trade fairs, case studies/ publications, waste markets and recyclables collection events, and IWEP advertisements in its quarterly *Business and Environment Magazine*.

Manpower constraints at PBE make it difficult to track all possible waste exchange referrals, or offer services beyond referrals and promotion. Nevertheless, there have been several documented case studies of successful waste exchanges. In addition to IWEP, the Davao City Chamber of Commerce and Industry in the Mindanao area and the Eco-Industrial Exchange Network (Eco–Index) of industrial estates in the Laguna-Batangas area also actively promote waste exchange, with some measure of success.

Continuing challenges exist with the promotion of 3R and Waste Exchange in the Philippines. among which are the lack of enforcement of even basic requirements of RA 9003 (such as the closure of open dumpsites, the establishment of MRFs, and the twenty five percent landfill diversion rate); the lack of widespread knowledge of the potential for waste reuse, and of the appropriate technologies; technology and economic limitations (for waste conversion) for some types of waste (like household batteries and junk cellphones); and the lack of incentives and a viable financial model for programs like IWEP. Thus, among the report recommendations are the following:

1. Improved 3R Knowledge Management - not only for Regional Ecology Centers but also with PBE's own IWEP;
2. Ramping up of advocacy programs for solid waste management using actual success stories;
3. Following through on the Presidential initiative to make the Executive Department and its Cabinet Secretaries accountable for the solid waste of their department;
4. For the citizenry to make their elected officials accountable by turning garbage management into a political governance issue;
5. Environmental investments in SWM as top priority by local governments, and from the private sector for new recycling facilities especially in other parts of the country; and
6. Policy initiatives that create incentives for environment technology development and adoption/ transfer, especially for locally–developed technologies, and setting a national recycling target and performance monitoring system

This report also acknowledges recommendations from the 2008 JICA Study on Recycling Industry Development which called for four key policy programs:

- Recycling Industry Information and Database Management, not only from local end users but also from waste importers/ exporters;
- National Action Plan formulation, for specific recyclable materials of highest value to the country;
- Local Recycling Plans Formulation, emphasizing the importance of source separation of recyclable materials and the development of new business / job opportunities);and
- Development of Recycling Guidelines, i.e., target recycling rates, measures to increase collection rate and use of recycled materials, consensus building.

Acronyms

ADB	Asian Development Bank
DENR	Department of Environment and Natural Resources
DOST	Department of Science and Technology
DTI	Department of Trade and Industry
EO	Executive Order
IWEP	Industry Waste Exchange Program
JICA	Japan International Cooperation Agency
LGU	local government unit
MRF	materials recovery facility
NEAPP	non-environmentally acceptable products and packaging
NGO	non-government organization
NSWMC	National Solid Waste Management Commission
PBE	Philippine Business for the Environment
PRIME	Private Sector Participation in Managing the Environment Project
RA	Republic Act
SWM	solid waste management

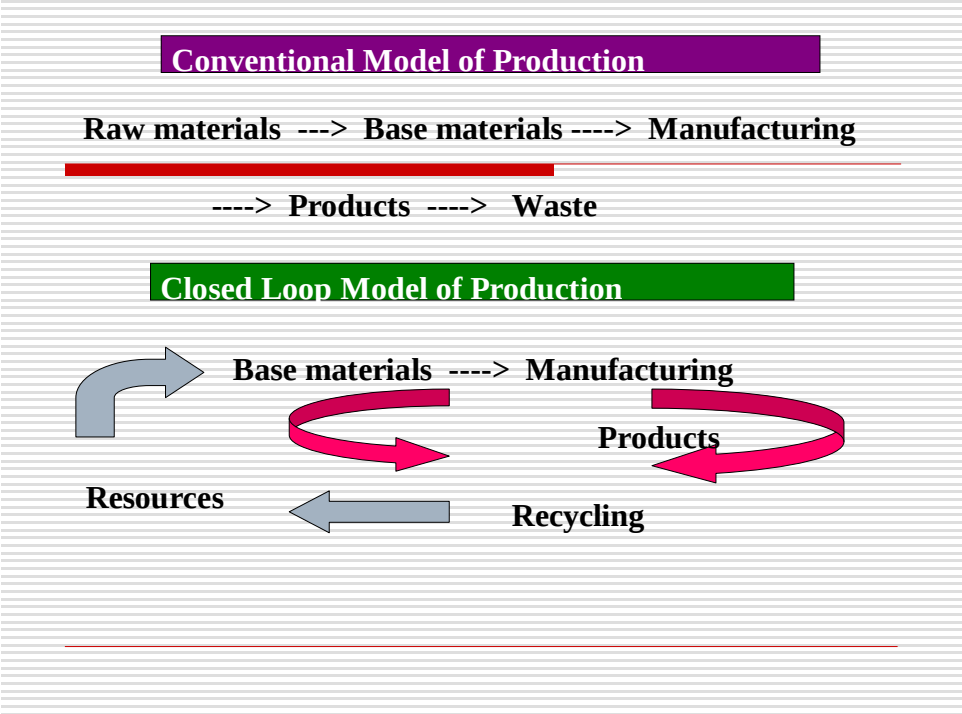
I. Introduction

Human and economic activities to support modern day lifestyles have created unsustainable patterns of production and consumption which have led to crisis proportions of waste, pollution and resource depletion in all parts of the world, and in Asia in particular, with its fast-growing economies.

In response, government and other sectors have begun attempting efforts to reduce waste, and to reuse, recover and recycle still useful waste materials to create an ecocycle society where materials extracted from the environment are managed efficiently and responsibly.

In the domestic sector, these efforts have focused on waste segregation for zero waste management, since as much as 80-90% of household waste is either compostable or recyclable in most developing countries. In the industry, this refers to a Closed Loop Production Model, where potential waste from different parts of the production process are identified and recovered or recycled for on–site or off- site applications. This differs markedly from the traditional production model where waste from the manufacturing process is merely disposed.

Figure 1. The Closed Loop Production Model vs. the Conventional Model



Faced with its own mounting environmental challenges as it pursues economic development, the Philippines is implementing various 3R programs and activities which are the subject of this report. To differentiate this report from other similar previous ones on the Philippine waste management situation, the focus will include 3R practices for second–generation/ non – traditional type of waste (e.g. which require special handling, and therefore different policy options) and recent emerging industry waste management

approaches which need to be considered in the context of deepening regional economic integration, transboundary waste movements and cross- boundary environmental issues.

II. Domestic and Industrial Waste Situation, Composition and Waste Flow in Metro Manila, Philippines

Waste is waste, whether it comes from households, industry, commercial establishments, public markets. It essentially refers to leftover materials, discards that are of no use to its original user even if, as some would argue, there really is no such thing as waste – everything is ultimately a resource or of value to someone or something else, which just happens to be in the wrong place.

II-1. Waste Situation

A Filipino generates between 0.3–0.7 kg of garbage daily, depending on income level. In 2004, the annual generation by households reached 10 million tons, and is expected to rise by 40% by end of the decade. The regions which produce the highest rate of waste are the National Capital Region (NCR) and the Southern Tagalog region (which has a concentration of industrial parks and small industries), accounting for 23% and 13% of the country's total waste volume, respectively[2].

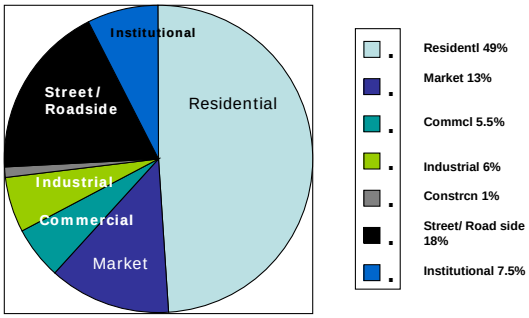
Table 1. Waste Generation by Region, 2000 (in million tons/yr)

NCR	**2.45**	**23.0 %**
CAR	**0.17**	**1.6 %**
Ilocos	**0.50**	**4.7 %**
Cagayan Valley	**0.32**	**3.0 %**
Cen Luzon	**0.96**	**9.0 %**
S Tagalog	**1.42**	**13.3 %**
Bicol	**0.54**	**5.1 %**
W Visayas	**0.82**	**7.7 %**
C Visayas	**0.74**	**7.0 %**
E Visayas	**0.43**	**4.0 %**
W Mindanao	**0.40**	**3.8 %**
N Mindanao	**0.37**	**3.4 %**
S Mindanao	**0.70**	**6.6 %**
Cen Mindanao	**0.33**	**3.1 %**
ARMM	**0.26**	**2.5 %**
Caraga	**0.26**	**2.4 %**
National	**10.67**	**100 %**

Recent data from the National Solid Waste Management Commission (NSWMC) states that Metro Manila generates more than 7,000 tons of garbage daily, compared to 6,700 tons in 2004 (i.e., an increase of at least 5%). Households account for the largest share of wastes produced, followed by market waste. This has prompted the government to step up community education efforts on waste segregation and to provide LGUs with the technical assistance they need to develop their SWM Programs, establish their MRFs and build sanitary landfills.

[2] Source: World Bank. 2001. Philippine Environment Monitor.

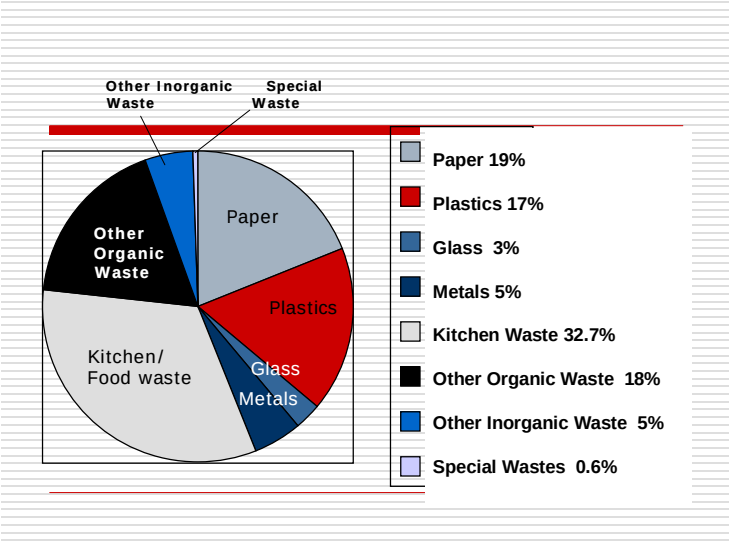
Figure 2. Waste Sources in Metro Manila[3]



II-2. Waste Composition

A waste analysis and characterization survey conducted in five local government units in Metro Manila under the 2003 Asian Development Bank Metro Manila Solid Waste Management Project, showed that more than 50% of waste collected was organic/ biodegradable, and 44% was recyclable. This implies that with proper waste management, only about six percent of the city's waste needs to be specially treated or disposed.

Figure 3. Composition of Disposed Municipal Solid Waste in Metro Manila



A 2008 JICA Study on Recycling Industry Development in the Philippines breaks down the volume of total recyclable materials in the waste stream, projected over the next two years as follows:

[3] National Solid Waste Management Commission

Table 2. Total Recyclable Materials in the Waste Stream (tons)

Materials	%	2006	2008	2010
Paper	19	3,601,317	3,856,274	4,129,280
Plastic	17	3,222,231	3,450,350	3,694,619
Iron	3	568,629	608,885	651,992
Aluminum	2	379,086	405,924	434,661
Glass	3	568,629	608,885	651,992
Total	44	8,339,891	8,930,318	9,562,544

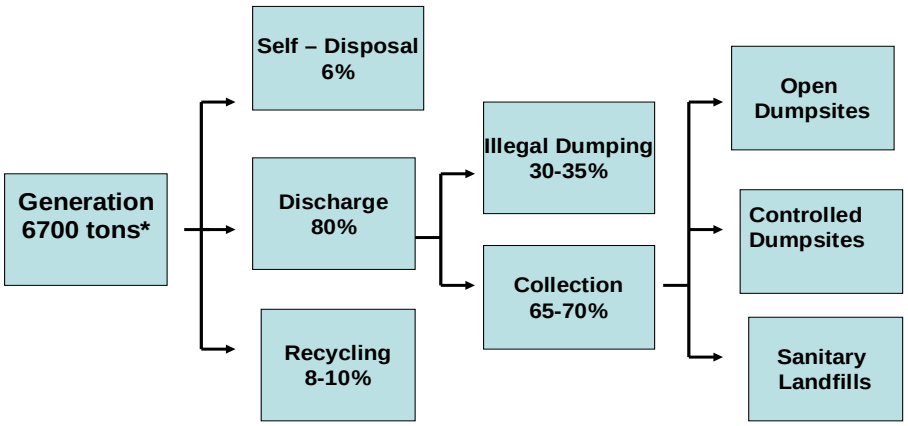
Table 2 shows the largest expected increase in the volume of waste paper, followed by plastics, as a result not only of population growth but also of increased consumerist practices. This implies that "raw material" for the recycling of such items should also increase.

II-3. Waste Flow

Waste from the waste generators (households, industries, commercial establishments) are either self–disposed, discharged (illegally or through legitimate waste collectors such as junk shops/ eco-aides[4] and municipal collection crews), or sent for recycling (either through waste dealers/ consolidators who in turn bring them to the recycling industries or export these to foreign buyers).

[4] Eco – aides were mostly former street scavengers, who have been organized and accredited by the Metro Manila Federation of Multipurpose Cooperatives under the *Linis Ganda* Foundation to collect recyclable materials at the community/ *barangay* levels. The Federation includes 17 individual member multipurpose cooperatives representing the 17 local governments of Metro Manila; at least 572 junk shops, 2500 junk shop workers, 1200 eco- aides and 132 waste truck drivers. (Source: The Garbage Book, 2004.*Solid Waste Management in Metro Manila, Department of Environment and Natural Resources and the Asian Development Bank*.)

Figure 4. Metro Manila Solid Waste Flow



Source: National Solid Waste Management Commission

Various unofficial claims put the recycling rate as high as 28% if waste retrieval by scavengers, and various community and civil society initiatives are taken into account. Nevertheless, the use of domestically available recyclable resources is still largely limited due to:

- Improper/ sporadic segregation of waste materials at sources of generation resulting in lower quality of recyclable materials;
- Lack of incentives to households and other waste generators like commercial establishments;
- Limited technological and financial capacity of local industries for raw material substitution;
- Price fluctuations in the international market and unstable domestic supply of recyclables;
- Logistics difficulties for the transport of recyclables (since the Philippines is mainly an archipelago and there are limited recycling facilities in the regions); and
- Lack of information and widespread network for resource/ recyclables recovery and collection.

The NSWMC estimates that 65-70% of discharged waste is collected in the urban areas, and eventually ends up in controlled dumpsites, sanitary landfills or open dumpsites. Collection efficiency in rural areas is at around 40%. According to the NSWMC, there are 24 existing sanitary landfills nationwide, with 21 more under construction in the next two years (NSWMC, 2008).

To improve the waste management system, Republic Act 9003, otherwise known as the Ecological Solid Waste Management (ESWM) Act, mandates that all *barangays* establish their MRFs, whether individually or in clusters. MRFs are intended as support systems for waste diversion from the landfill. The LGUs need to divert at least 25% of their solid wastes from waste disposal facilities through reuse, recycling, composting and other resource recovery activities within five years after the effectiveness of the Act, and

increased every three years afterwards. According to the NWMSC, there are now 2,312 existing MRFs covering about 20% of the total *barangays* (NSWMC, 2008).

Per capita cost of solid waste management ranges from ₱ 64.00 in Pateros City to ₱ 1,164.00 per person in Makati City (the affluent financial and residential district)[5]. In 2001, over ₱ 3.54 billion (US$ 667 million) was spent on the collection and disposal of solid wastes in Metro Manila, costing approximately ₱ 1,450 ($26.40) per ton (Table 3). Solid waste refers to discarded household, commercial waste, non -hazardous institutional and industrial waste, street sweepings, construction debris, agricultural waste and other non hazardous/ non toxic wastes (ADB 2004).

Table 3. Annual Per Capita SWM Cost & LGU Expense, 2001 (P'000)[6]

Annual Per Capita SWM Cost & LGU Expense, 2001 (P'000)

LGU	Tot Populn	Per Capita Cost	SWM Cost	Tot LGU Budget	%
Caloocan	1,190,087	300	357,077	141,883	*24%**
Las Pinas	477,791	160	76,361	850,009	9%
Makati	449,583	*1164**	418,577	5,270,998	8%
Malabon	342,447	64	22,067	348,800	6%
Mandaluyong	81,426	352	94,123	1,129,801	8%
Manila	1,597,841	360	574,990	4,558,818	13%
Marikina	395,316	134	52,804	778,475	7%
Muntinlupa	383,331	280	91,377	1,059,651	9%
Navotas	232,845	199	43,974	292,836	15%
Paranaque	454,579	402	182,893	1,358,644	13%
Pasay	358,670	680	243,807	1,219,353	20%
Pasig	510,412	314	160,458	1,814,072	9%
Pateros	58,016	64	2988	62,186	5%
Quezon City	*2,196,874**	429	*941,829**	4,467,316	21%
San Juan	118,927	436	46,701	430,373	11%
Taguig	472,329	256	52,370	432,394	12%
Valenzuela	490,579	109	42,716	734,606	6%
	9,811,053				
AVG ALL LGUs	---	393	3,558,345	26,300,215	13%

(Source: ADB Garbage Book, 2004)

An increase in the second–generation/ non– traditional type of waste has been observed in the recent years. This is due to the increased use of new consumer goods like electronic equipment and cellular phones, and the frequent replacement of old home appliances like television sets and refrigerators with the introduction of newer models and the importation of surplus units. Because these materials often have hazardous components, their resulting waste requires special handling.

In general, those units flow from the manufacturers or surplus importers to the retailers, electronic and surplus shops to the consumers. Once rendered as junk (either because of non–working condition or obsolescence), these are sold to junk shops, accredited waste collectors, exporters or recyclers for remanufacturing, reprocessing or recycling. Others are dismantled through informal backyard operations which create

[5] US $ - Peso exchange rate was approximately US$1 – P50 at that time
[6] Source: ADB Garbage Book, 2004

health and safety risks for the workers, and result in some component parts being sent to the dumpsites/ landfills together with municipal waste.

III. National Policy on Solid Waste Management and Recycling

The RA 9003 became a law on January 26, 2001. It introduces measures to "merge environmental protection with economic pursuits, recognizing the re-orientation of the community's view on solid waste and providing schemes for waste volume reduction, resource recovery, recycling and reuse". It goes beyond cleanliness and anti-littering programs to bring solid waste management into the home and workplace of every Filipino, and shifts 3R into a national strategy.

The Act describes the institutional roles and responsibilities of various stakeholders, with the NSWMC (under the Office of the President) as the lead Policy Making body, the Department of Environment and Natural Resources (DENR) as the lead agency for Technical Support and Enforcement, and the LGUs as the lead implementers**.** LGUs can pass the requisite ordinances and can determine the appropriate penalties/ fines for violations, the collection of which is divided between the LGU (40%) and the National SWM Trust Fund (60%), to be used to fund programs under the Act.

It mandates the creation of SWM Boards nationwide to develop and implement solid waste management plans, taking into consideration the physical and socio–economic conditions and needs of the concerned communities. Civil society and the private sector are tasked to initiate, participate and invest in integrated ecological solid waste management projects, manufacture environmentally friendly products and introduce, develop and adopt innovative processes that shall recycle and reuse materials, conserve raw materials and energy, reduce/ prevent waste and pollution.

Complimenting the mandatory requirement for the establishment of MRFs (Section 32), RA 9003 also requires segregation at source (Section 21); segregated collection (Section 23); and a prohibition against the use of open dumps for solid waste (Section 37).

Segregation at source refers to the use of separate and properly marked containers for different types of waste, and intensifying the recovery of materials and post consumer products. Waste is classified as either compostable, recyclable, non – recyclables/residuals, or special waste.

Segregated collection refers to the use of collection trucks/ accredited haulers, compartmentalized waste collection vehicles during collection schedules determined by the *barangays*.

Open dumpsites are to be closed and/or converted into controlled disposal facilities, or otherwise rehabilitated, and more sanitary landfills are to be constructed. According to the NSWMC, there are twenty four existing sanitary landfills nationwide, with twenty one more under construction in the next two years.

A novel provision of RA 9003 is the section on citizens' suits (Sec 52), which allows any citizen to sue any government official for neglecting his duties under the Law, through an arrangement that involves local NGOs, people's organizations (POs) and the

Integrated Bar of the Philippines (IBP) as representatives for the prosecuting parties. Such an approach has successfully put pressure on some local chief executives for the better implementation of the law, such as in the phase–out of open dumpsites and in the establishment of MRFs.

The collection, transport, handling, treatment, and disposal of special wastes is covered by another law, RA 6969, otherwise known as the Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990. Hazardous waste generators and waste management service providers need to register with the DENR and apply for special permits to conduct SWM activities such as transporting and operating treatment or recycling facilities, and importing waste materials. There are currently 82 hazardous waste management providers registered in the DENR database, of which 71 are located in Metro Manila/ Luzon[7].

RA 9003 also calls for the implementation of a national recycling program, whose components are to include Requirements for Eco-Labeling (Section 27); Environmentally Preferable Purchasing (section 28); and the Identification of Non-Environmentally Acceptable Products and Packaging (NEAPP) (Section 29).

With regards to eco-labeling, an eco-labeling body was set up at the Department of Trade Bureau of Product Standards (BPS) co–chaired by the DTI and the DENR, with representatives from NGOs and business sectors. The eco-labeling program aims to guide the Filipino consumer to choose products and services that pose minimum risks to the health and the environment. The Philippine National Eco-labeling Program, dubbed as "Green Choice Philippines", was launched in 2003.
Criteria have already been developed for thirty four product categories and the ecolabel has thus far been awarded to twelve products, namely two detergent powder brands (PRIDE and SURF), one detergent bar brand (PRIDE) , five cement brands (Rizal Super Blended Cement, Island Portland Cement, Palitada King Masonry Cement, APO Pozzolan Cement, APO Premium cement), one Natural infill material, X – TEC fully synthetic engine oil, AGIP Extra HTS Engine Oil and AGIP Diesel Sigma Plus Engine Oil. The Green Choice Philippines Seal of Approval is owned by the Philippine government through the Department of Trade and Industry and the Department of Environment and Natural Resources, and is administered by the Philippine Center for Environmental Protection and Sustainable Development, Inc., an environmental non – government organization. (www.pcepsd.org.ph)

Recognizing the potential influence of the government as one of the largest procurement blocks, the Office of the President also issued Executive Order 301 in March 2004 requiring all departments, bureaus, offices and agencies of the executive branch to establish their Green Procurement Programs. Although this has not been implemented nor monitored, one outcome of this is the inclusion of environmentally preferred criteria in the procurement guidelines of the Department of Budget and Management. A Technical Working Committee, tasked to develop the guidelines for NEAPP, has also been holding public hearings and consultations with business and other sectors, but has yet to finalize a list.

[7] Source: www.denr.gov.ph/nswmc

Very recently, President Gloria Macapagal-Arroyo also issued the Executive Order 774 in January 21 2009, reorganizing the Presidential Task Force on Climate Change and designating herself as the overall "Chief " and significantly stating (in Section 1) that the offices of the Task Force members comprised of the different Cabinet Secretaries, are to "immediately practice proper solid waste management." The EO also sets ~~and setting~~ aside every Friday of the week for the President to "devote five (5) hours to concerns and initiatives for environmental security".

This action created much hopeful thinking from the environmental sector, and bears watching in as much as it also sent a strong message of the link between environmental problems like solid waste and the larger issue of climate change.

IV. Waste Management Approaches

The challenges of the garbage crisis, the renewed policy emphasis and the initiatives taken by the government, civil society and the public sector have encouraged the development and adoption of different waste management approaches and technologies.

IV-1. Community- Based SWM Approaches

Foremost among these is the household and municipal composting, which refers to the biological decomposition of the organic portions of solid waste under controlled conditions to produce compost, a soil–like material high in organic matter, and therefore useful as organic fertilizer[8].

NGOs like the Recycling Movement of the Philippines have popularized an approach they call Zero Waste Management – an "ecological method of handling wastes that facilitates their sanitary retrieval, reuse or recycling through a combination of techniques or procedures which aim at maximum, if not total, use of wastes into healthful, beneficial, productive and aesthetic purposes." There are three basic steps to follow: segregation at source, labeling for efficient handling, and ecologically friendly use and disposal adopting the multi –Fs of recycling: factory returnables, feed, fertilizer, fuel, fine crafts, fermentables and filling materials[9]

Another well known NGO is the Metro Manila *Linis Ganda* Foundation, which established the Metro Manila Federation of Multi-purpose Cooperatives which organized the network of junk shops in Metro Manila mentioned earlier, trained eco – aides and provided them with seed money to collect the recyclables from households and bring them to the junk shops. In 2000, *Linis Ganda* purchased 101,850 tons of waste paper, corrugated boards, plastics and metals which fetched up to ₱ 132.5 million.

Other examples of community-based initiatives include the following:

(a) Doy Pack Recycling Program of the *Kababaihang Iisa and Layuning Umunlad ang Sambayanan* (KILUS) in Bgy Ugong, Pasig, which buys or solicits doy packs and transforms these into useful materials such as bags and place mats;

[8] Ma. Lourdes G. Rebullida, Resource Recovery in Solid Waste Management: Strategies, Initiatives, Policy Issues, 2000.
[9] Ibid.

(b) Bag Making Project of the *Samahan ng Muling Pagkabuhay* Multi Purpose Cooperative (SMP–MPC) of Smokey Mountain (the former infamous open dumpsite), which makes bags, baskets and decorative containers from old newspapers and telephone directories; and

(c) Tile making project (from collected/ sorted garbage) of Barangay *Bagong Buhay* in Pasig City, to name a few.

IV-2. Municipal Waste Management

The most widespread technologies for treatment and disposal of municipal garbage in the Philippines are composting and sanitary landfilling. This is primarily due to the characteristics of our solid waste which are generally high in moisture and organic content and low in calorific value. Incineration is restricted to treatment of infectious medical and hazardous wastes. LGUs generally use landfilling or landspreading as a disposal system. In 1999, each of the 1,607 LGUs operated and maintained their own open dumpsites, but with the passage of RA 9003 LGUs are required to convert these into controlled dumpsites and sanitary landfills.

IV-3. Industry Waste Management

Many industries have also adopted solid waste management as priority areas for their members. They have mounted environment awareness sessions and seminars on solid waste management to help their member companies to design and implement environment programs and waste reduction programs that would also eventually reduce their operational costs. Several of these industry groups are members of the *Business Agenda 21*, a network of industry associations launched by the PBE in 1998. This is in partnership with the Board of Investments (BOI) of DTI, through the United Nations Development Program (UNDP) - assisted Private Sector Partnership in Managing the Environment/ PRIME Project, and its follow up project called the Environmental Management Program for Industry Competitiveness (EPIC). These and other environmental assistance programs for industry, including for small enterprises, have led to more investments in environmental technologies and equipment to reduce waste and pollution.

IV-4. Environment Technologies

Since one of the most common barriers for addressing environmental problems is the lack of technology, both government and the private sector have developed and commercialized new and affordable environment technologies. The Department of Science and Technology (DOST) has also been at the forefront of developing technologies for managing biodegradable waste, recyclable materials and the residuals. Some examples are listed below[10]:

A. Technologies for Biodegradable Waste

- Vermicomposting – with the use of earthworms for creating organic fertilizer/ soil enhancers from wastes
- Bioreactor – for rapid soil composting using an aerated system for small scale applications

[10] www.denr.gov.ph/nswmc

- Biogas digester – for conversion of organic waste into energy and fertilizer through an anaerobic process
- Biodiesel production from used cooking oil – through transesterification
- Magnetic thermo decomposer - using energy from oscillating magnets and thermal breakdown of molecules
- Green charcoal from biodegradable solid waste
- Liquefaction technology to convert garbage into methane gas, organic fertilizer or concrete aggregates

B. Technologies for Recyclable Materials
- Laminates recycling
- Polystyrene recycling
- Glass recycling
- Paper recycling
- Aluminum can recycling
- Tin can recycling
- Plastics recycling
- Used tires as tire – derived fuel
- Co–processing in cement kilns
- Electronics waste recycling
- Remanufacturing of spent Ink and toner cartridges
- Used lead acid battery recycling

C. Technologies for Residuals Management/ Treatment
- Residuals waste processing into non–load bearing concrete materials (e.g. hollow blocks, benches, perimeter walls, traffic barriers) – palingenesis, hydromex technologies

New business opportunities have resulted in more environment service providers for the treatment of special and hazardous materials, such as fluorescent lamps and bulbs, sludge, and contaminated waste. However, there is still much room for expansion here, and treatment costs are not always within the reach of smaller companies, especially those in the regions outside of Metro Manila/ Luzon where such facilities may be sparse or non–existent. Thus, the uptake for these environment technologies needs to be hastened through information sharing, technical and financial assistance, incentives and, most importantly, political will.

V. Waste Exchange as a Strategy for Waste Management and Reduction in the Philippines

Waste Exchange is another option for managing residual wastes, preferably after attempts have already been taken to reduce or reuse waste. In the Philippines, the PBE implements the IWEP, which aims to match waste generators with waste buyers/ treaters.

Waste Exchange is a matching process, a market mechanism, and an environment program all–in–one because it brings together two parties that can mutually benefit from the exchange. It creates a market for still useful waste materials/ by-products, and protects the environment by reducing the waste stream and diverting the amount of waste that goes to landfills. Thus, it generates economic returns for the waste generator and the

waste buyer, promotes resource recovery and recycling of waste back to the manufacturing process, and reduces the environmental impacts from industry waste disposal.

Among the typical users of Waste Exchanges are companies, LGUs, environment entrepreneurs or entities that:

- Are interested in substituting expensive or hard – to – get raw material;
- Are interested in reducing raw material costs by using by-products as production inputs;
- Have surplus products or raw materials;
- Have manufacturing by-products whose marketability they wish to determine;
- Have off-spec or obsolete manufactured products or equipment;
- Looking for ways to cut down disposal costs; and
- Have wastes which can be used by others.

The PBE IWEP operates as a Waste Exchange Information Clearinghouse, which manages a database of waste generators and waste buyers, and promotes waste exchange and resource recovery through orientation sessions, company in–house seminars, environmental exhibit/ trade fairs, and case studies/ publications. It publishes IWEP advertisements in its quarterly *Business and Environment Magazine*, upon request of IWEP users.

The PBE IWEP lists entries under any of the following categories:

- Acids
- Alkalis
- Other inorganic chemicals
- Solvent
- Other organic chemicals
- Oils and waxes
- Plastics and rubber
- Textiles and leather
- Wood and paper
- Metals and metal sludges
- Miscellaneous (glass, electronics, used lead batteries, etc.)

Interested users are requested to register their company using an information form that describes the volume and frequency of waste generated, the industrial process that generates the wastes, the classification and physical state of the waste, and the current handling practices. Registration is done free of charge.

If the PBE IWEP is able to identify a possible match, both parties enter into negotiations to determine whether the transaction pushes through or not, based on such considerations as technical compatibility, quantitative match, economic feasibility, legal/ regulatory factors. Under this set–up, the parties may or may not decide to give feedback to PBE on the outcome of their transaction, which makes it difficult for the IWEP to monitor the actual number of successful waste exchanges that it has facilitated. Manpower constraints at PBE also make it difficult to track all possible waste exchange referrals, or offer services beyond referrals and promotion.

Nevertheless, there have been several documented case studies of successful waste exchanges. These include the following:

- Waste paper into paper mill feedstock;
- Waste textile, waste wood, food waste animal and plant residue waste into compost;
- Cellulose waste into solid fuel;
- Metal scraps for metal recovery;
- Electronic waste for metal and lead recovery;
- Used lead acid batteries for plastics and lead recovery;
- Organic sludge for methane production;
- Incombustible construction waste into construction aggregates;
- Waste plastic into fuel oil;
- Textile scraps into industrial rags; and
- Synthetic waste materials (e.g. scrap tires, rubber and plastic waste, graphite dust), industrial wastes (e.g. bamboo dust, bagasse from the sugar industry, carbon/ petrochemical waste, waste oil), and agricultural wastes (e.g. Rice husks, straw, coconut/ peanut husks) into alternative fuel for cement kilns.

Over the years, IWEP has received over 1,500 waste listings and registered close to 500 company participants. Through the annual Earth Day/ Environment Month Recyclables Collection Events which PBE has implemented with various partners since 2002, it has collected 1,947 m^3 of recyclable materials (equivalent to about 195 ten–ton dump trucks) worth ₱ 3,295,830.00**,** and diverted these from the landfill and on to the local recycling industry. This includes traditional waste such as paper, plastic, aluminum cans, tin cans, scrap metals; and special wastes such as junk electronics and appliances, used lead acid batteries, used ink and toner cartridges. More waste is also retrieved through the regular weekend mall–based Waste Markets/ Recyclables Fairs. This activity has been conducted since 2007, and has become regular features in many places, supported by the DENR, LGUs, the business and NGO community and the media.

Among the benefits experienced by IWEP users are the following:

- Sales revenue and/or avoided disposal costs for waste generators;
- Reduced raw material cost for users;
- Energy savings incurred from processing raw materials;
- Environmental protection;
- Better national perspective on waste management issues;
- Better cooperation among business, industry, government and recycling advocates; and
- Opportunity for companies, trade associations, and chambers of commerce to demonstrate environmental responsibility and accountability.

Despite the above benefits, the success of IWEP is constrained by the lack of similar set–ups in areas outside Metro Manila. An attempt was made in 2001 to create IWEP regional nodes in partnership with the Cebu City Chamber of Commerce and Industry (CCCII) in the Visayas region, the Davao City Chamber of Commerce and Industry (DCCCII) and the PhiVIDEC Industrial Estates in Misamis Oriental which are both in the Mindanao region. However, only the DCCCII IWEP continues to operate, in part because there was no transfer of training/ proper turnover upon the resignation of the designated point persons in the other nodes, or there was lack of interest to sustain IWEP.

The DCCCII reports that, based on a survey of their members, most of the waste materials traded are either waste paper or fiberboard, plastics or used tires (for donation). They also continue to hold monthly Recyclables Collection Events in their area as a continuing promotion strategy for waste exchange. Buying prices, however, have been significantly lower in recent months due to price fluctuations abroad affected by the global financial crisis.

Also, around 2001-2002, the UNDP–assisted PRIME project mentioned earlier, launched an Industrial Ecology (IE) component, with Waste Exchange as a core strategy for closing the production loop. Working with a pilot group of six industrial estates and their volunteer company locators, the IE program established a place-based waste exchange program in the Laguna-Batangas and Bataan area, to take advantage of the industry's proximity with each other, the existing management structure, and the volume of by-products available when aggregated.

The pilot industry estates included the following:

- Carmelray Industrial Park (CIP) 1;
- Laguna International Industrial Park (LIIP);
- LIMA Technology Center (LIMA);
- Light Industry and Science Park (LISP) 1 and 2; and
- Laguna Technopark Incorporated (LTI).

The key strategies used were awareness sessions with the industry estate management and company locators, data gathering and analysis, information dissemination and recyclables collection events for preliminary by–products matching. This resulted in approximately nine tons of total wastes diverted from the landfill, saved garbage hauling costs and hauling fees equivalent to about nine dump trucks, and a ₱ 174,534.00 value redemption from 2004–2006[11].

The group has established itself as the Eco-Industrial Exchange Network (Eco–Index), adding four more Laguna–based industrial parks to its network (i.e., the Carmelray Industrial Park 2, First Cavite Industrial Estate, First Philippine Industrial Park, Calamba Premier Industrial Park), and providing management support for environmental management concerns. Eco–Index, in the long run, aims to encourage industries within these areas to take an active part in minimizing adverse impacts to the environment. Their support programs include the following:

- Advocacy events to promote sustainable industrial development through resource recovery and eco-industrial development approaches and community building initiatives;
- Maintenance of an online portal and waste (by-product) generation database in selected industrial estates;
- Environmental management directory for industrial estates and locators (i.e., list of treaters, list of service providers, list of government agencies, etc.);
- Resource pool for in-house trainings and seminars on:
  - industrial ecology, by product exchange, resource recovery; Regulatory compliance; and other environmental management tools (Environmental Cost Accounting (ECA), Environmental Management System(EMS), etc.).

[11] www.ecoindex.org

- Development of publications, manuals and guidebooks on relevant industrial estate management concerns.

VI. Challenges to Solid Waste Management and Waste Exchange

From the abovementioned discussion, it is apparent that important initial steps have been taken to promote a Philippine eco-cycle society, but still many continuing challenges need to be addressed. Enforcement of even basic requirements of RA 9003 (such as the closure of open dumpsites, the establishment of MRFs, and the 25% landfill diversion rate, etc.) needs to be taken seriously. Key to all of this is the participation of all relevant stakeholders as active players (not as bystanders), with the recognition that solid waste is not a problem of government alone, but a problem of everyone.

Despite stepped–up efforts, there is still lack of widespread knowledge of the potential for waste reuse, and of the appropriate technologies whether the barriers are technical, financial, or attitudinal. At the same time, technology and economic limitations (for waste conversion) also still exist for some types of waste (like household batteries and junk cellular phones).

Without policy incentives and a viable financial model, programs like IWEP face an uphill battle with respect to the continuity of supply in large quantities; improvement in local and national databases; transport and logistics costs for inter – island waste exchanges. IWEP requires a major leap forward to, firstly, improve its database management system; expand to other parts of the country; and to eventually be brought up to a regional level; where it will then be faced with even larger issues regarding matters such as regional standards for tradable waste, technology verification, and country–specific environmental laws and customs procedures.

VII. Report Recommendations

Based on the above discussion, the current study offers the following for consideration by the ERIA study group. Although presented in the context of the Philippine situation, useful implications can be derived for a subsequent region wide approach to 3R.

1. 3R Knowledge Management - Although RA 9003 describes the establishment of Regional Ecology Centers to serve, among other things, as the clearinghouse for solid waste management data and information, these are yet to be fully functional, for reasons that are not clear and therefore have to be uncovered and addressed. As with PBE's own IWEP, an ideal set–up is likely to be hampered by the lack of trained full time personnel, and the lack of funding to offer value added services such as waste characterization, monitoring and documentation. Also, in the case of IWEP which runs as a pro–bono operation, an effective model for financial self–reliance still needs to be developed.

2. Advocacy for better solid waste management needs to be ramped up, through a number of ways, such as:
   - By using actual success stories with demonstrable environmental, social, and economic benefits to communities, business establishments, local governments;

- Popularizing events that make it easy for the public to participate such as the recyclables collection events, mall–based waste markets/ recyclables fairs, and perhaps through a future on–line waste trading system; and
- Giving recognition/ awards, and publishing best practices so that these can be replicated quickly.

3. Following through on the Presidential initiative to make the Executive Department and its Cabinet Secretaries accountable for the solid waste of their department and department's activities will send a strong message to the public

4. Encouraging the rest of the citizenry to make their elected officials accountable by turning garbage management into a political governance issue

5. Environmental investments in SWM should be made a top priority
   - by local governments, as new environmental businesses also create positive social impact through livelihood and income opportunities
   - area-specific recycling market studies can be used to also identify investment opportunities by the private sector for new recycling facilities especially in other parts of the country

6. Policy initiatives that create incentives for environment technology development and adoption/ transfer, especially for locally–developed technologies, mandating their adoption, and setting a national recycling target and performance monitoring system

In addition, the 2008 JICA Study on Recycling Industry Development in the Philippines recommended a number of strategies to enhance recycling performance in the country, involving the government, the private sector, recycling industry and the waste generators. The study paradigm is that recycling performance can be increased if the national and local institutional set–up is strengthened, the recycling system is improved, and awareness of segregation, proper handling and recycling is improved. The study identified the need for four key policy programs[12]:

- a Recycling Industry Information and Database Management (not only from local end users but also from waste importers/ exporters);
- National action plan formulation (for specific recyclable materials of highest value to the country);
- Local recycling plans formulation (emphasizing the importance of source separation of recyclable materials and the development of new business/ job opportunities); and
- Development of recycling guidelines (i.e., target recycling rates, measures to increase collection rate and use of recycled materials, consensus building).

In general, it is my opinion that those who have been working hard to address our solid waste management situation need to put a twist to an old and pressing problem to combat the complacency that afflicts a large part of Philippine society. This twist involves finding ways to, "make the garbage problem a very personal issue – for the homeowner

[12] Study on Recycling Industry Development in the Philippines, Board of Investments – Department of Trade and Industry, and Japan International Cooperation Agency, 2008

or market stall owner who is inconvenienced by a breakdown in the garbage collection schedule, for the business owner who must pay higher hauling/ disposal fees, for the parent whose child can become ill from unhealthy surroundings, for the elected official whose political stock depends on how he rids his locality of unsightly garbage, for the household help and restaurant personnel who can earn extra income from recyclables segregation and collection, or the child who can trade in an empty plastic bottle or soda can for a pencil or notebook."

This study recognizes much yet needs to be done, but it is hopeful since ~~as~~ much is happening today compared to five or ten years ago. Yet we need to act more urgently and swiftly if we are to reverse the downward environment spiral which in the final analysis, is not quite only about managing our waste, but about *Managing Ourselves!*

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