Chapter 2

Current Situation of Waste Recycling in Indonesia

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Chapter 2. Current Situation of Waste Recycling in Indonesia

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1. Introduction

The problem of waste management in developing countries, such as Indonesia, has a number of aspects associated with them, such as technical, institutional, financial, environmental and social aspects. To effectively and efficiently overcome this problem a holistic approach to develop solutions is required. The impact of these aspects varies markedly depending upon the income levels and socio-economic factors of individual countries or cities. Higher per capita income levels in developed countries allows for the financial means to maintain appropriate collection systems, treatment and disposal management. The generally higher education levels of the population in developed countries also provide the support for implementation of 3Rs of waste programs, public education and strict environmental regulations. Eventually it became clear that a sustainable improvement could be reached only by the integration of socio-economic and socio-cultural elements into the whole scheme. In Indonesia, proper waste management have been a major challenges in waste problem, but concern on gradually waste reduction through recycling have been raised in recent years. With the increasing growth of population and economic activities, the volumes of waste to be handled would increase accordingly. This paper reviews current situation of waste recycling in Indonesia. In the first section, the development of legislation on waste was explained. Section two overviews the flow of municipal solid waste management. Section three focus on hazardous waste management. In section four, recycling of waste electronics and electric equipment was reviewed.

2. Legal Aspect

2-1. Hazardous Waste Regulations: [1]

Interest regarding hazardous wastes in Indonesia had emerged since 1990s, especially after the intensified industrial activities. The hazardous wastes management in Indonesia refers to the principles and guidelines for sustainable development as stipulated in Law No. 4/1982 on Basic Provisions for Managing the Living Environment. The amendment of this Law has been issued by Law No. 23/1997 on Management of Living Environment.

The management of hazardous wastes was regulated in 1994, through the *Peraturan Pemerintah* (PP) or Government Regulation (GR) No. 19/1994, then revised through the PP No. 12/1995, an improvement and betterment of the PP No. 19/1994 by introducing reuse and recycling approach. Further, this regulation was improved in 1999 through the new PP (GR) No. 18/1999 amended by PP No. 85/1999. This regulation did not only prevent and minimize the generation of hazardous waste, but it also regulated their control, storage, transport, treatment and final disposal, including recycling and recovery. In addition, it also addressed issues for importing and exporting hazardous waste Decree of the Head of the *Badan Pengelola Dampak Lingkungan (BAPEDAL)* or

Environmental Protection Agency (EPA) 01/Bapedal/09/1995 to 05/Bapedal/09/1995 were further regulated those Government Regulations.

Before 1994, the handling of hazardous wastes was integrated with the other pollution control programs. After legislation of the PP No. 19/1994, the issue of hazardous wastes had been given special attention particularly those from industries. Based on the "cradle-to- grave" concept, these regulations control the handling of hazardous waste, starting from its place of generation, storage, transport, recycling, processing, to its final disposal, including the monitoring procedures at every step along the chain.

A waste may be considered hazardous for a number of reasons. Of that reasons, the potential for some wastes to cause a toxic reaction in humans is the most fearful anxiety among public concern. PP No. 18/1999 amended by PP No. 85/1999 defined a waste to be hazardous under legislation if it meets one or more of the following conditions:

- exhibits characteristics such as being explosive, ignitable, reactive, toxic by Toxicity Leaching Characteristics Procedure (TLCP), infectious, corrosive, and/or toxicity by Lethal Doses-50 (LD_{50}) tests;
- is a non specific source which includes generic wastes generated by a variety of general process, such as spent halogenated solvents tetrachloroethylene, trichloroethylene, etc;
- is a specific source which is generated from specific industrial process, such as bottom sediment sludge from the treatment of wastewaters from wood preserving industry process that use pentachlorophenol; and
- is a specific commercial chemical product or intermediate, discarded commercial chemical products, off-specification species, container residues, and spill residues thereof.

Other regulations that directly affect the quality and quantity of the generated hazardous wastes, are followings which control hazardous materials, namely:

- Government Regulation No. 7/1973 pertaining to the control, circulation, storage and use of pesticides
- Decree of the Ministry of Health No. 453/Menkes/Per/XI/1983 pertaining to hazardous materials
- Decree Letter of the Ministry of Industry No. 148/M/SK/4/1985 pertaining to the safeguarding of toxic and hazardous materials
- Decrees of the Ministry of Trade No. 155/Kp/VII/95 and No. 156/Kp/VII/95 pertaining on the trade of controlled imported goods
- Decree Letter of the Ministry of Agriculture No. 724/Kpts/TP.270/9/1984 pertaining to the prohibition of using the Ethylene Dibromide (EDB)
- Decree Letter of the Ministry of Agriculture No. 536/Kpts/TP.270/7/1985 pertaining to pesticide control

The first centralized hazardous waste treatment plant in Indonesia had been in operation since 1994. It was located in Cileungsi - Bogor (West of Java Province). This facility was meant initially to accept all wastes categorized as hazardous from industries in the surroundings of Jakarta, Bogor, Tangerang and Bekasi (JABOTABEK). It was presumed that from the planned operation area in 2001, there will be 67,000 tonnes of sludge deposits from industrial waste treatment processes per year, and 18,000 tonnes of liquid waste containing solvents, oil-spill or used oil per year.

2-2. Solid Waste Management (SWM) Regulations: [2]

Since May 7, 2008 Indonesia has introduced Law of Solid Waste Management (Law No. 18/2008), which has been drafted since 2003. The finalization of this law was delayed for such a long time until it was revived after the incidence of landslide of the Leuwigajah final disposal in February 2005. With full support from the government and parliament, it reached an agreement that a new paradigm in waste management in Indonesia was required. This SWM Bill was submitted to Parliament by the Government of Indonesia in August 2007.

The law of SWM defines solid waste as the residues of human daily activities and/or residues of natural processes in solid forms. Wastes specified under this law include the following: (a) domestic waste; (b) domestic waste equivalents; and (c) specific wastes:

- Domestic wastes, those generated by daily activities performed within households, but not include feces and specific wastes;
- Domestic waste equivalents, those generated from commercial zones, industrial estates, special zones, social facilities, public facilities and any other facility; and
- Specific wastes, those that require special management due to their properties, concentrations and/or volumes, in forms of:
  - hazardous materials contained wastes;
  - hazardous wastes contained;
  - wastes generated by disasters;
  - remnants of constructions ruins;
  - un-processable wastes due to availability of technology; and
  - non-periodical generated wastes

Waste management is performed under several principles: responsibility, continuity, benefits, equity, consciousness, commonness, safety, security and economic value. All of them aimed to improve the health of the community, and environmental quality, as well as convert wastes into resources.

The basis of waste management under this new Law is waste reductions as the first priority, and waste handling as the next priority. This Law also outlines directions on the tasks and authorities of governments, such as, but not limited to:

- conduct studies, develop programs on waste reduction and waste handling with the main emphasis on local-specific technology applications;
- promote and facilitate the development of efforts in reducing, handling and beneficially using wastes and yields of waste processing;
- perform coordination between governmental agencies, communities and business world so that there is an integration of efforts in waste management;
- establish national policies and strategies, norm development, standards, procedures, and criteria of waste management; and
- facilitate and develop co-operations between local areas, partnership and networking in waste management.

Some of the central issues of Law No. 18/2008 are as follows:

- extended producers responsibility (EPR), every producer should indicate a label on their product packaging and/or their final products about reducing and proper

handling of waste; and they should also manage the packaging of their products that are impossible or very difficult to be decomposed by natural processes;

- the application of waste reuse and recycling through the entire chains of waste transport, since their origin to their final disposals;
- selection of waste processing and dumping technologies that are safe and healthy, and conform with Indonesian situation. Open dumping and open burning are forbidden and during five years after the passing of the law, open dumping would be completely banned; and
- prohibition to import waste into Indonesia territories, and to mix waste with dangerous wastes.

3. Municipal Solid Waste (MSW) Recycling

3-1. MSW management in Indonesia [3]

The generation rate of MSW is generally calculated as 2.5 – 3.0 l/capita/day based on standard national of MSW generation (SNI S 04-1993-03) established in 1993. Based on a survey in Bandung area in 2005, the estimated MSW generated in this area was 0.59 kg/capita-day. Based on a survey in 2005-2006, the average of organic wastes in Bandung area was 52% (weight) and for inorganic wastes was 48% (weight).

There are not enough collection-transportation vehicles available. The transport vehicles are very often "old-timers" where the waste has to be filled in manually without any covers, which are above the heads of the workers. Open vehicles loose part of their load during their tour to the dumping area. There is generally too much time lost during transport due to traffic problems in the street. A transport vehicle sometimes needs hours to cover a few kilometres from city to landfill. Therefore most of the collection vehicles can do only 2-3 trips a day. In certain protocol areas and special zones, door-to-door collection is applicable using a better collection of MSW, such as compaction vehicles. This is carried out only in larger cities.

In so far, most of existing MSW management system in Indonesian municipalities relies on the existence of landfill. Most of wastes transported to final disposal sites are treated through open dumping, and it was estimated that only as much as 10% of it that were treated through better system such as controlled landfill. In many sites, these facilities are nothing more but uncontrolled open dumping sites. The main reason for this practice is due to the limitation of operational budget. Lack of serious attention over these final disposals tend to be a general practice on the part of city administrators in Indonesia, along with their presupposition that the waste handling over these landfills would run on them.

The common practiced for a landfill site is usually based on administrative borders. This is understandable, as the landfill manager is usually the city cleanliness division, working under the auspices of the local government. Differences regarding the administrative borders have sometimes brought unfavorable effects, such as the different perceptions between the respective local area governments: between Jakarta City and Bekasi City (landfill of Bantar Gebang), Bandung City and Bandung District/Cimahi City (landfill of Leuwigajah) and the like.

Rapid population growth in urban areas, socio-cultural classes heterogeneity and community participation that is generally not well directed and well organized have resulted the complexities of MSW problems to be handled in a municipality. On the other hand, fund situation and relatively low priority in waste handling among local governments are general trends, along with the limitations in proper human resources, adding to the low performance of municipality in handling the sanitation and waste in urban area in Indonesia. Many aspects involved in the cause of inadequate MSW management, some of these are lacks of supports of municipalities to address wastes problems systematically, integrated and comprehensively, lack of standard policies that are comprehensive and consistent in matters of waste handling, and lack of disciplines among waste managers in applying proper technical procedures. During the last years, because the problems of solid waste disposal became too obvious, the pressures of the public and the growing awareness concerning the environment also have caused a change in the policy concerning waste management. But still the progress in this field of environmental protection is slow and improvements are often rarely visible.

The MSW management in Indonesia has reached its relatively sound performance during 1990-1995, where many cities were being motivated to improve their cleanliness/sanitation due to, inter alia, the existence of Adipura Award program which would be granted to any city eligible to be called as successful city. Ever since, the multidimensional crises in Indonesia and the reforms entailing such crises in end of 1990s, turning point in MSW management in Indonesia begun. The era was significantly marked by fundamental changes in political and governmental aspects, such as decentralization and local autonomy era. In line with the implementation of local autonomy policy, municipal/district governments took over the full authority and responsibility of waste management from the central/province government. Many of these local governments adjusted the related policies, even drastically, especially in its institutional aspects. Another significant impact is the appearance of locality ego-centrism, which in turn poses difficulties to municipal governments to operate their respective landfills that generally situated in sites outside their own jurisdiction. The local autonomy era without well-supported local officials is one of the main factors responsible for the degradation of waste management sector in Indonesia. The main cause is lack of political will associated with the importance of MSW management within their own municipalities or districts to the extent that their views of funding priorities for waste management are at the lowest ranks.

The generally accepted practice of main sources of financing of MSW handling among most of Indonesian cities is originated from governmental development budget. The second main financial source comes from waste retribution charged to waste generators. It is indeed hard to raise the retribution, considering the still limited capacity of the people. The ideal condition is that the collected retribution would afford all of operating cost and expenses required, including all of maintenance expenses and even any depreciation expenses. Almost all of MSW management operators are experiencing fund deficit from their regular operation. There are some reasons they have been stated, including improper tariff structures, low appreciation of waste generators, including local governments themselves, to repay the service equivalent to the respective obligation.

One reason to the low-awareness on the part of the community to pay MSW tipping fee is that they are lacking knowledge of information associated with costs or expenses required to handle wastes. The currently prevalent circumstances is that there are two different services by two different service providers: the first involve cost of wastes

collection from households to be collected to transfer station, normally operated by their respective neighborhoods, and the second involve cost to transport the collected wastes from those transfer stations to final disposal, which were the responsibility of municipality's waste management. Most of community members, however, lack the knowledge of the complete stages to the extent that they feel they should pay multiple waste retributions.

3-2. MSW Recycling in General

One of the important mandates in the Law No. 18/2008 is the implementation of waste separation. Any recyclable waste is collected from its respective sources, such as residential areas, commercial zones, temporary collection facilities and the final processing facilities. Wastes are recycled to useful raw materials for production processes (i.e., reprocessing and remanufacturing activities). Every country recognizes the important of recycling. In most countries, plastics, glasses, papers, and metals are well collected by either the informal sector or municipalities, and these materials are recycled. In the case of MSW in Indonesia, there are two main recycling flows. In the first flow, collectors, including those in the informal sectors, collect recyclable materials at sources. In the second flow, these materials are separated and recycled by the municipality after MSW collection. Recycling activities in this context are all activities of reusing objects that previously been called as "waste", either by directly self-reusing or by selling to waste traders.

Most of Indonesian people in all economic levels have different terminology in perceiving the end-of-life of goods, including consumer goods. In other countries, especially in developed countries, some goods like used newspapers, old magazine/book, old clothes, old electronic-electrical etc. are considered to be waste and tend to generate any problems. In Indonesia, these wastes would be rather be perceived as used object that still have an economic value, to the extent that they rarely would be found in municipal waste management chains, for the very reason that these stuffs are actually saleable, or could be donated to the others who have lower income. Like in any other major city in developing countries, the informal sectors play an important role in any recovery effort over the usable materials of waste. The recycling activity engages this sector, to include housewives, waste workers (from the cleansing division), vendors of used articles, and waste pickers. Middle-men or intermediary traders are found in all corners of the Indonesian cities to buy used articles directly door-to-door. Dry waste (inorganic waste) is the most easily found object for waste recycling in large cities in Indonesia.

Another very active group in waste recycling activity is the waste pickers (scavengers). The existence of waste pickers in the waste management system brings about two different opinions. Some people consider that the activity will not only provide opportunities for the poor people to work in this sector, but will also help to reduce the amount of waste for disposal to the final dumping site. The other considers that this activity would bring a "bad" image to the country. So far, the role of informal sector in waste recovering activity has not been well organized.

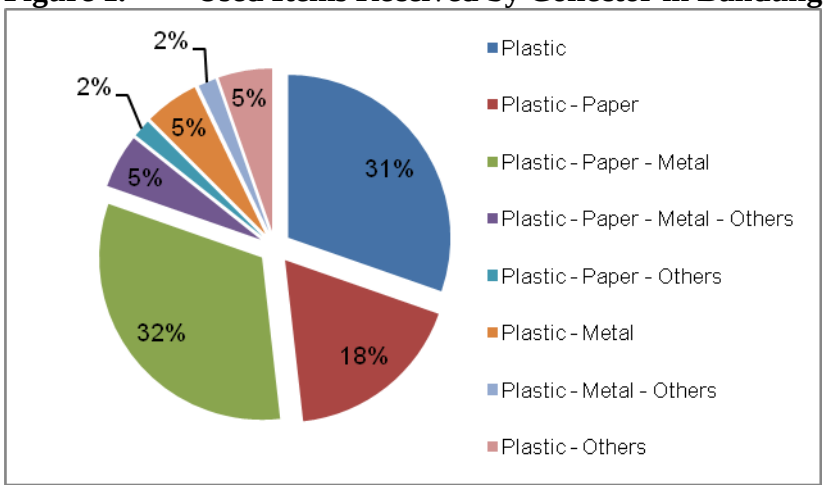
A positive impact derived from the current SWM systems in developing countries and economies in transition is the high level of recycling of the inorganic component of MSW. Although the methods employed for sorting and separation of MSW in these countries are considered inappropriate for solid waste management systems, as defined by

developed countries, these existing method not only provide an income stream to the hundreds of thousand people involved in this informal sector but also ensure a far greater amount of MSW generated is recycled.

Some of the recyclable wastes are collected by wastes scavengers who sell these wastes to the collectors. The latter separate and classify the wastes into several groups of items depending on the types, then sell them to the whole sellers. These sellers will then trade these wastes to recycling factories. Some parts of these wastes are recycled within the cities that produce them, but in general they sell these wastes to other cities, or even export them aboard.

Research results in 2007 [4] on waste of mineral water packaging in Bandung City showed that the most frequently traded used items were mineral water packaging plastics (bottles and cups), plastic sheets (leaves), newspapers, office supplies papers, ex packaging cardboard boxes, glass bottles, iron, metals (aluminum, copper) and used electronics debris (Figure 1).

Figure 1. Used Items Received by Collector in Bandung



[Source: Ref. 4]

This profile of used items trading is also similar to the results of a survey conducted in 2008 among recyclers in five cities, which include the Batam island, Bogor City, Magelang City, Makasar City and Pontianak City. Most of the respondents said that the most common used items recycled for local and export purposes comprised of plastics, papers, irons and metals [7].

3-3. Plastic Waste Recycling

The quality of wastes as used items that have potentials to be recycled determines their market selling prices. The recycling business-chains players in this activity are collectors (waste traders, and scavengers), intermediaries and recycler industries. They have their own criteria that should be met by their respective business partners. The discussion of some categories of plastic recycling players will be explained in the following sub-sections.

Based on the interviews with one of the plastic recycling players in Bandung City in March 2009, it could be concluded that most of the intermediaries or brokers in the recycling business channels serve as the main hubs between small collectors and large collectors, or between collectors and pellet making industries. These brokers work independently and individually using territorial bond or relatives based relationships, or listing by phone to get buyers or sellers. These brokers have authority in determining the quality of any item that would be released by the sellers, and to be offered later to the buyers or, alternatively, these brokers would find the items requested by the buyers. For example, these brokers would search the requested items from collectors in form of colored or transparent PET (*Polyethylene terephthalate*) plastic bottles in already pressed conditions for pellet making industries according to their consumers' requests. Brokers income from this very role is in the form of commission percentage of their pre-agreed amount upon selling or buying prices.

According to the interviews with one of the collectors of used plastic packaging, who is also the owner and manager of pellet making and recycled product factory, the power of a broker to survive and expand through the course of weak economic conditions lies in his or her wide networks (inter city, intra city, even international), the availability of supporting means such as press machines and/or cracking and pelletizing machineries to meet markets' needs, and the reliability of the products to be sold. Generally, these plastic packaging items collectors determine minimum standards for any item to be accepted from their counterparts e.g. scavengers. These standards are, but not limited to, as follows:

- Transparent PP (*Polypropylene*) from mineral water cups and transparent or colored PET from any drinking product bottles are usually been determined under two-tonnes/week minimum quantities requirement [5, 6].
- Other types of wastes that can be accepted by some plastic waste collectors such as papers, metals and glasses have no definite criteria [4].

Recycling industries or more widely known as pelletizing industries, in some cases serve dual roles, either as collectors or as end users of recycled products, depending on their business scales and the completeness of their own production means. Based on study in 2008 [4] and interviews with one of the collectors [6], it showed that plastic pellet manufacturing industries were generally requiring materials in the form of homogenous scrapped plastics in terms of their packaging uniformities, such as PP-only scraps or PET-only scraps. As long as these pellet industries gave grinding machines, however, they preferred to accept items in their pressed forms, because this would guarantee the scraps quality as export products or premium products for local usages. The impurity in the scrap of plastic mix of product from several different sub-collectors was frequently found such as the PVC (*Polyvinyl chloride*), PS *(Polystyrene*), iron rod, broken glasses, and aluminum rods.

Based on the interviews in February 2009 with one of big collector/recycler in Bekasi city [7], the grade of quality required to produce the end-product in forms of coconut root sweepers, would be met by green, red and blue pellets, depending on the color of the sweeper frames to be produced. For the end-products in form of plastic balls and kid coin holders, however, they required used grease bottles HDPE (*High-density polyethylene*) pellets. Thus, the most essential thing is the homogen quality based on packaging plastics they accepted from their trusted business partners. This will play an important role for their product to be successful and in maintaining good partnerships.

A producer of plastic zipper (2008) in Cimahi City (West of Java Province) expressed similar views [8]. His company produces zipper that requires transparent and colored PET as its raw materials. It has established criteria for any items that it would accept from its partner-collectors, in that these items should be already in their pressed forms. The main reason for setting these criteria is due to limited areas of its raw material warehouses and that the quality of the scrap products is generally better if they are produce in in-house basis. In this way, his industry will only sort these pressed materials based on their colors, cleansing, scrapping and washing through drying processes.

3-4. Plastic Waste Price Variations

Based on study in 2008 [4], the selling prices of plastic waste at the sources and collectors levels in Bandung City for June-November 2008 periods are presented in Tables 1 to 5 (1 US$ was equivalent to Rp 9,300 in June 2008 up to Rp 11,000 in November 2008).

Table 1. Plastic Waste Prices at the Sources Level [4]

Type	Sources Category (thousand Rp/kg)								
	HH	School	College	Stars Hotel	Budget Hotel	Restaurant	Office	Mall	Hospital
Cup (PP)	2 - 7	0.5 – 6	4 – 6	1.2	2.5 – 4	2 – 4	-	4 – 6	1.7 – 6
Bottle (Clear PET)	2 – 5.5	2 - 6	3 - 6	1.2 – 3.5	1.5 – 3	0.6 – 6	3	2 – 3	1.7 – 4.5
Color PET, (brand name)	2 - 3	0.8 - 6	-	-	4.5	1	-	0.5 -1	0.5 – 1

HH = household

Table 2. Plastic Waste Prices at the Collectors Level [4]

Type	Sources Category (thousand Rp/kg)		
	Mobile Scavenger / Junk Dealer	Temporary Station (TPS) Scavenger	Landfill Scavenger
Cup (PP)	4	4.5	4.5
Bottle (Clear PET)	3	3.5	3
Color PET	1.75	1.75	1.5

Table 3. Range of Plastic Waste Prices at Scavengers Level [4]

Type	Prices (thousand Rp/kg)	
	Buying-Prices	Selling-Prices
Cup(PP)	0.8 – 7	1.5 – 11.5
Bottle (Clear PET)	0.4 – 4.5	0.5 – 6.5
Color PET	0.2 - 3	0.4 – 3.5

Table 4. Range of Plastic Wastes Prices at Collectors Level [4]

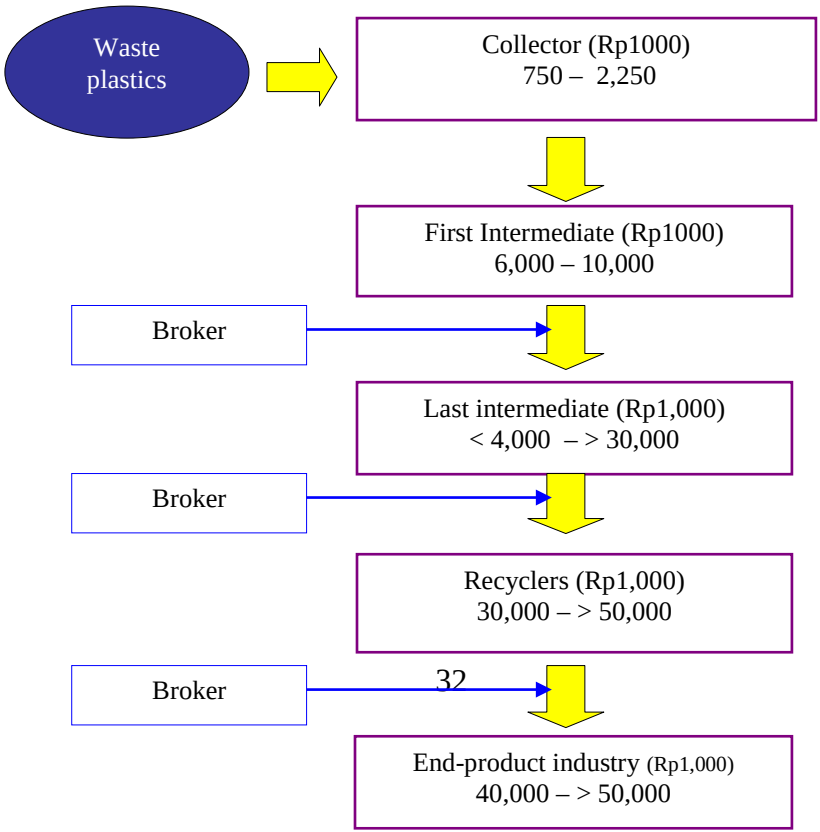
Plastics Waste	Prices (thousand Rp/kg)	
	Buying-Prices	Selling-Prices
Cup(PP)	1 - 11	2.5 -16
Bottle (Clear PET)	1 – 5.5	1.5 – 8
Color PET	0.5 – 4.5	1 - 7.5

Table 5. Prices at End-product Industries [6]

Raw Material	Buying-Prices (thousand Rp/kg)
Pellet virgin *(per November 2008)*	10
PET clear- *scraps*	4.5
PET clear - bottle	3 – 3.5
PET colour - bottle	2.5

Luck in engaging to recycling business, especially plastic recycling business is felt strongly especially by plastic grinding business players or large collectors with fix relations with industries that use their products as raw materials or end product industries. The range of gains or profit usually earned by large collectors is more than Rp. 10,000,000 per month. For large collectors with dual roles as raw material making industries and small end product manufacturing industries, this figure could reach as high as Rp. 30,000,000 per month. Monthly gross revenues or routine turnover of each plastic recycling business players based on previous research [4] and direct interviews with a large collector, pelletizing industry and end products manufacturing industry [6] are shown on Fig. 2.

Figure 2. Average Monthly Omzet of Recycling Business in 2008



[Source of data: Ref. 4 and 6]

The magnitude of monthly turnover, especially for large collectors and recycled product manufacturing industries, depends on the quantities of sales and purchases of its corresponding used items. Large collector with dual roles as raw materials making industries and recycled products manufacturing industries such as Mr. Baedowy [6], the owner of the Majestic Buana Group (MBG) in Bekasi City – West Java, expressed their strong interests with recycling business due to their incredible profits potentials. According to him, daily net profit from plastic bottle flake (PET) business could reach at least Rp. 500 a kilogram of plastic wastes and if it is supported by the capacity of milling machines of 1 tonne of plastic wastes a day, then the minimum Rp.500,000/day profit or Rp. 15,000,000/month net profits would be guaranteed.

3-5. Plastic Recycling Association [6]

Based on interviews with Mr. Baedowy, it is known that there is a Plastic Recycling Association of Indonesia, led by himself. Currently, this association has more than 40 member organizations all over Indonesia. This association serves as a network through partnership programs and businesses building programs with the Majestic Buana Group (MBG). The association members (hereinafter would be referred as "partners") are bonded through selling-buying written contracts, that they should use the MBG-owned machineries for the procurements and acquisitions of the end product of plastic waste milling.

The rights and obligations stipulated under the contracts between the MBG and its partners are as follows:

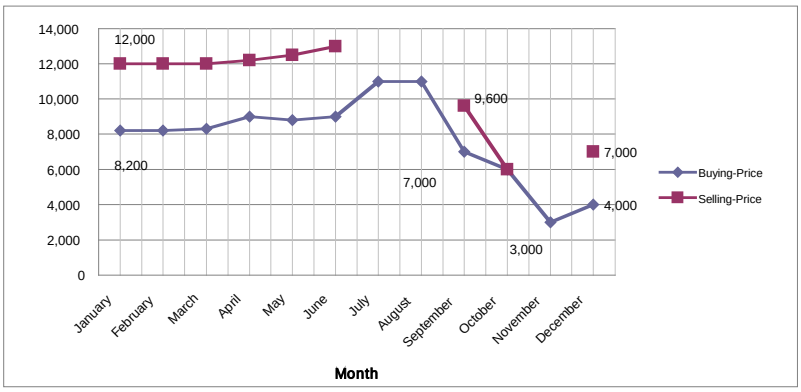
- The MBG as the center of the association is required to train and develop its partners so that the latter can ultimately have the abilities to produce their own plastic products independently;
- Th MBG is required to absorb the entire products of PET flake from its partners as long as these products meet the MBG predetermined standards. i.e, they should be in dry conditions and pass quality control tests procedure. This quality control procedure aimed to maintain the product homogeneity against any pollutant, such as rubber bracelet and ties;
- Every partner is allowed to sell its plastic flake products to third parties as long as it sent prior notice to the MBG;
- Every 20^{th} day of each month, partners are required to propose PET selling price listings based on the needs and conditions of market as observed by the partners to the MBG, so that the latter will be aware of the problems faced by its partners and take proper actions accordingly, and that nobody will be hurt;
- The acquisition price of the MBG from its partners should be determined every 25^{th} day of each month and should apply from the first day until the end day of the following month, and should be re-evaluated every 25^{th} day of each month;

- Payments from the MBG to its partner should be executed through the agreed upon inter bank transfer procedures, the maximum delay payment from the MBG is one working day from the date of the relevant items received; and
- Partners should deposit Rp.10,000,000 cash to the MBG as a guarantee against any possible breach of contracts, such as that partner sells their products to the third parties without prior notices. Should the signing of selling and buying contracts have lapsed until two-year periods with no breach of contracts, these money guarantee would be reimbursed by the MBG.

3-6. Plastic Prices Fluctuation

The study in 2008 [4] found that there was a flux in the buying and selling prices of PP from January until November 2008 as depicted in Figure 3. Based on the information gathered from several main collectors in Bandung City, it was seen that there were increases in PP plastic prices at the collectors level during the beginning through mid year of 2008 and reached their optimum level at July – August 2008 period. Entering September through November 2008 period, the purchase prices at collector level decreased significantly to more or less 50% of their beginning year's position. This decrease percentage was obtained by comparing the begriming year's price position relative to the lowest prices occurred during the period. It seemed that the main cause of this price decline was global economic condition. By January 2008 through June 2008, collector level price rose to Rp.13,000 per kg PP flake available. No collector level price data available for July – August 2008 period, because during that period the collectors were not selling PP flake available to industries. The similar conditions were observed once again in November, when the collectors preferred to build their inventory stocks, rather than to sell them with lower process, awaiting the prices to be rebounded.

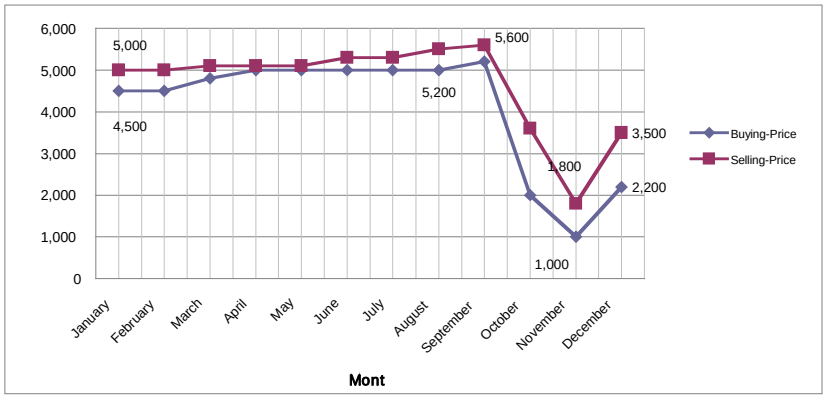
Figure 3. Fluctuation of Selling-buying Prices of PP in 2008



[Source: Ref. 4]

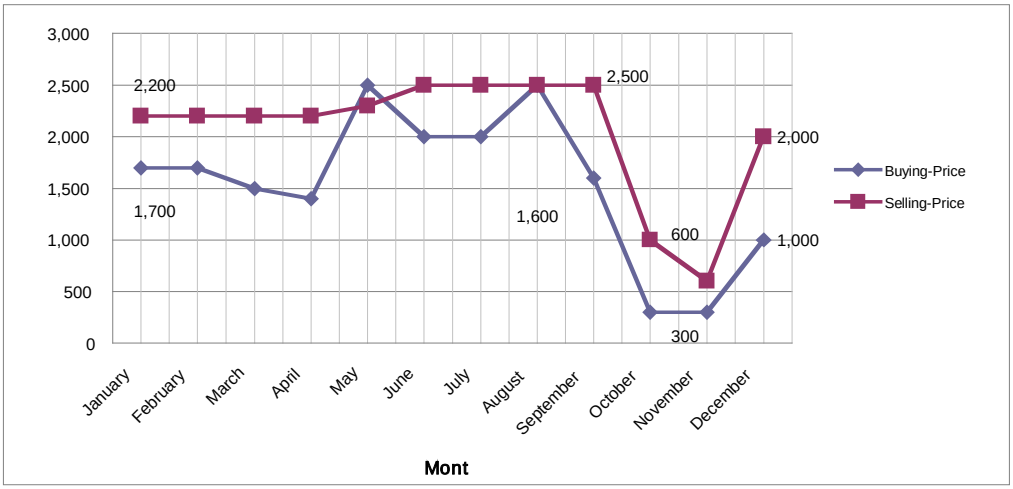
The similar conditions were also observed for packaged mineral waters, the source of transparent and colored PET wastes. Figure 4 depicts the fluctuation of transparent PET prices and Figure 5 depicts that of colored PET.

Figure 4. Fluctuation of Transparent PET Buying Prices in 2008



[Source: Ref. 4]

Figure 5. Fluctuation of Colored PET Buying Prices in 2008



[Source: Ref. 4]

The buying prices of transparent PET declined up to 78% from its beginning year position, while the selling price declined up to 64% in November 2008. The highest PT prices were achieved in September 2008 to Rp 5,600 level for selling prices and Rp. 5,200 for buying prices. A significant declines in selling and buying prices occurred from October to November 2008.

Colored PET experienced over 82% buying prices decline, and 73% selling price decline. The most significant decline in colored PET buying prices occurred in September 2008 to Rp. 2,500 level, and further declined to Rp. 300 level. The most significant decline in colored PET selling prices occurred in September 2008 to Rp. 2,500 level and further declined to Rp. 600 level.

Based on information from the same collector, price is normally fluctuated in a certain period. But 2008 price decline was the most significant one. The main factor causing this very significant price decline was the stress of global economic crisis. The prices changes have occurred especially for bottle PET during 2001-2009 periods (Table 6).

Table 6. Fluctuation of Used PET Plastic During the Last Nine Years [5]

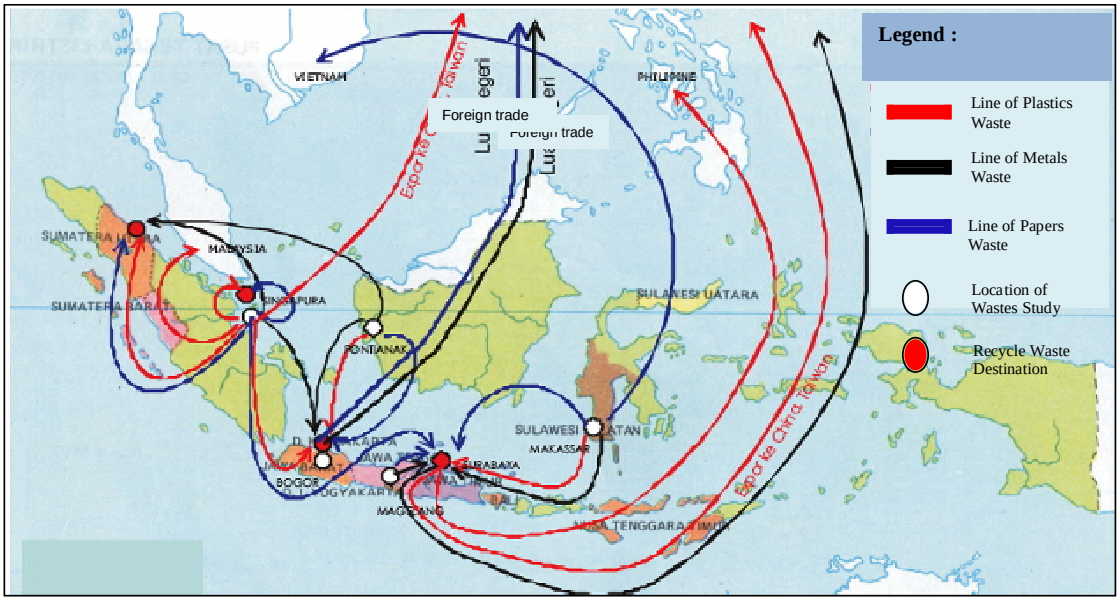
Year	Raw Material (Bottles) Rp/Kg	Scraps Product Rp/Kg
2001	1,500	3,100
2002	1,300	2,700
2003	1,000	2,300
2004	1,500	3,100
2005	2,500	5,000
2006	2,800	5,600
2007	3,000	5,000
2008	5,500	7,800
Januari 2009	2,000	4,000
Februari 2009	2,200	4,500

It was known that the decline for the used plastic price and scraps sales in 2008 were affected by the decline in the world's oil prices. This condition has made small scavengers and collectors, who have no strong network, bankrupt. Although, they have abundant stocks but they could not sell their stocks. The recycling products manufacturing industries have exploited these conditions by playing the price games. Any industries that offer lower prices would need to "surrender" if the collectors or raw materials manufacturing industries could maintain the prices at the level commensurate with the prices of the corresponding "virgin" products. It could be said that the most dominant players that determine the prices are large collectors, who have milling machines and pelletizing machines with good, homogenous products qualities. The recycling product manufacturing industries, however, have some role in determining the prices at collector level or pellet manufacturing industries level because these industries have tonne/day or tonne/week production targets. Nevertheless, changes in market selling and buying prices are greatly affected by global economic conditions, i.e., world's oil prices changes have their effects on production costs and transportation expenses.

3-7. Waste Recycling Routes

Based on data gathered from the Ministry of Environment of Indonesia (MEI) [7], the map of waste recycling in Indonesia is shown Figure 6. This map of recycling routes is constructed based on the findings of the survey among waste recycling business players that have been collected by the MEI's study from five cities which include Batam, Bogor, Magelang, Makassar and Pontianak.

Figure 6. Map of Used Material Route to Export

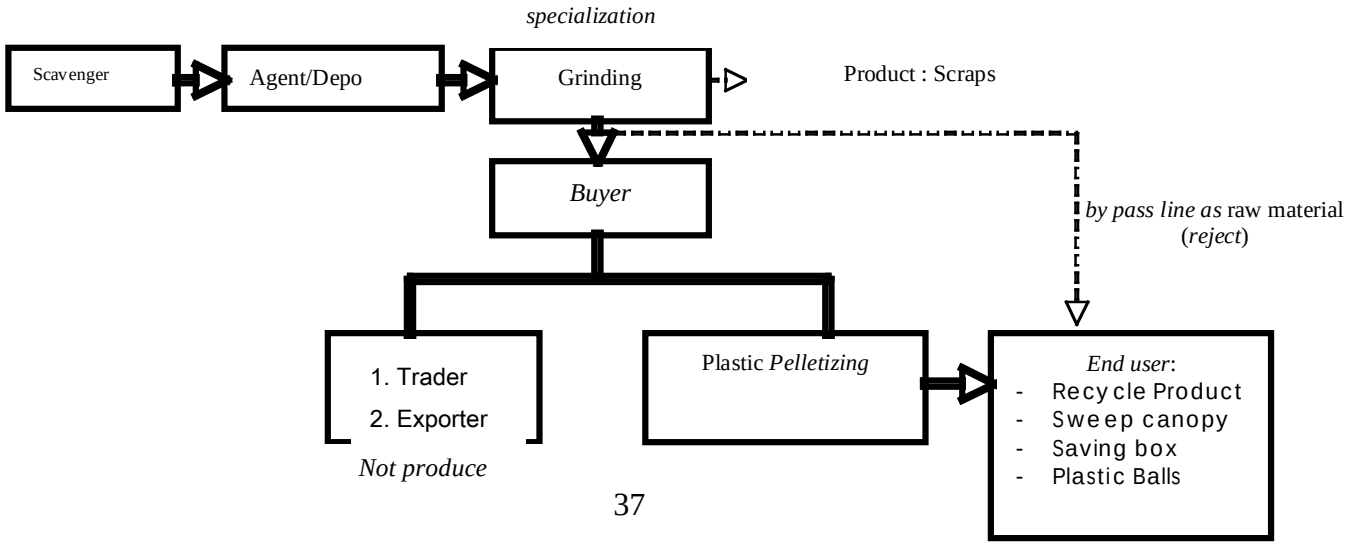


[Source: Ref. 7]

Waste recycling factories in Indonesia as the ultimate players in waste recycling business do not only manufacture finished goods, but also intermediate products (raw materials) such as papers, plastic flake or granules and scrapped irons. Bekasi City and its surrounding cities such as Cibitung and Cikarang are widely known as the area of finished goods, intermediate products and raw material exporters, although their top priority is domestic markets.

According to the MEI (2007), the PET bottles recycling factories and other factories manufacture pellet plastic products to be processed further into finished goods (plastic made appliances). Some part of these plastic flakes and pellets are exported to other countries like Singapore, Taiwan, China, Malaysia and Philippines, though most of their products are used for domestic industrial purposes. Figure 7 shows the traveling routes of domestic plastic wastes until they reach their final destinations, showing the routes that involve recycling business players [6].

Figure 7. Traveling Routes of Plastic Wastes Recycling

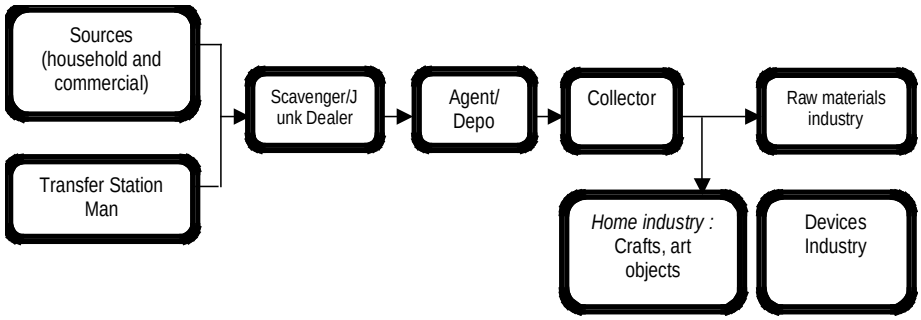


[Source: Ref. 6]

The capacity of plastic waste-based recycling business in Indonesia in managing their business is evidenced by the very existence of plastic recycling organizations like the MBG. They are able to maintain the quality of their products and good business relationships, thus their PET scraps products are able to enter into the international markets.

Generally speaking, other wastes that have their specific potentials to be recycled and enjoyed public popularities other than plastics are papers and metals. The paper- and metal-based waste traveling paths based on 2008's report [7] do not significantly differ from plastic-based waste. However, it seems, that these paper- and metal-based waste recycling businesses have not yet been accommodated in an association or partnership program such as the case of plastic-based waste recycling business. Figures 8 and 9 illustrate the paths of metal- and paper-based waste travels based on the data and results/findings of the previous researches [7, 9].

Figure 8. Paths of Metal-based Travels



Based on a study in 2007 [9] on metal based-waste recycling, it was found out that any waste containing metal element would be discarded by their consumers. Metal compositions on each player varied according to their respective statuses and the sources of the items received. In general, there are three metals most frequently found in recycling activities at Bandung City: irons, zincs and aluminums.

The difference between purchasing and selling prices is also affected by the exact status of its respective recycling players. The main cause behinds this relationship is that the final prices of any metal-based waste is affected by its own quality. Large scavengers receive most of this waste from small waste scavengers, thus the items they received in most cases are dirtier than those items sold by the used products sellers. This is because the latter purchased his or her used items from households and institutional sources.

These wastes would be then transported by the scavengers or be separated in the temporary accumulation sites. In general, these scavengers only pre sorted the recyclable wastes they found. This metal would be then sold to collectors and large collectors. The

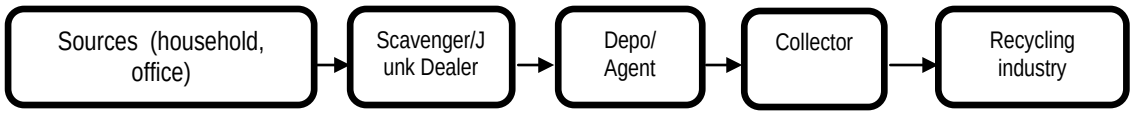
average purchase process for iron and zinc at scavengers through large collectors is Rp. 1,100/kg, while non-iron metal based waste is Rp. 15,425.

The consumers usage duration pertaining to materials required for recycling metal-based wastes will determine the quantities of copper-based waste available to be recycled. PT Copperindo Aneka Nusa is one of the producers of copper-based products such as; copper wires, copper bus bars, round copper and brass wares that made from waste cable and copper pipes provided by large collectors in Java, Sumatera and Bandung. The sales target of this company is the PLN (*Perusahaan Listrik Negara* - States own Electricity Utility Company) for the purposes of installations, cables, rounds, iron took-took, and home industry based artisans. The top prioritized sales targets are Surabaya and Jakarta cities.

The MEI's data reported [7] that iron- and metal-based scraps from Batam and Pontianak would be delivered to Medan and Jakarta, while the same scraps from Makassar and Magelang would be delivered to Surabaya. While there are exports of iron- and metal-based recycling products to countries like Taiwan and China, most of these products are absorbed by domestic steel factories. The Jabotabek Area (Jakarta, Bogor and Bekasi) areas and Surabaya play important roles in the network of recycling business because the majority of waste recycling activities occur in these areas.

The same data source also reported the facts that in exploiting paper-based recycling, these wastes are transported to Jakarta (From Batam, Pontianak and Bogor) and Surabaya (paper wastes from Batam, Magelang and Makassar). In addition to delivery to Surabaya, paper based-wastes from Magelang are delivered to Magelang's pulp- and papers-based factories. Though here are paper-based waste export, most of these paper-based wastes are absorbed domestically as raw materials of paper recycling. Figure 9 depicts the traveling paths of these wastes.

Figure 9. Paths of Paper Wastes



It should be known that the trading businesses of waste that has great potentials in recycling businesses are widely practiced through the internet, such as through *indonetwork.com* [10] or *Majalah Pengusaha* websites [11]. Companies or individuals that post their advertisements either as sellers or buyers are usually large collectors or recycling products manufacturing industries such as CV Megantara Utama in Bekasi City and U.D Sregep in Yogyakarta, that have been registered as large companies that search used papers in large quantities. The collectors offer the prices of the used newspapers at Rp. 1,200 – Rp. 1,300, and Rp. 1,500 for HVS paper. Its monthly sales for collected paper-based product could reach Rp. 20,000,000 as long as it has the ability to deliver 1,000 – 1,100 tonnes of paper based wastes.

3-8. Government-facilitated 3Rs Activities

The Government of Indonesia through the Ministry of Environment (MEI) and the Ministry of Public Work (PWI), facilitates 3Rs activities performed at several regions in

the country. The top priority in the implementation of these activities is the recycling of organic wastes into either individual or communal level composts.

The implementation of 3Rs activities by the MEI is administered in Singaparna (West Java Province), Jombang (East Java Province) and Magelang Cities (Central Java Province) from 2007 to 2009. This program separates the wastes, starting from its sources until the final processing on communal level composting sites [12]. The 3Rs activities implemented by the PWI was reported to be the best practice on addressing waste management issues in some regions of Indonesia in 2008. Similarly, the PWI administers the 3Rs implementation on waste separations at their sources and regions, and the composting of organic wastes. Some of the organic wastes management under composting strategy adopted by this institution is as follows [13]:

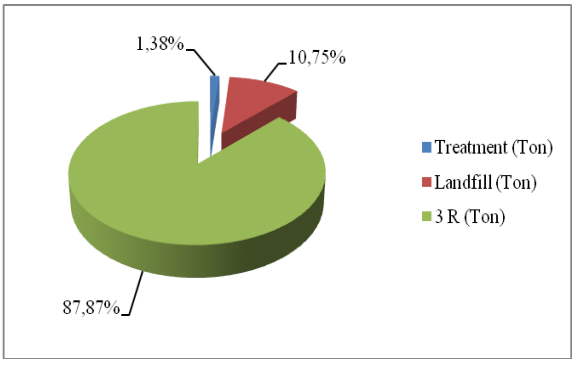
- integrated waste management at Sragen Regency (Central Java Province), Tangerang City (Banten), and a high school at SMUN 13 (North Jakarta);
- independent waste Management at Kampung Sukunan, Sleman (Yogyakarta Province);
- sub-neighborhood level waste management at Mampang Prapatan (Jakarta);
- compost production by CV Mitra Tani, Tasikmalaya (West Java Province);
- hotel waste management by PT Jimbaran Lestari (Bali Province);
- implementation of household waste management under Takakura method at Kampung Rungkut, Surabaya (East Java Province);
- paper wastes recycling by 'Bale Kertas', a handicraft group at Mataram (East Nusa Tenggara Province); and
- Household waste management at Monang Maning Residential Areas, Denpasar (Bali Province).

4. Hazardous Waste (HW) Recycling

4-1. HW Management in Indonesia

Most of HW waste in Indonesia as recorded by the MEI, originated from various industrial activities. For HW management activities, there are data on the quantities in terms of types and magnitudes of the hazardous waste that are managed, dumped, and processed under 3Rs principles during 2007 (Fig. 10). The most prevalent treatment for this type of waste was 3Rs-based management. The sector that produces the largest amounts of hazardous is mining industry sector.

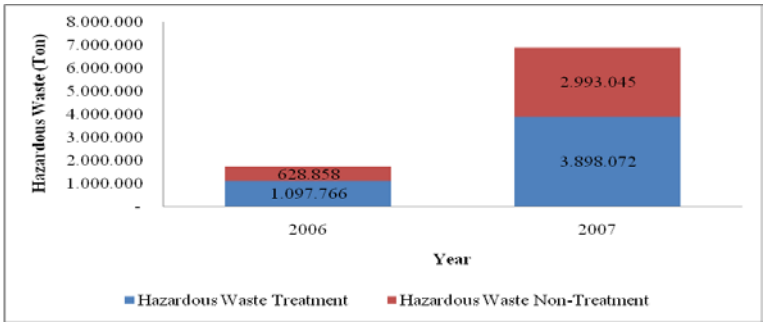
Figure 10. Hazardous Wastes Handling in 2007



[Source of data: Ref. 14]

In 2006-2007, the proportions of HW produced relative to the HW managed form linear trend. This means that any increase on HW produced entails an increase in the HW managed. The increasing generation of HW in 2007 compared to that in 2006 was mostly due to better coverage of statistical data in 2007. In 2006, the percentage of the managed hazardous was 64%, while in 2007 it was 57% [14]. Figure 11 shows the reports on managing HW during 2006-2007.

Figure 11. Hazardous Waste Handling in 2006 – 2007

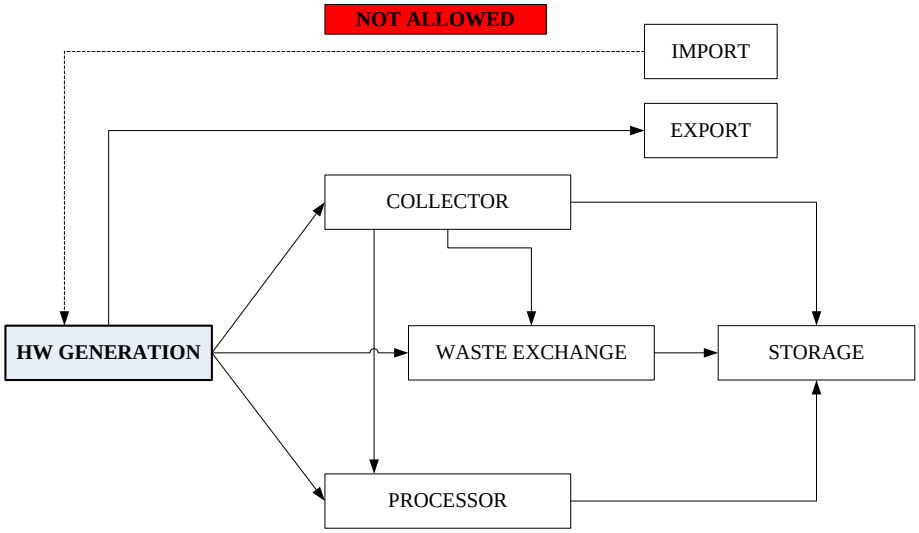


[Source of data: Ref. 14]

As explained in the beginning of this paper, the legal basis of the HW management in Indonesia is GR No. 18/1999 as amended by GR 85/1999, and its lower relevant regulations. At the very onset, these GRs on HW introduce the wastes minimization and recycling principles. These HW is one of the groups of wastes that has been specified in detailed through the law, GRs, and Ministry Regulations (MR). Other types of wastes that have been specified under Law No. 18/2008 are those waste originated from daily human activities. There is one type of waste in Indonesia that has not been yet specified by a regulation in Law order, i.e., any waste other than hazardous and not formally included as one of the municipal waste categories, such as sludge from biological waste water treatment plant from industrial activities.

HW management involves various players, from producers, collectors, transporters and processors. In addition, there are interrelationships among these hazardous wastes management players (Fig. 12). At the national level, HW management is based on “polluter pays principle” and “from cradle to grave” control system. Waste generators are required to handle the HW they generate, and the applicable regulations allow these generators to outsource these management activities from third-party. Every HW management activity is required to hold permit and recommendation from the MEI. For example, any activity that transports these wastes should be accompanied by a set of hazardous wastes documents (manifest). Through this permit mechanism, HW management activity is controlled and implemented well at the national level. Any hazardous waste that could not be processed domestically is allowed to be exported through a notification procedure. However, the importing of any hazardous waste is strictly prohibited.

Figure 12. Hazardous Wastes Management System in Indonesia



[Source: Ref. 14]

Measures that have been taken to promote corporate compliance in environmental management include the following: the implementation of PROPER (*Program Penilaian Peringkat Kerja Perusahaan dalam Lingkungan Hidup* – The Evaluation Program on Corporate Performance Rating on Living Environment). The regulation that serves as the legal basis for this PROPER activities is the Decree of the Minister of Environment No. 127/2002 [15]. Since 1995, Every year the Government of Indonesia evaluates the performances of companies/business activities in controlling pollution as specified by the Decree of the Minister of Environment 35A/7/1995 to control negative impacts over the environment. There are 5 ranks of business activity performance, i.e.:

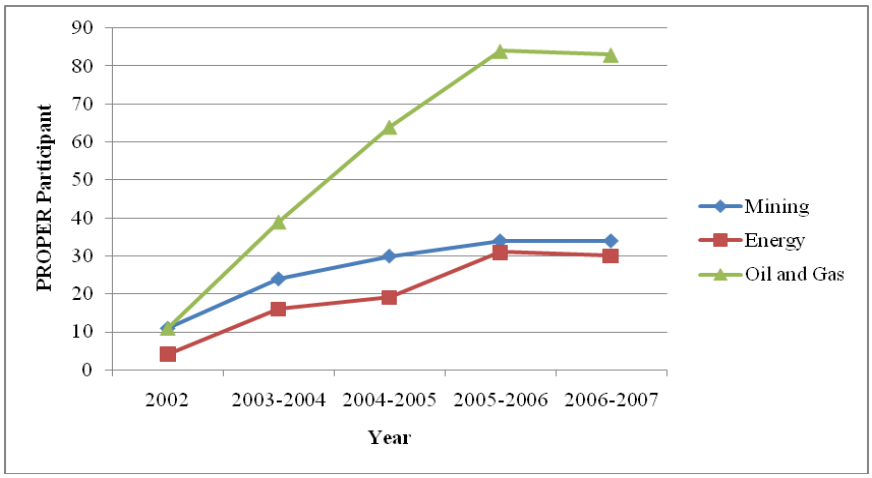
- Golden Rank: the business activity performs clean and/or zero emission production and very successful in its environmental management to the extent that it could serve as model for other businesses.
- Green Rank: the business activity performs successful environmental management efforts exceeding the requirements specified by the applicable law and regulations.
- Blue Rank: the business activity performs successful environmental management efforts in accordance with the requirements specified by applicable law and regulations.
- Red Rank: the business activity performs environmental management efforts but still has not achieved minimum requirements specified by applicable law and regulations.
- Black Rank: the business activity does not perform environmental or business management efforts o the extent that it generate negative impacts over the environment.

The business activity performance is assessed by the rate of its efforts in controlling negative environmental impacts, and the rate of its achievement in controlling these negative environmental impacts. That ranking designation will not formally impair the ongoing business activities. However, final rank obtained by a business activity will give image or impression to the general public about its environmental management efforts.

For mining, energy and oil-gas sectors, the indices of the PROPER program's success were observed through the increase of the numbers of the participating companies during 2002-2007 (Fig. 13). This manifested the improved awareness among hazardous wastes producers from these sectors of the environmental program. The participant of the PROPER program in 2006 from manufacturing and agro-industrial sectors was [14]:

- 38 participants from basic industries;
- 39 participant from chemical industries;
- 42 participant from multifarious specific industries;
- 79 participant from general industries
- 97 participants from agricultural industries; and
- 61 participant from forest products industries.

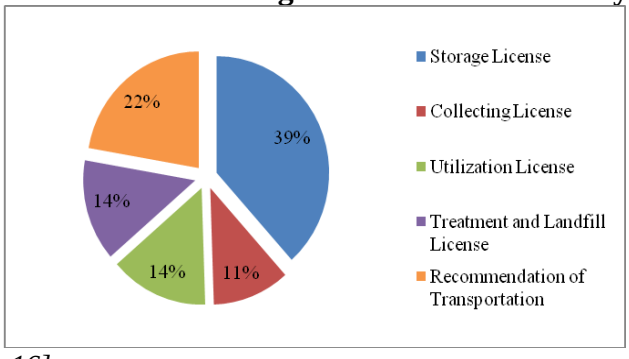
Figure 13. Increase of PROPER Program's Participants in 2002-2007 from Mining, Energy and Oil-Gas Sectors



[Source of data: Ref. 14]

Permits issued by the MEI for HW management purposes comprise of permits on storage, collection, usage, processing, landfill, and recommendations on hazardous wastes transports. The 2008 statistical data [16] shows the percentage of the different type of permits that have been issued by MEI for 1,200 HW management permits (Figure 14).

Figure 14. Hazardous Wastes Management Permits Issued by the MEI in 2008

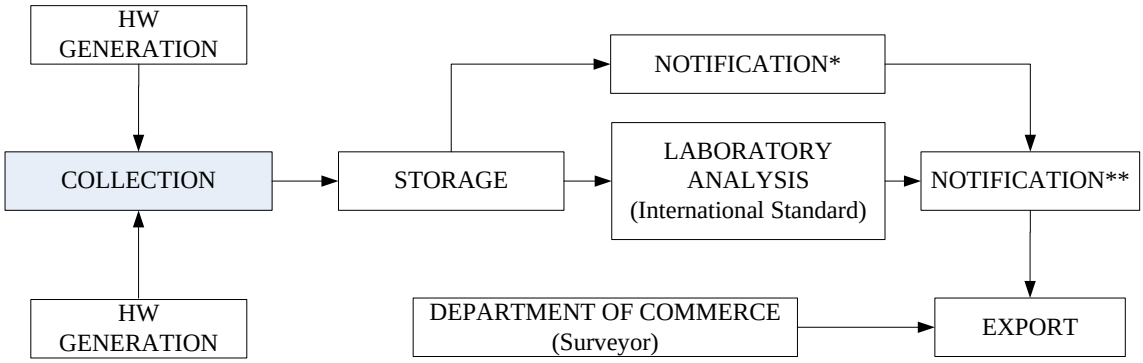


[Source data: Ref. 16]

Brief description of the MEI issued permits are as follows:

- Permit on storage by Local Government EPA, the authority to temporary store the hazardous wastes. It is issued to wastes generators before these wastes could be managed further. The maximum storage days are 90 calendar days;
- Permit on collection by Local Government EPA, the authority of a private institution to collect hazardous waste at various sources, that would be subsequently transported to any party that has actual ability to handle the related HW, and has the required permit to perform these activities.
- Permit on usage, a permit issued by the MEI to the recyclers. This permit covers notification permit to export the corresponding HW (Transboundary movement of hazardous wastes) in cooperation with the Department of Trade as surveyor. The procedures for HW export activities are illustrated on Figure 15, along with its detailed description.

Figure 15. Procedures of HW Export [17]



**Notification from ME from country of destination to MEI*
***Notification from MEI to the exporter*
Source: communication with an exporter

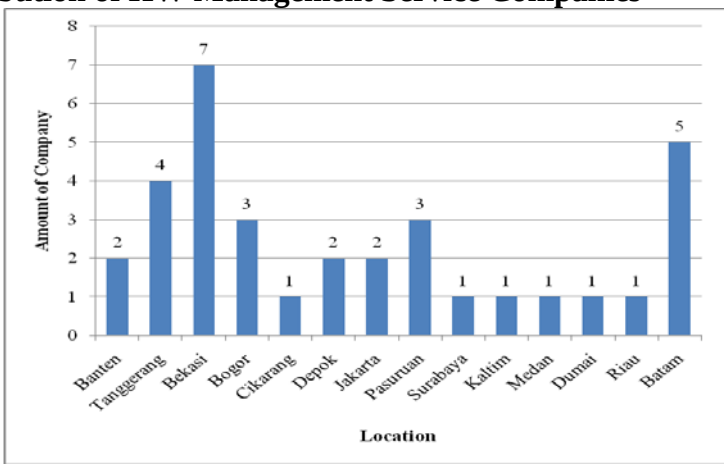
- The legally required limit of hazardous wastes storage is 90 calendar days; however, this time limit is frequently been exceeded;
- Contacts any purchaser listed in the Ministry of Environment from the country of destination as the party that would manage the hazardous wastes;
- Sends samples of hazardous wastes as required by the purchaser, especially for their compositions, usually accompanied by data on the results of internationally accredited laboratory checks; and
- Export notification by Ministry of Environment of Indonesia will be issued to the exporter after having received acceptance notification by Ministry of Environment of the country of destination that explicitly states its acceptance and ability to manage the incoming hazardous wastes.

- Permit on processing and landfill by the MEI, one of the processes done either individually or through outsourced party that allows to transform HW into fuels substitutes, or raw material substitutes. The recommendation stated that the relevant party shall have its independent laboratory to test the resulted products of these processes. For landfill, in addition to the outsourcing from Class 1 Landfill, there are some private companies that hold the required permit to perform on site landfill (Class II Landfill); and

- Transport recommendation, this cites that transportation activities should be planned and complied with any regulation issued by the Department of Transportation. The latter provides training facilities, especially for transport standard and procedures.

Generally, service companies that specialized in providing HW processing services as listed in the MEI are home based at Java islands, accounting for over 74% of the entire listed companies. Figure 16 shows the percentage distribution of these companies. Regulations on the procedures of HW permit for 2009 are being drafted.

Figure 16. Distribution of HW Management Service Companies



[Source of data: Ref. 16]

4-2. HW Management on the Implementation of 3R Principles

The use and recycling of hazardous wastes is regulated under Ministry Regulation No. 02/2008. These activities are allowed under special permit regulation but it should be accompanied with controlling and surveillance activities. Some of the indices of these surveillances activities are reductions of the environmental negative impacts over the corresponding hazardous wastes landfill areas and the natural resources savings directly associated with these uses as fuels and raw material substitutes. Table 7 shows the development of HW usage activities in Indonesia from 2001, and the types of HW uses that tend to be increasing from time to time.

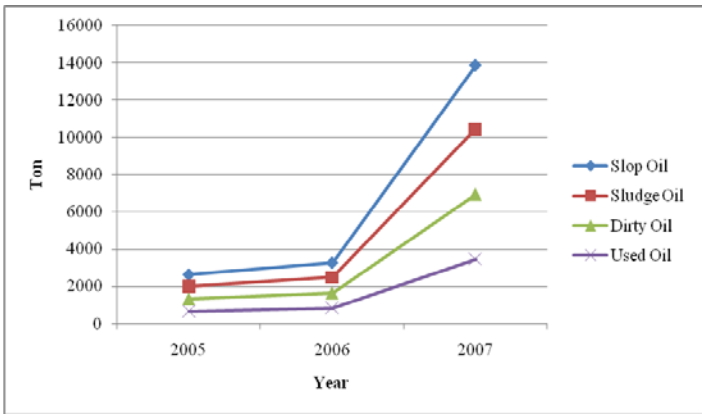
Table 7. Development of Hazardous Wastes Reuse in Indonesia *[15]*

2001/ 2002	Fly ash	Copper slag	MPB							
2003	Fly ash	Copper slag	MPB	$CuCl_2$ & $FeCl_2$	Solder dross	Used catalyst	Sludge Aluminum			
2004	Fly ash	Copper slag	MPB	$CuCl_2$ & $FeCl_2$	Solder dross	Used catalyst	Sludge Aluminum	Used Tire	RCC catalyst	Shoe factory waste

Figure 17 illustrates the increasing amount of HW used as fuels substitutes from greases and dirty oils wastes. For some types of hazardous wastes, such as fly ash, their

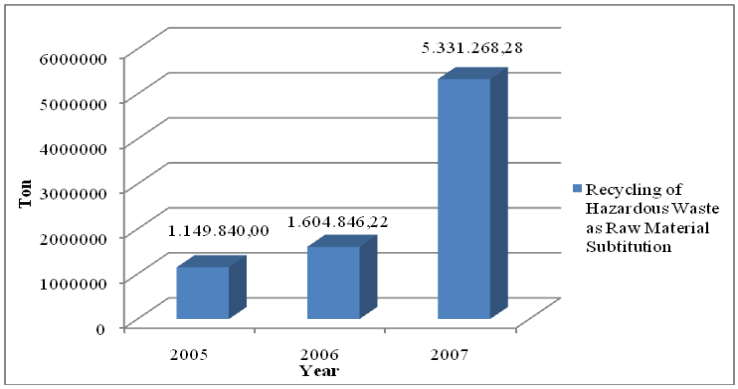
uses as raw material substitutes are predominantly significant. As shown in Figure 18, the usage values for 2005-2007 period were increasing.

Figure 17. Reuse of HW as Fuel Substitutes



[Source of data: Ref. 14]

Figure 18. Recycling of HW as Raw Material Substitutes



[Source of data: Ref. 14]

5. Used Electronic-Electrical Equipments (3Es) in Indonesia

5-1. General pattern of Used 3Es

During the last ten years, the quantities of electronic goods such as televisions, refrigerators, computers and mobile phones in Indonesia were drastically increasing that led to the increase in the amount of used electronic goods- and electronic based-wastes. It is estimated that the rate of this increase is between 3%-5% range of more than threefold than general wastes. UNEP data showed that the production of electronic wastes in the world in 2005 was over 20-50 millions tonnes a year. Some components of used electronic or electric devices or their related wastes (e-waste), require a management that should meet certain requirements, due to their hazardous nature [18].

The distribution of electronic industries in Indonesia includes the following [19]:

- Banten, Jakarta, and West Java Provinces;
- Batam, Riau Island Province;
- East Java Province;

- Kudus, Central Java Province;
- Yogyakarta Special Regions;
- North Sumatera Province; among others.

Until this time, there is no proper definition of e-waste. The entire applicable law and regulation in Indonesia have not specifically defined the e-waste. However, we could interpret an e-waste as any electronic or electric object that does not have any use or function or does not be needed anymore, and that can be disposed either as a whole or some part of it [19]. We should distinguish between e-waste and used electronic or electric objects because the latter still have sufficiently high economic values. Thus, not all of e-wastes should be treated as hazardous wastes. However, there are no clear criteria or definitions that distinguish between e-waste and used electronic and electric objects.

From the results of the survey of electronic equipments uses among households levels in Bandung Area in 2006 [20], it was found that some of the 3Es will extend their routes through relational ties, such as: being transferred to their families, their friends, or donated to the others or whoever in need them. These routes will flow almost without end and form chain-relations, from the higher income level parties to the lower income ones, and probably from higher income regions (such as urban regions) to the lower income communities (rural regions) and similar chain-relations. The role of refurbishment/repair is very important in extending the end-of-life of any electronic equipment, generally through replacements of out-of-order electronic components by the new ones or through cannibal system, i.e., through the uses that are still functioning electronic parts of the unusable electronic equipment. These mechanisms are the answer of the question: why the electronic equipments are rarely found within the urban waste chain. It is due to the fact that there will always the ways to recover them instantly by those who were at works in informal sectors.

The final chain of any object route is waste. As in another waste component in Indonesia, the role of the informal sectors is very important in maintaining e-waste as objects having high selling values. The value position of e-waste is considered higher than used plastic or papers. It's position is more less same with the position of iron/metal waste (scraps), with their higher selling values. There is some conviction that these practices were prevailing in other major cities in Indonesia. It is rarely found used nails or used electrical cables or similar object in the final disposals, except for several component such as used batteries. Most of these wastes have been recovered before they arrival at the landfill. A survey through interviewed of 105 scavengers working at Bandung final disposal at Sarimukti (receiving about 750 ton of municipal waste per day) shows these practices [20].

In Indonesia, there are at least 100 millions of cellular phones, and some of their contents are copper and other materials that belong to HW category. If the used or disposed electronic or electric appliances would be recycled, an environmental friendly recycling procedure is required. Should they have to be disposed into the environment, the disposal should be done in accordance with the applicable law and regulations to avoid environmental pollution and threats against health. A zero e-waste might be hard to achieve. But, the one thing that should be done is to have a better control over electronic wastes [21]

E-waste comprises hazardous components and non-hazardous ones. In Indonesia, all e-wastes have been included under hazardous waste category. Their origins are from household activities and office activities. Some of e-waste producing objects are: AC, refrigerators, TV, computers, notebooks, cell phones, washing machines, radio/tapes, VCD/DVD players, among others [21].

Under applicable regulations, there are three main sources of e-wastes in Indonesia: electronic industry, post-consumption and illegal import, including smuggling. The main cause of the many difficulties faced in gathering electronic-based data is due to collection through illegal trafficking and informal sector that varied widely in Indonesian' regions [22].

5-2. Waste Transboudary's Applicable Policies in Indonesia

Some regulations that have been implemented on hazardous wastes imports in Indonesia are as follows [21]:

- Importing of all types of hazardous wastes is prohibited. For accumulator wastes, this regulation is effectively applicable since September 2002;
- Since September 1997, a ban has been passed to avoid the granting of permit for all types of business activities that use imported hazardous wastes as their raw materials;
- Since January 1998, the importing of hazardous wastes, including accumulators, is strictly prohibited, including those from any country listed on Appendix VII of the Basel Convention;
- Accumulator imports are permitted only from any developing country as a member of the Basel Convention and other country through bilateral, multilateral and regional cooperation;
- The Decree of the Ministry of Industry and Trade No. 756/MPP/Kep/11/2002 on used machines and its accessories import. These items are defined as any machinery or equipment that could be reused or renovated and not in their scrap forms.
- Used machineries and its related equipments imports could be performed only by the user that has already has a license to perform production process or any other usage over the licensed facilities;
- This decree of the Ministry of Trade and Industry strictly prohibits import of used electronic and electric objects such as refrigerators, AC, electric fan, washing machines, TV and video projectors, telephone set (including its wireless versions) PCB and CRT monitors; and the following table [Table 8] lists the used electronic and electric objects that could not be imported based on the Regulation of the Ministry of Industry and Trade No. 39/M-DAG/PER/12/2005

Table 8. Prohibited Import of Used Electronics and Electric Good *[21]*

No.	HS Number	Description
1	8418	Refrigerator, freezer and its component, electrical and others, compressor exclude for AC in HS Number 84.15
2	8419	Machinery, plant or laboratory equipment, heated electrically or not (exclude burner, oven, and others in 85.14) to process material with temperature difference such as heating, cooking, grilling, destilation, rectification, sterilisation, pasteurisation, condensation, cooling, exclude machinery or installation for household appliances; instant water heater and with storage, non electric
3	8419.11	Instant water heater with gas
4	8422	Dish washer
5	8465	Machinery for processing of PCB
6	8471	Automatic data processing machine and its units, magnetic and optical reader, machinery for data writer on coded data media and its processor, not described or not include in other HS Number
7	8475	Machinery for assembling of electrical lamp, tube or valve or flash lamp, in glass envelope, machine for making glass or glass product by heating
8	8501	Electric motor and generator (exclude electric power plant)
9	8514	Burner and electric oven for industry or laboratory for heating material process by induction or dielectric loss
10	8517	Electric apparatus for telephone or telegraph
11	8525	Transmission, receiver, recorder and reproduction apparatus, television camera, recorder camera and video, camera digital
12	8525.20	Wireless LAN, internet mobile phone, internet video conference, other mobile phone
13	8539	Light bulb or tubular lamp, include sealed beam and ultra violet and infra red lamp

Until the present time, there are no data on the used electronic and electric objects or e-waste trans-boundary movements either to or from foreign countries. Recently, the increasingly prevalent practices of used electronic appliances illegal trafficking made the situations even worst. Several sources of used electronic and electric appliances and e-wastes circulation in Indonesia areas follows [21]:

- Import through false import documents or on behalf of other names;
- Illegal imports, by inserting used electronic and electric appliances to legally imported virgin objects.
- Donation activities on behalf of certain governmental institutions or privately owned enterprises.

Based on inspections by the Government of Indonesia, it showed that the practice of used electronic and electric appliances still prevailed in Indonesia. For examples, waste from electronic and electric appliances that contain or have been contaminated by hazardous materials (such as PCB) could be imported to Indonesia in illegal ways by declaring on the related import document that these items were mixed metal materials. Small islands usually served as the targeted markets of illegally imported e-wastes to Indonesia.

In 2005, there were 50 units of 40-feet long containers of waste entered to Indonesia. The import documents stated that the entire items in these containers was new office equipments and mixed metal scraps. The intention of this import was to process these mixed metal scraps to be subsequently re-exported. The governmental inspection officers found contaminated components, i.e., there were some items that contain PCBs, categorized as hazardous wastes. This case indicates that while we have had definite

regulations on hazardous wastes import, the possibility of breaching these regulations in Indonesia still exists.

The Department of Trade through its Ministerial Decree No. 229/MPP/Kep/07/07 on the General Rules on Import Affairs explicitly specifies that the only objects that would be allowed to be imported to Indonesia are new, virgin objects. The Department strictly prohibits imports of used electronic appliances, such as, televisions, refrigerators, computers, irons, and washing machines, among others. Used electronic appliances and electronic wastes entered in several regions of Indonesia either illegally or "legally." The latter refers to any import that uses illegal import permit documents. Batam island, as special or bonded areas in Indonesia, has some freedom in importing any kinds of items, except for any items that would be prohibited to be imported. Therefore, these virgin items would be lower in their prices, and its imported used counterparts even have lowest prices. The majority of these imported used items are imported from Singapore and Malaysia.

Batam is one of the final destinations of electronic wastes and used items. Most of used electronic goods currently traded in Batam are imported, especially from Singapore. Some of the types are PCB rejects, coils, cables, plastic scraps, solders, glass tubes, televisions frames and TV monitors. Its trading centers are located at several trading centers such as Batam Center, Aviari Market, Sengkuang Market, Batu Aji Street, and some malls. These used electronic goods are strongly needed in Batam due to its large market share, even they are generally have shorter lifespan, with more expensive services components than new ones.

For Eastern Indonesia regions, the distribution of electronic wastes from Singapore and Malaysia since 1980s has been centered at Pare-Pare (South Celebes) and Wakatobi Islands (Southeast Celebes). By their types, 10% of their total items come from Singapore (the main hub of used electronic items) and 5% from Malaysia.

These illegally imported used electronic items were generally reconditioned and sold as secondhand electronic and electric appliances. In 2006, Indonesian Police Officers successfully caught the efforts to illegally imported used PCs that have been reported on their import document as brand new PCs. They confiscated about 1,000 units of used PCs and hundreds of other PC components. These items came from Singapore and entered Indonesia through Pekanbaru to be subsequently traded inter insularly [20]. Generally, many advanced countries dispose their electronic and electric wastes to developing countries or the least developed countries under the masquerade of donation activities or human aids for natural disaster victims or educational purposes, despite the facts that the useful life of these items such as PCs are very short or even nil.

On a wider scales, the long routes of the 3Es as we have been discussed above, i.e. on their route to reach individuals or communities or regions having lower economic incomes, could rise a concern that resulted environmental impacts would be hidden problems or delayed problems and spreading problems to another regions with probably have more limited economic and educational capabilities than the original sources. These would be applied on regional and international scales as well, thorough uncontrollable transboundary 3Es and e-waste. Moreover, there is higher possibility that the components of a new-3E coming to Indonesia (formally or illegally) are assembled by e-waste inside. We should establish protection control and effort, including through regulations, and

more importantly through fair and responsible and serious rules of the games, due to the fact that the potential victims of their impacts are the part of the community having lower capacities. Any policy or considerations in economic growth should take these problems into account.

6. Conclusion

This paper reviews current situation of waste recycling in Indonesia from the legal aspect and the flows of municipal solid waste, hazardous waste and e-waste. It was noted that the role of informal sectors as waste collectors and recyclers are important. The dependence upon final disposal and the difficulties in finding disposal sites have made the 3Rs concept are interesting to be considered. Although related regulations have been established, additional efforts should be implemented for proper management of waste and further utilization of recyclable waste. The existence of Solid Waste Management Act 18/2008 and other related regulations is expected to bring major changes in solid waste management in Indonesia. However, all parties should realize that the existence of regulations and laws does not always mean that there exists a strict enforcement of such rules. We need a strong political will to respect these regulations.

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