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Successful Source Separation in Asian Cities: Lessons from Japan's Experience and an Action Research in Thailand

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A child participating source separation program in Hat Yai, Thailand. Provided by CBRINT.

Dumping site in Hat Yai, Thailand. Provided by CBRINT.

Michikazu Kojima ed., *Promoting 3Rs in Developing Countries: Lessons from the Japanese Experience*, Chiba, IDE-JETRO, 2008.

Introduction

Municipal solid waste (MSW) management is one of the biggest social issues in developing countries in Asia. It mirrors not only the gaps between the increasing amounts of solid waste (SW) driven by the rapid economic growth and the capacity of the MSW infrastructure, but also the imbalance or distortion in the social system which is resulted from the slighted policy on environment. Today's issues are more complex and beyond the problem of the capacity gap. Historically, the need for solid waste management began with urbanization and local governments became responsible for its management for sanitary reasons. In those days, when society remained less developed and less urbanized, problems concerning solid waste were limited to matters which the local government could manage. However, rapid economic growth, urbanization and awareness rising in social development turned the issue into a more political or social one, and a variety of social conflicts among stakeholders could be seen. Asian cities are already facing conflicts between public cleansing authorities and NIMBYs[1] over the management of disposal sites, conflicts between cities over the acceptance of disposal sites, and conflicts between communities over utilization of disposal sites and so on. In those days, MSW issues were often too complex for local governments to handle.

While these issues are unsettled, since the 1990s sustainability from the viewpoint of the environment and resource conservation and cross-border issues from the viewpoint of globalization have started to be imposed on MSW management. The government should cope with developing hot issues such as waste electrical and electronic equipment (WEEE) and end-of-life vehicles (ELV), extended producer responsibilities (EPR) and so on[2]. Thus, it can be said that Asian cities are facing a "tri-lemma" of problems[3] at the same time, while industrialized countries are able to spend time on arranging their infrastructures and institutions.

One more aspect which has been similarly puzzling for Asian cities is the existence of waste pickers. The government is apt to regard them as informal agents from the official stance, and sometimes even denies their existence, particularly in the case of scavengers, while they actually play an important role in reducing the amount of waste to be disposed of and in conserving resources. Accordingly, how to formalize or modernize these waste pickers is also an issue in big cities.

Seen in many of the recent MSW master plans of Asian cities, the policy inspired by the idea of integrated solid waste management (ISWM)[4] that is widely accepted by the industrialized nations, is positioned as an important policy measure to solve the present MSW issues described above. In the recent understanding of ISWM broadly accepted in industrialized countries, ISWM connects to solid waste management through a waste hierarchy that comprises reduction, reuse, recycling, incineration and landfill. In this context, the 3Rs (Reduce,

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[1] Not In My Back Yard.

[2] WEEE and ELV are new waste-related policies to promote recycling based on EPR. The 3Rs (Reduce, Reuse and Recycle) policy in Japan is also in line with these policies. Globalization requires prompt adjustment between these policies in the industrialized nations and policies in developing countries.

[3] Insufficient infrastructure, NIMBY politics and sustainability.

[4] According to the World Bank (1999), integrated solid waste management (ISWM) was first defined by Tchobanoglous et al. (1993) as the selection and application of appropriate techniques, technologies, and management programs to achieve specific waste management objectives and goals. Afterward, the UNEP Technology Centre (1996) described the importance of viewing solid waste management from the inter-relationships among various waste activities, and UNEP emphasizes the importance of involving not only the public and private sectors, but also the informal sector in MSW planning.

Reuse, Recycle) are positioned as prioritized measures in ISWM. Participatory measures such as waste separation at source with the cooperation of the generator (hereafter, "source separation") and the stakeholder dialogue are expected to play key roles in ISWM. In particular, the source separation can contribute to waste reduction, resource conservation, empowering activity within the community, and reducing MSW costs.

Also, in the dimension of international cooperation, some industrialized countries[5] including Japan have started to focus their attention on environmental assistance in MSW and to emphasize capacity development in their aid policies after reviewing past aid schemes.[6] The organization of international cooperation and many NGOs funded by these governments have been assisting the promotion of sustainable MSW management involving source separation in developing countries in Asia. Regarding source separation, Japan has constructed a unique system called "bunbetsu" (separation) accompanied by voluntary action and cooperation between residents, and this type of source separation seems to have the potential to be applied to the cities in Asia.

This participatory measure also aims at the involvement of people from the informal sector such as community and waste pickers. However, neither the introduction of source separation nor the formalization of waste pickers appears very successful in practice, and very few significant outcomes can be seen so far. Why are these ideas fruitless?

This chapter tries to answer this question and show possible solutions to current MSW issues. Possible solutions focus on source separation. Although the insights below are based on the author's experimental action research project[7] in Thailand funded by JICA (Japan International Cooperation Agency), the situation in Asian cities looks similar to this case.

In the first part, the general scheme of the MSW issue in Asian cities is illustrated referring to the case of Thailand. Also, after showing that the introduction of source separation is indispensable to sound MSW management and solving the current issue, what the crucial hurdle is that makes it difficult to introduce source separation is discussed.

The second part is relevant to the history of MSW management in Japan, focusing on how Japan has been constructing a source separation system by overcoming the problems faced in common by the cities of Asia.

And in the third part, from this review and from observations from the case study in Thailand, some implications are proposed that may lead source separation towards success in Asian countries.

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[5] Germany, Denmark, Holland, Canada, and Japan are very positive to the foreign aid in the field of the solid waste management.

[6] Matsuoka et al. (2002) discusses the fact that aid countries for environmental assistance started to review their past policies at the beginning of the 1990s to emphasize strengthening the form of the organizations and institutions concerned, and developing the capacity for creating a mechanism for sustainable development.

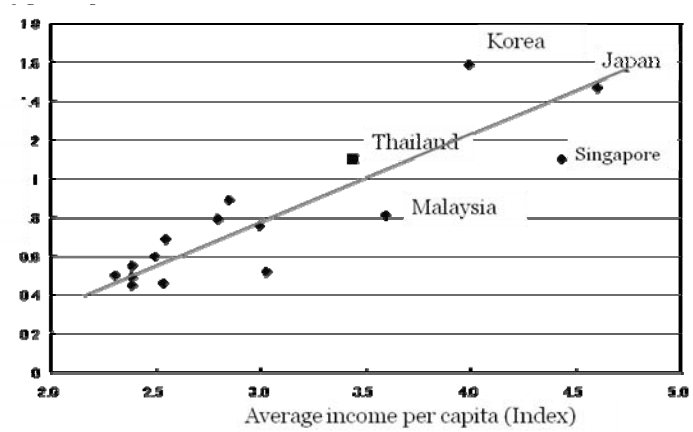
[7] The project was conducted by Bunkyo University and the Waste Policy Institute in collaboration with the Prince of Songklha University in Thailand, funded by JICA from 2003 to 2006.

1.1 What is the MSW Issue in the Developing Countries?

1.1.1 Growing Social Pressure Caused by Increasing Amounts of Solid Waste

Rapid economic growth brings about wide social change and a variety of distortions in society at the same time. Important social changes relevant to solid waste issues are mass consumption, birth of the urban middle class and rise in its social awareness, and lifestyle changes. As seen in Figure 1, the amount of solid waste per capita has a close relationship to the GDP per capita[8], rapid economic growth causes skyrocketing increases in the amount of waste due to the income effect. Lifestyle changes incidental to this also causes changes in the quantity and quality of MSW discarded. For instance, the shifting of distribution routes from traditional retailers to supermarkets in core cities causes changes in packaging, and this results in changes in the quality and quality of the waste. In developing countries, in general, MSW management is limited to waste collection and disposal in a very simple way known as open disposal due to budget constraints and the lack of skill and experience in managing landfill.

Fig. 1 Correlation between Income Levels and Amount of Solid Waste Disposed of in Asia



Accordingly, the residents around the disposal site suffer not only bad odors and unsanitary conditions affecting their daily lives, but they also sometimes become victims of serious diseases caused by toxic waste and "dump slide" disasters.[9] This has given rise to protest movements by the residents, known as the "NIMBY Syndrome" in many cities. The NIMBY Syndrome can be thought of as phenomena resulted from policy failures and rise in the awareness of the growing urban middle classes, driven by economic growth. However, the gap between the social awareness of the growing middle classes and the old regime, poor infrastructure, shortcomings in policy-making capacity and the immaturity of the democracies involved, accelerates NIMBY politics.

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[8] World Bank (1999).

[9] Limited to cases since 2000, disasters caused by dump slides of municipal solid waste have been reported in the Philippines (see Merry et al., 2005), Indonesia (see www.usembassyjakarta.org/econ/ESTH highlight_sep_oct06.html, and www.sp18.com/2005/02), and China (see http://www.landfill.cn/ArticleShow1.asp?BigClassName).

Fig. 2 Circumstances Surrounding MSW Management in Asian Cities

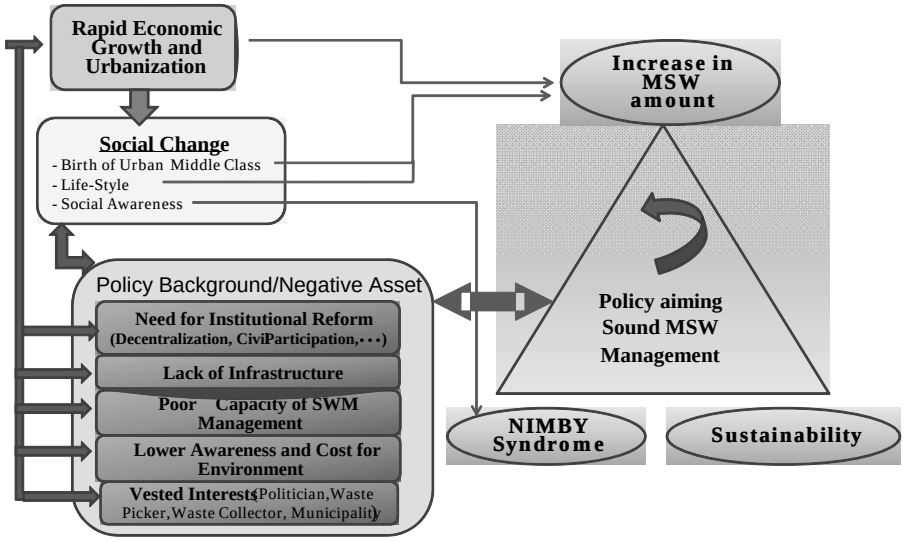

Figure 2 shows circumstances surrounding MSW management and the structure of the tri-lemma in Asian Cities. Many Asian cities are trying to implement ISW management under the constraints of negative assets from the past that include out-of-date institution, lack of infrastructure and facilities, limited MSW management capacity, lower awareness of the cost of environmental improvements. As mentioned below, vested interest in the recycling activities or business also plays a negative and sometimes crucial role in the changeover to sound MSW management.

1.1.2 Policy and Planning for Solving the MSW Issue

Let us look at the struggle towards ISW management in practice by examining the case of Thailand.

Institutional change: Legislation and administration

In Thailand, after the Public Health Act was established in 1941, the government prepared legislative and administrative schemes in the period from 1950 to 1980, including the Municipality Act, the Provincial Administration Act and the Sanitation District Act, to deal with the MSW issue of those days. The Sixth National Economic Development Plan 1987-91 was the first plan directed at sound MSW management. It inevitably involved controlling environmental deterioration and the environmental protest movements caused by rapid economic growth. The plan sets out five year reduction targets for MSW, the appropriate policies, introduction of privatization, promotion of recycling and the treatment of hazardous waste, and it also supports MSW planning by municipalities.

In 1992, the plan was put into effect with institutional reforms. The Enhancement and Conservation of National Environmental Quality Act was established, which lays out the basic strategy and funding; a new ministry was founded—the Ministry of Science, Technology

and Environment[10]—which was responsible for MSW management, and the Public Health Act was amended to give municipalities full responsibility for MSW management. Under the new scheme, the Environmental Quality and Management Plan 1997-2016 and related plans[11] form the present structure of MSW management policy.

From the social dimension, the Amended Constitution of 1997 stipulates the need for civil participation, and the Decentralized Act, which provided the right of taxation to the new self-governing bodies (Tumbon Administrative Organization—TAO) in local areas and charged them with establishing services to fulfill the basic needs. In 1996, the MSW Authority[12] reviewed past policies[13] (PCD 1996), and pointed out the problems: i) lack of a long-term view, lack of capacity in management and operational skills (for municipalities), ii) ineffective regulation, non-prioritized budget allocation and low coordination within the related ministries (central government), and iii) low cooperation and awareness of solid waste (waste generators).

An action plan was formulated up to 2002:

- Standards to increase the efficiency of waste collection and transportation
- Guidelines and standards to improve unsanitary waste disposal and its environmental impact
- Establishment of common waste disposal sites and the founding of a center for environmental communication for conflicts in constructing disposal sites
- Prioritizing urgent areas to avoid critical situations by co-investing in facilities with the private sector
- Increase in the effectiveness of fee collection
- Waste reduction plan which covers regulations and the creation of a recycling-market mechanism
- Enhancing people's awareness of waste reduction and cooperation with government units in waste disposal operations

In spite of the new laws and administrative measures, the situation became more serious after the 1990s as shown below. In 2003, following a Cabinet decision to assign the Ministry of Natural Resources and the Environment (MONRE) to draft a National Waste Management Plan, MONRE put forward a draft of the National Integrated Waste Management Plan. However, there is no prospect of approval due to the political unrest after 2006. A research report[14] (Chulalongkorn University 2004) that reviews MSW measures and identifies legal loopholes in the draft of the new plan recommends an additional specific law and a key agency. These will be responsible for formulating the policy and coordinating with the agencies involved in waste management, both at the national and local levels. This recommendation is based on the observation that current legislative and administrative schemes lack any unified institutional function that not only provides a link at the policy-making level, but also implements the plan by coordinating with the agencies involved to ensure that plan is properly implemented. It also stresses the necessity for new legislation that certifies the implementation of procedures for

[10] Currently restructured as the Ministry of Natural Resources and the Environment, MONRE.
[11] The Environmental Quality Management Plan, and the Policy and Prospective Plan.
[12] The Pollution Control Department (PCD) of MONRE is responsible for policy on solid waste management.
[13] Policies, measures, and action plans regarding municipal solid waste management in Thailand, the Pollution Control Department, Ministry of Science, Technology and Environment, 1996 (in Thai).
[14] Chulalongkorn University (2004).

the collection of waste separated at source, procedures for granting operating licenses to private businesses, and some procedures to manage waste disposal.

As in the case of Thailand, current MSW-related institutions in many developing countries appear to be out-of-date. The legislation and administrative procedures established from the viewpoint of preventing infectious diseases look too narrow to cope with the tri-lemma and to achieve integrated MSW management.

Facilities and technology

All policy reports on MSW management in developing countries highlight the poor infrastructure and the need to improve it. In the case of Thailand, the research report mentioned above shows the recent state of the equipment and technology from survey data on local governments as follows. Survey targets are a total of 1050 of local governments.

Many local governments face problems of shortages of staff, odors, and even pests, and 62% of the responding local governments (hereafter, "respondents") think that the current system of waste management is inadequate. Among the most common problems are inadequate funds, equipment, and the availability of disposal sites.[15] Local governments generally acknowledge that the technology currently used should be improved, but also recognize that effective management is costly. Let us examine this in more detail.

(1) *Landfill*

According to a World Bank Report (2003), at the beginning of the 2000s, only 4% of more than 1,000 smaller municipalities use landfill, while 57% of provincial capitals, 76 cities in Thailand, have engineered sanitary landfill sites. This means that still 90% of all disposal sites remain in an unsanitary condition. However, conditions have been improving looked at from a population-weighted base. The important thing is that, even where there are sanitary landfill sites, only five of those sites in provincial capitals truly operate with all the operational practices and environmental controls and conditions expected of a sanitary landfill site. In particular, only 21% of sites have leachate treatment, monitoring wells, and gas ventilation systems, and only 14% of sites operate with effective environmental controls, in spite of the fact that an estimated 70,000 tons of generated hazardous waste and 8,000 tons of infectious waste are disposed of in combination with municipal waste.

Regarding the conflicts over landfill or disposal sites, the research report indicates that half of provincial capitals have experience in meeting public opposition to landfill sites. And of those, one third had to abandon or postpone plans to establish new landfill sites following NIMBY protests.

Of course, the government has been taking action on this serious problem. As a result, in particular, progress can be seen in the conversion to sanitary landfill sites in the core cities, and instead of the costly upgrading of individual landfill sites, large facilities that are shared among more than one local government have been constructed with the cooperation of the provincial office.[16] A total of 21 of the shared landfill sites have been constructed and are operating successfully.

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[15] Fifty-nine percent of respondents answered that they have not introduced landfill techniques.

[16] The Thaksin Cabinet reinforced the power and duties of the provincial governors, and in addition established the Provincial Administrative Organization (PAO) as a provincial self-governing body in 1997.

Two decades have passed since the first national MSW plan was established, but nevertheless the situation still looks serious, and the problem has spread to local areas. It is important not only to provide needed capacity at sanitary landfill sites, but also to equip them with facilities for environmental management and disaster protection.

(2) *Collection and transportation*

Collection vehicles are essential in supplying an MSW service. In the survey data, 47% of responding local governments answered that the number of collection vehicles is inadequate. The author, however, cannot take this survey data at face value. According to his rough estimate for 1998, the collection efficiency of the public collectors in Bangkok is just half that of those in Tokyo. This is due to the fact that collectors have to work to separate out recyclable waste. If they can concentrate on waste collection, the number of vehicles can be largely reduced.

(3) *Treatment technology*

The introduction of incinerators has advantages in reducing the amount of waste disposed of in landfill and in sanitary processing, however, costs are high and the ISWM put a lower priority on incineration from a sustainability viewpoint. There are only three incinerators in Thailand, except for small incinerators for the treatment of infectious waste. The author has some criticism of the master plan formulated by a Japanese organization in the 1990s, which recommended incineration in Bangkok City, and still thinks that incineration is too expensive for developing countries, apart from the sustainability issue. The World Bank Report (2003) also concludes that incinerators are not likely to be cost-effective at this time in Thailand, because they are costly and operationally complex alternative to landfill. The report also concludes that given the option of transporting waste to landfill sites outside of land-limited urban areas and islands, it is likely that investments in recycling and landfill-based disposal systems will be a more cost effective investment than incurring large costs with incineration.

Composting is regarded as an appropriate technology for developing countries. Total of 113[17] composting facilities are operating in Thailand. However, the amount of waste sent to these composting plants is estimated at only 0.02% of all MSW. The Bangkok City, though it had experienced operating the composting plant in the past, reexamined introduction of a large scale composting plant recently, but finally it was abandoned. The operation of composting technology requires skill in many cases, and it cannot maintain a product quality suitable for commercial use except in the case as fertilizer for nonfood. Once the waste is mixed, it is very hard to obtain a product of good quality. Consequently it requires separation of the organic waste at source. The UN report (UNEP-IETC 1996)[18] concludes that promotion of source separation as a basis for ensuring a useful compost product is not likely to occur in most developing countries. Accordingly, mixed waste input, in conjunction with manual separation of non-compostables, may allow for significantly more compost production. Market development will also be important in promoting the use of compost beyond the bounds of traditional practices.

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[17] World Bank (2003).

[18] *International Source Book on Environmentally Sound Technologies for Municipal Solid Waste Management*.

Besides these conventional technologies, some projects are testing the feasibility of new technologies. Bio-gasification technology using both industrial and household organic waste after separation is in operation in Rayong.[19] Rayong's biogas project is in line with Thailand's goal of increasing the use of renewable energy from 0.5% to 8% by 2011. Also, in Nontabiri, where the landfill site for Bangkok City is located, technology to generate electricity from landfill gas is in operation supported by a Japanese company.[20] This technology satisfies both protection for the discharge of global warming gases and recovery of the energy. In both cases, the seeking of international cooperation for CO_2 credits using the Clean Development Mechanism (CDM)[21] scheme increases the project's feasibility.

It seems that there is no accordance on the most appropriate sound technology for Asian Cities. In particular, treatment costs and the need for pre-separation are crucial for the choice of appropriate technology. At present, composting technology can be carried out in an environmentally sound fashion and investment in composting facilities is easier to obtain when they are properly operated and assisted by the industrialized countries with CO_2 credits.

MSW cost and fees

Environmental awareness has an effect on the cost of MSW management. The World Bank Report (1999) shows that cities in both developing and industrialized countries generally do not spend more than 0.5% of their per capita GNP on urban waste services except in the case of Japan, which is significantly higher. But reflecting the differences in GNP, the total per capita cost of solid waste disposal in developing countries is about one-eighth to one-thirtieth of that in the industrialized countries in the 1990s. Lower cost restricts the selectivity among the wider policy options even if available options exist. Among the cost items, incineration costs are very high, which is a good reason for the low-income countries to give up its introduction so far. Another reason to explain the cost gap is extremely lower disposal cost for the lower-income countries. As usual in these countries, most disposal sites operate open dumping, the cost of which is far lower compared to that of the industrialized countries where environmental regulations on landfill became commonly stricter since the 1990s.

Regarding solid waste fees in Asian cities, a variety of charge systems that include unit fees, fixed sums, no direct fees (from the general budget) can be seen as ways of recovering the cost of handling MSW. Even when there is a charge for solid waste services, the fee recovery rate in developing countries is very low in general, because MSW services are such that illegal dumping is easy, especially for the poor. This indicates that MSW services in developing countries cannot easily apply a fee system like the service that the beneficiaries share the cost such as with the public transportation service. In Thailand, the average fee recovery rate is reportedly lower than 10%. International organizations often recommend raising the MSW fee or introduction of unit pricing to reduce the amount of solid waste and to enhance public awareness. However, it appears inexpedient to expect such a policy to work as well as in the industrialized countries where the illegal dumping ratio is quite low. Based on the polluter pays principle (PPP), many countries impose a fee or tax on MSW services, but a fee system

[19] ICREI (2004).

[20] Obayashi (2003).

[21] CDM is an arrangement under the Kyoto Protocol allowing industrialized countries with a greenhouse gas reduction commitment to invest in projects that reduce emissions in developing countries as an alternative to more expensive emission reductions in their own countries. In this case, companies in industrialized countries invest in the gasification project in Thailand and gain CO_2 credits.

requires careful investigation from the standpoint of the fee-recovery rate, incentive for dischargers and the cost of collecting the fees.

Source separation

In Thailand, the concept of the ISWM was officially incorporated into the 9th National Economic and Social Development Plan in 2002 for the first time, but in fact, many attempts to introduce source separation had been previously conducted, mainly at the community or school level. For example, in the 1990s, an environmental NGO under the sponsorship of a big bank and with support of a minister campaigned for its introduction in Bangkok City. However, designating a source separation program requires social adjustments and insights into the locality. The environmental awareness of the residents and their behavior concerning local governmental policies and monetary incentives for cooperation depend entirely on the stage of social and economic development which defines the historically and culturally structured relationships in any society.

According to the research report mentioned above, 85% of local governments in Thailand who responded to the survey think that source separation is preferable; however, 88% of the respondents do not have a system for separating waste at source. The main reason why local governments are in this situation lies in lack of cooperation on the part of the general public, their lack of understanding over the appropriate method to separate waste, and the absence of an approach to waste separation. In all cases, publicity campaigns (82%), facilitating the separation of recyclable waste (65%) and providing more information in educational establishments (62%) are effective.

1.1.3 Obstacles to the Source Separation System is the Key to Solving the Issue

Indispensable source separation

What is the solution emerging from the tri-lemma that developing countries find themselves in? Doubtlessly, the most effective measure for sound MSW management is introduction of source separation[22] and low-cost landfill management. As shown in Table 1, source separation has a variety of merits and it is indispensable in achieving ISWM, even in the case of introducing incinerators. In particular, if the separation of organic waste, which occupies approximately half of the composition of solid waste, on a wet basis is successfully done, both waste reduction and sanitary landfills will easily be achieved. It also contributes to resource conservation and a rise in public awareness.

Thus, source separation was addressed as a key measure in developing countries, and this seemed to accelerate after the recommendation by the international organization.[23] As mentioned above, however, its introduction was not very successful in Thailand with the exception of Phitsanulok, a case which will be discussed in detail later.

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[22] In the 1970's, industrialized countries invested huge amounts of money in developing automatic separators for mixed solid waste. In Japan too, the government implemented the "Stardust" project (1973-82). However, these attempts ended in failure. At present, source separation is believed to be the most efficient and essential method of sustainable MSW management.

[23] In 1992, UN Agenda 21 recommended Environmentally Sound Management of Solid Wastes and Sewage-related Issues in Chapter 21. The UNEP published a report titled "International Source Book on Environmental Sound Technologies for Municipal Solid Waste Management" in 1996.

Table 1 Advantages of Source Separation

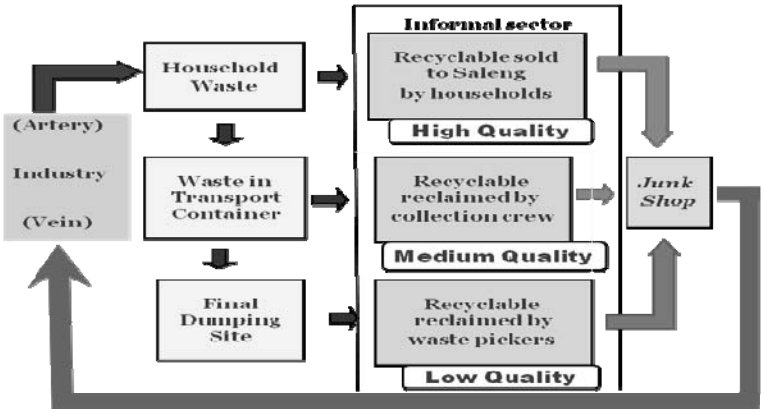
	Source Separation	Mixed Waste
Reduce (to disposal site or incineration)	Maximum reduction of 20% (recyclables) or 50% (organic waste) is expected.	Cuts the lifetime of landfill sites
Reuse	Promoting reuse	No change
Recycle	Most efficient measure for recycling	No change
Waste to energy	Very effective for better operation (achieves a low moisture content)	Incombustible
Environmental awareness	Removal of the waste bin encourages awareness and community activity.	No better effects

According to explanations from the local government side, lack of cooperation and understanding are the major causes of unsuccessful performance. But, as a result of the authors' action research program in Thailand, he cannot fully agree with this view and thinks that there are other hidden causes. Before examining the author's view, some additional explanation on the present collection system may be required.

In Thailand, solid waste and recyclables are collected by three kinds of waste collectors, as shown in Figure 3.

The first is the private waste collector, called a "Saleng," who buys recyclables on the doorstep and sell them to junkshop dealers. Waste picking is easy work and most Saleng who usually come to urban areas from nearby[24] can start work without any special skills or funding. In the case of Thailand, there is no special "patron-client" relationship between the Saleng collectors and the junkshop, and the purchase price dominates the connection between them. In the context of MSW management, they cooperate in reducing the amount of solid waste sent to the disposal site, while they are also a hindrance, since they sometimes scatter refuse in the community and even threaten the security of the community. Normally, most Saleng and many of the small junk shop owners are regarded as informal workers who don't pay tax.

Fig. 3 Triple-Layered Collection System for Recyclables in Thailand



Source: Somtip and Rotchanatch (1997).

[24] In the case of Thailand, many Saleng are farmers and seek work in the cities in the farming off-season to supplement their income, while junkshop dealers are businesses that require capital and a market in which to sell their collected recyclables. In general, junkshop dealers are small business and many of them work in the informal sector without paying tax or without a business license.

After selling the recyclables to Saleng, residents throw their waste in waste bins and the public crews collect them. In Thailand, two thirds of local authorities directly manages the services from collection to disposal, one third contracts out a part of the service under the supervision of the authorities, and 30%, mainly the local authorities around Bangkok City, privatize all these services.[25] They are believed to belong to the formal sector in a sense that they are employees of the local authorities. However, it may be too much to say that they are also likely to work in the informal sector because they supplement their income by selling the items they collect from the household in many cases. In the case of Thailand, their salary is kept lower by detailed governmental regulations, taking their side income into account. In our experience, the public collection sector is the toughest stakeholder in building a source separation system as shown below.

At the final stage, the waste is disposed of at the landfill sites or in open dumping sites, where the third kind of collector called scavengers pick recyclables out of the dumped waste. Scavengers are commonly seen in Asian countries,[26] living at or around disposal sites in big cities. They often work together with family members and live in insanitary and socially discriminated circumstances.[27] According to the World Bank Report (2003), a total of 1,783 scavengers were still working at landfill or disposal sites in 2003.

In Thailand, the waste is collected in waste bins located along the street. Two or three colored waste bins are used to distinguish dry waste from wet waste. However, such waste separation campaigns normally have no effect. Residents can discard their waste any time through 24 hours, and accordingly the present system is convenient for the discarder. As for recyclables, the residents usually sell them to Saleng who visit every household, and the rest of the waste is discarded in waste bins.

Obstacles to introducing source separation

There are many patterns of source separation classified by:

- Who collects? Public or private collection?
- What is the target waste? Recyclables, organic waste, noncombustibles, toxic waste and so on?
- Who separates? The household or the community?
- Charging system with incentive or voluntary system?
- Collection method. At curb-side stations, in front of houses, or at collection spots available throughout 24 hours?

The type that is more appropriate depends on the social conditions such as the activities of the community, mutual monitoring of correct discarding, public collection method, effectiveness of monetary incentives and the activities of waste collectors. For instance, in many industrialized countries, recyclables collections have not been autonomous since the1990s; accordingly local authorities pay the collection costs of recyclables[28] or a designated private re-

[25] Chulalongkorn University (2004).

[26] Furedy (1989) indicates that scavenging is commonly seen in Asia with the exception of Japan and China. Yet some evidence, (e.g., Yoshida 2007) shows the existence of scavengers in China, and waste pickers could certainly be seen in Japan up until the 1960's.

[27] Certainly they are discriminated against. However, their income level is not necessarily the worst and they have a de-facto vested interest in waste picking in the author's experience in Southern Thailand. The UN study (1990) supports the same result.

[28] In this case, not only the public but also the consumer and the producer are responsible for paying part of the

cycler collects them for a fee[29] to maintain the target recycling rate irrespective of market conditions. In both cases, the recycling business is almost[30] under the control of the central or local government as business partner or contractor. As seen in the next chapter, public collection of recyclables in Japan was established in Numazu City in 1975 with the aim of minimizing waste after a big conflict over landfill management. During the conflict, the public cleansing authority and the residents together surveyed the contents of the discarded waste and found the amount of waste sent to landfill could be reduced more than 60% if residents would separate. This type of waste separation, characterized as voluntary cooperation by the community, and the change in the collection crew's role and awareness rapidly spreading to whole country.

In developing countries, on the other hand, the recyclable's market is still functioning autonomously and waste pickers are unlikely to disappear even under depressed market conditions. The gain from selling recyclables is still valuable income, not only for waste pickers and collectors as shown in Figure 4, but also for housewives. Hence, while welcoming community empowerment, harmonization of interest among stakeholders should be carefully promoted and managed to maintain incentive systems when source separation is introduced.

Let us look at this point in detail from the author's experience. Suppose that a municipality decides to introduce a source separation program.

In the case in which recyclables are collected by the private sector (Saleng), better separation of the recyclables by residents will result in decreased side income for the public collection crews and additional fringe benefits for the Saleng. However, in this case, reform of the recycling industry cannot be expected while the collected amount of recyclables continues to rise. In the case public collection of recyclables is depended upon, residents will not permit collection crews to collect recyclables for free and some Saleng will end up losing their jobs. In this situation, how to pay back the net sale of the recyclables to the dischargers also becomes a concern. Normally, the accounting work of Salengs when buying recyclables is highly inefficient; accordingly, how to design the payback system in an efficient way is an issue that needs to be solved. One idea is to introduce community-based source separation systems that allow community members to check and record the amount of recyclables according to the material and this will be calculated and a certain ratio (payback) paid to each household. To realize such a system, the community needs to be very active. The issue of to whom the separated recyclables belong also needs to be discussed.

What happens when the municipality starts organic waste separation? Who among the public collection crews are willing to collect non-valuable organic waste? In this case, a separate contract between collectors and the authority will be required.

Regarding waste pickers, it will likely be a difficult task for local governments to regulate or control them. Local governments have occasionally tried to control Saleng (private collector) and dump site scavengers, but this is difficult to do, since the scavengers have traditionally done this, and there is resistance to making them outcasts or criminalizing them.

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cost of collection and recycling. When unit pricing is introduced for MSW, normal recyclables are collected for free for the strategic purpose of promoting recycling.

[29] In Germany, according to the mandatory deposit scheme, the consumer is required to pay the additional cost, as a deposit, for the collection and recycling of the packaging when purchasing a product, and the designated organization contracted by the producers is required to collect and recycle it using the deposit.

[30] When the recycling market is bouyant, non-registered recyclers often illegally pick up recyclables from collection points.

Things are more serious. In the author's experience, the method of allocating gains to collectors from selling recyclables was more complex and cleverly organized. In addition to side income for the collectors, some of the people in charge of managing the collection authorities also got kickbacks from the collectors as well. Beside this, unjust gains due to overcharging[31] or overclaiming for transportation and fuel by collection crews were also shared out between them. Under such a corrupt structure, the newly planned source separation system necessarily interferes with hidden vested interests. According to the survey of local governments mentioned above, which revealed a public outcry regarding the solid waste collection process, 17% of respondents in the Bangkok Metropolitan Region selected "fee corruption". Fee corruption can be thought the waste collectors' intercepting the collection fee paid by residents, which they pocket as a tip while residents assume they have paid a fee.

The introduction of source separation conflicts with waste pickers' vested interests too. In the 1990s, the Bangkok Metropolitan Administration (BMA) tried to introduce a source separation system, but the public cleansing department faced strong protests from the recyclers. Finally the director of the planning section was murdered and the project was abandoned. It is said that there exist two powerful "Waste-Mafias" in Bangkok. In fact, waste pickers at the large waste transfer station pay 100 baht (US$3) as a daily fee to likely this organization even now.

Thus, introducing source separation inevitably faces difficulties since it changes the hidden vested interests of the public sector and the private waste collector, and this fact was probably never discussed in the formal reports despite a crucial cause. Particularly on the solid waste issue, the question is an awkward one, because it touches on the dark side of social reform. In addition to enhancing public awareness, how to modernize the public collection system by raising the standing and the awareness of public collectors, and how to reform and formalize recyclers are crucial points in implementing source separation. In the next chapter, the history of reform of the public sector and waste collectors is discussed for the case of Japan.

1.2 Japan's Experience: A History of the Introduction of Source Separation

This section illustrates how Japanese society has been constructing a source separation system from the historical aspect, focusing on the crucial points in developing countries. The points discussed are summarized below:

- What was the turning point in modernizing the public collection system?
- Why did waste pickers disappear?
- What initiated the agreement to introduce an inconvenient collection system from the resident's viewpoint?

1.2.1 Overview of Japan's MSW History Related to Source Separation

Because of the limited space, the history of MSW management described below focuses only on collection-related matters in order to highlight the reasons why Japan successfully introduced a source separation system.

[31] In many Thai cities truck scales are not in place. The international aid project that the author participated in donated a truck scale, but it was never used by the municipality except in a test for another purpose.

(1) *Before 1900*

The history of MSW management in Japan can be divided into four or five periods. In the first period up until the first MSW law in 1900, individual households or communities in urban areas employed waste pickers to clean up the surroundings; accordingly the SW management body was a form of self-governing cleansing.[32]

(2) *1900 to the end of the war in 1945*

Twice, in 1879 and 1886, more than one hundred thousand people perished from cholera, and solid waste was identified as the source of infection. Hence a new law was established—the Dirt Cleansing Act in 1900—made the municipality responsible for collection and disposal to prevent infectious disease. The public played the major role in MSW management. Note that the act recommended incineration, despite the fact that incinerators were not commercially available in Japan. As in the case of other countries, the Public Health Authorities were responsible for MSW, and this continued for a long time until recently. The municipality was responsible for the collection and disposal of solid waste under the Ministry. The central government prepared legislation that designated the authority and funds to local governments.[33] In as little as twenty years after the new scheme started, NIMBY protests broke out. These were quite serious in Tokyo, but they were not widely seen as a social conflict. As urbanization accelerated in this second period and the increasing amounts of solid waste and the lack of dumping sites became more serious, the act was amended in 1936 to assign the responsibility for incineration to the municipalities; the separation of organic waste was encouraged, and this was processed into fertilizer until incinerators were constructed. While this MSW policy was in operation, Japan was plunged into war, and MSW management was put under the control of the military authorities. Recyclables were requisitioned as the army's strategic materials during the war, and communities were forced to participate in activities to recycle metal, with community members monitoring each other.

(3) *End of the war in 1945 to the emergence of the NIMBY syndrome around 1970*

At the end of the war and amid the destruction, Japan's cities were flooded with people who had been bombed out and returning soldiers. Waste picking was common in the major cities. In the reconstruction and development process, MSW services were revived in 1947 and source separation, which had been interrupted during the war, was reestablished. In Tokyo, the Department of Public Cleansing was established, but the major concern up until the late 1960s was the treatment of night soil.

With the outbreak of the Korean War, the regulatory economic policy imposed by the occupation army on Japanese industries was relaxed, and basic industries such as iron and steel restarted operation. This activated recycling and raised the price of recyclables, resulting in an increase in the number of waste pickers, which recorded a peak in 1952 when the price of scrap was at its highest. The rapid economic growth from 1955 accelerated material production, urbanization and brought skyrocketing amounts of MSW. Fortunately the Tokyo Metropolitan Government owned a big landfill site known as "Yume-no-shima" (dream island)" in Tokyo Bay and collection workers were also brought in from the workers involved in night soil collection, which had been replaced by sewage systems.

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[32] As the waste pickers' concern was to collect recyclables, dumping in public spaces was common.

[33] In Japan, with the passing of The Dirt Cleansing Law, relevant municipalities were limited to large core cities.

Notable in this period was the change in the collection system for MSW in Tokyo. With the Tokyo Olympics near at hand, waste bins were removed in 1961 so that they would not spoil the beauty of the streets.[34] Prior to implementation, the Tokyo Metropolitan Government was preparing a new collection system according to the recommendations of an American expert on MSW.[35] His recommendations were:

1) Adopt mixed waste collection using a container with a lid and abolish raking up work by hand
2) Sanitary patrols to monitor and crack down on illegal dumping in the streets
3) Promotion of mechanization to give collectors pride in their job
4) Create a new section to obtain the cooperation of residents and citizen's committees with publicity, education at schools and in the community

Residents were required to discard their solid waste at a fixed station and at fixed time using a plastic bucket. This change in the collection system had a great impact on MSW management.

First, adopting a fixed-time and fixed-place collection system determined the extended role that the community played in the collection, and changed the status and frame of mind of the public collection crews, one of the aims of the recommendations of the experts. Residents associations, which were functioning as the basic units for disseminating administrative information, became central players. Historically, the associations, originally organized to ensure sanitation in the late 1800s, had changed their mission. Before the war, they acted as brotherhood and vigilante groups, and during the war, the military regime forced them to monitor the community's inhabitants to ensure that they were carrying out recycling of material for the military. It is certain that the existence of these workable community organizations assisted in changing the collection system. In those days, the residents sought to make their communities beautiful and safe and to get rid of inconvenience. This resulted in raising environmental awareness.

Second, relevant to the first point, it became impossible for waste pickers to pick valuables out of the waste bins in front of houses, and in fact waste pickers abruptly disappeared from Tokyo after the Olympic Games in 1964, as shown in detail later.

(4) *From the NIMBY syndrome around 1970 to sustainable MSW management in 1987*

In the 1960s, MSW management entered a more complex situation, facing the NIMBY Syndrome and environmental issues. A crisis occurred in Tokyo in 1965. Triggered by a massive outbreak of flies in 1965 at the city's biggest landfill site, residents living around the site used force to bring the transportation of waste generated in other areas to a stop at last. Also in other areas, residents in different areas were fighting a war over the site selected for the planned incinerator. Thus, the situation was becoming complex and more serious, involving the authorities, and the Mayor declared a "War on Trash" in the city council in 1971. After three years of dialogue between the stakeholders, the war ended by suspending the construction of a new landfill site near the old one, and the principle of "dispose of waste within your own ward" was adopted. Right up to the present, this principle has been widely adopted as de facto legislation. It is remarkable that the participatory dialogue gave birth to a resolution out

[34] After a year of experimentation in 1960, removal was completed in 1966.

[35] Mr. Reveman was the Vice Director of the Department of Solid Waste Management in New York City at that time.

of social conflict with the structure of a social dilemma.[36] With the heavy and constant coverage by TV and newspapers, the public acknowledged the seriousness of the MSW issue and realized their responsibility as waste generators to cooperate.

There were big changes in the solid waste issue from the 1960s to the 1970s, not only from the political but also from the environmental aspect. Rapid growth and innovation had changed the composition of discarded waste, and the amount of hard-to-manage materials to be disposed of such as plastics and waste containing toxic materials was on the increase in those days. The waste now included materials that had previously been reused, like furniture, tires and electrical and electronics products. Corresponding to this change in the type of waste, the Waste Disposal and Public Cleaning Law was established in 1970, which provided the industrial waste with discharger's responsibility and the general waste collected from the public. The change in the term from "dirt" to "waste" in this new law showed a symbolic change in the contents of the discarded materials.

Following the introduction of fixed-time and fixed-place collections, a waste separation program at collection points was established in Tokyo in 1973. Different from source separation aimed at recovering recyclables, this separation was intended to eliminate plastics, which damaged incinerators in those days. However, it is probably that the first oil crisis that happened in the same year had a positive influence by encouraging residents to take on more tiresome tasks. In 1972, group collection of recyclables by residents associations and women's clubs was established in Toshima Ward in Tokyo. This kind of group collection is widely seen in Japan and the local government normally subsidizes the transportation costs for this voluntary activity. Group collection also triggered recyclers to find new collection routes in cooperation with community residents and local governments. In 1987, plastic bags were allowed instead of plastic buckets as a result of requests from residents in Tokyo.

(5) *Sustainable MSW management in 1987*

As the first MSW law recommended incineration in the earlier days, incineration-centered policies characterize historical Japanese MSW management and the central government encouraged the construction of incinerators since 1972. A decade after the oil crisis in 1973 the situation became favorable for MSW management and the recycling market. However, the bubble economy driven by the sudden decrease in oil prices in 1987 and the lower price of virgin materials due to the strong yen after 1985 put MSW management and the recycling industry into difficulties again. In the 1990s, a series of countermeasures were taken to promote recycling and waste reduction and finally the government decided to introduce a new recycling scheme that could maintain a constant recycling rate regardless of market conditions. The Law for the Promotion of Recycling of Containers and Packaging was the first law based on extended producer responsibility (EPR) to cope with the nonautonomous market for recyclables in 1997. Following this law, similar laws directing producers to collect and recycle such as the WEEE and the ELV directives were introduced and MSW management in Japan has been obliged rethink from an incineration-centered approach to ISWM.

[36] Social dilemmas are extensions of the prisoner's dilemma with more than three players. Social dilemmas are situations in which private interests are at odds with collective interests. Such situations arise because people frequently attach more weight to their short-term selfish interests than to the long-term interests of the group, organization, or society to which they belong. Many of the most challenging issues we face, from the interpersonal to the intergroup, are at their core social dilemmas (cited from Wikipedia, http://en.wikipedia.org/wiki/Social_dilemma).

1.2.2 Modernization of Waste Collection in Japan

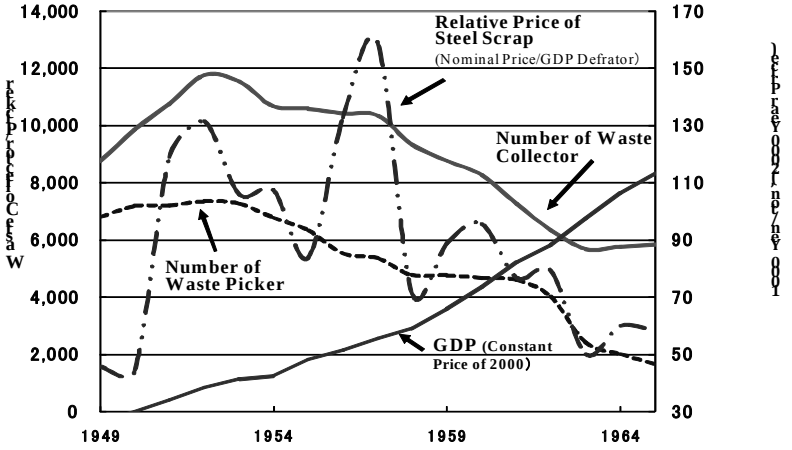
During the second period, Japanese society formed a unique sector of waste collector's/pickers. Although professional waste collectors had existed for a long time before the Dirt Cleansing Law in 1900, another sector of waste pickers grew up in the period during which homeless people came to live in urban slums in Tokyo after the Great Kanto Earthquake of 1923. Neither was necessarily a formal sector, but nevertheless waste collectors often cooperated with the regulatory authorities in each epoch, although pickers and collectors were always at war with each other. Curiously, the two sectors structured their respective recovery routes for recyclables around a market known as "Tateba." Of the two sectors, the waste pickers were supported by specific junk shop owners who rented houses to them and gave them work. The relationship between the waste picker and the junk shop owner was something of a "patron-client" relationship, and also a kind of feudal system. Accordingly, this structure was maintained over a long period, except for during the war, when both were forcibly co-opted into the war effort. Both sectors were discriminated against by society and sometimes were suspected of being hotbeds of infectious disease and crime by the police and were regulated by the sanitary authorities.

During the history of MSW, the first regulations stipulated that they use disinfecting equipment. This regulation was a burden, and some junk shop owners in the waste collector's market organized the first association against the regulation at the beginning of the 1900s. In this way, a waste collector's association was founded to maintain an information channel to the authorities and at the same time made efforts to exclude waste pickers from the market. Before and during the war both were under the control of the military regime.

After the war, waste pickers were commonly seen in urban streets and the number recorded a peak in 1952 soon after the relaxation of economic regulation. The number of waste collectors/pickers corresponds closely to the price of scrap iron as shown Figure 4. The local authorities realized they were a hotbed of the infectious diseases and disorder and controlled the waste pickers at all times. The relationship between the waste pickers and the authorities was a history of repeated regulations to eliminate them followed by resistance to the regulations by the pickers.

The first regulation imposed on waste pickers was a severe ordinance in 1915 which forced them to place disinfecting equipment within the junk shop site. However, it was relaxed after reviewing its ineffectiveness in the 1930s. The authorities also guided one group of waste pickers into forming an organization in order to secure their cooperation. After the war, facing a rapid increase in the number of waste pickers, the authorities introduced a registration and licensing system in 1953 and 1954. The system originally required the waste collectors association to regulate newcomers to waste picking.

Fig. 4 The Number of Waste Pickers and the Price of Scrap Steel



However, it is disputable whether these measures for controlling waste pickers, such as forming associations, introducing licenses, prohibiting waste picking, and forced relocation, were effective. Looking at the rapidly diminishing number of waste pickers in the 1960s, it can be said that economic growth and the rise in living standards was the biggest influence. It brought the waste pickers opportunities to change their occupation. In Japan, feudal relationships resembling quasi-households were also one of the causes of the delays in modernization. For many waste pickers, the work was not hereditary, and compulsory education, which was common in those days, encouraged the children of waste collectors/pickers to attend school.

Other influential factors were motorization and the removal of the waste bin. In Japan, motorization started at the beginning of the 1960s. However, owning a car was too ambitious for the poorer waste pickers. They could not increase their productivity without a car, while waste pickers in developing countries nowadays collect recyclables by car or motorcycle. And the policy of removing the waste bin mentioned above put an end to the waste pickers. Thus waste pickers almost disappeared. However, this did not lead to the formalization of the waste collector. Coping with the rapid increase in the amount of waste, the authorities in Tokyo started public collection of recyclables in 1955. The waste collector's association was against this policy, but finally offered to cooperate with the authorities by collecting recyclables together with the communities. By changing their course from conflict to cooperation, the waste collectors became willing to be involved in public collection in order to survive, and came to play a part in public collection in the 1960s. This cooperation was tightened after the oil crisis in 1973, which stimulated resource conservation. A new law in 1970 stipulated that the recycler should get permission from the governor in the case of industrial waste, or from the mayor in case of general waste, which promoted recyclers to modernize both their facilities and their management systems.

During the period from 1973 to 1987, the recycling market was becoming active due to the higher prices of energy and materials. However, both public collections and private recyclers again fell into difficulties from the middle of the 1980s when the strong yen was fixed at the Plaza Accord in 1985 and with the sudden fall in the price of oil in 1987. The Japanese economy enjoyed prosperity, but the rapid increase in productivity, reductions in price of raw materials, increases in labor costs and the price of property all acted unfavorably for the recycling market, which was characterized as a labor-intensive and land-use-intensive industry. In the 1990s, many recyclers changed or discontinued business, and a new scheme incorporating

EPR was enacted. This assured a non-fluctuating market, and at the same time, it moved the market into a new era of more transparent competition.

1.2.3 Reform of Public Collection

We can observe a scene in the case of Thailand in which public collection has formed a kind of hotbed giving birth to corruption and an employment system that prohibits the source separation system. Also in Japan, the side income for the collection crews was formally granted since 1930 and could be seen everywhere up until the 1970s. The collectors were held to be lower status and sometimes discriminated against. In Tokyo, the turning point was triggered by the introduction of fixed-time and fixed-point collections and the "Trash War." People acknowledged the seriousness of the solid waste issue and the importance of cooperation in solving the issue through the mass media. Public collection crews were also aware of their role in settling the issue. Their role of just collecting waste had changed into a job of educating and persuading community members. This brought about a rise in the public collector's status and attitude. When interviewed by the author, a collector who was involved in the 500 day trash-war in Numazu City answered that the collectors had been discriminated against within the collection authorities, and that pocketing the money earned from selling collected recyclables was usual practice. However, the social conflict and introduction of the source separation system completely changed their role and attitude. They were willing to give up the privilege of having a side income for a new style of work with a higher status with the authorities and society. Coupled with change in people's environmental awareness, the reform of the collection system modernized the collectors' attitude to their work.

1.3 Implications for the MSW Issues in Developing Countries from Japan's Experience

This section attempts to look at some of the implications of constructing a source separation system in a developing country from my knowledge of Japan's history and his observations of action research.

As far as I know, there are only two successful cases of source separation on a city scale in Asian cities. The first case is Markina City, known as the best-managed and cleanest city in the Philippines. In this case, the former city mayor successfully achieved an efficient MSW collection system and sanitary landfill by his own discipline and strong political will. Waste collectors are prohibited from accessing households and recyclables from are all collected from houses and managed by public collection. It is said that this success was achieved by the mayor's strong will to spare no pains in battling even with the Waste-Mafia. The mayor alone solved both the problems of the old public collection system and the waste pickers' issue; accordingly the solution much depends on the character of the main actor and this success seems unlikely to be replicated in other cities.

The second case is Phitsanulok City in Thailand. It is interesting to see how the city achieved a higher level of participatory source separation.

1.3.1 Success in Phitsanulok

Success in the Phitsanulok City shows us the conditions for constructing sound MSW management in Thailand, and also shows specific characteristics that are not easily applied to other cities. In 1995 a female candidate whose campaign platforms were extirpation of corruption and resolution of the solid waste issue was appointed as mayor of this city. She requested the German government to advise on environment-friendly MSW policies and technology, and successfully implemented the series of MSW policies shown below assisted by the GTZ (German international cooperation enterprise) (Hantrakul and Scholl 2004):

1) Waste reduction by introducing community-based source separation of organic waste and recyclables
2) Waste treatment by composting and sanitary landfills
3) Reform of the MSW management organization with crossover/horizontal functions in the municipality and a change of attitude in getting the MSW authorities to encourage cooperation between the service provider and the residents
4) Implementing the "beneficiary pays" principle in MSW services by exhaustive fee collection and by cutting subsidies from the general budget
5) Solution involving peripheral TAOs (small cities).

These policies resulted in a remarkable almost 40% reduction in waste between 1996 and 2002, more than an 80% fee-collection ratio and the achievement of sound landfilling. In addition to the mayor's leadership and recommendations from GTZ, the existence of competent recyclers should not be ignored. One junk shop owner rising from the Saleng played a major role in constructing the community-based separation system and in controlling the waste pickers. The junk shop owner, Dr. Somtai, is now the president of the biggest recycler in Thailand, Wongpanit Corporation. He is the hero of a success story and was awarded a medal for distinguished achievements by his Majesty the King. The key to his success was to collect recyclables from the community by inspiring the community and children's activity. Wongpanit grew up to be the dominant recycler in this area, and now the company can buy recyclables at a higher price than any other recycler using its own information network in the recyclables' market through franchisees. The current method of collecting recyclables from the community is as follows:

1) Wongpanit announces today's prices of recyclables by item to community leaders in advance.
2) Community leaders account for and make a list of the recyclables that each household brings into their community spaces for collection.
3) On receiving the list from the community, Wongpanit sends a car to pick them up and pay the total amount of money.
4) Quality of the separated materials is strictly managed based on the company's standards.

Not only the communities but also Saleng and the public collection crew sell their collected recyclables to this company according to the standards. The company never purchases recyclables from waste collectors who do not keep to the standards. Thus, Wongpanit can control the waste collectors and waste pickers by making use of its dominant market power, and cooperates with the waste reduction and recycling policy without any subsidy from the municipal offices. Promotion of recycling and higher purchase prices contribute to a higher fee collec-

tion ratio, because it is easier for the residents to gain by selling their recyclables to pay their fee.

How wonderful it is to see a good trend towards ISWM! However, this kind of good practice cannot be seen in other areas where Wongpanit's franchisees have started business, despite efforts to transfer the Phitsanulok experience to the whole country. In the author's view, the success required the correct policy to raise community awareness, political leadership to change the attitude of the public collection department and the municipal organization, a dominant recycler that can control the waste collectors in line with the municipal policy and technological assistance. Is it possible to arrange all these factors for success together? As with the Markina City case, the Phitsanulok case looks very difficult to replicate in other cities.

1.3.2 Solution Leading to Success in Source Separation

Again, much emphasis should be placed on source separation for sound MSW management in developing countries. In the conclusion, some policy implications for constructing such a system obtained from the history of MSW in Japan and from observations of the author's action research in Thailand will be discussed below.

Need for new legislation to enable the introduction of participatory measures

As there is little experience of decentralized political schemes in developing countries, it is easy to imagine that adapting participatory measures is accompanied by many difficulties. Immature political and environmental awareness of civil and lower community activities and lack of a policy-making capacity in MSW management in local governments are all barriers to solving the tri-lemma. While MSW management has become a serious social issue, local politicians tend to escape from this troublesome solution accompanying the participatory measures. In the case of Thailand, the decision-makers tend to take an outsourcing solution which just extends the problem to local areas, just as Bangkok and Chengmai always contracted out all MSW services to the private sector and brought all the solid waste outside the cities. From the lessons learned in Japan, disclosing the conflict to the public rather than postponement or concealment of the conflict resulted in increasing the social capacity to solve the problem. In Tokyo and also in Numazu, participatory procedures including dialogue among the stakeholders finally assisted in finding a better solution. Such political confusion may seem to affect the head's prestige at first sight, but nevertheless it will have a favorable effect on public attitudes to the MSW issue. In the author's view, Thai citizens in urban areas are trained to cooperate with social issues and the community is active enough to make decisions on the social dilemma.

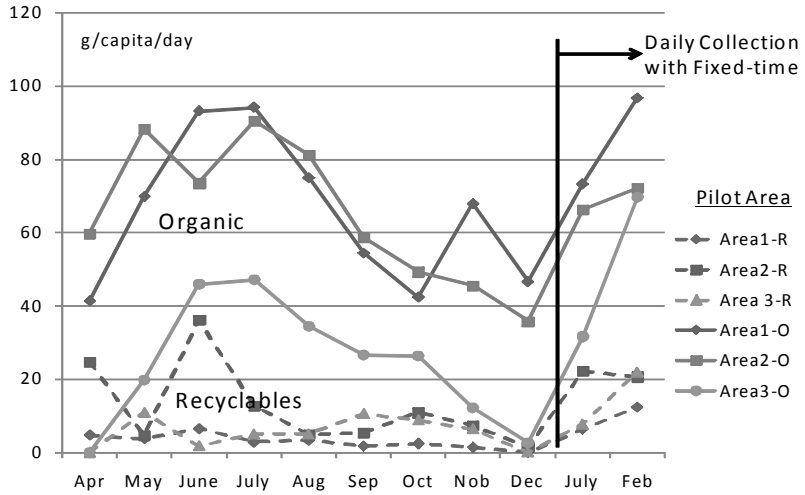
In connection with the legislation in the Thai case, a new law which enables the integrated administration of large regions and a new key agency that is responsible for setting the policy and coordinating with the agencies concerned on waste management both at the national and local levels will be effective as the research report recommends. In addition, legislation that certifies the change in the current public collection system mentioned next to implement procedures for source separation is indispensable.

Change in public collection

The public collection system should be drastically changed. First, the present employment system for collectors is premised on the side income they generate from waste picking. But the national provision of a collector's salary that is reduced to take into account the side income in no way contributes to a reduction in the budget; rather it results in lowering the collection efficiency and even gives birth to a hotbed of corruption. Concentrating the public collection crews on collection work will increase the collection efficiency, which will result in a reduction in the number of collection vehicles. Not only their salary, but also their social status should be improved by letting them play the new role of collection service provider as can be seen in the Phitsanulok case. From the Japanese experience, both the status and attitude of the public collection crews drastically changed after the big conflicts over the MSW management issue were resolved, and after introducing a source separation system which requires face-to-face communication with the community.

Second, the present collection method using waste bins is easier for the discarder but it is unsanitary and spoils the beauty of the streets. When introducing a source separation system, a fixed-time and fixed-collection system is recommended. This collection system will assist in changing public awareness and community activity as well because it requires cooperation between community members. Figure 5 indicates the monthly collection amount of organic and recyclable waste from three pilot areas in our action research program that introduced the same collection method mentioned above. The project faced difficulties with irregular collection times by the municipalities three months after the project started, which discouraged the residents from cooperating with the project. But once a fixed-time daily collection was reinstated, the cooperation rate rapidly recovered. Thus, the removal of waste bins and introduction of fixed-time and fixed-point collections seems to be very effective in implementing a source separation system.

Fig. 5 Change in Collected Amount in the Action Research Program



Source: Final Report of the CBRINT Project.

Formalization of waste pickers and promotion of recycling

The Phitsanulok case and Japan's historical experience teach us much about how to formalize the job of waste picking.

Many trials have been reported on the formalization of waste pickers, and in particular scavenging.[37] These include job training, campaigns to raise environmental awareness, introduction of licenses, subsidization, opening night schools, employment in other jobs and so on. However, these trials also seem unlikely to be successful. Just as seen in the case of Japan, using economic and market incentives rather than supportive or command-and-control measures seems more effective for waste pickers. In Phitsanulok, a dominant recycler successfully controlled the waste pickers in its area using the power of the market. In the case where small-scale recyclers and informal recyclers coexist, something like an industrial policy to assist specific innovative recyclers to grow may be required. The end users of recyclables, such as the secondary metal processing industry and the paper manufacturing industry, can contribute to the formalization of waste pickers. They have power in the recycling market as purchasers, and accordingly, the collection route will be cleaned up more by purchasing recyclables from recyclers with a license, for instance.

And local governments should have a clear recycling policy. Although enhancing recycling activities is beneficial to local governments from budgetary and waste reduction perspectives, local governments normally have no coordination with the recyclers. Their major concern is raising awareness in the community. But local governments should think over policies such as giving direct incentives to recyclers who can coordinate with the recycling policy and a policy of excluding waste pickers without licenses. According to the simulation results of the action research project,[38] even public collection of recyclables can also be applied without changing total MSW costs by reducing the collection frequency for recyclables. In integrated MSW management, a system approach along the flow of recycled materials is important, where all the stakeholders—including the recycling industry—are required to cooperate under a waste reduction and recycling policy.

Introduction of source separation in implementing ISWM in developing countries is not easy because it requires changes in society including adjustments to vested interests. Nevertheless, a serious MSW situation will not be eased without such participatory measures. Tough but minute examination of how to design a source separation system that appropriate to the area in question should be implemented.

Conclusions

The present serious situation with solid waste management in many Asian cities has already entered a phase where the NIMBY syndrome has appeared, and is beyond problems of insufficient infrastructure. Such a phase mirrors broader the social distortion or imbalances driven by rapid economic growth and urbanization; accordingly it requires a more comprehensive solution. Asian cities also have a common problem of how to reform traditional waste pickers. Moreover, while these issues are unsettled, the new requirement for sustainability has been imposed on MSW policies since the 1990s. Thus Asian cities are facing a situation that can be termed a “tri-lemma.”

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[37] As far as the author knows, the projects are: trials conducted by US and Canadian NGOs in Indonesian cities such as Jakarta, Bandon and Surabaya; two projects aimed at formalization of scavengers in Manila; the UN program in Madras, India; a program aimed at job conversion assisted by a German international agency in Katmandu; a capacity developing program with US technical assistance in Phnom Penh, Cambodia.

[38] Final Report of the CBRINT project

Immediate policy targets to solve the tri-lemma should be addressed to reduce the amount of waste and ensure sanitary and safe landfill sites. In order to meet these targets, the concept of Integrated Solid Waste Management (ISWM), which prioritizes the 3Rs (Reduce, Reuse, Recycle) and which requires participatory measures including source separation and dialogue among the stakeholders along the waste stream, looks the most promising. Although many trials based on ISWM in Asian cities have not been very successful so far, achieving success with source separation is still the key point to emerge from the tri-lemma. From the author's action research program in Thailand that aimed to introduce a source separation system, and from the study of Japan's historical experience in constructing a source separation system, the following implications can be drawn:

- Regarding the legal system for MSW management in the case of Thailand, the present legislative and administrative scheme lacks unified institutional functions to achieve its targets both in policy making and in implementation, as the Chulalongkorn Report also points out. In this context, new unitary legislation with administrative relevance to MSW management is required. In the policy field, procedure to ensure safe landfill management, waste reduction and recycling-enhancing policy which can coordinate public collections with private recyclers, and enhancement of source separation should be prioritized.

- The employment of measures to ensure the introduction of source separation is also indispensable. As Japan's experience shows, its introduction means a switching of the key players in solid waste collection from the public to the community or waste discarders. Accordingly, the public collection system should be modernized to cope with the new scheme. In the case of Thailand, abolishing the collection of recyclables by collection crews, which will improve the collection efficiency and reduce the number of collection vehicles and enable an increase in both their social standing and their attitude in educating community residents, is important. Technically, converting the collection method from the convenient but unsanitary waste bin collection system to a fixed-time and fixed-point collection system can ease waste separation and promote community activity at the same time.

- In addition to environmental education through the media and at school, forcible measure will be required to improve the habits of the discarders of waste. From Japan's experience, removal of the convenient waste bin through a change in the collection system with the aim of securing safety and orderliness in the community enhanced community activity, and the dialogue needed to resolve serious conflicts such as the "trash war" had a strong effect on getting the parties to accept participatory measures. Confidence in public policy and the MSW authorities is also important in securing the cooperation of residents, and hence reform of the public collection system as described above is indispensable.

- Introducing policy measures through the recyclables market rather than forcible measures to control the waste pickers and collectors appears to be more effective in formalizing the work of waste pickers from Japan's experience. Standardizing the quality of recyclables and purchasing policy to assure a collection route through to the final end user—normally this sector is big business—is necessary. On the public side, the government should have a clear policy on the activities of recyclers with regard to which activities can assist in reducing waste and increasing sustainability. Local governments should consider introducing policies

that give direct incentives to those recyclers who can coordinate with the recycling policy and the exclude waste pickers without licenses.

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