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Stakeholders' Relationships in Recycling Systems: Experiences in the Philippines and Japan*

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Junk shop in Bagio, Philippines.
Photo by Michikazu Kojima in October 2006.

Instruction on source separation posted near an elevator of an apartment house in Chiba, Japan.
Photo by Michikazu Kojima in 2008.

Categories are "combustible," "incombustible," "toxic waste," "recyclable materials," and "bulky items." "Recyclable Materials" consist of glasses (subcategories: clear bottles, brown bottles and other), cans, PET bottles, papers (subcategories: newspaper, magazine, carton, milk carton and miscellaneous paper) and clothing items.

* Data on the Philippines is derived from the study "Recycling in the Philippines: Focus on Recycling and Trading Dimensions" (2005-7) by Michikazu Kojima, Ma. Lourdes G. Rebullida and Femilia Honorio, undertaken by IDE-JETRO, the Foundation for Integrative and Development Studies, and the UP Center for Integrative and Development Studies.

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Introduction

This chapter examines the stakeholders and their relationships in the recycling system, specifically waste generators, waste collectors, trader-consolidators, recycler-processors, and manufacturers. It presents the experiences of the Philippines and Japan, to help clarify the terms and concepts employed when referring to various types of stakeholders in the recycling system. It is assumed that if reliable relationships exist between stakeholders and the linkages work well, the recycling system will operate effectively, resulting in quality materials being recovered and reused through the system. This in turn leads to a steady stream of demand for waste resources, referred to as recyclables as well as the production of quality recycled materials. When such relationships and linkages fail, however, certain preventive and remedial measures are needed to sustain recycling as a strategic solution for protecting the environment and conserving natural resources, even as economic development is pursued.

The basic framework can be found in related literature, while study results serve to clarify the terms, concepts, and processes involving the types of stakeholders that play a role in the operation of the recycling system. In the study conducted and as used in this chapter, the "recycling system" refers to the interactions between stakeholders in conducting transactions involving recyclable waste resources, which undergo processes resulting in materials of use in the manufacture of recycled products. The stakeholders in a recycling system primarily include those discussed hereon. The "waste generator" uses or consumes materials, thereby generating waste, and either discards this waste for final disposal or sells it to the "waste collector." Waste collectors include those at the levels of collection and aggregation ("primary level" and "secondary level" waste collectors, respectively), who in turn bring the materials to the "trader-consolidator." The trader-consolidator assembles volumes of waste from the waste collectors and engage in recovering waste resources, specifically, "recyclables." At these stages, however, the waste generator may or may not have been reliable in providing appropriate quality waste resources to the waste collector, which in turn flow to the trader-consolidator. Next, the "recycler" performs processes on the waste materials, and finally, the "manufacturer" uses these materials to make "recycled products." The requirement for quality in production may result in rejection of, or a reduction in the buying price for, the waste resources concerned. Fraud may occur, such as the inclusion of recyclables or waste resources of unacceptable quality. On the other hand, reliability depends on stakeholders providing each other with quality materials at each transaction level. The sustainability of the recycling system and its contribution to environmental management may be threatened if the relationships thereof become unreliable.

The economic development level of the countries involved also sets parameters for the relationships between recycling stakeholders. In some developing countries, waste generators are disinclined to segregate types of waste and instead pass this responsibility to the waste collector. However, segregation at source is a vital precondition for a workable recycling system as this ensures a level of waste material quality capable of meeting the demands of recyclers and manufacturers. Furthermore, the countries' developmental levels determine factors such as the level of consumer demand for high quality products, whether made of virgin or recycled materials. The prospects for recycling and its contribution to environmental sustainability could be undermined if recyclables used as production resources and the resulting recycled products are of poor quality. Thus it is argued that demand for recyclables and recycled

materials will decline if quality declines. Such a decline would undermine the policies of countries such as the Philippines and Japan which practice recycling through the reuse of waste resources. Recycling is viewed as a possible solution to the problem of natural resource depletion through the use of virgin materials in production, and the problem of environmental degradation due to indiscriminate disposal.

This paper presents the Philippine and Japanese experiences on the linkages between stakeholders in the recycling system, in the context of the laws and policies of the respective countries. The gaps, failures, and learning experiences therein serve as starting points for corresponding measures to sustain recycling and actualize policy implementation.

The Philippine data was obtained from the 2005-7 study initiated by the Institute of Developing Economies (IDE) based in Japan, in cooperation with the Foundation for Integrative and Development Studies (FIDS) and the University of the Philippines Center for Integrative and Development Studies (UPCIDS). The findings come from a total of 63 junkshops, seven traders, and 11 recycling plants. An earlier study in 1999 by the Japan International Cooperation Agency (JICA) examined solid waste management in the Philippines, prior to the legislation of Republic Act 2003, the Ecological Solid Waste Management Act of the Philippines. Other studies in the Philippines focused on efforts by local governments, nongovernmental organizations, businesses, industries and communities (Rebullida 2000, 2002; Philssa 1996; Philippine Business for the Environment 2002; Lapid 2004). Almost concurrently with the IDE study, JICA and the Philippine Board of Investment embarked on the "Study on Recycling Industry Development" (2006-7). The 2006-7 IDE (Phase II) and JICA studies showed mutually reenforcing results.

Data on Japanese experiences in recycling were obtained by interviews, site visits, documents, and secondary references available in Japan.

4.1 The Philippine Experience

4.1.1 Policy Framework

The Philippines enacted Republic Act 9003, the Ecological Solid Waste Management Act of 2000, in response to environmental problems affecting mainly urban areas and the threats to life and health posed by improper solid waste management. The law places recycling within the "ecological solid waste management" framework, involving the "systematic administration of activities which provide for segregation at source, segregated transportation, storage, transfer, processing, treatment, and disposal of solid waste; and all other waste management activities which do not harm the environment."

Republic Act 9003 requires products and materials to be environmentally acceptable, and defines post-consumer products and environmentally unacceptable products. The process of recycling should start with the design, quality, and packaging of the product at the time of production, such that the materials thereof are amenable to recycling. Implementation of the framework and the law entails the provision of opportunities for recycling, starting with the availability of and access to recycling receptacles and material recovery facilities. The waste undergoes sorting and segregation right from the point of waste generation as well as collection and storage in a material recovery facility to avoid being discarded to the final disposal site. The materials are sent to the manufacturer's buyback centers. In effect, the process re-

sults in waste reduction, insofar as only the residuals (waste which can no longer be reused) are transported to the final disposal site—these days comprising sanitary landfills rather than an open dumpsites.

The act also mandates implementation by central government and local government agencies, and encourages the participation of the private sector, nongovernmental organizations and communities. The successful implementation of recycling in the Philippines would further help facilitate the actualization of this law as well as helping to address the country's problems of environmental pollution and natural resource depletion due to production and consumption. Examining precisely what is workable or unworkable in terms of recycling is vital in determining appropriate measures for actualizing the law.

4.1.2 Stakeholders in the Philippine Recycling System

Initially, research literature provided the deductive foundation for the framework used in the IDE study from 2005 to 2006. Subsequently, the survey data itself provided the empirical foundation for the types of stakeholders and their relationships in the trading of recyclables in the recycling system. The IDE study results in the Philippines clarify the use of the term "recycler" as generally pertaining to the different types of stakeholders in the recycling system, though in a restrictive sense, it refers to the recycler-processor, who performs the necessary processes on the recyclables, the results of which are the materials used, by themselves or in combination with virgin materials, in the manufacture of so-called "recycled products."

Trading process flow and recycler relationships

The recycling system involves the trading (buying and selling) of waste materials, considered as waste resources. Stakeholders are those who participate in the recycling system. The trading system and the specific types of stakeholders are described below:

1. Waste generators are the primary sources, as these are the first level collectors and sellers of recyclables. They are considered to comprise individuals, households, institutions (such as schools and government offices), commercial and business establishments, and manufacturers in various industries. The waste generators consume or use materials, after which they either discard these for final disposal or sell them to various types of waste collectors and processors of recyclables, namely: roving pushcart collectors (also known as eco-aides or scavengers)—, primary junkshops, consolidator-traders, recycling plants, or even directly to manufacturers that use recyclables and recycled materials.
2. The primary junkshop is a buyer of recyclables from the primary waste generators described above. The primary junkshop in turn sells to the next level of buyer. Primary junkshops generally have small-scale operations, and often sell their collection of recyclables to larger scale junkshops—known as trader-consolidators. Alternatively, they may sell directly to a recycler-processor, or even to a recycled product manufacturer.
3. The trader-consolidator is essentially a junkshop handling large volumes of recyclables. In some cases it may sell to a larger trader-consolidator. The trader-consolidator aggregates volumes of recyclables for sale to a recycler-processor, and sometimes even sells directly to a recycled product manufacturer.
4. The recycler-processor refers restrictively to units which process recyclables into a reusable form. These processed recyclables then become reusable materials, to be used in the

manufacture of recycled products, either by themselves or in combination with virgin or other materials.

5. The manufacturer buys the processed recyclables and uses them, either as they are as reusable materials or in combination with virgin materials, to produce recycled products.

The junkshops are differentiated by the characteristics of their business structures and trading operations, including such variables as space, capital, recycling processes, transportation, equipment, volume of collection, market, and trading network. The trading relationships between the types of recyclers affect the level of the trade as well as the flow of recyclable materials within the country and to foreign countries. The research data also calls attention to important dimensions in the recyclers' trade operations and recycling processes, such as transportation, equipment, pollution control measures; problems in collection, storage, and sales, as well as health, labor and other social concerns. Some junkshops and trader-consolidators prefer to deal only with one type of waste material, such as paper, metal, glass, or plastic; others handle a range of types. There are also trader-consolidators that export volumes of recyclables by type to overseas buyers.

There are two types of junkshop that are indispensable to the aggregation of recyclables. These are described below.

(1) Type 1 – Primary Junkshop. This category purchases and collects from primary sources or generators of recyclables, including households, markets, commercial and industrial establishments, and offices. Primary Junkshops hire so-called eco-aides, that is, roving collectors of recyclables who buy from primary sources of waste generation. The primary junkshop handles small volumes, and has limited space and capital and few workers; and sells to larger junkshops, namely trader-consolidators, and in some cases directly to recycling plants.

(2) Type 2 – Trader-Consolidator. This category also buys from primary sources and primary junkshops, but is responsible for consolidating volumes of recyclables. Compared to primary junkshops, trader-consolidators operate with considerably more space, capital, and workers, and handle larger collection volumes. They sell to recycling plants, or to larger trader-consolidators, which also act as exporters of recyclables to buyers in other countries. However in practice, trader-consolidators are not easily distinguishable from other junkshops. Some can be identified only by self-disclosure, while others are identified by other organizations.

The recycling plant is an important stakeholder because it converts processed recyclables into new recycled products. Recycling plants usually engage in processing a single type of recyclable – specifically paper, metal, plastic, or glass.

Based on the study findings, Figure 1 below presents the stakeholders in the Philippine recycling system. It shows a generic model for the transaction flow of any one type of recyclable.

Characteristics of recycling stakeholders in the Philippines

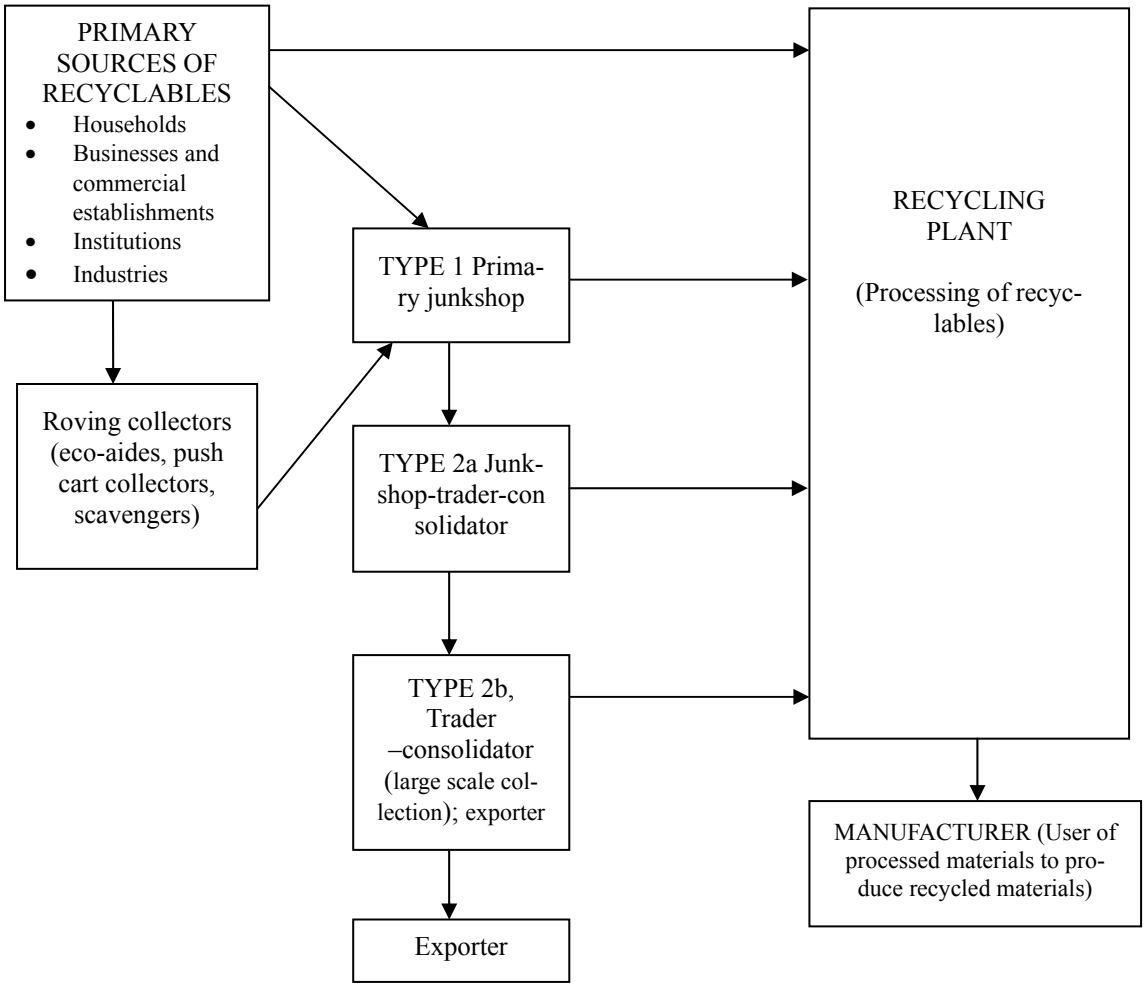
The characteristics of the recycling system's stakeholders are described below based on the study findings. The six variables of location, business organization, capital, length of operation, labor force, and space are considered vital to the operation and sustainability of the recycling system.

Location. Junkshops are usually found in residential areas, within *barangays*, while trader-consolidators tend to be located either in commercial or residential areas, or in one case in the sample, at a dumpsite. On the other hand, recycling plants are generally located in industrial zones.

Business organization. Junkshops are generally sole proprietorships. On the other hand, recycling plants are mostly corporations, and engage in processing recyclables into new recycled materials sold to product manufacturers that use recycled materials.

Capital. The sample junkshops located in the Metro Manila and North Luzon areas can largely be grouped in the following categories based on their capital: up to PHP20,000; PHP20,000 to PHP60,000; and PHP60,000 to PHP100,000. A few sample junkshops in the Metro Manila area have higher capitals of PHP300,000 to PHP500,000, while one has a capital of PHP1 million. While junkshops with such capital levels may be considered trader-consolidators, the respondents in question preferred not to classify their businesses in this category, but rather as "scrap dealers." Competition among junkshops makes rolling capital a crucial factor when buying volumes of recyclables. Trader-consolidators in the North Luzon area can be identified as such by the Business Licensing Unit of the local government. They can be classified by their capital as follows: up to PHP20,000; and up to PHP200,000.

Fig. 1 Recyclers Flow of Trade and Flow of Recyclable Recycling



Recycling plants prefer to keep their levels of capital confidential. One plant in the sample disclosed a range of between PHP40 million and PHP50 million. The type of processing, the necessary equipment, and the volume of material required are all factors contributing to recycling plants' needs for huge sums of capital.

Length of operation. Nearly half of the junkshops in the sample, including trader-consolidators, had only been in operation for five years or less; others had been operating for up to 10 years. Such low figures may be considered a result of legislation and policies on recycling. These new junkshops compete with each other as well as with those that have been in business for longer periods. At least one sample recycling plant had been operating for between 20 and 30 years; one between 30 and 40 years; and one between 50 and 60 years. Three of the 11 sample recycling plants had been in operation for up to 10 years and two for up to 20 years. This suggests that the majority of recycling plants may have been operating for shorter periods.

Labor force. The majority of the sample junkshops have one to five workers; a few have up to 10 to 15 workers; while one in Metro Manila has 26 to 30 workers. Six of the 11 sample recycling plants have up to 100 workers. The number of workers can indicate the extent of the organization's business operations and, in the case of junkshops, the type**.**

*Space***.** The various recyclers either own or rent the space they use for the trading and processing operations. Space is rented by more than half of the junkshops, while the remainder owns their own land. Rental costs vary and can be as much as PHP35,000 monthly. The majority (76%) of junkshops occupy an area of up to 300 m^2; a few have between 300 and 700 m^2. The sample traders in North Luzon have from 500 to 2000 m^2. At least one sample recycling plant disclosed their land area at less than 1000 m^2; another at up to 5000 m^2; while another one possessed a land area of between 15,000 and 20,000 m^2. In cases of rental, costs ranged from PHP1,000 to PHP50,000 at the low end, up to PHP1million to PHP5 million monthly.

4.1.3 Linkage Breakdowns between Stakeholders in the Philippine Recycling System

The recyclables market: Supply and demand for types of recyclables

Paper types in the recycling system include white paper, newspapers, carton boxes, and assorted paper. However, small junkshops, trader-consolidator junkshops, and recycling plants alike all face difficulties due to improper sorting of paper, or the improper content of heavy impurities in attempts to increase weight and value. Furthermore, recycling plants find paper materials difficult to dissolve when plastic materials are admixed.

In the case of glass, white glass, whole or broken, is preferred, but recycling plants regularly find impurities in such recyclables, eventually leading to rejection for processing or the production of defective products. PET plastics are also preferred but recycling plants will reject supplied volumes if found to be poor in quality.

In contrast, there is not much demand for waste tin cans or colored glass bottles due to the lack of willing buyers. Some traders will not buy yellow copper, brass or bronze waste due to the risk of theft and the problems thereof.

Table 1 Recyclers' Common Criteria for Buying and Selling Recyclables

Type	Common Criteria for Buying Recyclables	Common Processes Conducted before Selling Recyclables
Paper	Dry, sorted/segregated; availability of buyers	Sorting/segregating, drying, compacting
Metals	Dismantled, sorted/segregated; availability of buyers	Sorting/segregating, cutting/dismantling, compacting
Glass	Sorted, crushed (dismantled); availability of buyers	Sorting, compacting, crushing (dismantling)
Plastic	Sorted, dry; availability of buyers	Sorting/segregating, cleaning/washing, drying
E-waste	Dismantled/disassembled, sorted; availability of buyers	Cutting/dismantling, sorting, compacting
Automotive batteries	Dismantled/disassembled, sorted; availability of buyers	Sorting/segregating, dismantling, drying

If domestically generated recyclable wastes are of insufficient quality, recycling plants invariably prefer to import. Hence, improving the quality of collected recyclable waste would appear essential to the steady demand for waste resources.

Criteria for buying and selling recyclables

When buyers reject recyclables, sellers incur loss of capital and profit. Table 1 shows the criteria used by junkshops, trader-consolidators, and recycling plants respectively when buying recyclables, as well as the processes conducted on recyclables to ensure quality for trade purposes.

Reasons for refusal of recyclables

Problems are anticipated in the trade of white paper in conjunction with the expected importation of recycled white paper. Recyclers generally find it troublesome when materials are not sorted and segregated, forcing them to conduct such processes themselves after purchase. Rejected materials also lead to losses of profit and reductions in volumes of quality recyclables for all recyclers. Trader-consolidators consider the following factors when deciding to buy or reject recyclables: availability of buyers, length of storage time required, storage space, and the prices offered by buyers, for each type of recyclable. Small junkshops and trader-consolidators usually refuse dirty recyclables because they will be rejected by their end buyers, the recycling plants. They also reject bulky materials due to lack of space. Recycling plants are concerned with material quality and requirements for processing (Table 2).

Table 2 Comparative Stakeholders' Perceptions of Problems in Trading

Type of Waste	Recycling Plants	Trader-Consolidators	Junkshops
White paper	Not segregated upon delivery	Competes with incoming cheap paper waste resources	Not enough supply to meet demand of traders; no direct traders
	Hard to dissolve due to plastic impurities		Too tedious to sort and segregate; dirty/messy to collect/store; limited storage space
Newspapers		Compete with incoming imported cheap paper waste resources	Not enough supply to meet demand of traders
	Not segregated upon delivery		Limited storage space
	Hard to dissolve due to plastic impurities		Fire hazard
Paper boxes, corrugated cartons		Compete with incoming imported cheap paper waste resources	Not enough supply to meet demand of traders; no direct traders
	Not segregated upon delivery		Dirty/messy to collect/store; limited storage space/too bulky
	Quality: hard to dissolve due to plastic impurities		Fire hazard
Assorted paper		Competes with incoming imported cheap recycled paper	Not enough supply to meet demand of traders; no buyers/direct traders
	Not segregated upon delivery		Too troublesome to sort/segregate, dirty/messy to collect/store; limited storage space
	Hard to dissolve due to plastic impurities		Fire hazard
Aluminum (light and heavy)	Low price and supply; seasonal prices; unsteady supply		
Tin		No buyers; few suppliers	
Lead		No buyers; few suppliers; poisonous	
Yellow copper/bronze		Low in price and supply	
White glass bottles/jars			Limited storage space; fragile/dangerous to stock; dirty/messy to collect/store; no buyers; not profitable; not interested

Type of Waste	Recycling Plants	Trader-Consolidators	Junkshops
Colored glass bottles	Contains impurities	No recycling companies available	No buyers
		Buy beer and soft drinks bottles only	Not enough supply for collection/buying
			Limited storage space; fragile/dangerous to stock; dirty/messy to collect/store
Broken white glass		No recycling companies available	No buyers
			Limited storage space; fragile/dangerous to stock; dirty/messy to collect/store; not profitable
Broken colored glass		No buyers, no recycling company available	No buyers
			Limited storage space; fragile/dangerous to stock; dirty/messy to collect/store; not profitable
PET plastics bottle		Too many processes required	Dirty/messy to collect/store
	Poor quality, too many rejects		Too many rejects/impurities; lack of familiarity/ knowledge
	Not segregated upon delivery		Limited storage space; too bulky
		No buyers; not knowing where to sell; not interested	
PETE wasteplastic bags	Not segregated upon delivery		Lack of familiarity/ knowledge; too many rejects/impurities
			Limited storage space; too bulky; dirty/messy/odorous to collect/store; no buyers (not traded); not interested
Assorted plastics (*sibak*)	Not segregated upon delivery		Limited storage space; too bulky
			Too many rejects/impurities; lack of familiarity /knowledge; dirty/messy/ odorous to collect/store
PP-PE plastic	Not segregated; sometimes comes with other types of plastic		

Type of Waste	Recycling Plants	Trader-Consolidators	Junkshops
Computers (desktops, laptops, printers)		Cannot sell	No buyers; no direct traders
			Limited storage space; require dismantling before collection/purchase; no weighing standard (for pricing)
Circuit boards (of computers, TVs, radios)		No buyers; cannot sell	No buyers; no direct traders
			Limited storage space; require dismantling before collection/purchase; no weighing standard (for pricing); lack of familiarity/knowledge
VHS, VCD, DVD players		Not interested; cannot sell	No buyers; no direct traders
			Limited storage space; no weighing standard (for pricing); require dismantling before collection/purchase
Electrical appliances (fans, refrigerators, washing machines, gas stoves/ovens, flat irons)			Limited storage space; no weighing standard (for pricing); require dismantling before collection/purchase; no buyers; no direct traders
Electronic appliances (karaoke machines, stereo systems, radios)		No buyers	No buyers; no direct traders
		Consist only of hard plastic	Require dismantling before collection/purchase
			No weighing standard (for pricing); limited storage space
Air-conditioning units			Limited storage space; no weighing standard (for pricing); require dismantling before collection/purchase; no buyers; no direct traders
Cell phones and accessories		No buyers, recycling companies require bulk volume)	No buyers; no direct traders
		Few suppliers	
			Risk of theft; limited storage space; no weighing standard (for pricing); require dismantling before collection/purchase
Automotive batteries			Fire hazard; not saleable; no buyers
Batteries (dry cell, lithium, cell phone batteries)		No buyers, cannot sell	No buyers
			Limited storage space; too bulky

Type of Waste	Recycling Plants	Trader-Consolidators	Junkshops
Styrofoam	Supply unreliable /insufficient		Limited storage space; too bulky
		No buyers, cannot sell, no recycling companies available	No buyers
			Fire hazard; not interested
Rubber			Limited storage space; too bulky; no buyers; fire hazard; not interested
Textiles/cloth			Limited storage space; too bulky; no buyers; fire hazard; not interested
Wood/furniture			Limited storage space; too bulky; no buyers; fire hazard; not interested
Oils, solvents, sludge			Limited storage space; too bulky; no buyers; not interested

4.1.4 Analysis of Philippine Recycling Stakeholders

The study results describe the actual operations among the key stakeholders in the buying –and selling of recyclables, considered as waste resources to be processed for reuse in the production of recycled products. The stakeholders in the trading chain are distinguished by the volume and extent of their trading transactions and the processing they conduct on the waste resources.

In the trade of waste resources, up to the stages of processing and reuse in manufacturing, the problem of poor waste resource quality has been frequently encountered, often traceable to fraud, indicating unreliable behavior among stakeholders. This has resulted in loss of profit when materials are rejected in transactions between one stakeholder and the next in the trading chain. The commercial viability of recycled materials is undermined by rejection from buyers, specifically, traders, manufacturers and importers.

Major lessons from the obstacles to recycling in the Philippines are as follows:

1. Quality standards should be developed by stakeholders for the different types of waste resources to be considered acceptable for recycling purposes, specifically for paper, tin cans, aluminum cans, glass bottles, and PET bottles.
2. There is a need to implement the sorting and segregation of waste resources at strategic points in the recycling system, particularly at the point of waste generation, for the purpose of maintaining their cleanliness and quality, and facilitating the collection of recyclables by type.
3. Policy and planning for the development of the recycling industry should include measures for financing, transportation, equipment, as well as measures to prevent fraud and trade in stolen materials.
4. The identification of markets is essential to encourage the collection, processing, and business transactions of various types of recyclables as well as the manufacture of recycled products out of these materials.

4.2 The Japanese Experience

Previous sections described the failure of linkages in the recycling system and measures to foster reliable linkages between stakeholders in the Philippines. A similar situation exists in other developing countries. Although the same kinds of problems once existed in Japan, some efforts have been made to improve trading relationships.

4.2.1 Policies and Laws in Japan

There are at least six laws in Japan that define the responsibilities of stakeholders in the recycling system.

The first was the Law for the Promotion of the Utilization of Recyclable Resources enacted in 1991, thereafter modified in 2000 to the Law for the Promotion of the Effective Utilization of Resources. Based on this law, the Japanese government specified the responsibilities of manufactures or business entities in several categories, as presented in Table 3.

Furthermore, a further five recycling-related laws have been enacted since the 1990s (Table 4). The Law for the Promotion of the Sorted Collection and Recycling of Containers and Packaging requires business entities that manufacture and use containers and packages to bear the financial responsibility of recycling. They are required to pay the necessary recycling fees to a designated corporation, the "Japan Containers and Packaging Recycling Association." This association then selects a recycling plant through tender and makes payment to the recycling plant. Local governments also play a role in the collection of waste containers and packages.

The Law for the Recycling of Specified Kinds of Home Appliances defines the responsibilities of manufacturers in physically recovering resources. Recycling fees may be imposed on consumers by manufacturers. Retailers who deliver new home appliances are obliged to take back the replaced items. Targeted items include TVs, air conditioners, refrigerators and washing machines. Such items are relatively bulky and heavy, and are usually delivered by retailers to customers.

Under the Law for the Recycling of End-of-Life Vehicles, two manufacturers associations collect the treatment fees for destroying coolants and disposing shredded dust and air bags. Since automobiles are usually already dismantled in the market prior to recycling, the responsibilities of the manufacturers are correspondingly smaller.

The Construction Material Recycling Law and the Law for the Promotion of Recycling and Related Activities for the Treatment of Cyclical Food Resources emphasize the responsibilities of the waste generator rather than the producer. The Law for the Promotion of Recycling and Activities for the Treatment of Cyclical Food Resources requires large-scale waste generators such as restaurants, food processing industries and other food service providers to make efforts to reduce amounts of food waste and to recycle. Relatively large-scale waste generators should formulate action programs and report the results of their programs to the prefectural government. The Construction Material Recycling Law also requires contractors to sort out and recycle waste generated in the work of building demolition. Construction companies are required to make proper arrangements with a contractor and report their activities to the prefectural government.

Table 3 Categories and Obligations under the Law for the Promotion of Effective Utilization of Recyclable Resources

Category	Obligations	Industry/Products
Designated resource-saving industries	Business entities required to reduce generation of by-products	Pulp and paper; inorganic chemical manufacturing; iron-making and steel-making/rolling; primary comer smelting and refining; automobile manufacturing
Designated resource-recycling industries	Business entities encouraged to use recyclable resources and parts	Paper manufacturing; glass container manufacturing; rigid PVC pipes and pipe fitting manufacturing; copier manufacturing
Specified reuse-promoted products	Required to ensure rational use of raw materials, prolong product life, and reduce generation of other used products	Automobiles; home appliances; PCs; pachinko machines (a type of game machine); metal furniture; gas and oil appliances
Specified reuse promoted products	Manufacturers required to promote use of recyclable resources and recovered products	Automobiles; home appliances; PCs; pachinko machines; copier; metal furniture; gas and oil appliances; bathroom units and kitchen systems; devices using compact rechargeable batteries
Specified labeled products	Manufacturers required to label products to facilitate sorted collection	Steel and aluminum cans; PET bottles; compact rechargeable batteries; PVC construction materials; paper/plastic containers and packages
Specified resource-recycled products	Manufacturers required to promote self-collection and recycling	PCs; compact rechargeable batteries
Specified by-products	Business entities required to promote use of these by-products as recyclable resources	Coal ash generated by the electricity industry; soil and sand; slag of concrete-asphalt and lumber generated by construction industry

Source: Compiled from various sources.

Table 4 List of Japanese Laws on Recycling

Law for the Recycling of End-of Life Vehicles	Enacted: 2002 Enforced: 2005
Construction Material Recycling Law	Enacted: 2000 Partially Enacted: 2000 Fully Enforced: 2003
Law for the Recycling of Specified Kinds of Home Appliances	Enacted: 1998 Enforced: 2001
Law for the Promotion of Recycling and Related Activities for the Treatment of Cyclical Food Resources	Enacted: 2000 Enforced: 2001 Last Revision: 2007
Law for the Promotion of the Sorted Collection and Recycling of Containers and Packaging	Enacted: 1995 Partially enforced:1997 Fully enforced: 2000

Source: Compiled from various sources.

If the recyclables are collected and properly recycled in the market, there is less need to define the obligations of stakeholders. So why does Japan define these responsibilities by laws? In the 1990s, Japan faced the problems of a lack of landfill sites and the illegal dumping of shredded dust and construction waste. In order to reduce volumes of waste, the responsibilities of stakeholders are defined by laws.

4.2.2 Classification and Criteria for Recycling Collection in Japan

There are many kinds of recyclable waste. If one type of waste is mixed with other waste, the recycler needs to sort out the waste from other materials. This increases recycling costs. To utilize recyclable waste effectively, Japan has devised a classification system for recyclable waste and criteria for receiving recyclable waste.

The classification of recyclable waste depends to a large extent on recycling technology. Naturally, paper, plastic and steel cannot be recycled in a single system. However, many people may be unaware of the precise classifications of recyclables. To facilitate the smooth transaction of recyclable waste, a standard classification was set up by the Japanese government and collaborating recyclers associations.

As an example, paper is classified into several categories. The recycling process differs slightly according to the category of paper. Waste paper categories also differ in terms of value.

It is debatable which is the oldest classification system for recyclable waste paper in Japan. The Ministry of Commerce and Industry devised the "Classification of Waste Paper" in 1939, which classified waste paper into 27 categories. The current classification system was set up in 1971 by the Paper Recycling Promotion Center, consisting of nine categories and 29 subcategories. The nine categories are: "hard white shavings," "cards," "woody white shavings; white manila," "fine printed paper," "woody printed paper," "old newsprint," "old magazines," "craft brown," "old corrugated containers," and "others."

The criteria for receiving recyclable wastes are equally important. If impurities are mixed with recyclables and entered into the recycling process, the resulting recycled material may not be saleable. A recycling factory also loses money if it buys nonrecyclable waste at the same price as recyclable waste. If each user follows its own criteria, collectors face difficulties in handling recyclable waste. At the same time, collectors can earn more money when they mix non-valuable waste with valuable recyclable waste and sell it at the same price as pure recyclable waste. This situation made it necessary to determine the criteria that set minimum standards concerning impurities and permissible levels of other paper waste.

To establish these kinds of criteria, the Paper Recycling Promotion Center conducted a survey in 1979 of paper mills and consolidators. The survey showed that 33.3% of paper mills have written criteria for receiving used paper and 59.1% have criteria in non-written form. The findings showed that instability in transactions resulted from unclear criteria, as well as from different criteria being set by individual paper mills. Consequently, both paper mills and consolidators recognized the importance of establishing common criteria. They agreed that common criteria would ensure a stable supply of quality used paper to paper mills and would serve to reduce complaints to paper mills from consolidators. The survey identified quality problems regarding used paper, such as water content, the permissible level of mixture with other types of paper, and the content of impurities. The results of the 1979 survey were scruti-

nized by committees consisting of representatives from paper mills, consolidators, the Ministry of International Trade and Industry, the Clean Japan Center — a foundation specializing in waste management and recycling — and the Paper Recycling Promotion Center.

The criteria have been revised several times due to the introduction of new types of paper and new treatment technologies. The revisions were also undertaken by a committee comprised of stakeholders. The latest list of impurities in used paper is shown below. The range of the impurities and specifications continues to be extended.

Similar classifications, standards, or guidelines have been developed for sorting other kinds of recyclable waste, such as glass cullet bottles. In developing such criteria, it is noteworthy that stakeholders have been accorded participation in the formulation process. In Japan's experience, the survey was used as a starting point for stakeholders in reaching a common understanding of current conditions and problems (refer to Box 1, Box 2, and Table 5).

Box 1 List of Impurities in Waste Paper in Criteria for 1979

Carbon, resin processed paper, oiled paper, waxed paper, aluminum foil, plastic processed paper, non-woven fabric, cellophane, synthetic paper, expanded polystyrene, pitch, plastic bags, and others. (Source: Paper Recycling Promotion Center)

Box 2 List of Impurities in Waste Paper in Criteria for 2005

List A: Materials unrelated to the raw materials for paper, which may cause significant problems

1) Stone, glass, metal, sand, and wood chips, etc.
2) Plastic
3) Resin-impregnated paper, parchment paper, textiles
4) Tarpaulin paper, waxed paper, construction materials such as gypsum board
5) Textile printing paper, thermal foam coated paper, synthetic paper, non-woven fabric
6) Other materials which may cause damage to processes or products

List B: Materials unsuitable to be mixed with raw materials for paper

1) Carbon
2) Carbonless Paper
3) Vinyl or Polyethylene Coated or Laminated Paper
4) Adhesive tape (but adhesive tape attached on the Carton box is excluded.
5) Thermal Paper, Perfumed Paper
6) Other materials not suitable for paper production

(Source: Paper Recycling Promotion Center)

Table 5 Criteria for Standard Quality of Waste Paper

	Impurities		Other Paper	Water content
	List A	List B		
Newspapers	Not acceptable	Less than 0.3%	Less than 1% *	Less than 12%
Cartons	Not acceptable	Less than 0.3%	Less than 3%	Less than 12%
Magazines	Not acceptable	Less than 0.5%	Less than 5%	Less than 12%
Miscellaneous paper	Not acceptable	Less than 0.5%		Less than 12%
Office paper	Not acceptable	Less than 0.5%		Less than 12%

Source: Compiled from Criteria for Standard Quality of Waste Paper, revised on November 29, 2006. * excluding inserted leaflets.

4.2.3 Industrial Waste Information Exchange Program

The Industrial Waste Information Exchange Program links suppliers with users in the industrial waste industry, in order to enhance the utilization of industrial waste. In Japan, local governments have conducted such programs. The basic structure of a waste information exchange program is shown in Figure 2 below.

A third party such as a local government, or a chamber of commerce or other public service organization acts as a locus for collecting information regarding waste generated from industries and potential users of waste, through questionnaire surveys or Internet-based reporting. The third party works as a middleman, who provides information about the supplier to the user and vice versa. Following information dissemination, the suppliers and users negotiate prices and conditions directly between themselves. The media used to disseminate the information may include paper documents, magazines and Internet. Examples of successful cases together with the types of waste concerned are shown in Table 6.

This kind of program was initiated in Europe in the 1970s. In Japan, Oita Prefecture started such a program in 1976. When the Oita prefectural government conducted a survey on industrial waste generation and treatment in 1975 and 1976, they discovered a number of cases where industrial waste that could have been recycled or used was instead disposed. The prefectural government thus recognized the need for programs to bridge the gap between waste generators and recyclers. Similar programs were also initiated by the governments of other prefectures, including Ehime, Okayama, Osaka. The Clean Japan Center assisted in some of these programs. In addition, it supported the interlinking of these programs, which encouraged the undertaking of transactions over a wider area. At least 20 similar programs had been launched as of 1988. Some currently active programs may be found in Kanagawa, Kumamoto and other prefectures.

Several keys to sustaining such programs have been pointed out. It is preferable to have industrial and commercial associations involved in the program than to have the government organize everything. If a local governmental agency operates the program, it is likely to fail, as private companies may not want to disclose their information to the government, and civil servants may not understand the technical aspects involved. Before negotiations between a potential supplier and user can take place, the third party should provide detailed information based on the intentions of both sides. The third party should also investigate the companies involved at the time of registration (Figure 2 and Table 6).

Fig. 2 Basic Structure of Waste Information Exchange Program

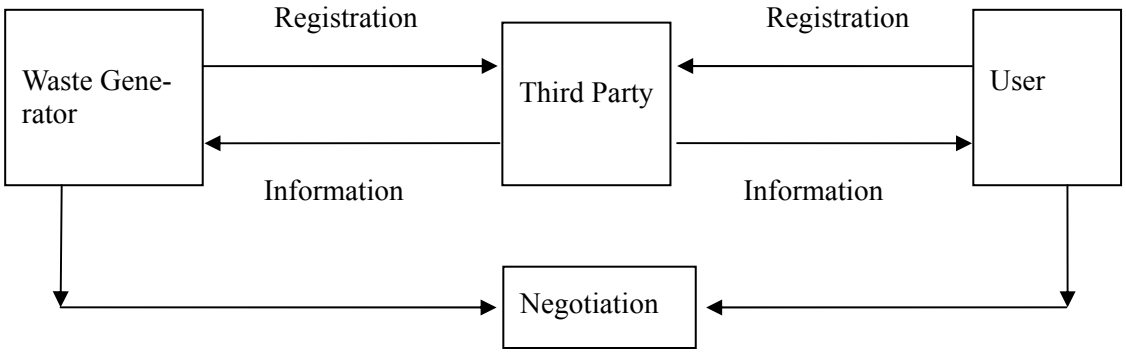


Table 6 Examples of Successful Cases of Waste Information Exchange

Waste	Supplier	User	Utilization
Ash	Power plant	Chemical industry	Neutralizer
Sewage sludge	Sewage plant	Cement industry	Raw material for cement
Sludge	Paper mill	Manufacturer of fertilizer and feed	Fertilizer and feed
Cooking oil	Catering service, hospital	Recycling of waste oil	Raw material for soap
Waste oil	Transport industry	Recycling of waste oil	Recycled oil
Waste oil	Transport industry	Public bath service	Fuel
Solvent	Electrical industry	Recycler	Recycled solvent
Tires	Dismantler of automobiles	Cement	Raw material for cement
Tires	Transport industry	Manufacturer	Recycled rubber
Paper waste	Steel industry	Paper industry	Raw material for paper
Wood chips	Lumber industry	Livestock breeder	Floor cover for livestock sheds
Slag	Manufacturer	Construction industry	Base course material
Dust	Manufacturer of lime	Cement industry	Raw material for cement

Source: Compiled from Clean Japan Center (1988a).

4.2.4 Eco-Town Projects

Eco-town projects began in Japan in 1997. In eco-town projects, local governments collaborate with private companies in promoting recycling and waste minimization, making use of the industrial infrastructure of the region. The project activities are supported by the Ministry of the Environment and the Ministry of Economy, Trade and Industry, especially in the development of advanced recycling facilities.

Before starting an eco-town project in a certain region, the local government prepares an eco-town proposal. This proposal is scrutinized by the two above-mentioned ministries, with the view of using it to serve as a model for other regions. To date, a total of 26 eco-towns have been approved. Eco-towns vary in type. For example, in Kitakyushu Eco-Town, recycling factories have been built and operate in an eco-industrial park. Generally, the factories are newly developed. Collaboration with research institutions located in the region is also stressed. In Kawasaki Eco-Town, linkages between the steel, chemical and other relatively large industries have been enhanced, and new facilities have been constructed.

If a recycling factory is not located in a region producing a certain type of waste, or if the capacity of the recycling factories present is insufficient to efficiently utilize a certain type of waste, one policy option is the establishment of an eco-industrial park.

4.2.5 Recycled products under Japanese Industrial Standards

Japanese Industrial Standards (JIS) specify standards for industrial activities in Japan, including standards for products and testing methods. The legal foundation for JIS is the Indus-

trial Standardization Law. Japanese Industrial Standards cover dozens of recycled products and testing methods, and are designed to promote the consumption of recycled products. Table 7 shows examples of standards that have been formulated.

The process of formulating standards is as follows. An industrial association or other organization submits a JIS draft to the Japanese Industrial Standards Committee. Following consultation with experts and stakeholders, the Japanese Industrial Standards Committee establishes the standard and publicizes it.

Table 7 Recycled Products under Japanese Industrial Standards

Code	Year Established	Latest Amendment or Confirmation	
A5011-1:2003	1997		Slag aggregate for concrete – Part 1: Blast furnace slag aggregate
A5011-2:2003	1997		Slag aggregate for concrete – Part 2 : Ferronickel slag aggregate
A5011-3:2003	1997		Slag aggregate for concrete – Part 3 : Copper slag aggregate
A5011-4:2003			Slag aggregate for concrete – Part 4: Electric arc furnace oxidizing slag aggregate
A5015:1992	1979	2003	Iron and steel slag for road construction
A5021:2005			Recycled aggregate for concrete –(class H)
A5022:2007			Recycled concrete using recycled aggregate (class M)
A5023:2006			Recycled concrete using recycled aggregate (class L)
A5031:2006			Melt-solidified slag aggregate for concrete derived from municipal solid waste and sewage sludge
A5032:2006			Melt-solidified slag material for road construction derived from municipal solid waste and sewage sludge
A5731:2002			Recycled plastic inspection chambers and covers for rainwater
A5741:2006			Wood-plastic recycled composite
A5905:2003	1957	1994	Fiberboards
A5908:2003	1957	1994	Particleboards
A6201:1999	1958	2004	Fly ash for use in concrete
A6206:1997	1995	2002	Ground granulated blast-furnace slag for concrete
G3111:2005	1956	1987	Rerolled carbon steel
G3117:1987	1969	2004	Rerolled steel bars for concrete reinforcement
K6313:1999	1951	2003	Reclaimed rubber
K6316:1998		2003	Vulcanized particulate rubber
K6329:1997	1954	2002	Retreaded tires
K6370:1999	1955	2003	Compounded stock for retreading and repair
K6450:1999		2003	Rubber blocks and rubber pavements – test methods
K6930:1994		2006	Reclaimed granular molding materials from agricultural polyvinyl chloride film
K6931:1991	1979	2001	Reclaimed plastics bars, rods, plates and piles
K6932:2007	1981	2006	Recycled plastic stakes
K7390:2003			Testing methods for reclaimed polyethylene terephthalate (PET) moulding materials from PET bottles
K9797:2006			Unplasticized polyvinyl chloride (PVC-U) three layer pipes with recycled solid cores
K9798:2006			Unplasticized polyvinyl chloride (PVC-U) three layer pipes with recycled foamed cores
L3204:2000	1985	2005	Recovered fiber felt
R5214:2003	2002		Ecocement
P4501-1993	1962	1998	Toilet tissue papers
Z1506:2003	1951	1997	Corrugated shipping containers

Source: Compiled from Japanese Standards Association (2007).

To speed up the establishment of a Sound Material-Cycle Society, the Japanese Industrial Standards Committee developed an Action Program for Promoting Formulation of Environmental JIS in 2001, which also covers standards relating to recycling. Some of the items specified in the Action Program have been requested by local governments which wish to promote the use of recycled products. One former obstacle to the use of recycled products was the fact that no clear standards existed to ensure the quality of recycled products. After JIS for recycled products established, government can easily schedule the recycled products in their procurement.

According to an expert, certain JIS for recycled products lack specified environmental safety testing methods. Hence there is still room for improvement in Japanese standards. Nevertheless in general, the creation of standards for recycled goods has significantly improved their reliability.

4.2.6 Eco-Labeling and Green Procurement

In order to promote environmentally friendly products, ecolabeling has been introduced in several countries. Ecolabeling covers efforts to tackle diverse environmental issues, including efforts in recycling. According to ISO classification, there are three types of ecolabeling. Type I, which is defined in ISO14024, is certified by a third party, based on measurement against a standard. Type II, defined in ISO 14021, is a declaration of environmentally sound features by the manufacturer itself. Finally, Type III, defined in ISO 14025, is ecolabeling indicating information disclosure.

In Japan, Eco Mark, a Type I ecolabel, was introduced in 1989. It covers 47 categories and about 4,600 branded products. Products are examined in terms of various aspects, including recycling and energy conservation. Some product categories are directly related to the 3Rs, such as "No. 22: Products made from used tires"; "No. 31: Refillable containers"; and "No.129: Recycled soap made from cooking oil." Criteria for paper also include requirement regarding the use of waste paper.

EcoLeaf is an example of a Type III ecolabel, which was introduced in 2002 by the Japan Environmental Management Association for Industry, with support from the Ministry of Economy, Trade and Industry. EcoLeaf environmental declarations apply the life cycle assessment (LCA) method to quantitatively present environmental product information. Based on extensive data analysis, environmental impacts such as global warming and acidification are shown in the label.

Ecolabeling alone may not significantly impact the level of consumption of environmentally friendly products. Moreover, if production volumes are low, products may become expensive as producers cannot enjoy the benefits of mass production. Since the public sector itself is a large consumer of products, implementing an environmentally friendly public procurement policy can serve to promote the production of environmentally friendly products.

Japan enacted the Green Purchasing Law in 2000. This law obligates the central and local governments and affiliated organizations to take the lead in purchasing eco-friendly products.

4.3 Current Measures to Overcome Breakdowns in Linkages: Implications for the Philippine Recycling System

As shown in section 2, the Japanese central and local governments as well as industrial associations have conducted numerous efforts to establish proper relationships between waste generators, collectors and recyclers. Although such kinds of collective action by stakeholders are still relatively weak in the Philippines, several efforts have been initiated in the Philippines to overcome breakdowns in linkages between stakeholders. These are presented below.

4.3.1 Quality Standards for Recyclable Waste

In the 2006-8 JICA project in the Philippines, the "Study on the Development of the Recycling Industry," quality standards for recyclable waste, including paper, tin cans, aluminum cans, glass bottles, PET bottles, plastic containers and packages, and white food trays and packages, have been formulated by recyclers of these materials. Dissemination of the related guidelines and actual implementation of the standards may help improve transactions between stakeholders. However, in the process of developing the guidelines, the involvement of consolidators and collectors has been limited in the Philippine case. If stakeholders themselves were involved in the process of developing guidelines and quality standards, the process itself would become an opportunity to disseminate information to Philippine stakeholders.

As far as is currently known, there has been no collective action by Philippine recyclers to set standards for recyclable waste. One incentive for recyclers to disseminate standards for recyclables to waste collectors and generators would be an improvement in the quality of segregated waste, which would in turn reduce recycling costs.

4.3.2 Industrial Waste Exchange Program

The Philippine Business for the Environment (PBE) organizes the Industrial Waste Exchange Network, which helps to link generators and users of industrial waste. This government program began in 1988, initiated by the Environmental Management Bureau (EMB) of the Department of the Environment and Natural Resources (DENR). However, companies have been reluctant to disclose detailed information about their waste to the EMB since this same government agency also handles pollution control. Since the EMB met limited success in tying up industrial waste generators and users, management of the Industrial Waste Exchange Network was transferred to the PBE in 1998.

Under current practice, industrial waste generators and users register in a database for matching companies that generate waste with those that recycle waste. More than 400 companies have participated to date, and it is said that 1,100 or more renewable materials and types of waste have been registered.

The PBE's activities are chiefly concentrated in Metro Manila, the National Capital Region of the Philippines. In other areas, partners have been selected in some cases, such as in Cebu. However, activity outside Metro Manila is limited, as most industrial users of recyclable waste are located in the capital region and the neighboring area.

4.3.3 Pilot Collection Conducted by Industries

A pilot collection program for mobile phones has been conducted as part of the "Study on the Development of the Recycling Industry," a joint project between the Philippines' Board of Investments and the Japan International Cooperation Agency (a BOI-JICA project). Mobile phone manufacturers have been reluctant to join the program, but participating service providers and retailers expressed eagerness to continue the collection program even after BOI-JICA project finished. Bins for collecting mobile phones have been placed in some malls and government buildings. The collected items are taken away by an e-waste recycler in the Philippines.

A pilot collection program for plastic bags has also been conducted in this BOI-JICA project. It has been conducted by a plastic manufacturers' association and has received positive responses from some communities and schools. The manufacturers also said they would be willing to continue the project.

Both of these pilot collections presently cover only the Metro Manila region. However, expansion to other regions is expected in the future.

4.3.4 Ecolabeling and Green Procurement

Article 26 of RA 9003 states that the Department of Trade and Industry (DTI) shall make proposals to stimulate the demand for the production of products containing post-consumer and recovered materials. Moreover, Article 27, entitled "Requirements for ecolabeling" requires the Department of Trade and Industry (DTI) to formulate and implement a coding system for packaging materials and products to facilitate waste recycling and reuse.

The memorandum of understanding (MoU) on the establishment of ecolabeling was signed by the Product Standards Office of the DTI, the Environmental Management Bureau of the DENR, and a nongovernmental organization, the Clean & Green Foundation, in March 2001. The ecolabel certifies third parties in accordance with ISO14024. Although guidelines for every product are stipulated, to date only detergent and cement products have been certified.

Regarding green procurement, in 2004, the Philippine president issued Executive Order No. 301, which mandates each government organization to undertake a green procurement program. Specifically, it requires the using of environmental criteria as bidding conditions, the defining of standards and conditions for environmentally friendly products, the development of programs to provide incentives for the supply and consumption of environmentally friendly products, and other measures. Moreover, the details of the green procurement programs carried out by each organization should be reported to the National Ecolabelling Program Board (ELPB).

Before this order was issued, the BOI established the BOI Green Procurement Plan in 2003, and established guidelines for paper (bond paper, tissues, toilet paper, folders, envelopes) and office automation equipment (computers, copiers, fax machines, etc.). The guidelines encourage persons-in-charge to purchase ecolabeled products and domestic products.

4.4 Recommendations for the Philippines

Although there are several efforts to improve the linkages among stakeholders in the Philippines, they are still weak. The failure of stakeholders to satisfy supply and demand requirements at each transaction point in the Philippine recycling system can undermine the environmental sustainability expected from the recycling efforts. Central and local governments, the private sector, and civil society alike advocate the need for cooperation in order to achieve recycling goals. Given the data from the Philippine and Japanese experiences, the following recommendations can be made to improve cooperation between stakeholders.

1. Communication and information must reach all stakeholders regarding the desired quality and quantity of recyclables, specifically relating to the supply and demand requirements of recycling plants and manufacturers.
2. The sorting and segregation of clean recyclables are vital for enabling recycling processors and manufacturers to produce recycled materials. These activities must be undertaken at the waste generation and collection stages. Public information and logistics must be provided to adequately prepare waste generators to engage in the sorting and segregation of quality recyclables.
3. Quality standards for recyclables and recycled materials need to be developed among stakeholders through values formation and capacity building, and compliance must be monitored and evaluated for further action.
4. To achieve the accumulation of large volumes of recyclables, there needs to be logistical support for all stakeholders, including financing, transportation, processing technology, market research and planning.
5. The theft of potentially saleable recyclables causes trouble to all stakeholders, not to mention to the country's law and order authorities. This must be addressed by policy to ensure the flow of quality recyclables to junkshops, recycling plants and exporters.
6. For strategic planning, market planning development, and other forms of intervention, it is vital to engage the participation of stakeholders—the recycling plants and recycling industry associations, the trader-consolidators, and the junkshops. The relevant central and local governmental agencies should also serve as principal participants in planning and implementing effective recycling strategies. With their recent initiative, the BOI and the DTI could be designated as lead organizations, with support from JICA.

Conclusions

The findings of the IDE study describe the stakeholders and their patterns of interaction and operations, as well as issues and concerns relating to the Philippine recycling system. The experiences of Japan are also instructive for the Philippine efforts in planning the development of its own recycling industry.

In the Philippine setting, the critical problem in stakeholders' relationships in the buying –and selling of recyclables, as well as in the processing of these recyclables by recycling plants and manufacturers, comes down to the poor quality of waste materials, referred to as recyclables. The volume and quality of recyclables are constrained by weak compliance with sorting and segregation at the waste generation level, which also leads to dirty and unsuitable recyclables for processing and manufacturing recycled products. When sellers dishonestly in-

clude poor quality waste materials and impurities, buyers incur loss from having to reject and discard unsuitable materials; or, if such materials are used, this results in higher costs of pretreatment for reuse in manufacturing, or poor quality manufactured recycled products.

Unreliable stakeholder behavior, where poor quality materials are passed on in the recycling process, undermines the potential for expanding markets for recyclables and recycled products. The trading interface of the waste generators, primary collectors, and consolidators is constrained by the pricing of and demand for recyclables from the recycling plants and manufacturers. Instability in price and demand undermines the profitability and stockpiling of recyclables, resulting in unsteady supply. In the long run, the recycling plants and manufacturers cannot simply rely on the collectors for the volume they need, given their technological capacity and market demand. These factors undermine the recycling system and may defeat the goal of environmental sustainability by curtailing the extraction and use of virgin materials in the continued cycles of production and consumption.

The experiences of Japan in recycling and the recent initiatives of the Philippines prove to be mutually instructive for planning the development of the recycling industry, specifically in standards setting, ecolabeling, and green procurement. They may also be helpful for other developing economies.

The length of operation of Japanese policies and project interventions indicate their sustainability. As shown in Section 3, similar activities have been introduced in the Philippines. It is important for the Philippine government and organizations to learn not only the policy tools used in Japan, but also the process of formulating policies and coordinating relations among stakeholders. To address the problem of theft, possible measures would include a registration system for collectors and junkshops, and intervention in management systems.

Drawing from the recycling problems and recent initiatives in the Philippines, as well as from Japan's positive experiences in resolving similar problems, it can be seen that various measures exist to sustain recycling as a solution to environmental problems relating to waste materials. Fundamentally, there is a need to develop a culture of waste sorting and segregation among society as a whole. Improvements in the systems of collection, procurement, and waste exchange can help increase the volume of recyclables. The setting of quality standards and information dissemination can help improve the quality of the collected waste materials, as well as decrease the costs of pretreatment at the recycling plant. Meanwhile, the creation and expansion of markets with steady buyers encourage the collection and trading of recyclables. Developing the recycling industry in the Philippines and sustaining existing initiatives in Japan are both in line with global commitments to protecting the environment from degradation from pollution due to improper handling of waste, specifically solid waste from different sources of generation.

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