# PRACTICAL GUIDANCE FOR WASTE SEPARATION

State Ministry of Environment
The Republic of Indonesia

2008

# *Preface*

I am gladly welcome publication of this book, 'Practical Guidance on Separation of Wastes'. I would like to express my high gratitude to Japan International Cooperation Agency (JICA) that has greatly supported the compilation and publication of this book.

The publication of this book achieves its right momentum in coincidence with endorsement of Undang-Undang No. 18/2008 concerning Waste Management. One of the important things provided in the said Undang-Undang on the Waste Management is that all wastes must be separated.

Separation or sorting of wastes is one of the most difficult things in the waste management flow, because this relates to the human behavior that surely needs long and big efforts to develop. The guidance in this book is hopefully could become a basis for waste separation effort in an urban integrated waste management program.

Hopefully the guidance is useful, especially for waste management efforts in many cities in Indonesia.

Jakarta, August 2008

Deputy Minister for
Environmental Pollution Control
State Ministry of Environment

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# 1. General

The current status of solid waste management in many cities is coming to the surface as uncontrollable problem, and it increases and diversifies to follow increase of the population and economic growth. Increase of uncontrollable waste emerges as logical consequence of human and industrial activity; where it causes many problems in urban environment such as, aesthetics of a city, human health; moreover it brings about disaster (methane gas explosion, land slide, air pollution by open burning, etc). On the other hand, solid waste management, which is conducted by the solid waste management agency, just focuses to collect and deliver the waste to Final Disposal Site (TPA) for final disposal without treatment. Most of TPA has an environmental problem. For example, mostly, it is not layered completely with water resistant material like a geo-textile, no measures are taken for treatment of leachate, open dumping and open burning are still allowed and the like. As the result, it may cause many problem such as absorption of leachate into the ground water, bad smell, air pollution and the like.

To reduce emerging waste, now is the time to promote separated discharge and separated collection in the expectation to decrease waste problem as mentioned above. It is also the time to decrease waste dumping into the river, lake and others water areas, to decrease improper open burning of waste, to decrease waste picker in the isolated area of the final disposal site and to restrain consumption of natural resources.

When we wish starting implementation of separated discharge and separated collection of waste, it is important to confirm state of the present recycle system; and we have to predict how it works when the treatment quantity increases. In the first instance, it is important to conduct needs assessment in this case.

# 2. Present Condition of Recycle Networking

## 2.1. Recycle route

Recycled wastes are collected from source of waste such as residential, commercial areas, Temporary Disposal Site (TPS), and TPA. Most of the recycled wastes are collected by a waste picker; then, the waste picker sells them to a junkshop. The junkshop sorts and classifies them into many items depending on the types; then, it sells them to the recycle factory directly or to the bigger junkshop (agent). A part of such wastes is processed (recycled) in the city, but most of them are delivered to others cities or exported to abroad.

Technically, the solid wastes are delivered from its sources (housing area, industrial area and market) by people to TPS or to the waste transporter (truck). In some cities, just a few numbers of sources of waste are delivered their waste to TPS. Most of the households do not separate the waste for discharge and collection of their waste at the sources.

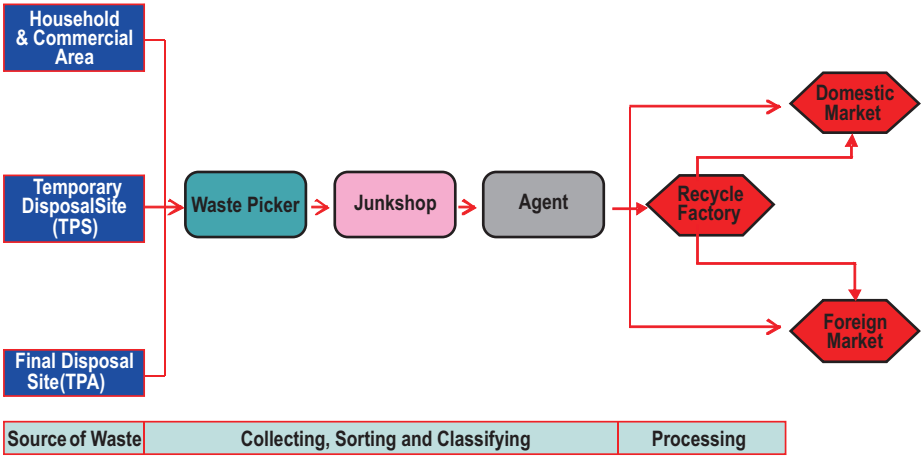



***Figure 1***: Model Diagram of Waste Recycle Networking

***Box 1*** : The recycling network about waste generated from 5 cities (Batam City, Bogor City, Magelang City, Makassar City, Pontianak City)

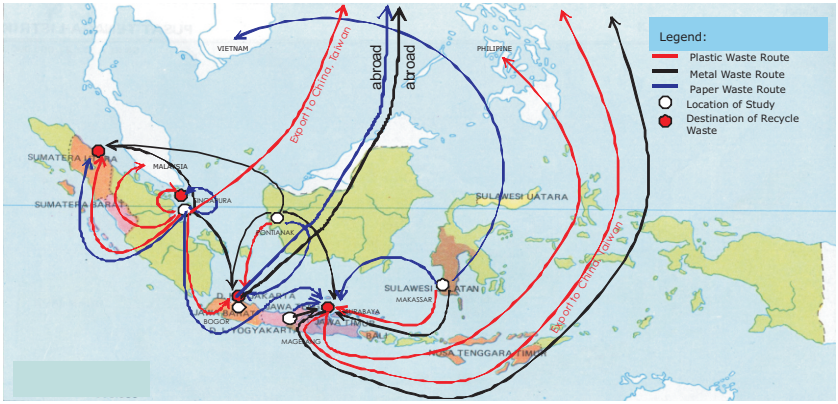



***Figure 2*** : Map of Recycle Waste Route

In the PET bottle and other plastic recycle factory, it is chopped into fine flake or mould by thermoforming to the pellet; then, the pellets are processed to a finished (plastic wares) product. Part of the chopped flakes or thermoformed pellets are exported to abroad such as Singapore, Taiwan, China, Malaysia, and Philippines; but majority of them seem to be used as raw material in the local plastic industry.

For the purpose of recycling paper, paper wastes are sent to Jakarta (from Batam, Pontianak, and Bogor), and to Surabaya (from Batam, Magelang, and Makassar); besides, a part of the paper wastes from Makassar is exported to Vietnam and those from Batam is exported to Singapore. Besides those sent to Surabaya, the paper wastes from Magelang are sent to Paper Factory in Magelang. Though we know there are paper wastes that are exported to abroad, majority of them seem to be applied for domestic consumption as raw material for recycled paper.

Scrap/dismantled iron and ferrous metal from Batam and Pontianak is sent to Medan and Jakarta. Meanwhile, scrap/dismantled iron from Makassar and Magelang is sent to Surabaya. Although there are used iron/metal that are exported to abroad such as China and Taiwan, most of them seem to be consumed in the domestic iron & steel industry.

Jabotabek (Jakarta and its surrounding areas) and Surabaya play important role in the waste recycle network; because majority of the recycle factories exists in these areas. Recycle factory is meant not just a factory that produces finished product but also produces half-finished product (raw material) such as scrap paper, plastic mould/pellet, scrap iron and the like. So, besides export of the finished product, these areas export to abroad half-finished product and raw materials, too; even though majority of the recycled raw materials seem to be used in the domestic market.

Note: This information is based on fact-finding survey to operators concerned with waste recycle.

## 2.2 Composting

In relation with organic waste recycling method, it is divided in 3 processing; first, composting, second, methanation and third, the animal feed. Meanwhile, for composting, various methods are taken by community in many cities, such as an aerobic method, worm method (produce compost with the worm that helps to accelerate bio-degradation process), and conventional method. Although they can produce compost, it is rather for themselves than selling the compost for gardening or agriculture.

***Box 2***: Composting at household:

First of all, it needs to separate the raw garbage. There is a method to bury a small part of a metal drum like barrel with both top and bottom ends open into the soil; then, put the raw garbage in it and cover the top of it with soil and repeat the processes. After the raw garbage is put into the container, cover the top of it with a lid. In this case, a place where it sinks under water in the rainy season must be avoided. For composting, it takes about 3 ~ 6 months time.

There is a container called composting vessel; which is a perforated box containing fermentative bacteria in it. In this method, wide land is not needed and composting can be realized sanitarily in a short time. With a composting vessel of 50 ~ 60 litter capacity, raw garbage generated from one household could be processed. As a vessel, there are several types that can be used for this method; a plastic vessel with many pores covered, of which outside is attached with a carpet or a carton with good ventilation to prevent leakage of the

contents in the vessel, a vessel made of wood, a vessel made of ceramic and the like. In each case, the important thing is air permeability.

Fill almost half of the vessel with compost (fully ripened) or rice bran (by adding the mixture the fermentative bacteria used for the locally produced fermentative food or the fermentative food itself, in which the bacterial have still alive, fermentation is accelerated); then, mix the raw garbage chopped as small as possible into the fermentative bacteria base (in the vessel) everyday. On the top of the vessel must be covered with a cloth of good ventilation to prevent invasion of insects; the vessel must be kept indoors or under the eaves to avoid infiltration of rainwater. Moisture is another important element. The proper moisture is; when you grasp the compost, no water drips (not too much wet) and when you unlink hand, handprint is left there (not too much dried). When it seems too wet, it must be adjusted by putting chaff or sawdust. In 3~4 months time, the vessel will get full; then, take out almost half of the contents and keep it in another vessel or in a bag for about 2 weeks ~ 1 month time to make the compost fully ripe. The remainder in the vessel can be used as the fermentative bacteria.

Source: Data from Kita-Kyushu City, Japan

## 2.3. Assessment on Impact of Recycling to Environment

Most of people do not separate their waste for discharge and collection. Although a part of them has made separated discharge, infrastructures such as separated TPS and separated transporter have not been developed yet; as the result of it, there is no consistency and stability in the separated collection of waste.

Most places for recycling wastes in junkshop are not environmental friendly. Most of them just dump the wastes on the ground without water resistant layer foundation and cover to protect them from wind and rain. In the separation process, many junkshops often dump the useless wastes and then burn them. Frequently, chopping and dismantling recycle wastes is made with no consideration if it contains hazardous material; as the result, it has potential impact to the environment and besides it, it gets to be a threat to the workers' health in the junkshop.

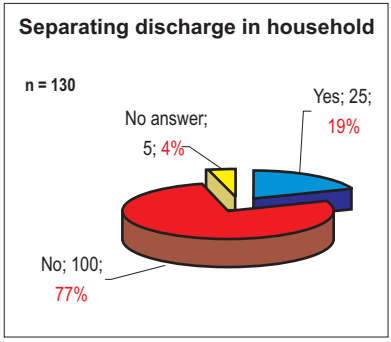
Most of the plastic recycle factories have not worked out yet environmental impact management and monitoring; at least, in some paper and metal factories, even though they have environmental impact assessment study and have waste treatment/processing, actually, they are not consistent in working out it as sustainable program.

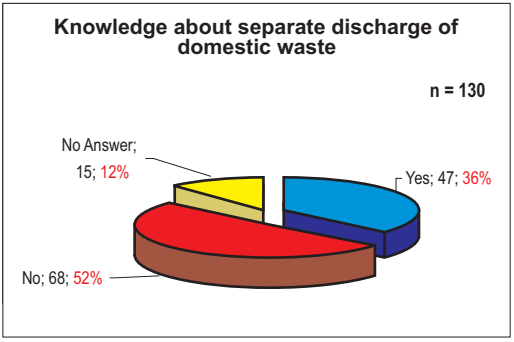
In the case of a plastic recycle factory, most of the owners do not understand if their waste (solid, gas, liquid) has an environmental problem. Especially, the thermal-forming machine often emits gaseous waste, to which the workers are exposed. The waste, which is discharged from the process of paper recycle, often causes bad smell and the liquid waste. And metal smelter often disturbs quality of air and noise.

## 3. Practical Separation of Wastes

### 3.1 Point of Separated Discharge

Separated discharge of waste is worked out in the effort to minimize waste burden in the total solid waste management. It means if we like to develop integrated solid waste management, we have to design it as integrated system, where we will manage solid waste from the upstream (source of waste) to the downstream (TPA and others solid waste treatment).




Source : Interview at Batam, Bogor, Magelang, Makassar, Pontianak City, MoE and JICA, 2007

At first, separated discharge activity should be carried out at a place as much upstream as possible (household, commercial area etc.). It is the most effective method to get single material, which is suitable for recycle and less extraneous waste.

On the other hand, separation activity in TPA should be avoided for the following reasons :

1) It decreases the value of waste.

2) It is dangerous and unhygienic for waste pickers.

3) It makes difficult the proper operation and maintenance of TPA.

Points of separated discharge are to change of behavior, to provide the best practical method, and to keep sustainability of an effort for separate discharge.

City/district government should inform inhabitants about the necessity of separated discharge concretely as the way to keep the city clean and healthy referring to the actual waste management problem and proper analysis.

Important thing is to share the information about the effect of waste separation activity among the people who participate in separated discharge of waste; the information includes reducing city/district government burden in relation with waste management and giving more benefit to the people for better livelihoods.

City/district government also should announce kind and method of separated discharge waste plainly.

Then, the city/district government defines the kinds and methods based on the result of proper analysis; that is, what kind of waste is suitable to separate, what have been already carried out for the separated discharge by a part of inhabitants and the like.

City/district government should define the feasible kind and the method by considering the above effect, burden, expenses, actual circumstances in the area, local wisdom and the like; and then, it should decide the kind of waste to be separated as recommendation for implementation in the city.

It is effective to conduct education of public in relation with the necessity of separated discharge activity through the education in the school, public campaign, media event, and the like.

***Box 3*** : Makassar Case Study

The Lurah, the lowest leader in the government structure, who is responsible in leading Kelurahan (bellow Head of Sub-district), formulates the method; and then, deliver it to inhabitant through public education such as training of the trainer, village meeting, simple publication, technical assistance; Lurah was empowered to control most of the activities directly. Besides having developed separated discharge method and deliver it to its special purpose including composting, Lurah also encouraged to keep Kelurahan clean and green through using the compost for parks and yards.

### 3.2. Separated Discharge Methode

For reference, this chapter shows some models regarding to methods on separated discharge of waste, such as :

Model 1 : Separating one or more inorganic wastes at the household or the commercial place. This model focuses on separation of inorganic wastes such as PET bottle, other plastics, ferrous metal and paper. It is considered these separated wastes are delivered to an existing recycle factory; so, it might become the key point whether any proper recycle factory exists. This model is simple to work out; that is, just prepare a bag or a container to collect the waste. City/district government needs to introduce clearly how to do the separated discharge.

Model 2 : Separating food organic wastes for compost at the household or the commercial place. This model focuses on separation of food organic wastes to be collected in a container and delivery of them to the composting process (factory) or composting at household. The important thing is that we need to provide a closed-type container to collect the food organic wastes so as to prevent invasion of insects and others. It needs frequent delivery because food organic wastes decompose very quickly. Because of it, if we need fresh raw material for the compost, regularity in collection interval is needed. City/district government need to introduce which kind of organic waste should be separated for making compost and how to separate. It must be kept in

mind that, basically, suitable organic wastes for compost are limited, although discharge rate of organic waste occupies high percentage in many cities. Besides being processed as compost, the said waste could be processed in a feed mill or in a methanation factory.

Model 3 : Separating one or more inorganic wastes and food organic wastes at household or commercial place. This model is made by providing the containers to collect one or more inorganic wastes and food organic wastes; for instance, inorganic wastes can be separated in one container and food organic wastes for another container. For the advance level, inorganic wastes (plastic, paper, ferrous metal, etc.) can be separated in plural containers and food organic wastes for another container. It is rather complicated, but the important thing is how we could keep consistency to separate the wastes as life style.

Model 4 : Separating one or more inorganic wastes at TPS (or other public places for separation). This model should prepare the container(s) to collect one (or more) inorganic waste(s) in TPS. For instance, inorganic wastes are separated in 1 container at household; then as the second step, the city/ district government separates the said inorganic wastes one more time (into PET bottle, other plastics, glass bottles, etc.). In the case that this model is used, we should prepare its precondition such as facilities to collect separated inorganic wastes from household or commercial areas. The aim of it is that this model needs special conditions to keep conditions of the separated inorganic waste from source so that they would not contaminated by other kinds of wastes during transportation to TPS.

In the process to determine the model to be selected, the best practical method should be developed; which has been tried in some cities and/or in the cities that consider the effective waste management system together with burden of household, burden of collection, eco-friendly aspect, stability aspect. As the results, the city could start the practical waste recycle activity rationally from the part that is easy to tackle.

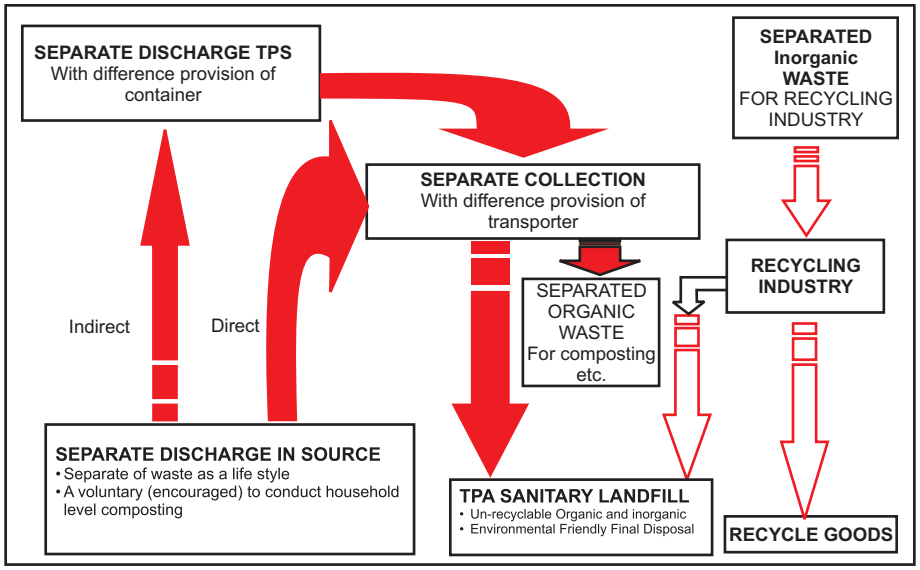



***Figure 3*** : Perspective of Integrated Waste Management

## 3.3. Marketing of Compost Fertilizer

To develop reliable compost, food organic waste should be separated for discharge at discharged place such as in the household, commercial area or factory of food products; then, separated organic wastes must be prevented from contamination by toxic or extraneous materials.

To enhance the value of compost, it is important to ferment it fully by securing proper aerobic respiration, humid, temperature and duration.

People use their compost for themselves and, so far, it is not easy to find out the practical way to market the compost to increase its demand. To secure stable demand, it is important to make good cooperation between producer of compost and consumer (farmers, park managers, etc.) by exchanging information and requesting each other.

## 3.4. Point of Separated Collection

Basic points of view for separated collection are as follows :

(1) City/district government should formulate a plan for efficient collection method where the collectors are able to collect the separated discharge of waste without excessive burden.

(2) City/district government should manage or keep to watch the collection process.

There were some cases that waste was discharged separately by people in the different container or the plastic bag; but waste collector remixed it in one trolley or in one truck. Such action breaks the reliability of the recycle system and loses the motivation of people who conduct separated discharge of the waste. It is important to secure certain separated collection system with each separated discharged of waste.

### 3.5. Separated Collection Method

For reference, this chapter shows some models regarding methods on separated collection as follow:

Model 1: Decreasing number of time of collection per one kind of waste. It means that how we could set up the date and the time for loading and pick up to transfer the separated collection of waste to treatment/recycling places, so that the separated collection of waste could be transferred timely. The date and the time for loading and pick up should be scheduled as integrated transport management so that it could achieve an effective and efficient loading time with possibility to be reviewed periodically so as to reach more efficient (reducing collection time) collection in a certain period of time. Regarding to minimize the excessive cost and burden; of course, it is possible to set up different day for collection in each area. City/district government needs to inform clearly to inhabitants when and what kind of wastes would be collected.

Model 2 : Involving a waste picker and the recycle network for inorganic waste collection. This model encourages involvement of an inorganic waste picker and their recycle network to collect separated inorganic waste from household or commercial areas in a certain fixed time. Setting up the certain or fixed time is important to create the recycling industry as a stable process. But attention must be paid to the fact that almost of the waste pickers just collects the good/valuable wastes and leave inferior or less value wastes. The city/district government should secure environmental friendly recycling flow, which will be mentioned later.

Model 3 : Separating one or more inorganic wastes at TPS. This model develops separated collection in TPS by providing different containers to collect inorganic wastes. Total containers are kept in place continuously for separated discharge of waste. Besides, it needs the investment (cost) on providing containers; also need to conduct socialization program to collectors to avoid scattering the remained wastes in the surrounding of container after they took the valuable wastes.

## 4. Prevent Environmental Pollution in Recycle Process

As discussed in the Assessment on Impact of Recycling to Environment before, we could find out the fact that the recycling process could result in the waste e.g. gaseous emission, solid waste, and liquid waste. In relation to prevent environment from pollution in the recycling process, it is directed to prevent its exposure to pollution and to avoid illness and diseases suffered by inhabitants, and to keep sustainability of environment.

To prevent environment from pollution by recycle process, the points to be kept in mind are as follow:

First, city/district government should grasp the recycling flow when it plans and conducts separated discharge and separated collection activity; it should secure or improve an environmental friendly recycling flow.

Second, to secure an environment friendly recycling flow, the relevant local government should enforce the related environmental regulations (regulation for preventing water pollution, air pollution, and implementing of EIA etc.). Then, the local government should control and cooperate with a proper recycle activity.

Meanwhile, for proper application, multi stakeholders, especially relevant key sections in the local government, private sector and civil society should be involved through partnership and development of multisectoral organization.

## 5. Fixed Recycle System

Generally, commercial transaction of recycled waste goods is not stable, because demand for the recycled-goods is basically not so high and the demand changes easily.

After city/district government starts the waste recycling activity, if the waste network collapses, it is difficult for the government to secure alternative treatment system for the emergent waste.

To avoid such matter, city/district government should forecast and confirm the long-term demand for recycled-goods when it selects the method on separated discharge and separated collection of waste. On the other hand, it is also important to secure making marketable recycle-goods as recycle system. One of the effective method for city/district government is to start the activities by small size at first, then, they could develop large scale trial (pilot project) while minimizing the problems caused by mistakes in planning stage.

City/district government should set up a plan for recycling of wastes as a part of integrated waste management, including consideration for a proper waste treatment especially for certain wastes, which are difficult to be recycled. In the integrated waste management; the city/district government should develop method for the separated discharge and separated collection of waste by providing a simple infrastructure, which is needed for separated collection and separated loading of waste as the way of separation that would be established as a method.

## 6. Postscript

For constructing stable, sound material cycle society, it is important to create partnership and to exchange information effectively among the government, the private sector, academia, NGOs and consumers.

For example, the private sector should endeavor to reduce the amount of waste by recycling or re-use of waste. The private sector should not develop products, which are difficult to handle or process when they are discarded. In addition, the private sector should cooperate with the central government and local governments in their 3R activities.

Basic principles that are referred to in the plan for this recycling program

should be the main service that would give direction to the public service with criteria, which can be evaluated. Like as other public services, this recycling program should be stable, consistent, predictable, equitable, efficient, auditable, and environmental friendly.

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