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Supporting Capacity Development for Solid Waste Management in Developing Countries

— Towards Improving Solid Waste Management Capacity of Entire Society —

July 2005

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This report is based on the discussion and findings of the study group on "Future Direction for Cooperation to Developing Countries in Solid Waste Sector," organized by the Japan International Cooperation Agency (JICA). The views expressed in the report are those of the members of the Study Committee and do not necessarily reflect the official views of JICA.

Throughout the report, Japanese personal names are transcribed in the order commonly used in Japan, i.e. family name first, followed by the personal name.

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Foreword

Human activities involve the generation of waste, and the waste stream-from generation to final disposal-continues to change along with the evolution of the economic, historical, cultural, environmental and other aspects of a society. Solid waste problems in developing countries range from inadequate waste collection systems to environmental pollution due to improper final disposal. There is also a direct relationship between solid waste problems and the problems of urban poverty. Therefore, it is impossible to find universal solutions to these waste problems.

Solid waste problems are not a new issue for developing countries or for developed countries to deal with. Yet there is an increasingly deterioration in the systematic adoption of waste management systems in the developing world since traditional systems of solid waste management (SWM) are no longer unable to cope with the increasing amounts of solid waste as a result of the rising levels in recent years of waste generation as developing countries experience economic growth and the introduction of mass consumption lifestyles from the developed countries.

Many developing countries continue to have high hopes of Japan regarding expertise and technology in this sector. Japan has a history of overcoming urban waste problems under government leadership and in cooperation with local communities during the period of high economic growth after the Second World War; such problems were so serious that the then Governor of Tokyo at the time declared a "War on Garbage."

It should be noted, however, that the present SWM issues facing Japan are different from those for developing countries. Attempts to introduce SWM techniques used in Japan to developing countries without an understanding of their societies and other conditions will not work effectively at best. They will eventually result in unfortunate consequences for both the developing countries and Japan. As a donor, Japan should first accurately assess the issues and needs of each developing country and then explore the optimal form of aid to the country or society. This approach is essential to ensure that the outcomes of aid are more effective and sustainable.

With this in mind, this study calls for support for capacity development initiatives taken by aid recipients as the linchpin of JICA's future assistance in the SWM sector. In other words, the primary objective of aid in this sector must be to support recipients in enhancing their SWM capacity for the entire society and in building sustainable SWM systems.

This capacity development approach is in line with the direction that JICA's technical cooperation is now attempting to take. Elements of capacity development for the recipients were actually already included in JICA's past assistance in the SWM sector in the form of, for example, collaboration in formulating development plans. It is worth noting, as a feature of this report, that a review of the past experience of JICA and SWM issues has pointed to the direction of capacity development.

Recent moves by JICA have created a better environment for the integrated approach of capacity development at home and abroad. In Japan, JICA reorganized itself when the agency attained the status of an independent administrative institution in October 2003. The new setup, featuring issue-based departments, has created the Global Environment Department, which has a clear responsibility for SWM affairs. This department is already exploring ways of improving coordination among aid schemes to bolster aid in the SWM sector. In the recipient countries, Japan has set up local ODA task forces involving JICA, JBIC and other Japanese agencies. These task forces are expected to improve coordination among these agencies.

I sincerely hope that this report will be widely used as a basic reference for the development and implementation of technical cooperation.

This study committee, consisting of outside experts, JICA staff and consultants, met many times to discuss issues with the participation and support of a number of resource persons. I would like to take this opportunity to express my sincere gratitude to those who contributed to this study and report.

April 2004
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Contents

Executive Summary

1. Prior Conditions for Considering Issues and Aid in the Solid Waste Sector; Recent Aid Trends and their Implications-Lessons Learned and Future Directions for Aid; and Approaches to Capacity Development Support (Chapter 1)

It is not appropriate to assess the solid waste problems in a particular way since various aspects, such as the economic, cultural and historical background in any society, are reflected in the nature of the problems. These problems are becoming more and more serious because solid waste management (SWM) systems that have been formed in developing countries over the years can no longer cope with rapid urbanization, including population concentration in the cities, and changes in consumption patterns. As SWM is closely related to the state of the respective society, solid waste issues should be addressed on a case-by-case basis.

This conclusion is in accordance with the observation of donors that there are no cases in which the technologies of developed countries can be directly applied to developing countries. Donors should understand this fact first and then endeavor to answer the question: what are really appropriate inputs and applicable technologies? As waste problems are a mirror of the entire society, it is inappropriate to regard these problems as an issue for the waste sector alone. Donors need to conduct problem analysis in the context of the overall social structure and consider what kind of support can be provided to ensure that recipients exercise ownership and develop their own SWM capacity.

Donors have learned two major lessons from their experience. One is that cooperation with respect to the 'hardware' provision in the 1970s and early 1980s based on the input of equipment, facilities, installations, etc., has proved ineffective over the long term; aid effectiveness was unsustainable due to the inadequate administrative capacity of the recipients. The other is that the capacity and ownership of the recipients play a major role in achieving aid effectiveness in cooperation in the provision of 'software,' which has focused on planning, management, and operation and maintenance since the late 1980s. In recent years, donors tend to look at the overall picture of the capacity of the recipients and take integrated approaches designed to explore ways to help them to improve their overall waste management capacity. In other words, donors increasingly adopt a capacity development concept that emphasizes social aspects as well.

The concept of capacity development is aimed at helping developing countries with their endogenous and continuous process of improvement. This makes the concept quite different from donor-led or expert-led capacity-building approaches that are designed to promote the growth of the recipients by filling any void in their capacity with technology transfer and technical cooperation.

JICA is gradually shifting its direction with regard to cooperation towards improving the capacity of developing countries in terms of their problem-solving and management with the emphasis on ownership by the recipient countries. For example, JICA is increasing the number of pilot projects and is introducing "software" components along with equipment in its grant aid projects. Donors should place such approaches at the center of their assistance in SWM and take every opportunity to provide incentives and opportunities for the recipients.

2. Structuring of Issues in the Solid Waste Sector; Lessons Learned from Aid Projects and Programs (Chapters 2 and 3)

Chapter 2 begins by structuring the issues in the solid waste sector and identifying factors behind them (Section 2-1). The idea is to provide a general picture of common challenges for developing countries and a frame of reference for addressing them. The charts in this section can serve as a problem analysis tool-a tool that can be used to consider what policy or which direction to take in solving problems according to the SWM management capacity of the recipients. In such problem analysis, it is desirable for the recipients to become involved as the key actors and share the process of identifying SWM issues with the donors. The second to fourth sections of Chapter 2 discuss these issues in relation to such aspects as cities, organizations/institutions, and society. Section 2-5 sheds light on the issues in the context of environmental pollution. Section 2-6 structures issues around processes in the waste management flow (waste generation, collection, intermediate treatment, recycling, and final disposal).

Chapter 3 takes up actual cases of SWM support in the Philippines, Laos, El Salvador and Sri Lanka and draws lessons for future assistance. One of the common lessons thus learned is that multifaceted approaches to capacity development play a major role in sustaining aid effectiveness. Another lesson is the need for sustained support and follow-up.

3. Methodologies and Considerations for Applying the Capacity Development Concept to Assistance in SWM (Chapter 4)

Stressing the ownership and initiative of the recipients is the key to the success of aid approaches that involve the capacity development concept in the solid waste sector. Donors should primarily work together with the recipients to select aid inputs, after looking realistically at the actual situation in the developing countries and identifying obstacles and appropriate technologies for SWM. Regarding appropriate technology, technologies that are rational and appropriate for the donors are not always so for the recipients. Donors are, after all, external actors.

It should also be remembered that capacity development is a gradual process. It is impractical to raise the capacity of developing countries to the levels of developed countries all at once. In this regard, JICA needs to establish a sustainable monitoring framework with the appropriate mobilization of human and institutional resources to follow up on the capacity development process. This should be done in addition to taking integrated approaches with an optimal combination of various types of aid schemes that are designed to cope with diverse situations.

Before considering specific aid components, the following items should be assessed or defined: (i) the background of the recipients and the development assistance available to them; (ii) the recipients' concerns and needs; (iii) the wastes covered; and (iv) implementing agencies and counterparts. The next important step is to assess both the overall and SWM capacities of recipients and identify related issues.

In this chapter, the capacity of the recipients is analyzed in terms of its characteristics at three different levels: (i) individuals (knowledge and skills of individuals engaged in waste management services); (ii) organizations (physical, human and intellectual assets, leadership, organizational management frameworks, and organizational cultures that are all needed for organizations involved in waste management to achieve their objectives); and (iii) institutions and societies (the environment, conditions and mechanisms that are all required to ensure that waste management systems work; policies,

institutions, frameworks, customs and norms). Essential check items required to assess capacities at these three levels are also provided. These analyzing and checking processes identify the problems and what kind of capacities should be improved-in other words, the specific objectives of an aid project.

4. Future Directions for JICA's Technical Cooperation (Chapter 5)

As discussed earlier, in order to implement capacity development support in development assistance, respect for ownership by the recipients is an important element to consider for the future of the waste management sector. Techniques and considerations for practicing aid approaches centering on capacity development support on the ground are identified for both the project preparation/formation and implementation phases. In addition, priority issues to be addressed to effect a shift in direction for development assistance are defined as: (i) emphasis on community-based waste management; (ii) development of the capacity to allocate resources as a short-term solution; (iii) sustained aid delivery; (iv) development of a grand design for aid; (v) recognition of social relationships among different stakeholders and the promotion of their involvement; and (vi) a focus on waste collection and landfill operations where inputs and resources are limited.

Recommendations on how to direct JICA operations toward capacity development support are summarized as: (i) knowledge accumulation; and (ii) directions for the improvement of each aid scheme.

Capacity development support in SWM constitutes a key concept in exploring future directions for technical cooperation. In retrospect, some attributes of this concept can be found in JICA's past operations and experiences. However, these attributes are derived from the trial-and-error processes of individual projects; these processes have yet to give rise to the establishment of this concept.

Two major challenges have to be addressed. One is to establish practical methodologies for capacity development support by accumulating experience and drawing lessons from such experience, in addition to the original goal of improving the outcomes of each project. The other is to build up the human and other resources to provide such support.

Introduction Supporting Capacity Development for Solid Waste Sector in Developing Countries: Background, Methods and Objectives of the Study

1. Background to the Study

Developing countries have a range of solid waste problems, including: inadequate waste collection systems, open dumping and other forms of improper final disposal and the resulting environmental pollution, scavenging at landfill sites by waste pickers, and illegal dumping. These problems are being aggravated by growing waste generation rates associated with economic growth, increases in consumption levels, and the transition to mass consumption lifestyles in developing countries. There is concern that these problems, if left unaddressed, will become a serious challenge for generations to come. This concern has been shared by the international community since the 1990s. Agenda 21, a global action plan for sustainable development adopted at the UN Conference on Environment Development in Rio de Janeiro (the Earth Summit) in 1992, called for the environmentally sound management of solid wastes, among other priority issues.

Japan has already launched a series of initiatives to tackle solid waste issues. At the Special Session of the UN General Assembly (UNGASS) held in 1997 to review and appraise the implementation of Agenda 21, Japan announced the Initiative for Sustainable Development towards the 21st Century (ISD). ISD set out the philosophy and an action program for Japan's development assistance in the environmental sector. In 2002, Japan announced its Environmental Conservation Initiative for Sustainable Development (EcoISD), which built on ISD and was designed to provide more efficient and effective aid in this sector. EcoISD emphasized "waste management" as part of its focus on one of Japan's fields of expertise in which it has extensive experience-pollution control and improvement of the living environment in urban areas. The third Japan-Pacific Islands Forum (PIF) Summit Meeting in May 2003 issued the Okinawa Initiative: the Regional Development Strategy and Joint Action Plan for a More Prosperous and Safer Pacific. Among other priorities, this initiative called on Japan to support the development of a regional strategy for solid waste management (SWM) and provide technical assistance in the SWM sector. This clearly shows that Japan is expected to play a more positive role in development aid in relation to SWM.

Based on these initiatives, JICA has been employing a range of aid schemes-including development studies, the dispatch of experts, technical cooperation projects, and technical training of overseas participants-to meet numerous requirements for assistance in the solid waste sector. The problem is that JICA has been selecting these aid modalities on a case-by-case basis. In other words, JICA has not necessarily been taking a comprehensive approach to the SWM sector.

Given all these background factors, this study committee has been assigned two major tasks. One is to identify and structure all SWM issues facing developing countries with reference to recent trends in this sector. The other is to explore the future directions and approaches for Japan's development assistance in the SWM

sector. It should be noted that this study generally focuses on municipal solid waste, which should be addressed as an issue that is of the highest priority. Hazardous wastes and medical wastes are considered here only in relation to municipal solid waste. Radioactive waste is beyond the scope of this study.

2. The Message of the Report

Two principles underlie this report. The first principle is the introduction of the concept of capacity development in development assistance in the SWM sector. The report focuses on how to define the concept of capacity development in the context of SWM and on how to deliver better aid, including ways to put the concept into practice and considerations to be adopted in the delivery of aid.

To date, donors have tried a variety of aid approaches in this sector. Yet these approaches can largely be divided into those based on physical inputs, such as waste collection vehicles and heavy machinery for landfill operations, and those based on non-physical inputs, including technology transfer and master plan development.

These traditional approaches had one thing in common-the idea that because developing countries lack sufficient skills and ability, this lack could be overcome though the input of expertise (knowledge and skills) and equipment from external donors (particularly "teaching" by experts to their counterparts in aid projects). Consequently, there has been insufficient attention paid to ownership by the aid recipients, in other words, the development of the capacity of local government institutions and residents who are the direct stakeholders in SWM.

Despite some successful cases, there is no denying the fact that these approaches have often brought about outcomes that have turned out to be "pie in the sky" solutions that produced "a graveyard of provided equipment," or to have deepened the dependency of the recipients on aid.

The members of the study committee shared serious concerns about these "stern realities of aid." The questions for the committee were: how to overcome these negative aspects and how to better contribute to capacity development.

The committee tried to answer these questions by setting a new direction: a shift towards assistance in SWM based on the concept of capacity development. The report concluded that it is important to arrange aid inputs so as to enhance the overall capacity of the recipients based on a comprehensive assessment of capacities[1] at three levels: individuals, organizations, and institutions/societies, while ensuring ownership by the recipients.

The second principle is an emphasis on social aspects. Although urban SWM services are generally delivered by municipalities, the efficiency and performance of service delivery is significantly reduced unless communities play an active part in SWM. Without drawing on past examples of local opposition to the proposed siting of landfills, it is nevertheless clear that consideration for communities and agreement with them are now essential elements of the delivery of waste services. It can even be argued that solid waste problems are social phenomena closely related to urban and economic problems (especially poverty).

In this report, special emphasis is placed on the relationship between waste and the society and economy. Chapter 2 stresses the need for social considerations. Chapter 3 tries to identify lessons and issues from case studies of community-based projects and programs.

These two principles are not a product of theoretical discussions. They have been derived from almost two decades of JICA's direct experience in the solid waste management sector, that is, a history of cooperation between JICA-numerous experts, consultants, volunteers and other personnel in the public and private sectors-and their counterparts in the developing countries.

[1] For the definition of capacity and the concept of capacity development, see Appendix 1, Glossary, and Sections 1-2-2, 4-1, and 4-2.

The members of this study committee would be more than happy if the reader perceives signs of this history between the lines.

3. Organization of the Report

The organization of this report is illustrated in Figure 0-1. As this figure shows, the report is made up of five chapters.

Chapter 1 first reviews and characterizes both the issues surrounding solid waste problems in developing countries and the constraints on aid delivery as background information. Then this chapter looks at recent trends in bilateral and international donors and aid agencies in Japan. Special emphasis is placed on international aid trends, especially efforts since the 1990s to apply the capacity development concept to the SWM sector.

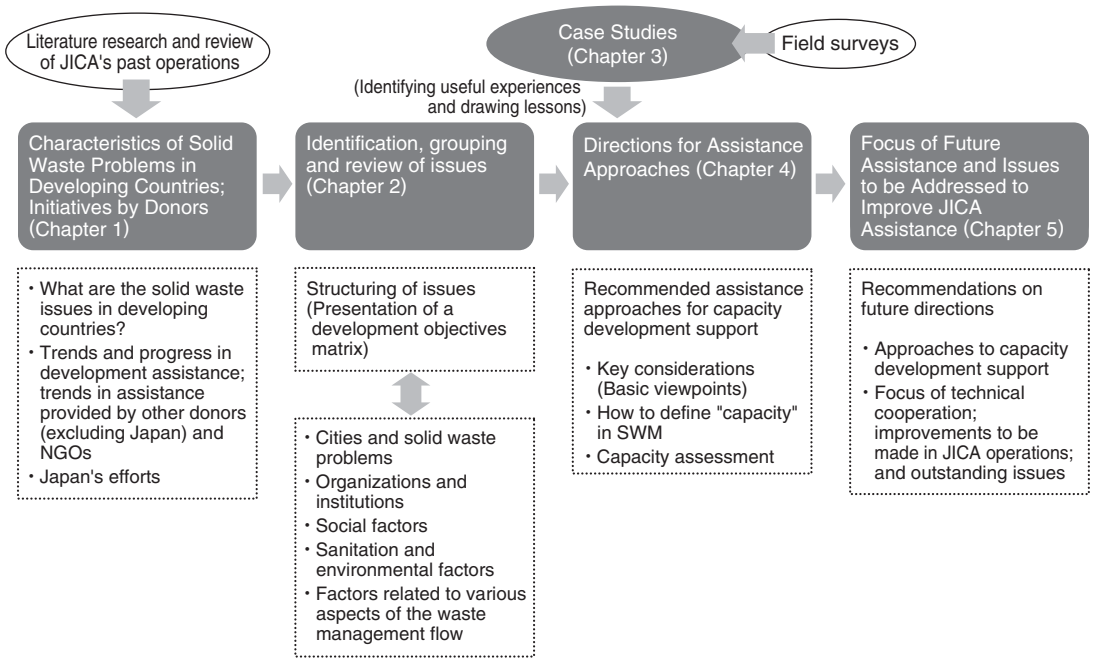
Chapter 2 reviews and structures the issues facing SWM in developing countries in the form of a menu. Then each issue on the menu is analyzed and characterized. This menu can be used as a tool for problem analysis, project formulation and evaluation. In other words, the purpose of this chapter is to provide a frame of reference for SWM issues in developing countries.

Chapter 3 provides case studies of JICA's projects and programs in the SWM sector. Efforts to address some of the issues structured in Chapter 2 are introduced in these case studies. This chapter also tries to identify success factors and constraints and to draw lessons for the implementation of aid projects.

Chapter 4 puts forward approaches to be adopted for aid related to SWM in the context of capacity development support, drawing on discussions in Chapters 2 and 3. Key considerations for the implementation of these approaches are also identified.

In conclusion, Chapter 5 reviews methodologies to apply the concept of capacity development support to aid for SWM. Priority issues are also identified. This chapter also puts forward recommendations for improving JICA's operations and addressing outstanding issues.

Figure 0-1 Organization of the Report



4. Methodology of the Study

For this study, JICA set up a group entitled the "Study Committee on the Directions for Development Assistance in the Solid Waste Sector," which was largely made up of a board comprising third-party experts and a task force consisting of JICA staff. The committee met a total of six times between October 2003 and July 2004.

The Second Research and Development Division of IFIC-JICA[2] served as the secretariat and took charge of overall management, including the holding of committee meetings and the compilation of this report. The board, resource persons and the secretariat made presentations on key issues and the whole committee discussed them. The committee also conducted follow-up surveys in the Philippines and Laos to draw lessons from JICA's past projects. The findings of these surveys were incorporated in the case studies. In September 2004, the committee held an open meeting to introduce the past discussions and the contents of this report and to exchange views. Based on the comments from panelists and the floor, the committee reviewed the contents of this report.

This report has put together recommendations on future directions for aid in the SWM sector based on the findings of these surveys and the discussions in the committee. A list of committee members and authors by section is given below.

5. List of Committee Members

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[2] Renamed "Aid Effectiveness Team, Research Group" as part of the restructuring of JICA in April 2004.

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* Organizational affiliation and position for each member are as of August 2004. If a member withdraws from the Committee because of reasons such as personnel change, indicated affiliation and position are at the last time he/she had been participated to the committee.

6. List of Authors

The list of authors of this study is listed below. The draft is written based on the discussions of the Committee meetings, a field survey, and literature reviewing. The draft articles are elaborated and summarized by each authors and Committee secretariat.

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Population sizes of cities and waste problems	KONDO Sei, OTSUKI Noriko
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Informal Sector, community-based solid waste management, community participation, promotion of environmental education and public awareness	MIYAKE Hiroyuki
Consensus-building, securing of landfill sites	NAGAISHI Masafumi, YOSHIDA Mitsuo
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Waste recycling, source reduction	WATANABE Taisuke

Editorial Staff: KONDO Sei, WATANABE Taisuke, YOSHIDA Mitsuo

Chapter 1 Characteristics of Solid Waste Problems in Developing Countries

This chapter discusses issues surrounding solid waste management in developing countries and summarizes the main features of these issues. It also sets out the basic approaches for Japan's development assistance to address these issues and provides an overview of recent initiatives by JICA and other bilateral and multilateral donors in this sector. Special emphasis is placed on trends from the 1990s to the present.

1-1 What are the solid waste challenges in developing countries?

(1) Waste problems as a reflection of the state of a society

Waste is like a mirror that reflects various aspects of a society.

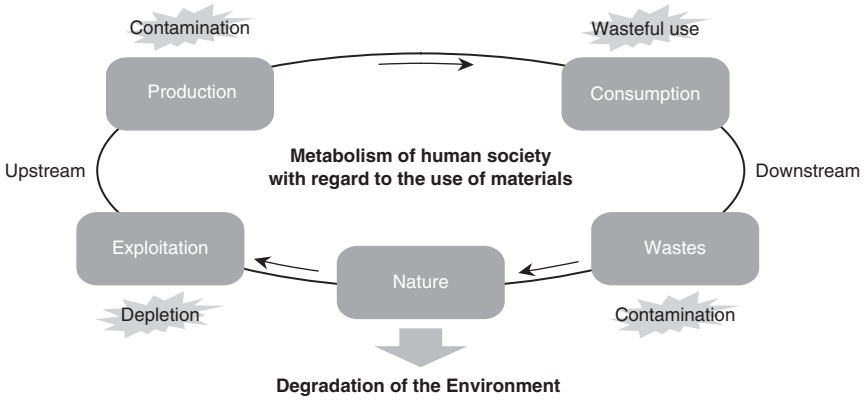
Waste problems are said to be the mirror of a society[1]. The state of a society is closely related to its economic, historical, cultural, environmental and other aspects. These aspects differ depending on the country, city or community, as do waste problems. Understanding the state of a society therefore provides a direction to an understanding of the waste problems in that particular society. Conversely, it is possible to understand the state of a society by looking at its waste problems. For example, shell mounds-heaps of shells or kitchen middens left by shellfish eaters in prehistoric times-provide clues to what that prehistoric society was like and how people in that society lived.

Turning to the history of waste management in Japan, waste problems have indeed reflected the changing state of Japanese society. In and after the high growth period of the mid-20th century, industry churned out products and consumers embraced wasteful consumption patterns and lifestyles based on the paradigm of mass production and mass waste. Japanese society took this ever-increasing volume of waste for granted-often even with difficult-to-treat waste containing various chemicals. The country's efforts to increase the number of treatment/disposal sites failed to catch up with the increasing volume of waste, allowing illegal disposal to become widespread. Strict measures to control water and air pollution amid growing concern about the environment resulted in increases in sludge, soot, dust and other solid industrial wastes, putting an additional strain on the country's waste disposal capacity. Despite local efforts, such as the sorted collection of combustible, noncombustible and recyclable wastes, Japan depended on the construction of more and more incineration plants and other disposal sites to cope with the growth in solid waste. Japan's emphasis on incineration as a means of waste treatment led to more incinerated waste than in any other country. As for industrial waste, the country tightened regulations and penalties for disposal contractors[2].

However, the root causes of solid waste problems are actually related to the profligate generation of solid waste and the mass production and mass consumption of products without consideration for their final disposal. There can be no solution to the problems of solid waste until the entire flow of the processes of production, consumption and disposal are considered as an integrated system. In addition, the proposed

[1] Sakurai (2000)
[2] Tanaka, et al. (2003)

Figure 1-1 Metabolism between Nature and Human Society regarding the Flow of Materials



Source : prepared by YOSHIDA Mitsuo

construction of new incineration facilities or landfill sites has become extremely controversial with local opposition based on the NIMBY (not-in-my-backyard) principle and the growing limitations on the total amount of available capacity at current landfill sites. These were the additional factors that prompted the search for a more fundamental solution to solid waste problems. Thus, by the end of the 20th century, Japan had finally begun to deal with the solid waste problem involving all segments of the society. These efforts evolved into the concept of a "recycling-based society," as a result of which the Basic Law for Establishing a Recycling-based Society was enacted, followed by major revisions of the Waste Management and Public Cleansing Law and the Law for Promotion of the Effective Utilization of Resources as well as the enactment of several product-specific recycling laws[3]. This somewhat acerbic history of waste management in Japan can be considered a reflection of the changes that took place in the state of the country's society from the post-war period of high economic growth, to a world economic power, then to the collapse of the "bubble economy" and the ensuing stagnation, and finally to the present process of stabilization.

Solid waste problems in developing countries are aggravated by the malfunctioning of traditional waste management systems due to rapid development and the concentration of the population.

Just like a river running from the mountains upstream down to the sea, when human produce and consume material (upstream process), society inevitably generates more and more solid waste (downstream processes). In other words, there is a metabolism occurring in materials between nature and human society[4]. In any society, therefore, solid waste is disposed of in one way or another and this management system has evolved and has been optimized over time. Careful observation will reveal that such historically evolved waste management systems exist in any developing country. However, in parallel with the drastic expansion of upstream activities such as that experienced by Japan in the latter half of the 20th century, developing countries in particular have also seen their traditional waste management systems overwhelmed as the goal of "development" was pursued too rapidly, there was insufficient care in planning and a lack attention to problems associated with urbanization and

[3] *ibid.*

[4] This is why the flow from production to consumption is compared to the arteries of the human body and the flow of solid waste reuse and recycling back to production is referred to as "venous logistics."

population concentration which grew at an accelerated pace. Obviously, a divergence had arisen in various countries between the state of the society and its waste management system. As a result, major problems of littering, disorderly waste dumping and other harmful impacts on public health and the environment have emerged. These issues now form the basic background behind today's solid waste problems in developing countries.

(2) Characteristics of solid waste problems in developing countries

There is clearly no universal panacea for the solid waste problems of developing countries.

Today, the total population of developing countries accounts for more than 70% of the world's population. Waste management in these countries is of grave concern from two points of view. Firstly, the process of urbanization and population concentration that is inextricably linked to waste management issues is progressing at a pace that is much faster than was ever experienced by today's industrialized countries. The issue of waste management in developing countries, therefore, has emerged as a critical and impending disaster. Secondly, these countries have often difficulty in streamlining the institutional systems, administrative bodies, management capabilities and human resources that are needed to take the lead in solving solid waste problems. It is thus very difficult for them to respond effectively to the newly emerging challenge of solid waste management. The underdeveloped capacity of the relevant actors in developing countries has been pointed out by many donors in the field of international cooperation since the 1990s. This is a situation that is common to many developing countries due to the negative legacy of long periods of colonial subordination, education problems and various other factors.

Developing countries are certainly not unaware of the environmental pollution and solid waste problems that industrialized countries have experienced. In developing countries, as in industrialized countries, public awareness regarding the need for improvements in environmental quality is growing, and the importance of proper waste management is becoming more widely recognized. This growing awareness is reflected in the number of requests for development assistance or technical cooperation in the field of waste management. However, as discussed above, proper waste management can be achieved only through consideration of its close connection to the state of the society, which is in turn based on the state of its economy and institutions, as well as its history and culture. The simplistic transfer of waste management technologies, or the transplanting of waste management systems from industrialized countries, can be unproductive. The technical literature published in industrialized countries mostly deals with technologies and systems that are too expensive or too technologically sophisticated to be introduced into any developing country. This literature cannot be used as it is even as materials for training courses [5]. The introduction of the experiences and technology of industrialized countries without regard for the circumstances in the recipient country has in quite a few cases ended up as the unfortunate imposition of an inappropriate system.

In summary, there is actually a very specific, unique and well-established background to every solid waste problem. It is just impossible to find a universal panacea.

(3) External problems and internal problems

There are, nonetheless, common phenomena and issues regarding the solid waste problems facing many developing countries, and it is worth

[5] Flintoff (1984)

summarizing them with a view to clarifying the means to deal with individual solid waste problems. Based on this perspective, the predecessor report[6] by this Study Group classified for descriptive purposes the waste management problems commonly found among developing countries into three groups, as either 'external,' 'simultaneously external and internal,' or 'uniquely internal,' from the viewpoint of the municipal waste management sector. The problems thus classified are summarized in Table 1-1.

The term "external" here can be considered as referring to problems that are caused by substantial social changes that are closely related to the upstream production and consumption activities from the viewpoint of the "metabolism of human society in relation to the use of materials" mentioned above. As for the term "internal," this can be considered as referring to the downstream disbenefits and mismatches that occur as a result of social changes.

(4) Factors impeding the process of benefiting from assistance

Donors are coming to realize that the impediments to all parties gaining the full benefits of assistance lie not only in the developing countries, but also in their own approaches.

What then are the requirements to ensure that extending assistance to developing countries is successful when faced with such a wide variety of solid waste problems?

A revisit of a number of past cases of development cooperation raises various problems and challenges, which largely derive from human, technical, organizational, financial, institutional, social and economic constraints on the side of both the donor and the recipient[7]. These constraints in the developing countries and donor countries are discussed below.

Table 1-1 Categories of Problems Common to Waste Management in Developing Countries

(1) External problems	• population explosion, rapid urbanization, expansion of squatter settlements • socio-economic crisis • insufficient public education and community participation
(2) Simultaneously external and internal	• rapid increase in the volume of municipal and industrial solid wastes, lack of waste reduction efforts • lack of interest in solid waste problems among central and local government authorities • immature system of local autonomy • lack of coordination among sectors, organizations and municipalities • lack of a clear policy on waste pickers • lack of capacity in public cleansing departments, inadequate development programs for human resources • friction between management and labor within public cleansing departments or services • inadequate legal systems, insufficient law enforcement • weak financial base
(3) Internal problems	• lack of organizational capacity in municipal waste management • lack of short-, medium- or long-term planning • inadequate operation and maintenance structure for machinery and equipment, low utilization rate • use of technology that is technically, economically or socially inadequate

Source : Prepared by YOSHIDA Mitsuo from Sakurai (2000)

[6] Institute for International Cooperation, JICA (1993)

[7] Drawn from the views of Ogawa (1996), Kitawaki (2000b) and Sakurai (2000) and findings by this Study Committee.

1) Constraints faced by developing countries

(a) Human and technical factors

Human resources for waste management are scarce or, in some cases, totally lacking. Officials without technical training in waste management are assigned to handle the complex issues involved, and the basis on which they may then receive technical assistance can therefore also be limited. This lack of capacity with regard to the human resources available to manage solid waste is also a reason for the lack of comprehensive waste management planning in developing countries. Furthermore, the collection and analysis of solid waste data are generally not given sufficient attention. As a result, there are few opportunities for waste management administrators to become experts and to formulate and implement waste management plans that are tailored to the actual situation in their country. This in turn makes it extremely difficult to license or develop technologies that are best suited to the local conditions.

(b) Financial factors

Waste management services are generally a low-priority item in government budget allocations, thus the financial base for these activities is weak. This is particularly true of local governments who are the real overseers of solid waste management programs. To make up for deficiencies in the budget allocations, municipalities have tended to switch from collective municipal garbage disposal to outsourcing contracted services. However, in developing countries, there is a wide disparity in the ability of residents to pay user fees for garbage collection, and as a result the municipal fiscal situation has often hardly improved. This poses a challenge for those involved in trying to establish sustainable waste management systems. Even if the initial investment costs are covered by development assistance from donors, several times the formerly allotted funds are then often required for the operation and maintenance (O/M) of the solid waste management system[8]. In addition, many developing countries suffer from a lack of capacity in fiscal planning and management. Consequently, waste management programs remain unsustainable and public trust is lost.

(c) Organizational, structural and institutional factors

The waste management regime in developing countries is seldom integrated, and there is often no clear assignment of responsibilities for tasks and schedules among the organizations involved. Furthermore, there is often no umbrella organization to coordinate overlapping responsibilities for waste management that involve more than one agency. This situation not only hinders the effective implementation of waste management operations, but also produces confusion in relation to technical cooperation and development assistance projects among the donors. Along with these organizational and structural problems, the lack of an effective legal system and technical standards constitute a major constraint. Generally speaking, there is no integrated legal framework to deal with waste management in developing countries. In addition, legal provisions related to solid waste are often incorporated as fragmented elements in disparate laws, such as laws for public hygiene, local administration, and environment protection.

(d) Economic factors

The level of economic development is closely linked not only to fiscal aspects, but also to the viability of proper waste management. Economic development is indispensable as an assurance of the establishment of a fiscal basis for waste management, and industrial development is very important for the procurement and maintenance of machinery and equipment for waste management. In addition, the development of local recycling industries is a prerequisite for

[8] Based on the cost of waste management operations over a 10-year period, the cost of O/M is 3 to 5 times the initial investment. It should be noted that O/M expenditures will continue to be required even after the tenth year and the cost of machinery replacement must be included in the actual budget planning, according to an estimation by OTSUKI Noriko based on various assumptions.

the recycling of solid wastes; recycling is not normally feasible if high transportation costs are incurred in delivering recyclable materials to recycling plants overseas or in remote areas.

(e) Social factors

The social status of waste management workers is generally low. In some cases workers come from a specific social stratum, or caste, and in others the industry is controlled by a 'waste mafia.' In such circumstances, work ethics and job performance tend to remain ineffectual. The private sector base that should otherwise complement public sector services is also rather weak in developing countries. Against this background, solutions are often pursued through the participation of residents in partnership with the community and NGOs. Extensive environmental education is nevertheless indispensable for community partnership to be truly effective. Social problems, such as unemployment and poverty, are inextricably linked to the presence of waste pickers, requiring attention to the social implications of waste management policy development. In developing countries, however, interaction between the administrative authorities and citizens is rare, and the opportunities for partnership are remote.

2) Constraints on the part of donor countries

(a) Human and technical factors

The expertise and technologies that industrialized donor countries can offer do not necessarily match the needs of developing countries in terms of the available human resources where waste management is at a more elementary stage. As a result, there is often a significant gap in understanding and communication between the technical experts dispatched by the donor and the officials of the recipient government.

(b) Budgetary factors

Donors have budgetary constraints of their own, irrespective of the waste management needs of developing countries.

(c) Institutional and structural factors

Different agencies in the donor governments have various levels of authority and differing responsibilities. The combination of various cooperation schemes for waste management projects requires coordination among the disparate agencies involved, making it extremely difficult to form a comprehensive project package. Substantial effort is therefore expended in coordination among the different organizations before reaching a consensus on an overall package involving loans, technical cooperation and equipment supply.

(d) Economic factors

Donors are often inclined to choose teams of consultants from their own country, and, as a result, end up selecting technologies and equipment that are not necessarily best suited to the needs of the recipient country. This is actually one of the main reasons that the technologies that are subsequently transferred turn out to be inappropriate. To overcome such limitations, the more extensive utilization of local consultants is required.

(e) Social factors

The one-way transfer of technology and project planning is the approach often taken by donors, with little regard for the differences in social systems, cultures and customs between them and the recipients.

(5) Toward capacity development in waste management

Developing countries require assistance in order to mobilize their own capacity to deal with their own situation, which is referred to as capacity development.

This overview of various aspects of waste management in developing countries and the constraints to international assistance can be considered as the background to capacity development.

As was underlined in the predecessor report[9], the first consideration that waste management experts from industrialized countries need to observe in any technical cooperation project is to follow the waste management methods that have evolved historically in the community and that are currently being practiced in that society, and to analyze the roots of these methods in relation to the state of the society and the nature of the difficulties that have arisen from recent rapid social changes.

If this approach is taken, the real task of waste management experts from industrialized countries is to help the recipient countries to develop their capacity to overcome these difficulties and to establish their own new waste management systems that respond to the actual situation they face, taking into consideration the processes through which the former methods have been acquired and optimized over the years. In other words, the task for the future is to extend assistance to support capacity development in waste management.

In the first paragraphs of this section, it was mentioned that waste is like a mirror that reflects various aspects of a society. To put it differently, solid waste problems cannot be solved independently from other issues; an approach that encompasses various factors, particularly societal, is an absolute requirement. This is quite evident from the historical evolution of Japan's waste management operations and the current situation as it was described in previous sections. The actors involved in capacity development can be categorized into three levels: individuals, organizations and institutions/society[10]. It should be reiterated here that for the resolution of solid waste problems, the available capacity at the institutional and societal level is a very important element, in addition to the need to bolster the capacity of the individuals and organizations involved in the waste management sector, who are the traditional targets of technical cooperation.

1-2 Progress and recent trends in official development assistance for waste management

Since the 1970s many donors have extended multilateral and bilateral development assistance in the solid waste management sector to respond to issues arising from the rapid progress of urbanization in developing countries. In the paragraphs that follow, an overview is given of the lessons learned from the actual experience of these donors through their implementation of solid waste projects. The latest trends that have evolved from reflection on the lessons learned from overseas development assistance and cooperation in the field of waste management are then reviewed.

1-2-1 Trends in conventional overseas development assistance approaches in solid waste management

Requests from developing countries for development assistance and cooperation in the field of waste management have been made with particular emphasis on projects in the capital city and other urban areas where there has been a rapid rise in the concentration of the population, and donors have responded with many grants or loan projects. The approaches of these conventional development assistance and cooperation programs for urban waste problems in developing countries can be classified into the following three categories.

(1) Hardware approach (since the 1970s)

This approach based on the supply of 'hardware' does not have a lasting effect in terms of overseas development assistance unless it is accompanied by an appropriate scheme for the development of technical skills and a management system.

The initial approach of overseas development

[9] Institute for International Cooperation, JICA (1993)
[10] Task Force on Aid Approaches, JICA (2004). See also Reference Material 1.

assistance in this regard is based on the provision of machinery and equipment, such as waste collection vehicles, collection equipment, processing facilities and other hardware, in order to reinforce the existing collection fleet as part of urban environmental improvement efforts. This is the approach most frequently employed since the 1970s, which was a period of new initiatives in overseas development assistance and cooperation in the solid waste management sector. A typical example is the urban development program that the World Bank promoted from 1976 in 40 cities around the world, including Cairo, Alexandria, Manila, Djakarta and Singapore [11]. A total of more than $500 million was injected into this program for waste management alone. However, these funds were not directed to independent waste management projects, but were envisaged as part of overall urban improvement projects that also involved public water supply, sewage, public transportation, and so on. In most cases, overseas development assistance often took the form of providing waste collection machinery or waste disposal facilities [12].

In some cases, such hardware-based projects did contribute to raising the waste collection rates in the cities involved and to the continuous improvement of urban waste management operations. A well-known model of good practice is the World Bank project in Singapore. Under strict control by the recipient government, a basic reform of the waste management system, including the construction of new incineration facilities, was carried out and a new framework for the country's waste management operations was established [13]. In addition, it was around this period that manuals were written on the methodologies for equipment supply and other technical cooperation/aid projects and appropriate waste management technologies, drawing upon the many actual examples of overseas development assistance in waste management [14].

Subsequent assessments have revealed that however much hardware might have been provided, this type of development assistance only has a short-lived, unsustainable effect and could even have adverse consequences in cases where the recipient developing country lacks a master plan (M/P) or medium- to long-term planning process for waste management, or lacks the non-physical (operational) techniques and knowledge to utilize and maintain the equipment and facilities that are provided, or has an outmoded administrative system [15].

(2) Software approach (since the late 1980s)

The success of an approach based on the software or operational expertise depends on the capacity and level of ownership of the recipient.

Reflection on the first type of approach as mentioned above led to the introduction of a new approach based on development assistance for non-physical aspects such as planning, operations, maintenance and administration. In this report, this approach is defined as the provision of assistance for planning, the development of waste management systems and technology transfer that focuses on the improvement of fundamental technological capacity. Mr. Carl Bartone, an urban planning specialist who was long involved in waste management projects at the World Bank, has strongly advocated the need for assistance to the planning aspect, based on his experience of the World Bank's projects in the 1970s and 1980s, as described above [16]. According to this approach, the indispensable elements were the conduct of preliminary studies preceding the actual input of hardware taken under the first approach and the

[11] Cointreau (1982)
[12] Bartone (1990) pp.59-65
[13] Leitmann (1999)
[14] Cointreau (1982), Curi (1985) as examples.
[15] Barton (1990)
[16] *ibid.*

preparation of waste management plans (non-physical inputs). These studies included surveys of the actual solid waste situation, M/P preparation, management and financial analyses, feasibility studies (F/S) and design aspects. As will be seen in the following section, this 'software-based' approach was actually embodied in the many development studies and grant aid projects that JICA extended in the solid waste management sector from the end of the 1980s through the 1990s.

The main focus of this approach is not the simple input of hardware, but rather the preparation of an M/P encompassing every waste management component (input of 'software'). The input of vehicles, equipment and other hardware is carried out only during the process of building up the waste management system in accordance with the M/P. Whether a sustainable waste management system based on preparatory studies and the resulting plan is successfully developed, that is to say, whether the inputs and development assistance in the non-physical arena are effectively made use of, largely depends on whether there is a receptive environment in the recipient country in terms of the available human resources, organization, finance, structure and institutions. In other words, whether there is both the ability to implement (capacity) and independent initiative (ownership). When the implementing agency has a certain degree of capacity, this step (development assistance) functions as the impetus for development assistance recipients to take their own initiative to improve and establish a waste management system, even though there may still be various barriers to this. Examples of this include the waste management systems of Bangkok [17], São Paulo [18], Mexico City [19], Almaty, Kazakhstan, and Panama that had a relatively high level of human resources capacity and organizational structure yet also had a sense of urgency concerning waste problems due to the rapid growth of their economies.

However, where the capacity or ownership is not sufficient, the M/P cannot be implemented and the newly-constructed waste management system and the supplied machinery and equipment cannot be sustained. An even more problematic aspect is that any failure could result in undue reliance on overseas development assistance.

It must be remembered that donors can 'engage in' the capacity development process, but cannot 'provide' capacity directly.

An example of a published critical analysis written from the standpoint of developing countries on failed cases is the one on Katmandu, Nepal [20]. For a period of more than 12 years from the early 1980s to the 1990s, the city received from a certain bilateral donor continuous development assistance under a technical cooperation scheme. The planning, organizational structure setup, machinery and equipment supply, technology transfer, human resources training, pilot project implementation and all other activities conceivable at the time were all systematically provided to the city. However, immediately after the donor withdrew from the city in 1993, the waste management system become dysfunctional, and the waste problems became exacerbated to the same extent that urbanization had advanced. In this case, the reason for this included shortcomings in the administrative body and system, an underdeveloped managerial capacity with regard to operations and finance, and few opportunities for participation by the residents [21]. To be sure, many non-physical inputs were provided in this case, in addition to the hardware. However, underlying this unfortunate failure was an insufficiency in organizational, institutional and structural capacity, stemming from the weak sense

[17] Ashford et al. (2000), Matsumoto and Matsuoka (1996)
[18] Mendes et al. (2003)
[19] Ojeda-Benitez et al. (2000), Yamamoto et al. (2003)
[20] Thapa (1998)
[21] *ibid.*

of ownership. As far as development assistance with regard to organizational, institutional and structural aspects is concerned, any donor, who is after all an outsider, can be 'engaged' in extending indirect support, but can never 'provide' such assistance as such. This is illustrated well by the Katmandu case in which the system became dysfunctional immediately after the project was completed.

As will be described later in this report, there are similar cases related to JICA's past technical cooperation projects in waste management.

(3) Capacity development approach (since the 1990s)

The third approach represents a new direction in development assistance that is based on reflections on experience with the second approach and positions capacity development of the main actors at the forefront of waste management in the developing country. This approach is defined here as a process of overall comprehension and assessment of the existing institutions and policy environment, as well as the level of capacity of the recipient country according to its cultural and social background, and an examination of the most appropriate contents, strategy and methodology of the assistance. In other words, it is an approach in which the first step is to help improve the capacity and then to develop the physical and non-physical types of assistance in a comprehensive way and in accordance with the recipient's resulting capacity.

1) Narrowly-defined 'Institutional Development' (organization reinforcement) [22]

In the early days, the 'actors' involved in capacity development were thought to be local government officials who were in charge of waste management operations and the emphasis was on the development and improvement of these human resources, as well as the organization and management of administrative bodies responsible for waste management operations, meaning conventional 'institutional development' in the narrow sense. In terms of organizational reinforcement, for example, the methodology for positioning waste management as part of overall urban improvement projects as was observed in World Bank projects in the 1970s and 1980s was inherited by the Healthy City Projects (HCPs) that WHO/UNDP promoted during the 1990s in cities in Asia, Africa and Latin America. These projects had the aim of reorganizing and revitalizing individual urban environmental operations through a cross-sectoral approach centered on public hygiene and public health projects, and, through this process, also had the aim of improving the organization and management of local administrative bodies. In this context, such projects can be regarded as a form of 'institutional development' assistance in the narrow sense of the term [23].

2) Issues related to waste management actors and leaders

A new approach is emerging that encapsulates the involvement of a variety of actors, such as NGOs and CBOs, and at the same time encompasses the entire society.

Capacity development, in the narrow sense of 'institutional development' in relation to waste management authorities, which are generally local government agencies as described above, is in itself an important task. However, in reality, waste problems are difficult to solve through capacity improvements in administrative bodies alone. It has increasingly been pointed out that there is a need for a new approach from the societal viewpoint emphasizing consensus building, community participation and partnership [24]. These references to social

[22] Cambell (1999)

[23] Harpham, et al. (2001). In Botswana, there are cases in which institutional improvement of the legal system and organizational streamlining was instituted through self-reliant efforts and donors where were then invited to provide the necessary funds. Phatshwe (2001)

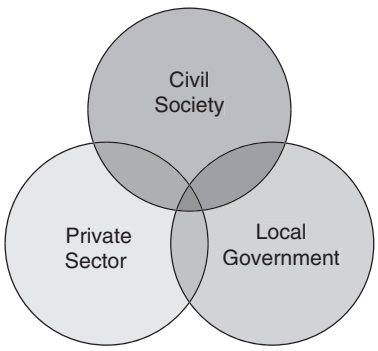
[24] Van de Klundert and Lardinois (1995), Medina (1997), Van de Klundent and Anshutz (2000), Moningka (2000)

partnerships stem from the following situation. Firstly, the continuing deterioration in the environment due to the intensification of population concentrations and rapid urbanization and development has overwhelmed the ability of local governments to respond. Secondly, under such circumstances, communities have had to resort to assistance from CBOs and NGOs in order to address the problems. Thirdly, as a result, the relationship between the administrative authorities and the local communities has changed, and it has become widely recognized that communities themselves come to play an indispensable role in urban environmental management. In addition, the concepts of 'community participation in solid waste management' and 'community-based solid waste management (CBSWM)' are increasingly being advocated as a means of responding to the inadequate responses from local governments[25]. This change is described as the enlargement and deepening of the range of waste management actors involved in the solution to related problems facing urban areas[26].

As a result, the targets of capacity development have had to be extended to all the stakeholders involved (the residents and their communities, NGOs, CBOs and private industrial corporations), and the partnership between them has been strengthened, leading to those engaged in development assistance embracing a concept of 'capacity development' that encompasses all sectors of the society[27, 28].

In this third approach, contracting to private sector and privatization are actively pursued under the principle of 'public private partnership (PPP).' One of the recent characteristics is that such initiatives are taken in many cities of developing countries as well[29]. It is because of the expected benefits such as improved waste management service through quality improvement in operation/maintenance, reduced cost, better environmental protection through improved technology, and infrastructure investment with private-sector funds[30]. There are a variety of forms ranging from partial contracting to

Figure 1-2 Targets of Capacity Development for Comprehensive Urban Solid Waste Management



Each sector has a role to play by itself, as well as in partnership with other sectors. Therefore, comprehensive and sustainable solid waste management is not achievable without capacity development in all sectors.

Source : UNDP (1997) as modified by YOSHIDA Mitsuo

[25] Moningka (2000)
[26] Jutting (2003)
[27] Schubeler et al. (1996), Campbell (1999), Van de Klundert and Anshutz (1999)
[28] Eade (1997) of Oxfam calls this a community- and people-centered approach to 'capacity building.' However, the term 'capacity building' is sometimes used to mean the provision of 'software,' as mentioned above. In this report, therefore, this term is not used in order to avoid confusion.
[29] For a typical guide pack for donor, see Cointreau-Levine (1994) or Cointreau-Levine and Coad (2000).
[30] See Section 2-3-4 for details.

complete privatization, and in developing countries as well, not only NGOs and CBOs but also genuine waste industries are emerging [31]. It is worth noting that with the advance of PPP, free collection and disposal of garbage has been switched to paid services to one extent or another, and is quite common in many developing countries today. But paid services take different forms and are mainly classified into 4 systems: "specific rate," the fee increases as the waste volume increases in this system, "pay-for-large-volume-only," no fee charged until certain waste quantity is reached in this system, "fixed charge," a fixed fee regardless of waste volume in this system and "comparative specific fee," waste fee is linked to metered electricity consumption in this system. Positive effects of switching to paid services are said to be: (i) reduction of waste generation, (ii) promotion of recycling, (iii) more equitable cost sharing would become a subject of discussion in case of "specific rate system," (iv) prevention of contamination by business-related urban wastes, (v) securing revenue, and (vi) increase of people's awareness. On the other hand, concerns are raised such as: (i) double taxation, (ii) regressive to income level, (iii) increase of illegal dumping, and (iv) not conducive to changing the economic structure of mass-production/mass-consumption [32]. Further, private-sector participation could become a hotbed for corruption and social problems around vested interests or penetration of 'waste mafia' that commit illegal dumping to dodge landfill costs, unless it is implemented properly and with sufficient transparency. Therefore, growth of private companies by free competition, proper planning, work environment, and monitoring and control of services are keys to the success of PPP [33]. In this sense, improvement of leadership and administrative capacity of the government authorities in solid waste management is always an issue if private-sector contracting may be advanced. In the case of projects in Accra, Ghana and Hyderabad, India, privatization was introduced at the insistence of the donor, even though the capacity on the part of administrative authorities had not been developed fully. While solid waste collection was indeed improved, negative results such as regional divide, deteriorated work environment and increased environmental impact were also reported. There is a report, too, that privatization was tried as a quick fix to solid waste problems in the local cities of Helauda and Biratnagar, Nepal, but the private entity had to withdraw because of the lack of experiences and know-how in contractual working relationship, leaving a confused solid waste management system behind [34]. All these experiences suggest that privatization can cover only a portion of the capacity required for solid waste management and there is always a role to be played by the local government. Privatization can never take over everything.

Another example of privatization is intended to combat poverty through integration and strengthening of informal sector in solid waste management. A well-known case in point is the non-profit organization 'Coopamare' whose members are former waste pickers in São Paulo. In line with the government's policy of privatization, eight waste pickers jointly acquired some collection carts with help from an NGO in 1985 and started to recover valuable wastes (papers). In ten years time, the membership grew to more than 100 and the organization became self-standing with a piece of land of its own. Triggered by privatization, some informal workers below poverty line were thus integrated into the formal side of São Paulo's solid waste management system and established themselves [35].

In addition, one of the most recent aid trends introduces the gender perspective into capacity

[31] For example, government-led aggressive waste management business promotion measures with economic tools are taken in the urban area of China. See Dong et al. (2002).
[32] Yoshida (1998)
[33] Massoud and El-Fadel (2002), Massoud et al. (2003)
[34] Report on Accra and Hyderabad in Post et al. (2003). Report on Hetauda, Napal in IGES (2002).
[35] Wegelin and Borgman (1995), Van de Klundert and Lardinois (1995)

improvement. In solid waste management, especially in developing countries, women play a decisive role. Waste management in households is basically a woman's job[36] in these countries. Many waste management CBOs are organized by women (examples in Karachi, Chennai, Dacca, Hanoi). A majority of waste pickers are women and children (example of Bangalore, India). Most of sophisticated sorting is done by low-wage female workers (Bangladesh). The gender aspect will be an indispensable perspective in future social approach.

1-2-2 Spread of the concept 'Capacity Development' and its projection to solid waste management foreign aid

Capacity development for the foreign aid requires the shift of the perspective to 'emphasize the recipient's own initiative.'

Project formation in the solid waste management sector chimes in with the concept of 'Capacity Development'[37] that has been advocated as the desirable fundamental direction in assistance cooperation to developing countries since the mid-1990s.

The concept of capacity development emerged through the process of self-critical evaluation by the UNDP and other international foreign aid organizations with respect to the technical cooperation and foreign aid projects they had promoted for the previous four decades. They concluded that effects of many of those projects were questionable as to their sustainable impact, national ownership and appropriate technologies. Traditional projects, though intended to assist developing countries, had after all a structure of putting the assisting country in the driver's seat with donor-driven, input-oriented, cost-benefit and expert-led practices and with much less attention to the initiative of recipient countries. Simply put, traditional foreign aid cooperation was focused on 'What and Why' questions but had neglected the 'How' questions for the parties involved on the recipient side[38]. While there were indeed project objectives related to 'institution development' in the narrow sense, they were targeted only for a limited range of implementation agencies. Attention should be paid to the fact that capacity development could have institution development as one of its elements but it encompasses a much wider variety of actors such as individuals, groups and communities. When considering that capacity can be divided into three levels, namely, individuals, organizations, and institution/society, we find for example that the relationship between an individual and his/her organization, institution and customs cannot be ignored for him/her to realize his/her expertise and skill to the maximum, and conversely for a specific institution or system to function properly, the relevant organizations and individuals must have the ability to understand it fully and act accordingly[39]. Thus, the main point in capacity development approach is in placing emphasis on the primary role of the recipient and then understanding not only the individuals and organizations of solid waste management authorities but also the institution and society comprehensively as the total capacity for solid waste management. And then, the interactions between the different levels of capacity should be analyzed, and strategies should be defined to extend assistance to where it is most needed in order to raise the overall solid waste management capacity in the society.

Based on the actual experiences of past technical cooperation in solid waste management, the method of assistance for capacity development can be roughly grouped into the following five categories[40]:

(i) Increase : to provide the expertise, know-how,

[36] Scheinberg et al.(1999)
[37] UNDP (1997)
[38] *ibid.*
[39] Task Force on Aid Approaches, JICA (2004)
[40] Categorization based on Mabuchi and Kuwajima (2004)

equipment and 'software' and help increase the skill, management capability and planning capability:

(ii) Build : to help build up the institutional/ organizational capacity such as legal system on solid waste, system for solid waste management, administrative organization for solid waste management, and forum for citizens to participate in solid waste management;

(iii) Disseminate : to set the solid waste management system of a specific area as a model, and disseminate it to other areas of similar conditions;

(iv) Sustain : to help sustain an existing or newly-structured solid waste management system through proper financial management and/or economic incentives;

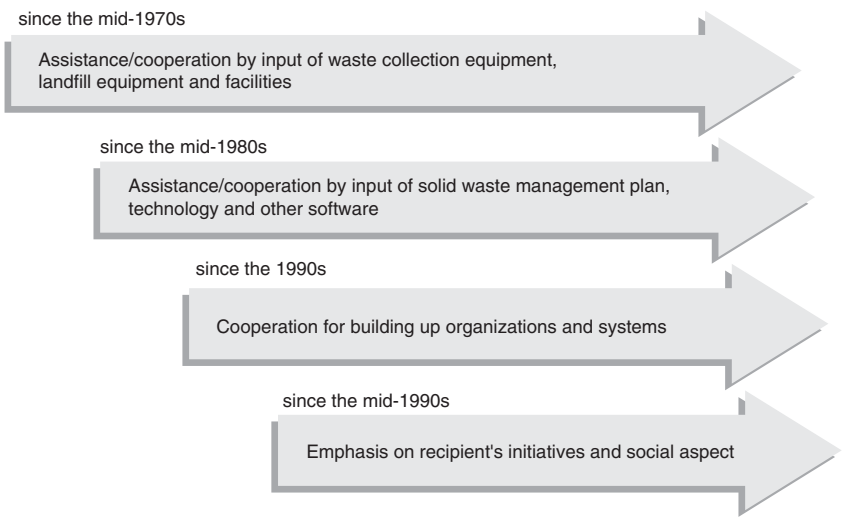
(v) Reduce loss : to help achieve more efficient utilization of human and physical assets and improve management through modification/ improvement of existing solid waste management system.

The roles of donor in these activities are also varied. The donor may play the role of provider of resources (equipment, etc.) and/or technology, expertise and know-how. It may be a presenter of institutions and standards. It may act as an organizer for a partnership between administrative authorities and community or a mediator between stakeholders with different interest. Or it may simply act as a chaperon, escort runner or a supporter.

1-2-3 Genealogy of foreign aid in solid waste management

As illustrated in Figure 1-3, three general directions can be found in foreign aid for solid waste management. They are: (i) input of equipment and other hardware as a part of urban environmental improvement, (ii) assistance in the planning of solid waste management system and emphasis on input of non-physical, and (iii) assistance for capacity development (that can be divided into two steps of flow, namely, assistance to building up organizations and systems–institution development in the narrow sense, and

Figure 1−3 Genealogy of approaches in solid waste management assistance



The arrows indicate the chronological development. At present (right end), it is necessary to take a right mix of these approaches in accordance with the prevailing conditions. For the sake of convenience, 'cooperation for building up organizations and systems' and 'emphasis on recipient's initiatives and social aspect' are shown by two separate arrows, but they are in fact two stepwise flows in '(iii) capacity development assistance' and they are described as one in the body text.

Source : prepared by YOSHIDA Mitsuo

emphasis on recipient's initiatives and social aspect). These three directions can be said as having evolved stepwise through trial and error and overlaps with each other after reassessment and evaluation of each direction. In the last 10 years, the third direction or capacity development assistance has been the mainstream of international trend. But the direction of emphasis on capacity development assistance and on social aspect involves a huge variety of approaches, depending on the target city and its society and culture. It can be described as an ensemble of locality-specific approaches. There is not always a general solution, and the cooperation by the donor, who is by nature an outsider, is necessarily limited in scope.

Donors should play the role of catalyst for the voluntary, spontaneous process of capacity development by developing countries.

On the part of donors, some changes are taking place. Intercity cooperation[41] and NGO assistance and partnership are active today in the solid waste management sector, in addition to the conventional multilateral or bilateral donors. But even though many excellent individual experiences have been reported as we have summarized into five categories of assistance method, the capacity development in the true sense of the term, namely, one that takes into perspective the roles of all stakeholders (government, general public and private sector) in solid waste management requires a long-term commitment. There have been few representative cases to this date, and we should say true capacity development in solid waste management is still in a developmental stage.

Box 1.1 Six M's-the Key to the Success of Technical Cooperation

MATSUFUJI Yasushi, Professor at the Faculty of Engineering, Fukuoka University points out that "The key elements required to improve solid waste management services in developing countries are the six M's, that is, money, manpower, material, management, maintenance and motivation. Accurate assessment of these six M's in developing countries is essential."

It has often been noted that a lack of three of the M's-money [financial resources], manpower [human resources], and material [physical resources]-is the main obstacle to development in developing countries. As has been discussed earlier, however, it has become clear that the traditional approach designed to fill a void in these three M's alone is unlikely to bring about successful outcomes through the accumulation of trial-and-error processes by donors in technical cooperation. In other words, aid inputs may not be put to good use if there is a lack of another two of the six M's-management [management capacity] and maintenance [the capacity to maintain aid effectiveness]. Furthermore, without the last M-motivation [a sense of ownership by the implementing actors], aid projects are unlikely to give rise to sustained local efforts to maintain or even build on the outcomes of such projects after their completion.

As a matter of fact, the preceding paragraph-the process of adding more M's-paraphrases the history of aid approaches discussed in Section 1-2-3. At any rate, how to take balanced approaches for the combination of these six M's will be the key to the success of development assistance by external donors.

KONDO Sei

* The content of this box is based on the comments Professor MATSUFUJI Yasushi made at the seminar of this Study Committee. He is a former JICA expert in sanitary landfill who worked in Malaysia on a long-term assignment.

[41] For example, the Kitakyushu Initiative. (IGES (2002))

It is the very recipient country that improves the system and implements capacity development in order to operate a sustainable solid waste management. That indeed is the main point of introducing the concept of capacity development. In other words, 'support' or 'assistance' could in cases have a self-contradictory meaning in actual implementation. It must be remembered that capacity development must be an intrinsic continuous process by the own initiative of the developing country and that the donor who is an outsider should be no more than a supporter and only has a catalytic role to play [42] by providing the incentives, opportunity and place for the developing country to promote the above process.

1-2-4 Trend of solid waste management foreign aid by donors

We have reviewed the general global trends and evolution in foreign aid to solid waste management in developing countries. Now, let us make an overview of foreign aid activities by individual donors in the world, such as international organizations, bilateral cooperation and international NGOs in the last decade.

(1) International organizations and agencies

1) World Bank and regional development banks

The World Bank is the world's largest foreign aid organization in solid waste management with a 30-strong staff of municipal waste management experts [43]. Since the 1980s the Bank has promoted more than 100 solid waste management projects worth an aggregate of more than US$1 billion in developing countries. These projects were carried out from basically two approaches: (i) assistance in solid waste management improvement from the viewpoint of urban development, and (ii) solid waste management and disposal from the viewpoint of environmental protection, pollution abatement, and removal of environmental contamination. These approaches took the form of programs; the former approach is called the Urban Development Program (UDP) [44], and the latter is included in the New Ideas in Pollution Regulation (NIPR) [45] as projects for hazardous waste disposal. But taken altogether, the former or urban development approach has by far the larger number of projects, showing the predominantly strong tendency to take up municipal waste management as one element of assistance to city management improvement. As we discussed in Section 1-2, the World Bank extended many solid waste management assistance consisting mainly of input of machinery, equipment and other hardware since the 1970s. Subsequently, input of nonphysicals was added, and since the 1990s the emphasis has been on capacity development. The Bank considers that the key issues are strategic service planning, institutional arrangements, private sector participation, financial management, and environmental management. More recently, there have been World Bank assistance projects specifically directed to solid waste management, though not too many so far. Examples include: Toshkent (1998), Bosnia and Herzegovina (2002), Latvia (1999), and Mexico (1994).

In addition, expansion of cleaning service or solid waste management is listed as a high priority task for certain countries, such as Ghana in the Bank's Poverty Reduction Strategy (PRS), from the viewpoint of assisting the fight against poverty problems in cities and providing city services to poor urban residents.

Like the World Bank, the Inter-American Development Bank (IDB) [46] extends assistances

[42] Task Force on Aid Approaches, JICA (2004)
[43] Bartone(2000b)
[44] http://www.worldbank.org/urban/solid_wm/swm_body.htm (Accessed in October 2004). This World Bank portal site for solid waste management contains many basic literatures for review of foreign aids to developing countries in solid waste management.
[45] http://www.worldbank.org/nipr/ (Accessed in October 2004)
[46] http://www.iadb.org/sds/ENV/site_44_e.htm (Accessed in October 2004)

for urban solid waste management to The Bahamas and other Latin American countries, as a component of urban development. IDB has clearly indicated its preferred assistance to privatization projects[47]. On the other hand, the Asian Development Bank (ADB) has not necessarily announced a policy of supporting solid waste management per se, but like the World Bank, it has extended assistance to projects that include solid waste management as a part of urban development. Also, ADB often deals with the problems of waste pickers, squatters and other urban poverty issues through assistance to solid waste management. Inter-city and regional cooperation in solid waste management is frequently stressed. The European Bank for Reconstruction and Development (EBRD) is actively engaged in a number of sewage/drainage and municipal solid waste management improvement projects in the former Soviet country cities, including Almaty and Toshkent in Central Europe, Budapest and Zagreb in Eastern Europe and St. Petersburg in Russia. Together with the improvement of obsolete facilities and systems, EBRD has taken the approach of pushing for privatization. The African Development Bank (AfDB) has few records of assistance in the solid waste management sector.

2) United Nations organizations

United Nations organizations that render assistance to solid waste management in developing countries are World Health Organization (WHO) and United Nations Environment Programme (UNEP). And in partnership with these organizations, United Nations Development Programme (UNDP) also plays a role in solid waste management. UN organizations are not only involved directly in the operation of technical cooperation and assistance programs but also orienting a large part of their activities to compilation and generalization of information, issuance of guidelines, and preparation of papers and manuals. They play a very important role as the source of international information and data. Equally important is their role of proposing standards and guidelines relating to solid waste management, based on their generalization work of information and data. It is therefore necessary to search through the information made available by these organizations, when one plans to render assistance to solid waste management in developing countries.

WHO[48] extends assistance to solid waste management from the viewpoint of ensuring public hygiene and healthy lifestyle of citizenry, and implements technical cooperation projects mostly for disposal of medical and hazardous waste. Especially in the field of infectious medical wastes, WHO has prepared and published the most systematic manuals available today and has accumulated the appropriate technologies. It is the source for 'must read' materials for everyone promoting technical cooperation in medical waste management.[49]

UNEP, through its International Environmental Technology Centre (IETC)[50] located in Osaka and Shiga, Japan, is engaged in an extensive collection of technical information and accumulation of appropriate technologies for sewage treatment and solid waste management from the viewpoint of urban environment management.

In partnership with UNEP, United Nations Industrial Development Organization (UNIDO)[51] extends assistance to solid waste management focusing on African cities from their bases in Dar-es-Salaam and Nairobi.

United Nations Institute for Training and Research (UNITAR), in partnership with International Labour Organization (ILO),

[47] IADB (2003)
[48] http://www.euro.who.int/eprise/main/who/progs/hoh/publications/20020430_1(Accessed in October 2004)
[49] WHO (1999), http://www.who.int/docstore/water_sanitation_health/wastemanag/begin.htm#Contents (Accessed in October 2004)
[50] http://www.unep.or.jp/ietc/knowledge/index.asp#start (Accessed in October 2004)
[51] http://www.unido.org/en/doc/3765 (Accessed in October 2004)

promotes 'Chemical and Waste Management Programme' and 'Training and Capacity Building Programme for Implementation of the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)[52]. It has accumulated information on the management of hazardous chemical wastes and problems in work environment. On its part, ILO implements its own projects of solid waste management privatization in an effort to expand employment opportunity. Successful cases are reported in Dar-es-Salaam and other locations[53].

United Nations Centre for Human Settlements (UNCHS-Habitat)[54] has established Urban Management Programme, under which it has implemented assistance projects for municipal solid waste management from the standpoint of improving human habitat. Since 1991, it is engaged in Sustainable Waste Management in African Cities (SWMAC) that mainly targets cities in Africa.

UNDP has promoted many solid waste management projects in developing countries in cooperation with the World Bank, UNIDO, UNEP and UNCHS-Habitat. Recent projects worth noting include: power generation from landfill gas based on the concept of 'waste-to-energy', and improvement of landfill site (methane gas recovery) in line with the scheme of clean development mechanism (CDM) for greenhouse gas reduction. UNDP has many experiences of working in partnership with bilateral donors including the Netherlands, Norway, Germany and the U.S. JICA's community-based solid waste management project (pilot project) in Manila was succeeded and developed by UNDP in partnership with the Japanese government[55].

(2) Bilateral cooperation

Multilateral donors, bilateral donors and international NGOs are independently developing cooperation out of their respective positions. Mutual partnership and coordination will be a crucial challenge.

1) Germany

Germany makes its bilateral cooperation through GTZ[56]. Solid waste management is regarded as an element of cooperation for environment and infrastructure, and three focus areas have been identified: hazardous waste, municipal waste management and waste management policy. Like JICA, GTZ has implemented many solid waste management projects in Asia, Africa and Latin America, and also serves as development consultant for specific projects. A characteristic approach of GTZ is human networking. Networks are formed between the GTZ experts and the recipient country's project members and counterparts, and information exchange and follow-up are made. There are four such networks at present: Mediterranean Environmental Network - Near and Middle East, Maghreb (MEN - REM), Services on Water and Sanitation - Subsaharan Africa (SOWAS), Rural Development - Latin America and the Caribbean, and Transport, Environment, Energy, Water - Asia (TEEWAS).

2) The Netherlands

Technical cooperation in urban waste management by the government of the Netherlands to developing countries is called Urban Waste Expertise Program (UWEP), and a non-profit NGO based in that country by the name of WASTE[57] is charged with the operational responsibility. Many adviser-type capacity

[52] http://www.unitar.org/cwm/c/tw/ws8/index.htm (Accessed in October 2004)
[53] Bakker et al. (2000)
[54] http://www.unhabitat.org/programmes/urbansanitation/ (Accessed in October 2004)
[55] See Section 3-1 for details.
[56] http://www.gtz.de/themen/environment-infrastructure/english/waste.htm (Accessed in October 2004)
[57] www.waste.nl/index.html (Accessed in October 2004) Reports by WASTE are contained systematically in this website. Many of them are a must.

development assistance projects have been promoted rather than those of hardware input, and the Netherlands is at the forefront in implementing projects based on the community participation approach and attention to gender issues. Reports and publications by WASTE have a very high quality as the basic information on solid waste management cooperation to developing countries.

3) Switzerland

Swiss Agency for Development and Cooperation (SDC), as in the case of the Dutch government, entrusts the operation of technical cooperation in environment, water and waste sector to an NGO based in Switzerland called SKAT (Swiss Center for Development Cooperation in Technology and Management)[58]. It is particularly active in organizing seminars and workshops and providing publication and information services[59]. Its cooperation projects are mostly capacity development type, as opposed to hardware input. It often works in partnership with WASTE or GTZ with respect to community participation and gender issues.

4) United States

Solid waste management cooperation programs that the U.S. implements through U.S. Agency for International Development (USAID)[60] are characteristically implemented in a number of cities of a target country. In this way, a country-specific model of solid waste management is formulated one by one, capitalizing on the relatively uniform natural, social, cultural and economic conditions of the project locations. Target countries include Egypt, India, Latin American countries and Eastern European countries. The fundamental approach is privatization of solid waste management operation or contracting out to private sector.

In addition to the countries mentioned above, Norway, Denmark, Canada and France extend technical cooperation in solid waste management. In recent years, Europe's solid waste management cooperation to Eastern Europe (regional cooperation) is also made through European Union's EEA (European Environment Agency)[61].

(3) International NGOs

As we have seen in the above with regard to bilateral donors–the Netherlands and Switzerland–, there are NGOs that operate closely in the bilateral cooperation scheme. On the other hand, there are some NGOs that are playing important roles internationally in solid waste management cooperation to developing countries.

International Solid Waste Association (ISWA) is an international association with its headquarters in Denmark, and functions as the international union of academic societies and public institutions of member countries. At the same time, it has a character of an international NGO. Support to waste management in developing countries is clearly mentioned in its mission statement, and scientific information on solid waste management is made available to developing countries. In particular, Waste Management & Research, ISWA's international journal, and ISWA Newsletter often cover topics related to solid waste management in developing countries, and ISWA publishes texts for developing countries[62].

The Water, Engineering and Development Centre (WEDC)–a research and education center of UK's Loughborough University–offers training courses in water supply management, solid waste management and sewage treatment as well as postgraduate education and research. WEDC organizes an annual conference in a developing country together with a local organizing committee formed by the local agencies operating

[58] http://www.skat-foundation.org/about/profile.htm (Accessed in October 2004)
[59] http://www.skat-foundation.org/publications/htm/directory/frameset_dir.htm (Accessed in October 2004) A directory of publications on solid waste management for low- and middle-income countries can be viewed on this website.
[60] http://www.usaid.gov/index.html (Accessed in October 2004) Reports can be accessed from this website.
[61] http://themes.eea.eu.int/Environmental_issues/waste (Accessed in October 2004)
[62] http://www.iswa.org/ (Accessed in October 2004) Information on publications can be searched from this site.

in water supply, solid waste management and/or sewage treatment[63]. The conference proceedings often contain articles and papers on solid waste management in developing countries, and serve as an international forum for information exchange that help solve the knowledge divide between industrialized countries and developing countries.

The Collaborative Working Group for the Promotion of Solid Waste Management in Low- and Medium-Income Countries (CWG)[64] is a network founded in 1995 to encourage solid waste management in developing countries. It was originally launched by Switzerland's SKAT in conjunction with SDC's technical cooperation in solid waste management. But CWG has evolved into an international network, as it kept holding annual workshops in Switzerland, the U.S., Egypt and Brazil. The workshop provides a good opportunity for information exchange on appropriate technologies and methodology of cooperation/assistance.

1-2-5 Solid waste in the international trend in environmental issues

Solid waste has become a major issue in environment protection in the 21st century.

In recent years, solid waste is increasingly taken up as a major issue in the international trend of environmental protection, and there have been a number of international initiatives for cooperation, regulations and measures. In the paragraphs to follow, we make an overview of such initiatives.

(1) World Summit on Sustainable Development (WSSD) or the Johannesburg Summit

In June 1992 the United Nations Conference on Environment and Development (UNCED or 'Earth Summit') was held and adopted a global action plan called 'Agenda 21' for international activities in environment protection. Ten years later, in August 2002, WSSD was held for the purpose of making any necessary reviews on the action plan and discussing new challenges that have emerged in the meantime. The Plan of Implementation, an agreed document of the Summit that came out of intergovernmental negotiations, lists the following concrete actions in the paragraph related to solid waste[65]:

(i) Develop waste management systems, with highest priorities placed on waste prevention and minimization, reuse and recycling, and environmentally sound disposal facilities, including technology to recapture the energy contained in waste, and encourage small-scale waste-recycling initiatives that support urban and rural waste management and provide income-generating opportunities, with international support for developing countries;

(ii) Promote waste prevention and minimization by encouraging production of reusable consumer goods and biodegradable products and developing the infrastructure required.

(2) Millennium Development Goals (MDGs)[66]

The Millennium Development Goals that were adopted by the U.N. General Assembly in 2000 include as its Goal 7 'to ensure environmental sustainability', and within that Goal cites as Targets 9 and 11 'to integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources' and 'achieve significant improvement in the lives of at least 100 million slum dwellers' by 2020, respectively. Although there are no direct references to solid wastes in the specific targets, the MDGs call for appropriate environmental considerations as well as social consciousness to the problems of waste pickers and other poor people in cities.

[63] http: http://wedc.lboro.ac.uk/conferences/conference.php (Accessed in October 2004)
[64] http://www.skat-foundation.org/publications/htm/infopage_4/content/workinggroup.htm (Accessed in October 2004)
[65] United Nations (2002) p.19. Solid wastes are referred to in Paragraph 21.
[66] UNDP (2000)

(3) Global climate change

Japan has ratified the Kyoto Protocol in June 2002, and the Protocol came into force in February 2005. In the field of solid waste, recovery of methane gas from landfill sites and recapturing of energy from organic wastes are drawing attention. In terms of cooperation with developing countries, possibilities of promoting projects under the Clean Development Mechanism (CDM) are being explored.

(4) G8 Action Plan (Science and Technology for Sustainable Development: "3R" Action Plan and Progress on Implementation: 3R Initiative) [67]

At the June 2004 G8 Summit held at Sea Island, U.S., Japan proposed the 3R Initiative that aims to build a global recycling-oriented society through promotion of three R's-Reduce, Reuse and Recycle. This proposal was endorsed by the Summit participants. The Initiative calls for reduction of barriers to the international flow of goods, materials, products and technologies, encouragement of cooperation among various stakeholders, and promotion of science and technology, all directed to the promotion of 3R. In relation to foreign aid to developing countries, cooperation in areas such as capacity development, raising public awareness, human resource development and implementation of recycling projects is sought. The Initiative was formally launched at the 3R Initiative ministerial meeting in April 2005.

(5) Transboundary movements of solid wastes

In regard to transboundary movements of hazardous wastes, inappropriate 'exports' (disposal) of hazardous wastes from industrialized countries to developing countries took place in the 1980s, as represented by the Koko Incident (see Section 2-5-2). An international response to the problem was the adoption of Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal that regulates the 'export' of hazardous wastes from a country with waste processing technologies to other countries. The Convention went into force in May 2002, and Japan acceded to the Convention in 1993 [68]. In recent years, export and import of solid wastes for recycling purposes are on the rise also in Asia, reflecting the increased demand for recycled resources. Export and import of recyclable wastes, if conducted in ways compatible with environment protection, will contribute to more efficient utilization of natural resources. Efforts by both industrialized and developing countries are needed to ensure this to happen.

(6) Persistent Organic Pollutants (POPs)

The Stockholm Convention on Persistent Organic Pollutants (POPs) is an international treaty by which the signatory countries will work jointly to ban the production, use and export/import of 12 POPs including PCB and DDT and reduce discharge of dioxins from disposal and wastes incineration. It entered into force in May 2004. With respect to solid waste, the Convention provides for safekeeping of DDT, PCB, etc., proper management and disposal of solid wastes, and technical and financial assistance by industrialized countries to developing countries [69].

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[67] Official website of Ministerial Conference on the 3R Initiative (http://www.env.go.jp/earch/3r/en/). (Accessed in April 2005)

[68] The Basel Convention stipulates cooperation for development of human resources and technical capacity of developing countries for environmentally sound waste management. Technical guidelines for management of hazardous and other wastes are prepared and other common issues are discussed at the Conference of the Parties and its Workshops. The Convention also provides for establishment of Basel Convention Regional Centres for Training and Technology Transfer charged especially with the responsibility to improve the waste management capability of developing countries. In the Asia/Pacific region, the Centres have been opened in China and Indonesia. It can be described as a kind of South-South cooperation, and Japan extends financial and other assistance to these Centres. http://www.mofa.go.jp/mofaj/gaiko/kankyo/jyoyaku/basel.html (Accessed in September 2004)

[69] UNEP (2001), Hosomi (2001)

1-3 Japan's efforts

Technical cooperation in solid waste management is identified as one of the priority targets in Japan's ODA in the field of environment. In this section, we will make an overview of Japan's aid policy in environment and the recent development in its cooperation relating to solid waste management.

1-3-1 Japan's aid policy in the field of environment and solid waste management

(1) ODA Charter

In Japan's Official Development Aid Charter, as revised in 2003, a priority is given to 'addressing global issues.' It says 'As for global issues such as global warming and other environmental problem ..., further efforts must be given immediately and in a coordinated manner by the international community. Japan will address these issues through ODA and will play an active role in the creation of international norms.' Further, the Charter states the pursuit of 'environmental conservation and development in tandem' as one of the principles for ODA implementation.

(2) Environmental Conservation Initiative for Sustainable Development (EcoISD) [70]

This is a policy statement that Japan has announced to reaffirm its commitment to promote environmental international cooperation through ODA and to do so in a way more efficient and effective. Four priority areas are cited: (i) efforts to address global warming, (ii) pollution control, (iii) fresh water issues, and (iv) conservation of natural environment.

Solid waste management is covered in the above measure (ii) against environmental pollution. It says Japan, utilizing its past experiences, intends to prioritize support to measures to control pollution abatement and improve the living environment measures in urban areas (air pollution, water contamination, solid waste management, etc.) and points out that good combinations of effective enforcement of regulation and technical/financial incentives are crucial for policy measures to be successful. The action plan under this initiative includes: dissemination of technologies and know-how through institution building, introduction of win-win approach by utilization of yen loans and other means, support of the activities of Japan's local governments for their international cooperation programs, development and transfer of low-cost, easy to handle technologies appropriate to the realities of developing countries, support of human resource development of recipient countries to facilitate technology transfer, and support of the building of technical bases required for capacity building on engineering.

(3) Koizumi Initiative

On the occasion of the WSSD we mentioned earlier, Japan announced its own initiative called 'Concrete Actions of Japanese Government to be taken for Sustainable Development - Towards Global Sharing' also known as 'Koizumi Initiative.' With regard to environment, the Initiative states the establishment and announcement of above-mentioned EcoISD, taking a leading role for the early entry into force of the Stockholm Convention on Persistent Organic Pollutants (POPs), and working toward early ratification of the Rotterdam Convention on Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (PIC Treaty).

(4) The 3rd Japan-PIF Summit Meeting

The 3rd Japan-Pacific Islands Forum (PIF) Summit Meeting was held in March 2003 in

[70] Website of Ministry of Foreign Affairs of Japan ; http://www.mofa.go.jp/mofaj/gaiko/oda/seisaku/bunya/kankyo/wssd.html; Accessed in September 2004. EcoISD is an update of the 'Initiatives for Sustainable Development Toward the 21st Century' or 'ISD' that Japan announced at the 1997 Special Session of the UN General Assembly on Environment and Development (UNGASS), reflecting the global trends since that time.

Okinawa. The joint declaration by the leaders following the summit meeting ('Okinawa Initiative') identified five priority policy targets [71]. In one of these targets 'A Safer and More Sustainable Environment,' solid waste management is named as an area of priority focus.

In the accompanying Joint Action Plan, solid waste management is taken up as an important headline issue, and this document calls for formulation and design of a well-defined strategy to support awareness raising, policy instruments, institutional strengthening and improved collection, disposal or recycling, taking into account particular circumstances and unique features of PIF members [72]. In the Fact Sheet that was announced on the occasion enumerating Japan's concrete assistance to the region includes support for development of a regional master plan for waste management and implementation of a model project in the region.

1-3-2 Support by JICA

Project implementation with due consideration to its environmental and social impact is asked of JICA.

(1) JICA's aid policy in environmental field

Solid wastes cooperation projects that JICA implements for developing countries, which cover all of the subjects except yen loans and local government programs, are based on the policy of EcoISD mentioned above. In April 2004, JICA established and announced an environment policy for itself, and made it clear that JICA, as Japan's ODA implementation body, will promote cooperation projects that contribute to the protection and restoration of the environment in line with Japan's foreign aid policy [73]. Specifically, the policy states promotion of technical cooperation projects contributing to environment protection, mitigation of the environmental impact of development projects through complying with the "JICA Guidelines for Environmental and Social Considerations," development of awareness and education activities through introducing of JICA's environmental efforts, and sustainable surveys and research concerning environmental issues.

In accordance with the government policy, JICA implements solid waste management cooperation projects from the viewpoints of: (i) assisting not only the central government but also local governments that are closer to the people, (ii) improving services to urban residents, capitalizing on Japan's past experiences, and (iii) reducing possibilities of public hygiene deterioration and environmental pollution from solid waste. The above-mentioned JICA Guidelines for Environmental and Social Considerations have the objective of encouraging the recipient country to make due environmental and social considerations when implementing projects that may have impact upon the environment and the local community. The Guidelines, updated in April 2004, provide for a basic policy of environmental and social considerations, information disclosure and consultation with the stakeholders [74]. Further, the coverage of schemes to which the Guidelines apply has been expanded to include the entire steps of development studies, preliminary studies of grant aid projects, and technical cooperation projects, to ensure full compliance. Therefore, cooperation in solid wastes under any one of the above schemes should be implemented in accordance with these procedures.

(2) Review of JICA cooperation projects

Let us now move on to a review of projects JICA has implemented in the solid waste management sector. Our review will cover development studies, grant aid projects, dispatch

[71] PIF (2003) p.2
[72] *ibid.* p.5
[73] http://www.jica.go.jp/environment/houshin.html (Accessed in May 2005)
[74] Japan International Cooperation Agency (2004d)
http://www.jica.go.jp/english/about/policy/envi/index.html (Accessed in May 2005)

Table 1-2 Summary of Development Studies and Grant Aid Projects

Year	Middle East	Africa	Asia	Latin America	Europe	Pacific
1991				Guatemala		
1992			Vientiane Karachi	Guatemala Managua Tegucigalpa		
1993	Sanaá	Bamako	Surabaya	Bolivia	Poznan Budapest	
1994	Aden Amman	Djibouti		Asuncion	Sofia	
1995			Colombo	Managua San Salvador Santo Domingo	Bucharest	
1996	Alexandria Phases I and II* Damascus Local cities in Jordan	Morocco Addis Ababa	Ujung Pandang Rawalpindi Vientiane*	Callao Santiago (I)		Vanuatu
1997		Chitungwiza Dar-es-Salaam	Bangkok Quetta			
1998	Tunisia (I) Aleppo	Nairobi	Colombo vicinity	3cities in Nicaragua Asuncion		
1999	Palestine		Manila Maldives Halong Bay	Tegucigalpa Mexico City		
2000	Adana/Mersin		Hanoi Almaty	San Salvador		
2001		Niger	Hai Phong Baku Philippines Phase I (H) (I)			
2002	Local cities in Syria		Bangkok (I) Philippines Phase II (H) (I) Hanoi			
2003			Sri Lanka Xian	Panama	Romania (H)	
2004	Amman		Phnom Penh Malaysia			
2005			Dhaka			
Total (DS*/GAP)	3／9	4／4	18／8	9／8	5／0	0／1

Underlines denote grant aid projects. Asterisked cases include facilities construction, while others are only for equipment supply. (I) stands for industrial solid wastes, and (H) for hazardous wastes. Development study cases are listed in the year in which the final report was submitted, and grant aid projects in the year in which the E/N was concluded. Cases shown in a given year are not necessarily in chronological order.

Source : prepared by OTSUKI Noriko.

of experts, dispatch of volunteers, technical training of overseas participants and JICA Partnership Program, because these are the main schemes used for this sector. Since the predecessor study [75] has summarized the projects up to around 1992, this Study will deal with the projects from 1993 and onward in principle, and touch upon some 1991/1992 projects that are associated with the more recent schemes.

Development studies that are directed only to solid waste issues and those which are related to sectors in urban environmental problems but with a good deal of focus on solid waste management were selected out for review. There were 39 such studies in total. The number of grant aid projects that were reviewed was 30. The

[75] The Institute for International Cooperation, JICA (1993)

Table 1-3 Dispatch of Experts, JOCV and Senior Volunteers

Year	Middle East	Africa	Asia	Latin America	Europe	Pacific
1993				Guatemala		
1994				Argentina		
1995			China Thailand* Philippines* Indonesia*	Argentina Paraguay Paraguay		
1996			Maldives	Bolivia Bolivia Argentina		
1997	Bahrain* Morocco		Indonesia*	Costa Rica Costa Rica		<Samoa>
1998	Tunisia			Costa Rica		
1999			Philippines Philippines* Laos Mongolia Laos Indonesia* Viet Nam*	Costa Rica Brazil*		Samoa*
2000	Saudi Arabia* Tunisia*	Kenya	Pakistan Laos Cambodia Indonesia Sri Lanka Sri Lanka Bangladesh Cambodia	Mexico* <Mexico> Costa Rica Nicaragua Paraguay		
2001	Bahrain* Turkey*	Kenya*	<Thailand> <Laos>	<Paraguay> <Dominican Republic> <Dominican Republic>		<Samoa>
2002			<Uzbekistan> Pakistan Nepal Philippines Philippines	Cuba El Salvador El Salvador <Dominican Republic>		Fiji
2003	Tunisia	Tanzania	Philippines	<Bolivia> Costa Rica	Czech Republic Serbia Montenegro	

Unmarked cases (31 in total) represent expert dispatches for duration between 16 to 364 days, while asterisked cases (16) represent those with duration of 1 year or longer. Underlined cases (15) denote the JOCV scheme, and those in parenthesis the senior volunteer. Cases are listed in the year in which the dispatch began.

Source : prepared by OTSUKI Noriko.

development studies and grant aid projects reviewed are summarized in Table 1-2. Cases of expert dispatch under the project-based technical cooperation were excluded, and only the independent dispatches of experts were counted. Seventy-five such cases were reviewed in total. With respect to dispatch of volunteers, 15 cases of JOCV dispatch and 12 cases of senior volunteer dispatch were reviewed. Table 1-3 summarizes the year and area of these dispatch cases. In regard to technical training of overseas participants in Japan, 13 training courses that were under way in 2002-2003 were made the subject of the review.

(3) Development Studies

The trend is changing such as greater emphasis on the improvement of recipient's research and planning capability, decreased cases of F/S and increased cases of P/P.

JICA's development study is a technical cooperation scheme, which is conducted by mainly a consultant team for a relatively short time period of about 2 years. A large number of personnel are put into the scheme to assist the study and planning.

1) Study components

As mentioned above, the development study is assistance at the planning stage and its basic components have been master plan (M/P) preparation and feasibility study (F/S) implementation. In recent years, however, changes like the ones described below are taking place.

(i) Cases are increasing in which action plans (A/P) [76] are prepared instead of M/P.

This tendency is believed to reflect the preference on the part of developing countries of a guidance for action about 'What should we do tomorrow?' to a long-term plan looking at 10 years from now.

(ii) The number of F/S cases is decreasing.

The decrease in the number of F/S cases is believed to be related to the substitution of M/P by A/P. In the case of M/P, the plan is for a long term and therefore tends to envisage a large-scale project. In contrast, no large-size funding is contemplated in an A/P to help the implementing organization take actions immediately, and hence there is little need to prepare an F/S to support a concrete project planning required for financial cooperation. Looking from a different angle, one may say that development studies are not necessarily linked to financial cooperation (grant aid or otherwise).

(iii) The number of pilot project (P/P) cases is increasing [77]

In departure from its traditional roles like 'verification of M/P' or 'data collection for F/S', P/P is increasingly expected to play the roles as 'the means to let C/P have the ownership' and 'motivation for M/P implementation' and furthermore as 'compilation of concrete improvement cases within the framework of development study.' In other words, P/P is now positioned more as a 'tool for capacity development' to realize self-reliant sustainable solid waste management than as a 'planning tool' or 'verification tool' in the technical aspect. More recently, however, some argue that the rush to P/P is bringing about a deterioration of the quality of the necessary planning. More will be discussed on P/P in the subsequent paragraph 3).

(iv) Updating of M/P and capacity development for A/P preparation and implementation are increasing.

Even in cases where M/P is prepared, most recent ones are characterized by an emphasis on the counterpart's capacity development in the actual work of M/P preparation to ensure sustainability, as opposed to the conventional modus operandi of sending a survey mission to the site and presenting an M/P proposal based on the survey findings. Solid waste issue is like 'a mirror that reflects various aspects of a society' and it changes with the changes in society. The trend, therefore, is to place greater importance on

[76] In an M/P study, a target year (generally 10 years from the start) is usually set and a basic plan for development project is drawn up. In comparison, an A/P is characterized by the preparation of a shorter-term action program and the emphasis on immediate improvements. Incidentally, the term A/P sometimes refers to the report that a participant in the technical training program for overseas participants writes to state how he/she will address the problems at home, utilizing the knowledge he/she has acquired during the training. That A/P is of a different nature from the one recommended in a development study.

[77] According to the record validation by the IFIC (1993) concerning development studies between 1978 and 1994, an F/S was performed in all the 14 cases, an M/P was also performed in some of the cases. As for this time, however, an F/S was performed in 7 cases while a P/P was performed in 12 cases out of those 14 cases of surveyed development studies, which were independently conducted by a solid waste sector. This supports the fact that a technique with testing specific improving cases has become well established. The specific improving cases can be demonstrated and presented by implementing a P/P during the period of development studies.

helping developing the recipient's capacity to update M/P along with the changes in society, rather than attempting to increase the accuracy of a long-term M/P.

Table 1-4 Characteristics of Proposals in M/P relating to Major Themes of Study Group

Major theme	Considerations/recommendations in M/P
Public awareness	Pointed out in all development studies. Often taken up also in P/P. Recommendations : campaigns, educations on solid waste in school, use of mass media, preparation and distribution of teaching and other materials, etc. Messages to be sent out : city beautification in general, appropriate discharge, correct method of discharge and other topics, all in accordance with the priorities of the locality Opinion polls are often taken to investigate public willingness to cooperate with solid waste management and to bear financial burden.
Expansion of garbage collection to non-service areas (including squatter districts)	Collection methods viable in the non-service area must be recommended. Recommendations : setting up of collection points, promotion of primary collection by NGO, CBO or micro-enterprise, etc. Recommended collection methods are often tested by P/P.
Public consent to locating landfill sites	There are hardly any cases of taking up public consensus building issue per se, even where IEE or EIA are done. There are however many successful cases of P/P by which already-existing low-quality landfill sites were improved to a level acceptable to the neighborhood.
Landfill site construction	Appropriate technologies incorporating locally-available resources are often recommended for the site structure and leachate treatment. To maintain the good landfill site conditions attained by P/P is a big task.
Waste picker problem	Improvement of dangerous, unhealthy work environment is recommended as a short-term measure. This is done in P/P at times. In some cases, recommendations for long-term solution were made, suggesting internalization of the salvage activity into formal process of solid waste management (such as grouping of micro enterprises and employment at recycling centers).
Recycling	In situations where garbage collection and proper disposal are the impending issues, or where prospect for availability of disposal facilities is reasonably good, recommendations are centered on assistance to the prevailing private-sector initiatives for recycling. Otherwise, recommendations mostly call for government-led initiatives for recycling, and in some cases, include utilization of community organizations or NGOs to involve citizen participation. Sometimes, P/P is implemented for recycling activities through separate collection.
Institution and organization	Recommendations : restructuring of solid waste organizations (upgrading, integration, and creation), conversion to public corporation, clarification of responsibilities of sections involved, streamlining of legal framework (especially, enactment of a comprehensive solid waste management law), etc. In the case of industrial solid waste, emphasis is on streamlining of legal framework, as administrative authorities are responsible for supervision and not for operation.
Operation and finance	Many recommendations call for improvement in the financial aspect of solid waste management, because the weight of running cost is very large. Recommendations : Introduction or revision of paid service, improvement of fee collection method, improvement of accounting system, improvement of vehicles traffic control, data compilation on solid waste, capacity improvement for organizational management, etc.
Partnership with CBOs and NGOs	In situations where CBOs, NGOs and other social organization are active in providing garbage collection services to non-service areas or recovery of value materials, further promotion of such activities is recommended. In some cases, civic organizations are mobilized as communication medium from government to citizenry on rules for appropriate garbage discharge.
Religion/ethnicity	There was no M/P that reflected considerations to religion or ethnicity. This is a task for future.
Contracting to private sector and PPP	Many development studies encourage contracting to private sector the part of solid waste collection and/or disposal operations. Simultaneously, full performance of the resulting supervision responsibility on the part administrative authorities is recommended.

Source : prepared by OTSUKI Noriko.

2) Development themes taken up in development studies

The objective of this Study Group is to explore approaches to development challenges in the solid waste management issues in developing countries. Some of these challenges have been identified as especially important. Table 1-4 is a summary of these important themes and how they were considered and what recommendations have been made in the M/P.

3) Pilot project (P/P)

Counterpart-led P/P is a seedbed for capacity development assistance approach and is a goldmine of proven examples.

(i) Significance of P/P

Conventionally, P/P was carried out for the purpose of examining the viability of the plan proposed by M/P or collecting data for F/S. In recent years, however, awareness has risen about the importance of capacity development of the governmental body for solid waste management operation, and P/P is increasingly viewed as an opportunity for technology transfer, a trial for self-standing operation, or a motivation to implementing M/P. Therefore, a greater importance is placed on the counterpart's proposals and ownership.

(ii) Themes of P/P

Table 1-5 is a summary of P/P by theme. As can been seen from the Table, improvement of collection operation, improvement of existing landfill sites and public awareness promotion are high in the ranking among the development studies on municipal waste. On the other hand, there have been much less cases of industrial solid waste and hence less cases of P/P. Since the role of counterpart organization in this case is guidance, supervision and regulatory, being not involved in the operation itself, P/P covers themes like promotion of recycle and improvement of supervision capacity.

(4) Grant aid

To make hardware cooperation sustainable, it is increasingly accompanied by cooperation in the non-physical aspect.

Grant aid cooperation is a scheme by which funds are provided to a national government without the repayment obligation for the purpose of facilities construction or procurement of machinery and equipment. Because of the scheme's nature, only the countries recognized as being in economic hardship are eligible [78].

Table 1-5 Pilot Project Themes

Theme	39 P/P cases	33 municipal waste cases	6 industrial waste cases
collection expansion	9	9	0
separate collection	3	3	0
existing landfill site improvement	11	11	0
public awareness promotion	12	12	0
illegal disposal countermeasures	2	2	0
recycling	9	5	4
operational/organizational improvement	11	10	3
others	8	4	4
total	65	56	11

Source : prepared by OTSUKI Noriko.

[78] Countries with per capita GNP of approximately US$1,400 or less are eligible as of August 2004.

Table 1-6 Contents of Grant Aid Cooperation

Contents	Collection equipment	Landfills site equipment	Facilities	Environment monitoring equipment	Total
number of cases	28 (breakdown allowing overlaps) trucks 20 container vehicles 18 compacter trucks 21	26	2 (breakdown allowing overlaps) landfill site composting plant 1 maintenance shop 1	2	30

Source : prepared by OTSUKI Noriko.

1) Contents of cooperation

The average E/N value of the 30 cases reviewed was 730 million yen[79], with the highest being 1.7 billion yen (Bolivia, 1993) and the lowest 144 million yen (Vanuatu, 1996). The contents of cooperation are summarized in Table 1-6. The 30 cases all involved supply of equipment, of which 28 cases included compacter trucks or other collection vehicles or equipment (dump trucks, container trucks, etc.). Wheel loaders, bulldozers and other heavy-duty equipment for landfill sites were included in most of the machinery and equipment supply cases (26 cases). In the two recent cases (Hanoi, 2002 and Xian, 2003), environment monitoring equipment was provided for the first time, in view of the responsibility of the local operative body to keep the environmental impact to minimal levels. On the other hand, facilities are rarely provided under the grant aid scheme. There have been only two such cases including the ones already covered by the predecessor study[80].

As we already discussed in the Section 'Hardware approach', grant aid in solid waste sector does not always bring about the expected effect, if the recipient does not have enough non-physical and other capacities. Furthermore, some of the supplied equipment may have parts and components that are not readily available or may be too sophisticated in light of the prevailing conditions in the recipient country. This can cause problems in the maintenance and sustainability of the equipment. Unless an adequate financial plan is made, the necessary equipment replacement over time cannot be realized because of financial constraints, and the equipment could end up being 'a foreign aid in ruins.'

As can be seen from Table 1-2, no grant aid was extended in the solid waste sector between 1999 and 2002. This was the period in which Japan's Ministry of Foreign Affairs made a thorough review on the subject of grant aid in the solid waste sector. The review is believed that it has been necessitated out of concern over the heavy dependence of the aid cooperation effect on local public acceptance, citizen participation and other social considerations in the recipient country.

In some cases, however, efforts are made to raise the sustainability of the aid by introducing a new style of hardware supply. In the case of Asuncion, for example, the equipment is provided to an entity under the federation of metropolitan municipalities. This entity assumes the responsibility of maintaining the equipment and rent it out to the individual municipality. The rental fee collected is to be used for future replacement. According to the terminal evaluation report, however, the rental fee collection was not progressing so smoothly, and its future is yet to be seen. In the Vientiane, Lao case, the provided garbage collection equipment is used to expand the collection service on the basis of 'beneficiaries pay principle', and is contributing to solidifying the financial base for the public sanitation service[81]. In this project, in addition, dispatch of experts and volunteers was made as a follow-up to the equipment supply under the grant aid scheme. Technology transfer and technical guidance on maintenance were carried out by experts and

[79] 1 million yen approximately equals to US$9,500, as of February 2005.
[80] The Institute for International Cooperation, JICA (1993)
[81] See also Section 3-2 for details of this project.

Table 1-7 Projects with 'soft' Components

Project (City)	E/N made in	'soft' component
Asuncion	1998	• Equipment rental fee collection system • Clean landfill manual for landfill site
Hanoi	2002	• Technical cooperation to environment monitoring operation
Xian	2003	• Support to waste transfer depot management • Support for improved management of landfill site • Environmental monitoring
Amman	2004	• Technical guidance for landfill method of final disposal • Technical guidance for equipment opration

Source : prepared by OTSUKI Noriko and KONDO sei.

JOCV, and a good maintenance system was established including maintenance workshop (see Photo 3-3). This is another example of providing back-up to hardware input cooperation.

2) 'Soft' components

In recent years, cooperation in 'soft' components can be introduced during the implementation design stage of grant aid projects in order to ensure the effects of hardware cooperation. In the solid waste sector, there have been 4 such cases of built-in 'soft' components, as shown in Table 1-7.

(5) Experts dispatch

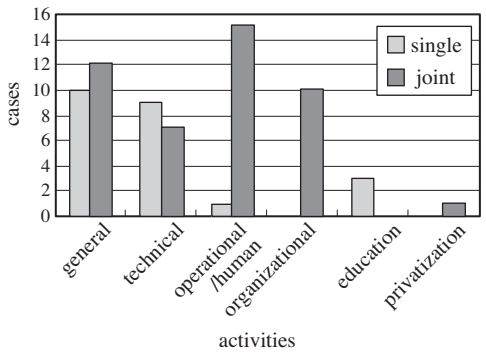
Experts are not only messengers in technology transfer but also coaches for capacity improvement in human resources, institutions and systems.

Dispatch of experts is a technical cooperation scheme under which experts in specific fields are sent to a developing country either on a long-term basis (one year or longer, usually approximately 2 years) or short-term (less than one year, usually several months) to work within the local implementing organization to provide advise, technical cooperation, technology transfer and/or joint research. As the dispatch is made independently, the input volume is relatively small, but unlike development studies, there is more flexibility to the terms of reference (TOR), and the technical cooperation projects can be defined on site to better fit the local counterpart's situation. In some cases, new projects are formed in the course of implementing the original technical cooperation.

In our review this time, there were 75 cases of experts dispatch. Twenty-eight of them were for duration of no longer than 15 days, representing dispatch of speakers for seminars or technical specialists for a very limited scope of topics. Our review was made on the other 47 cases in respect of their position in ODA and their themes. Some experts dispatch projects were positioned as an element of concerted efforts in conjunction with development studies, grant aid cooperation or other experts dispatch projects to seek synergy, while others were implemented independently without any particular link to other schemes or programs. The themes of the experts dispatch reviewed were categorized into: solid waste management in general, technical support, operational improvement/human development, institutional improvement, education on wastes, and privatization support. (In many cases, a single dispatch fell into more than one category.)

As in Figure 1-4, experts dispatch in conjunction with other schemes can be understood as being more concentrated on the support in

Figure 1-4 Activities of Dispatched Experts



Source : prepared by OTSUKI Noriko.

operational, human development, organizational and institutional aspects than independent dispatches. Apparently, this is a reflection of the need on the part of the recipient country for these themes, when it wants to fully utilize the equipment that it has received under a grant aid scheme or to implement the plan that has been formulated under a development study scheme. It is fair to say that the experts dispatch is an effective scheme for 'soft' aid or management support, human development and detailed follow-up, because these activities can be conducted based on a good understanding of the recipient's capacity.

The cases (28 in total) that were carried out in conjunction with other schemes consisted of: 5 cases of dispatch following grant aid projects, 7 cases preceding development studies, 7 cases following development studies, and 9 others [82].

(6) Volunteer dispatch

JICA's volunteer dispatch consists of two schemes: Japan Overseas Cooperation Volunteers (JOCV) and senior volunteers. The former is for young technical experts or volunteers aged 39 years or younger, and the latter is for veteran technical experts over 40 years of age.

Our review included 15 JOCV cases and 11 senior volunteer cases. Latin America ranked first as their destination with 14 cases, followed by Asia (7), small island states (3) and Africa (2).

Many of the JOCV cases represent technical cooperation activities that require steady continued efforts hand-in-hand with the local residents, such as composting and solid waste education in combination with programs of rural development or promotion of organic farming. Some dispatches were made as part of overall rural development or environmental education projects. In some other cases, volunteers were dispatched for the purpose of extending technical cooperation relating to the maintenance of equipment and machinery that had been provided under a grant aid scheme [83]. JOCV dispatch, though not involving large financial input, has the advantage of providing detailed cooperation in close interaction with the local parties, and can be described as a scheme quite fit for this kind of linkage with other schemes. Senior volunteers, on the other hand, are mostly made with the objective of making advices to and otherwise assisting the local administrative bodies in the formulation of solid waste management plans or environment protection plans in general, capitalizing on the volunteers' profound experiences.

(7) Technical training of overseas participants

Efforts are underway to raise effectiveness of technical training, such as linkage with other schemes and better uniformity of trainees in terms of regional background and development levels.

In the solid waste sector, JICA organizations in Japan, with support from domestic partner agencies and organizations, accept approximately 60 to 80 participants from overseas to group-type training courses (by country-focused, group or general) [84]. Many of the courses are for 5-10 trainees each with a duration of 1-2 months. Their course program is of 'technology presentation' type, featuring mainly lectures and site visits, and the lectures mostly tend to be about the solid waste management institutions and experiences in Japan. Some cases feature practical training and exercise on the actual work of putting applicable technologies into practice.

[82] The others include: linkage with other experts dispatch, supplementary relationship with then ongoing development studies, linkage with JBIC projects, and dispatch in preparation for development studies or grant aid projects that did not come through.

[83] In the Laos case for example. See section 3-2 in detail.

[84] The counterpart training that is conducted as a part of the development studies is excluded from these courses (although it has been integrated into country-focused training courses according to JICA's schematic classification, as of 2004). However, the lectures and site visits under group training and the participants of counterpart training programs were joined for the sake of training efficiency.

(See Box 1.2.) A typical training curriculum is run as follows: First, as an introduction to the course, each trainee is asked to self-examine the challenges and current situation by writing a country report or a job report. Next, the main part of the curriculum is conducted. At the close, each trainee prepares an action report, with the view to materializing what he/she has learned. Our review of the courses that were run in the years 2002 and 2003 shows they can be roughly divided into two types. One of them encompasses the entire flow of solid waste management (planning, collection and transportation, primary processing and final disposal) in a comprehensive manner. The other type is focused on the technical aspect such as final disposal or landfill site management. In addition, many of the courses partially include topics of solid waste management improvement and facilitation, such as more efficient use of resources, analytical technique, public awareness and education. A review of program components of each training course is summarized in Table 1-8.

Solid waste management courses that were held during the period of our review consisted

Box 1.2 Hands-on Practice and Coordination with the JICA Partnership Program with Local Governments

–Training Course: Landfill Technology for Solid Waste Management in Malaysia–

This training course is designed to provide not only theory, but also practice, by offering hands-on experience with the Fukuoka Method[1]. This landfill method utilizes materials that are locally available, such as bamboo and waste tires. JICA links this training course with the Development Study on Safe Landfill Closures and the Rehabilitation of Landfill Sites in Malaysia to make the course more effective. For further synergy, JICA also invites trainees from developing countries under the local government partnership training program within the framework of research and development.

KONDO Sei

[1] For details of the Fukuoka method, see Box 2.6 in Section 2-5.

Table 1-8 Program Components of Solid Waste Management Training Courses

Course title/components	Planning	Collection/ Transportation	Intermediate processing	Final disposal	Resources utilization	Analytical technique	Public awareness /Education
Seminar on Comprehensive Solid Waste Management	■	■	■	■	■	■	■
Comprehensive Solid Waste Management Technique	■	■	■	■	■	■	■
Waste Management for Eastern European Countries	■	■	■	■		■	■
Waste Management Techniques for Central American Countries	■	■	■	■	■		■
Solid Waste Management for Nepal	■	■	■	■	■		■
Urban Solid Waste Management	■	■	■	■			
Local Administration for Environmental Protection in Sri Lanka	■	■	■	■			■
Municipal Solid Waste Management for South Pacific Forum Countries	■	■	■	■			
Solid Waste Management for Viet Nam		■	■	■	■		
Landfill Technology for Solid Waste Management for Malaysia		■	■	■			
Industrial Pollution Control Engineering Environment Measures			■	■		■	
Treatment and Recycle Technologies for Industrial Effluent and Waste			■	■	■		
Industrial Solid Waste Recycling Technology				■	■		

■ : Hatched boxes represent the components that were included as main components. Simple site visits are excluded.

Source : prepared by KONDO Sei.

mainly of region- or country-focused courses[85]. This is in some respect a response to the problems that the group training courses have to be rather general in nature because of the substantially large variations in the background and solid waste management situations of the allotted countries that result in large differences in the level of understanding of the participants and the training effects. And the increase in the number of region-focused training courses (directed to a group of

Box 1.3 Examination and Verification of Appropriate Technologies through the JICA Training Program

—Training Course: Municipal Solid Waste Management for South Pacific Forum (PIF) Countries—

Pacific island nations are facing a major environmental challenge with growing residential wastes. For one thing, economic development in these nations has put in place a one-way material flow-a flow of imports. For another, people have acquired a lifestyle that depends heavily on imports in the urbanization process.[1]

This course offers the opportunity to learn about waste management administration and technologies in Okinawa Prefecture, Japan, with the overall objective of contributing to economically-sound development. Okinawa Prefecture, which shares many geographical features with Pacific island nations, is striving to promote regional tourism by taking advantage of local coral reefs.

For this course, a number of attempts have been made to develop follow-up activities and human networking. The following are some examples of such attempts:

(1) A combination of training in Japan and third-country training for developing applicable technologies

By providing training in Okinawa and Samoa alternately every year, JICA offers trainees in this course opportunities to link what they have learned about the initiatives and experiences of Japan with development in the field of models involving landfill technologies. Such models are verified in the course. In fact, efforts have been made to develop teaching materials from model development experiences in Samoa. Of note, cooperation with a JICA expert who was once assigned to the South Pacific Regional Environment Programme (SPREP) on a long-term basis has been playing a major role in maintaining linkages with third-country training. For example, the expert conducted follow-up activities designed to put into practice what the trainees had learned and action plans that they had developed in this course.

(2) IT training and a mailing list

In order to improve waste management administration after government officials who have participated in the training go back to their home country, the backing of budget allocations will be essential. It is often the case that IT training provided by JICA helps these officials to make effective presentations using IT technologies to their superiors in an effort to secure the necessary budget allocations. JICA has thus included IT training in the course and installed a server at its office in Okinawa to allow those who have completed this course and returned home to participate in a mailing list to exchange information on solid waste management in an island setting[2]. This is an interesting attempt to provide a tool for follow-up and information exchange despite various difficulties. One such difficulty concerns the management of the server. Another difficulty is that the discussion tends to be low-key without the intervention of resource persons.

KONDO Sei

* The content of this box is based on the presentation given by SAKURAI Kunitoshi, Professor at Okinawa University at the second Study Committee meeting.

[1] JICA (2004c), p 9.

[2] For the value of networking among people who have completed JICA training courses, see the case of El Salvador in Section 3-3, in which the activity of former JICA trainees in their home country has culminated in a fresh technical cooperation project.

[85] Country-focused training is chosen and programmed following a review of needs survey and application for technical cooperation from JICA's overseas offices.

Box 1.4 Use of Third-Country Resources

—Providing C/P training in a third country in the Study on Solid Waste Management in Phnom Penh Municipality in the Kingdom of Cambodia—

In this development study, JICA provided counterpart (C/P) training in Laos instead of Japan in the form of "individual training," in which an individual training curriculum is prepared for each trainee. Providing such training in the third country made it possible to increase the annual number of trainees to five from the usual one or two. A member of the study mission participated as a lecturer. Other lecturers included one of the Laotian counterparts in a series of JICA projects for Laos, including development studies and grant aid projects[1]. These arrangements had the following advantages:

(i) Presenting recommendations to the Cambodian counterparts in Laos, which has a background similar to Cambodia, made it easier from them to understand these recommendations more vividly. As Laos is close to Cambodia in terms of both cultural setting and SWM level, the Cambodian counterparts also gained more insights than they would have if they had received the training in Japan, which tends to focus on facility inspection tours and lectures.

(ii) Acting as a lecturer offered the opportunity for the Laotian to take a fresh look at their SWM framework, as well as the opportunity for the Laotian SWM staff member to develop his own capacity. This in turn served as a follow-up on a series of JICA projects for Laos.

KONDO Sei

* In the preparation of this box, reference was made to the C/P training report compiled by Kokusai Kogyo Co., Ltd., which conducted the development study above.

[1] For details, see Section 3-2.

countries having similar backgrounds) is a reflection of its advantage of serving dual purposes, namely, (i) allowing participants to interact with fellow participants from other countries and learn new things from them, and (ii) securing a number of participants from countries and cities with similar local conditions that is large enough to run a highly focused course designed with considerations to the region's characteristics. (See Box 1.3.)

Especially in the country-focused courses, there were cases that envisaged linkage with dispatch of experts or development study[86]. These training courses are not to accomplish only the technology transfer effects by ordinary training but also the capacity development of the counterparts in technical cooperation projects and their active participation to the projects. An increased ownership toward materialization of the recommendations after the completion of the technical cooperation project is also expected.

In some other cases, the counterpart is called to serve as lecturer in his/her own country or in a third country after the end of development study. An exemplar case that contributed to the capacity development of both the lecturer and the trainees is described in Box 1.4. Another post-training follow-up effort is the group counseling through a videoconference on the JICA-Net[87].

In addition, there is an individual long-stay (a few years) study in Japan, taking advantage of JICA's allotment in the Japanese Government (Ministry of Education) Scholarship. It is suited for the development of high technology level human resources from a long-term perspective. In the solid waste management sector, Hokkaido University and Okayama University are among the universities that are known to have received such students. The students are often selected from amongst the expert counterparts (young full-time officials of the recipient country), because careful attention must be paid to the applicant'

[86] See Section 3-4 for a specific case in Sri Lanka.

[87] JICA-Net is a computerized network of digital communications that enables simultaneous multilateral conference and distance training.

research capability and competence evaluation at the time of recommendation, and further because the so-called 'brain drain' from developing countries should be avoided.

(8) Project-type technical cooperation

There are not many project-type technical cooperation cases in solid waste management sector. Only two cases came out in our review, and both had the objective of research and development of treatment technologies for industrial solid waste. Both were implemented within the framework of the 'Proactive Environment Protection Cooperation' that Japan launched in 1993 with the view to making proactive contribution to the environment protection in developing countries[88]. Incidentally, the scheme has been reorganized as 'technical cooperation project' since fiscal 2002, inheriting the concept of project-type technical cooperation[89]. As a result, dispatch of experts, acceptance of trainees, supply of equipment, etc. can be each regarded as a component of a technical cooperation project, and the components can be flexibly combined and tailored to the needs of individual project. In future project formation, the perspective of selecting the optimal combination of various inputs to achieve the intended objective will be tested.

(9) JICA partnership program - collaboration with Japanese NGOs, local governments and other institutions

The former JICA Partnership Program was launched in fiscal 1998. It is implemented by the project proposals from Japanese NGOs, local governments, universities, etc. In fiscal 2002, this program was renovated as JICA Partnership Program with the objective of encouraging participation of a wider range of people in international cooperation.

There have been 4 cases of projects in solid waste management sector, which is not a big number relative to the existing needs[90]. This may be a reflection of the difficulty on the part of NGOs to provide a comprehensive and sustainable assistance in this sector beyond pilot project-type cooperation. NGOs excel in grass-roots activities such as lifestyle improvement and poverty reduction from an eye-level close to that of ordinary citizen, while fundamental reforms in the solid waste management sector cannot be realized without the intervention and involvement of administrative bodies that are responsible for solid waste management. In fact, the aforementioned projects were mainly dealt with very localized individual themes involving direct interaction and improvement efforts with the civic society or local administration, such as setting up of a recycling system jointly with a university, introduction of a composting facility for livestock waste, and collection and disposal improvement assistance by a local government through provision of second-hand equipment and technical guidance.

In the JICA Partnership Program with local government in Japan, there are cases that efforts are made to pursue a synergy between acceptance of a trainee into research and development area and the existing training course for practical technical work of solid waste landfill[91].

(10) South-South cooperation

Standard-bearers of South-South cooperation must have self-standing capacity. In that sense, south-south cooperation is a goal of technical cooperation.

[88] Two cases in Malaysia and Brazil.

[89] The aim of technical cooperation project is to quickly and accurately respond to the diversified and upgraded development needs. To meet the end, its concept was integrated into that of the similar projects (including dispatch of expert teams, research cooperation, and aftercare cooperation) and its scheme was reorganized in 2002 by having a new concept that can take optimal choice according to its aim and contexts.

[90] Two cases of former JICA Partnership Program (Thailand and Philippines) and 2 cases of former Small-scale Development Partner Program (Mongol and Viet Nam). Some composting or other SWM-related activities that might be included in rural development projects are not counted for the purpose of this review.

[91] See Box 1.1.

South-South cooperation is a scheme to support cooperation between 'countries of the South' by which individuals and organizations who have received JICA's technical cooperation utilize the acquired knowledge and technologies to extend, in their turn, technical cooperation to nearby developing countries that are under conditions similar to theirs. The scheme is characterized by the spread effect of technical cooperation, encouragement of counterpart's self-reliance, and propagation of appropriate technologies fitting to the developing country conditions, and it has numerous advantages. There are 3 sub-schemes, namely, third-country group training by which a group training course is held in a third country, third-country individual training by which the counterpart(s) is sent to and trained in a third country that has already received technical cooperation; see Box 1-4 in details, and third-country experts dispatch by which the counterpart(s) is sent to a third country as an expert(s) to give technical guidance there. In the solid waste management sector, third-country group training and third-country individual training have been carried out.

In Tunisia, for example, building upon the fruits of JICA's technical cooperation through expert dispatch, the expert counterparts played a key role in organizing a third-country group training program for the theme of 'solid waste management and environmental pollution measures' inviting 20 participants from nearby African and Middle East countries (2002-2004). It was promoted in collaboration with the contemporary METAP Project of the World Bank, and made a significant contribution to the advancement of information exchange on appropriate technologies for solid waste and waste water management in arid/semiarid climate. The course was each time attended by JICA short-term experts dispatched from Japan as lecturers, who introduced the latest information on relevant technologies. Today, the Tunisian implementation organization plays to a good extent the role of center for regional cooperation without intervention from Japan. Joint research programs are underway with Jordan, Egypt, Morocco, Burkina Faso and others. This is a good example of a spread effect expanding international cooperation. From the standpoint of capacity development, it should be remembered that the scheme contributes to not only the spread effect of technology but also the establishment and deepening of technology as well as the improvement of management capability and advancement of organizational capacity. These are the advantages of holding a training course by the counterparts themselves.

In this way, South-South cooperation can be regarded as a goal of technical cooperation and capacity development. Besides Tunisia, third-country group training in the solid waste management sector has been carried out in Mexico, Singapore and El Salvador (planned) so far. It is expected to increase in the future.

(11) Program approach

In order for the solid waste management operation in the target country or city to be run in a self-reliant manner, the implementing organization is required to possess an execution ability flexible enough to cope with the changes in the local situation and socioeconomic conditions. Therefore, it is increasingly important to adopt a complex 'program approach' as opposed to single 'project approach.' By the program approach, development study, grant aid, experts dispatch, volunteer dispatch, training and other input components and schemed are flexibly coordinated in response to the situation and challenges of the relevant country or region[92]. There have indeed been cases in which expert dispatch was made for the purpose of smooth implementation of a development study or a grant aid project or in which development study was coordinated with a training course for the purpose of improving the

[92] After the organizational reform in April 2004, JICA's organizational system has been changed from the scheme/sector-oriented division system to the issue-based division system. By this change, the organization is establishing the base of the system to consider the putting elements and schemes in more comprehensive and flexible manner.

Box 1.5 Patterns and cases of coordination among JICA schemes in the solid waste sector

Patterns of coordination among JICA schemes implemented in the past can largely be divided into the following:

Pattern 1 : Dispatch of Experts → Development Study (project formulation and direction identification by experts)

Pattern 2 : Development Study → Dispatch of Experts (experts support the follow-up on the development study, implementation of the recommendations and make the necessary arrangements to promote grant aid)

Pattern 3 : Development Study → Grant Aid (provision of equipment as part of support for the implementation of recommendations)

Pattern 4 : Grant Aid → Dispatch of Experts/Volunteers (support for the operation and maintenance of equipment in grant aid)

Aid projects and programs are often implemented through a combination of some or all of these patterns in parallel or in succession, as shown by the following cases. Some projects and programs even include the dispatch of volunteers (see the case of Laos in Section 3-2) or country-specific training for synergistic effects (see (iv) below).

(i) Asuncion, Paraguay: dispatch of experts [1991-92; 1992-94] and development study [1994] → dispatch of experts [1995] → grant aid [1998] dispatch of experts [2000] (Patterns 1, 2, 3, 4)

First, an expert assigned to Asuncion on a long-term basis called for institutional, financial and other kinds of support for M/P formulation. The subsequent development study stressed the need for grant aid (an expert was again assigned to Paraguay during this period of development study as well). This study also suggested that Paraguay make the necessary arrangements to receive grant aid. The counterpart organization promoted organizational reform when two experts were in Paraguay to follow up on the implementation of the recommendations of the development study. The two experts were the above-mentioned expert and a development study consultant. The fact that they were thoroughly familiar with local situation and conditions played an important role in bringing about successful outcomes. The D/D (Detailed Design) in grant aid resulted in the full-fledged launch of an aid-receiving organization. After the completion of the grant aid project, an expert was dispatched to help this organization with a scheme for loaning equipment to local governments.

(ii) Mexico City, Mexico: development study [1999] → dispatch of experts [2000] (Pattern 2)

The development study came up with an M/P that could be implemented through self-financing by the recipient. JICA then dispatched an expert to support the implementation of the M/P. In addition to policy advice, they provided guidance in the field. The development study report was well read even by a staff member at the counterpart organization who was working in the field.

(iii) Hanoi, Viet Nam (development study [1998-2000] → dispatch of experts [1999-2001] → grant aid [2002] (Patterns 2, 3)

In this case, the period of development study and that of expert dispatch substantially overlapped, as the two projects were mutually supportive. In fact, the dispatched expert worked to deal with whatever the development study would come up with, supporting capacity building-including human resources development and organizational improvement-in the implementing agencies for solid waste management. This institutional capacity development laid the groundwork for the city to receive equipment in grant aid. As a follow-up, JICA provided consultations via teleconferencing, which was made possible by JICA-Net.

(iv) Secondary cities of Sri Lanka (development study [2003]; Training Course: Local Administration for Environmental Protection in Sri Lanka)

This new training course was developed during the process of reviewing the group training course on "Local Administration for Environmental Protection," with consideration given to possible coordination with the development study entitled "Study on the Improvement of Solid Waste Management in the Secondary Cities of Sri Lanka." Synergy was achieved by selecting trainees from the model cities for the development study and inviting a study team member as a lecturer.

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implementation ability of the recipient organization. Specific cases will be discussed in Chapters 3 and 4, and other coordination cases are outlined in Box 1.5.

(12) JICA's past cooperation in the solid waste management sector (a wrap-up)

JICA's assistance is shifting to the direction of fostering developing country's own initiative toward improvement of its problem-solving capability.

As we have seen, a recent trend in development study is to prepare an 'action plan' as an outcome, present a practical plan fit to the realities of the recipient country, and give a push to take the next step by a pilot project. In grant aid, supply of hardware alone does not lead to the expected results and it is supplemented by the input of non-physical components to make the hardware supply truly useful. These trends stem from the increased awareness that the people and organizations of a society, after all, have the primarily responsible for the problem of solid waste they generate and that donor's position is to help them fulfill the responsibility.

Meanwhile, training, experts dispatch and volunteer dispatch, by their nature, have more direct impact on the capacity improvement of the individuals involved in comparison with development studies or grant aid projects, and have contributed to human resource building on their own merit. In addition, these schemes have supplemented development studies and grant aid projects by covering individual capacity domain, which offers useful information for adopting a program approach in future assistance.

The purpose of solid waste management may be the same around the world in that it is about collecting solid wastes properly and disposing of them safely and properly outside the range of usual livelihood. However, the core problem is unique and special as we have discussed, and what is more, it is dynamic along with the change of society. The decade we have reviewed may be described as one in which germination of a new shift from direct problem-solving attempt by assistance from outside to acquisition of own problem-solving capability by the developing country, in other words, to 'capacity development' or 'encouragement of developing country's own initiative.'

1-3-3 Assistance by organizations other than JICA

(1) Japan Bank for International Cooperation (Yen Loans) [93]

Yen loans for environment-related projects, including those in the solid waste management sector, had a 42.9% share in the total amount of yen loans the Japan Bank for International Cooperation (JBIC) approved during fiscal 2002 [94]. Actual cases of yen loans in the solid waste management sector included: (i) project loans, and (ii) financial intermediary loans (two-step loans).

Among the project loan cases in the period from fiscal 1990 to 2002, those specialized in the solid waste management sector were few, but there were several urban environment improvement project in which solid waste management problem was addressed as a project component. (See Table 1-9.) The provided funds were directed to a large variety of uses including rehabilitation of existing disposal site, construction of final disposal site (sanitary landfill) and intermediate processing plant, and procurement of collection and disposal vehicles and other machinery and equipment. In many cases, consulting service to foster the capability to operate and maintain these facilities and

[93] Visit JBIC website for the descriptions of this section. http://www.jbic.go.jp

[94] In order to provide incentives to environment-related projects, preferential interest rate systems called 'environment interest rate' and 'special environment interest rate' were introduced in fiscal 1995 and 1997, respectively, and the solid waste management sector is eligible.

Table 1-9 Examples of Yen Loan Assistances (1990-2002)

① Project loans

Country	Major theme	Date of L/A	Loan Amount	Funds directed to
Philippines	Subic Bay Freeport Environment Management Project	1997.3.18	1,034	Disposal site renovation, collection vehicles and other equipment procurement, consulting service.
Philippines	Subic Freeport Environment Management Project (Phase II)	2003.3.28	991	New landfill site improvement, old sanitary landfill site closure, composting facilities construction on closured site, consulting service.
Indonesia	Jakarta Solid Waste Management System Improvement Project	1993.11.4	3,863	Equipment procurement (container trucks, compacter trucks, street sweepers, landfill heavy machinery) , transfer station construction, vehicle maintenance shop improvement, final disposal site improvement.
Philippines	Special Economic Zones Environment Management Project	1997.3.18	2,746	Waste water treatment and reuse facilities and solid waste management facilities improvement in the export processing zone, consulting service.
China	Xiang River Basin Hunan Environmental Improvement Project	1997.9.12	5,678	Sewage system improvement, industrial pollution abatement, city gas supply, solid waste sanitary disposal facilities construction.
Brazil	Parana State Environmental Improvement Project	1998.1.8	23,686	Water supply and sewage systems improvement, hazardous pesticides recovery center, incineration facilities, landfill site construction, used pesticides container recovery, recycling system improvement, consulting service.

② Two-step loans

Country	Major theme	Date of L/A	Loan Amount	Funds directed to
Philippines	Environmental Infrastructure Support Credit Program	1996.3.29	5,158	Mid- to long-term funds for installation, modification, replacement, relocation of private sector facilities for prevention or reduction of industrial pollution, expenses for consulting service, training and technology transfer, environment monitoring equipment procurement, initial working capital associated with the above, etc.
Sri Lanka	Environmentally Friendly Solutions Fund	1998.9.28	2,730	Equipment capital investment for environment protection measures against industrial pollution prevention.
Thai	The Environmental Fund Project	1993.9.22	11,200	Funds to municipal governments for environment protection projects such as final disposal site construction.

amounts: million yen (environmental component only)
L/A: Loan Agreement
Source: prepared by KONDO Sei, based on JBIC website (http://www.jbic.go.jp)

equipment was also included in the scope of the loan. With respect to two-step loan, there was no case specifically directed to solid waste management, but a loan was made available to municipal governments for sewage system and solid waste management facilities, and a low-interest long-term loan was extended to private enterprises for environment improvement and pollution prevention.

(2) NGOs

NGOs, unlike organizations between government agencies, mainly conduct cooperation at the grass roots level, and are capable of extending finely-textured assistances from an eye level much closer to that of the local citizenry. Actual cases of NGO activities included environmental education in school, fostering of common understanding among local residents on the question of public awareness about solid waste issues, and solid waste separation activities (and using the income for community improvement). Bridge Asia Japan (BAJ), for example, has been engaged in a comprehensive community improvement project through solid waste separation activities comprising the above-mentioned components[95]. Other examples include: medical support and income improvement by vocational training for the neighbors and waste pickers of a final disposal site[96], and building up of a recycling system of organic waste through composting[97]. In addition, several NGOs provide support to visitors and/or waste collectors at waste disposal sites in Metropolitan Manila.

In view of the present activity characteristics of Japanese NGOs, their main activities in the solid waste management sector seem to be carried out as part of the above-mentioned grass-roots programs rather than as a comprehensive support to the overall solid waste management plans with direct interaction with the government. In that sense, it would be fair to say that there exists a fine division of labor in development studies, grant aid projects and loan projects. Further, collaborative efforts with NGOs (Japanese or otherwise) in volunteer dispatch, experts dispatch and other schemes of JICA would be worth considering from the standpoint of enlarging the activity options for both JICA and NGOs.

Apart from NGOs, Japan Society of Waste Management Experts[98] often takes up topics on assistance to developing countries in the context of its international exchange activities. In its annual autumn conference almost without exception, JICA experts and/or NGO activists give presentations on their actual experiences and cooperation outcome of assistance to developing countries in the solid waste management sector. These presentations extensively put forward the fruits, problems and challenges of a large variety of specific case examples, and provide a wealth of useful information for the study of methodology on future technical cooperation to developing countries in the solid waste management sector[99]. In the International Session of the conference, reports from Asian countries are also presented. It is hoped that the Society will play a more active role as a forum for exchange of technical information and reports of actual experiences with respect to assistances to developing countries in the solid waste management sector.

In recent years, in addition, municipal governments have started exchanging information and cooperating with each other to solve their common problems, as the solid waste management issue is closely related to urban

[95] This project was initially implemented as the pilot project in the framework of a JBIC proposal-type project formulation survey ('A Survey on the Establishment of a Recycling Program for Municipal Solid Waste in Viet Nam'), and has been ongoing ever since. For that country, BAJ has proposed a Compost Producing Landfill, a method to prolong the life of landfill sites and at the same time produce compost by composting the solid waste in the landfill site and using it as cover soil.

[96] For example, Intercommunication Center for Asia and Nippon (ICAN) is active in this field.

[97] For example, Environmental Counselling Association of Nagasaki, a registered NPO, is engaged in such activities.

[98] http://www.jswme.gr.jp/

[99] Sakurai (1990, 1991, 1992, 1993, 1994), Nakamura (1993), Shimura et al.(1994), Kusunoki and Shimura (1995), Shimura and Anai (1995), Shikura and Harada (2000), Yoshida et al. (2003)

problems. The city of Kitakyushu, Japan, for example, is cooperating with the Institute for Global Environmental Strategies (IGES) to advocate the 'Kitakyushu Initiative' in networking cities in Asia (Asian network of environmental cooperation cities). As a part of this initiative, a seminar with focus on solid waste management was conducted[100]. Such dissemination of messages from municipal governments is another new movement in international cooperation beyond the bounds of conventional ODA.

[100] IGES (2002)

Chapter 2 Understanding Issues of Assistance in the Solid Waste Sector

The preceding chapter has identified the characteristics of and problems with solid waste management (SWM) in developing countries, summarized donor trends, and reviewed Japan's experience in technical cooperation. This chapter structures specific issues related to SWM there and provides basic information for exploring assistance for capacity development in this sector. Specifically, Section 2-1 reviews such issues systematically and summarized them in charts and matrices. The following sections provide an explanation of each of these issues.

2-1 Issues related to assistance in SWM

Problem analysis through the systematic understanding of the background factors related to solid waste problems takes precedence in examining ways to solve solid waste problems.

This section presents development objective matrices that summarize specific issues in SWM sector to get a general picture in developing countries. This process is designed to systematize development issues so that the matrices can be used as a tool for identifying issues and formulating projects for each user. At present, the socioeconomic aspects should be given special consideration in planning development assistance in this sector in addition to technical aspects, and the roles should be played by different stakeholders.

Here, an "issue" refers to an obstacle that has to be overcome to solve a given solid waste problem. In other words, it is a specific subject for which a recipient is required to develop its capacity. The process of systematizing issues is the process of identifying specific subjects for capacity development support.

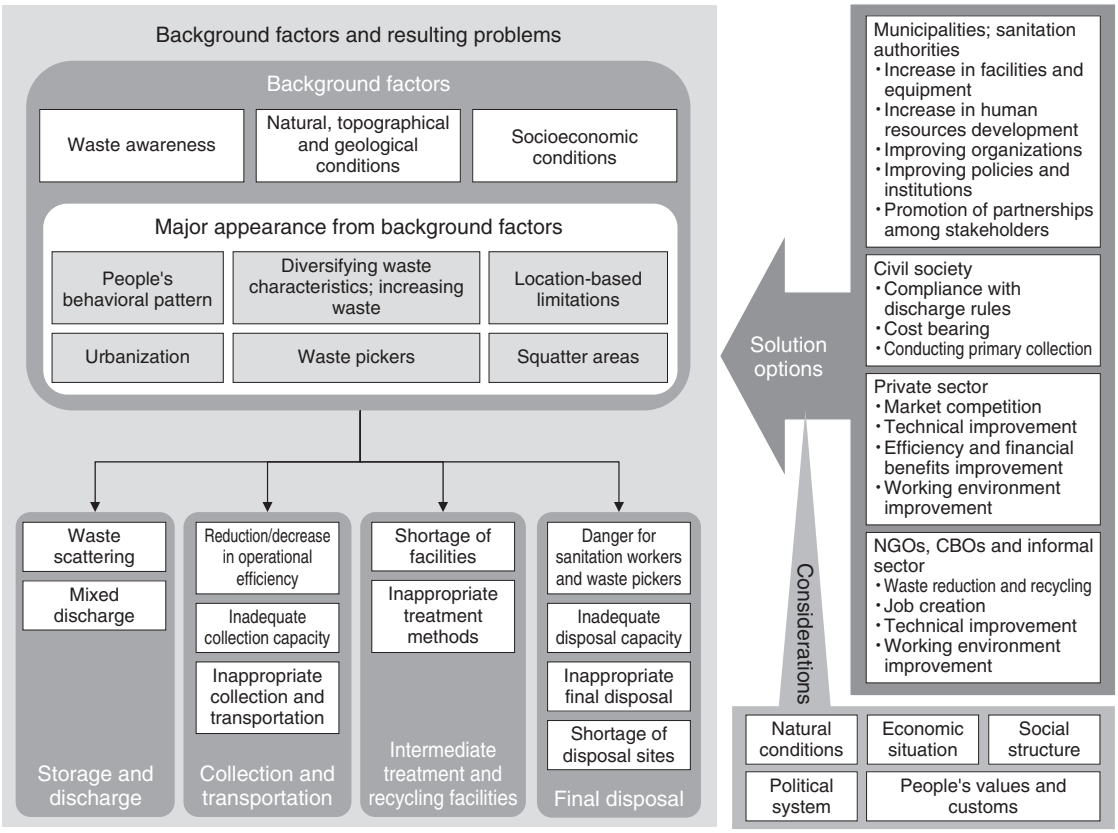
2-1-1 Understanding issues in the solid waste sector

(1) Correlation between issues and methods for their solution

As mentioned in Chapter 1, waste problems reflect society, economy, culture and natural conditions and other factors. These various background factors play a significant role in determining how each problem manifests itself-how each problem occurs, what form it takes, and how far it develops-at each phase of the solid waste management process: storage and discharge, collection, intermediate treatment, and final disposal.

When donors support recipients in developing their capacities to solve these waste problems, it should be noted that stakeholders in capacity building, i.e. entities expected to implement solution options are not limited to local governments as a whole or their departments or sections in charge of SWM. They also include a variety of other stakeholders, such as civil society, the private sector, NGOs, CBOs and the informal sector. Each stakeholder has a role to play by itself or by working with others toward solving waste problems. The specific solution options to be taken should be decided with consideration given to the natural conditions, socioeconomic situations, culture and political system of a given

Figure 2−1 Background Factors, Resulting Problems, and Solution Options in the Solid Waste Sector



Source : Compiled by OTSUKI Noriko

area. In fact, unless these factors are assessed accurately, options for solving waste problems cannot be devised. Nor can capacity development policies based on these options be formulated, or directions for donors' assistance be defined.

Figure 2-1 summarizes background factors, problems and what action should be taken and by whom in relation to solid waste management in a given city. This comprehensive diagram allows for predictive analysis of stakeholders, problems and objectives. It can also serve as a tool to share the understanding of solid waste problems between donors and implementing agencies.

Any developing country city has already some kind of SWM system in place. For each city, such a system has been optimized in the historical and cultural context. Yet the system is now unable to cope with recent changes such as population growth due to urbanization and diversification of wastes under the paradigm of mass production and mass consumption, causing various problems at each level of waste management service. Table 2-1 shows examples of specific problems resulting from background factors and inadequate capacities of municipalities and other stakeholders. Reversely, it is possible to identify capacity development issues to be addressed at each level of SWM service based on these examples.

(2) Roles of each stakeholder in SWM

Understanding of the roles of each stakeholder in SWM is an important element of the process of setting objectives for improving the overall SWM capacity of the entire society.

The primary counterparts in JICA's

Table 2-1 Causal Factors and Specific Examples of Solid Waste Problems in Developing Countries

Problem factors			Problems caused			
			Storage and discharge	Collection and transportation	Intermediate treatment	Final disposal
Background factors	Population, economic level, climate, topography, etc.	• Increases in waste quantities • Changes in waste characteristics • Seasonal variations, floods and other natural disasters • Underdeveloped urban infrastructure • Operational difficulties • Difficulties in procuring sites • Diversification of city residents	• Inappropriate storage and discharge methods for the quantities and characteristics of the wastes • Inappropriate storage and discharge methods inappropriate for lifestyles • Inappropriate storage and discharge methods inappropriate for climatic conditions • Difficulties in establishing collection points	• Traffic congestion due to population growth • Expansion of the areas with poor access to collection service, including squatter areas • Selection of equipment inappropriate for waste quantities and characteristics • Driving difficulties due to flooding • Poor access due to poor road conditions, including steed roads	• Intermediate treatment inappropriate for waste quantities or characteristics • Intermediate treatment inappropriate for climatic conditions • Difficulties in siting treatment facilities	• Environmental impacts of hazardous, infectious and corrosive wastes • Scarcity of landfill sites due to increasing waste quantities • Increases in the amount of leachate due to heavy rain • Difficulties in siting landfills • Pollution of rivers and groundwater due to leachate • Difficulties in procuring cover soil material
Inadequate SWM by municipalities	Social aspects	• Inadequate understanding of waste issues • Unwillingness to cooperate • Gaps between rich and poor • Formation of slum areas • Disintegration of traditional communities	• Inadequate waste reduction • Improper discharge • Waste left uncollected and scattered around collection points (containers, etc.) • Scattering of waste on streets, etc. due to scavenging	• Denial of access to service by low-income earners due to the failure to pay fees • Low social status of collection workers • Scavenging in the collection process (including scavenging by collection workers themselves, which lowers collection efficiency.)	• NIMBY syndrome • Bringing-in of inadequately separated wastes • Intermediate treatment and recycled products unfit for economic activity	• NIMBY syndrome • Scavenging at landfills • Unsanitary and dangerous working environment for waste pickers
	Institutional aspects	• Lack of policy objectives • Lack of appropriate laws, standards or guidelines • Inconclusive decentralization or weak power of municipalities • Inadequate systems concerning organizations in charge of SWM	• Lack of rules on storage and discharge • Inadequate policies or frameworks for waste reduction and source separation • Mixing of industrial waste into municipal waste • Mixing of hazardous wastes into municipal waste	• Illegal dumping • Lack of safety measures for collection workers • Inappropriate contracts with private contractors • Areas without access to collection service	• Local opposition to the proposed siting of facilities • Lack of safety measures for sanitation workers • Inappropriate contracts with private contractors • Environmental impacts	• Lack of safety measures for sanitation workers • Lack of safety measures for waste pickers • Inappropriate contracts with private contractors • Environmental impacts
	Organizational aspects	• Opaque decision-making process • Lack of a shared sense of purpose • Frequent personnel changes • Lack of organizational management capacity • Lack of policy-making capacity • Lack of coordination and partnership with private waste service providers and other organizations	• Inadequate or inappropriate guidance for communities • Waste left uncollected and littered due to irregular discharge	• Inefficient operation • Inadequate supervision • Inadequate planning • Waste left uncollected and littered due to incomplete collection	• Inefficient operation • Inadequate supervision • Inadequate planning	• Inefficient operation • Inadequate supervision • Inadequate planning

Problem factors			Problems caused			
			Storage and discharge	Collection and transportation	Intermediate treatment	Final disposal
Inadequate SWM by municipalities	Financial aspects	• Underdeveloped tax collection system • Low priority for SWM in budget allocation • Lack of financial management capacity • Lack of financial planning in anticipation of equipment renewal, etc. • Inadequate assessment of cost-recovery performance • Inappropriate allocation of collected fees for other purposes than SWM service	• Inadequacy or lack of containers for storage and discharge at collection points • Incomplete collection of waste collection fees	• Insufficient amounts of collected waste collection fees • Inappropriate allocation of collected fees for other purposes than SWM service • Insufficient allocations from the general-account budget of the municipality • Insufficient expenses for equipment and fuel • Insufficient expenses for operating and maintaining equipment • Insufficient expenses for renewing equipment	• Insufficient expenses for operating and maintaining facilities • Low operating rates for facilities • Excessive inventories of recycled products • Mismatches with markets	• Insufficient amounts of collected waste disposal fees • Insufficient allocations from the general-account budget of the municipality • Insufficient expenses for operating and maintaining equipment • Insufficient expenses for renewing equipment • Difficulties in procuring cover soil material
	Technical aspects	• Inadequate skills • Lack of skilled human resources • Inadequate policies for human resources development (HRD) • Inadequate technical information	• Inadequate or inappropriate guidance for communities • Inadequate waste separation	• Insufficient capacity for maintaining equipment • Inadequate planning • Inappropriate collection methods • Inefficiency • Inadequate supervision over private contractors	• Introduction of inappropriate intermediate treatment • Inappropriate operation and maintenance • Inadequate planning • Negative impact on the environment and resultant encouragement of NIMBY opposition • Inadequate supervision over private contractors	• Inappropriate disposal methods • Inappropriate operation and maintenance • Inadequate planning • Negative impact on the environment and resultant encouragement of NIMBY opposition • Inadequate supervision over private contractors

* The left column on "social aspects" is crossed out because each member of the society plays a part in SWM although social aspects serve as background factors for the municipality in question.

Source : Compiled by OTSUKI Noriko

assistance in the solid waste sector are mostly municipality because they are most likely given responsibility and power for solid waste disposal. For this reason, JICA's technical cooperation projects have focused on capacity development support for SWM departments and sections at individual and organizational levels that involves assistance for both 'hard' and 'soft' aspects.

Meanwhile, collaborative relationships between municipalities and all the other stakeholders are essential for such authorities to deliver SWM service appropriately. Figure 2-2 shows desirable relationships among entities that implement solution options in Figure 2-1 and other stakeholders in SWM. This diagram offers hints as to which directions capacity development at each level of society should go, including the option of building partnerships and frameworks between stakeholders.

2-1-2 Development Objectives Matrix in the SWM sector

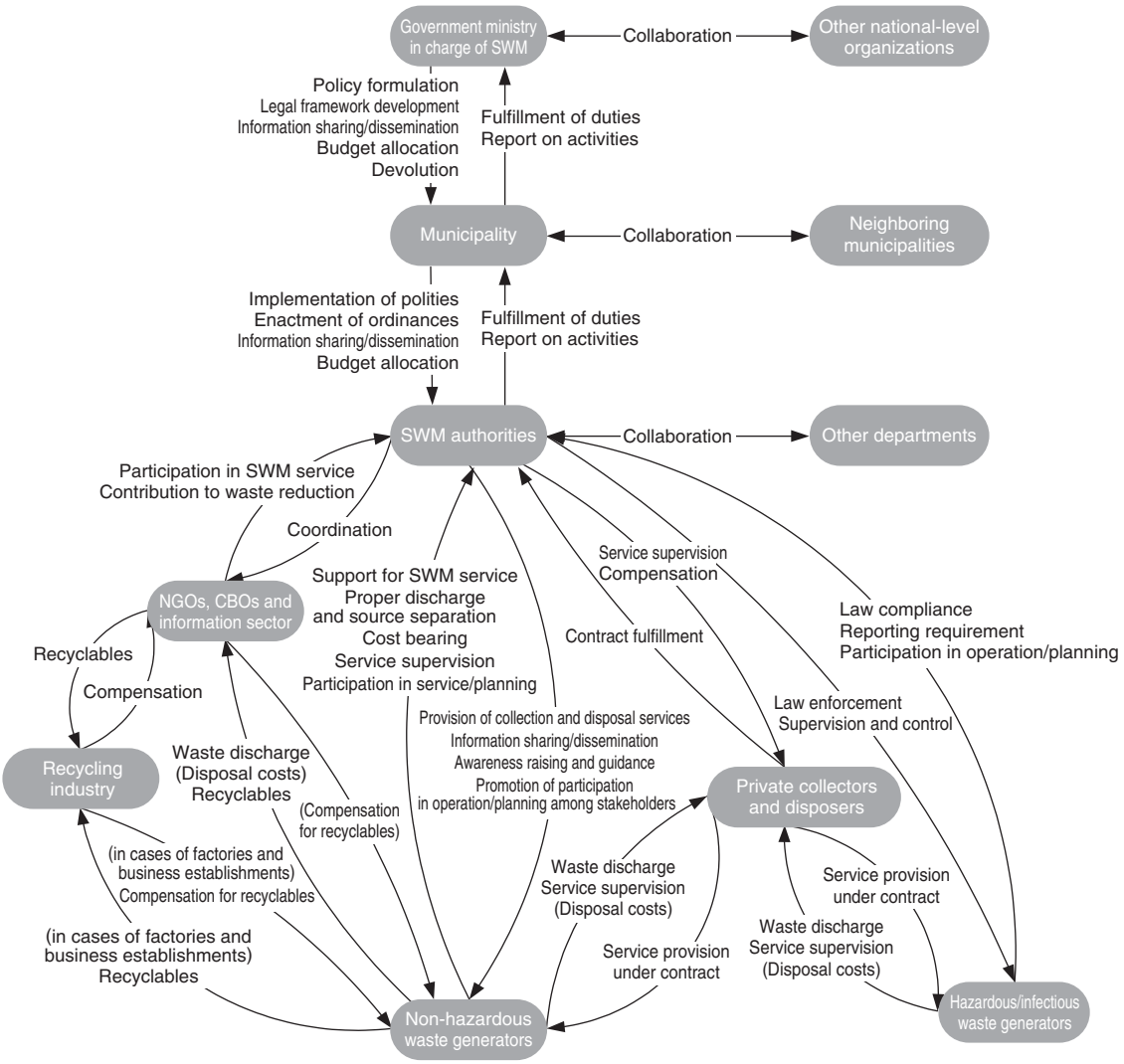
Table 2-2 summarizes development objectives in the SWM sector from different aspects of problem factors (institutional, organizational, social and other aspects) by structuring issues in this sector. This Development Objectives Matrix sets out the improvement of each aspect as Development Objectives, which are broken down into Mid-term Objectives and further to Sub-targets of Mid-term

Objectives. The following sections of this chapter focus on the components of each development objective. At any rate, this chart provides a cross-sectoral picture of what policy or which direction to take in solving problems in SWM (development objectives) in a tree form. The chart can serve as a tool that can be used to identify which objective donors should address according to the capacity of the counterparts. The matrix also offers examples of aid activities. The environmental and public health aspects, especially the management of hazardous and medical wastes are discussed in detail in Section 2-5 since they are deemed to deserve the special attention of donor countries in the developed world because of their extent influence [1].

Table 2-3 structures issues around solid waste management (SWM) components along the waste flow, which plays an important role in SWM. This matrix is useful in identifying which process in the flow has problems and in determining aid components to solve them. Each process in the flow is detailed in Section 2-6.

Integrated input in the form of aid programs calls for the use of both these two matrices to adopt a multifaceted approach.

Figure 2-2 Relationships among different stakeholders in SWM



Source : Compiled by OTSUKI Noriko

[1] Such an objective as "the establishment of SWM with appropriate consideration given to the environmental and public health aspects" are not included. This is because such an objective is deemed to be an outcome goal that will be achieved by fulfilling the two development objectives in Table 2-2.

Table 2-2 Development Objectives Matrix in the Solid Waste Management Sector (Cross-sectoral Issues)

Development Objective	Mid-term Objective	Sub-targets of Mid-term Objectives		Examples of Aid Activities
1. Developing SWM capacity	1-1. Improvement in the institutional aspect	1	Formulating SWM policy	Assessing the current situation and identifying problems; fact-finding survey
				Formulating a SWM plan through a development study
				Information disclosure at the planning phase; support for consensus building among stakeholders; assistance for theintroduction of an appropriate planning process with EIA support, etc.
		2	Development of law and legislation	Clearly defining waste and waste services; clarifying the responsibility for disposal; providing advice on legislation to strengthen the monitoring framework and tighten penalties; developing model laws; supporting waste classification, coding and database development.
		3	Establishing the organization responsible for SWM	Encouraging communication between organizations concerned to codify their roles in official documents
	1-2. Improvement in the organizational aspect	1	Defining job descriptions within organizations	Support in codifying the roles of organizations in official documents and defining the assignment of responsibilities within organizations
				Establishment of appropriate division of duties through support for reviewing contractual relationship between the public and private sectors and revising contract documents
				Support in introducing a permits and licenses system and performance indicators for private business operators; establishment of techniques to control such operators by the training of staff, etc.
		2	Ensuring appropriate personnel distribution in both quality and quantity	Defining the level of expertise required of each department; suggesting performance indicators to meet the need for human resources
				Promoting sanitation service at higher education institutions; securing or reducing human resources through vocational training designed to promote reemployment of workers made redundant
		3	Development of organizational management capacity	Introduction of internal and external auditing systems through support for the introduction of ISO9000s and ISO14000s
				Increasing operational efficiency through support for the development of manuals for various types of operations
				Support for revising wage systems; establishment of evaluation items; fair evaluation of staff performance through support in evaluation implementation
		4	Development of the capacity for cooperation and coordination with other organizations	Support for the establishment of liaison arrangements with other organizations; support in holding committee meetings regularly
				Support for PR using newsletters and the Internet; support for the establishment of information sharing systems
	1-3. Improvement in the financial aspect	1	Ensuring proper financial management	Clarifying SWM costs and expenses based on fact-finding survey on costs of SWM services
				Clarifying the budget and income based on fact-finding survey on the financial status
				Technology transfers related to the development and use of accounting management software
		2	Establishing arrangements for cost recovery (self-finance)	Assessing expenses at municipal, provincial and national levels
				Support for the establishment of a reasonable charge system toward the introduction of a system to collect waste disposal fees; advice on appropriate collection methods and arrangements
				Increasing access to investment financing through the provision of development funds for municipalities with the application of "two-step" loans
		3	Improvement of the balance between income and expenses through cost reductions	Reviewing collection routes; support for the construction of transfer stations; improving collection and transportation efficiency through support for operating efficiency analysis with time-and-motion study
				Support for the introduction of regional waste disposal with the establishment of a broader intermunicipal cooperation framework
				Analysis of cost-saving effects of privatization with an eye to outsourcing SWM services to the private sector or even privatizing SWM

Development Objective	Mid-term Objective	Sub-targets of Mid-term Objectives		Examples of Aid Activities
	1-4. Closer cooperation with the private sector	1	Appropriate promotion of private sector participation	Support for reviewing contractual relationship between the public and private sectors and for revising contract documents
				Recommendations on the scope of outsourcing or privatizing SWM services towards the introduction of such moves
		2	Development of the municipality's capacity to supervise the private sector	Support for reviewing contractual relationship between the public and private sectors and for revising contract documents
				Support in introducing a permit and licensing system and performance indicators for private business operators; establishment of techniques to control such operators through the training of staff, etc.
	1-5. Improvements in the technical aspects	1	Improvement of skills	Support for formulating and implementing HRD plans in combination with training programs
				Developing manuals for collection service and landfill site operation
				Support for establishing internal and external cooperative relations with universities, research institutes, etc.
		2	Development and introduction of appropriate technologies	Promoting technical development by accumulating, promoting and introducing technical expertise and research findings in various countries
				Introduction and optimization of technologies with pilot-scale application and advice
				Promoting the appropriate facility development through support in designing (for better performance), constructing, operating and managing facilities, including transfer of technologies designed to minimize environmental impacts
2. Establishment of a SWM framework suitable for the society	2-1. Appropriate consideration to cultural and social aspects	1	SWM that considers culture and customs	Assessing the current level of public awareness about waste based on opinion polls
				Holding a public hearing for each social group about SWM planning to apply systems that accommodates their cultures and customs
		2	Handling of the informal sector	Establishing operational rules agreed between landfill managers and waste pickers to promote partnership with the informal sector
				Support for registering waste pickers and informal scrap dealers and organizing unions
				Offering alternative livelihoods by providing waste pickers with vocational training
		3	Respect for the consensus building process in SWM	Involving civil society in the planning process through the reflection of the community's opinions received via public hearings and the Internet
				Support for information disclosure, including information on the schedule and actual progress on SWM planning
				Support for organizing a monitoring committee that involves residents and business establishments
	2-2. Encouraging waste generators to participate in the planning of SWM	1	Development of the capacities of CBOs	Promoting the involvement of CBOs through support for information campaigns on the roles of communities in SWM
				Support for community activities with technical guidance on separate collection and sale of recycled items
		2	Promoting the understanding of solid waste problems and issues	Support for developing teaching materials on solid waste
				Support for public awareness raising through information campaigns, including preparation of campaign leaflets
				Support for information campaigns designed to make the public familiar with legislation for SWM with focus on raising the awareness of generators of wastes (including hazardous andmedical wastes) about their responsibility
				Raising public awareness through support for developing tools for guidance and publicity materials regarding hazardous and medical wastes, including their effects on human health and the environment, characteristics of their properties and how to handle them
				Support for the establishment of a framework to provide consultations on the telephone or Internet and other information on how to reduce store and discharge waste properly
				Teaching how to develop publicity tools; developing the ability to guide the residents through OJT that includes public hearings
				Promoting awareness building for waste service providers, strengthening the collector's capacity for implementing SWM so as to be trusted by the beneficiaries

Source : Compiled by MURATA Takuya and OTSUKI Noriko

Table 2-3 Development Objectives Structured Around SWM Components

Components	Subcomponents	Elements of subcomponents	Descriptions and examples of items to be improved
Ensuring proper generation, storage and discharge	Raising public awareness about SWM	Improving solid waste education	Promoting the understanding of waste streams and the importance of SWM
		Disseminating information on the proper store and discharge of waste	Communicating and disseminating information designed to encourage people to use storage containers with lids and set out refuse for collection at the prescribed time on the prescribed day
		Improving methods for guiding the residents	Methods for selecting publicity methods; methods for developing publicity tools; the use of CBOs
	Ensuring that proper discharge methods are used	Selecting proper discharge methods	Selecting discharge methods, including discharge at the curbside or waste collection points; adequate consideration to culture and customs
		Developing discharge rules and ensuring compliance with them	Designating the time and type of container for the discharge of waste; promoting the growth of CBOs that work to ensure compliance with these rules
Expanding and improving collection service	Establishing a collection system	Clarifying the responsibility for collection	Clarifying where collection responsibility lies depending on the source and nature of wastes especially hazardous, non-hazardous, etc.
		Establishing organizations responsible for collection	Defining the relationships among entities that do actual collection, those that supervise the service, and those that finance it
	Formulating collection plans	Assessing the current situation	Surveying collection rates, the collection service available area, the levels of service user satisfaction, etc.
		Appropriate planning and implementation	Setting improvement goals above and developing and implementing measures to achieve these goals
	Expanding collection service	Build-up of collection equipment	Procuring new collection equipment
		Promoting the involvement of NGOs and civil society organizations in primary collection	An arrangement where NGOs are responsible for primary collection along feeder roads from residential areas to arterial roads, from where the municipal government takes charge of secondary collection
		Outsourcing SWM services to the private sector or introducing privatization	Development of a contract administration and supervision framework
	Improving collection efficiency	Improving collection methods	Decreasing the collection frequency from every day to every other day; changing from door-to-door collection to station collection
		Reviewing collection routes	Taking shortest routes; avoiding traffic jams
		Improving personnel management methods	Ensuring appropriate personnel distribution and payment; preventing the pick-up and separation of recyclables during collection; improving operational efficiency
		Replacement of equipment	Removing old or damaged equipment
		Improving equipment	Replacing trucks with compactors or container trucks
		Improving the maintenance system	Preventive maintenance of equipment; prompt repair; proper inventory control, including timely replenishment
		Ensuring compliance with discharge rules	Allowing refuse discharge on the collection days
		Introducing transfer stations	Reducing transportation costs
		Outsourcing SWM services to the private sector or introducing privatization	Development of a contract administration and supervision framework
		Collection cost analysis	Assessing the proportion of collection costs in the total waste service costs; calculating the total collection costs and their unit costs (the total collection costs divided by the total collected amount)

Components	Subcomponents	Elements of subcomponents		Descriptions and examples of items to be improved
	Improving the quality of collection service	Keeping regular collection hours	Personnel management	Managing the working hours for drivers and collection workers
			Reviewing collection routes	Taking shortest routes; avoiding traffic jams
			Securing well-maintained equipment steadily	Improving the maintenance system and replacing equipment
			Keeping regular collection hours and informing the public of such collection hours	Calling for the discharge of waste in accordance with collection hours
		Collection service that will leave no waste uncollected	Improving collection methods and informing the public of such improvements	Introducing bell collection
			Ensuring that discharge rules are strictly observed	Ensuring that people set out refuse in a container or bag only on collection days
	Improving public area sanitation	Reducing the mobilization of resources for public area sanitation	Improving collection service	Implementing measures shown above
			Installing public dustbins	Installing dustbins in public areas
			Improving the practice of throwing away garbage	Calling on the public to use dustbins and properly set out waste for collection
		Optimizing public area sanitation	Optimizing the combination of manual operations by sanitation workers and mechanized operations	Maintaining manual operations by sanitation workers with an appropriate level of mechanization
			Improving the efficiency of sanitation methods	Improving waste containers, transportation methods, sanitation routes, etc.
			Ensuring safety of sweepers	Providing uniforms, gloves, tools, etc.
Introducing and improving intermediate treatment(not limited to methods cited here)	Volume reduction	Introducing and improving size-reduction facilities		
		Introducing and improving the compaction process		
	Waste reduction	Introducing and improving incineration facilities		
		Collection of recyclables		See "Recycling and waste reduction"
		Introducing and improving composting facilities		
	Stabilization and detoxification	Introducing and improving incineration facilities		
		Introducing and improving sterilization facilities		
		Introducing and improving chemical treatment facilities		
	Energy recovery	Introducing and improving waste-to-energy plants		
		Introducing and improving plants using biomass energy		
Improving final disposal	Institutional building	Clarifying the responsibility for final disposal		Clarifying the division of responsibility for operation, management and financing of final disposal
	Final disposal planning	Assessing the current situation		Operation methods, remaining life years, environmental impacts, etc.
		Appropriate planning		Setting goals and defining ways to achieve them in light of the items above
		Appropriate planning procedures and consensus building	Participatory planning process	Dialogue with local residents
			Information disclosure	Ensuring transparency of the planning process
	Preventing or reducing the environmental impacts of final disposal sites	Appropriate site selection		Sites where ground water levels are low, ecological resources are scarce, or the topology is steep
		Appropriate design and construction of final disposal sites		Enclosing bunds, seepage control, leachate collection and treatment, gas collection and venting, monitoring facilities, etc.

Components	Subcomponents	Elements of subcomponents		Descriptions and examples of items to be improved
		Environmental impact assessment (EIA)		Proper EIA of such projects as the expansion of existing landfill sites and the development of new landfill sites
		Proper operation of final disposal sites	Control and management of incoming vehicles	Installation of truck scales, etc.
			Securing cover soil	Procurement on-sites or purchase from off-site sources
			Securing and maintaining heavy machinery	Heavy machinery procurement and maintenance systems
			Training and allocating engineers	Mastering landfill operating skills
			Implementing soil covering; operating and maintaining environmental pollution control facilities	Implementing environmental pollution control activities
			Cost analysis and reduction; securing of operating capital	Assessing the proportion of final disposal costs in total sanitation costs; securing financing
			Establishing the monitoring framework	Monitoring surface and ground water in the neighborhoods
			Outsourcing/privatization of SWM services to the private sector	Development of a contract administration and supervision framework
			Waste picker control	Setting rules on the collection of recyclables and soil covering; helping them find new jobs; organizing them
		Development of legislation that calls for the prevention or reduction of environmental impacts of final disposal sites		Requirements and guidelines for landfills; clarification of the oversight responsibility
		Introducing intermediate treatment facilities for waste stabilization		Incineration, composting, chemical treatment, etc.
Promoting recycling and waste reduction	Promoting recycling	Promoting separate collection of recyclables	Promoting source separation of recyclables	Promoting the sale of recyclables to scrap dealers
			Promoting community-based collection of recyclables	Encouraging local residents or schools to join forces to collect and sell recyclables
			Institutionalizing informal collection activities	Establishing a system to register buyers of recyclables and waste pickers at landfills; improving the working environment
			Introducing separate collection of waste	By the municipal government or its contractors
			Introducing facilities to select recyclables	By the municipal government or its contractors
		Promoting the use of recyclables	Promoting the purchase of recycled products	Raising public awareness; introducing a labeling system
			Introducing a green procurement system	Setting numerical targets on procurement of recycled products by government agencies
	Promoting waste reduction	Promoting waste reduction at home		Disseminating methods and technique to reduce waste at home
		Promoting waste reduction at establishments		Disseminating reduction technologies for the production process; training production; providing financial support for improving production processes
		Introducing extended producer responsibility (EPR)		Setting the scope of waste involving EPR, the extent of EPR, etc.

Source : Compiled by OTSUKI Noriko

2-2 Cities and waste problems

Placing waste problems in the recipient city in a proper context and understanding their multifaceted aspects are prerequisite for determining the focus of aid.

Technical cooperation in the solid waste sector for developing country cities must first consider that each city is placed under different conditions. The first focus is SWM conditions for the city, including the types and amounts of wastes, how they are disposed of, and the technical, financial and institutional capacities of the city. It is necessary to determine the status and priority of waste problems in relation to other problems facing the city. This section briefly look at the status and characteristics of urban waste problems and then perceives their general trends from different aspects.

2-2-1 Urban waste problems

(1) Status of waste problems in the municipal government

Conserving the living environment to protect the public health of city residents is one of the basic civil services of the municipal government. In that sense, proper disposal of waste that residents generate from their daily activities constitutes a key element of civil service. In developing country cities, however, solid waste management (SWM) by municipal governments are generally inadequate due to their insufficient institutional capacities, coupled with the lack of funds and technologies, low levels of public interest in SWM, and distinct social conditions.

In densely-populated cities, waste generated from daily activities may be left in streets, vacant lots and waterways. This not only spoils urban landscapes but also causes health risks for residents by way of air, soil and water pollution. Open burning emits smoke and dust, which causes air pollution for cities. Incineration with incinerators may emit dioxins and other hazardous substances and pose health hazards, if they are of primitive type and cannot control incineration properly. Dumping large quantities of waste on the ground where the groundwater table is high contaminates soil and groundwater, resulting in poor qualities of drinking water. Organic waste dumped in rivers decomposes and gives off odors, and rivers thus polluted emit methane and other hazardous gases. Accumulation of such waste block river flows, causing floods during the rainy season.

In the early stages, SWM service is aimed at maintaining public health and cleaning up streets. Such service generally takes the form of cleaning streets and collection and removal of waste by manual labor. Only part of the city is served. Such sanitation service plays an important role in reducing unemployment because it requires large manpower.

Collection and recycling of waste are also done by the informal sector. Scrap dealers recover metal, paper and other recyclables in waste, and sell them on local markets. Waste pickers pick up recyclables to gain cash income there. This kind of primitive recycling system has advantages in terms of resource recycling. However, it is quite problematic in that the system is maintained by people who works in adverse social environments and in poverty state. In addition, recycling that disregards public health-reuse of used bottles that are not disinfected, for example-poses health hazards.

In developing country cities, the residents are generally less concerned about air, soil and water pollution due to inappropriate solid waste management as well as health risks it poses. Likewise, control of pollution caused by waste is given low priority by municipal governments. In general, as the economy develops and living standards in cities go up, SWM service improves. Growing interest in health risks of improper waste management prompts the introduction of sanitary

landfill. The areas with access to collection service expand and the collection rates increase. However, cities in countries poorer than middle income countries have slums as well as wealthy districts, and waste collection and recycling constitute an important source of income for slum residents.

In contrast, cities in developed countries such as Japan, Germany and South Korea no longer see solid waste management only in the context of keeping cities tidy and maintaining sanitation and public health. They are beginning to see SWM as part of larger efforts to create a "recycling-oriented society" or "recycling economy." There are moves among developing country cities to learn and introduce such an idea soon. For example, the Chinese government is recently showing great interest in efforts toward a recycling economy.

As described above, municipal solid waste management has many aspects, including keeping streets tidy, maintaining sanitation and public health, making civic life comfortable, and promoting resource recycling. Technical cooperation programs and projects for developing country cities must clarify which aspect will be emphasized as the first step. To do so, it is important to assess the needs of the recipient city that accurately reflect the current state of affairs there.

(2) Type, quantity and composition of waste

In general, the quantity of waste increases as income levels improve. Lifestyles and regional characteristics have a great impact on waste composition.

Municipal solid waste is generated from a range of sources, and its type and properties vary depending on the source. In addition, different counties define, classify and handle waste differently.[2]

In many developing countries, waste is not so clearly classified as in Japan. Instead, residential waste and waste generated from shops, markets, restaurants, offices, etc. are lumped into "municipal solid waste (MSW)." Such MSW corresponds with "general waste" in Japan, but it is not divided into household waste and business waste in many developing countries. That means that waste from shops, markets, restaurants, offices, etc. are processed or disposed of together with residential waste as one. Vegetable garbage and food residues from food markets and restaurants, in particular, emit odors after decomposing. Such garbage turns watercourses into sewage canals if dumped into them. Some developing counties have regulations and systems to control hazardous wastes. However, such wastes from household industry or medium and small factories may be blended with municipal solid waste.

There is a clear correlation between income levels on one hand and waste quantities and composition on the other. The higher the income levels grow, the more the per capita waste generation becomes, and so does the proportions of paper, plastic, glass and metal. A World Bank report[3] describes the quantities and composition of urban municipal solid waste per capita in the world (Table 2-4). The proportion of "others" for low-income countries is large because it includes ashes from coal and charcoal used as fuel. The similar situation was seen in South Korea during the 1980s, but the proportion of ash in residential waste fell sharply due to the spread of city gas. More than 80% of urban MSW excluding "others" in low-income countries is organic matter such as kitchen waste and food residues.

As these examples show, waste quantity and composition are closely related to changing lifestyles. Nonetheless, it should be noted that differences in classification and definition of

[2] In Japan, waste falls roughly into two types: general waste and industrial waste. General waste is subdivided into residential waste and ordinary business waste. Generators of industrial or ordinary business waste must dispose of such waste themselves or pay for the disposal.

[3] World Bank (2000)

Table 2-4 Generation and composition of urban MSW

		Low-income countries	Middle-income countries	High-income countries
Quantity (unit: kg/person/day)		0.64	0.73	1.64
Composition (%)	Organic	41	58	28
	Paper	5	15	36
	Plastic	4	11	9
	Glass	2	2	7
	Metal	1	3	8
	Others	47	11	12

Source : World Bank (1999)

waste among countries preclude direct comparison of these figures.

(3) Increasing waste and the growth of difficult-to-treat waste

As a global trend, waste quantities generated in cities are on a steady rise due to rural-to-urban migration, quantitative expansion of consumption-oriented lifestyles, and qualitative change of consumer goods (e.g. a wider use of plastic and packaging such as PET bottles, glass bottles and cans). Also increasing are wastes that are dangerous and difficult to dispose of, including contents of spray cans and infectious medical wastes. Developed countries now embrace the idea of extended producer responsibility (EPR)-whereby producers assume a certain level of responsibility for their products even after they are disposed of as well as during their production and use stages-as one of the basic principles of solid waste management. These countries are developing laws and systems to put the principle into practice. In developing countries, however, this principle is not yet commonly accepted. To make matters worse, materials collected as wastes in developed countries are sometimes exported to developing countries as used goods.

In fact, the difference between wastes and recyclables is not so clear. Wastes in a country may be recyclable resources in another country. For this reason, wastes are exported as resources in some cases. There are also case that hazardous wastes are mixed and exported illegally to developing countries. The Basel Convention, which came in force in 1992, prohibits transboundary movements of hazardous wastes from developed countries to developing countries.

2-2-2 Economic levels of cities and waste problems

Economic levels of cities are directly linked with finances and service delivery capacities of municipal governments, which in turn has a great impact on SWM.

SWM service of a city depends very much on its overall economic condition, living standards and consumption styles of the residents, and other factors. Among these factors, the economic level is the biggest factor in urban SWM. It influences both the condition of the residents-waste generators-and the service delivery capacity of municipal authorities in charge of waste collection and disposal. Again, as income levels rise, the quantity and type of waste will change, and so will the residents' expectations for the quality of SWM service and their willingness to pay (WTP). Moreover, the financial capacity of a municipality will determine the amount of financing and technologies that can be mobilized for SWM service. As a result, there are general trends as shown below:

(i) Low-income cities

Recyclables in waste are recovered by scrap dealers and others. The primary objective of

Table 2-5 Examples of waste composition in developing country cities covered by JICA development studies

Country/city		Laos	Nicaragua		Tanzania	Philippines	Honduras	Poland		Paraguay	Turkey	
		Vientiane	Granada	Managua	Dar es Salaam	Metro Manila	Tegucigalpa	Lublin		Asuncion	Adana Greater Municipality	Mersin Greater Municipality
Component	Unit							(with ash)	(without ash)			
GDRP[1)]	(US$)	87	265	400G	397	697	1,235	1,395G		1,810N	2960	3,000
Kitchen waste	%	16.9	49.84	34.86	42	45.82	47.2	45.27	65.26	36.6	70.77	75.53
Paper	%	2.8	5.29	5.37	3.1	15.39	11.5	13.67	11.11	6.4	13.8	9.88
Textiles	%	1.6	1.98	1.87	1.2	4.33	2.8	2.1	3.77	1.3	3.43	1.77
Plastic	%	6.1	6.11	3.88	2.2	15.6	7.1	4.4	3.8	3.9	6.42	5.87
Glass and wood	%	38.2	24.9	27.11	25.3	7.45	11.6	1.61	2.3	22.2	1.04	1.62
Leather and rubber	%	1.1	0.29	2	0.9	0.8	2.2	2.67	1.83	0.7	0.17	0.29
Combustibles-Total	%	66.7	88.41	75.09	74.7	89.39	82.4	69.72	88.06	71.1	95.63	94.96
Metal	%	3.7	1.11	1.69	2	5.47	1.9	3.31	3.05	1.3	0.72	0.53
Bottles and glass	%	9.3	1.05	2.91	3.5	2.69	3.5	5.23	6.51	3.1	2.55	3.33
Ceramics and stones	%	(Included in glass)	5.21	8.07	0.4	1.26	12.1	21.74	2.38	2.5	0.96	1.14
Miscellaneous	%	20.3	4.22	12.24	19.4	1.19	0.1	—	—	22	0.14	0.04
Noncombustibles-Total	%	33.3	11.59	24.91	25.3	10.61	17.6	30.28	11.94	28.9	4.37	5.04
Total	%	100	100	100	100	100	100	100	100	100	100	100
Apparent specific gravity (ASG[2)])	kg/l	0.17	0.2	0.2	0.39	0.18	0.2	0.22	0.18	0.22	0.29	0.31

1) No alphabet : GRDP (Gross Regional Domestic Product) cited from the final reports.
G : GDP/capita for the country
N : GNI/capita for the country cited from the World Bank's World Development Indicators (1998 or 2002 which is nearer to when the study was conducted for the city). GNI (Gross National Income), a synonym of GNP (Gross National Product), represents the total value of goods and services produced by the citizens of a particular country over a given period of time.

Source : prepared by OTSUKI Noriko.

Table 2-6 Classification and Sources of Solid Wastes

Source		Classification of solid waste
Residential	Single and multifamily residences	Food wastes, paper/cardboard, plastics, textiles, leather, yard wastes, trees/wood, glass, metals, ashes/cinders, end-of-life products (e.g. consumer electronics, batteries, oil, tires), and hazardous wastes
Industrial/ Mining	Manufacturing, construction sites, power and chemical plants, mines, refineries	Industrial process wastes, scraps, sludge, off-specification products, packaging, food wastes, ashes, hazardous waste etc.
Commercial Activity	Stores, hotels, restaurants, markets, office buildings, etc.	Paper/cardboard, plastics, wood, food wastes, glass, metals, ashes/cinders, end-of-life office equipment (PCs, etc.), hazardous wastes
Public Institutions	Schools, hospitals, prisons, government centers	
Construction	New construction sites, road repair, renovation sites, demolition of buildings	Dirt, sludge, wood, metal, concrete, etc.
Municipal services	Street sweeping, parks, beaches, other recreational areas, drinking water and wastewater treatment plants	Street sweepings; landscape and tree trimmings; general wastes from parks, beaches, and other recreational areas; sludge
Agriculture	Fields, orchards, pastures, dairies, feedlots, etc.	Spoiled food wastes, agricultural wastes, hazardous wastes (e.g. pesticides)

Source : ESCAP (2000) "State of the Environment in Asia-Pacific Region," p.170, with revisions made by IMURA Hidefumi.

urban SWM service is to collect other unsanitary wastes and dispose them outside the city. Waste collection is dependent on human power and the area served is limited. Where collection service is unavailable, garbage and sludge that have no economic value are dumped or left on roads and vacant lots and in canals, damaging public health and urban landscapes. More than 90% of SWM costs are personnel expenses for collection.

(ii) Middle-income cities

Waste collection service by municipal authorities covers a wider area than in low-income cities. Trucks are employed for collection. Some cities use batch type incineration facilities and even compost wastes in pilot scale. Although open dumping remains, sanitary landfill is beginning to be employed. The proportion of collection costs in total SWM costs is lower, but remains between 50-80%.

(iii) High-income cities

These cities put more emphasis on waste reduction, separate collection and recycling. Incineration and sanitary landfill are in wider use. For this reason, costs of equipment and machinery, including maintenance costs, account for a large share of the total SWM costs, while collection costs represent less than 50%.

Table 2-7 provides a comparison of SWM practices among groups of cities of different economic levels based on case studies on 12 Asian cities.[4] Economic development in general results in more waste generation and higher disposal costs. As if to offset growing wastes, however, the quality of SWM service delivery by the formal sector tends to be improved as well. In fact, SWM service is improving year by year in cities in middle-income countries that are riding a tide of economic development. At issue are cities that have failed to catch such a wave. These cities can provide only limited service due to inadequate financing, allowing for the informal sector to play a larger role there.

These situations are summarized in Table 2-8.

Photo 2-1 An example of equipment used to produce compost from food residues in a slum.

A compost barrel for food residues installed in a slum in Dhaka, Bangladesh. The compost thus produces is a source of income as it is collected and bought by a NGO.

Table 2-7 Solid Waste Management in Cities (comparison of case studies in 12 Asian cities)

	Group A (low-income)	Group B (middle-income)	Group C (high-income)
City	Dhaka, Katmandu, Ulaanbaatar, Yangon	Cebu, Nonthaburi, Chongqing, Surabaya	Fukuoka, Kitakyushu, Macao
GDP per capita (USD)	Less than 3,000	3000～10000	Over 10,000
Waste generation (kg/person/day)	0.3～0.6	0.7～1.1	1.4～1.5
Collection coverage	Less than 70%	80 to 90%	Approximately 100%
Disposal costs (USD/person/year)	Less than 1	1～3	38～220
% of SWM expenditure in total municipal budget (%)	15.4～38	6～23.2	1.6～5
Recycling	Informal (metal, glass, plastic, composting)	Formal + Informal (metal, glass, plastic, composting)	Formal (metal, glass, plastic, furniture, textiles)
Incineration treatment rate (implementing cities / total cities)	0/5	1/4	3/3

Source : IGES (2002)

[4] ESCAP (2000)

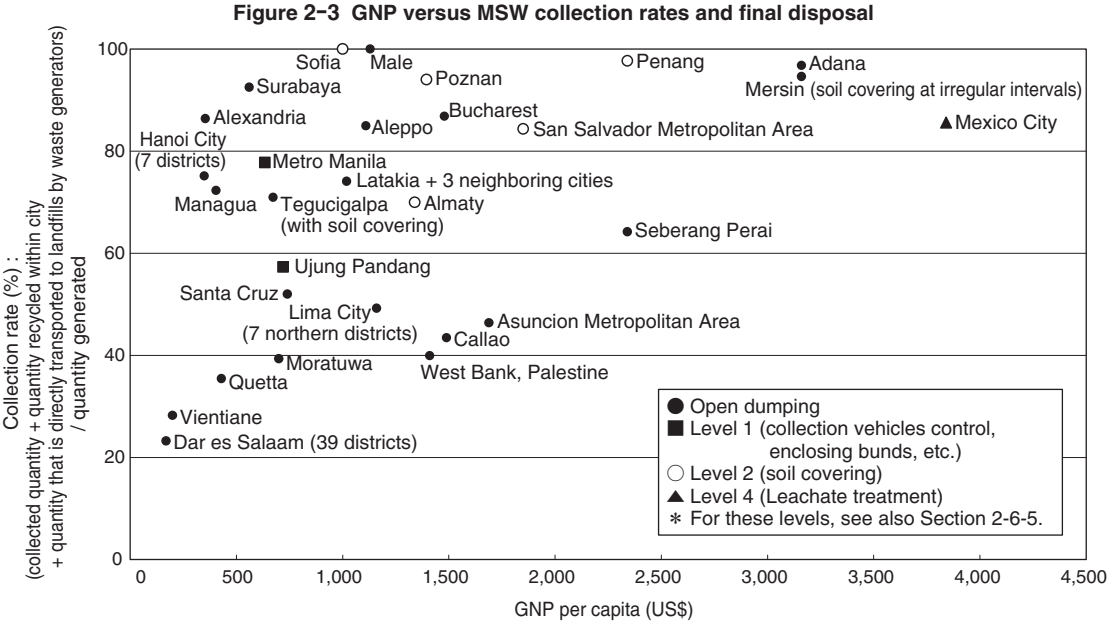
Table 2-8 Economic Development Levels and SWM Systems in Cities

Economic levels of cities / Activity	Low income	Middle income	High income
Source reduction	No organized programs, but reuse and low per capita waste generation rates are common.	Some discussion of source reduction, but rarely incorporated into any organized program.	Education "not to generate waste" gains momentum. Emphasis is placed on is waste reduction, reuse of materials, and recycling.
Collection	Service is limited to high visibility areas, the wealthy, and businesses willing to pay.	Expanded collection areas. Trucks are used for collection.	More thaw 90% of the city has access to regular collection service. Vehicles specially designed for collection are used.
Recycling	Most recycling is through the informal sector (scrap dealers and waste pickers). Localized markets for recycling are common.	While the informal sector is still involved, relatively large machinery is sometimes used for sorting and recycling. Materials are often hauled out of the city as recyclables.	Sorting and recycling with high technology. Recyclable materials are handled on a market economy basis.
Composting	No organized programs. Wastes including organic matter are not put to good use.	Efforts toward composting are made at many parts of the city. Large composting plants are generally unsuccessful. Small-scale composting projects tend to be more successful.	Large-scale composting is possible, but the market for compost is small (competition with chemical fertilizers, decreasing farmland around a big city).
Incineration	Not common or successful because of high capital and operation costs. High percentages of moisture and inorganic matters call for supplement fuel and have a smaller impact on volume reduction.	Incinerators are sometimes used but not common due to economic reasons.	Commonly adopted in cities where landfill sites are not readily available. Pollution control is a must. Cogeneration is also common.
Landfilling	Usually open dumping with virtually no environmental controls.	Some controlled and sanitary landfills with some environmental controls. Open dumping is still common.	Sanitary landfills with strict environmental controls, including impermeable liners, seepage controls, leachate and gas treatment.
Costs	Collection costs represent 80-90% of the SWM budget. Collection fees are regulated by some municipalities, but the quality of collection service is low.	Collection costs represent 50-80% of the SWM budget. Collection and disposal fees are regulated by some municipalities. Innovative arrangements are in place for fee collection.	Collection costs represent less than 50 percent of the SWM budget. Large budget allocations to intermediate treatment, such as incineration, etc. Composting and recycling can reduce costs and increase options available to waste planners.

Source : Compiled by IMURA Hidefumi based on the data from ESCAP (2000) "State of the Environment in Asia-Pacific Region," p.176.

Box 2.1 Association of GNP with MSW collection rates and final disposal

Figure 2-3 GNP versus MSW collection rates and final disposal



Source : Compiled by OTSUKI Noriko based on a compilation of data obtained by member companies of the Japan Waste Management Consultant Association (JWMCA) through a development study by JICA and grant aid projects that they have implemented. The compilation has been made by a JWMCA member, and all the data are those at the time these studies and projects were implemented. GNP per capita is based on statistics of each country for convenience.

Figure 2-3 shows how per capita GNP relates to the collection rates of municipal solid waste (MSW) in the recipient cities. The collection rate here refers to the proportion of the collected quantity-including the quantity of MSW recycled or carried to disposal sites by waste generators themselves-in the generated quantity, not the quantity of MSW discharged. This is because many studies do not distinguish between the two types of quantities and do not provide the discharged quantity.

This figure indicates a correlation between high GNP per capita and high collection rates. However, in cities where GNP per capita is low, the collection rate varies greatly. High collection rates with low GNP per capita or low collection rates with middle-level GNP per capita can be explained by a number of factors. Among them are social structure, the level of participation of civil society in SWM, the forms of waste generation and discharge, and equipment provided by donors, as highlighted by the following cases.

(i) Sofia, Poznan and Bucharest once enjoyed substantial public services thanks to socialist policies. During the periods of the development studies, however, GNP showed no signs of steady growth at best, when the countries were in a transition toward a market economy.

(ii) In Indonesian cities such as Surabaya and Ujung Pandang, primary collection systems operated by CBOs are in place.

(iii) In the Asuncion Metropolitan Area, the waste generation rate is high due mainly to yard trimmings generated from detached houses, which are the norm in the area. Yet collected quantities are small compared with generated quantities because a large part is incinerated by waste generators themselved in their yards and elsewhere.

(iv) Managua had been provided with equipment in grant aid from Japan three years ago, when this data was collected (by the development study).

Figure 2-3 also indicates the conditions of final disposal sites when the development studies were launched using four symbols. There is a positive association between the sanitary level of final disposal sites and per capita GNP; as per capita GNP increases, the level will go up from open dumping to Level 1, Level 2 and further to Level 4.

OTSUKI Noriko

2-2-3 Population sizes of cities and waste problems

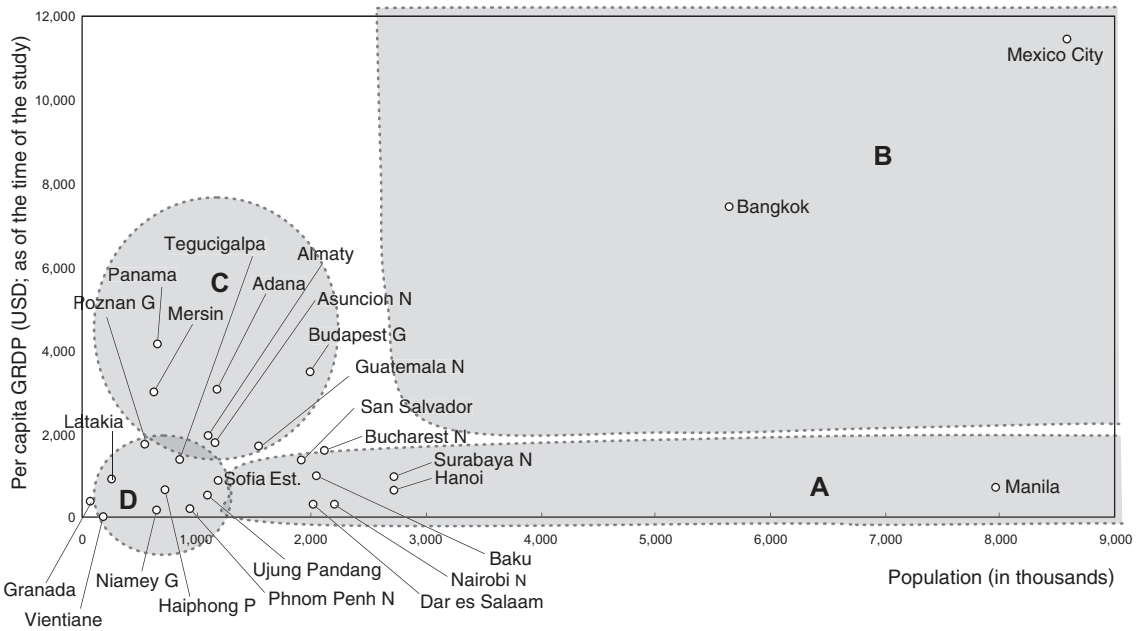
Solid waste problems for a city are significantly influenced by its population size.

In general, a populous, big city has a large-scale budget, and therefore it is more advanced in terms of institutional arrangements with a department specifically assigned to deal with SWM. On the other hand, a low-income city, with a low average income and a wider gap between rich and poor, tends to provide inadequate SWM service; collection service is often limited to rich residential districts, leaving slum areas without access to such service. Figure 2-4 classifies developing country cities into four groups in terms of population and GDP. SWM challenges for each group can be summarized as follows:

A : Large and poor (population one million or more; e.g., Manila, Dhaka)

- Given a large total quantity of waste generated with many generation sources, the expansion of collection service is an important task. In places where job opportunities are limited and cheap labor is readily available, waste pickers are actively involved in SWM and market forces play a certain role in promoting waste reduction and recycling.
- While collection service is expanding, landfill sites are becoming more and more scarce.
- The management capacity of the municipal government should be improved. Focus should be placed on capacity development that entails public participation, partnership and human resources development.
- Communities and NGOs are complementing inadequate SWM service by the public sector.

Figure 2-4 Types of cities by population and GRDP



Source : Compiled by OTSUKI Noriko and KONDO Sei based on a compilation of data obtained by member companies of the Japan Waste Management Consultant Association (JWMCA) through development study by JICA and grant aid projects they implemented. The compilation has been made by a JWMCA member. GRDP per capita is based on statistics of each country.

No alphabet : Population and GRDP (Gross Regional Domestic Product) quoted from the final reports.
G : GDP/capita for the country cited from the report
N : GNI/capita for the country cited from the World Bank's World Development Indicators (1998 or 2002, which is nearer to when the study was conducted for the city). GNI (Gross National Income) is a new terminology that replaces GNP.
Est. : Estimated GRDP based on GDP in the final report

Such community-based solid waste management (CBSWM) is facing a major challenging of expanding services geographically, as public interest and knowledge about waste problems, as well as income levels vary greatly from district to district, and there are areas where many immigrants from surrounding regions live.

B : Large and middle-income (e.g. Bangkok, Mexico City)

- As the economy reaches a certain level, a municipality will acquire technical and financial capacities. In such a municipality, collection service by the public (or private) sector will be improved to a satisfactory level.
- On a negative note, residents will be more environmentally conscious and inclined to NIMBY mind-set as the municipality's economic levels improve. The municipality will face a new challenge of how to build a consensus with residents and establish properly-managed landfills.
- Relatively high economic levels makes it more difficult to implement recycling with spontaneous waste pickers than in a city of Type A. As a result, the per capita quantity of waste landfilled tends to be larger, and so does the quantity of hazardous waste. This calls for the establishment of policies to promote waste reduction, recovery of recyclables, and separate processing of hazardous waste. Then waste education or larger environmental education will have a larger role to play in SWM.
- The proportion of wastes generated from commercial sources (including office buildings) is higher; residential wastes account for less than 50% in both Bangkok and Mexico City, while they represent 75% in Manila, which belongs to Group A. An effective option is to develop and implement a policy that focuses on these large waste generation sources.
- Aid for infrastructure development with loans and investments is effective for improving SWM. Such aid may have positive implications for neighboring countries in terms of the potential for south-south cooperation.
- Political factors stemming from heightened public awareness may significantly influence SWM service. Consensus building and social consideration are more sensitive issues.

C : Small and middle-income (e.g. Goa, Budapest)

- This type is often seen in regional cities in more advanced developing countries and cities in Central and Eastern European counties and island nations. Cities of this type most likely have an essential SWM system in place. There are different needs depending on the conditions in each country. Yet cities of this type generally need to improve their existing systems, such as a shift toward sanitary landfills.

D : Small and low-income (population below one million; e.g. Vientiane, Nuwara Eliya)

- Given low levels of economic development and therefore relative smaller quantities of waste generated, top priority should be placed on proper collection and proper disposal in landfills. As cities of this type tend to be short of funds, financial assistance is likely to improve the situation remarkably. Attention should be paid, however, to how to finance operating costs after such assistance.
- Municipal government should make efficient use of resources available and develop its capacity to achieve operational efficiency with the help of residents.
- There is potential for CBSWM where traditional communities are still functioning properly. As far as recycling is concerned, however, the market has often been established by waste pickers and junk dealers. Therefore, goals for CBSWM should be carefully established.

The above classification is highly conceptual. Proper understanding of issues facing each city or district requires consideration of a range of factors, including social conditions, cultural characteristics, functions of communities, waste composition and the waste flow. In many

cities that are expanding in both population and area, collection service is less likely to be extended to urban fringes, that is, low-income areas or squatter areas.

2-2-4 Other conditions that affect solid waste problems

National and climatic conditions and lifestyles peculiar to a given city have significant effects on waste composition and applicable disposal forms. These conditions should be considered when exploring means for appropriate solid waste management.

(1) Natural and climatic conditions

Natural and climatic conditions limit the options available for SWM. For example, landfills in areas with high precipitation need to pay special attention to rainwater drainage and on-site road access. Cities with steep topography may need to mobilize more resources for equipment maintenance because transportation vehicles and heavy machinery for soil covering at landfills are more prone to breakdown because of severe topographic conditions [5]. Low-altitude islands of Pacific island countries have no choice but to adopt coastal landfills and such landfills should be designed to prevent discharge into the sea caused by typhoons. In low and swampy areas, the traditional concept of sanitary landfill may not be an appropriate technology because earth and sand, which are used as cover soil at landfills, may be short supply. This is because they are also used as banking materials and considered to have high economic values [6].

(2) Lifestyles

Lifestyles also affect waste characteristics. In areas where coal is used for heating in winter (e.g. Ulan Bator, Mongolia), ash accounts for a large proportion of residential waste. In Seoul and other cities in South Korea, a large part of residential waste was charcoal ash up to the 1980s. Waste in South Korea has a high moisture content because Koreans eat a lot of kimchi (Korean pickle) and soup dishes and kitchen waste in the country includes these foods. Cities where high-density multi-family residents dominate produce relatively small quantities of yard trimmings. In contrast, cities where a detached house with a yard is the norm generate smaller quantities of kitchen wastes because they are often buried in yards or otherwise disposed of by waste generators themselves. Lifestyles that take mass production and mass consumption for granted are associated with increased quantities of packaging wastes (paper, plastic, PET, etc.).

2-2-5 Association with other sectors (drainage, excreta, sewage, public health)

Whether a municipal drainage system function properly significantly depends on the state of SWM. This is because uncollected wastes often find their ways into drainage canals and block drain. In fact, areas along drainage canales and rivers are often squatted by landless persons, they tend to dump wastes into these drains and watercourses. SWM is necessary from the viewpoint of the public health sector; collection points and landfills for wastes (especially garbage) may attract flies and mosquitoes, which in turn may carry infectious diseases.

In addition to SWM, urban public health may be affected by another major issue-treatment of human excreta and wastewater (domestic wastewater, sewage). Sludge generated from the treatment of excreta and wastewater may be handled as waste. This issue should be also taken into consideration as it is linked to the issues of composting and other forms of recycling of organic materials in SWM.

Particularly from the public health aspect, management of human excreta and sewerage development should be integrated with SWM, yet such integration have rarely been practiced.

[5] Kitawaki (2000a)
[6] Kitawaki (2000b)

Wastes are sometimes landfilled in upstream areas from where water is drawn for tap water. Much attention must be paid to the locations of landfills in relation to those of drinking water sources.

These subsectors are often under the jurisdiction of different departments. This fact should be paid attention to consider sector-wide approaches.

2-3 Organizational and institutional capacities of municipal authorities

2-3-1 Institutions

(1) The concept of rules and the roles of legislation

In general, the concept of institutions refers to not only laws and government institutions but also various arrangements and human relationships that drive society. For this reason, the World Bank and other donors have recently come to divide institutions into formal and informal rules. In other words, they see institutions as sets of these two types of rules and take notice of the role of the latter type [7].

Formal rules can be expressed as what are stipulated in documents, such as laws and government institutions. Informal rules, on the other hand, refer to social customs and norms, tradition, values and human relations that have been developed based on the culture, religions and history of a nation or region [8].

Informal rules play a major role in determining how formal rules function in a country or city. Seemingly similar laws and organizations take quite different forms of practices and have different implications depending on the country or city. In other words, how the laws and organization in the country or city function and achieve their purposes are largely determined by its informal rules.

One of the notions that summarize informal rules is social capital and such capital is the work of non-economic factors that determine the networking, communications and interaction among people, and these factors are meaningless without the context of social relationship.

It goes without saying that both formal and informal aspects should be addressed in providing assistance in solid waste management.

Different countries have different laws and government institutions regarding solid waste. In addition, institutions are subject to change according to the characteristics of waste problems. For example, SWM service in Japan was once based almost solely on the Waste Management and Public Cleansing Law. However, the basic principle of SWM service was then changed significantly, and a number of new laws were introduced, including the Containers and Packaging Recycling Law and the Basic Law for Establishing a Recycling-based Society. Despite this change, the basic nature of waste has not changed; waste is generated from daily activities. It is therefore natural that SWM is implemented by municipalities. Municipalities are responsible for collection, treatment and disposal of waste while the central government establishes an institutional framework. As a result, the scope of SWM service varies significantly from city to city within a country, depending on the financial capacity of cities. This is especially true of cities in developing countries.

The level of SWM service, not to mention any other public service, is highly dependent on how far institutionalization under the law is implemented. The term institutionalization under the law here refers to the development of formal rules written in laws and regulations. Institutionalization involves such aspects as: (i) development of relevant legislation; (ii) development of competent government institutions; (iii) financing; and (iv) capacity development and securing of human resources necessary for institutionalization.

Table 2-9 compares the progress in legislative development for SWM among selected Asian countries [9]. According to the table, most of

[7] World Bank (1999)
[8] *ibid*, World Bank (2001)

these countries have already SWM legislation. However, institutionalization by law or ordinance does not suffice, as SWM is primarily implemented by municipalities. The point is whether such legislation has been translated into effective rules and thus properly implemented.

Clear definition of wastes by law is a prerequisite for the development of a SWM system.

The type of waste determines risks involved, management methods and treatment technologies [10]. For this reason, it is essential for each country to clearly define wastes and then set out responsibilities and standards for waste

Table 2-9 SWM legislation in selected Asian countries

	Specific legislation	Remarks
Japan	Waste Management and Public Cleansing Law (1970)	Separate legislation for recycling
China	Law of the People's Republic of China on the Prevention and Control of Environmental Pollution by Solid Waste (1995)	
Mongolia	Law on household and industrial waste	The "environmentally-friendly waste management program" was endorsed by the Cabinet
Malaysia	Environment Quality (Scheduled Wastes) Regulations (1989) based on the Environment Quality Act (1974)	No legislation for non-hazardous wastes (as of 2003), but some cities have Refuse Collection, Removal and Disposal By-Laws based on the Local Government Act of 1976.
Thailand	The Public Health Act (1992) and the National Environment Quality Control and Enhancement Act (1992) cover SWM but they have no specific provisions.	Wastes generated from industrial plants are virtually controlled by the Factory Act of 1992 (or the Industrial Estate Authority of Thailand Act of 1979 for those within industrial estates).
Indonesia	PP No. 85/1999 concerning the Amendment of the PP No. 18/1999 (only for hazardous wastes)	No legislation for municipal waste (as of 2003)
Philippines	Solid waste: Ecological Solid waste Management Act of 2000 (RA9003) Hazardous wastes: Toxic Substances and Hazardous and Nuclear Wastes Control Act of 1990 (RA6969)	
Viet Nam	Law on Environmental Protection (1993) Government Directive No.199/TTg (1997) [Prime Minister's Decision on Urgent Measures to Manage Solid Wastes in Urban and Industrial Districts] Government Directive No.155/1999/QD-TTg (1999) [Regulation on Hazardous Waste Management]	
Cambodia	Sub-Decree on Solid Waste Management based on the Law on Environmental Protection and Natural Resources Management (1997)	
Myanmar	No legislation (as of 2001)	
Sri Lanka	National Environmental Act No.47 (1980) Extraordinary of the Municipal Council Ordinance (1987) as a standard municipal ordinance.	
Nepal	Solid Waste (Management and Resource Mobilization) Act (1986) Local Self-Governance Act (1999)	Solid Waste Management National Policy (1997). Acts and policies concerned have become largely irrelevant after much of the authority over SWM was delegated to local governments under the Local Self-Governance Act (1999).
Bangladesh	No legislation (as of 2003)	Provisions on waste management in the Dhaka City Corporation Ordinance.

Source : Compiled by WATANABE Taisuke from JICA reports.

[9] ESCAP (2000)
[10] See Section 2-5 for details.

management according to the types of waste in order to control environmental pollution and take rational measures.

Developing countries where SWM is at nascent stages generally lack statutory or institutional definition of wastes. For this reason, they often combine different types of waste in the waste stream, which consists of collection, transportation, treatment and disposal. In some of the countries where the central government has not enacted SWM-related laws, municipalities have established relevant ordinances.

It is impossible to develop an appropriate SWM system without clear statutory definition or classification of waste. A lack of such definition may invite improper disposal or treatment and then result in environmental pollution. Consequently, assistance in SWM presumes laws and institutions for SWM, including clear definitions and classification of wastes. Or it should be aimed at establishing such laws and institutions (with capacity development support in this sector).

Formal rules cannot be implemented effectively without statutory definitions of the scope of SWM service and the competent departments. The next step is to see if each department is provided with adequate budget allocations and human resources in relation to its services. Bureaucratic sectionalism and lack of coordination among government offices are common problems for all the countries in the world to different degrees. Yet this problem is often a major challenge for developing countries in terms of aid effectiveness. For example, equipment that has been provided for use by the entire implementing agency is sometimes used by a single department only.

(2) Informal rules: roles of social capital

Unwritten rules play an important role in some recipients. Lack of this understanding will be a major obstacle in achieving aid effectiveness.

Even in cities where waste collection service by municipalities has not been fully institutionalized, some kind of collection system is in place. If municipal authorities cannot mobilize enough financial resources to deliver collection, transportation and treatment services, the practical option may be to allow for a certain level of involvement of the informal sector, including waste pickers. Such involvement will be made possible by social capital of a given city, such as human networks, relationships of trust, and social norms.

Such informal rules, however, are difficult for external donors to assess. Imprudent intervention by such donors may even trigger a friction or conflict with local communities. Involvement or assistance in solving problems in a specific city by external donors has both benefits and limitations. The key is accurate assessment of the situation of the city. Suggestions beyond the practical capacity for aid implementation are irrelevant.

SWM has many factors other than technology. Waste reduction at source and separate collection are important elements of SWM, and they require community involvement. Developing a network for communicating information and knowledge with the help of CBOs is a key to wider implications of aid. At issue here is whether a community as a whole can take collaborated action. Collaborated action may be impeded by heterogeneity in the community, including a gap between rich and poor, religious differences, and a caste system [11].

In fact, such negative social capital is a major obstacle to the economic development of developing countries. Removing that obstacle is

[11] These factors that have negative effects on development may be also regarded as part of social capital. See JICA (2002).

no easy task. What is also needed is to establish dialogue relations and partnership between local authorities and the residents. In this context, NGOs are expected to play a positive role as they are familiar with local problems and issues. In fact, NGOs can serve as mediators among different stakeholders. Support for the activities of such NGOs is also a task of development aid.

(3) Need for national policies and plans

National policies and plans for SWM are prerequisites for appropriate planning of municipal SWM for each city. Without master planning at the national level, there may be a lack of consistency in SWM among different cities. It is also necessary to consider involving stakeholders in the policymaking and planning processes. Affairs regarding treaties and other international frameworks, as well as comprehensive statutory and institutional responses (laws, ordinances, etc.) to SWM, fall under the responsibility of the central government. Support at this level includes, in the context of JICA assistance, recommendations through development studies and the dispatch of experts who also serve as policy advisors. As assistance at this level concern national policy, there are many constraints also. Yet if such assistance is implemented successfully, its impact will be great.

2-3-2 Organizations and management

The central and local governments have a major issue of how to maintain their organizational capacities.

(1) Central government organizations

The central government is tasked with the development of legislation and overall policy at the national level, while municipalities provide SWM service. Only a few developing countries have a department specializing in SWM in a central government office [12]. In many developing countries, SWM is administered by a limited

Box 2.2 M/P reflected in national planning
–Training Course: Landfill Technology for Solid Waste Management in Malaysia–

In its Master Plan Study for Hazardous Waste Management in Romania (development study; between February 2002 through August 2003), JICA supported the formulation of M/P and A/P in the hazardous waste management sector, where a policy response was urgently needed. Romania needed to develop a SWM system that is in harmony with EU standards toward joining the EU. To that end, the country had to formulate a national plan for SWM. With this background, this master plan study was designed to develop a M/P that is consistent with national planning so that the M/P would eventually be reflected in a national plan for hazardous waste management.

In a typical development study by JICA, a proposed M/P is submitted toward the completion of the study. In this particular study, however, JICA spent a period of almost six months during the latter half of the study to help Romania to incorporate the proposed M/P into national planning, in line with pilot projects. The objective was to allow the country to make the M/P and A/P its own. This process most likely played an important role in developing the ownership of the implementing agencies in relation to the application of the M/P and A/P. Nevertheless, the M/P and A/P were integrated into the national plan and strategy for SWM and formally approved by the Romanian government in September 2004.

KONDO Sei

* The content of this box has been prepared with reference also made to the findings of the interview survey that was conducted by SAKAGUCHI Kiichiro (EX CORPORATION) when he visited Romania again in April 2004. Mr. Sakaguchi was the leader of the development study mission team to the country.

[12] Such government offices include the ministry of the environment and the ministry of public health. Industrial and hazardous wastes are sometimes under the jurisdiction of an industrial ministry or agency. In such a case, clear distinction of roles should be made among different government offices.

number of staff members, who often works for other sectors.

The central government sets rules based on laws and regulations under laws. By laws and regulations, procedures or performance standards are set, such as approval of the construction of landfill sites and other facilities and the operation of private businesses, as well as setting technical standards for such facilities. Central government also guides municipalities though financing (e.g. subsidies). Funds from the central government have a great impact particularly on municipalities that lack capital investment for the construction of new landfills.

Developing countries have a greater risk that frequent transfers and job hunting of staff members may prevent organizations from accumulating intellectual expertise.

(2) Municipal organizations

Different cities (and countries) have different government institutions for SWM. At any rate, they generally have some department in charge of SWM, as waste collection is one of the fundamental public services provided by municipalities. In some municipalities, collection, landfill and equipment maintenance are taken care of by different departments. In this case, integrated management or even coordination among different types of operation is difficult. In addition, it is necessary to define in writing the often blurred definition of responsibility of each department. Clear distinction on role is also needed for stakeholders outside municipal organizations, including communities, private organizations and contractors. Supervision is also needed for contractors and privatized organizations if any.

As waste collection and street sweeping are labor-intensive, municipalities employ many workers for these operations. Better SWM service with quality improvements through operational streamlining and on-time collection requires training and strict supervision of workers, which is often difficult.

There are a number of reasons for such difficulty. First, the sheer number of workers makes it difficult to supervise all of them properly. Second, because their opportunities for promotion or job change are limited, they lack incentives for operational improvement. This is discussed in detail in Section 2-4-1. Third, collection of recyclables, a factor for reduced operational efficiency, is a valuable income source.

These difficulties associated with labor management provides an incentive for municipalities to contract out some of SWM services to private businesses. Yet it is extremely difficult to fire many workers because unilateral dismissal invite strong opposition from them.

Organizations or institutions in form do not necessarily mean that they function in substance. Institutionalization must involve not only the establishment of institutions but also a built-in mechanism to operate and maintain them effectively. Specific requirements include: regular examination and assessment of potentials for better service; development of expertise in SWM systems; preparation of statistical data and manuals; mobilization of necessary resources, including funds, capital and equipment; and capacity development for each of the staff at organizations through long-term training. It is important to establish a framework that facilitates endogenous promotion of management capacities to make appropriate use of human, physical, and intellectual assets of organizations.

There is also a need for a mechanism for evaluating the performance of public service delivery, identifying items that need improvement, and putting the continuous improvement process in place. The development and operation of such a mechanism is easier said than done. It starts with the preparation of necessary documentation. The next step is to strengthen organizational management with the introduction of performance standards as well as

internal and external auditing systems. This will facilitate the gradual process for improvement.

(3) Regional waste management

It is often the case that a municipality cannot find appropriate location for a waste treatment or disposal facility and instead find one in other municipality. Taking advantage of such opportunities, municipalities sometimes join forces to construct, operate and maintain waste treatment or disposal facilities. This approach can achieve economies of scale in relation to the treatment and disposal of collected wastes. Operational efficiency is often increased under an arrangement whereby waste collection is implemented by each community and treatment and disposal jointly by neighboring municipalities. A major prerequisite for such an arrangement is coordination among the municipalities, which may not be possible without articulating its advantages and disadvantages based on appropriate planning.

An intermunicipal arrangement can take the form of an agreement, a SWM association or even an integrated authority. In some countries, the procedures for establishing intermunicipal associations are provided for in local government laws. Many capital cities have some kind of confederation of municipalities that forms a metropolitan area.

(4) Human resources

Human resources of the SWM department of a municipal authority fall into two categories: administrative officials who develop and implement the operational framework; and sanitation workers who actually provide SWM services on the ground.

Administrative officials in developing countries tend to lack special expertise in SWM due in part to frequent personnel shuffling and staff's tendency to quit jobs, making the administrative management capacity for SWM often vulnerable[13]. A major challenge is how to render personal capacities into organizational capacities in a sustainable manner and further develop a mechanism for endogenous and sustained processes for organizational improvement as discussed above. Another major challenge is how to motivate staff, who tend to lose their drive because their jobs are often despised.

A problem with sanitation workers is that their operations, such as collection and transport of wastes, tend to be regarded as unskilled labor. Many low-income countries do not now have automobiles for collection; they use push carts (or pulling carts) instead[14]. They may be unskilled workers, but they should be trained so that they collect all the eligible waste in the collection area and that they work safely on the busy streets.

Thus, such training should be supported by documentation to explain the reason and the process of the operation, training and monitoring of the operation. Training will not be successful unless waste management authorities understand the need for it.

Financial vulnerability by low priority of SWM in municipalities and a large proportion of labor costs in the SWM budget are two of the major characteristics common to developing countries.

2-3-3 Finance

Municipal SWM service is usually financed in the general-account budget of a municipality, unless the municipality has a waste management public corporation with an independent budget. In municipalities that collect service fees, such fees go to either the general budget or the budget of the SWM department. The bottom line for designing any public service is the assessment of the levels

[13] A Laotian counterpart in a JICA project stayed in the same office for more than ten years, and this seems to have had a favorable impact on the implementation of the recommendations in the M/P study (see section 3-2 for details). Such an arrangement may have a downside; it may promote a top-down approach and hinder information sharing within the organization.

[14] See Section 2-6-2.

of service and costs. The details of SWM service in a municipality and its cost-effectiveness should be accurately analyzed in the context of development aid and technical cooperation as well. Municipalities without data on itemized costs should focus on the preparation of such data.

Costs of waste collection, treatment and disposal are much dependent on the levels of waste collection service and treatment and disposal technologies. In low-income cities, which do not afford advanced technologies for treatment and disposal, labor costs for collection and transport services account for a large share of the SWM budget[15]. Only rich cities can afford facilities for appropriate intermediate treatment and final disposal because a vast amount of money is required for their operation and maintenance as well as their construction. Since it is unfeasible to cover these costs with fee collection from residents, they should be financed by allocations of the general-account budget of a municipality. Hence the level of SWM service depends on the financial capacity of a municipality to a large extent.

Although SWM requires a certain level of funds regardless of the financial condition of a municipality, it tends to be given low priority in budget allocation. Budget allocations to SWM may greatly change due to political factors. These circumstances point to the need for reinforcing the vulnerable financial base and securing revenue sources.

Financial management is also an important issue because SWM costs account for a large share-usually 20-50%[16]-of municipal fiscal spending in developing countries. More appropriate financial management requires four essential elements: (i) improving cost recovery; (ii) strengthening accounting control (costs, budget) and strict information management concerning service delivery; (iii) increasing access to investment financing; and (iv) reducing costs. The following paragraphs outline these elements.

(1) Cost recovery

Some people argue that residents should be charged user fees for waste collection and disposal services. It is not easy, however, to charge such fees in developing countries due to such factors as a large poor population, rampant fee evasions, and a large cost of fee collection for a municipality[17].

Collecting fees according to the amount of waste generated is no easy task. A more practical and effective approach is to require waste generators to set out waste in fee-charging garbage bags for collection-an approach has been introduced by many municipalities in Japan. This approach is adopted in South Korea on a national

Table 2-10 Options to improve cost recovery

Mechanisms	Can adequate revenues be generated?	Can the revenues be easily collected?	Does the polluter pay more?	It the mechanism politically feasible?	Is the mechanism easily enforceable?
User charges:					
Solid waste tax	+	−	+/−	−	−
Volumetric charges	+	−	+	−	−
Tipping fees	+	+	+	−	+/−
Other sources:					
Property taxes	−	+	−	−	−
Business license fees	+	+	−	−	+
Utility surcharges	+	+	+/−	−	+
Grants	+	+	−	−	−

Source : Bartone (2000a)

[15] In municipalities where vehicles are used for collection and transportation, fuel costs also represent a large part and are therefore a burden on municipal finances. This is also true about heavy machinery at landfills. Such machinery is sometimes out of operation due to a lack of budget allocations for its fuel (see the case of Laos in Section 3-2).

[16] Cointreau-Levine (1994) .p7.

[17] To overcome such difficulties, some municipalities collect sanitation or waste collection fees together with utility charges as pay-for-use rates. The idea is to cut costs associated with door-to-door collection and to charge users in part according to their living standards.

scale and in Nonthaburi, Thailand (a city near Bangkok) on a trial basis. Income from the sale of such garbage bags can be used for various purposes, including covering part of labor cost for waste collection. Because it is difficult to recover total SWM costs with this approach, this income should be used to create a recycling market or other good purposes.

Options to improve cost recovery are summarized in Table 2-10.

(2) Strengthening the financial management system

To stabilize SWM finance, it is necessary to solidify the basis for its management. To that end, the following items should be reinforced:

(i) Accounting for costs and expenditures: itemized costs (operation and maintenance [collection, transportation, landfill, road sweeping], fee collection, debt payment and depreciation)
(ii) Clarification of budget and income
(iii) Computer-assisted management

The most important requirement for analyzing the current state and problems with SWM service is cost analysis. Cost analysis is based on the calculation of basic data for each type of operations, including waste collection, disposal and road sweeping, namely the quantity handled and manpower and costs for each type of equipment (labor cost, capital cost, operation and maintenance cost, depreciation and amortization cost). Cost analysis allows for efficient review of the allocation of the SWM budget. It also provides a means of quantitative assessment when reviewing the allocation of the municipal budget as a whole.

Table 2-11 Typical SWM costs in Latin America and Asia

Service	Cost
Collection	15—45 US$/ton
Road sweeping	10—20 US$/ton
Transportation	5—15 US$/ton
Disposal	3—10 US$/ton

Source : Bartone (2000a)

[18] Bartone (2000a)
[19] Cointreau-Levine, et al. (2000), Part I.

(3) Increasing access to investment financing

It is important to increase access to investment financing because in addition to current expenses, a lot of money is needed for new landfill sites and other purposes. The following are specific options to do so [18]:

- Reinforcing the creditworthiness of municipalities
- Establishing special loans for municipalities
- Promoting private-sector investment
- Considering matching grants to cope with externalities

(4) Reducing costs

The following are some of the cost-cutting options:

- Reducing surplus workforce

Municipalities tend to secure workforce more than necessary as part of job security arrangements. Reviewing routes for waste collection and road sweeping may also make it possible to streamlining workforce.

- Use of private contactors

It is a common practice to contract out some services to the private sector for efficiency and cost reduction (see the next section).

2-3-4 Partnership with the private sector

Public-private partnership (PPP) is being promoted in the SWM sector as well either as an option to complement public services or for efficient service delivery. Advantages of PPP include [19]:

- The private sector can provide a more efficient or cost-effective service because it is under the pressure of market forces to achieve profitability and pay greater attention to customer satisfaction.
- The private sector often has better access to capital financing.
- The private sector may have easier access to specialist skills and expertise. For example,

companies can form joint ventures with international specialist firms.

- The private sector is leading the development of waste management technologies in the waste industry. The involvement of private sector may provide access to state-of-the-art technical services[20].

Some people believe that the private sector is always cheaper, more efficient, and more reliable. Others believe that the private sector does not care for the environment and will cause serious pollution. These beliefs are all common misconception concerning private sector participation[21].

(1) Considerations for private sector participation

Proper contracts and management by the public sector, and a competitive environment are keys to the success of PPP after its introduction.

Considerations for public sector participation are summarized below[22,23]:

(i) Maintain a balance between the private sector and government

It is important to create an competitive environment. This can be achieved if government retains part (at least 30% at the beginning) of the overall collection service area and continues to provide the solid waste collection service in this part until private sector participation is well established. It is not advisable to commission the entire collection area to the private sector from the beginning. In addition, private sector participation should be phased in at the same pace as the increase in demand for SWM service and the decrease in the number of sanitation workers through attrition. Hasty introduction of private service may invite opposition from such workers.

(ii) Labor redundancy

One of the most pressing concerns when privatizing is how to minimize the termination of employees. Freezing the hiring of new staff to allow for natural attrition is one of the options to minimize the negative social impact.

Box 2.3 Where does the waste go?: waste business in Manila

Solid waste management in Metro Manila continues to be in a critical situation; new landfill sites are scarce and existing landfills are almost full (see Section 3-1). In a desperate effort to alleviate the situation, local authorities recently presented a proposal to haul solid waste by train and dispose of it at landfills more than 100 kilometers away on a regular basis. Under these circumstances, how is the waste generated every day disposed of?

Private waste collection business is thriving in Metro Manila. Private service providers collect waste for a fee under contract to condominiums and residential areas in the metropolitan area. It is said that the private sector collect almost 60% of waste generated in Metro Manila.

Such private businesses should be given approval for final disposal and supervised properly by a competent local authority (Solid Waste Management Office of the Metro Manila Development Authority in this particular case). Yet the authority does not seem to keep track of these businesses, and it is unclear where the collected waste has gone. They likely dispose of the waste in their private land in the suburbs without proper management or monitoring. Some people even talk about "waste mafia."

In Japan too, illegal dumping of industrial waste by private businesses have come to the surface for some time. Examples in the Philippines and Japan suggest that private sector participation could undermine the ban on illegal dumping without proper licensing, supervise and monitoring by government.

YOSHIDA Mitsuo

[20] The keynote address at the ISWA Annual Congress 2000 in Paris.
[21] Cointreau-Levine, et al. (2000), Part I, pp.5-6.
[22] *ibid*, Part II, pp.23-36.
[23] Institute for International Cooperation, JICA (1993)

(iii) Appropriate duration of agreement

Efforts should be made to minimize investment risks in order to promote capital investment by the private sector. Agreement durations should cover the standard depreciation period. For example, contracts or franchises that involve investment in vehicles should have a minimum length of five years. Shorter periods bring about unfavorable results for both contactors and public authorities (e.g. higher prices or lower quality of service because contractors or franchisees are forced to depreciate their investments over shorter period).

(iv) Willingness to pay

Collection of user charges enables the service to be financially sustainable. House-to-house surveys can indicate which methods of waste collection are preferred and the sensitivity of generators to the level of the charge that they will be asked to pay. Surveys also provide contextual information on their ability to pay for service. On the other hand, until people actually receive a service, they are not able to predict accurately how much they would be willing to pay for it. For this reason, willingness-to-pay surveys need to be conducted both prior to, and after, the start of the waste collection service.

(v) Economies of scale

Pilot testing and time-and-motion study can determine collection efficiency, which depends on: the number of workers assigned to the equipment; the types of containers; the locations of collection points; and the road and traffic conditions. In the case of transfer systems, the capacity of the transfer vehicles, the distance to the disposal facility, and the sizes of the collection areas are major determinants of collection efficiency. Economies of scale for landfill mainly come from landfill capacity. For this reason, bundling the needs of several small to medium-sized cities into one regional facility needs to be considered as appropriate.

(vi) Contract documents[24]

Specifications and requirements should be carefully specified in private sector participation agreements so as to monitor and supervise the performance of private service providers (and penalize them if necessary). To that end, contractual documents should specify the service quantitativeness such as collection frequency and the amount of waste to be collected. This makes it necessary to public authorities to continue providing service in part of the collection service area to keep track of operating costs.

(vii) Performance monitoring

The aspects of performance to be monitored include the frequency, quantity, efficiency, productivity, reliability, quality and cost of service. Comparative performance monitoring of all private sector and government players increases competition among service providers.

(viii) Guarantee against political risk

Risk of political intervention-including intervention in the selection of contractors and interference in actual operations-is a major obstacle to effective private sector participation. The best way to minimize the risk of political intervention is to improve the transparency and accountability of the procurement process, and making procurements truly competitive.

(ix) Licensing

For collection of special wastes (such as from hospitals and laboratories) or general wastes from large generators, private firms may be allowed to compete freely in getting subscribers to their service. However, a program to license only reliable firms is essential to block the entry of unscrupulous companies that cut costs by illegal dumping and other unacceptable practices. As part of a licensing program, legislation is necessary to grant licenses only to reliable firms. A special category of license for hazardous wastes should be required.

(2) Capacity required of municipalities to supervise private sector

The introduction of private sector participation usually requires municipal

[24] See Cointreau-Levine, et al. (2000), Part V. for specific contractual clauses and sample contracts.

strengthening, because of the new tasks which municipal managers are required to perform, including appropriate contracting-out and performance supervise and monitoring. The following paragraphs list issues that generally need to be addressed in capacity development for municipalities and in preparation for the participation of the private sector:

(i) At the municipal level

- Strengthening of municipal capacity to analyze existing costs and the estimated costs of privatization activities which could increase investment and improve efficiency
- Establishment of new municipal ordinances to achieve such objectives as cooperation with resident, implementation of the user pays principle, appropriate discharge of waste, and waste reduction
- Strengthening of capacity to specify technical requirements and performance standards and operations monitoring indices
- Strengthening of capacity to prepare the documents for contractual and licensing agreements, evaluate bidders and negotiate the terms of agreement
- Improving the flexibility and efficiency of the municipal workforce
- Development of cost recovery mechanisms
- Development of competence in supervision and performance monitoring
- Development of mechanisms to enforce sanctions for poor performance and illegal conduct

(ii) At the central government level

- Development of policy guidance on private sector participation and cost recovery, to enable municipal leaders to take necessary political steps
- Development of legal deterrents against illegal dumping of wastes and the use of open dumps, coupled with adequate capacity for enforcement
- Development of guidance and standards for segregation, storage, treatment, and disposal of each categories of wastes

(3) Involvement of micro and small enterprises (MSE)

A micro and small enterprise (MSE) can take the form of a small private enterprise, co-operative, community-based enterprise, or labor contract by a group or social organization. MSEs cannot provide large-scales services or take advantage of economies of scale. Despite these disadvantages, MSEs have the following advantages in terms of the waste management business aspects[25]:

- MSEs can provide services at a low cost due to such factors as low capital cost with the use of handcarts, etc. and lower wages of MSE workers compared with workers hired by municipal counterparts.
- Because of their small size, MSEs can better cope with different types of housing and access roads.
- Since MSEs are usually based in the neighborhood they serve, they favor community participation and control. They also can play a role in recycling promotion and other public environmental education.
- MSEs are labor-intensive and thus can create more employment than large enterprises.
- The involvement of a number of MSEs creates environment of competition among them.

(4) Considerations for the participation of international waste industry

In the context of private sector participation, businesses in the waste industry abroad (from developed countries such as the U.S. and Germany) can often participate in SWM in developing countries. Such participation takes the form of investment, BOT or direct participation. In recent years, some developing countries take advantage of CDM of the Kyoto Mechanism to lure the waste industry in developed countries to projects designed to collect landfill methane gas or even generate power using such gas. In fact, UNDP is proactively encouraging developing countries (e.g. Bangladesh, India, Indonesia and

[25] Haan, et al. (1998), pp.11-16.

Latvia) to use CDM in order to attract finances from developed countries for improving their landfills. Regarding projects for methane gas collection and power generation, there is concern about the safety and environmental impact of colleted gas or suspension of collection for some reason.

There are some concerns about direct participation of the private sector overseas associated with their special emphasis on profitability of SWM service (setting charges for collection, treatment and disposal). For example, the private sector may provide services only to the wealthy who can afford such charges. In addition, agreements for such private sector participation tend to be monopolistic in nature to secure profitability and their period is often more than ten years. Such agreements may provide a quick fix to the immediate problems and generate income for developing countries from licensing fees. However, they may limit future options for SWM policy (as highlighted by the case of Phnom Penh[26]). To prevent such a situation, municipalities in developing countries should improve their capacity regarding contract negotiations.

Municipalities must have the capacity to supervise and control the activities of the private businesses under contract. However, many developing countries do not have enough experience or expertise in proper SWM to carry out such supervision and control regarding the performance of obligations stipulated in such agreements. Private sector participation under these circumstances has the risk that public service delivery will be at the mercy of private sector entities. In fact, SWM service in Biratnagar, Nepal was thrown into disarray after a U.S.-based company, which had been providing service under contract to the city, withdrew from the business for cost-effective reasons[27]. If the municipal government had had the capacity for supervision and control, it could have known the withdrawal beforehand and the confusion could have been averted at least.

2-4 Social factors[28]

2-4-1 Historical and sociocultural background of sanitation service and sweepers

It is necessary to consider what assistance can be provided to reduce social prejudice and discrimination.

(1) decomposition of garbage under subtropical or tropical climate

Many developing countries are in the tropical or subtropical regions. Southeast Asia and South Asia, in particular, are characterized by a high temperature and humid climate. In addition, kitchen waste and other organic matter account for much of municipal solid waste (MSW) in developing countries, as discussed in Section 2-1-1. Due to these factors, organic matters (especially kitchen waste) decompose extremely fast. These wastes, if left for a few

[26] Phnom Penh Municipality concluded a 47-year concession agreement with a Canadian-affiliated company Cintri in March 2002. The agreement granted to Cintri all the rights concerning SWM services in the entire city, ranging from waste collection to final disposal and fee collection (although provisions concerning the development, operation and management of landfills were removed from the agreement in December 2002). The agreement includes a provision that Cintri is under no obligation to provide waste collection service in economically unfeasible areas. As a result, many parts of the city were left without access to collection service.

[27] Plummer and Slater (2001)

[28] JICA (2002) characterizes the notion of social capital, which is recently regarded by the World Bank and other donors as an important concept for development, especially in social development sector. In this study, networks, organizations and membership, norms and values, trust, and group behavior are viewed as useful social resources although they are not visible. These resources are traditionally handled as social considerations. What is significant is that they are regarded as capital that can be measured and accumulated and that can be altered by external intervention. The 2002 study does not provide case studies for SWM sector due to time constraints, this study committee on SWM also fails to have in-depth discussion on the application of this concept or its relevancy, validity, necessity and significance. However, the relevancy and validity of the social capital concept in SWM must be pursued both theoretically and empirically in the future. Pargal, et al. (1999) may serve as a basis for such discussion.

days, begin to give off an offensive odor and invite flies. Garbage (organic matter) has nothing to do with odor or insanitariness right after it is thrown out. However, it begins to decompose if it is not treated promptly and properly. This decomposing process gives the impression that garbage itself is a filthy thing that makes people uncomfortable. This has implications for the lowest social status of people engaged in SWM. The following paragraphs discuss considerations for SWM from the viewpoint of waste workers. Some cases in South Asia and other regions are used to illustrate these considerations.

(2) Social status of the waste disposal (sanitation) work and sweepers

In developing countries, production and consumption are at the center of economic activity. Government offices and the general public alike do not have much interest in the waste disposal process after consumption. There are two major reasons for this. First, budget allocations for SWM service, which is low on the policy agenda, tend to be small when the municipal budget itself is limited. Second, residents regard waste as filthy and unsanitary as discussed above. They do not relish touching refuse and try to stay away from it. Especially in South Asia, people try to keep a distance even from those who handle waste, resulting in social disdain for them.

People involved in sanitation service in South Asia are often those in a certain classes, ethnic groups or religious sects-socially vulnerable minority groups. In Hindu societies of South Asia, sanitary service is the traditional occupation of sweeper caste groups and was originally linked with night soil disposal. According to the social notion of purity/impurity in Hinduism, sanitation service and night soil disposal are considered an impure act. For this reason, certain caste groups at the bottom of the social stratification are often engaged in these services. They are generally known as Bhangi[29] (the generic term) in northern India, Chuhra in Punjab Province, Mehtar in Bihar Province and the Bengal region, and Chyame or Pode in Nepal. Minority religious sects or ethnic groups that provide sanitation service include Christians in Punjab Province, Pakistan (Chuhra's mass conversion between late 19th century and early 20th century) and Indian Tamils in Sri Lanka (who migrated from the Tamil region of southern India).

As the urban population grew, waste generation increased and so did demand for sweepers. In addition, sanitation service was considered less severe than night soil disposal in terms of physical "dirtiness." For these reasons, people not belonging to certain caste or ethnic groups who have traditionally been engaged in sanitation service began to enter this sector. Now the urban poor sees municipal sweepers as those who enjoy stable income compared with informal sector workers.

In Dhaka city, sweeper caste groups (Hindus) once dominated the quota of municipal sweepers. Now poor Muslims from rural areas outnumber these traditional sweepers. Compared with Muslim sweepers, sweeper caste groups have three social disadvantages as minorities: (i) they are not Bengali in terms of an ethnic group; (ii) they are Hindus in a Muslim-dominated country in terms of religion; and (iii) they are ranked the lowest in the caste hierarchy in a Hindu society. With sanitation service now regarded as one of the viable occupations among the Muslims, Hindu sweeper caste groups are having a hard time for their very survival; they have been deprived of the opportunities for education or vocational training.

(3) Toward eliminating social prejudice and discrimination

One of the important issues for proper SWM is how urban residents recognize and understand sanitation service and sweepers. If there is social prejudice and even discrimination against sanitation service and sweepers, it is difficult to rally enough support from the residents even if

[29] For details about Bhangi, see Syamlal (1992) and Shinoda (1995).

municipalities call for their support and cooperation for proper implementation of SWM. Sweepers themselves are often too much swayed by such prejudice and discrimination, which reduces their morale.

This is why social prejudice and discrimination must be eliminated as soon as possible. There are two major challenges in doing so. The first challenge is related to sanitation or physical dirtiness. There are two types of physical dirtiness. One is dirtiness derived from waste itself, especially kitchen garbage that can decompose rapidly. The other is dirtiness in physical appearance of sweepers who have to be engaged in SWM without the provision of uniforms, masks, gloves or boots (and their physical health problems).

The second challenge is how heightened environmental awareness can be put into action for SWM. Middle and upper classes in developing countries are increasingly aware of environmental issues due in part to a growing volume of information on environmental degradation. Today, the significance of environmental NGOs is recognized in any developing country. Such NGOs are expanding their activities into SWM in cooperation with local communities, including the collection of recyclables. This demonstrates that middle and upper classes are beginning to show their interest in SWM in areas where they live, while working for environmental NGOs as staff or members as part of their duties. Still, few NGOs or CBOs have gone far enough to involve sweepers in their programs for hygiene education and environmental education and interact with them so as to understand their socioeconomic conditions and the actual state of sanitation service as a whole. At issue is how to plan and implement such environmental education programs [30].

2-4-2 The informal sector — waste pickers and recyclable collectors

(1) Conditions and waste pickers and recyclable collectors

Efforts should be made to integrate waste pickers and recyclable collectors in the SWM framework, rather than just exclude them.

A typical scene at waste transfer stations and landfills in developing countries is that recyclables (wastes that can be recycled as resources) in wastes are dug up or taken out and sold to junk shops. This operation is done by waste pickers (scavengers) and recyclable collectors. Their economic activities constitute part of the urban informal sector, which accounts for a large part of the economy of developing countries.

From a socioeconomic perspective, waste collection activity in the urban informal sector have the following advantages and disadvantages. The advantages include its significant contribution to effective recycling of metal, glass, paper, plastic and other finite resources in a practical manner. Such recycling is nonetheless pursed in developed countries with much investment, although its systems and forms are different. Another advantage is that it provides an important job opportunity and income source for the poor in developing countries, where employment opportunity in the formal sector is limited. It is worth noting that many of the waste pickers and recyclable collectors are migrant workers, that is, people from the provinces (this business is one of the few trades that they can easily enter into) [31]. Moreover, the percentage of women and children is higher than in other trades [32].

[30] A joint project between JICA and the sanitary department of Delhi City incorporates training of low caste sweepers working on the ground into a technical assistance program, in addition to an environmental education campaign for residents. From JICA, KAMIKAWA Yoshio, a long-term expert, and OKUZAWA Shinjiro, Project Formulation Advisor, have participated in this project, formally known as the Pilot Project on Segregation of Household Waste.

[31] Nakanishi (1991), p.111 and pp.171-172. Nakanishi concludes from surveys on slums in and around the Philippine capital of Manila that recyclable collection is one of the typical trades for newly-arrived migrant workers. He explains the fact that many of them are relatives to each other or from the same provinces in terms of their relations with their employers, in other words, patron-client relations.

[32] Furedy (1990)

On the other hand, waste collection in the urban informal sector has two major disadvantages. First, disorderly picking of recyclables at curbside containers and waste transfer stations scatter other wastes, making the immediate environment unsanitary and extremely reducing the efficiency of public waste collection service. Second, waste pickers and recyclable collectors work in a dangerous and unsanitary environment. They have a much higher risk of health hazards than in other types of workers[33]. For example, they are highly susceptible to respiratory and dermatological ailments and injuries as they are exposed to smoke and toxic gases from open burning at landfills, pathogens from the decomposition of organic matters including carcasses and kitchen garbage, and dangerous objects such as broken pieces of glass and metals.

(2) A shift in the evaluation of waste pickers and recyclable collectors

JICA and other international aid agencies traditionally focused on the disadvantages outlined above in their studies and aid projects, although they paid some attention to the advantages. Aid agencies emphasized the need to exclude these informal waste workers from the public SWM process, especially from transfer stations and landfills. They explored ways to meet that need.

In recent years, however, international aid agencies are shifting its aid approaches and methodologies. Based on many years of their experience, aid agencies are increasingly aware that the option of simply excluding waste pickers and recyclable collectors from the SWM process has its limitations. In fact, it is extremely difficult to expel them from transfer stations and landfills unless the root cause-poverty they live in or poverty in society as a whole-is dissolved. Aid agencies are beginning to understand that the issue is how to live with them, not exclude them.

Based on this understanding, JICA has already implemented a project in Tegucigalpa, the capital city of Honduras. A major product of this project, the M/P report on SWM[34], includes a recommendation that waste pickers and recyclable collectors should be encouraged to participate in the process of developing the rules for operating a landfill so that C/P will fully understand the environmentally problematic practices of landfill operators[35].

As this example shows, aid projects should be designed to maximize the advantages and minimize the disadvantages of these informal waste workers to the benefit of SWM. To that end, the following steps should be taken.

The first step is to integrate recyclable collection activity by waste pickers and recyclable collectors into the formal SWM system (though such means as organizing them into micro enterprises and hiring them at new recycling centers). Donors can encourage them to establish their associations, for instance. The second step is to improve their welfare and working environment by, for example, providing sanitary education/training and protective gears such as masks, gloves and boots.

Specific components of these two steps include: fact-finding survey and registration of waste pickers and recyclable collectors to organize them; provision of hygiene education (including vaccination, medical treatment and protective gears); provision of opportunities for children to receive school education; support for the establishment of distribution channels for recyclables; and partnership with relevant NGOs. Unfortunately, however, only a few central and local governments in developing countries recognize the urgent need to plan and implement these actions at the moment.

(3) Considerations for the development of a formal recyclable collection system

Ideally speaking, the development of a

[33] Hunt (1996), pp.111-118.
[34] JICA (1999)
[35] Nagaishi and Doi (2002)

formal system for recyclable collection should be supported by the efforts of waste pickers to organize themselves. In reality, however, government agencies, private businesses and NGOs will play a central role in operating such a system [36]. In the development process, the following issues should be considered:

(i) Promoting awareness of human rights

At issue is to what extent staff at government agencies, private business and NGOs can work with waste pickers and recyclable collectors on an equal footing with a strong sense of human rights - the former generally come from the middle and upper classes, while the latter are ranked the lowest in the socioeconomic hierarchy in a given developing country. Unless this issue is thoroughly addressed, specific measures to improve their working and sanitary conditions will not be implemented in earnest. If the two groups fail to forge a relationship of trust as a result, there will

Box 2.4 A case of waste pickers and recyclable collectors
–A thought at the Matuail Landfill site in Dhaka, Bangladesh–

There is a final disposal site currently in use in the Matuail area, located in the southeast suburbs of Dhaka city. More than 200 waste pickers and recyclable collectors work at this landfill. Most of them come from the rural areas of Bangladesh, not from Dhaka. The proportion of women and children is noticeably high although no statistical data is available.

When I visited the landfill, I saw a women in her twenties engaging in "resource recovery" work on a huge pile of waste. Her work was obviously health-threatening. It included collecting plastic packaging from a pile of waste, burning it in an empty oil drum cut in half with foul-smelling smoke billowing from it, and then cutting a lump of the black ash into cubes of side 15 centimeters. These cubes were traded as "solid fuel."

The woman used to live in the southern part of Bangladesh, where most of the land is inundated during the rainy season. She lost her small field due to soil erosion by the river nearby. Five years ago, she left her home town with her husband and children for Dhaka and arrived at this landfill. Her husband has been too ill to work for years. (I did not ask how he has fallen ill. Maybe I was afraid that her answer would be that he ruined his health by making this "solid fuel" for a long time.)

When a plastic material is burned at a low temperature, it emits highly toxic dioxins. Everyone in Japan knows this fact partly because of the extensive media coverage of dioxins a few years ago. The Japanese government has tightened its control over dioxin-producing practices. But this woman has probably been deprived of the opportunity to know the danger of burning plastics totally. Even if she knew it, she would have a hard time finding an alternative job or livelihood.

The solid fuel she makes surely finds its way into the hands of poor people because of its cheap price. It is perfectly obvious that both the producer and consumer of this fuel suffer health hazards. Behind this tragedy is the socioeconomic conditions peculiar to developing countries-poverty and lack of knowledge and information.

MIYAKE Hiroyuki

* The content of this box is based on the experience of Professor MIYAKE Hiroyuki, a member of our study committee, when he visit the Matuail Landfill site in Dhaka in December 2003.

Photo 2-2 A woman engaged in "resource recovery" at the Matuail Landfill site

[36] In Payatas, the Philippines, a missionary NGO has succeeded in organizing waste pickers and even supporting them to set up micro enterprises through community-based activities. Vincentian Missionaries (1998)

be no prospect for rectifying the situation.

(ii) Necessary education and training for employers

Appropriate and adequate education and training should be provided to "employers" under a recyclable collection system-high and middle-ranking officials of government agencies, managers or contact persons at private businesses, and staffs of NGOs-to ensure fairness and transparency in employing waste pickers and recyclable collectors. If such job openings are limited in a sociopolitical environment where graft is rampant, both employers and employees may become conscious of a patron-client relationship between the two. There is a high risk that competition or even conflict among these informal workers will intensify for the limited job openings. As a result, employers may demand a bribe from them as a employment guarantee fee. (In fact, this practice is common in the employment of sweepers in some developing countries.)

(iii) Consideration for women and children

It is essential to consider how to guarantee employment opportunity for the socioeconomically vulnerable in the case of a limited quota for employment as mentioned above. Recyclable collection service allows for entry of women and children as a easy means to earn cash income despite its hard working and sanitary environments, as discussed earlier. In short, it provides a livelihood for people who are generally regarded as the socioeconomically vulnerable. The formal recyclable collection system to be introduced should be designed to guarantee free and easy entry for the socioeconomically vulnerable. If the system is designed to give priority to men in employment, women, children and other socioeconomically vulnerable people will be excluded. That would put them into dire poverty. For this reason, these people must be given the opportunity to receive appropriate education and vocational training so that they will have more job opportunities.

(iv) Relationship with recyclable collection mafia

In some developing countries, mafias sometimes organize waste pickers and recyclable collectors. Some municipal officials even maintain good relations with such mafias by receiving bribes. It is important to sever these relations when developing a formal recyclable collection system. System planners should ask themselves: "do we have no choice but integrate these mafias into the formal system in an acceptable manner? or can we exclude them?" They have to weigh up all these options from every angle and based on all the information available.

2-4-3 Community-based SWM; community participation

How external donors can support CBSWM?

Community-based solid waste management (CBSWM) is the approach whereby members of a community themselves manage such activities as waste collection, resource recovery (e.g. composting) and sale of recycled products. This approach is recently attracting attention of donors.

CBSWM arises because government institutions often fail to satisfy communities' needs for SWM service although they are expected to play the leading role in solid waste management. In that sense, members of CBSWM organizations tend to take pride in keeping a distance from government institutions although they do not intend to go against them. This is one of the factors that make it sometimes difficult for traditional aid approaches-providing ODA through government institutions-to involve existing CBSWM organizations or arrangements. CBSWM can be classified into the following three types according to the characteristics of the implementation structure.

(i) In Type I, community activists set up a

CBSWM organization, which finds suitable waste collectors and contracts out all the primary collection services to them. Although residents support such contractors through source separation and other means, waste collectors collect waste collection fees door-to-door. (e.g. a CBO in Dhaka)

(ii) In Type II, the community concludes a service contract directly with a private business, which is often a micro enterprise. The business collects fees directly from service users. The service may include everything from waste collection to final disposal. (e.g. a community in Manila)

(iii) In Type III, community activists set up a CBSWM organization, which plans and manage SWM service, including fee collection and other financial activities. The service often includes a wide range of operations, including recycling of recyclables and composting as well as waste collection. Workers are hired and paid by the CBSWN organization. (e.g. an NGO in Dhaka)

There may be hybrid types between or among the three. In Type I and Type II, the level of independence of the CBSWM organization or arrangement is not necessarily high, although the community exercises its initiative. In actual service delivery, community members are passive service receivers. In Type III, on the other hand, the CBSWM organization maintains a high level of independence and proactive organizational management. The analysis of these three types suggests that proactive participation and motivation on the CBSWM organization members are keys to CBSWM. Type III deserves attention in terms of not only solid waste management but also community participation and community empowerment.

(1) Role of community members in CBSWM

Community members participate in CBSWM or contribute to it by paying fees, providing equipment or labour. The role of community leaders is especially important. The sustainability of CBSWM is largely dependent on their initiative [37].

In addition, it is essential to ensure the contribution of women. In many societies, women are responsible for their households and for keeping them clean. They are the primary users of urban services and play a major role in setting the trend in waste storage and discharge.

(2) Organizations

Organized CBSWM activities are carried out by micro-enterprises or community-based organizations (CBOs) or through the partnership between these two types of organizations.

(3) Issues

A study by the Water and Environmental Health at London and Loughborough (WELL) identifies the key lessons which have been learned from community-based initiatives and the issues to be tackled [38].

(4) Factors that increase sustainability

Due to the factors above, external donors often have difficulty making CBSWM take root in communities after their aid projects are completed. In this context, a study concludes that project design that considers the following factors can increase the sustainability of CBSWM [39].

(i) Communication

Communication strategies, like awareness-raising campaigns, stimulate community members to participate and support projects. This can increase local ownership of projects and enhance a sense of responsibility for services.

(ii) Community leaders and CBOs

Community leaders and CBOs can stimulate community participation and ensure that community needs are taken into account. Community leaders can act as intermediaries

[37] Barangays in the case study of the Philippines in Section 3-1 provide a good example to support the notion that the outcomes greatly vary depending on the initiative and qualifications of community leaders.
[38] Ali and Snel (1999)
[39] Moningka (2000), pp.15-19.

Table 2-12 Key lessons and issues for community-based initiatives

Category	Issue
Willingness to participate	Motivation on the part of the community cannot be assumed, and willingness to manage schemes is initially low. Many communities feel that it is solely a municipal responsibility to undertake the collection, transportation and disposal of waste.
Linkages with the municipality	Community-based collection schemes could ultimately become part of the municipal system if the linkages between the communities and the municipalities are addressed at the inception stage of the schemes.
Finance	In community-based waste collection schemes, both cost recovery and access to finance are important. This has to be addressed both at the community level and at the city level.
Ability of the poorest to pay	The ability and willingness of the poorest to pay for waste collection schemes is very limited.
Reliability of workers	Waste collectors (workers) are often perceived by the community to be unreliable.
Location and space for communal bins	It is difficult to secure adequate space for storing waste for collection and for recycling.
Gender sensitivity	Women are to a large extent responsible for household waste management. A proportion of municipal sweepers (waste collectors) is female. There is an important gender dimension at both levels.
Equipment	For an efficient waste collection system, it is important to use equipment which is appropriate to the physical nature of the area and to the characteristics of the waste.
Transfer and transportation of waste	A reliable primary waste collection scheme depends upon the design and location of transfer and transportation.

Source : Compiled by WATANABE Taisuke from Ali and Snel (1999)

between CBOs, the municipal authorities and other stakeholders to solve conflicts or overcome constraints. In whatever way community leaders are involved, their representativeness and legitimacy should be assessed. CBOs must also be representative of the community. If community leaders or CBOs do not represent the community or represent only a small part of it, difficulties will arise.

(iii) Women

Women play a determining role in waste management and form important channels of communication. Through such channels, women can be active members of CBOs and stimulate participation of other women in the community.

(iv) Municipal authorities

Support and recognition from municipal authorities can bolster community initiatives and CBOs. In fact, such support and recognition are imperative, because municipal authorities transport and dispose of waste that has been collected.

(v) Intermediaries

An organization, like a NGO, which can act as an intermediary or interface between the community and other stakeholders, plays a vital role in sustaining activities of CBOs. NGOs sometimes adopt different collection methods. In that case, standardization of these methods is necessary for the benefit for SWM for the whole municipality.

(vi) Cooperation between the CBO and the local authority

Cooperation implies creating a partnership between the CBO or micro-enterprise and the municipality based on a clear division of responsibilities and a mutual commitment to carry out the service. In this way, conflicts between the CBO or micro-enterprise and the local authority can be prevented and the continuity of the waste service ensured.

(vii) Finance and operation

Financial and operational stability are necessary for the continuation of services. Setting up an effective fee collection system is necessary to make the waste system financially viable and to ensure its continuity.

2-4-4 Promotion of environmental education and public awareness

(1) Importance and activities of waste-related education in developing countries

Solving SWM problems requires not only the advancement of science technology and the

introduction of necessary systems but also a light level of public awareness and behavior commensurate with that level. In other words, waste-related education and awareness programs are needed as well. This is because storage and discharge of waste is done by citizens as waste generators. It can be said that proper implementation of SWM will not be possible unless citizens acquire proper knowledge, raise their awareness, and put acquired knowledge and heightened awareness into action. This should be emphasized particularly in developing countries, which cannot mobilize necessary financial resources to the development and introduction of technologies for SWM. Nonetheless, developing countries are lagging behind in environmental education that covers SWM. It was not until recently that central governments and NGOs in the developing world recognized the need to raising public awareness about sanitation and environmental conservation and began to put that recognition into action with the help of multilateral institutions and governments and NGOs in developed countries [40].

Environmental education initiatives have recently launched in many developing countries. Botswana is tackling the problem of illegal dumping with not only legislative measures but also a policy that focuses on environmental education on waste. Under the policy, the country is mounting a number of awareness raising campaigns (including a campaign to reduce the use of plastic bags) and school education programs. Illegal dumping was rampant in Botswana. For example, of the 250,000 tons of residential waste generated annually, 62% was dumped illegally outside government control, and only 38% was collected and transported to landfills for proper disposal [41].

For information, of the JICA projects for municipal solid waste management (MSWM) since 1991, there are 11 pilot projects (P/P) that are designed to provide hygiene education or raise public awareness. Most of them are implemented in or after 1995 [42]. In other words, almost all of the recent pilot projects in master plan studies on SWM include components on hygiene education or awareness-raising among the residents. This indicates that JICA takes into consideration environmental education as a major issue. [43]

(2) Objectives and target areas of environmental education

Waste education and awareness campaigns alone do not provide fundamental solutions to solid waste problems. Wide-ranging environmental education should be promoted.

As discussed above, a small but increasing number of cities in developing country are working to raise the MSWM awareness of local adults and children through hygiene education and environmental education. Yet waste education alone does not provide a fundamental solution to municipal solid waste (MSW) problems. This is because MSW problems do not arise independently as they are closely related to a range of other development and environmental problems.

For this reason, broader environmental education is necessary at communities and schools. Such education should be designed to provide knowledge (and incentives to raise awareness) about the environmental as a whole and even encourage local adults and children put

[40] JICA also sends experts, JOCVs and Senior Overseas Volunteers to developing countries to provide environmental education that includes SWM.

[41] Kgathi and Bolaane (2001), pp. 342-353.

[42] Even before 1995, some of JICA's study missions to Laos, Poland and other countries mounted awareness campaigns of their own initiative in projects that were not characterized as P/P.

[43] See Table 1-5. All the development studies (M/P) under review stress the need for community participation and awareness campaigns to promote such participation. This provides further evidence that such requirements are deemed essential for SWM. Section 3-4-2 outlines recent P/P on environmental education in Sri Lanka.

that knowledge into action[44]. This is quite obvious in light of the current arrangement whereby knowledge is unilaterally communicated from municipal officials to residents and from teachers to pupils and students (teaching by rote).

What are the goals and methods of ideal environmental education then? The internationally recognized objective of environmental education is defined in the Belgrade Charter. The 1975 charter states that "the goal of environmental education is to make a world population get much aware of and concerned about the environment and its associated problems... towards the solution of current problems and the prevention of new ones."[45] According to the charter, the objectives of environmental education are[46]:

(i) Awareness: to help individuals and social groups acquire an awareness of and sensitivity to the total environment and its allied problems.

(ii) Knowledge: to help individuals and social groups acquire basic understanding of the total environment, its associated problems and humanity's critically responsible presence and role in it.

(iii) Attitude: to help individuals and social groups acquire social values, strong feelings of concern for the environment and the motivation for actively participating in its protection and improvement.

(iv) Skills: to help individuals and social groups acquire the skills for solving environmental problems.

(v) Evaluation ability: to help individuals and social groups evaluate environmental measures and education programs in terms of ecological, political, economic, social, esthetic and educational factors.

(vi) Participation: to help individuals and social groups develop a sense of responsibility and urgency regarding environmental problems to ensure appropriate action to solve those problems.

Target areas for environmental education can be divided into school education and home/community education. In other words, schools, parents and communities play an important role in environmental education. School education is deemed most important than home/community education for the promotion of environmental awareness. School education is designed to accommodate two development stages of children. At the first stage (between babyhood and the lower grades of elementary school), there is no distinction between sensibility and reason (cognition). Children recognize things intuitively while creating a mental image of them. For this reason, sensuous cognition and physical cognition are emphasized at this stage. At the second stage (the upper grades of elementary school and above), practical cognition based on practice and knowledge is also emphasized apart from sensuous cognition[47].

(3) Issues for SWM-oriented environmental education in developing countries

In light of the above discussion, the following paragraphs summarize the issues and explore future directions for waste-oriented environmental education in developing country cities.

(i) Current state and issues

Developing countries generally place emphasis on hygiene education and basic subjects such as arithmetic and national language in school education. The concept of environmental

[44] Japan also needs such education. Schools in Japan now provide "integrated learning" classes in an effort to make a shift from the traditional style of teaching by rote. These classes are designed to encourage pupils and students to develop their problem-solving ability and have a "zest for living." Many schools teach environmental education in these classes. They are exploring participatory, hands-on teaching methods that are appropriate for "integrated learning" classes with the help of local residents. Although teachers are expected to serve as coordinators or facilitators in these classes, many of them are at a loss what to do because of a lack of experience or training in this new teaching style.

[45] UNESCO (1975), p.86.

[46] Environmental education is a component of Education for Sustainable Development (ESD), which is advocated by the United Nations as comprehensive and integrated education designed to solve problems facing the world in the 21st century. ESD-J, a Japan-based organization that has been established to promote ESD, is chaired by ABE Osamu, Professor at College of Social Relations, Rikkyo University. Prof. Abe stresses the importance of "sustainable community development" for creating a sustainable society. For details, see Abe (2004).

[47] Sajima (1999), pp.19-22.

education has not yet taken root there. Although information and knowledge about the environment are communicated at times in science and social studies classes, this cannot be characterized as systematic environmental education that is designed to appeal to the senses of pupils and students and prompt their action.

(ii) Target

The target of environmental education is pupils and students at school and local residents in communities. At school, environmental education should be designed to appeal to the senses of pupils in lower graders and encourage older children to put what they have learned into practice in their daily activities. Because environmental education is a rather new concept, it is necessary to ensure that municipal officials, NGO staffs, and teachers receive substantial training in advance. Environmental education for pupils is especially important because the future of SWM depends on them. Besides, it is more difficult to change the already-established mind-set and behavior of adults.

(iii) Content

SWM-oriented environmental education should include such aspects as maintaining public health (through hygiene education, etc.), keeping the streets clean and tidy, closing the loop to conserve resources and energy, and protecting the human rights in relation to social prejudice and discrimination derived from waste. It should further be linked with other problems associated with development and environment. Such linkage can be established by, for example, teaching the fact that certain types of plastic wastes produce dioxins when burnt at low temperatures, as an introduction to the problem of air pollution or health hazards. Another option, among others, is to present a case in which plastic wastes drifting in the sea killed turtles and fish because they ate these materials, as an introduction to the subject of biodiversity.

(iv) Approaches

An effective approach would be to provide many opportunities for hands-on experience, in addition to lecture-type teaching, particularly at the level of basic education. It is important that learners can enrich their senses, enjoy learning, and maintain their interest. There should be a linkage between school education and community education. If environmental education is taught only at school, not at the community level, in other words, if adults, who assume social responsibilities, have no interest in or knowledge about the environment, children who want to conserve the environment may be discouraged. In addition, if people receive environmental education at school but have no such opportunities after graduation, their knowledge and awareness about environmental conservation will surely wane, as so will the level of participation in environmental conservation activities. For these reasons, it is necessary to take every opportunity to explore how best to promote environmental education at the community level. To that end, it is necessary to encourage residents to participate in environmental education programs with the help of environmental NGOs and others, as discussed earlier. Moreover, long-term, sustainable approaches are required because it takes environmental education a long time to produce positive outcomes[48].

2-4-5 Securing landfill sites: consensus-building concerning the citing of disposal facilities

The construction of waste disposal facilities must be based on a consensus with local communities, and developing countries are no exception.

Many of the final disposal sites in developing countries lack a proper management of carried-in waste or other environmental controls. They are often just open dumping sites with no measures to minimize environmental pollution. The border between a landfill and the surrounding area is unclear in many cases. Such landfills have a range of adverse effects on the

[48] Institute for International Cooperation, JICA (2005)

environment and landscape of the surrounding areas with odors, flies and rodent vectors, untreated landfill gas and leachate, and windblown litter.

Consequently not only neighboring residents but also the general public as a whole develop an aversion to such "locally unwanted facilities," that is, NIMBY (not-in-my-back-yard) syndrome. This public sentiment is what makes it difficult to construct new disposal sites or enlarge the existing ones in developing countries. The sentiment is so strong that a mere plan to construct a sanitary landfill or other disposal site that pays adequate attention to the environment and the landscape almost always invites opposition from local residents and even becomes a major focus of public concern.

This trend is especially noticeable in recent years among growing public concern about the environment and progress in the democratization process, as illustrated by the case study of Manila, the Philippines in 3-1. Now, securing sites for landfills is the key to the success of a MSWM system as a whole in developing countries as well.

It may be inappropriate, however, to attribute the cause of local opposition-often described as the NIMBY syndrome-only to the egoism of local residents. It is more appropriate to regard it as the consequence of adverse sentiments developed over the years toward insufficient treatment technologies at disposal sites, odors, pollution by leachate, salt damage, damage to crops by methane gas, fires, and other hazards.

It is therefore impossible to construct or enlarge landfills or other disposal sites without building a consensus with local residents and other stakeholders. Such consensus calls for the following requirements:

(i) Eliminating community aversion to disposal sites

As mentioned above, disposal sites in developing countries are mostly open dumping sites or more of the same sites with inadequate measures to protect the environment or landscape. Residents cannot image exactly what a sanitary landfill is like, and they tend to have a strong prejudice toward landfills in general. Moreover, municipal officials cannot persuade residents because they have little knowledge and experience with sanitary landfill. The prejudice of residents toward disposal sites should be removed with demonstration projects that improve existing sites using the sanitary landfill method.

(ii) Involving residents in landfill projects as early as the planning phase

Clearly, it is important to involve residents in the decision-making process of a project as early as the planning phase toward consensus

Table 2-13 Technical measures to avoid the NIMBY syndrome in relation to final disposal sites

Category	Technical measure
Establishment of construction technologies for final disposal sites	・Establishment of liner facilities and the leachate collection system that are mutually supportive ・Technologies to install seepage control works and the groundwater pollution monitoring system ・Working face minimization and section landfill technologies to minimize leachate ・Appropriate technologies for leachate treatment
Establishment of landfill and management technologies at final disposal sites	・Monitoring technologies of the appropriateness of carried-in wastes ・Landfill technologies to enlarge the aerobic landfill area for the purposer of early stabilization (in the case of semiaerobic or aerobic structure) ・Proper control of the amount of leachate ・Technologies for landfill separation and early stabilization ・Clarification of the working face ・Leachate treatment technologies ・Cover material selection and soil covering methods ・Landfill gas control technologies ・Landfill subsidence control technologies and monitoring ・Technologies to control landfill water balance ・Emergency response technologies for contamination, fires, etc.

Source : Hanashima (1994), with revisions made by YOSHIDA Mitsuo

Box 2.5 Building a Consensus with Residents for New Landfills —Case Studies of Cambodia, Laos and Sri Lanka—

(i) Study on Solid Waste Management in Phnom Penh Municipality in the Kingdom of Cambodia (development study)

JICA provided support for the Stung Mean Chey Disposal Site (SMCDS), the only landfill in Phnom Penh as a pilot project of this study. The objectives of the project were to improve the facilities and operation of the landfill and to consider the validity of candidate sites for a new landfill. As far as SMCDS, the study mission from JICA focused on facility and operational improvement because the city government had already secured land in the adjacent area.

As for a new disposal site in Dang Kor, the study mission played a more positive role. Specifically, the mission reviewed candidate sites based on the results of the existing surveys and the field survey. The mission also helped the city government with two public hearings before the government procured the actual site.

In the first public hearing (October 20, 2003), members of the mission explained why a new disposal site was necessary to 96 residents from 12 villages that would be affected. After introducing the findings of this development study regarding the state of SWM service in Phnom Penh, mission members explained why this particular area had been chosen for a new disposal site based on review findings. The members also presented a detailed landfill plan and called for understanding and cooperation for further surveys by explaining what would be surveyed and why.

The second public hearing (December 25, 2003) was attended by 379 people, including 248 landowners within a one-kilometer radius from the center of the proposed disposal site, as well as residents along the proposed access road and the downstream area of the nearby river. City officials briefed the attendants on the background of the construction plan. Members of the study mission presented the findings of the EIA survey and the outline of the plan.

After these public hearings, the city government obtained approval from the government on January 15, 2004 and set up a site acquisition commission. Later, a surge in land prices and other factors promoted the commission to amend the plan in consultation with the study mission. The commission eventually succeeded in concluding land purchase agreements with the landowners.

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(ii) A case of landfill construction in Laos

A development study (M/P) for Laos recommended a project to construct a new disposal site in an area where waste had been dumped illegally after the completion of the study. When this project was implemented, there was no major opposition from local residents partly because waterworks were also built for them. As discussed later in Section 3-2, the fact that things went smoothly during the site acquisition phase played a major role in ensuring that the recommended project was not only accepted but also put into action successfully. This experience provides a lesson that adequate attention should be paid to site selection and residents.

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building among diversifying awareness of residents. Of course, the need for this arrangement is not limited to "locally unwanted facilities" like disposal sites.

(iii) Establishing the monitoring framework

It is important to ensure that competent entities, usually municipalities, operate and maintain disposal sites in a properly and sustained manner. This is an effective approach for alleviating or even eliminating the aversion of residents and involving them into projects.

Table 2-13 summarizes technical measures to remove the aversion of residents to landfills in light of the three requirements outlined above. This table also serves as a list of objectives or components of technical assistance projects,

(iii) Study on Improvement of Solid Waste Management in Secondary Cities of Sri Lanka (development study)

As one of the pilot projects of this study, JICA provided support for the Gohagoda landfill site (existing) in Kandy city and Moon Plains landfill site (new) in Nuwara Eliya city. Specifically, the project improved landfill facilities, transferred sanitary landfill technologies, and established a monitoring committee. (The case study of Sri Lanka is discussed in detail in Section 3-4.)

The monitoring committee was set up to ensure that the competent municipality properly operates and maintains the landfill in a sustained manner. It comprised the representatives of the neighboring communities, officials at relevant agencies, staff members of environmental NGOs, officials at the Central Environmental Authority (CEA), municipal officials in charge of SWM, and members of the environmental committee. The monitoring committee established a system for holding regular meetings, making evaluation based on a monitoring checklist, and making its findings known to the residents.

The establishment of the monitoring committee also served to raise the interest of the residents in the landfill, In this context, Nuwara Eliya city deserves special attention. The city's monitoring committee was set up at an early stage and chaired by a monk living near the landfill. Thanks in part to the monk, the committee was able to hold a number of briefings for residents at his temple and visit the site to keep track of progress in the construction work. After the landfill went into operation, primary school children toured the site as part of environmental education. Officials at neighboring municipalities visited the landfill to gain expertise in sanitary landfill. This disposal site is clearly serving its purpose as a model sanitary landfill of Sri Lanka.

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Photo 2-3 Building a consensus with residents around Moon Plains landfill site in Nuwara Eliya city

Photo on left : A briefing for residents around the landfill
Photo on right : On-site inspection by monitoring committee members

which should accommodate technical levels of recipients. Such technical assistance and capacity development constitute a basis for winning the understanding of residents regarding landfill siting and building a consensus with them.

Japan is recently employing the risk communication technique in building a consensus with local residents in relation to the establishment of waste treatment and disposal facilities[49]. Developing countries are also advised to consider adopting this technique. Risk communication is a pragmatic approach that has emerged in the 1970s to deal with problems such as hazardous chemical materials. It tries to solve problems through the interaction process in which the sender and receiver exchange information and view about the risks involved. In risk communication, it is important to communicate

[49] Urano, ed. (2001); Ishizuka and Tanaka (2003); and Bredariol and Magrini (2003)

(share) both positive and negative aspects of the issue in question in a fair manner. By promoting such communication, the stakeholders can develop a relationship through which they can consider and cope with the risks involved and eventually take action to avoid them.

2-5 Health and environmental factors

This section provides an overview of environmental pollution caused by waste, with a special focus on public health problems as well as environmental pollution in developing countries.

2-5-1 Pollution related to the generation, transportation and dumping of waste

Municipal solid waste (MSW) includes: residential waste, such as garbage and bulky wastes from households; and business waste such as paper waste from office buildings and other wastes from shops and restaurants. Human excreta are sometimes included in MSW in countries such as Japan[50]. Residential waste tends to increase as the economy expands. In developing countries, garbage and other organic wastes represent the main proportion of MSW. Plastic waste from containers, packaging and bags is on the rise in urban areas.

(1) Public health problems

Wastes, when they are left as they are, generate foul odors. Odors from decomposed food residues and other wastes attract insects and rodents such as flies and rats, causing public health problems. These odors, whose sources are ammonia, hydrogen sulfide, or other chemicals, are not just a nuisance; they may be the cause of poisoning, irritation of the respiratory mucous membranes or otherwise damage human health. Furthermore, human excreta or sewage sludge, if handled with other wastes and treated inadequately, provides routes of infection for viruses, bacteria, protozoa, vermin and other disease vectors, or rodents[51]. It is believed that improper waste management was the cause of a series of cholera outbreaks in Japan during the late 19th century.

The situation in developing countries is worse as a result of inadequate waste collection systems and improper landfill operations partly due to insufficient capacity of the facilities and equipment. In Bangalore, India, for instance, untreated waste is dumped into a large open dumping landfill. An epidemiological survey on child waste pickers at this landfill showed that the incidences of parasitosis, scabies, bronchial disease, digestive disease and lymphoadenoma were significantly higher than that for other children in the city[52]. This indicates the harsh working conditions for waste pickers and suggests that improper waste landfill is quite detrimental to public health. Waste that is left uncollected and other litter on urban streets due to inappropriate collection also cause similar public health problems.

(2) Pollution caused by illegal dumping and littering

In areas without access to collection services, wastes are simply discarded, causing the public health problems mentioned above. Wastes that have been collected may be dumped illegally before they reach the landfills in order to cut transportation costs, or for other reasons. This practice also causes the above-mentioned public health problems or problems similar to those arising when wastes are disposed of in open dumping landfills (which is discussed in section (6) below). To make matters worse, pollution may remain unnoticed, since illegal dumping often occurs in inconspicuous locations.

[50] In Japan, all types of wastes not defined as industrial wastes are aggregated as "general waste," which includes residential waste, human excreta, and business wastes, such as paper waste from office buildings. General wastes that pose a high risk of affecting human health or the living environment, such as materials that are explosive, toxic, infectious, etc. are stipulated as "specially controlled municipal wastes."

[51] Kitawaki (2000b); Carpenter et al. (2001)

[52] Hunt (1996)

(3) Pollution associated with incineration

Incineration is often an option for relatively high-income countries or areas where landfill sites are extremely difficult to secure. The volume of waste is reduced by incineration (volume reduction). Incineration ash (also known as bottom ash or main ash) and fly ash (air-borne solid particles extracted from the incineration gases) often contain heavy metals and other hazardous materials, requiring special controls when they are landfilled [53].

Apart from the concentration of such toxic metals, it is widely known that the incineration process also produces soot and dust, hydrogen chloride, nitrogen oxides, mercury, dioxins (PCDDs/PCDFs), coplanar PCBs (Co-PCBs) and other new types of hazardous chemical substances [54]. Incineration plants should be designed to minimize the emissions of chemical substances that are harmful to human health. This can be achieved with facilities that prevent the production of these substances or through the installation of exhaust gas treatment equipment.

(4) Pollution associated with composting

Composting is one of the options often adopted for the intermediate treatment of MSW in developing countries. There are two major reasons for this. One is that organic wastes, including garbage, account for more than 50%-sometimes over 70%-of MSW in the developing countries. The other is that this option not only reduces the volume of waste, but also produces compost, which can be used as a soil conditioner or alternative fertilizer [55].

However, proper precautions should be exercised to avoid soil pollution from the compost. Hazardous materials have little chance of finding their way into compost if the raw materials for the compost are wastes that have been properly separated at source (e.g. vegetable garbage from vegetable markets, or fish waste from fish markets). If wastes generated in cities are mixed and used to produce compost, that compost will without doubt include heavy metals and other hazardous materials, even if every effort has been made to remove these materials as part to the pretreatment process. Inevitably, compost made directly from MSW has a high concentration of heavy metals and other hazardous materials. If such compost is admixed with the soil, these hazardous materials accumulate and become concentrated, causing soil pollution [56]. This is one of the factors that reduce the marketability of MSW-derived compost. It is advisable to limit the application of compost made from mixed waste on crop fields, which absorb heavy metals well. The regular application of such compost to the same field is very risky. Ultimately, its use is virtually limited to gardening and forestry.

(5) Positive and negative aspects of recycling

In developed countries, the wider use of disposable containers and packaging, such as polyethylene terephthalate (PET) and other plastic bottles, paper cartons and aluminum cans, is generating an increasing amount of waste whose total volume is rising at an alarming rate. The reduction, reuse and recycling of such wastes is a major challenge for solid waste management (SWM).

In developing countries, on the other hand, a social system for recycling these materials has often already been established. In such systems, the materials are separated at source and recovered by waste pickers and others for reuse or

[53] Main ash and fly ash are handled as separate types of wastes. In Japan, main ash is regarded as general waste due to its low elution concentration of heavy metals and is disposed of at controlled landfill sites. Fly ash, on the other hand, contains a high concentration of heavy metals and dioxins. It is classified as "general waste subject to special controls" and is required by law to receive intermediate treatment (detoxification processes to prevent elution). See Kankyo Horei Kenkyukai, ed. (2004), p.19, and Ishikawa (1995).

[54] Hiraoka (1990); Tanaka (1996)

[55] Hoornweg et al. (1999)

[56] Yoshida et al. (2003); Hamdi et al. (2003); Hoornweg et al. (1999)

reprocessing according to market demand. Ultimately, public health problems and environmental pollution associated with MSW can be reduced significantly by separating, reusing and recycling these recyclable materials. A major issue for development assistance is how to enable solid waste management (SWM) in developing countries to become more efficient while ensuring that the existing recycling systems are maintained on a sustainable basis. In this context, the activities of an NGO in the City of Manila in the Philippines, provides a good example. This NGO helped waste pickers living at the landfill sites to set up recycling businesses. While reinforcing the existing recycling system, these activities contributed significantly to the establishment of environmentally friendly SWM [57].

Yet the "venous industry" that reuses and recycles waste in developing countries does not deserve unconditional praise. Generally speaking, recycling is technically costly. Under pressure from market forces, recycled products generally have to compete with those made from virgin materials. There is a strong incentive to cut costs at the expense of consideration for working conditions, the quality of recycling facilities, and the environmental impact, even though the costs of manually separating wastes are already low. This is illustrated by the case of Dhaka, Bangladesh (see Photo 2-4). There is always the risk of health hazards and environmental pollution.

The separation process for recycling means that materials not recovered in the process are disposed of as wastes. These wastes, if left uncollected at the collection points, pollute the soil there and cause public health problems.

(6) Environmental impacts associated with final disposal sites

Among the environmental impacts associated with final disposal sites, pollution from landfill leachate and gas emissions is well known.

Leachate is produced in landfill layers and seeps into the surrounding soil and groundwater, causing environmental pollution. The amount of leachate is determined by the water balance involving rainfall at the landfill site. The rainfall that seeps into the landfill layer as "input" elutes the hazardous materials and produces leachate as the "output." For this reason, the leachate can be reduced primarily by preventing rainfall from seeping into the landfill layer. New landfill sites should be designed to control leachate with a seepage control structure.

In the landfill layer, organic matter is largely decomposed by microorganisms. Due to this decomposition process, the components of the leachate change over time. In the early stages of a landfill, relatively acid leachate is produced, eluting heavy metals and other hazardous substances. The

Photo 2-4 Informal separation and recycling scenes in Dhaka city, Bangladesh

Waste collection work is dependent on low cost labor, especially women and children (photo on left). The recycling workshops are generally small and their working conditions are harsh. The photo on the right shows a factory where plastics recovered from waste are remelted and cast into slippers.

[57] Vincentian Missionaries (1998)

elution process is a continuous long-term one. Studies[58] show that organic matter is largely decomposed within the landfill. According to these studies, the concentration of such organic matter in leachate, which is 1,000 times the environmental standard (in terms of BOD), will be significantly reduced by the time the leachate is leaked into the environment, as long as organic matter is carried by infiltrating rainwater. In short, a landfill can be regarded as a huge decomposition reactor driven by microorganisms.

Although the structure of the landfill is important, the most effective solution to the problem of environmental pollution caused by leachates is landfill control. This solution prohibits the carrying-in of wastes (often industrial wastes) that contain high concentrations of heavy metals and other materials that cannot be decomposed by microorganisms, undiluted solutions of organic hazardous materials, and materials soaked in such solutions. Wastes that include hazardous wastes are subjected separately to strict controls on their disposal.

In fact, due to inadequate landfill controls, leachate from final deposal sites is causing environmental pollution in newly-industrialized cities in developing countries. Such leachate is often found to contain high concentrations of heavy metals or hazardous elements such as bromine, which are used in flame retardant additives. Tunisia, for example, is struggling to cope with leachate that contains hazardous substances from a landfill that was closed in 1999. Before its closure, this open-dumping landfill received municipal and industrial wastes generated from the greater Tunis region over 30 years. This leachate contained high concentrations of non-metallic elements such as boron, sulfur, arsenic, selenium and bromine, and heavy metals such as titanium, chromium, cobalt, nickel and mercury. These hazardous substances are now polluting the soil and sediments and affecting the water quality of the groundwater and lakes around the closed landfill[59]. This illustrates the negative legacy that results from inadequate landfill controls or the disposal of untreated hazardous wastes in landfills.

Landfill gases are another byproduct of the process of the decomposition of organic waste by microorganisms within landfills. Its components include carbon dioxide, methane, nitrous oxide and hydrogen sulfide. Hydrogen sulfide, even in small quantities, is highly toxic and landfill gas with a low concentration of this substance is hazardous to human health. Carbon dioxide and methane are greenhouse gases, thus their impact on the global environment is a matter of concern.

Methane gas deserves special attention because its contribution to global warming is more than 20 times that of carbon dioxide. There are two options for reducing methane gas: (i) collecting the gas from landfills and using it as a source of energy; and (ii) designing landfills to curb methane emissions. For the first option, anaerobic landfills, which are commonly adopted in Europe, are recommended. With this method, donors are recently considering assistance that takes advantage of the Clean Development Mechanism (CDM) under the Kyoto Protocol and the Global Environment Facility (GEF) to construct facilities to collect methane gas and generate power[60]. For the second option, the preceding study by JICA[61] estimates the relative greenhouse effects of different types of landfill methods (in terms of CO2 equivalent). According to the study, if the effect of an anaerobic landfill is assumed to be 1.0, that for a semiaerobic landfill is 0.43, compared to 0.23 for a recirculatory semiaerobic landfill and 0.16 for an aerobic landfill. Therefore, a reasonable solution is the adoption of a semiaerobic landfill or aerobic landfill. Donors should provide support for landfill design that employs these methods.

[58] Tanaka et al. (1991); Ikeguchi (1994)
[59] Yoshida and Ghrabi (2002); lbrahim et al. (2003)
[60] UNDP (2003) focuses on the applicability of CDM. The applicability of these options in India is noted in ETSU (1997) and Shekdar (1997), in Viet Nam in Augenstein, et al. (1996), and in Asian developing countries in Shikura and Harada (1997).
[61] Institute for International Cooperation, JICA (1993) Chapter 6, Section 1.

Box 2.6 The Road to Sanitary Landfill: Fukuoka Method

At landfill sites in Japan, leachate is usually controlled through a seepage control structure, such as impermeable liners or non-corrosive, stable partitions, so that it will not pollute the groundwater. (Inert type landfill sites and controlled landfill sites are required by law in order to prevent the leachate from seeping into the groundwater or public water bodies.) This approach is difficult for developing countries to adopt for both financial and technical reasons. Landfills in developing countries should be improved by less costly and the application of more appropriate technologies.

The Fukuoka landfill method is a semiaerobic landfill structure developed through joint research between the Faculty of Engineering, Fukuoka University, and the City of Fukuoka, which was launched in the late 1960s. This structure has large leachate collection and drainage pipes (large-diameter pipes) and gas collection pipes laid at appropriate intervals along the bottom of the landfill. This arrangement allows the leachate to be drained out of the landfill. In addition, the convection of air due to heat generated from the waste decomposition process allows fresh air to flow into and through the landfill. This makes the waste layers aerobic, thus promoting microbial activity. Microbial activity drives the decomposition process of the waste and reduces the BOD of the leachate as well as methane gas emissions. Since the landfill gases are largely made up of carbon dioxide, the contribution of the semiaerobic landfill to global warming is about half of that of an anaerobic landfill, which allows less air in the waste layers. Moreover, by draining leachate promptly out of the landfill, the semiaerobic structure controls its seepage into the groundwater table, reducing its impact on the groundwater [1].

Since the structure is simple and the cost is low, the Fukuoka method can be applied in developing countries using locally available resources. A technical cooperation project designed to improve a landfill in Malaysia (to which MATSUFUJI Yasushi, Professor at Fukuoka University and an expert in this method, was assigned) adopted this method extensively and achieved considerable success. Successful cases using this method were subsequently reported from Iran, China, Mexico and the Pacific region, thus attracting international attention [2]. As it has been highly evaluated as an appropriate technology, JICA is promoting this method in its Technical Training Program of Overseas Participants. Using the teaching materials that it has developed [3], JICA is promoting technology transfer and technical guidance (see Section 1-3 for details).

YOSHIDA Mitsuo, KONDO Sei

[1] Matsufuji (1997) [2] Johannessen and Boyer (1999) [3] Including teaching materials for JICA-Net; JICA (2004).

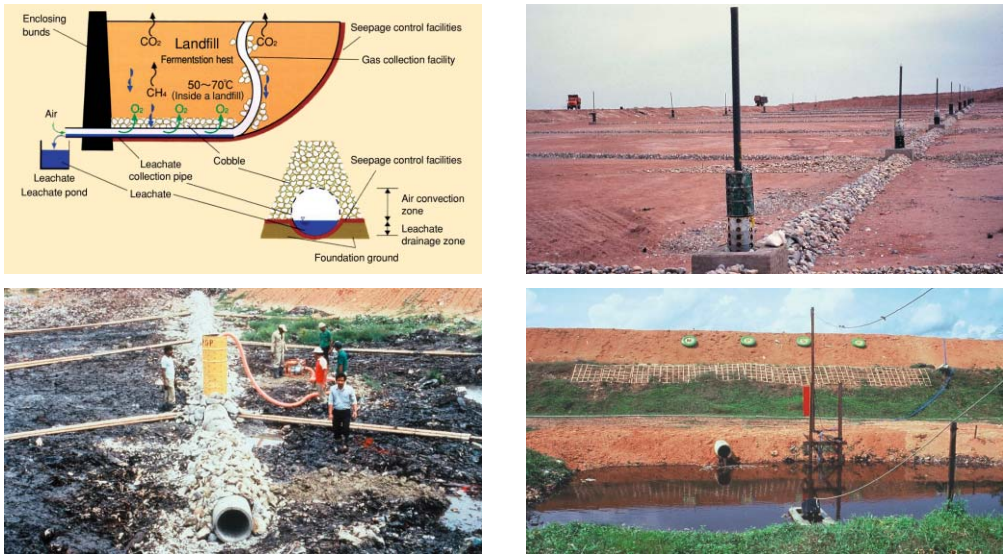


Photo 2-5 Structure of the Fukuoka method and its application in developing countries

Upper left : Structural chart of the Fukuoka method (Courtesy of the City of Fukuoka)
Upper right : Application in Teheran. Gas collection pipes laid at appropriate intervals. (Courtesy of the City of Fukuoka)
Lower left : Application in Malaysia under the guidance of a JICA expert (Prof. MATSUFUJI Yasushi). Bamboo, oil drums, construction debris and other materials that are locally available are used for the Fukuoka method. (Courtesy of Prof. Matsufuji)
Lower right : A retention pond and the termination of a leachate collection and drainage pipe in the landfill shown in the photo at lower left. The end of the drainage pipe is open to the air.

* These photos are provided through Mr. SAKAI Michihiro (now assigned by the City of Fukuoka to the UN Habitat Fukuoka Office).

2-5-2 Hazardous and medical wastes

Hazardous or medical wastes require proper management, since even small quantities can have a serious impact on the environment and human health.

Although this report generally deals with non-hazardous solid wastes, this section focuses on hazardous and medical wastes. This is because these types of wastes are often mixed with non-hazardous wastes for collection, treatment or disposal in developing countries. It is also often the case that developing countries do not have regulations regarding hazardous wastes [62]. Even if they do, such regulations are often disregarded.

(1) Industrial wastes and hazardous wastes

In developing countries, problems with industrial waste disposal tend to arise when industries are concentrated in certain areas or when hazardous wastes are generated in large quantities [63].

For donors, it is important to first check whether the recipient country concerned defines and controls hazardous wastes. In fact, many developing countries do not define industrial waste; they just classify wastes into just hazardous and non-hazardous wastes. Some developing countries have no classification system for wastes in the first place. The next step is to examine the definitions, if any, of radioactive, infectious and explosive wastes. These types of wastes, together with wastes collectively characterized as toxic or hazardous, need to be handled separately and differently from general municipal waste.

The proper management of hazardous substances in industrial waste is an extremely important issue for developing countries today. Businesses in developed countries are increasingly adopting a strategy of processing industrial products in developing countries where labor costs are low. If environmental standards in such developing countries do not cover new pollutants, these businesses may run the risk of discharging unregulated hazardous chemicals into the environment. For example, there is a possibility that chlorinated organic solvents, such as trichloroethylene (TCE) and tetrachloroethylene (PCE) used in dry cleaning or cleaning integrated circuits and printed circuit boards will be discharged indiscriminately into the soil and groundwater, contaminating drinking water. If discharged in large quantities or in high concentrations, these chemicals cannot be decomposed by microorganisms alone and they will find their way into the atmospheric circulation system and the hydrological cycle, including the rivers and oceans. They might even cause environmental pollution on a global scale.

Problems with hazardous wastes can be analyzed in three types of cases, as listed below:

- No regulations over industrial or hazardous wastes.
- Regulations over industrial or hazardous wastes in place but no treatment facilities based on such regulations.
- Both regulations over industrial or hazardous wastes and treatment facilities in place, but the regulations are not fully implemented.

It should be noted that even if regulations are in place, there is always an incentive to dump hazardous wastes illegally or mix them with other wastes, since the treatment of hazardous wastes is more costly than for non-hazardous wastes.

(2) Medical waste

Different countries define medical waste differently. Yet it is reasonable to use the term "medical waste" or "health care waste" as the

[62] In Japanese law, hazardous wastes (specially controlled municipal waste and specially controlled industrial waste) refer to wastes specified by a Cabinet Order as those that are explosive, toxic, infectious or otherwise harmful to human health or the living environment. However, the criteria for hazardous wastes vary greatly depending on the country. In some countries, wastes that are flammable, corrosive, or reactive as well as toxic are classified as hazardous wastes and regulated accordingly. In many other countries, wastes are divided into hazardous and non-hazardous wastes for the purpose of statutory control, without classifying them as industrial or non-industrial.

[63] The adjective "hazardous" here implies both "toxic" and "dangerous."

generic term for waste generated in medical services in general, and refer to waste that involves risks associated with vehicles of infection as infectious waste or pathological waste. Infectious waste, which must be placed under tight controls, accounts for 25-40% of medical waste as a whole [64].

Without the proper management and disposal of infectious waste, biohazards will result, including the spread of communicable disease. In developing countries, infectious waste is sometimes treated in the MSW flow (Photo 2-6), but this is quite dangerous. The public should be made aware of the risks involved. Hospitals must ensure the segregated management of infectious waste. WHO has published a detailed manual concerning the safety management of medical wastes.[65] This manual should preferably be followed.

Incineration is the most common and recommendable treatment for infectious waste. This does not mean, however, that any incineration method is appropriate. Microorganisms that are sources of infection must be processed in a suitable high-temperature chamber for a specified period so that they are completely disinfected. Unless this requirement is met, harmful bacteria and other pathogens may remain in the incineration residue or exhaust gases. A study in Japan shows that after infectious waste was burned in a small-scale rubbish furnace, the quantity of which was larger than the furnace's capacity, harmful bacteria remained in the exhaust gases and incineration ash [66]. Without appropriate incineration technology, it is impossible to prevent environment pollution that results in biohazards.

Some developing countries (the Philippines, Tunisia, etc.) ban the incineration treatment of waste as well as medical waste altogether for fear that it might produce dioxins. Donors should support these countries in ensuring the proper management of medical waste by such means as exploring alternative treatment technologies and conducting risk assessment.

(3) Transboundary movement of hazardous wastes to developing countries

Transboundary movements and the ocean dumping of wastes that contain toxic chemical wastes can have a serious impact on the global environment. Between the 1970s and 1980s, developed countries in the West exported hazardous wastes to countries in Africa and South America. Without proper treatment, these wastes often polluted the soil, groundwater and the environment in general in these countries [67]. In 1988, for example, more than 3,000 tons of wastes

Photo 2-6 Environmental pollution caused by hazardous wastes in Dhaka city, Bangladesh

The photo on the left shows medical (infectious) wastes that are collected as municipal solid waste. The photo on the right shows sludge open-dumped next to a leather processing factory. The sludge may cause hexavalent chromium pollution.

[64] Institute for International Cooperation, JICA (1993)
[65] WHO (1999)
[66] Takatsuki (1991)
[67] Third World Network (1989), Nomoto and Sakumoto (1996) Chapter 6.

that contained a large quantity of PCBs were shipped from Italy to Koko Port in Nigeria and left in the open air near the port. The shipper took back the wastes after strong protests from the Nigerian government. The freighter carrying the wastes sailed around the world but was denied entry at every port. This is known as the Koko incident.

To avoid the recurrence of such an incident, the international community adopted the Basel Convention on the Control of the Transboundary Movement of Hazardous Wastes and their Disposal in March 1989, at the initiative of UNEP. This convention, which controls the export of hazardous wastes by countries that have appropriate waste treatment technologies, came into effect in May 1992. Requirements under the convention include written consent, prior notification, and re-importation in the case of inappropriate export or disposal. Today, the transboundary movement of hazardous wastes is controlled under the Basel Convention, the London Convention and other international agreements. Yet the movement of such wastes from developed countries to developing countries is not always fully controlled due to such factors as inadequate domestic laws in the former countries and the economic benefits to be gained from the transfer of such wastes [68].

Issues concerning the management of hazardous wastes in developing countries include the development of legislation and standards, the improvement of monitoring technologies, the adoption of proper treatment methods, and the establishment of methods for environmental impact assessment. However, it may be worth adding that such monitoring and treatment methods cover the physical and technical aspects alone and provide after-the-fact solutions only. In other words, they are passive solutions; the focus should be on how to assess hazardous waste generation and proper treatment of the wastes [69]. The development of treatment and management methods is indeed necessary, but a more important issue is how to reduce hazardous wastes generation, in other words, how to control such wastes in the "upper reaches" of the waste stream.

2-6 Technical issues and structural factors along the waste management flow

This section summarizes technical issues and factors in each stage of the waste management flow (also known as the "waste stream" and "waste flow") as shown in Figure 2-5. Since it is difficult to limit the focus of discussion to the technical aspects, other aspects-including background information and factors related to solution planning-are also referred to, as necessary.

2-6-1 Generation, separation, storage and the discharge of wastes

Whether wastes are properly handled from the generation to the discharge stages has a considerable impact on the entire waste stream and urban sanitation.

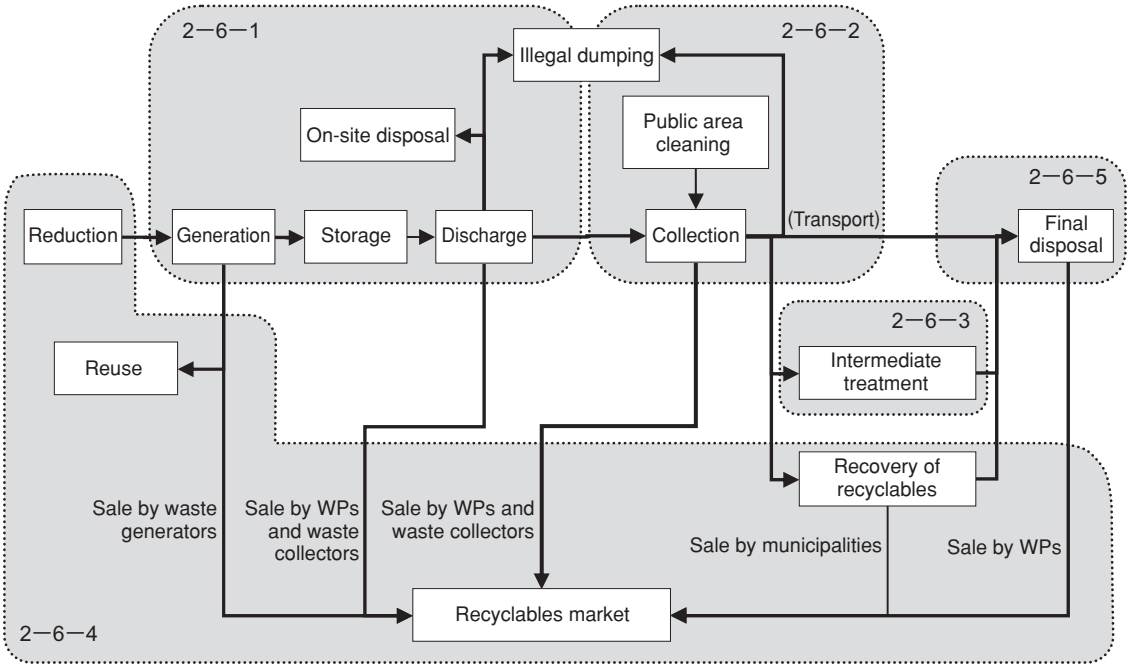
(1) Overview

Waste is generated when a product becomes useless from the point of view of its owner in the light of its designed purpose. Recent discussions concerning waste management have tended to focus on the stages before waste generation-or on waste reduction to be exact. Waste reduction can be achieved by selective purchasing or the production of highly durable goods. This theme is discussed in Section 2-6-4. This section instead focuses on waste generation as the first stage of the waste stream. It is worth noting that recyclables separated at source are sometimes not recognized as "wastes" by waste generators. This should be remembered when conducting field surveys on waste generators to collect waste generation data.

The behavior of each generator of waste determines how these wastes are treated from

[68] Clapp (2001)
[69] Takatsuki (1991)

Figure 2-5 Flow Chart of a Typical Waste Stream



WPs : Waste pickers.
The number corresponds to the section concerned.

Source : Compiled by OTSUKI Noriko

generation to discharge. Whether the wastes are properly handled at these early stages in the waste flow is an important factor in the improvement of the entire waste flow and urban sanitation. These stages are the only phases where the waste generators are directly involved in solid waste management (SWM). These stages therefore reflect the knowledge and awareness of the generators concerning waste management.

Once the waste is generated, the first thing the waste generator does is to store it. The types of containers used to store waste are very diverse depending on financial capacity and custom. Plastic buckets or bamboo baskets may be used as containers. When the condition of such storage containers-what they are made of, in what form, whether they have a lid, and where they are placed-is inappropriate with regard to the quantities and properties of the wastes, a range of problems may arise, including foul odors, windblown litter, and the attraction of flies, rats and other pathogen-carrying animals.

Waste stored by the waste generator is discharged within a short time. How the waste is discharged is closely related to the type of collection service available to the waste generator (the forms of collection services are discussed in the next section). Table 2-14 shows problems associated with the discharge of wastes and possible solutions that can be adopted by the waste generators.

Sharp-edged or pointed items in waste, explosive wastes and liquid wastes may cause safety and health problems at the subsequent stages of intermediate treatment and final disposal no matter how they are collected. Wastes with such properties are regularly generated from households as well as industrial plants and medical institutions. Municipalities should establish storage and discharge rules according to the properties of the wastes, publicize these and ensure that the residents observe them.

(2) Discharge out of wastes where the collection service is inadequate

Residents may dispose of waste themselves by burying or burning it in their backyards or may even dump it illegally in areas where no collection service is available or the service is inadequate or inconvenient in terms of the low collection frequency or distance to the collection point. These uncollected wastes may litter the neighborhood and give rise to secondary problems. For example, they may find their way into ditches, causing flooding due to blockage. In addition, rainwater may gather in the emptied waste containers, providing a breeding ground for mosquitoes and flies.

Avoiding these adverse situations requires expanding the collection areas and improving the collection service. The next section discusses how this can be achieved.

2-6-2 Collection and transportation of waste

Waste collection and transportation are the basis for SWM and represent the major proportion of the SWM budget in developing country cities.

Waste collection and transportation constitute the operations to transfer wastes from their source to the ultimate destination-the final disposal sites (or intermediate treatment facilities). The most important objective of SWM services is to "remove waste from the neighborhood." In this sense, the operation of collection and transportation forms the basis of SWM services. However, developing country cities, especially cities that are experiencing rapid population growth or fast-growing urban sprawl, often fail to achieve this objective since they lag behind in providing collection services for the entire city. Nevertheless, collection and transportation represent the largest proportion of the SWM budget in developing country cities. For this reason, the introduction of optimal systems in these stages of the waste stream can produce significant outcomes.

With regard to terminology, the division between collection and transportation is sometimes blurred. In this section, the whole operation of transferring wastes from their source to the final disposal sites (or intermediate treatment facilities) is referred to as "collection and transportation." When these two words are used separately, "collection" means "gathering

Table 2-14 Problems and solutions at the discharge stage according to the form of collection

Collection form	Problems	Solutions for the waste generators
Door-to-door collection	Waste scatters when loading it onto the collection vehicle.	・Use a waste container that minimizes litter when loading.
Curbside collection	The wind or animals scatter waste placed at the curbside. Waste scatters when loading it onto the collection vehicle.	・Use a bag or container that can hold the waste securely. ・Use a container or net that prevents dogs, cats, crows, etc. from scattering the waste. ・Do not place the waste at the curbside too early. (The municipality needs to set the collection times and to notify the residents.)
Station collection	Waste litters the collection points. Waste remains uncollected, disfigures the landscape or attracts rats and flies. Waste is scattered when the collection workers load it onto the vehicle manually, e.g. by using a shovel.	・Place the waste in a plastic bag that should be securely closed. ・Place the waste properly within the designated space. ・Use a container or net to prevent dogs, cats, crows, etc. from scattering the waste. ・Do not place the waste at the collection point too early. (Municipality needs to establish the collection times and to notify the residents.) ・Residents who use the same collection point take turns in cleaning it regularly, as appropriate (depending on the division of responsibilities between the municipality and the residents regarding the management of collection points.)
Bell collection	Waste is scattered when loading it onto the collection vehicle.	・Load the waste onto the collection vehicle carefully. Take every opportunity to avoid litter. ・Use a waste container that minimizes the generation of litter when loading.

Source : Compiled by OTSUKI Noriko

wastes from the various sources" while "transportation" means "transferring the gathered wastes to the final disposal sites (or intermediate treatment facilities)."

(1) Collection methods

One of the technical issues in the collection stage is the selection of an optimal collection method. Table 2-15 shows the major forms of collection and their characteristics.

The selection of an optimal method is merely a process through which solid waste planners consider: which type of collection method in the table they will adopt; what equipment they will use; how often they will collect the wastes; and how they will allocate human resources. Waste planners should examine a range of issues from their social, economic, natural and cultural aspects. Among such issues are: the quantities and characteristics of the wastes, the financial capacity of the municipality, road conditions, the availability of support from the waste generators, lifestyles, the home environment, land use in the neighborhood, and climatic conditions.

Table 2-16 shows how each of these issues or considerations affects the selection of the collection methods. There may be other issues and considerations depending on local conditions. In addition, it is often the case that more than one method is adopted for the area concerned, rather than only one.

Based on their own vested interests, many people are formally or informally involved in collection services. These services also interact with residents in various ways on a daily basis. As a result, the services are often susceptible to political intervention. In addition, since these services are closely associated with the discharge

Table 2-15 Collection forms and their characteristics

Collection form	Method	Advantages	Disadvantages
Door-to-door collection	Waste collectors visit each household and receive the waste. Equipment other than vehicles is often used, such as handcarts and animal carts. It is not feasible to haul wastes collected door-to-door directly to final disposal sites in terms of both distance and operational efficiency. This method is usually combined with station collection, and door-to-door collection covers transfer from the generator sources to the collection points.	Quite convenient for the waste generators. It creates many jobs since it is labor intensive.	High labor cost. Minimal participation of the waste generators in SWM.
Curbside collection	The waste generators place the waste in front of the front door or entrance of their homes. Handcarts and vehicles are used for the collection. Some municipalities use containers that can be lifted mechanically and emptied into the collection vehicles.	Convenient for the waste generators.	Could scatter waste or otherwise disfigure the landscape due to the use of inappropriate containers or a discrepancy between the discharge time and the collection time.
Station collection	The waste is carried to the communal collection points by the residents or door-to-door waste collectors for temporary storage. This method is also referred to as container collection if containers are placed at the collection points. Dump trucks, compactors and other vehicles are usually employed for transportation from the collection points.	High collection efficiency. Once the collection points are established, can provide collection services in hitherto non-service areas due to poor accessibility to individual houses.	Inadequate management of collection points results in the scattering of waste, creating unsanitary conditions. Sites for the collection points may be difficult to secure. Waste, containers, concrete enclosures and other structures at the collection points may be affected by strong sunlight, torrential rain, wind gusts, and animals living nearby. Manual transshipment of waste to the collection vehicles may cause problems, including short shipment, scattering of waste, and loss of time.
bell collection	Waste collectors call the attention of residents by ringing a bell or playing music from a loudspeaker on the collection vehicle. Dump trucks, compactors and other vehicles are usually employed in this method.	High collection efficiency in rather densely-populated areas. Little litter since there is no time lag between set-out and collection.	Inappropriate for residents who are busy or living in high-rise multifamily dwellings. Meaningless if residents are not at home. To avoid this, waste planners need to establish a collection schedule (collection day and time) and make it known to the residents. Municipalities need to operate the collection work according to the set schedule.

Source : Compiled by OTSUKI Noriko

behavior of the waste generators, an approach that goes beyond technical solutions, apart from optimal design of the methods of collection, is required when such services are introduced.

(2) Problems associated with diversifying the collection service providers

It has been considered in most cities that SWM, particularly waste collection services, should be the responsibility of municipalities. Yet, in many developing country cities, the collection capacity does not fully meet public demand for the collection services. In fact, an increasing number of municipalities are promoting private sector participation (PSP) to expand such collection services. The fact remains, however, that the success of PSP depends on the institutional capacity of the municipality, including its ability to supervise and pay private service providers. In addition, it may be difficult for municipalities to provide public waste disposal services for squatter settlements. As if to fill this void, a range of small-scale non-public organizations, such as NGOs, CBOs and micro-enterprises, are increasingly providing such services to these areas (see Sections 2-3-4 and 2-4-3).

Given the limitations of the capacity of municipalities, participation of a range of entities in collection services is essential in order to achieve the key objective of removing waste from every neighborhood. Yet attention should be given to the need for integrated waste management that covers the entire waste flow, as illustrated in Figure 2-5. Unless wastes collected from their source are transported to landfills and properly disposed of, problems arise elsewhere in the form of illegal dumping, for instance. Long-distance haulage and landfill management, which are beyond the capacity of small-scale non-public organizations, should essentially be the responsibility of municipalities.

For this reason, if a municipality wants to promote collection services by NGOs, CBOs and micro-enterprises as a component of its SWM, the municipality should have sufficient SWM

Table 2-16 Issues and considerations in selecting the collection methods

Issues	Considerations in collection method selection	Factors that affect collection method selection
Quantities and characteristics of the waste	Average waste generation on a mass basis; average density; average waste generation on a volumetric basis.	Required volumetric capacities of waste storage containers and collection points; required collection frequency (depending on the relationship between the available space and the waste generation on a volumetric basis); capacity and specifications of the equipment.
Financial capacity of the municipality	Financial capacity for replacing/purchasing and maintaining equipment, hiring workers, etc.	Applicable equipment options; collection frequency; collection form options.
Road conditions	Width; traffic congestion level; gradient; roadbed conditions.	Types and specifications of the equipment.
Configuration and arrangement of the collection points	Configuration that facilitates waste removal from the collection points; distribution density of the collection points.	Waste in bags or waste only? Collection vehicles are compactors, container vehicles or trucks?
Availability of support from the waste generators	Willingness of the waste generators to bring waste to the collection points and support their management; a sense of solidarity among the waste generators.	Collection form options; methods for managing collection points.
Lifestyles	Whether family members are at home or not; their daily schedules.	Collection form options; collection work plan.
Home environment	Availability of storage space depending on, for example, whether the homes are multifamily dwellings or detached houses.	Collection frequency.
Land use in the neighborhood	Availability of space for the collection points depending on, for example, the density of the homes and land ownership.	Collection form options; distribution of the collection points.
Weather conditions	Decomposition rate for organic wastes under hot and humid conditions; possibility of the collection points being inundated due to high rainfall.	Collection frequency; structures for storage containers and collection points.

Source : Compiled by OTSUKI Noriko

capacity so that it can transport wastes that have been collected by these small-scale non-public organizations to the landfills and dispose of them properly.

(3) Problems with the recovery of recyclables at the collection stage

In many cases, recyclables are recovered at the collection stage by collection workers. Problems associated with this practice include low collection efficiency and injuries resulting from picking the waste. The recovery and sale of recyclables often provides an important supplementary source of income for collection workers whose regular pay is usually low. This is why the social aspects of SWM need to be addressed in addition to the institutional and managerial aspects.

(4) Waste transportation

Waste transportation rarely becomes an issue if the final disposal sites (or intermediate treatment facilities) are located near built-up areas, since such transportation is regarded as an extension of the collection services. In areas experiencing rapid urbanization, however, it is physically difficult to construct a final disposal site near the built-up areas. Moreover, the NIMBY (not in my backyard) phenomenon is growing amid democratization and the heightened awareness of city residents. In fact, the tendency is for final disposal sites to be constructed further and further away from built-up areas.

When final disposal sites are far from urban areas, the time taken for driving becomes longer than for collecting if the collection vehicles always transport wastes to the final disposal sites. This is economically unfeasible in terms of the energy efficiency of transportation and operational efficiency of the collection workers. This is because more time is spent on transport than collection. There is even the possibility that wastes will be dumped illegally on the way due to a lack of conscientiousness or inadequate supervision of the drivers and workers. To solve these problems associated with long haulage distances, it is necessary to consider the introduction of transfer stations, where wastes are transferred from collection vehicles to larger vehicles such as tractor trailers.

Higher transport efficiency is achieved when the transfer stations are constructed nearer to the waste collection areas. The nearer the transfer stations are to residential areas, the greater the attention that needs to be paid to the environmental, sanitary and social aspects of this arrangement. Transfer stations, for their part, should be designed to ensure that the working area is closed to the outside with the use of covering and other structures, so that odor emissions, waste scattering and food scavenging by animals can be prevented. When waste pickers are to be given opportunities to recover recyclables, it is necessary to control their entry and exit, and set rules on operational procedures.

(5) Public area cleansing

In developing country cities, the cleaning of streets, parks and other public areas often represents a significant part of SWM.

Cleaning of the streets, parks and other public areas, together with the collection and transportation of waste, plays an important role in SWM in that it removes waste from cities to maintain sanitary conditions. Public area cleaning often represents a major part of SWM as a whole in developing countries [70]. This is due to the following factors:

(i) Traffic scatters the stones and sand on the road surface due to bad road conditions.

(ii) Waste is left uncollected on the streets or in

[70] JICA (1992) estimates that street sweeping accounts for 23% of the total expenditures of the SWM department of the Vientiane Municipality. It represents about 50% of the collection expenditures. According to JICA (1999), street sweeping makes up 39% of the total SWM expenditures in the Tegucigalpa area, Honduras. This is comparable to collection expenditures.

other public areas due to inadequate or inappropriate collection services.

(iii) People litter because there are no litter bins installed in public areas or because people do not observe the discharge rules.

(iv) Waste from landscape care and tree trimmings are generated in large quantities in tropical regions where the vegetation is abundant.

(v) Street sweepers are also often hired without demand assessment under pressure to create jobs.

Steps to be taken to reduce factors (ii) and (iii) include improving the collection services as discussed earlier, installing litter bins for pedestrians, controlling littering, and promoting civic education to ensure that every citizen observes the discharge rules. These steps can reduce the burden of public area cleaning on municipal finances.

Yet the need for public area cleaning remains. To improve this service, the following issues should be considered:

(i) Weighing up the pros and cons of introducing street sweeping cars

Public area cleaning provides a means of creating jobs in developing countries, where labor costs are low. Many women also work as street sweepers[71]. As a result, some of the street sweeping cars are not actually needed in many cases. When they are judged to be necessary, even so, it is important to select street sweepers that can accommodate an operational environment that is significantly different from that in developed countries, since roads in developing countries are often covered with scattered stones and sand.

(ii) Optimizing storage containers, transshipment and transportation for street sweepings

In a typical street sweeping operation, street sweepings collected in containers by the sweepers are transshipped to vehicles at transfer points and hauled to the final disposal sites. The time taken for transportation to the transfer stations and transshipment there should be reduced for operational efficiency. Steps to this end include: the use of large containers as far as possible; the adoption of a system that allows for direct transshipment to vehicles at the transfer points without unloading the street sweepings onto the ground before loading; and the selection of sweeping routes that minimize the need for sweepers to cross the street.

To ensure the safety and health of sweepers, it is important for them to wear gloves, masks, uniforms and other protective gear.

(6) Maintenance of vehicles

Solid waste management employs vehicles and heavy machinery for the processes of collection, transportation and final disposal. The number of service years of such vehicles is about seven years in developed countries, but often more than ten years in developing countries. Decrepit vehicles themselves cause air pollution and may block the traffic if they break down on the road. Moreover, frequent breakdowns hinder the reliable delivery of collection services and the proper management of final disposal sites. Therefore, the maintenance of vehicles is an important issue, but it faces the following problems in developing countries:

(i) Municipal solid waste in developing country cities tends to be high in organic and moisture content and the density is therefore also high. This means that the weight load on vehicles tends to be higher than in developed countries, where the load capacity is specified in volume rather than weight.

(ii) The operational environments are harsh, with roads in a bad state of repair and landfill sites in a muddy condition due to the high rainfall.

(iii) Vehicles are often provided by external donors. The problem with this is that spare parts and technical support are unavailable where there are no agencies of the vehicle manufacturers concerned. Another problem is the difficulties associated with the systematic procurement of spare parts, unified inventory control, and the acquisition of repair skills, if the fleet has various types of vehicles.

[71] The website of UNEP/International Environmental Technology Centre (http://www.unep.or.jp/ietc/ESTdir/Pub/MSW/SP/SP3/SP3_4.asp (Accessed in October 2004).

(iv) Operational control procedures such as keeping vehicle operation records and inventory ledgers of vehicles and spare parts are not institutionalized.
(v) Financial mobilization to replace vehicles and procure parts is inadequate. Even if funding is adequate at the municipality level, the SWM department often cannot spend even a small amount of money at its discretion to take prompt action since municipalities tend to be excessively fastidious in ensuring accountability for their expenses.
(vi) Other departments often control the entire vehicle fleet of the municipality, hindering prompt or flexible action by the SWM department.

To solve these problems, a number of steps should be taken when introducing vehicles and heavy machinery. Among such steps are: designing specifications to accommodate local conditions (such as natural conditions, road conditions, the quantities and characteristics of the waste, and the types of the existing vehicles), instructing how to use and manage, establishing meticulous aftercare systems, improving management frameworks, and formulating financial plans to purchase spare parts and equipment in the future.

2-6-3 Intermediate treatment

Intermediate treatment has many advantages, such as volume and weight reduction and stabilization of the waste, but the introduction of this treatment requires careful examination of its cost-effectiveness.

Intermediate treatment refers to any type of processing applied to the waste between its collection and final disposal. This has many advantages: volume and weight reduction of the waste, stabilization of the waste (elimination of decomposability and toxicity), effective use of resources, and reduction of its impact on global warming.

The following paragraphs summarize major options for intermediate treatment and issues associated with each option. Waste reduction and resource recovery are also discussed in Section 2-6-5.

(1) Size reduction

Size reduction processing may be applied to bulky wastes such as furniture and electrical appliances so that they can be easily sent for final disposal. After size reduction processing, recyclables may be recovered, including the recovery of iron using powerful magnets. In developing countries, however, such bulky wastes are mostly recovered as recyclables before their collection and transportation. Therefore, size reduction processing is largely applied as part of a pretreatment process for composting, which is discussed later.

(2) Incineration

Incineration is a major technique for intermediate treatment in developed countries. Japan's municipal waste incineration rate is exceptionally high. This is because landfilling is costly due to the high price of land, and the volume and weight reduction of the waste afforded by incineration greatly reduces the final disposal costs. In addition, energy recovery from incineration helps prevent global warming. Such energy recovery is called "waste-to-energy" as an alternative to fossil fuel electric power generation.

However, incineration may not be appropriate for many cities in developing countries for the following reasons:
(i) Final disposal costs are generally low in developing countries since land prices are relatively low and the final disposal methods are simple. Waste reduction by incineration therefore does not significantly reduce the final disposal costs. Hence, incineration is irrelevant as a financial measure in general. The impact of incineration on waste volume reduction is less when the density of the waste is higher than in developed countries, which is often the case.

(ii) A comparison with the composition of waste in cities in developed countries shows that waste in the developing countries contains more kitchen waste, earth/sand and yard trimmings, and less paper and plastics. Thus the calorific value of the waste is lower, which requires supplementary fuel for incineration, in other words, extra operational costs.
(iii) There is a lack of financial capacity to cover the cost of the construction, operation and maintenance of incinerators.
(iv) There is a lack of highly skilled personnel that can control pollution and maintain stable incinerator operations, which are made more difficult by the variable composition of the waste.

For these reasons, before introducing the incineration process, it is necessary to weigh up a number of factors, including the level of difficulty of securing final disposal sites in the future, the costs of final disposal, trends in the quantities and characteristics of the waste, and the technical level of the municipality [72].

(3) Composting

Composting refers to a microbial process in which the organic portion of the waste is allowed to decompose under aerobic conditions. The resultant product, known as compost, does not give off odors or decompose. Compost is applied to farmland and pasture as a soil conditioner or organic fertilizer. It is also used as a cover material for landfill sites. Composting has a number of advantages. It reduces the waste to be disposed of in landfills. When the compost is put to use in landfills, it reduces methane emissions caused by the anaerobic decomposition of the organic portion of the waste. The contribution of methane emissions to global warming is much greater than that of carbon dioxide emissions. If impurities such as plastics and metals are removed from the compost for the purpose of quality control, as discussed later, they can be recovered as recyclables.

Due to these advantages and the high organic content of MSW in developing countries, composting is generally regarded as a promising option for waste treatment. However, the following issues should be considered before deciding to apply this option:

(i) Demand prospects for the compost

Demand in the agricultural sector is subject to seasonal fluctuations. The construction of storage facilities and other steps are required to cope with these fluctuations.

(ii) Economic viability

The sales price of compost should be set based on such factors as the price of alternatives (synthetic fertilizers and manure) and the willingness to pay on the part of farmers (consumers). The cost of transportation between the market (farms) and composting facilities should also be taken into account. Municipalities should be ready to bear a financial burden caused from economic viability lower than their expectations.

(iii) Quality control

To improve the quality of compost, it is necessary to introduce separate collection or remove impurities at the pretreatment and final phases of composting. Demand forecasting in (i) and price setting in (ii) should be carried out according the quality of the compost. A viable option may be to compost only market waste, which is generally organic and stable in composition.

Photo 2-7 An example of small-scale composting equipment (in Manila, Philippines)

The rotating drum allows for mixing and aeration.

[72] The World Bank has prepared a useful and comprehensive tool for decision-makers for the introduction of municipal solid waste incineration in developing countries. Rand et al. (2002).

(iv) Disposal of residues

Residues are inevitable. It is necessary to forecast their quantities and develop a disposal plan.

(v) Consensus building

It is inevitable that the composting process will produce foul odors to varying degrees. This is why consensus building with local residents is necessary, not to mention careful site selection. Some composting facilities installed without prior consensus building were forced to close [73].

There are two types of composting: centralized large-scale composting that serves the whole or part of the area of a city and decentralized small-scale composting that covers a certain number of waste generators or a community. Composting processes can be largely divided into two types: the windrow process and the aerated static pile process. The former is a simple method of building the material (waste) into a large pile like a ridge and physically turning (mixing) it on a regular basis to maintain aerobic conditions. The latter method involves building the material into a pile over a vent pipe and forcing air through the material. For facility operation, a wide range of options are available in relation to shredding, fermentation, recyclables recovery, and a choice between manual or mechanical operation for each process. The facility design and operational management should accommodate local conditions, including: the quantity and quality of the incoming wastes, the general conditions in the recyclables market, wage levels, the area of available land, and the distribution and fluctuations in compost demand [74].

(4) Biomass energy

Biomass energy is energy based on the carbon in plants produced by photosynthesis, which uses the energy from sunlight. When biomass energy is consumed, carbon is released. This carbon was originally in the air when the biomass was formed. Therefore, biomass energy does not increase carbon dioxide in the air, unlike oil, coal and other fossil energy sources. This is why biomass energy is regarded as a renewable form of energy that does not contribute to global warming.

Since food residues, yard trimmings and paper in MSW are broadly regarded as biomass, energy produced by the incineration process discussed in the preceding paragraphs is a type of biomass energy. When the term "biomass energy" is used in a narrow sense, it refers only to energy produced using industrial organic wastes, that is, chaff, bagasse (residues left after the extraction of the juice from sugar cane), manure and other similar wastes that are generated in large quantities. Biomass energy can be used by burning biomass directly or the gas or oil produced from the biomass through methane fermentation or pyrolysis to generate heat or electric power. Ethanol, which is produced by the alcoholic fermentation of biomass, can be used as an alternative fuel to gasoline [75].

2-6-4 Waste recycling and reduction

Waste recycling and reduction is an important element of SWM in developing countries as well as developed countries in terms of reducing SWM costs, effective use of resources, and lessening the burden on the environment. Developed countries emphasize waste reduction, reuse, recycling, heat recovery and proper disposal in this order of priority. This idea is increasingly accepted by developing countries. This section focuses on the promotion of the 3Rs (reduce, reuse, recycle) in the context

[73] In Katmandu, Nepal, for example, a composting plant that had been constructed with aid from a bilateral donor was forced to suspend operations in the face of many complaints from local residents. In a suburb of the Tunisian capital, an automatic composting plant was built with aid from another bilateral donor. Yet the Tunisian Government decided to close the plant under pressure from local opposition. Instead, a new plant is being constructed in a rural area.

[74] Hoornweg et al. (1999) provides a useful guidance note for the introduction of composting in developing countries. This document is downloadable from the website of the World Bank.

[75] Ikegami (2002), in the introduction, provides a useful reference material on the use of biomass energy in the solid waste sector.

of SWM in developing countries.

The characteristics of waste reduction and recycling in developing countries are as follows:

(i) The informal sector plays a large role.

(ii) The value of recyclable materials is higher than in developed countries, allowing recycling to be economically viable. With the growing importation and exportation of recyclables, the price of recyclables is susceptible to market fluctuations.

(iii) Recycling such as waste pickers provides an easy access to income for workers under harsh employment conditions.

(1) Recycling

1) Flow of recyclables recovery

As the waste flow chart in Figure 2-5 illustrates, materials in waste that retain a utility value may be traded in the recyclables market. The recovery of recyclables involves reclaiming what can be traded in the market from wastes. In developing countries, a large part of recyclables recovery is undertaken by the private sector, including the informal sector. By the access to the recyclables market, a wide variety of wastes are recovered, including bottles, cans, paper, metal and plastic. It is estimated that the recycling rate-the proportion of recyclables to be recovered in waste as a whole-is generally higher in developing countries than in developed countries. Behind the high recycling rate are urban population growth and limited employment opportunities. Low labor costs mean that it is possible to gain profits from the recovery of even recyclables with a low market value. Thus recyclables recovery in developing countries is more related to economic gains than to the goal of SWM in many cases.

The fact remains, however, that the recovery of recyclables has a number of advantages in the context of SWM, including the effective use of finite resources, the reduction of waste quantities to be transported and landfilled, and the extension of the service life of the final disposal sites. Recyclables recovery as a policy of the municipality is aimed at obtaining the benefits of these advantages.

The locations at which recyclables can be recovered are roughly divided into four, although they are subject to local conditions.

(i) Generation sources and their surroundings

Collectors make the rounds of households, collection points and establishments.

(ii) Collection process

Collection workers recover recyclables through their work (including the transshipment process at the transfer stations).

(iii) MRFs

Recyclables are separated from wastes and recovered at materials recovery facilities (MRFs, also known as recycling centers). At some MRFs, workers on both sides of a belt conveyor pick out specified recyclables from wastes on the moving belt. Other MRFs are smaller-scale community-based facilities that are equipped with separate containers for different types of recyclables. Waste generators bring recyclables to these facilities and place them in type-specific containers.

(iv) Final disposal sites

Waste pickers recover recyclables from wastes at the final disposal sites.

The recyclables stream after this primary recovery is complex. Yet recyclables recovered here generally go to secondary collectors/separators known as junk shops or intermediate processors for use in manufacturing products. For reference, Figure 2-6 shows the stream of paper (including recycled paper) and paper products in Malaysia.

2) Actors in the recycling process

It is assumed that the following actors input waste into the recycling process. Note that two considerations should be taken into account. Firstly, in developing countries, the informal sector plays an important role in the recycling process, unlike in the developed countries, as

discussed earlier. Secondly, municipalities are not so enthusiastic about recycling as a result.

(i) Households

The collection rate of such materials as glass, cans and plastic by collectors will improve if source separation is promoted at the household level. Source separation of organic wastes is an effective option in municipalities where there are favorable conditions for recycling these wastes, which represent the largest share of MSW in developing countries. It is common practice for collectors, scrap dealers and communities to recover recyclables from waste collection points.

(ii) Communities

Recycling activity at the community level is a major component of community-based solid waste management, which is now attracting attention. Such activity revolves around the composting of organic wastes and the collection of recyclables. See 2-4-3 for activities at the community level.

(iii) Establishments and markets

Recovery by scrap dealers is common.

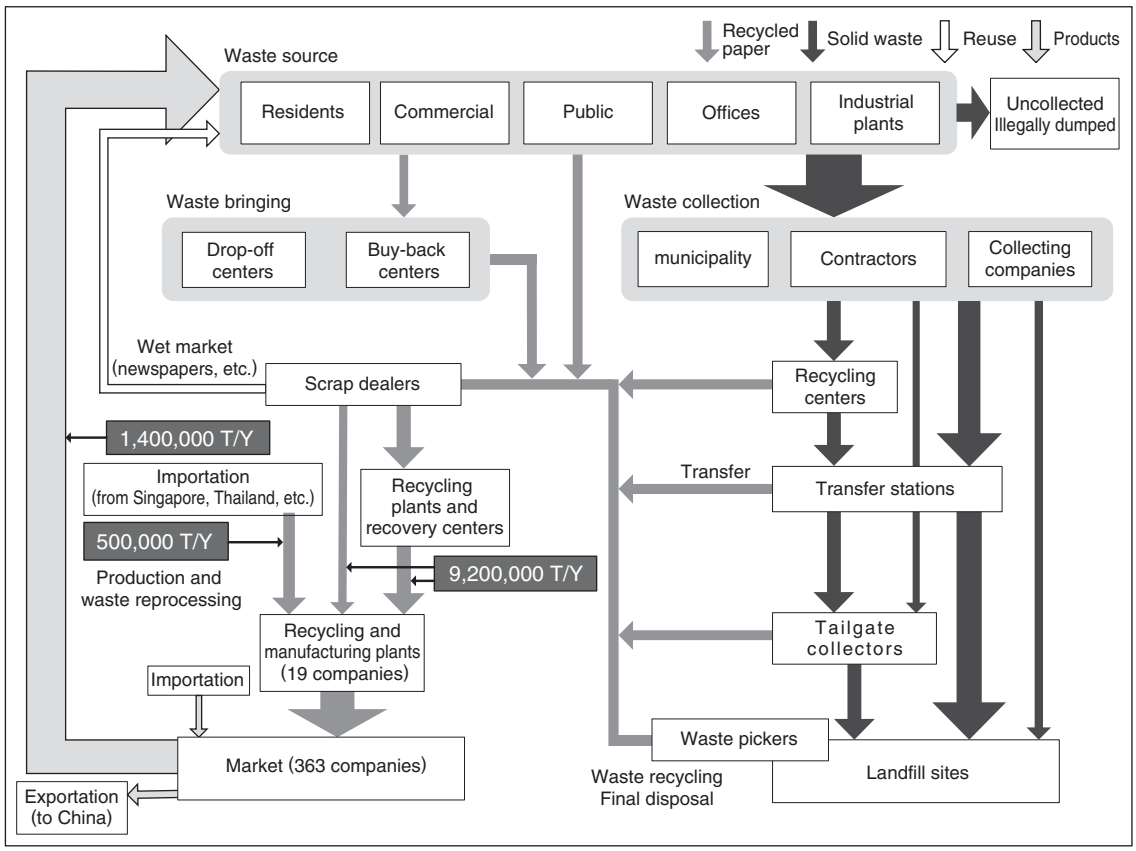
(iv) Scrap dealers and recyclers

Recyclables are further sorted by scrap dealers. Collection and sorting at this level may be multi-layered. Junk shops are sometimes concentrated in a particular area, as exemplified by auto parts dealers in large cities. The transportation costs involved vary according to the distance to the users of the recycled materials.

(v) Collection workers and waste pickers

Collection workers do recover recyclables during their work. They typically mount a basket on the collection vehicle for this purpose. Waste pickers recover recyclables from wastes at the landfill site.

Figure 2-6 Flow chart of the paper and paper product stream in Malaysia



Source : JICA (2004e)

(vi) Municipalities

Materials that can be recycled are already in the recycling stream without the intervention of the municipalities. Under circumstances where recyclables are traded on a market basis, it is difficult for municipalities to implement effective recycling programs. Separate collection by municipalities deserves caution since it pushes up the total collection costs.

3) Recycling markets

The scale of recycling is largely dependent on the market for products made from recycled materials. To promote recycled products, it is important for governments to raise public awareness and purchase such products as a matter of policy.

Recycling activity is limited in island nations and other countries where the recycling market is small.

4) Characteristics of the urban informal sector

Informal recycling is practiced along with waste collection services in many countries. How to maintain the existing recycling system is an important issue for SWM planning. Such an informal recycling system has the following benefits [76]:

(i) Creation of employment and income
(ii) Savings incurred through waste reduction
(iii) Extension of the service life of landfills through reduction of waste
(iv) Conservation of natural resources
(v) Savings on foreign currency through reduced reliance on materials and energy imports
(vi) Higher cost-effectiveness than formal recycling systems

Mr. NAKANISHI Toru has conducted a study on the urban informal sector in Metro Manila [77]. He concludes that scrap collection is virtually the only sector that provides a rather easy income means of access to people who have just moved from the provinces-a labor market that guarantees freedom of entry to some extent.

In the study, NAKANISHI first puts forward the hypothesis that: "The competition mechanism is not working effectively in markets in the urban informal sector. The mechanism is made irrelevant by the division into groups with the same blood relationship or groups of people from the same province. This division is deepened by mutually-beneficial personal relationships that have been formed to avert risks arising from imperfections in information. Because of this division, the labor market has the nature of a monopolistic buyers' market."

Then NAKANISHI proves this hypothesis by presenting four major facts. Firstly, each scrap collector concludes a verbal (or tacit) agreement with his or her scrap trader. Secondly, there are disparities in the buying prices for scrap. Thirdly, scrap dealers make loans to their scrap collectors. Fourthly, traditional values and norms are built into the patron-client relations between them [78].

5) Considerations for municipality involvement

A major difference between recyclables recovery as municipal activity and the same process as a private sector activity is that the former is based on rules set by the municipalities while the latter is based on economic incentives, that is, profitability. Separate collection rules for the private sector cannot be set by municipalities, who by their very nature cannot possibly be flexible enough to cope with the ever-changing market conditions for recycled products. Moreover, since municipality rules have to be simple, they usually separate wastes by the types of materials, such as bottles and paper. The problem is that materials of the same type are lumped together regardless of their market value. Furthermore, when there is a system in place whereby waste generators sell recyclables to scrap dealers, only materials with a low market value are put out for separate collection by the municipalities.

For these reasons, the following considerations should be taken into account if the

[76] World Bank (2001)
[77] Nakanishi (1991), pp. 130-149.
[78] *ibid*.

recovery of recyclables is to be introduced as the activity of the municipality.

(i) Prospects for recycling becoming a burden on municipal finances

For the reasons mentioned above, separate collection by the government involves many risks. Municipalities should be ready to mobilize financial resources to cope with these risks. Municipalities should also recognize that their institutions are poor at selling things. A major precondition for bearing such a financial burden is to focus on improving SWM, including cost reductions in waste transportation and final disposal and extension of the service life of landfills, rather than on gaining profits directly from recyclables recovery. In fact, final disposal costs tend to be low in developing countries due to the simple final disposal methods. In many cases, the recovery of recyclables has little impact on the reduction of final disposal costs. In such cases, municipalities should give priority to improving the final disposal sites over mobilizing funds for recyclables recovery.

(ii) Promotion of a dialogue with waste generators

When municipalities call on waste generators to practice source separation, they need to provide information not only on how to separate wastes, but also on why the separation is necessary and where the separated wastes will go after their collection, in order to ensure their compliance.

A dialogue should be conducted to gain the cooperation of the waste generators to clarify the division of responsibility for recyclables recovery. The collection of mixed wastes is convenient for the waste generators, but puts a strain on the separation process at resource recovery facilities. On the other hand, source separation poses difficulties for the waste generators, but makes it possible to simplify the separation process.

Dialogue is also needed to build a consensus with local residents who may be affected by the construction of resource recovery facilities. Such a consensus is also needed on how to control possible noise and foul odors from these facilities.

(iii) Intervention in existing separated collection systems by the private sector

Supply and demand in the recyclables market are subtly balanced. If municipality intervention in separate collection destroys this balance, the livelihoods of the private sector actors involved are threatened. Municipalities should refrain from intervention in separate collection by the private sector as far as such collection of specific materials is deemed sustainable based on the prospects for recyclables generation. Rather, municipality should focus on measures designed to support recyclables collection by the private sector.

6) Environmental labeling

Environmental labeling is a measure to promote recycling and recycled products. An increasing number of developing countries have already introduced environmental labeling. Reducing packaging and containers and the use of plastic bags at the retail sale level requires changing the mind-set of consumers.

(2) Source reduction

As the income levels in developing country cities rise, there is an increasing need for source reduction.

1) Reduction by households

At the household level, kitchen waste can be composted or used for livestock feed. Wastes generated from high income households tend to contain a high proportion of recyclable wastes.

2) Reduction by establishments

Many establishments adopt cleaner production, waste minimization, and other techniques to reduce both production costs and wastes. These managements are attracting attention as win-win approaches that are designed to both improve productivity and reduce the pollution load[79], with many businesses still

reluctant to respond to calls for environmental regulations as part of industrial environmental management. However, the widespread adoption of these approaches is hampered by difficulties in distributing information and securing the human and financial resources.

3) Extended Producer Responsibility (EPR)

An increasingly number of countries have adopted the concept of Extended Producer Responsibility (EPR), or are considering adopting it. At issue is: (i) the scope of wastes for which producers are to be held responsible; and (ii) how producers fulfill their responsibilities.

2-6-5 Final disposal

It is insufficient to merely meet the objective of "removing waste from the neighborhood." Without proper final disposal, all the proceeding processes do not solve the problem-they just transfer the problem to another location. This goes against the idea of sustainable development and imposes environmental pollution on the future generations. Any intermediate treatment produces residues no matter how advanced it is. Such residues as well as untreated wastes have to be transported to the final disposal sites and disposed of there under proper management.

(1) Problems and solutions

Open dumps can and must be improved in stages as appropriate.

Final disposal sites are more likely to be open dumps in developing country cities when their economic levels are low. Open dumping is a method of just disposing of waste without any management and environmental controls. Problems with open dumping and their solution are summarized below:

(i) Control of incoming wastes

A lack of control of incoming waste makes landfill management difficult. It is necessary to record the type and number of incoming vehicles and the amount of waste they carry in. It is desirable for a truck scale to be installed at the entrance of large landfill sites that have a long service life.

(ii) Landfill boundaries

An undefined landfill boundary allows the uncontrolled expansion of a landfill over time. This not only aggravates the problems in (iii) and (v) below, but also constitutes a factor contributing to conflicts over land ownership and other affairs. It is therefore necessary to define the landfill boundary by, for example, surrounding the landfill area with enclosing bunds and planting trees in the outer zone.

(iii) Method of landfill operation

Wastes are not just unloaded into the landfill. Such wastes should be leveled and their surface should be compacted (surface compaction[80]). Volume reduction by this method makes room for more waste, leading to more efficient use of the landfill space. Note that no further action promotes anaerobic fermentation of the organic portion of the waste. This in turn produces landfill gases, such as methane or other flammable gases. These gases, if ignited, cause smoke damage to the landfill and the surrounding areas. To prevent smoke damage, the waste, after surface compaction, should be covered with earth or an alternative (e.g. construction soil, and stabilized waste after the decomposition process is completed). This operation is called soil covering. Soil covering is also aimed at preventing the landfill layer from generating foul odors and providing a breeding ground for flies and rodents.

[79] For specific efforts and issues, see JICA (2003c) and committee for the promotion of Cooperation on Cleaner Production, JICA (2001). To download the former, go to http://gwweb.jica.go.jp/km/km_frame.nsf and click Bunyabetsu Kadai [Sectoral issues] and select Kogai Taisaku [Pollution control], and Kadaibetsu Shishin [JICA's thematic guideline] can be downloaded. The English version of the latter can be downloaded by library search from http://lvzopac.jica.go.jp/library/indexeng.html as a PDF file (as of May 2005).

[80] The process of compacting the surface of the dumped waste in a landfill with heavy machinery or by other means. Surface compaction increases the density of the waste and thus the landfill capacity, extending the service life of the landfill and lessening the risk of landslides and other disasters.

As a general guideline, when the haulage amount exceeds 50 tons a day[81], sufficient leveling and surface compaction necessitates the introduction of heavy machinery, such as bulldozers and wheel loaders, for soil covering.

In the case of soil covering, gas collection pipes must be installed given the risk of accumulated landfill gases exploding. Landfill gases can be vented into the air directly. They can also be collected and burned to convert methane to carbon dioxide, which has far less greenhouse effect, or to generate electricity and heat.

(iv) Approach roads and onsite roads

If approach roads and onsite roads are in a bad state of repair, they become muddy in the rainy season, making it difficult for vehicles to use them. Without access to the inside of a landfill, vehicle drivers and workers have no choice but to unload waste at the entrance or the surroundings of the landfill, leading to disorderly dumping. This is why these roads should be made less vulnerable to rain with pervious fill or by other means.

(v) Leachate management

Leachate refers to the moisture content of the waste itself or rainwater infiltrating into waste that has seeped out. Leachate is often recognized in developing countries as blackish water seeping out of a mountain of waste at landfills. It contains dissolved substances such as organic matter and its decomposition products, including chlorine and heavy metals that were originally contained in the waste. Leachate causes water pollution when it comes into contact with surface water or groundwater.

Leachate management starts with minimizing leachate generation. This can be done by soil covering to prevent the infiltration of rainwater, minimizing the working face and collecting and draining rainwater around the landfill. The leachate generated should be collected by leachate collection pipes laid on the bottom of the landfill layers for treatment. Treatment options include: a circulation method whereby the leachate is sent to a lagoon for primary treatment and then sent back to the landfill; aeration; and the multistage lagoon system for discharge into rivers. Selection of the most appropriate option is made taking into consideration such factors as precipitation, evapotranspiration, the area of the landfill, local water use and cost.

To adequately collect leachate so that it will not seep out into the natural water system, a number of steps should be taken before and during the construction of the landfill. These steps include: selecting a site with impervious layers, compacting cohesive soil, and laying an impermeable liner[82]. The installation of collection pipes expands the aerobic area in the landfill layer, thus promoting the decomposition of the waste.

(vi) Litter

Windblown litter disfigures the surroundings of a landfill. In addition to soil covering, a number of steps should be taken to prevent littering with waste. Among them are minimizing the working face, using a mobile fence around the working face, and building a separate fence around the site.

(vii) Waste pickers

Many waste pickers recover recyclables at landfill sites. They scramble to compete with each other for transportation vehicles to get recyclables with a higher market value. As soon as the wastes are unloaded, the pickers start working. This not only places the waste pickers at risk, but also inhibits unloading and soil covering work, bringing them into conflict with the sanitation authorities.

Just removing the waste pickers from the landfill sites is a difficult option. Recyclables recovery involves risks, but it provides an important source of livelihood given the limited

[81] World Bank, et al. (1998), p.14; Flintoff (1976), p.137.

[82] Johannessen (1999) provides a useful guidance note for the introduction of leachate management. Johannessen and Boyer (1999) report on the state of landfills in developing countries. Both documents are downloadable from the website of the World Bank.

job opportunities and the low educational levels of the poor. The short-term solution would be to control recyclables recovery work with rules that specify the hours during which waste pickers are allowed to work and exclude unregistered waste pickers. The long-term solution would be to encourage waste pickers to change jobs by providing opportunities for education and vocation training.

Photo 2-8 Leachate recirculation treatment system at a landfill in Mexico City

Leachate recirculation treatment at a landfill in Mexico City, Mexico. This system is low in cost and simple in structure, but high in treatment capacity. A gravel layer in the intake section (inset) and the pumping section (main photo).
Source : Yamamoto et al. (2003)

(2) Considerations for improving landfills

As discussed in Section 2-3-2, most of the SWM budget in developing countries is spent on the collection and transportation of wastes. Little is left for final disposal. As a result, open dumping and similar practices are given tacit approval. Yet the impacts that improper landfills have on the environment and landscape, and the public aversion to landfills as a whole, promotes the NIMBY phenomenon and makes the construction of new landfills extremely difficult. Therefore, converting existing landfills to sanitary landfills is essential in that it not only reduces the adverse effects on the environment and society, but also properly maintains the waste stream that ends in final disposal in a sustainable manner.

To improve landfills, the following considerations should be taken into account:

1) Understanding and support of decision-makers

Lack of understanding on the part of decision makers regarding the seriousness of the problem is one of the factors behind improper management at the final disposal sites in developing countries.

Once wastes are transported to the final disposal sites, many people think that the wastes have been disposed of properly. They rarely have any concern about what is happening at the landfills. Local residents around landfills remain small in number unless urbanization progresses. The public pay little attention to the fact that waste pickers, squatters and other vulnerable people are experiencing health hazards because of the landfills. Consequently, policymakers do not have much interest in problems with landfills. In urbanized societies where the adverse effects of landfills are attracting media attention, some politicians may begin to fan the NIMBY sentiment.

Again, appropriate final disposal is indispensable for full and proper solid waste management. This requires the mobilization of the necessary financial resources. Waste disposal costs at sanitary landfills amount to 3 to 10 dollars per ton depending on local conditions [83], such as the methods of procuring cover materials and the topographical features. Financial sources may be the general account budget of the municipality, the introduction of a system to charge waste collection services, raising collection charges, or financial support from donors overseas. Whatever the financial source may be, the understanding and support of decision-makers are indispensable.

2) Securing engineers

Many of the solutions to improving landfills identified above require some kind of equipment or facilities. For such equipment and facilities to

[83] Einsiedel (2000), p.152. For example, 200 liters of fuel is needed to operate a 180-horsepower bulldozer for eight hours for waste leveling, surface compaction, and soil covering. Many developing country cities cannot afford such additional fuel costs.

serve their original purpose, the people involved in landfill management needs to have sufficient skills. In other words, it is necessary to develop and hire appropriate human resources or train engineers. However, developing countries where open dumping is a common practice have virtually no practical skills for sanitary landfilling. This is why on-the-job training should be provided to achieve step-by-step improvements as shown below.

3) Setting appropriate levels and selecting solutions for improvement

In general, four levels can be set towards the goal of sanitary landfill.

The items to improve in relation to sanitary landfill sites and how far the environmental and social impacts can be minimized should be decided appropriately in relation to the characteristics and quantities of waste to be disposed of, the vulnerability of the receptors affected, the distances to them, and other factors that determine the relationship between the landfill and the receptors. The first step toward this end is to accurately assess the assumed impact based on local conditions, including: whether hazardous wastes are accepted; whether there is a water source used for drinking water; the distance to the aquifer and the geological conditions in between; and the population of the neighboring residential area and the distance to it. A wide range of options for improvement are available and their outcomes will vary greatly. It is necessary to select the option that is most appropriate to the level that has been set as a goal.

4) Step-by-step improvement

For many developing countries, it is often difficult to take all the necessary options at once due to technical and financial restraints. For this reason, a practical approach-implementing the feasible options in stages-is necessary.

5) Sustaining improvements

Some options for improvement-the introduction of equipment or facilities, for example-produce immediate results. Sustaining the improvements thus made requires strict operational management on a daily basis. To this end, it is necessary to regularly monitor littering, vehicle operations, the components of landfill gases, the properties of the leachate and other items for regular evaluation of the operation and maintenance arrangements of the landfill.

Table 2-17 Levels toward sanitary landfill

Key operations and facilities	Corresponding item number in Section 2-6-5 (1)	Level 1	Level 2	Level 3	Level 4
Control facilities	(i)	○	○	○	○
Measurement of the incoming waste	(i)	○	○	○	○
Enclosing bunds	(ii)		○	○	○
Buffer zone	(ii)		○	○	○
Landfill equipment	(iii)	○	○	○	○
Daily soil covering and gas venting	(iii)		○	○	○
Approach and on-site roads	(iv)	○	○	○	○
Leachate circulation treatment	(v)			○	○
Leachate purification	(v)				○
Seepage control works	(v)				○
Mobile fence for litter prevention	(vi)			○	○

Source : Compiled by OTSUKI Noriko from Matsufuji (1997), pp.1-15.

(3) Development of new landfills

Landfill site selection is the key to the successful development of new landfills; it can significantly reduce the cost of lessening the adverse effects of the landfills mentioned above and facilitate the processes leading up to the completion of new landfills.

1) Criteria for landfill site selection

The following criteria for landfill site selection should preferably be met:

(i) The landfill is far from residential areas.
(ii) The landfill is far from water sources.
(iii) The landfill can provide the necessary capacity.
(iv) The landfill is available considering the aspects of the legal and financial constraints.
(v) Haulage distances are short.
(vi) Cover materials are available in the neighborhood (it would be most desirable if soil produced in the landfill construction process can be used for the cover soil).
(vii) There is little risk of flooding or landslides.
(viii) There is an impermeable layer under the landfill.
(ix) The landfill is far from any airports.
(x) The drainage basin is small.
(xi) The landfill is far from natural parks, historic sites and other areas that require conservation.

The details of the criteria, including the standard distances from residential areas and water sources, the order or priority among the criteria, and the possible addition of other criteria should be considered according to conditions of each landfill site. It is difficult in practice to find a site that meets all these criteria. A more common approach is to select several sites that meet these criteria, if not all, and narrow down the candidates based on the assessment of the environmental impact and economic and financial conditions.

It is worth considering the development of a landfill for use by two or more municipalities under certain conditions. Such conditions include: the concentration of population and economic activity, which makes it difficult to find a site within the city; and the possibility of achieving economies of scale if small neighboring municipalities group together to share a landfill.

2) Considerations for site selection

A lack of consensus with communities is the greatest obstacle to the development of a new landfill. To build such a consensus, it is necessary to ensure the transparency of the development plan by, for example, disclosing information in the early stages where the site selection method is determined [84].

The implementation of a landfill development plan while building a consensus with the communities is a long-term process. Waste planners have to work on such a plan while there are many remaining service years left in the existing landfills. Improving the existing landfills to gain public confidence in landfills and the implementing agencies is also important for the smooth implementation of a new landfill plan.

(4) Landfill closure

Landfills are short-lived compared with many other types of socioeconomic infrastructure. The service life of a landfill is determined by such factors as: the landfill capacity, waste generation, the capacities of other landfills to receive waste, and the level of local opposition. When closing a landfill, final soil covering is implemented to stabilize the surface and the slopes of the landfill.

Even after the landfill is closed, there are ongoing processes in the waste layers: volume reduction under the weight of the waste itself and the covering soil (consolidation settlement), and decomposition of the organic portion of the waste. That means that the closed landfill has an unstable ground base and continues to produce landfill gases and leachate. There is a need to continue to monitor subsidence, the temperature and components of the landfill gases, the properties of the leachate, and the quality of the groundwater

[84] For consensus building, see also Section 2-4-5.

and surface water that may be affected. Proper after-closure management is a major requirement for permanent closure or conversion to farmland, a park, or other purposes, as well as environmental impact reduction.

Chapter 3 Lessons Learned from Donor Experience in Solving Solid Waste Problems (Case Studies)

This section takes up actual cases that JICA has been involved in, draws lessons for future assistance, lists points to consider in aid implementation and assesses factors that contribute to successful outcomes in order to accumulate data on effective approaches to capacity development[1].

3-1 Metro Manila in the Philippines

This section discusses the case of a development study on the formulation of an SWM master plan (M/P) in Metro Manila and a related pilot project (P/P) conducted during the period 1997-1999 in Metro Manila. In this P/P, the community-based collection and recycling of recyclable materials was actively pursued. An advanced form of this community-based approach was later adopted in projects carried out by the ADB and the UNDP. Accordingly, it was determined that Metro Manila could provide a model for consideration of the application of Community-based Solid Waste Management (CBSWM), which has been attracting attention as a recent example of new approaches to development aid. In the following sections, the impact of the implementation of the development study, the factors contributing to its success, and lessons regarding the application of CBSWM are clarified based on the results of a field study. The outcomes of this study are then considered from the perspective of capacity development.

3-1-1 Outline of SWM in Metro Manila and JICA's assistance

(1) Outline of JICA's assistance

Figure 3-1 illustrates the chronological sequence of development assistance for SWM in Manila.

1) Development study

The development study was carried out targeting 18 local governments or municipalities in Metro Manila, with the Metro Manila Development Authority (MMDA) as the counterpart. As a result of the study, the following main items were proposed in the M/P.

(ⅰ) Expansion of target collection areas

(ⅱ) Establishment of four new transfer stations

(ⅲ) Promotion of the collection of recyclables at the source and the construction of recycling centers next to transfer stations for the purpose of raising the recycling rate from the current 6% to 10%; the addition of compost plants as part of the new disposal sites

(ⅳ) The closure of all open dump sites by 2000; improvement of the existing landfill disposal sites and prolongation of their use until 2003

(ⅴ) Construction of a new sanitary landfill disposal site near the San Mateo landfill and commencement of its operation in 2004 (establishment of a compost plant as an annex)

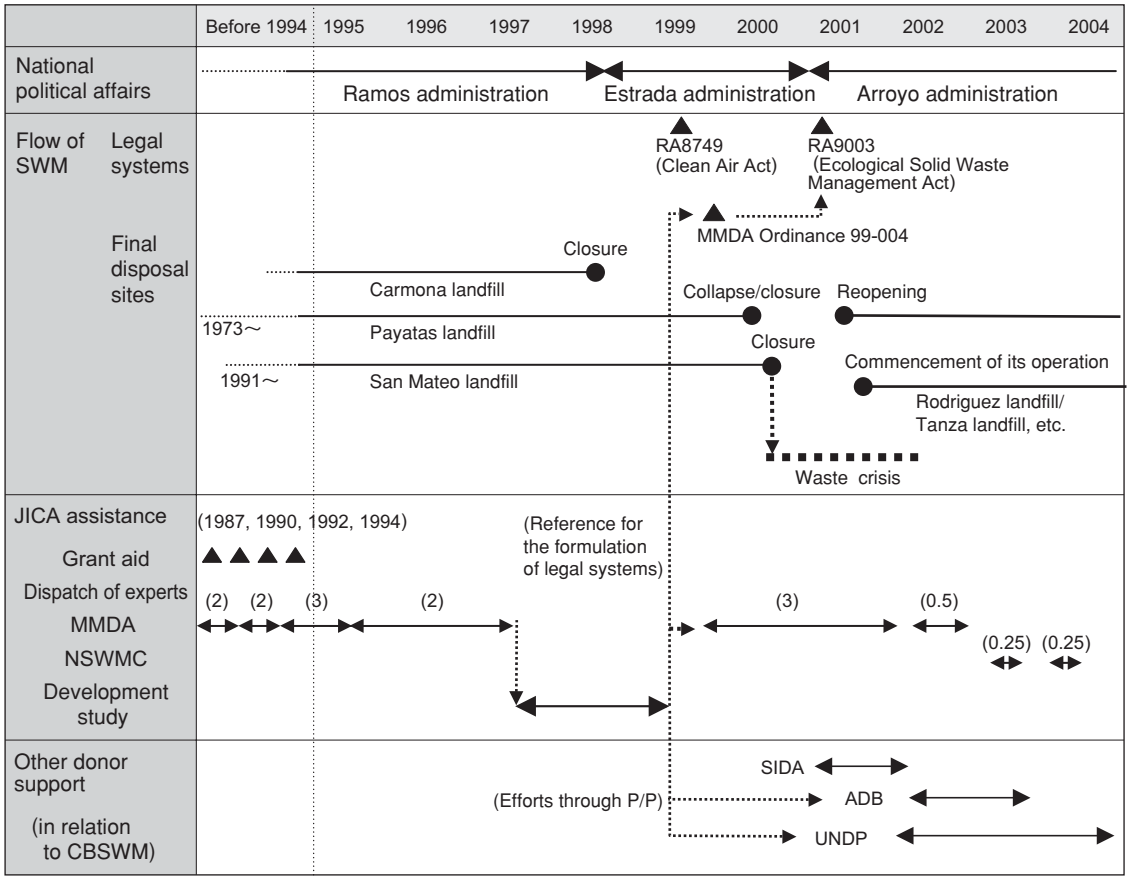
(ⅵ) Construction of the Manila Bay sea landfill, a sanitary landfill disposal site; Commencement of its operation in 2005 (establishment of a compost plant as an annex)

(ⅶ) Construction of an incineration plant; Commencement of its operation in 2005

(ⅷ) Promotion of environmental education and community participation

[1] Regarding the cases of the Philippines and Laos discussed in Chapter 3, the effectiveness, success factor, and obstacles were analyzed based on interview with the relevant people and a field study. The field study was conducted by dispatching a study team (YOSHIDA Mitsuo, OTSUKI Noriko, and KONDO Sei) organized by the secretariat of this study committee for the period from March 15 to 27, 2004, after collecting information by consultants on the site.

Figure 3-1 Flow of SWM and JICA's assistance (Manila)



*The numbers in brackets concerning the "Dispatch of experts" indicate the number of years.

Source : Compiled by OTSUKI Noriko and KONDO Sei based on the development study report and expert comprehensive reports

For the improvement of the San Mateo landfill in (iv) above, and the construction of a new sanitary landfill disposal site in v) above, an F/S was also carried out. In the study process, the following three P/Ps were carried out in order to consider and demonstrate appropriate proposal methods.

(ⅰ) Collection system improvement project

Primary collection using pushcarts was introduced to the three barangays[2] that had a low solid waste collection rate. In these barangays, collection started by determining the waste collection points and a method of wage payment for primary waste collectors through a consensus-building process with the residents. The effectiveness of this collection method in areas where the official collection system had access difficulties was confirmed.

(ⅱ) Community-based recycling activities

In two barangays, the sorting and collection of recyclables at the source, and sale of recyclables were tried out through workshops by barangay chairpersons and residents, the structuring of a core group, and the construction or establishment of recycling centers or stations.

(ⅲ) Education and PR activities concerning solid waste and environmental issues

A one-day environmental tour was planned and carried out with the participation of 45 high school students and 11 teachers. The group visited the Payatas open dump and San Mateo landfill. On the way, lectures on solid waste issues were given. The tour was videotaped for distribution to schools as waste education materials.

[2] Barangay is referred to as the smallest administrative unit of the Philippines.

2) Dispatch of experts/Grant aid

Before the development study, grant aid was provided throughout the four grant periods between 1987 and 1994. Through this grant aid, equipment for waste collection and disposal, such as compactor trucks and dump trucks, was provided[3]. Furthermore, throughout the periods between March 1988 and April 1997, four long-term experts were dispatched successively to MMDA. They contributed towards the maintenance and management of the equipment provided through the grant aid as well as assisting in the smooth start of the development study[4].

After the completion of the development study, JICA continued to dispatch a long-term expert for three years from March 1999, so that the M/P could be promoted. From November 2002, a short-term expert was dispatched in order to help improve environmental education materials.

As described below, based on the Republic Act No.9003 (RA9003), a new SWM system was established. In order to strengthen the administrative capacity of the National Solid Waste Management Commission (NSWMC), which is the administrative body for the new SWM system, a short-term expert was dispatched twice during 2003 and 2004.

(2) Major events concerning the Metro Manila SWM

1) Waste crisis in 2001 and the current situation related to final disposal

As illustrated in the above chronological table, in 2000, which was the year following the completion of the development study, the Payatas open dump and the San Mateo final disposal site were closed. As a result, Metro Manila faced a waste crisis, having lost virtually all its final disposal sites. As a relief measure, the Payatas open dump was reopened in the middle of 2001, and a new disposal site was established by Rodriguez Town in Rizal Province. These two disposal sites decided to accept solid waste from Metro Manila.

Currently, the Rodriquez disposal site is accepting solid waste from twelve local governments/municipalities in Metro Manila. Among these municipalities, two are also using the Tanza landfill in Navotas City. Another six local governments and municipalities have secured their own disposal sites in their local areas[5]. However, none of these six disposal sites are sanitary landfill disposal sites. Accordingly they are to be closed or to be refurbished to become sanitary landfills by 2006, according to RA9003.

2) Enactment of new laws

Two important Republic Acts concerning SWM were recently enacted in the Philippines. One was the Clean Air Act (RA8749), which was enacted in June 1999. This act made it extremely difficult to treat solid wastes by incineration. The other was the Ecological Solid Waste Management Act (RA9003), which was enacted in January 2001, right after the start of the Arroyo presidency. RA9003 stipulates the following: i) For the purpose of promoting the Act, the NSWMC, chaired by the secretary of the Department of Environment and Natural Resources (DENR) should be established; ii) the NSWMC should formulate an SWM framework at the national level; iii) Local Government Units (LGU)[6] should formulate SWM plans on the presupposition of a 25% reduction in the volume of waste for final disposal through the promotion of recycling and composting and the closure of final disposal sites other than those consisting of sanitary landfills, and both needed to be achieved within five years after enactment; iv) Each barangay should promote the sorting, collection, recycling or composting of recyclables by establishing a Materials Recovery Facility (MRF),

[3] To Metro Manila, 227 collection vehicles and 12 units of heavy equipment for the landfill site were provided.
[4] One of the long-term experts dispatched right before the development study also participated in this study as a member of the advisory committee located in Japan.
[5] ADB (2003)
[6] LGU is referred to as an administrative unit at the municipal level in the Philippines.

and so on[7].

3) Support by other donors

There are three main SWM support projects targeting Metro Manila that were implemented after the development study.

The first project is "Improvement in the recycling of paper/Reduction of solid waste to landfills in Metro Manila" carried out by the Swedish International Development Cooperation Agency (SIDA) with MMDA as its implementing agency. In this project, a program to separate and collect dry recyclables such as used paper and cans is being implemented in three places in Metro Manila.

A UNDP project called "Community-based ecological solid waste management in the Philippines" was financed by the Japan Human Resources Trust Fund, and was implemented with MMDA. The implementation period was from 2002 to the end of 2004. Community-based recycling, which is the intent of RA9003, was planned to be established in ten places. The project also included the construction of MRFs and the introduction of composting equipment.

An ADB project entitled the "Metro Manila Solid Waste Management Project TA3848-PHI" is a technical cooperation project with DENR as the counterpart. The final report of the project was submitted in September 2003. The project included proposals for the future state of Metro Manila SWM, the provision of technical guidance concerning the formulation of an SWM plan, and MRF improvement support in five barangays.

3-1-2 JICA's achievements, lessons learnt, and future tasks

(1) Role of the development study in SWM policies

Table 3-1 illustrates a comparison between JICA's M/P derived from the outcomes of the development study and the current situation of SWM policies in Metro Manila. Based on this table, after classifying goals set by JICA's M/P that have not been achieved and those that were subsequently overtaken by the current SWM policies, the contribution of the development study to the formation of the current SWM policies will be discussed.

Although the approaches taken differ between the JICA's M/P and the current policies concerning recycling methods, common factors are the promotion of recycling at the source and community participation. According to the M/P, the promotion of recycling could be achieved through the optimal combination of dispersed recycling, which is carried out at the source, and intensive recycling, which is carried out in some recycling bases. Probably following the concepts of the M/P, the MMDA recommended recycling at the source by establishing Ordinance 99-004, and constructed three recycling centers (total capacity: 2,500 tons[8]). At the moment, however, approaches that focus exclusively on dispersed recycling at the barangay level are being adopted in accordance with RA9003.

The construction of new final disposal sites and incineration plants and ancillary transfer stations, which is the essential part of the M/P, has not been realized.

The reasons why the M/P has not been implemented as described above are that the SWM policies came to primarily focus on the reduction of solid waste and the community-based recycling for this due to the change in SWM policies established by RA9003, and the enactment of the Clean Air Act, which made it impossible to dispose of solid waste by incineration. As strong protest movements by the community residents resulted in the closure of the San Mateo final disposal landfill, the establishment of a prospective disposal site nearby became impractical. The idea of sea

[7] In Metro Manila, MMDA established the Ordinance 99-004 "Regulation governing proper waste management at source in Metro Manila Area and for other purposes," which is aimed at the promotion of solid waste separation and collection. It demands that all discharger of solid waste should separate and collect recyclable waste at source, but it became invalid because of the establishment of RA 9003.

[8] Website of the Congress of the Philippines: www.congress.gov.ph/download/12th/oversight_sona2001.pdf (as of Sep., 2004)

landfill was not approved by most of the residents either.

The following three points can be considered as lessons to be drawn from this.

(ⅰ) The stability in the continuation of SWM policies among high-level officials of the recipient country's government is a prerequisite for the successful achievement of the implementation of the proposed M/P. Although the counterparts of the project are officials in the cleansing department of the target cities of the study, it is important to pay careful attention to changes in the SWM policies at the national level. Furthermore, it is necessary to consider the development of the ability to carry out flexible M/P modification on the part of the counterparts (capacity development support) in the case of policy changes.

Table 3-1 Comparison between JICA's M/P and the SWM policies in Metro Manila in 2004

Item	JICA's M/P (1999)	SWM policies in Metro Manila in 2004	Differences in the concept
Collection	Raising collection rate to 90% in 2010	Probably shown in the Local SWM Plans under formulation by LGUs	—
Transportation	New construction of four transfer stations	No plan shown	●
Targets of recycling	10% (2010)	25% (2006)	○
Recycling methods	Combination of dispersed recycling and intensive recycling ・Promotion of the collection of recyclables at source ・Construction of a recycling center (in the vicinity of the transfer station) ・Construction of a composting plant (in the vicinity of the new disposal site)	Specialized in dispersed recycling ・Promotion of the collection and composting of recyclables at the barangay level	○
Final disposal methods	・Open dump: Closed by 2000 ・Sanitary landfill disposal: Introduced from 2004	・Open dump: Closed by 2003 ・Sanitary landfill disposal: Introduced from 2007; not allowed otherwise	○
Final disposal site	・Construction of a new sanitary landfill site near the existing San Mateo landfill; Commencement of its operation in 2004 ・Construction of the Manila Bay sea sanitary landfill disposal site; Commencement of operation in 2005	・Proposals shown to the left have not been adopted ・The construction plan for a sanitary landfill disposal site that will start operation in 2007 has not be publicized	●
Incineration	・Construction of an incineration plant; commencement of its operation in 2005	・Incineration plants are virtually prohibited by the Clean Air Act and RA9003	●
Responsible bodies	・The Local Government Code (RA7160) stipulates that LGUs are basically responsible for SWM programs. However, during the periods of the M/P (until 2010), the following proposals are made considering the accumulation of experience and technology of each organization. ・Recycling at source: Mainly NGOs and CBOs with the assistance of LGUs ・Collection: LGU ・Transfer stations: LGUs or cooperative organizations that consist of the LGUs that use the station ・Recycling centers: Private contracts (by obtaining concessions from the LGU) ・Final disposal/incineration plant: MMDA ・Composting plant: Private companies (subsidiaries created as needed)	RA9003 stipulates that basically the LGUs should be responsible for SWM programs based on the Local Government Code. The responsible bodies are as follows. ・Recycling at the source: Barangays ・Collection: LGUs Shared use of facilities by the barangays and LGUs that have the same problem is allowed (Sec. 44). At the same time, the Metro Manila SWM Board chaired by the MMDA has a coordination function under the jurisdiction of the MMDA. Accordingly, the Act of Creating the MMDA (RA7924), which defines its powers and functions, is still in effect.	○
Raising awareness	Promotion of environmental education and community participation.	PR activities are being carried out in order to promote community participation in solid waste sorting and collection.	○

●: Large gap
○: Some similarity
—: Unknown
Source : Compiled by OTSUKI Noriko from the development study reports, RA9003, and the results of a public opinion survey in the field.

(ii) In order to establish facilities that are considered a "nuisance" by community residents, such as solid waste disposal sites, not only environmental education and awareness raising activities, but also technical cooperation components regarding social concerns are essential. For example, the administrative capacity should be enhanced through the introduction of consensus-building methods or other measures.

(iii) An increasing proportion of the collection services and administration of the final disposal sites is handled under private contracts. Accordingly, the promotion of an M/P is limited since the public administration's consciousness of accountability has been reduced and the proper management flow of solid waste is neglected. As the number of private contracts increases, the responsibility of the public administration for management and guidance also increases. Consequently, improvement of the capacity of the public administration is even more necessary.

The promotion of recycling at the source and the promotion of community participation, which are the foundations of the RA 9003, were carried out in the P/P under the development study. Later, these were further developed in the SIDA project. JICA's P/P was one of a number of factors contributing to the formulation of RA9003.

Many of the relevant people who were interviewed in the field survey pointed out that JICA's development study was significant as a reference. It provided the first scientific data on solid waste flows, which formed the general basic information for later SWM operations. It also developed the capacity of the counterparts in the MMDA through the development study by presenting scientific solid waste investigation procedures and raising awareness of the importance of the formulation of an M/P. These counterparts later directly or indirectly played leading roles in SWM operations in Manila.

(2) Attempts at CBSWM

1) JICA's P/P

With the adoption of the CBSWM method, JICA carried out a collection P/P in two barangays, and a recycling P/P in three barangays. Although these P/P activities were being successfully operated at the completion of the development study, none of these activities has been continued in any of the locations as of now. The factors explaining this are shown in Table 3-2.

Causal factors and the lessons drawn are listed below.

(i) Discontinuation of the activities due to changes among the leaders such as barangay leaders: in other words, CBSWM efforts in this case depended mostly on the personal qualities of individuals.

(ii) Unsatisfactory community participation and difficulty in the maintenance of the facilities due to the failure to build a consensus with the community residents: elevating the sense of ownership for the purpose of establishing the community residents' own SWM operations is necessary.

(iii) MMDA-JICA's withdrawal before the activities took off due to the short period of operation of the project: capacity development at the LGU or barangay level was not fully achieved. Considering the continuity of activities, persistent involvement with the project and appropriate support according to the level of development of the counterparts is necessary.

(iv) When the collection and recycling of recyclables is carried out, the issue of competition from existing junk shops may arise. Picking before the primary collection and theft may take place, so that collection and recycling become economically unattractive. In order to respond to the fluctuations in the recyclables market, CBSWM also needs to be flexible. In addition, there is a problem that CBSWM can come under political pressure from junk dealers who have vested interests. In such cases, the recycling activities should be geared towards community-

Table 3-2 Factors inhibiting the sustainability of the pilot project

	Barangay	Technical factors	Social factors	Political factors	Other factors
Collection P/P	Brgy. 182, Tondo, Manila		Continued for about half a year. Later, the residents gradually lost		
	Brgy. Batasan Hills, Kalayaan,			Conflicts and collusion among the decision-making people in the barangay.	
	Brgy. Bayan-bayanan, Malabon	The pushcart was too heavy.	For three years, activities were continued along with education and training. When the awareness-raising activities were completed, the main activity was also discontinued.		
Recycling P/P	Soldier's Village, Brgy. Sta. Lucia, Pasig		Insufficient consensus-building concerning the sharing of the profits from the recyclables; the activities continued for several months, but the residents gradually lost interest.	Due to personnel changes in the regional government, the officials in charge of the project were also replaced.	Competition from other collectors of recyclables.
	Brgy. 193, Pildera II, Pasay	Recycling stations were sabotaged and robbed. The odor and waste litter made the residents annoyed and they stayed away from the recycling station.	Some community residents did not support the project.		As waste collection services were not provided regularly, general waste was discharged at the recycling center instead.

Source : Compiled by OTSUKI Noriko from JICA (2004a) and interviews with the relevant people in the field survey

based sorting and discharge activities and should be included in the existing SWM system.

The MMDA, the counterpart that carried out the P/P with JICA, later handled the CBSWM operation as the implementing agency in the projects of SIDA and the UNDP, taking measures that utilized the experience gained in JICA's P/P. For example, their experience was used to establish the detailed and objective criteria for selecting the project sites, as part of which the intention and commitment of the mayors or barangay leaders should be clarified in the beginning, etc. Among other examples were the active use of elaborate participatory planning approaches, the construction of monitoring/assessment systems from the planning phase, and other techniques. In the project implementation phase, efforts are made to effectively market the collected items by the MRF by constantly checking the striking prices of junk shops. As this MMDA-UNDP's P/P is being carried out, its future development is attracting the attention of the relevant people.

Photo 3-1 Recycling center constructed in the Soldier's Village in the P/P

Presently closed and goods, including pushcarts that were used at the time, are stored inside.

(3) Lessons from the perspective of capacity development

Based on the notion that capacity development operates at the level of individuals, organizations, and institutions/societies[9], the lessons and JICA's achievement can be structured as in Table 3-3.

3-2 Vientiane in Laos

As illustrated in Figure 3-2, JICA provided continuous support to Vientiane City for ten years. Beginning with the development study during 1991 and 1992, support was provided using various schemes, including grant aid and the dispatch of experts/JOCV/senior volunteers. Before JICA's support was introduced, a system

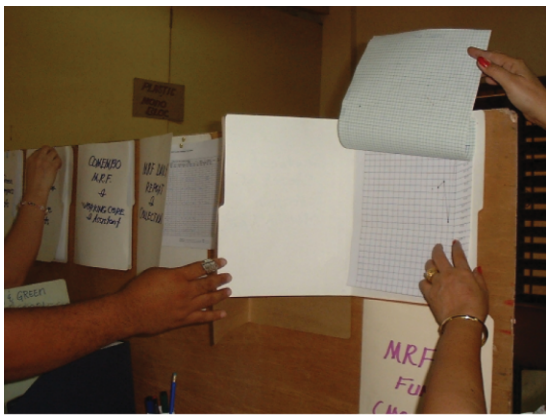


Photo 3-2 MRF project activities by the UNDP

Photo on left : Monitoring the volume of recycled items by graphing the data
Photo on right : Recycled items categorized and stored

Table 3-3 Lessons from the perspective of capacity development (Philippines)

Level of capacity development	Success/progress	Problems/future tasks
Individuals	• Consistent development of the counterparts since the M/P study	• The technology that JICA transferred has not reached relevant persons other than the counterparts • In the LGUs in particular, there are not enough officials with the appropriate technology and know-how to promote the project
Organizations	• The SWM system established by the MMDA and LGUs was organized more clearly • Comprehensive and basic information on solid waste flows in Manila was integrated and later served as a reference	• Organizational efforts were fragmented; Success depended on the abilities of the community or individuals, and were susceptible to personnel changes
Institutions/societies	• Introduction of community-based recycling/reduction efforts • Promotion of participation of the residents of the community in the SWM service • The M/P recommendations adopted in the effort to establish RA9003	• Unclear monitoring system concerning private contracts • Unsuccessful consensus-building concerning landfill site location setting
Roles played by JICA	• Implementation of basic solid waste investigations through the development study • Pioneering demonstration of CBSWM and its advancement to the project level by the UNDP • Promotion of recognition of the need for environmental education; compilation of practical teaching materials	• Unsatisfactory approaches to C/P concerning the consensus-building required to build a SWM system • Discontinued technical support • Unsatisfactory efforts to enhance dministrative management capacity to respond to the increase in the number of private contracts

Source : Compiled by YOSHIDA Mitsuo, OTSUKI Noriko and KONDO Sei

[9] Task Force on Aid Approaches, JICA (2004). See Chapter 4 for details.

for the collection and disposal of solid waste had not been concretely established in Vientiane City. In this case, an SWM framework formulated with JICA's support was established and it has still been effectively operated. This section describes the cooperation outcomes of such program-based approaches and draws lessons for future support. For this purpose, an assessment of a series of support measures applied to Vientiane City's SWM services, as well as an analysis of its success factors and problems, have been conducted, and the lessons are reviewed here from the perspective of capacity development.

3-2-1 Outline of Vientiane City's SWM and JICA's support

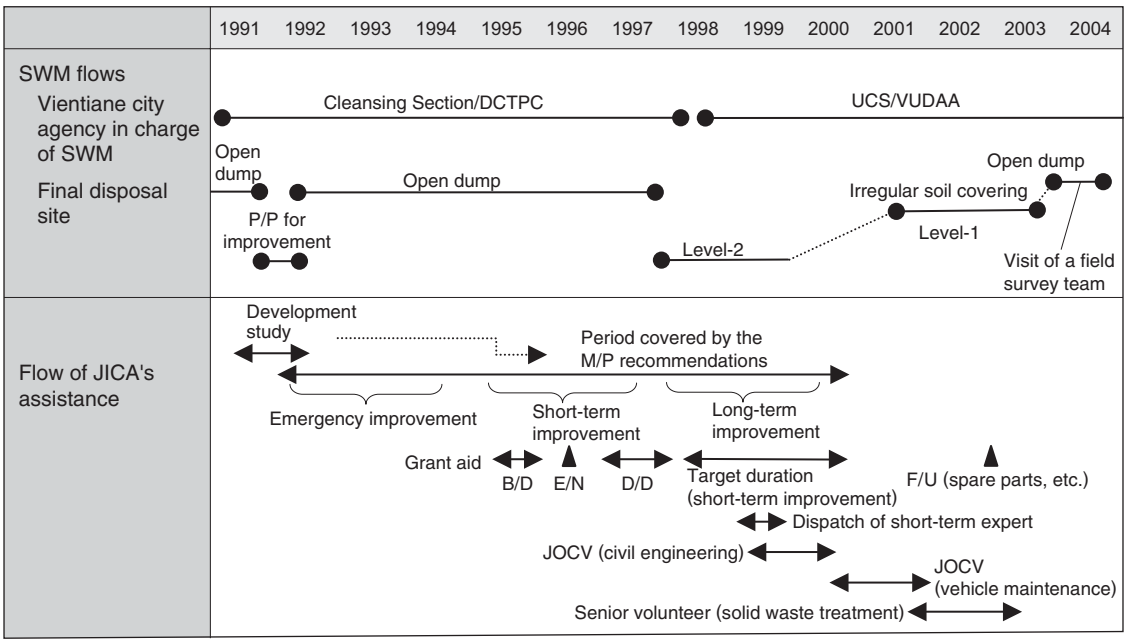
(1) Outline of JICA's assistance

JICA has been supporting Vientiane City's SWM for more than ten years. Chronological flow of JICA's support along with that of Vientiane City's SWM is illustrated in Figure 3-2.

1) Development study

The development study was carried out targeting four urbanized districts among the total of eight districts in Vientiane City. In those days, the SWM project in the target districts was not efficiently operated: collection rates in the target area were extremely low (general household recipients of collection services accounted for 4.8%), and the final disposal site was an open dump that was too disorganized to have a clear site boundary. Under these circumstances, an M/P was formulated that consisted of three phases: emergency improvement (1992-1994), short-term improvement (1995-1997), and medium-term improvement (1998-2000). In order to verify the adequacy of the proposals in the study, two P/Ps and five F/Ss were carried out. The F/Ss were adopted for five tasks that were especially given high priority from the short-term perspective. The contents of these projects and studies are shown in Table 3-4.

Figure 3–2 Chronological flow of SWM and JICA's assistance (Vientiane)



F/U : Follow-up of the grant aid by donation of spare parts, etc.

Source : Compiled by OTSUKI Noriko and KONDO Sei based on various reports and statistics

Table 3–4 JICA's M/P and P/P

Item	Details
Collection services	・Raised to 50% in 1995 and 100% in 2000
Final disposal facility	・Improvement to Level-2 in 1995, and Level-3 in 1998
Implementation system	・Establishment of a new department specializing in SWM; Commencement of new programs including R&D, administration of the final disposal facility, and raising public awareness ・Improvement of the vehicle depot and workshop for the purpose of preventive maintenance and minor repairs to vehicles and heavy equipment ・Implementation of appropriate training for sanitation workers
Collection of service charges	・Based on the user-pays principle, those who discharge the waste are charged for the cleaning services. Formulation of a fair service fee structure and making efforts to ensure accountability for expenditures
Legal systems	・Enactment of ordinances concerning the appropriate storage and discharge of solid waste; payment for solid waste services and treatment, the management of hazardous waste, control of illegal dumping and littering
Raising public awareness	・PR promotion concerning waste education and cleaning programs
P/P	i) Collection experiment: Selection of three villages within the target area of the study for the purpose of the expansion of collection services, and ensuring the reliability of collection systems and fee collection systems were introduced based on the user-pays principle ii) Sanitary landfill experiment: Technology transfer is carried out through field work concerning the improvement of access roads at the site, the construction of enclosing bunds, and sanitary landfill operations. Construction of a sanitary landfill was recommended to the senior city officials, stressing its significance
F/S	i) Expansion of the collection service area (recipient population: 50%) ii) Introduction of a container collection system for those who discharge waste in bulk iii) Obtaining the cooperation of the community residents in cleaning the roads, drainage ditches, and public areas iv) Establishment of an adequate operation and maintenance system for vehicles and machinery v) Establishment of sanitary landfill disposal (Level-2) at the final disposal site

Source : Compiled by OTSUKI Noriko based on JICA (1992)

2) Grant aid

Vientiane City wanted to receive grant aid from the Japanese Government in order to implement the short-term improvement plan formulated in the development study. However, it took several years to submit the application for the grant since it was one of the lower-priority tasks in Laos at the time. Eventually, in 1996, an intergovernmental agreement for the grant aid was signed (E/N). Through this grant aid, equipment was provided, including compactor trucks, dump trucks, container trucks, containers, bulldozers, caterpillar loaders, and excavators, and a maintenance shop and a final disposal site were constructed. This equipment and the facilities were handed over to the recipients in January 1998.

3) Dispatch of expert/JOCVs/senior volunteer

The grant aid provision was completed in 1998. In the following year, an expert in the field of urban sanitation was dispatched for 6 months from March to September 1999. Through this dispatch of the expert, comprehensive assistance was provided ranging from the physical aspects, such as guidance on soil covering methods and the installation of rainwater drainage pipes, to the non-physical aspects, such as advice on the improvement of management and legislation concerning solid waste.

A JOCV specializing in civil engineering work were dispatched for one and a half years from April 1999, and that specializing in vehicle maintenance was dispatched for two years from December 2000. They were mainly engaged in technology transfer to engineers in the field. A senior volunteer in the field of solid waste treatment was dispatched for two years from November 2001 in order to give advice on vehicle maintenance and management, and organizational operations, as well as guidance on location surveying at the disposal site.

(2) Main events concerning Vientiane City's SWM

1) Review of Vientiane City's SWM

When the development study and the grant aid program were carried out, the counterpart was the Cleansing Section of the Department of

Construction, Transportation, Posts and Communications (DCTPC) of Vientiane City. However, it became subordinate to the Vientiane Urban Development Administration Authority (VUDAA), and was called the Urban Cleansing Service (UCS). This restructuring was aimed at establishing a financially independent organization through decentralization and the transfer of discretionary powers by integrating the organization into the department that was in charge of overall urban problems. Although the DCTPC was a city department, it strongly took on the character of a regional branch of the Ministry of Communications, Transport, Posts and Construction.

VUDAA is carrying out the Vientiane Urban Infrastructure and Services Project (VUISP), which is aimed at setting reasonable solid waste service fees and an appropriate fiscal burden on the city through a detailed cost analysis and the promotion of an efficient collection program. The VUDAA and UCS have been meeting for consultations for several months since 2003, and will arrive at some conclusion in the middle of 2004.

2) Development by other donors

Among the forms of support to Vientiane City for SWM other than that provided by JICA is the "Integrated Solid Waste Management Project" by the UNDP, which is now in progress. It originated with CBSWM by an NGO in Vientiane, which was supported by the Netherlands in 2001 and by Germany in 2002. In other words, it consists of community-based activities to reduce and recycle solid waste in broader target areas.

The ADB is also planning the implementation of "Solid Waste Management and Income Generation for Vientiane's Poor" [10]. However, its TOR had not been completed at the time of the field study in March 2004, and detailed information could not be obtained.

3-2-2 JICA's achievements, lessons learnt, and future tasks

(1) Vientiane City solid waste services

1) Collection work

The achievements of solid waste collection from the time of the development study up to now are illustrated in Figure 3-3 below. The figure clearly indicates that the collection capacity improved enormously after the provision of equipment through the grant aid.

According to the basic design of the grant aid, the goal for the volume of waste collection by Vientiane City in 1998 is 23,994 tons per year [11]. This goal was attained two years after the provision of the equipment, and the collection volume has been increasing since.

2) Final disposal

Due to the improvement of the final disposal site through the grant aid, a Level-2 sanitary landfill was maintained up to 2000. However, it has gradually become difficult to operate the disposal site in a satisfactory manner. Among the multiple factors were the breakdown of the caterpillar loaders, the steep drop in currency values in the late 1990s, the subsequent rise in fuel costs [12], and the decrease in budget allotments in the cleansing field. By the end of 2003, the bulldozers and the caterpillar loaders had broken down, and the site had become an open dump in March 2004 [13]. Even if the equipment had been repaired, there would have been few funds left for the final disposal site. Additional investment is essential in order to restore the current open

[10] Website of ADB : http://www.adb.org/Documents/ADBBO/GRNT/37651012.ASP (Accessed in Sep. 2004)

[11] JICA (1996)

[12] The local currency Kip rate against the dollar dropped from about 716Kip/1US$ in 1992 to about 7,846Kip/1US$ in 2000 [JICA(2004b)]. The short-term expert in 1999 reports that budget was decided on the ground that heavy equipment would be used for 5 - 6 hours/day, but the budget actually allowed only 1 - 2 hours/day's operation.

[13] The damaged parts of the caterpillar loader were replaced and distributor was commissioned to repair. An engineer from Thailand tried repairing in vain. Although something was thought to be wrong with the electric control system, the failing point was not even detected. To replace drive tumblers and idle wheels of the bulldozer, new parts were being made. Although the re-start of the operation is scheduled, four months had already passed.

dump. There is also concern about the technical capabilities required to improve the new landfill site and build appropriate leachate collection system.

3) Maintenance shop

The maintenance shop, which was constructed through grant aid, can respond to most mechanical breakdowns through the repair work and guidance on inventory management of parts by JOCVs and senior volunteers as well as the follow-up of spare parts provision. Nearly seven years has past since the provision of the collection equipment, and its useful life is about to end. However, all the equipment, which is operated in good condition, will be useful for another few years. The maintenance shop has produced almost all the expected results.

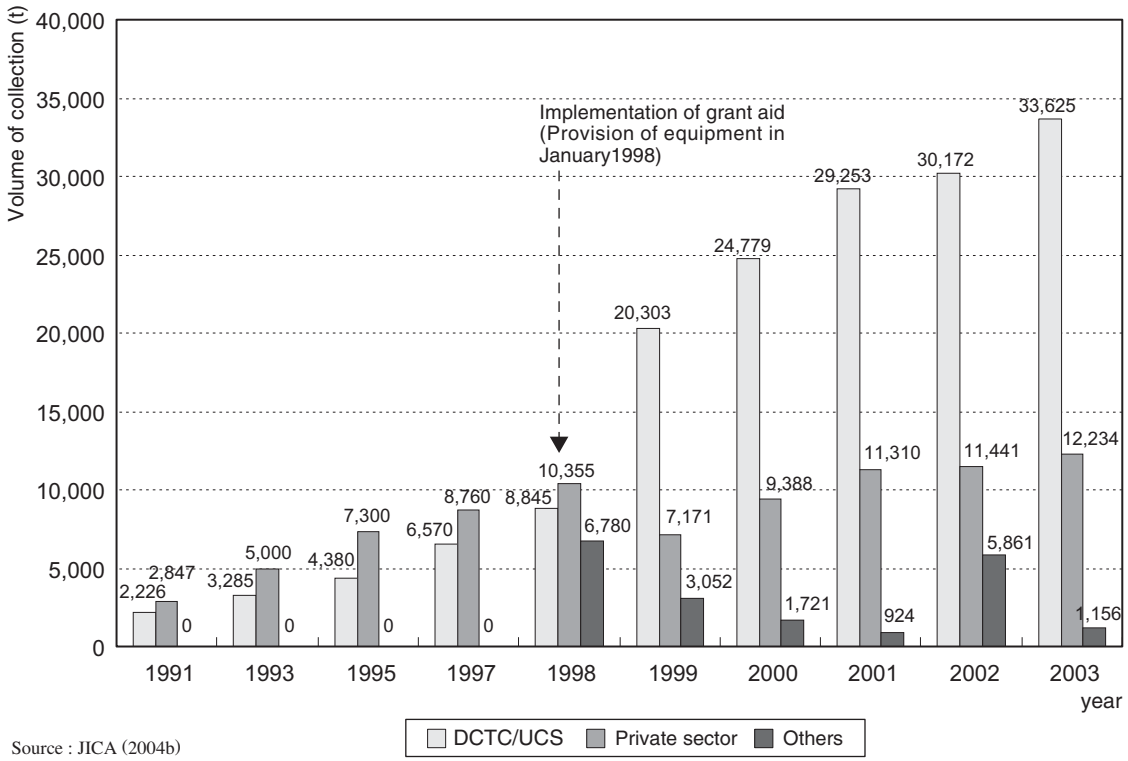
(2) Success factors

Although some problems with the final disposal site remain unsolved, every relevant person in Laos agrees that SWM in Vientiane has been rather successful. As described above, the volume of waste collection has drastically risen since 1998, most of the provided equipment is being operated in good condition, and the streets have become cleaner. The main success factors for this are listed below.

(ⅰ) Integrated organization system: SWM in Vientiane has been operated through a single agency that is in charge of SWM even though it went through a restructuring process. The leading officials in the agency came from among the former counterparts in the development study, which ensured consistency and continuity since the formulation of the M/P in the policies of the implementing agency in the operational phase.

(ⅱ) Appropriate inputs: After the formulation of the M/P, the collection/landfill equipment provided through grant aid, and the construction of a disposal site and a workshop, human resources (the expert, JOCVs, and the senior volunteers) were provided at the appropriate time,

Figure 3-3 Trend in the volume of waste collection in Vientiane City



Source : JICA (2004b)

Photo 3-3 Maintenance shop

This maintenance shop was constructed using the grant aid and the operational framework was established through the continuous support of volunteers. This maintenance shop is now contributing to the maintenance of equipment and vehicles by the Laos side themselves.

so that a synergistic effect was achieved. This indicates that it is important to provide not just temporary support, but support that includes appropriate follow-up in order to carry out SWM effectively. It is also necessary to consider a package of various forms of support from the planning phase to the implementation phase.

(iii) Human resources development: Capacity development from the perspective of human resources and organizations was successfully achieved, so that the UCS effectively utilized the equipment provided and carried out the SWM services smoothly. More specifically, solid waste investigation skills were acquired through the development study and the concept of SWM was introduced. Establishment of an independent repair system by opening a workshop made it possible to effectively maintain the waste collection vehicles. Technology transfer by JOCVs played a useful role in the establishment of the repair system by themselves.

(iv) Financial base system: The administration of the SWM services based on the collection of solid waste service fees, the framework proposed by the M/P, matched well with the cultural background of the existing Laos society and systems that had developed historically. Accordingly, it was accepted by the citizens rather easily, and the number of the service recipients greatly increased[14]. Based on a proposal by the Laos side, a service fee collection system was structured in units of villages (communities). The village supported the contracts between the UCS and the citizens, and collected the service fees. As a result, the system operated effectively. The citizens also actively cooperated in establishing waste repositories in the commercial sector. These factors worked synergistically so that the financial base of the SWM services improved, although some problems as described below remain.

(v) Success in locating the landfill: Regarding the idea in the M/P that the existing open dump should be remodeled to form a new landfill site, consensus-building proceeded smoothly since it was clear that it would result in improvements. Securing the location of the landfill disposal site made it possible to secure the SWM flow, including solid waste collection, transportation and disposal. It also contributed to the reduction of the initial investment costs.

(3) Problems and future tasks

Although JICA's assistance greatly contributed to establishing a comprehensive SWM system in Vientiane City, there are many remaining problems and future tasks to take into consideration. The details are listed as follows.

(i) Aggravated financial conditions surrounding the solid waste services

Due to the worsening economic situation, the operation of the SWM project based on solid waste service fees is becoming difficult. The problems are how to cope with the cost of outsourcing equipment repairs and the cost of fuel for the heavy equipment used for landfill disposal. The causes of this situation were analyzed as follows.

- The value of the local currency, the Kip, declined to one-fifteenth of its value at the time

[14] There was a view that high awareness of sanitation and a custom of cleaning the neighborhood among the citizens contributed to acquirement of the appropriate habit of waste discharge. When the development study was conducted in 1992, experimental collection was conducted and charging collection fee was also carried out. That may have also helped softening the resistance of the citizens.

of the development study due to a drop in the value of the currency value following the Asian Economic Crisis. However, it was difficult to fully raise solid waste service fees since the domestic unit cost of labor had not risen very much. When a general household receives waste collection services of a volume of one bamboo basket once a week, the M/P or the development study set the solid waste service fee at 1,000 Kip/month. On the other hand, the actual collection rate in March 2004 was 6,000 Kip/month. When the currency exchange rate was taken into consideration, the fee amounted to 1.4 dollars and 0.56 dollars, respectively. The solid waste service fee actually declined to one third.

- In addition to SWM, the UCS is conducting various other activities concerning urban beautification, including ornamentation in urban areas and tree planting in parks. In order to solve this issue concerning the organizational system, it was intended that the M/P would involve restructuring the system in order to establish an organization specializing in SWM. This plan has not materialized. As the city has not allocated a budget for such highly public services, the collected solid waste service fees cannot be used for their original purpose. It is also a fact that there is another problem in that the UCS's accounting system cannot clarify the separate balance for each category of activities. There will be important findings after the aforementioned UCS and VUDAA review these services.
- Collection by the private sector is gradually increasing, and this will continue. However, the rate charged for discharging waste at the final disposal site is one dollar per ton, and the income from this rate alone is not sufficient to ensure the sound operation of the sanitary landfill site. In other words, the principle that the landfill costs should be borne by private waste collectors has not been established in the project on waste collection through private contracts. The more the private contract system for waste collection advances, the worse the management situation of the disposal site will become.

(ii) Undeveloped legal systems

Although the M/P requires the development of effective legal systems, comprehensive laws concerning SWM and subsidiary environment issues have not been formulated. This has caused delays in improving the system of assigning responsibility for the landfill site facility to control environmental pollution, and this prevents progress in spreading the beneficial effects to other places in Laos [15].

(iii) Issues of the operation of the landfill disposal site

The operation of the sanitary landfill disposal site was considered in the M/P as a priority project. The current state of the site is a long way from achievement of the M/P's goal, being merely an open dump where, at most, vehicles that carry in waste can be measured and medical waste can be isolated. The UCS explains that the direct cause is the breakdown of heavy equipment, and they are actually making efforts to repair the equipment. However, practical alternative measures, such as re-consignment of the disposal site operations and leasing heavy equipment, have not been taken yet. The City has

Photo 3-4 Final disposal site

The site became an open dumping site since soil covering had not been carried out for several months, and the heavy equipment had broken down.

[15] At the time of the field study, some related persons explained that draft bills were being considered at the Ministry of Public Health.

not taken appropriate measures to deal with the financial problem described in i) above, either. Eventually, neither the UCS, which is the implementing agency, nor the City, which is the policy board, recognizes their responsibility for the operation of the landfill disposal site. The fact that a monitoring system for the operation of this disposal site has not been established due to the undeveloped legal system (mentioned in ii) above) is also aggravating the problem.

(iv) Unclear private contract policy

Two private companies are involved in the collection service. However, there are no clear regulations concerning the contractual relationship between these companies and the city/UCS, the assessment criteria for the approval of service operations, and the management system for carrying out the service contents.

(4) Lessons from the perspective of capacity development

From the outcomes described above, the achievements and the future tasks are structured from the perspective of capacity development, and are illustrated in Table 3-5.

3-3 San Salvador metropolitan area in El Salvador

This section takes up an actual case of the implementation of a development study in the San Salvador metropolitan area in the Republic of El Salvador. In the San Salvador metropolitan area, eleven cities among the total of fourteen cities participated in the regional waste disposal system, and are maintaining sanitary landfill operations. The solid waste regional management organization, which was established in the public administration sector based on the recommendations of the M/P, is operating effectively. The factors that have led to these proposals being put into practice is discussed in the following sections, taking the current state into consideration.

Table 3-5 Lessons from the perspective of capacity development (Laos)

Level of capacity development	Success/progress	Problems/future tasks
Individuals	・Consistent development of counterparts since the M/P study ・Development of the workshop and mechanics	・Lack of landfill engineers ・Lack of human resources
Organizations	・Integrated SWM management department (UCS) was organized ・Introduction of the SWM system was basically successful	・Unsatisfactory management control/financial analysis ・Unsatisfactory rational budget control due to the inclusion of non-SWM activities in UCS's affairs
Institutions/Societies	・Success in the user-pays fee system organized by village units ・Cooperation of the citizens has been obtained ・Success in securing a disposal site (building consensus with the residents) ・Partial implementation of private contracts	・Lack of legislation concerning SWM ・Undeveloped monitoring system ・Unclear policy on private contracts ・Efforts towards CBSWM is a future task
Roles played by JICA	・Consistent program approach resulting from the development study, grant aid, and the dispatch of expert/SV/JOCVs ・Appropriate input of equipment and the corresponding O/M technology transfer ・Progress in VUDAA/UCS's ownership of SWM in Vientiane; acquisition of the capacity to start voluntary revision of the M/P	・Need to raise awareness of environmental impacts and environmental management ・Unsatisfactory development of landfill engineers ・Unsatisfactory maintenance system for the equipment provided ・Unsatisfactory advice on the private sector's collection activities

Source : Compiled by YOSHIDA Mitsuo, OTSUKI Noriko and KONDO Sei

3-3-1 Events concerning the SWM in the San Salvador metropolitan area and JICA's support

(1) Background to the development study

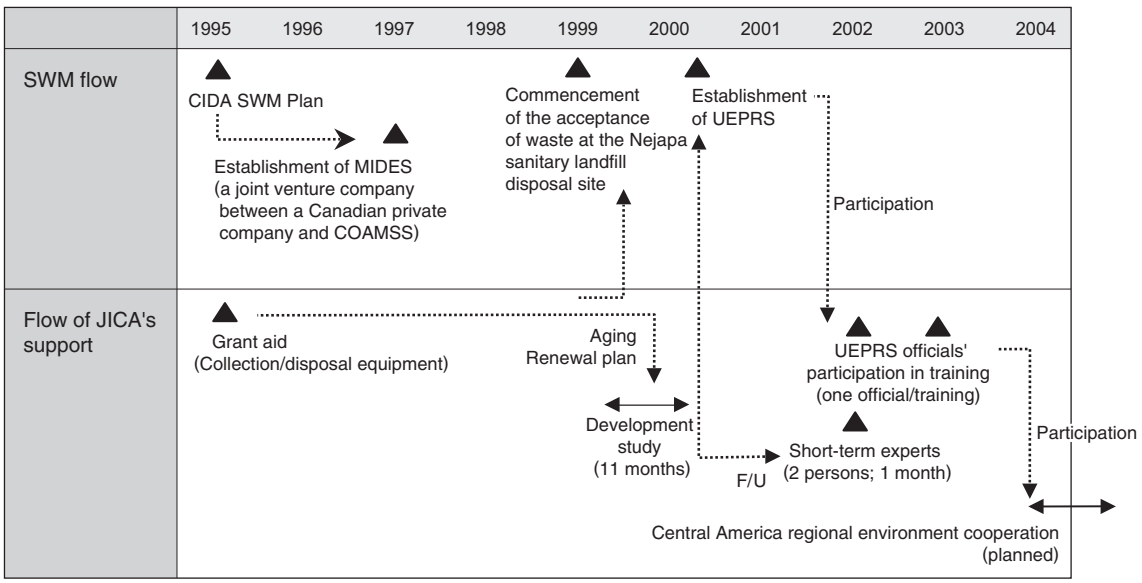
The San Salvador metropolitan area (14 cities) in the Republic of El Salvador (Total population: about 6.5 million) has a population of about 2 million. In the metropolitan area, about 490,000 tons of solid wastes are discharged annually as of 2003. According to the plan formulated with the financial assistance of CIDA in 1995, the MIDES project [16] was started by MIDES in order to improve SWM in the metropolitan area. MIDES, which was established in 1997, is a joint venture company of a Canadian private company and the counsel of mayors of the metropolitan area of San Salvador (COAMSS). However, the MIDES project, which lacked a supervision and management system for the collection, transfer and final disposal operations, required the reestablishment of an overall plan.

(2) Outline of JICA's assistance

JICA's assistance started under the circumstances described above and included a development study. The series of JICA assistances and events concerning SWM in El Salvador are outlined in Figure 3-4. At the request of El Salvador, JICA carried out a development study from December 1999 to November 2000, for the formulation of an M/P concerning regional SWM (excluding industrial wastes), which is to be completed in FY2010, and technology transfer targeting the 14 cities in the metropolitan area [17].

In the development study, the state of affairs, technology, institutions/organizations and financial conditions concerning urban SWM in the target areas were first investigated. A detailed study concerning the MIDES project was conducted next, and its problems were analyzed. The three priority tasks identified were: i) sanitary conditions (raising awareness among the residents), ii) waste collection in areas of poverty, iii) verification of the waste collection routes. In order to demonstrate the M/P recommendations

Figure 3-4 Chronological flow of SWM and JICA's assistance (El Salvador)



Source : Compiled by KONDO Sei

[16] MIDES project: A comprehensive project that consists of 7 programs. The budget allocated is US$61.2 million. Nejapa final landfill site, which is the main target of the project, accepts about 1,200 tons/day of waste from 11 cities. US$18/ton to Nejapa as disposal fee. The volume accounts for about 90% of the solid waste generated in the metropolitan area.

[17] Collection/disposal equipment was provided through the grant aid in 1995, before the development study. Although the equipment had been used, its replacement was included in the mid-term plan of M/P due to aging.

regarding the above tasks and obtain feedback, a pilot project (P/P) was carried out and an M/P was formulated.

The goals of the M/P were set out as follows: i) promotion of the citizen's welfare, ii) realization of a sustainable urban SWM, and iii) contribution to environmental conservation. For the formulation of the M/P, the future prediction of the volume and quality of waste, the financial conditions, and the economic growth rate were taken into consideration, technological systems for waste discharge/storage, collection/ transportation, intermediate treatment, final disposal, as well as medical waste management, were discussed. Considering that the target rate for urban waste collection in 2010 was 100%, the goals for each technology system were set and measures to be taken for them and the concrete improvement tasks required for the SWM system in each city and regional SWM system were proposed. Then, through an evaluation of 7 items, including the technology and financial conditions, the adequacy of the M/P was comprehensively verified.

In the end, the study team offered recommendations on the following items:(ⅰ) realization of the M/P, (ⅱ) accumulation of data and its effective utilization, (ⅲ) improvement of the collection routes, (ⅳ) intermediary transportation, (ⅴ) cleansing service operations, (ⅵ) independent accounting, (ⅶ) collection of waste fees, and (ⅷ) medical waste management.

In order to support the implementation of the M/P, two short-term experts were dispatched two years after the completion of the development study. Officials of the department of urban solid waste management (Unidad Ejecutora del Programa Regional de Residuos Solidos; UEPRS) in the office of planning of the metropolitan area of San Salvador (Oficina de Planificacion del Area Metropolitana de San Salvador; OPAMSS), which was the main implementing agency of the M/P, participated in "Urban solid waste management in Central America", a training course that was offered specially for the region in 2002, and in third-country training in Mexico and regional training in 2003.

3-3-2 Success factors and lessons from JICA's assistance

1) The current state of affairs after implementation of the development study and its outcomes

Table 3-6 illustrates the progress achieved for each proposal and the current state of the P/P. As of 2003, four years after the completion of the study, success to some degree can be found in 6 recommendations among the total of 8 main recommendations. Accordingly, it was judged that more than 70% of the recommendations had been implemented.

(2) Success factors and lessons

In concrete terms, the following factors seemed to have contributed to the partial realization of the M/P and the sustainable maintenance of an SWM system.

1) Establishment of UEPRS

The major outcome of this study was that UEPRS was established on the recommendation of the M/P. UEPRS provides technical support to each city in order to achieve the objective of the M/P of assisting Metropolitan SWM. It also continues to collect basic data by supervising the MIDES project, and submits reports and proposes improvement plans to COAMSS. The high level of achievement of the M/P is largely due to the contribution of UEPRS. Another factor is the securement of a stable foundation of finances and organizational operations, which was made possible by the establishment of a system in which MIDES regularly pays for project activity costs as administrative costs. The current situation investigated this time was carried out using data provided by UEPRS. However, if UEPRS or the predecessor organization had been

Table 3-6 Current conditions in the metropolitan area of San Salvador after the development study

Item	Level of achievement	Current conditions
Establishment of the department of urban SWM (UEPRS)	○	In response to the M/P's proposals, UEPRS was established in the office of planning of the metropolitan area of San Salvador (OPAMSS). For the UEPRS activity budget (including personnel costs), the MIDES project pays 0.25 dollars per 1 ton of waste. At the moment, this payment amounts to about 8,500 dollars per month. Although it started with 9 officials in December 2001, it currently consists of 7 officials (including 3 engineers).
Waste collection rate	○	The goal in 2003 in the M/P was 82.6%, which has been reached, being 88.3% as of December 2003 (73.8% in 1999). However, four cities among the fourteen target cities would not submit the relevant data to UEPRS. This is because the four cities illegally dumped waste without bring it into the large-scale sanitary landfill disposal site under the MIDES project. They are not conducting the accurate measurement of wastes.
Waste sorting	△	The M/P set the goal of sorting 5-10% of the waste discharged in the 4 cities in 2003. Currently, waste sorting is carried out under the "Eco station" project only in Nueva San Salvador city, receiving technical guidance from UEPRS. About 20,000 residents are participating in the waste sorting project.
Placement of transfer stations	×	A transfer station in Apopa City planned by MIDES in 1999 was not able to obtain the approval of the Ministry of Environment due to groundwater pollution, etc. Accordingly, as an alternative plan, an application for development approval in La Naval area was submitted in March 2002. Later, a residential area development planned by the government started in the same area, and the construction of a transfer station become impossible. The transfer station plan was taken back to the drawing board through discussions between MIDES and COAMSS. (In addition, the construction of an "environmental education center" and a "composting center" was excluded from the agreement. This resulted in a cut in the fees for discharging waste at the final disposal site from 18 dollars to 13 dollars.) Furthermore, UEPRS proposed an alternative plan of establishing five small-scale transfer stations, and its pilot project started in Nueva San Salvador city in July 2003 (establishment of a transfer station with 78 tons/day capacity of the waste accepted). This achievement has been introduced to COAMSS, and as a result expansion of the project is now being planned.
Establishment of a new sanitary landfill	×	In order that final disposal of waste discharged in the metropolitan area of San Salvador does not depend only on the MIDES project, the M/P proposed improving and using two existing open dump sites and two level-1 disposal sites. However, the two cities that own these disposal sites have not considered the plan.
Improvement of waste collection routes	○	Utilizing the manual compiled by the P/P in the development study, many cities in the metropolitan area are improving the collection routes.
Collection of waste fees	△	In many cities, the waste fees are collected by the electric power company under contract. A set of fees for collection, road cleaning, and final disposal is collected along with the electricity charges. There is a wide range of rating systems, depending on the municipality. Under the technical guidance of UEPRS, Nueva San Salvador City formulated ordinances concerning general waste management, including waste fee collection, so that a metered rate system will be introduced for residents who discharge large amounts of waste. When this is put into effect, Apopa City is planning to start a similar project. However, seven cities among the fourteen cities have rejected the intervention of UEPRS in their accounting.
Pilot project (P/P)	△	In the development study, three P/Ps were carried out: i) a campaign to raise the awareness of the residents regarding sanitary education/waste problems, ii) experimental waste collection in areas of poverty, iii) verification of the collection routes. None of these three projects has been continued. This is partly because the objectives of these P/Ps, except for i), were originally carried out mainly in order to verify the contents of the recommendations. The major reason was that all the officials in charge of these projects were transferred due to changes of the mayors. However, the video and teaching materials made for the sanitary education P/P are used in the activities in Nueva San Salvador City. In addition, the collection route manual, which was compiled through activities in the P/P for the verification of collection routes, was used in another city.

Source : Compiled by SASAKI Shogo

established during the development study, more advanced technology transfer through OJT could have been carried out.

2) Outcome of the follow-up by short-term experts

In August 2002, two years after the development study, 2 short-term experts were dispatched for a period of 20 days in order to evaluate the current level of implementation of the M/P and give advice on any adjustments required to the existing activities. Through the investigation and the evaluation of the current state of SWM, advice was given on adjustment of the M/P. In the follow-up, the achievements of UEPRS were highly appreciated and the advice

was given that the cities, which are the implementing agencies, should actively understand the M/P and carry it out.

The dispatch of these short-term experts was effective cooperation aid from two points of view. One is that the mayors who comprise the COAMSS came to recognize anew the significance of the improvement ideas proposed by UEPRS, which was established through the M/P. This led to greater efforts to put the ideas into practice. The other is that technical officials in UEPRS (expert counterparts) were greatly helped by JICA's follow-up work with them. The timing of the dispatch, two years after the development study, was appropriate, since this was when the state of implementation was becoming clear, and some changes in the plan had been made. Since follow-up activities of this type will have an effect on the realization of the plan, it is expected that further follow-up will be carried out.

3) Synergistic effects of the training programs and the activities of the ex-participants

While one of the main factors in the success of the development study was the establishment of UEPRS, it is also inevitable that it raised organizational and human resources capacity as well as contributing to maintaining this capacity in order for the organization to carry out its activities effectively. In relation to this point, JICA's training programs played an important role. Two out of the three engineers from UEPRS had completed JICA training and returned to their country. Jose Perez, the chief coordinator, participated in the regional training course on urban waste management in Central America in 2002. Marene Solano, a technical supervisor, received third-country training in Mexico and participated in the regional training course in 2003. After more than two years since the development study, they themselves knew the technology that was required. Brushing up of their technical knowledge was effectively provided through the training, which resulted in enhancement of the participants' awareness of their mission, and contributed to the effective operation of the M/P. This is a result of the ideal synergistic effects of JICA's projects. The JICA El Salvador Office recommended them as participants, expecting the above effects. This is a good example in which follow-up monitoring by JICA's overseas office functioned appropriately.

Furthermore, the SWM training project was carried out through follow-up cooperation with the former SWM participants' group (16 members) in November 2003. Through this project, in which these UEPRS staff played a leading role, technical cooperation is being provided to 167 small-scale municipalities throughout the nation, utilizing the technology and experience obtained through the development study and the M/P.

Through the leadership of the former trainees' group that belongs to the central government, a technical cooperation project called the El Salvador comprehensive SWM project to support small municipalities, which was part of a regional environmental cooperation program in Central America called the Central American SWM Program to Support Municipalities, was formulated and a formal request for cooperation was made. Responding to this request, JICA dispatched a preliminary study team in FY2004, and the project is now in the preparatory phase[18]. In this case, the outcomes of long-term human resources development that utilized various schemes, such as experience in the development study, training in Japan, third-country training, a follow-up project, and a regional planning study, have resulted in the successful elucidation of local needs and the formulation of new technical cooperation projects to meet these local needs. It is significant that the top objective of technical cooperation is to create spillover effects not only

[18] As a preparation of this project, training for acquiring basic knowledge and transferring technology for conducting investigation on the present state of solid waste and for technology transfer, called "Training for comprehensive SWM in east part of El Salvador," was to be provided for about 10 weeks in 2004, targeting 30 prospective counterparts of this project. The returned former trainee will be instructing the training.

in El Salvador, but also in Central American countries facing common conditions and with common foundations, and the sharing of information and experience is being carried out from a broad perspective.

(3) Lessons from the perspective of capacity development

The outcomes described above are summarized in Table 3-7 from the perspective of capacity development.

3-4 Local cities in Sri Lanka

Section 3-4 takes up, in the same way as the previous section, mainly the development study on SWM support in Sri Lanka as an actual case. This development study was aimed at solving SWM issues in local cities in Sri Lanka. The study team from Japan and officials of the municipalities investigated the current state of SWM matters in a model city, formulated an SWM plan (Action plan), and implemented a pilot project. Through these activities, practical SWM improvement was attempted. At the same time, by placing the focus on the activity process, capacity development on the part of the municipalities was supported. In addition, a guideline had been compiled to utilize lessons from the development study for not only in the model cities, but also in every local government in the nation. Through an outline description of the development study, the essence is given in the following sections for future SWM services.

Table 3–7 Lessons from the perspective of capacity development (El Salvador)

Level of capacity development	Success/progress	Problems/future tasks
Individuals	・Development of the personnel of UEPRS	
Organizations	・Establishment of UEPRS as an organization to control overall SWM in metropolitan areas ・Establishment of technology concerning the improvement of collection routes	・The system in which COAMSS utilizes UEPRS is still weak ・Techniques and knowledge on solid waste have not been passed on due to changes of the mayors and personnel changes among the officials in charge of solid waste
Institutions/societies	・The system of fee collection along with electric power charges has taken root ・The diffusion of technology and experience from UEPRS to small municipalities throughout the nation and in neighboring countries ・Participation of the residents in waste sorting ・Adjustment of the charges for waste transport to the final disposal site by MIDES according to the current state of the operation (action by UEPRS)	・Insufficient supervision by UEPRS over the cities in the SWM project ・Administrative functions are not working sufficiently due to a scarcity of know-how on liaisoning with the private sector ・Political polarity among the cities in the metropolitan area has had an impact on the SWM project; this is a destabilizing factor for issues related to transfer stations, new landfill location, and collection fees
Roles played by JICA	・In continuing technical cooperation even after the development study, JICA implemented the dispatch of experts, training in Japan, third-country training, and the follow-up of the training projects (the set of these activities eventually worked out as a program approach). Through these activities, the counterpart's ownership was developed. ・Through the preparation of a manual based on the experience of the development study, the outcomes of technical cooperation had ripple effects, so that not only in the metropolitan area of San Salvador, but capacity development overall country was achieved. ・Promotion of the utilization of the officials of UEPRS contributed to the expansion of human resources	・Insufficient consideration of the case in comparison with development studies in other countries in Central America, and insufficient utilization of their outcomes. ・There is a limitation in being a donor since the framework of Central American regional environmental cooperation, or multilateral cooperation, was not always consistent with that of JICA's bilateral cooperation

Source : Compiled by SASAKI Shogo and KONDO Sei

3-4-1 Background and overall outline of JICA's assistance

(1) Background to the implementation of the development study

Local administration in Sri Lanka is executed by 9 Provincial Councils (PCs) and 311 local authorities (LAs). The local authorities are further made up of 18 municipal councils (MCs), 37 urban councils (UCs), and 256 Pradeshiya Sabhas (PSs) as of 2003. LAs are responsible for the execution of SWM services, while the role of PCs in SWM administration is very limited. At the national level, the responsibility for policies and implementation plans concerning local authorities lies with the Ministry of Home Affairs, Provincial Councils and Local Government (MOHAPCLG). MOHAPCLG includes the Local Loans and Development Fund (LLDF) that furnishes loan to the local authorities, and the Sri Lanka Institute of Local Governance (SLILG), which promotes the administrative capacities of local authorities. The formulation of national level policies in SWM is conducted by the Ministry of Environment and Natural Resources (MOENR), while practical regulatory control and management are undertaken by the Central Environment Authority (CEA) under the supervision of the MOENR[19], the CEA is a government agency appointed to work on the National Environment Act (NEA)[20].

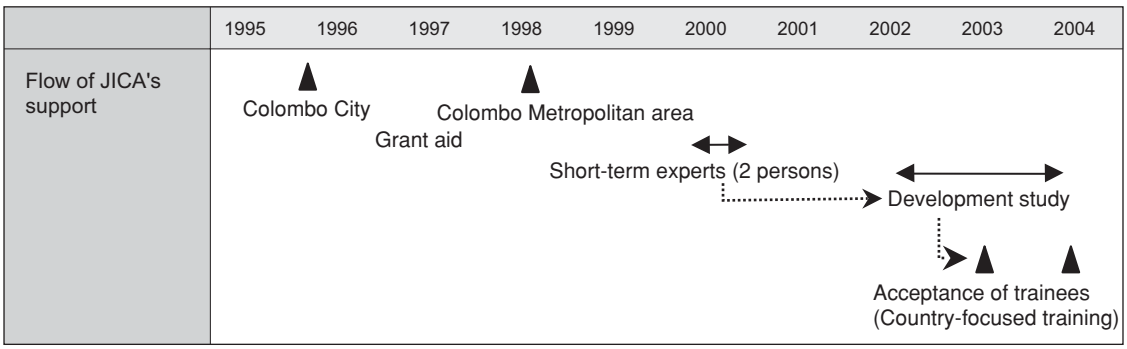
The general solid waste issues faced by the local authorities in Sri Lanka are too many to enumerate, but include: widespread waste scattering, terrible situations of landfill sites, difficulties in establishing new landfill sites, a little remaining capacity of existing landfill sites, huge SWM expenditure (about 20 to 50% of the LA's total budget), difficulty in controlling many collection workers, very high absentee and leaving work rate, many complaints from citizens, and political interventions.

Before the development study, JICA had provided solid waste support to Sri Lanka, mainly in the metropolitan area of Colombo, as described below. These are illustrated in Figure 3-5 (the year of implementation of the grant aid is referred to as the year of the signing of the E/N).

- 1995 : Grant aid "Improvement of solid waste management in the City of Colombo"
- 1997 : Grant aid "Solid waste management project for Colombo metropolitan area"
- 2000 : Dispatch of two short-term experts "Solid waste management"

In Colombo City, where urbanization has been rapidly advancing, the increase in the volume of waste and the complexity of the quality of the waste have also rapidly expanded. The collection, transportation and final disposal of wastes has become an almost intractable problem for the local authorities. The above two cases of

Figure 3-5 Chronological flow of JICA's assistance to Sri Lanka



Source : Compiled by KONDO Sei

[19] The Ministry of Healthcare, Nutrition and Uva Wellassa Development is taking charge of policy formulation and management of medical waste. It dispatches Medical Officers of Health (MOH) and Public Health Inspectors (PHI) to local authorities in order to cover healthcare management.

[20] It was enacted in 1980, and subsequently amended in 1988. The MOENR formulated National Strategy for SWM in 2000.

grant aid were for the provision of equipment (physical inputs), mainly for waste collection vehicles and disposal site equipment. While they were effective to a certain degree for the reinforcement of waste collection and transportation capacity, they did not result in any fundamental improvement in the overall SWM system, which includes final disposal. Accordingly, ripple effects concerning SWM improvements in local cities other than Colombo City could not be expected.

The government of Sri Lanka requested to implement a development study on SWM targeting local cities in September 2000[21]. In response to the request, JICA carried out a preparatory study and signed an S/W in September 2001, and carried out a development study from May 2002 to December 2003.

Considering the possibility of linkage with this study, a country-focused training program, targeting the administrative officials of local cities called "Local Administration for Environmental Protection in Sri Lanka-Towards an environmental city "Nagoya" started in January 2003 in order to promote the effectiveness of the study (See Box 3.1).

(2) Features and contents of the "Study on the improvement of solid waste management in the secondary cities of Sri Lanka"

The feature of the development study was that it is aimed at formulating an SWM plan (action plan) for each local city that focused on rather short-term effectiveness, not an M/P, which was based on a medium- to long-term perspective. In order to set the objectives and select the target cities, background information and the evaluation of capacity surveyed by the short-term experts (SWM) were taken into consideration. As a result, sufficient resources were made available for the project formulation. The five objectives of this development study are as follows:

(ⅰ) To formulate an appropriate and practical SWM action plan that matches the character of each city among the seven model cities;

(ⅱ) To jointly implement pilot projects (P/P) in the model cities aiming at the actual improvement of some aspect of SWM;

(ⅲ) To prepare guidelines for LAs for improvement of SWM;

(ⅳ) To prepare policy recommendations concerning SWM improvement in the local authorities for the central government; and

(ⅴ) To transfer technologies to the counterparts in Sri Lanka through the study.

Model cities were selected through consultations with the counterparts, taking into account the local characteristics and scale of each city. The selected cities were: Negombo, Chilaw, Gampaha, Kandy, Matale, Nuwara Eliya, and Badulla[22].

Table 3-8 Themes of the P/P that was carried out in each model city

Theme \ City	Chilaw	Negombo	Gampaha	Matale	Kandy	Nuwara Eliya	Badulla
Capacity strengthening	●	●	▲	●	▲	●	●
Waste minimization				●		●	●
Waste collection improvement	●	●	●	●	●	●	●
Environmental education	●		●	●		●	●
Landfill improvement					●	●	

● : Carried out, ▲ : Partially carried out

Source : Compiled by NAGAISHI Masafumi from JICA (2004f)

[21] A draft of the request for this study was formulated by JICA Sri Lanka office, MLG, which would be a counterpart of the study, and the short-term experts when they were dispatched in 2000.

[22] When this study was carried out, Chilaw City belonged to North Central Province, and had the population of 24,100. Negombo City (Western Province) had 146,000 citizens, Gampaha City (Western Province) had 57,400 citizens, Matale City (Central Province) had 36,300 citizens, Kandy City (Central Province) had 110,000 citizens, Nuwara Eliya City (Central Province) had 27,800 citizens, and Badulla City (Uva Province) had 41,000 citizens. Chilaw City was an UC, and the others were MCs.

3-4-2 Outline and evaluation of the pilot project

In this development study, a P/P that met the conditions of each target model city was carried out. One of the features of the implementation of the P/Ps is that technical cooperation and capacity development were carried out in the P/P itself. The themes of the P/P in each city are indicated in Table 3-8.

These P/Ps carried out in the local cities were aimed at providing opportunities for each of the counterparts to learn and deepen their understanding through the practical improvement process and operation of individual tasks in solid waste programs. They were also aimed at the acquisition by the counterparts of the ability to formulate and to revise SWM plans by themselves. In addition, the counterparts were able to derive lessons for their future tasks in formulating guidelines.

Accordingly, the following aspects were respected in setting the approaches to the above aims.

(ⅰ) Among the action plans made by the counterpart and the study team, high-priority improvement activities were selected as P/Ps.

(ⅱ) In order to promote the counterpart's initiative, the study team provided counterparts with only technical guidance in the initial stage and technical support during the P/P implementation.

(ⅲ) In order for the P/P to continue and spread to

Table 3-9 List of pilot projects

Targeting the nationwide level	
・Compilation and distribution of picture books on waste education for children and seminars on teaching methods (4) ・Formulation of model SWM ordinances for local authorities (5) ・Trial lectures on SWM for a public health inspectors' (PHI) training course (using the SWM guideline proposals targeting local authorities nationwide) ・SWM seminars for environmental NGOs ・SWM seminars for decision making level staff in local authorities ・Seminar for university students and staff on the related social issues	
Targeting model cities	
Capacity strengthening	・Preparation of SWM by-laws based on the SWM model by-laws ・Supervision of SWM services for officials of the local authorities (including public health inspectors), management, training on the matters related to cooperation from the residents (Kandy city excluded) ・Preparations for SWM management tools (SWM monthly reports, SWM control boards) ・Educational activities and Provision of necessary items for supervision and public promotion activities (motorcycles) ・Supporting activities of the improvement/finalization of the SWM plans (action plan)
Waste minimization	・Promotion of the composting of kitchen waste at the source of generation (provision of compost pits, compost barrels, etc.) ・Support to private sector recycling business ・Reduction campaign on food wastes ・Reduction of polyethylene shopping bags (liaison with the JOCV "Bring your own bag" campaign was implemented)
Waste collection improvement	・Establishment of proper solid waste discharge and collection rules, and announcement of the rules on bulletin boards (1) ・Introduction of the Bell Collection System ・Promotion of a combination of the bell collection system and curbside waste collection (1) ・Implementation of the appropriate distribution of various types of public waste bins ・Taking proper counter measures suitable to each public container ・Introduction of stationary collection by trailers at the collection stations
Environmental education	・Support for preparing environment education materials ・Establishment and operation of environmental education centers where general citizens and students can learn about the environment and solid waste issues (3) ・Establishment and operation of an on-site environmental education capability ・Implementation of public awareness-raising activities for residents ・Implementation of recycling in schools (3)
Landfill improvement	・Construction of the facilities required for sanitary landfill, provision of landfill equipment, technology transfer on sanitary landfill operation methods, and guidance in measures related to social considerations (2)

The numbers in the brackets identify the relevant place in the main text in section 3-4-2.

Source : Compiled by NAGAISHI Masafumi based on JICA (2004f)


Photo 3-5 Bell Collection System

Residents positively cooperated with the discharging method which the local authorities had set up; in Kandy City (photo left) and Badulla City (photo right)

other local authorities, only locally available resources, such as materials, equipment, technology, and human resources were utilized. From the same perspective, the study team only provided counterparts with technical assistance and financial assistance for the initial investment, not in the operation and maintenance costs.

(iv) As major cause of failure in past SWM projects were related to too much orientation of policy on technology, the "non-technical" issues (economic and social aspects, community participation) were placed a higher importance.

(v) The P/P menu was selected after assessing the basic capacity available so that the activities could be successfully carried out if the counterpart's capacity was raised a little.

(vi) Similar P/Ps will result in different outcomes, depending on the background, operational organization, and persons in charge, and experiencing such differences will provide important lessons. For this purpose, similar P/Ps were carried out in different model cities.

(vii) After reviewing the outcomes of the P/P, the counterparts themselves revised the SWM plan. Through this means, the counterparts raised their level of ownership as well as making the plan workable.

This study carried out many P/Ps, which are shown in Table 3-9. Among these P/Ps, some distinctive P/Ps were selected and their outlines and evaluation are reviewed next.

(1) Implementation of the Bell Collection System[23]

In the solid waste service, the contributions that residents can make most directly are activities at the time of waste discharge. If waste is properly discharged through the cooperation of the community residents, waste scattering will be reduced, and the cost of road cleaning and waste collection will also be reduced.

Practical implementation of Bell Collection System was carried out through the following process[24]: i) the study team made presentations on the Bell Collection System to officials of the local authorities, ii) the officials of the local authorities set the rules for the discharge of wastes, waste collection schedules, and target areas, iii) the officials of the local authorities carried out PR activities using leaflets and notice

[23] While a waste collecting vehicle is going around the town, it plays music, so that citizen will notice that the collection vehicle is coming. When the collection vehicle comes, they bring their waste out of their house, and hand it to the collection worker. Actually when they know they would not be at home when the collection vehicle comes, they are allowed to put their waste bin in front of their house beforehand (curbside collection).

[24] Bell Collection System in the P/P was carried out in a limited area in Badulla. However, the city government independently bought collecting tractors, and gradually expanded the target area, so that almost all areas came to be covered by the Bell Collection System. In Negombo City, the Bell Collection System proposed by the study team was stopped by the city government's consideration. However, citizens' strong opposition enabled re-starting of the collection service.

boards, iv) the officials of the local authorities made presentations on the implementation procedures for Bell Collection System to the collection workers and collection truck drivers, v) the bell collection system was implemented by local authorities.

The Bell Collection System was carried out with community participation in all of the above-mentioned model cities, which resulted in a reduction in waste scattering. It must have been inconvenient for the residents since they could discharge waste only on the collection days in the Bell Collection System, compared to the conventional method in which they could discharge waste at any time. Still, they cooperated with the new scheme very well. The factors for successfully gaining the cooperation of the residents were that the discharging method was clearly notified to the residents, the cooperation was within the range of the residents' ability, and the residents understood the advantages of the Bell Collection System. From the point of view of the local authorities, waste collection activity announced by playing music practically showed the execution of their activities to the residents. While this raised the residents' interest, any failure in the collection activity will result in drawing complaints from the residents. Accordingly, the local authority will become more aware of their responsibility for carrying out waste collection activities. Regularly carrying out collection activities without fail is one of the merits of the Bell Collection System.

(2) Improvement of the existing landfill site to a sanitary landfill

Challenges concerning the landfill site in Sri Lanka were grouped into two; mitigation of the environmental pollution caused by the existing landfill site, and establishment of new landfill sites. In this study, a P/P to improve the Gohagoda landfill site in Kandy City was carried out to overcome the former challenge. As a case of the latter, or the challenge of applying sanitary landfill technology to a new landfill site, the Moon Plain landfill site[25] in Nuwara Eliya City was constructed. The implementation outline for those two cases is as follows.

(i) Implementation of facility improvements, including the presentation of technology to reduce harmful effects on the environment and the structure of the sanitary landfill site.

The collection and treatment of leachate, soil covering of the wastes, turffing on the embankment, the installation of fences to prevent the scattering of waste litter, drainage ditch improvements, improvement of the access roads, and the construction and improvement of a control house (including heavy equipment garage) were carried out.

The main improvement work at the Gohagoda landfill site consisted of soil covering of the waste, turffing of the slopes, and the installation of fences to prevent waste scattering. This work involved the use of simple methods and inexpensive materials that could be obtained in the local area. While the contents of the improvement work were rather different from those of the Moon Plain landfill site in Nuwara Eliya City, the use of simple methods and inexpensive materials is a factor in common with the Moon Plain landfill site. Partly because both disposal sites had a simple structure, advanced technology was not necessary for their operation and management.

(ii) Technology transfer in sanitary landfill methods

By actively having the counterparts participate in the execution management of the construction work of the existing landfill site, they acquired knowledge concerning structure of the facility and methods for its operation and maintenance. Furthermore, an operation manual for the sanitary landfill was compiled, lectures on it were given, and technology transfer after the completion of improvement work was carried out. Technology transfer was implemented concerning waste surface compaction using bulldozers, soil

[25] In those days, Moon Plain landfill site was in the valley covered by artificial forests, and city government itself illegally dumping waste there.

covering, and the installation of the gas ventilation pipes.

(iii) Establishment of a monitoring committee

In order to maintain sustainable operation and maintenance, a monitoring committee was established, which held meetings regularly, and evaluation of the outcomes was announced to the public. The committee consisted of a representative of the residents near the landfill site, officials of the related organizations, environmental NGO staff, officials of the Central Environment Authority (CEA), staff of MC in charge of solid waste, and members of the environment committee. The committee was held regularly and its work was conducted according to a checklist formulated by the study team, and the outcomes were expected to be announced to the public. The committee raised interest among the city residents, so that many groups of elementary school children visited the landfill site as part of their environmental education and officials of the neighboring local authorities visited the site. In this way, the landfill site is playing a leading role as a model sanitary landfill site in the nation (See 2-4-5, Box 2.5).

Before the improvement of the Gohagoda disposal site in Kandy City, only 7% of the residents were satisfied with the operation of the site due to the adverse conditions, including serious offensive odors and dust, smoke hazards,

Photo 3-6 Before and after the improvements made at the Gohagoda disposal site in Kandy City

The landscape had deteriorated due to the slope where waste was exposed, and neighboring residents were annoyed by the scattering of waste litter, smoke pollution caused by fires, and nuisance caused by small animals and odors. Many complaints were made by the neighboring residents (photo above left and below left). Reshaping, soil covering, and turffing were conducted on the slopes, and a fence to prevent waste scattering was installed on the slopes. Smoke pollution and foul odors disappeared, the landscape was improved, and there were no more complaints from the neighboring residents (photo above and below right).

ground water pollution, adverse impacts from birds, rats, and dogs due to the presence of the site, higher levels of waste littering, and problems concerning the collection vehicles. After the improvements, those problems were solved and the proportion of residents who were satisfied with the operation of the site reached 97%[26].

In the case of Nuwara Eliya City, although waste used to be dumped illegally, the construction of the sanitary landfill disposal site mitigated various problems, such as fire erupting in the waste, offensive odors, nuisance factors caused by harmful insects, such as flies and mosquitoes, and other problems similar to those of the Gohagoda landfill site in Kandy City. The landscape of the site was also improved. Paving of the access road also made it easier for the collection vehicles to approach to the site even in bad weather.

(3) Promotion of environmental education

Various P/Ps were carried out from the perspective of environmental education in the model cities. Among these P/Ps, this section reviews the establishment of environmental education centers and recycling in the schools.

Environmental education centers were established in Chilaw City, Matale City, Nuwara Eliya City, and Badulla City. The opening of these environmental education centers completed a system in which environmental education in the centers and dispatched educators were able to be provided.

For each environmental education center, banners and leaflets for environmental education were made according to the counterparts' ideas. At the same time they also support the formulation of action plans for environmental education that are carried out independently and continued by the counterparts[27].

These action plans included an annual educational process sheet, and an accompanying education budget proposal. It helped the counterparts to secure a budget allocation.

Recycling activities in the schools were carried out only in Bampaha City. The objective of this P/P was for school students to learn about waste sorting and discharge, the significance and methods of recycling, as well as economic attitudes through practical mass activities involving the collection of recyclables. Storage space was set up in the schools. The students regularly brought in recyclable waste from their households, collected recyclables such as waste paper generated in the school, and stored these in the storage areas. When the volume of recyclables became large enough, the school asked the business in recyclables in the city to collect them. The income from selling the recyclables was used to buy sports gear and cleaning equipment. Depending on the circumstances of each school, various different activities and mass collection methods were adopted. For example recycling awareness activities targeting the teachers or environmental education workshops targeting the students were provided, or recycling promoters were appointed from among the teachers and students. The incentive for the school was that a little income could be obtained while the operation and management costs were low.

(4) Compilation of a waste education picture book

The MOENR took the leadership in the compilation and distribution of 100,000 copies of a picture book for waste education and 10,000 copies of a teaching manual, which were sent to public schools nationwide through the Central Environment Authority (CEA). While the preparation of the teaching materials for waste education had been carried out in various other SWM cases, this picture book is unique since it uses pictures that give a strong message without any text. The basis of this is a problem unique to

[26] From the results of the study of citizens' attitude conducted before (June 2002) and after (November 2003) the improvement work.

[27] Among the 4 cities that opened environmental education centers, Chilaw City, which opened the center first, provided some environmental education to about 1,500 persons for 9 months from March, 2003.

Sri Lanka, where the students' mother tongue often varies from Sinhalese and Tamilian to English. This picture book was innovative since it could be appreciated by anybody regardless of their mother tongue, and promoted voluntary learning by the students based on their own findings. The teachers' manual was separately prepared in three languages.

(5) Formulation of solid waste model by-laws

Although the MOENR had formulated a national strategy for SWM in 2000, this was not implemented. This was because local authorities, which were the responsible agencies for SWM services in practice, did not have by-laws for SWM in compliance with the national strategy. In addition, there were obstacles, such as the fact that the local authorities did not have sufficient capacity to independently formulate by-laws in compliance with the national SWM strategy, and that the provinces that had the authority to approve by-laws had not approved an by-law for a long time.

Through the support of the study team, a model by-law based on the national SWM strategy was formulated. In the model cities, revision of the model by-laws to produce appropriate by-laws that matched each city's unique conditions was carried out. Many local authority officials participated in the formulation of the by-laws, and commissioners to formulate the by-laws were selected. There were many processes involved in their formulation. For example, the committee members participated in several sessions of workshops conducted by the Sri Lankan Institute of Local Government (SLILG). In Kandy City, the ordinance was approved by the city assembly during the operational period of this study, and it is well on the way towards realization.

3-4-3 Knowledge and lessons obtained from the case

The outcomes of the study on SWM planning for local cities in Sri Lanka that are reviewed above can be structured from the perspective of capacity development support as shown in Table 3-11.

The features of this study and the lessons drawn from it are shown below.

(1) Utilization of information obtained by short-term experts

Through the extremely effective use of the information provided by the SWM short-term experts dispatched before the development study, the elucidation of local needs, the formulation of the cases, and assessment of the capacity in the preparation phase were carried out accurately. The experts provided useful information in setting the project goals and selecting the target cities, so that the support plan could be designed effectively.

Photo 3-7 Picture book for waste education

From diverse viewpoints on waste issues, this explains not only health and sanitation aspects, but also what children can do to reduce waste and ensure the cooperation of residents in cleanup projects.

Table 3-11 Lessons from the perspective of capacity development (Sri Lanka)

Level of capacity development	Success/progress	Problems/future tasks
Individuals	・Personnel development of the officials in charge of the local authority	・Shortage of human resources
Organizations	・Acquisition of the ability to formulate and implement each local authority's SWM plan ・Improvements in SWM ・Improvements in collection conditions ・Improvements in the existing final landfill site	・Differences in administrative capacity among the local authorities (for example, Gampaha had insufficient capacity since it became involved just after a merger)
Institutions/societies	・Establishment of a solid waste model ordinance and establishment of solid waste ordinances based on the model ordinance ・Expansion and deepening of waste education ・Reinforcement of partnerships between the residents, NGOs, and the private sector	・Future tasks are the promotion of the ripple effects of the outcomes of the model cities throughout the nation
Roles played by JICA	・Implementation of the study based on the counterparts initiatives; support to raise capacity through assistance in the formulation of action plans ・Introduction guidance on new tools (the Bell Collection System, public waste bins, composting at the source of generation, teaching materials such as the picture book) ・Physical and non-physical inputs that contribute to the improvement of landfill sites ・Support for the formulation of guidelines on the establishment of ordinances ・Synergistic effects resulting from linkages between the development study in the recipient country and training in Japan	・Future tasks include finding out how to engage in promoting the ripple effects throughout the nation after reviewing the outcomes in the seven specific cities.

Source : Compiled by YOSHIDA Mitsuo and NAGAISHI Masafumi

(2) Implementation of pilot projects that matched the capacities of the target cities

As the study team implemented the P/Ps according to the capacities of the target cities, the P/Ps carried out under the study had a comparatively wide range of menus. For example, the Gampaha City Government, right after the merger, did not have a very high administrative capacity. Accordingly, the P/Ps that required the initiative of the city government (such as the establishment of an environmental education center) were avoided, and recycling in schools, which could be operated independently through the initiative of the schools, was carried out.

(3) Implementation of pilot projects led by the city governments

The Bell Collection System was carried out in all the target cities. The basic stance of the study team was to help the project in the introduction phase and carry out monitoring, but let the city government take the lead in the project implementation as much as possible. For example, one target area, Badulla City, needed follow-up by the study team. However, the city bought tractors later by themselves to expand the area where the Bell Collection System had been introduced. The same stance was taken in the case of environmental education and recycling in the schools.

(4) Establishment of a monitoring system by community residents

In addition to the city government's initiative, effective monitoring of the project by the city residents was another feature of the P/Ps in this study. For example, monitoring committees were organized in the cases of improvement in the landfill sites in Kandy City and Nuwara Eliya City. Another leading example was the case of Negombo City's Bell Collection System. Although the City government stopped

the Bell Collection System after it was introduced, the collection was restarted as a result of strong demand from the community residents, through leaders of the community organizations.

Box 3.1 Country-Focused Training : Local Administration for Environmental Protection in Sri Lanka

–Towards an Environmental City "Nagoya"–

Coinciding with the development study, this country-focused training (CFT) course was launched in January 2003 at JICA's Chubu International Centre (renamed JICA Chubu in October 2003). The course, which mainly targets administrators (deputy mayors or their equivalents) or environmental officers of local governments in Sri Lanka, was held three times until fiscal year 2004, as shown in Table 3-4-3.

This CFT course was originally intended to cover public administration of the environment as a whole. Hence JICA adopted this course, not necessarily mindful of possible coordination with the development study mentioned in this section. In other words, this course and the development study were being prepared by different departments at JICA with no liaison between. Then a survey team was sent to Sri Lanka as part of the preparatory process of curriculum development. Through a field survey, the team learned that the main focus of local environmental administration is solid waste management (SWM). In consultation with the team, JICA redesigned the course to focus on SWM and maintain close coordination with the development study. This course was first held in the same year (2003) when P/Ps-a linchpin of the development study-were implemented. Thus necessary arrangements were made for close coordination, including the selection of participants only from the local governments covered by the P/Ps. Due to these factors, remarkable synergy was achieved between this course and the development study.

The curriculum components included: job report presentation by each participant; an introduction to municipal environmental administration in developing countries by JICA's senior advisors, experts and/or former study mission members (Part I); presentation on the practice of local administration of environmental conservation with case studies of Environmental Affairs Bureau, City of Nagoya; inspection tours of relevant facilities for possible application to the local governments to which the participants belonged; and the preparation and presentation of an action plan in order of sequence.

In the first and second rounds of this course, lectures presented by the head and members of the development study team had a great impact on the participants and the performance of the course as a whole, because they presented specific examples in Sri Lanka. Specifically, the lecture focused on the activities of the study mission in the country, progress and challenges of each P/P, and specific efforts to improve SWM, while providing latest information obtained on the ground.

The successful coordination between the CFT course and the development study was made possible in large part by close liaison the JICA domestic office maintained with the development study mission and the JICA departments concerned in an effort to develop an appropriate curriculum.

NAGAISHI Masafumi / YOSHIDA Mitsuo

* The content of this Box is based on reports by TAKATOI Shunsuke (then at JICA Chubu) and TAKANO Shintaro (at JICA Chubu).

Table 3–10 Profile of CFT: Local Administration for Environmental Protection in Sri Lanka

Round	Period	Quota of participants	No. of participants actually accepted	Local governments, etc. participants are from
1st	Jan. 6 – Feb. 24, 2003	7	5	Nuwara Eliya, Badulla, Matale, Kandy and Negombo (participation from Gampaha and Chilaw put on hold)
2nd	Oct. 9 – Nov. 29, 2003	7	7	Gampaha, Matara, Galle, Kalmunai, Batillcloa, Uva Province and Ministry of Public Administration and Home Affairs (in charge of local governments)
3rd	Oct. 11 – Nov. 28, 2004	5	6	Nuwara Eliya, Rathnapura, Sri Jayewardenepura Kotte, Kurunegala, Ministry of Trade, Commerce and Consumer Affairs, and Southern Province

(5) Implementation of pilot projects by taking continuity into consideration

This study implemented the formulation of SWM plans (action plans) that could be regarded as basic plan of SWM of the target cities. In the same period, experimental P/Ps, as represented by the lamdfill site improvement in Kandy and Nuwara Eliya Cities, were also carried out. These P/Ps were designed to indicate practical improvements that could be made from their implementation. In other words, these P/Ps were not considered as tools of the development study. Furthermore, these P/Ps included aspects of a preceding study implemented as a part of a feasibility study.

(6) Organization of the study team

Two former JOCVs (community development) dispatched to Sri Lanka who had just returned and a former JOCV dispatched to Guatemala, who specialized in environmental education, participated in the study. The implementation of a P/P targeting the local cities required the involvement of the community residents. Accordingly, the experience of JOCV activities was thought to be very useful.

(7) Extension of the study outcomes to local cities nationwide

Although this study targeted seven local cities, one of its objectives was to eventually extend the know-how of SWM to local cities throughout Sri Lanka. The SWM guidelines produced by the study are one of the outcome. In addition, there are several noteworthy features in the process of the study as follows: the implementation of technology transfer seminars involving not only officials from the seven target cities, but also those from other local authorities, the implementation of waste education seminars targeting senior officials of the local authorities of each province at a time, the provision of waste seminars targeting environmental NGOs, and the consideration for nationwide development of these activities.

3-5 Lessons from the case study

Four actual SWM project cases have been reviewed in the above sections, exploring the success factors and lessons. This section will attempt to draw common lessons for the implementation of future projects, and as materials to consider future directions in Chapter 4.

(1) Multifaceted approaches

The first success factor common to all the four cases considered here, was that approaches were taken for the capacity development at various levels. This was possible because the program was formulated by assigning the right persons to the right places, utilizing the characteristics of each JICA scheme. In the case of Laos, efforts were made to strengthen the capacity at various levels. At the organizational level, the M/P was formulated through a JICA development study and the equipment was provided through grant aid. At the individual level, experts, SVs, and JOCVs were dispatched in order to continue the effects of the above-mentioned organizational cooperation. In this process, the recipients themselves tried to enhance their capacity at the institutional/social level, achieving decentralization and establishing SWM departments. Although the direct targets of the support in the case of Sri Lanka were local authorities, the addition of community participation and environmental education support components to the overall support program provided benefits not only to organizations and individuals, but also strengthened the capacity of the society as a whole.

As described above, an approach in which appropriate inputs are provided through assessment from a broad perspective of the required capacity of the recipients at the time is effective in establishing the results of cooperation and ensuring continuity.

(2) Appropriate follow-up and monitoring

The second success factor is that follow-up is functioning appropriately in order to ensure continuation of the effects of cooperation. This, paradoxically, illustrates how difficult it is to establish the effects of temporary support. Needless to say, the effects of following-up depend on its proper timing and the contents of the input, not on the scale of the input. This refers to the outcomes achieved by the short-term experts in El Salvador.

Based on the assessment of capacity from the comprehensive perspective described above, consideration of the nature of the follow-up is required (or not required) to ensure independence on the part of the recipients and continuity in relation to the outcomes. For this purpose, monitoring from the phase of practical implementation of the case, and securing information sources is also important. Cooperation and support for the recipient country from foreign agencies, including JICA, cannot continue forever. The ideal is to provide support such that the outcomes of the support take root, and the recipients gain self-reliance and the ability to operate appropriate SWM services. In formulating cases and setting post-support directions, it is important to consider the effectiveness of the inputs based on a grand design that even covers post-support policy.

(3) Ensuring continuity: discontinuity with regard to human resources

The main reason that the activities proposed by the pilot projects did not take root in the Philippines was the discontinuity with regard to human resources. On the other hand, continuation of the effects of cooperation that occurred in the cases of El Salvador and Laos was largely the result of the same C/P being continuously engaged in SWM after the implementation of the project. In developing countries, a high rate of turnover in jobs and a high rate of resignation from positions are likely to be restraining factors. It is important to carry out not only transfer support in relation to technology and know-how with regard to specific individuals, but to generate activities that will maintain the provided technology as a part of the overall capacity of the organization. For this purpose, ensuring that implementation periods continue for a certain length of time and establishment of the following-up process mentioned above will enable support to function effectively.

Chapter 4 Directions for Capacity Development Support in Solid Waste Management

This chapter puts forward approaches to be adopted toward successful capacity development support for developing countries in the solid waste sector, drawing on specific issues and their characteristics identified in Chapter 2 and the lessons learned from case studies in Chapter 3. Specifically, Chapter 4 presents key considerations, identifies anew the components of the capacities required for SWM, and sets out the items for assessing them.

4-1 Key considerations for assistance in SWM

This chapter first focuses on three key considerations that should be continually kept in mind when providing development assistance in the solid waste management sector: (i) capacity development (CD) that emphasizes ownership by the recipients; (ii) appropriate technologies that accommodate constraints; and (iii) constraints on inputs and support.

4-1-1 Capacity development support that emphasizes ownership

Ensuring ownership by the recipient countries and their implementing agencies is the starting point for capacity development support.

In SWM, as well as in other sectors, the donor should do everything it can to achieve favorable outcomes while ensuring autonomy and sustainability on the part of the recipient. This requires strategic decisions regarding which component of the recipient's capacities should be addressed and which approach should be employed for each component. Such decisions should be based on an accurate assessment of a number of factors, including the overall capacity of the recipient country and the activities of governmental and non-governmental aid agencies.

It is therefore important that the donor should always apply a comprehensive frame of reference that covers each level of capacity, meaning individuals, organizations and institutions/society system, and that also respects the initiative and ownership of the recipient. In this sense, the idea of capacity development provides a comprehensive approach to technical assistance[1].

Chapter 3 reviews the experiences and lessons learned from cooperation projects in SWM in Manila, Vientiane, El Salvador, and Sri Lanka. In the context of capacity development, the experiences and lessons for each country have been summarized in a table in the form of success and progress versus problems and issues at the institutional/societal, organizational and individual (human resources) levels (Tables 3-3, 3-5, 3-7 and 3-11). These tables should be reinterpreted as examples of the successes and failures of aid approaches.

All these tables show that the higher the level, the more diversified the constraints and the deeper they are rooted in the society and culture. In other words, what can be achieved by inputs from external parties is more limited at the institutional/societal level than at the organizational level, and at the organizational level than at the individual level. This indicates that the higher the

[1] Task Force on Aid Approaches, JICA (2004). UNDP defines the term "capacity" in the context of development as "the ability of individuals, organizations, institutions, and societies to individually and collectively perform functions, solve problems, and set and achieve objectives (problem-solving ability)." UNDP (1997)

level, the more essential it is to ensure endogenous effort by the recipient. Capacity development at the individual level, for example, is closely related to individuals' mental inside, such as motivation and willingness. In principle, the way to develop the capacity of an organization or management is up to the members of the organization. All that any external parties can do is to provide advice. Even then, the appropriateness of the institutions and the social system of a given society can be judged only by the members of that society (the local residents, citizens, etc.). Without taking this into full consideration, the introduction of any "rational" and "appropriate" technology or system by external parties will not achieve the expected results. This is illustrated by the case study of Katmandu city (see Section 1-2), in which a variety of aid inputs failed to produce successful outcomes. In short, capacity development support should not be donor-driven; it must be addressed entirely through a strong sense of ownership and endogenous effort by the recipient countries.

4-1-2 Appropriate technologies that accommodate constraints

"Appropriate technologies" are technologies that build on the capacity of the recipient.

People in developed countries tend to be appalled at the status of SWM in developing countries, saying "Why can't they do such an easy job?" However, there are reasons for the current situation (which is inadequate in the eyes of people in developed countries). Ignorance of the background factors may invoke a backlash from the developing countries. It is necessary to first methodically observe and analyze the background factors in the developing country city concerned. Factors that constitute the background to the waste situation in developing country cities are identified and characterized in Chapter 2.

Developing countries have many technical and economic constraints. They also have different climatic conditions, natural features and social factors from those of developed countries. Japan should put these differences into perspective and ask itself such questions as, "What does the recipient country need most? Which sector (or component) needs assistance? What constitutes a breakthrough? Which approach is most needed?"

What is required of solid waste management (SWM) in developing countries? In most cases, their concept of SWM is completely different from that of Japan, where the means of controlling dioxins from waste incinerators or recycling materials for waste reduction are some of the main SWM issues. For example, waste planners in developing countries are making extensive efforts to collect wastes that are generated every day, to keep the streets clean, and to transport the collected wastes to designated landfills for disposal without causing littering on route. These are the basics of SWM in the eyes of people in the developed countries, but they are major issues or concerns for citizens in developing countries.

In fact, not all the wastes generated in developing country cities are collected due to a lack of collection vehicles or inadequate collection systems. As a result, the streets are not clean and cause fly infestations. In the suburbs, wastes are dumped haphazardly along roadsides and in open spaces. At designated landfills (disposal sites), if there are any, covering with soil is usually not practiced. Wastes in such places often combust spontaneously or are burned in the open by waste pickers to recover the copper and other recyclable metals in mixed waste.

As these examples indicate, the technical level of SWM that is required in developing countries is not necessarily high. The key requirement is to ensure that wastes are properly collected and disposed of at landfills in an environmentally-friendly manner within the constraints of limited financial resources. The

first step for donors therefore is to consider technologies that are appropriate on the ground (such technologies cover both the physical aspects, such as vehicles and other equipment, and the non-physical aspects, such as planning and management). The next step is to explore aid approaches based on such technologies. Appropriate technologies are often characterized as:

- Technically viable,
- Economically feasible,
- Culturally accepted, and
- Environmentally sound.

Technologies are not appropriate unless these four requirements are satisfied. In some cases, the locally available materials, equipment, labor force and skills are also considered to be additional requirements of appropriate technologies. Appropriate technologies can be summarized as "technologies that contribute to problem solving even to a limited extent within the constraints of the city or the country concerned."

As has been summarized in Chapter 1 (Section 1-1), constraints facing developing countries in the waste management sector are diverse. They include: human and technical factors; financial factors; institutional factors; economic factors; social factors, such as rapid urbanization and the expansion of slums; and natural and environmental factors, such as climatic conditions (dry, tropical, prone to flooding, etc.). The donor should have the expertise to identify the major constraints and the most pressing issues for the recipient.

Capacity development is a gradual process in which contradictory aspects are often inevitable.

Few developing countries can afford to divert sufficient financial resources to SWM. Donors cannot continue to permanently provide support for all aspects of SWM. After development assistance indicates an approximate course of action, provides technical guidance, and supplies some of the necessary equipment, it remains for the developing countries to help themselves. This is why capacity development is essential.

Within the bounds of such constraints, it is necessary to avoid targeting the best solution and instead opt for a better solution that may fail to meet the standards of developed countries, but will still improve the situation-an apparent compromise that donors have no choice but to accept.

In the case of the situation of a river running through an urban area of a developing country where heavy pollution by the leachate from a landfill, human excreta and sewage has occurred, such pollution may give rise to cholera and other water-borne infectious diseases. As part of its program to improve the urban environment, a donor may construct an advanced leachate treatment facility at the landfill, such as those commonly seen in developed countries. However, such a facility alone may not only fail to reduce river pollution, but may also impose leachate treatment costs (a few tens of US dollars per cubic meter in Japan) on the recipient country.

In contrast to Japan, where one of the main issues is how to completely eliminate groundwater pollution caused by landfill leachate, developing countries have yet to solve problems that Japan faced three decades ago, including the occurrence of fly infestations and the spontaneous combustion of wastes in landfills. It is not feasible to improve the situation to the level of developed countries all at once. Such an approach may be able to provide 'hardware' or 'software' resources to developing countries, but it cannot contribute to their capacity development. Capacity development is a gradual process; it is what developing countries achieve by themselves.

It is therefore necessary to devise a feasible plan that can improve the situation even slightly. Donors should set aside their own waste

management practices and provide assistance that accommodates local conditions, respects the views of the recipients and embraces appropriate technologies. The same amount of funding is likely to produce more effective outcomes if it is spent on, as for example in the case mentioned above, collection vehicles or truck scales to prevent overloaded vehicles from entering the sites, rather than on leachate treatment facilities. In any case, engineers and administrators in developing countries will eventually adopt the option of leachate prevention.

The concerns of people in developing countries with respect to SWM are not limited to keeping the streets clean. They also demand the regular and complete collection of wastes. Wastes left uncollected clog ditches and cause fly infestations that carry pathogens and mosquitoes that spread dengue fever, malaria and other communicable diseases. As discussed in Section 2-5, waste collection is one of the minimum requirements for maintaining public health.

To summarize, development aid in the waste management sector should ensure both proper waste collection and environmentally-friendly disposal at landfills based on an accurate assessment of the situation, especially problems with SWM, in developing countries. To this end, donors should provide technologies that cover both 'hardware' and 'software' aspects and support the capacity development of the recipients.

4-1-3 Constraints on inputs and support

Constraints concerning aid schemes on the part of donors can only be overcome by the donors themselves. The integration of projects into a program as well as reinforcement of the monitoring process are the clue to the solution.

Constraints for the donors have been classified into human and technical factors, organizational and institutional factors, economic factors and social factors in Section 1-1. These factors may stand in the way of effective aid approaches. Problems with human and technical factors and social factors are also associated with the issues mentioned in the above section on appropriate technologies. The following paragraphs focus on the main institutional and structural constraints on the part of the donors themselves.

One constraint is the difficulty of taking an integrated approach to aid projects for SWM when each donor or each of the organizations concerned within the donor agency has its own distinctive responsibilities and authority. Such an approach may, for example, integrate three different approaches-the provision of physical inputs, provision of 'software' inputs, and capacity development support-for integrated project formation. However, a combination of different approaches requires the application of different aid schemes, which in turn calls for coordination among the different organizations concerned.

Japan has been providing assistance in the solid waste sector through a range of aid schemes, including multilateral aid, loan aid, grant aid, technical cooperation (development studies and the dispatch of experts), training, and the dispatch of volunteers. All these schemes except for the first two are almost exclusively provided by JICA. There are favored approaches for each scheme. Depending on the conditions faced by the recipient, such approaches should be integrated and combined into an optimal approach.

In fact, JICA has succeeded in applying an integrated approach to a number of aid projects in the SWM sector. A series of aid schemes for the improvement of SWM in Vientiane, Laos is one such example. The integrated approach here encompassed a development study, training, grant aid, the dispatch of experts, and the dispatch of volunteers, in this sequence, thus contributing to a significant improvement in the SWM in the city. In addition, in the City of Manila, the Philippines, JICA achieved a measure of success in capacity development in a series of technical assistance

projects, including the dispatch of experts, training, a development study, the additional dispatch of experts and multilateral aid (with UNDP) in succession. JICA's coordinated approach in El Salvador, involving a development study, the dispatch of experts, and training, has developed into a new technical cooperation project that encompasses regional cooperation. In Sri Lanka, JICA's series of aid schemes-the dispatch of experts, a development study, and training-are aimed at developing a project designed to have wider ramifications.

Such moves to integrate aid approaches with the application of multiple aid schemes have been to date accidental rather than being planned from the beginning.

For the future, JICA needs to learn from these experiences and intentionally integrate projects into a program. This requires, among others, human resources and institutional arrangements to monitor aid projects in a sustained manner.

4-2 How to define "capacity" in SWM

How can the term "capacity" be defined in the context of SWM?

Of the three key considerations discussed in Section 4-1, the first two-CD that emphasizes ownership by the recipients and appropriate technologies that accommodate constraints-are closely associated with the capacity on the part of developing countries. The recipient's capacity for SWM and related issues should be assessed at three different levels, namely, the individual, organizational, and institutional/societal levels in a process termed "capacity assessment." In other words, it is necessary to identify which areas of capacity are inadequate and need to be developed for a given solid waste problem. The following paragraphs identify and characterize SWM-related capacities at each level.

4-2-1 Capacities at the individual level

SWM capacities at the individual level represent the knowledge and skills of the individuals who are engaged in solid waste management. More specifically, they represent the will, ability and sense of responsibility of these individuals to achieve their objectives by taking advantage of such knowledge and skills. The individuals referred to here include all the people engaged in SWM in the widest sense of the term, including not only individuals in the government institutions in charge of SWM, but also those in CBOs, NGOs, the private sector and the informal sector.

Those engaged in actual SWM services often have a low social status and inadequate education. In South Asia, some people often suffer from the caste system and are deprived of opportunities to receive even basic education. There is considerable room for improvement of the capacities of these people, or their knowledge and skills, on the ground. They should also be provided with opportunities for public health education in relation to their working environment.

In contrast, administrators in charge of the planning, operation and management of SWM services in developing countries have been given at least a basic education and are often highly educated with some even having studied in college abroad. Yet they sometimes lack on-the-ground knowledge or comprehensive knowledge concerning SWM. In some cases, their ethics may be called into question, not to mention their will and sense of responsibility as administrators.

Capacities at the individual level constitute a basis for-or element of-capacities at the organizational and institutional/societal levels, which are discussed below.

It is noteworthy that JICA's traditional activities in technical cooperation in the form of technology transfer, training and hands-on practice are chiefly designed to improve the capacities of individuals.

4-2-2 Capacities at the organizational level

SWM capacities at the organizational level represent the physical, human and intellectual assets, leadership, organizational management frameworks and organizational cultures that are all required to achieve objectives set by the organizations involved in SWM.

SWM is implemented not by separate individuals, but by teams of individuals. Therefore, some kind of organization is essential for its implementation. An organization involved in SWM, be it a government institution or an NGO, must have a group of people who have the necessary skills, managerial ability and planning ability (capacities at the individual level), in other words, the required human resources. A mechanism is also needed to develop such human resources. Also required are physical assets, including the facilities, equipment, land, funds and capital necessary for such SWM components as waste collection, transportation, intermediate treatment and final disposal. The approach based on inputs of 'hardware' components, which has been discussed in Section 1-2, is little more than an approach whereby external donors provide or support these physical assets.

These physical assets also require intellectual capacity for their application, including expertise in SWM technologies and systems, and statistical information, including waste flow data, literature, manuals, and research data. The approach based on non-physical inputs, which has been discussed in Section 1-2, is an approach whereby external donors provide these 'software' assets or conduct studies in the recipient countries.

All these human, physical and intellectual assets require an organizational form, management and leadership for their effective use. Management and leadership concern not only the improvement of the capacities of leaders and managerial staff at the individual level, but also a shared sense of purpose and discipline on the part of the members of an organization.

Capacity development at the organizational level cannot be achieved by the sum of the efforts at individual-level capacity development of the organization's members alone. It is not worthwhile for institutional development in the narrow sense, or intellectual asset augmentation, to be aimed at capacity building at the organizational level.

4-2-3 Capacities at the institutional /societal level

SWM capacities at the institutional/societal level represent the environment, conditions, mechanisms, policies, institutions, regimes, and norms that are all required both to enable capacities to be demonstrated at the individual and organizational levels and to ensure that sustainable SWM systems work.

SWM calls for a relevant legal framework, that is, legislation that defines wastes and determines where the responsibility for waste management lies. Based on such legislation, regulations should be established regarding standards on the collection, treatment and disposal of wastes and the management of environmental loads, standards for waste generation, and wider environmental standards. These regulations should be accompanied by legal enforcement, including the authority to provide guidance and to punish offenders.

SWM also calls for wider environmental and urban management policies, specific political objectives and leadership to achieve these objectives. The society's economic system, including its economic scale or level of economic development, is an important prerequisite both for capacities at the level of the legal framework, standards and policies and capacities for the establishment of an actual SWM system. Such a prerequisite encompasses the social infrastructure, including the transport system concerning SWM. How this prerequisite characterizes solid waste problems is discussed in Section 2-2.

In addition to frameworks, policies and the economy, SWM capacities at the institutional/ societal level may include informal institutions such as customs, taboos and norms concerning waste. Among social organizations involved in SWM are sweeper castes and social classes, CBOs, NGOs and other types of associations at the community level, and formal and informal recycling markets and industries.

Other capacities identified in the wider context of the entire social system concerning SWM include: environmental/waste education in schools and social education; systems (good governance) or partnerships to ensure that the opinions of local residents are taken into account; and ownership by the society as a whole in relation to SWM, especially public consensus, sentiment or willingness to work together to provide rational SWM services.

These SWM capacities at the three levels are summarized in Table 4-1.

4-3 Assessing the capacities of the recipient

Capacity assessment before determining aid components is the key to the success of development assistance.

Project formulation and goal setting constitute integral parts of any aid project, and they determine the success or failure of projects in the SWM as well as other sectors. Requests for

Table 4-1 SWM Capacities at Different Levels[2]

Level	Definition of capacity	SWM capacities
Individuals	The will and ability to set objectives and advance them using one's own knowledge and skills.	• Knowledge, linguistic competence, skills, expertise, wisdom, will and a sense of responsibility on the part of the individuals involved in SWM
Organizations	The decision-making processes and management systems, organizational culture, and frameworks required to achieve a specific objective.	• Human assets (human resources in the engineering, management, and planning sections in SWM, including the development of such resources) • Physical assets (facilities, equipment, land, funds and capital all required to provide SWM services) • Intellectual assets (expertise in SWM systems; statistical information including waste flows; literature; manuals; and research data) • An organization form, management, leadership and ownership that can put these assets to good use • A shared awareness within organizations
Institutions/ society systems	The environment and conditions necessary for demonstrating capabilities at the individual or organizational level, and the decision-making processes, and systems and frameworks necessary for the formulation and implementation of policies and strategies that are over and above any individual organization.	• Formal legal framework (laws, decrees and ordinances that describe the definition of wastes and clarify where the responsibility for waste management lies) • Formal regulations and standards (standards on the management, treatment and disposal of wastes; standards on waste generation rates; environmental standards; and legal force) • Policies and politics (articulated SWM policies, policy objectives and politics at central and local government levels) • Social infrastructure for SWM services • Informal institutions (customs, historical institutions, taboos and norms concerning waste) • Social hierarchy involved in SWM (waste pickers, certain castes, etc.) • Social organizations involved in SWM (CBOs, NGOs and other types of associations) • Formal and informal recycling markets and industries • Environmental/waste education • Systems (good governance) or partnership designed to ensure the reflection of the voices of local residents and communities in decision making; partnership between stakeholders concerning SWM • Social ownership for the implementation of SWM (public sentiments, consensus or willingness to work together)

Source : Compiled by YOSHIDA Mitsuo

[2] Capacities here are defined in reference to *ibid*.

aid from the government or agencies of the recipient are often vague to a greater or lesser extent, although these encompass a desire to solve the waste problems that they are facing. This points to the need for the donor to become involved in project formulation. To this end, the donor needs to examine the background to the problems, identify the concerns and needs of the recipient, and evaluate the ability of the recipient to solve these problems. Information needed in this project formulation phase should satisfy the three requirements discussed in the following paragraphs. Of note, this is also the process of primary assessment of the recipient's capacities for SWM.

4-3-1 Information required for considering the components of aid for SWM

The information essential for considering aid in the solid waste sector comprises the three W's. In other words, the donor must answer the following three questions:

(1) What area does the background information cover?
(2) What is the "waste problem" in question?
(3) Who generates the wastes and who manages them?

(1) What area does the background information cover?

The background information essential for any SWM project should cover the clearly defined extent of a city (or region) and include its natural conditions, geographical scale, population, economic capacity, demographic trends and economic development trends. As has already been discussed in Section 2-2, the scale, economic conditions and other factors of a city are reflected in its waste problems. Figure 2-4 and Section 2-2-3 show typical waste problems for each of the four types of city: "large and poor," "large and middle-income," "small and middle-income," and "small and low-income." Waste problems vary according to the type of city, and so do aid approaches.

The background information should also include the trends in other donor activities in the SWM sector to avoid unnecessary duplication. If another donor is planning or already implementing a relevant project for the same recipient, it is necessary to determine the scope and the objectives of the project and then hold prior consultations with that donor for possible segregation, coordination or even partnership.

The background to this is that the more urgent the problem facing the recipient country, the more donors the country turns to for aid. Yet the recipient country is generally reluctant to tell a donor that it is requesting aid from other donors. Moreover, different agencies of the recipient government may make different requests for assistance with their own motives in mind, but the central government may fail to ensure appropriate coordination among these different, sometimes overlapping, requests.

(2) What is the "waste problem" in question?

When a donor formulates an aid project for SWM based on a request from a recipient, the donor needs to describe what the recipient recognizes as its waste problems and what it wants the donor to do. This process is equivalent to setting the goals to be attained by the project.

Waste problems take many forms in actual settings. They may include the degradation of the urban environment, especially unsanitary streets, caused by the failure to collect wastes regularly and effectively, and environmental pollution around open dumps. The donor should list these problems and make a primary analysis of them, preferably working with the agency that made the request for aid. The next step for the donor is to determine which problem the requesting agency has the most interest in and what aspect of the problem the agency gives high priority to. Then the donor should make a proposal on what it can

do within its scheme for technical assistance.

It is said that "it is not the consciousness of men that determines their existence, but their social existence that determines their consciousness." Likewise, the scope of authority of the requesting agency or the person in charge determines the focus of the agency. Also, different stakeholders have different aspects that they focus on. The donor should take these factors in account and apply, as necessary, a participatory planning technique [3] that involves problem analysis based on stakeholder analysis.

(3) Who generates the wastes and who manages them?

The third requirement is to examine who generates the wastes and who manages them.

As discussed in detail in Chapter 2, waste comes in many forms, which are handled differently in different countries and cities. Yet waste can be largely divided into two types: industrial waste, which is generated by business activity; and non-industrial waste or general waste, which includes residential waste [4].

The former (industrial waste) must essentially be managed by either of two means: recycling, or self-disposal by the establishments (businesses, etc.) that generate the waste based on

Box 4.1 Tips for Preliminary Information Gathering: the Use of Human Resources Overseas

As discussed earlier, it is important to gather basic or background information concerning the relevant sector and region before implementing an aid project. In addition, more detailed information should also be obtained in advance, including: issues identified in the light of the trends in the activities of both the actors in the recipient country and other donors in the sector in question; challenges facing these activities; and the background to the details of what is considered are the needs for assistance. Such preliminary information can be gathered by a number of means. Yet it is often less costly and more convenient to take advantage of experienced people outside Japan who are familiar with the local situation, rather than involve Japanese staff who are external actors after all.

The Master Plan Study for Hazardous Waste Management in Romania (development study; from February 2002 through August 2003) provides a good example. In the process of considering aid components before implementing this study, JICA hired a British consultant through one of its overseas offices to gather local information inexpensively. With many years of experience in EU aid to Romania, this consultant had his own contacts and information sources. Thanks in large part to these qualifications of the consultant, JICA was able to obtain valuable information, especially in relation to compliance with EU laws and the details of aid given by the EU to the country. Few Japanese staff are familiar with such matters.

Such preliminary information gathering has a number of advantages. Firstly, it provides material for considering the aid framework. Secondly, it greatly reduces the workload of the JICA study mission or experts who visit the recipient country to gather basic information after the launch of a project. This facilitates a smooth transition to the next stage, in which the detailed aid components are determined. Thirdly, it is often less costly than to assign a Japanese team to information gathering in the recipient country for the same period. Because of these advantages, the use of human resources overseas is worth considering if few Japanese staff are familiar with local information or if capable local consultants are readily available.

On the other hand, there are some drawbacks. For example, without a clearly-defined TOR, the expected results may not be obtained. In addition, it is difficult to control information gathering operations from Japan. Primarily, JICA Headquarters and its overseas office in charge should jointly make arrangements to ensure the quality of such operations.

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[3] FASID (2004)

[4] See, for example, Nomura and Sakumoto (1997), Chapter 2 (comparison of legislation on general waste in Malaysia, Taiwan, South Korea and Japan).

the Polluter Pays Principle (PPP). Since industrial waste is rather homogeneous in composition and the rate of generation is generally stable, this makes it technically feasible to implement materials cycling based on recycling and reuse. Industrial wastes are often under the jurisdiction of a government office separate from the one that is in charge of general wastes. Consequently, industrial wastes are handled quite differently from general wastes. These factors point to the need to determine whether the waste to be addressed consists of industrial or general wastes in the first place.

Wastes can also be classified into hazardous and non-hazardous wastes. If the waste to be addressed is designated as hazardous waste, special attention should be paid to the managerial and technical improvement of generation sources and treatment methods. The components of technical assistance should be modified accordingly (see Section 2-5). In the case of industrial hazardous waste, donors should examine how relevant legislation defines such wastes and which party is responsible for the management of such wastes in the first place. In addition, it is necessary to clarify who should actually manage it and who should pay for such management.

If all types of waste are handled together without a clear definition of each type or clear assignment of responsibility, assistance for technical improvement can provide nothing more than temporary remedies, no matter how substantial the resources that are applied to such assistance. Ultimately, without institutional improvements, it is impossible to establish a sustainable SWM system. This is an issue associated with capacity assessment at the institutional/societal level, to be discussed below.

General waste, on the other hand, is usually managed by local government institutions.

A major issue for assistance to deal with general waste is whether the waste management department of the competent local government institution is well developed and integrated in the

Box 4.2 Disparities between the Requesting and Implementing Agencies

Aid requests to donors do not always come from the actual implementing agencies. In other words, such requests for assistance are sometimes far removed from the needs of those working on the ground.

There are three major reasons for this. Firstly, the SWM administrator is so distant from frontline workers that the requests the administrator puts together do not necessarily reflect the on-the-ground needs. Secondly, such requests are often put on hold due to frequent personnel changes among administrators or equivalent high-ranking officials. Thirdly, the division of responsibilities is unclear between the upper and lower SWM organizations, and therefore the chain of command is not clearly defined.

The disparities between the requesting and the implementing agencies are exemplified by an aid request in connection with JICA's master plan study for SWM in a regional city in a South Asian country. The request was made by the provincial government that administers municipalities, including the concerned city, through the central government to the Japanese Government. The provincial government did not carry out enough consultations with the municipal government that actually provides the SWM services in the city in the process of summarizing the requests. In fact, the implementing agency-the waste management department of the municipal government-was not informed of the request partly because the administrator who had made the request was replaced. JICA did not know this state of affairs until it conducted a field survey.

As this example illustrates, it is extremely important to gather information directly from the implementing agencies or counterparts in the strict sense of the term.

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recipient country. For example, India, Bangladesh and other former British colonies have often inherited age-old arrangements that were put in place when waste management was not an issue. Under these arrangements, the collection, transportation and disposal of wastes are under separate jurisdictions of different government institutions with a core of their own specialized engineers. These institutions have different budgets and are under different forms of management. Consequently, it is extremely difficult to secure coordination among them. As a result, assistance to the separate components often fails to bring about effective solid waste management, whatever the level of aid resources that are mobilized.

Inadequate SWM organizations constitute a major factor in the failure of project formulation. This is an issue primarily associated with capacity development at the organizational level. Yet donors may have to address the institutional aspects, which include recommendation for the reorganization of the SWM framework.

4-3-2 Items for capacity assessment

There are four items that should be identified first: (ⅰ) background conditions; (ⅱ) needs and issues; (ⅲ) the type of waste to be addressed; and (ⅳ) implementing agencies and counterparts. The next step (capacity assessment) is to assess the SWM capacities of the recipient and identify related issues at the three levels discussed in the previous section (see Table 4-1). In other words, it is necessary to identify which capacities are inadequate and therefore should be developed for a given solid waste problem. Through this process, project objectives reveal themselves. In fact, capacity assessment can be considered as the process of planning the details of technical assistance projects and implementing them.

Possible items for capacity assessment are listed below. See Appendix 2 (1) for a example of checklist for capacity development, which is useful for determining aid components. The items in this checklist provide valuable directions for assessing the capacities of the recipient at the social, organizational and individual levels.

Box 4.3 Capacity Development at the Individual Level Is Hard to Define

As an example of the failure of an approach to aid based on non-physical inputs, Section 1-2 has presented a project that a bilateral donor implemented over a period of 13 years between 1980 and 1993 in the Nepalese capital city of Katmandu [Thapa (1998)]. The SWM system in Katmandu ceased to function properly right after the donor withdrew from the city and the project was terminated in 1993. This indicated that the input of 'hardware' or 'software' resources was ineffective without ownership on the part of the recipient.

Although the original goal of the project was not attained, individuals were trained through technical guidance and training as part of the project, and their capacities were improved. In fact, these individuals played a leading role in formulating a Master Plan and other activities as counterparts in JICA's technical cooperation project in the solid waste sector-the development study that was launched in 2003.

As discussed below, collaboration is the key to the capacity development approach, and collaboration requires, as a precondition, a certain level of development of human resources on the part of the recipient. In this sense, the 13-year project, which was generally considered a failure, greatly contributed to capacity development at the individual level, thus laying the groundwork for successive project.

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(i) Capacity assessment at the individual level

- What is the level of knowledge, skills and techniques of the individuals in the SWM implementing agency?
- In what language can individuals communicate? Are they literate? (Is technical assistance possible in terms of the language(s) the donor uses?)
- What is the level of experience, willingness and sense of responsibility of the individuals?

Box 4.4 A "Community-Based" Approach for Vientiane

An international donor took a community-based approach when it implemented a program for solid waste management in Vientiane, Laos (see the case study in Section 3-2 for SWM in the capital city). The program was designed to reduce waste through the more efficient recovery of recyclable materials from the waste stream. To this end, the program had a number of components: (i) establishing a collection point for recyclables in each community; (ii) educating the residents about the importance of recycling; (iii) holding workshops on the segregation of recyclables; (iv) pooling the revenues from selling the recovered recyclables in community organizations that also served as a bank and using the revenues for community activities and community revitalization projects. The program tried to promote an initiative similar to recyclables recovery campaigns undertaken by residents' associations in urban areas in Japan and other countries.

This program was deemed a failure. It did not work at all in one of the targeted districts. The recyclables collection point in this district looked like a vacant lot. The concrete building that looked nicer than the homes in the neighborhood, was surrounded by a fence and was locked (see Photo 4-1). This is because residents in Vientiane had already been practicing recyclables recovery on their own initiative before the program was launched. They sold recyclables to scrap dealers (junk yards) and the gains from these sales were part of their personal income. It could be logically concluded that the residents would not give up this voluntary and profitable practice and instead support a "community-based" program.

The only activity that produced positive results was the holding of seminars on the differences between recyclable and non-recyclable materials. These seminars were attended by many residents and were highly evaluated by the communities.

This donor apparently tried to introduce community participation in the SWM system by taking advantage of the historical rural communities that remained in urbanized areas of Vientiane until today. Constructed collection points did not work, and the program could not make expected achievement. This is probably because the donor placed too much emphasis on the principle of the community-based approach and failed to properly assess the capacities at the societal system level, and the functions of the traditional communities and market in particular, before launching the program.

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Photo 4-1 A recyclables collection point built with aid from a donor

Left : Exterior appearance of the building
Middle : Interior appearance
Right : A junk shop in the same district. Residents and collectors bring in recyclables on pushcarts.

(ii) Capacity assessment at the organizational level

- What proportion of the physical assets-collection and treatment facilities, collection vehicles, landfill equipment, landfill sites, and funds to operate and maintain these-are assigned to the implementing agency? [Capacities in terms of physical aspects]
- Are intellectual assets available? Intellectual assets include skills and management expertise in operating and maintaining the SWM system, and research and statistical data on the qualities and quantities of wastes, waste flows, etc. [Capacities in terms of the non-physical aspects] Does the implementing agency have an accumulation of manuals and documentation on the findings of solid waste studies? Are they accessible?
- What level of human resources does the implementing agency have to ensure the capacities that cover the physical and non-physical aspects mentioned above? In other words, does each component of SWM have sufficient personnel? Is there a mechanism to train these human resources in a sustainable manner?
- Is the organization structured so that these human, physical and intellectual assets are fully utilized? Is the division of responsibility clearly defined? What is the level of management and leadership in the implementing agency?
- Do the members of the organization share an awareness of the waste situation? Do they share the goal of improving SWM?

(iii) Capacity assessment at the institutional /societal level

- Is there a formal legal framework governing waste (including laws, decrees and ordinances that define wastes and articulate where the responsibility for waste management lies)? Is waste legally defined? Is it clearly divided into general and industrial wastes? Is the responsibility for the management of each type of waste legally defined?
- Does legislation define official standards regarding the management, treatment and disposal of wastes, standards on waste generation, and broader environmental standards? Are standards on the disposal of hazardous wastes clearly defined? Does the legislation provide for a mechanism to enforce the standards and are legal measures applied to deal with offenders?
- Are SWM policies and policy objectives articulated at the central and local government levels? Is SWM integrated into a national strategy (e.g. a national five-year plan)? Can the politicians, government or regime implement such a strategy?
- What is the level of development of the basic social infrastructure for SWM services, including road networks, communication networks and sewerage systems?
- What kind of informal institutions exist in the recipient communities concerning SWM (customs, historical institutions, taboos and norms concerning waste)? How do they function in actual SWM?
- Are there social classes specifically involved in SWM (waste pickers, certain castes, etc.)? What role do they play in actual SWM?
- Are there social organizations involved in SWM (including CBOs such as neighborhood associations, NGOs voluntarily formed by citizens, industry associations, and academic societies)? What interests do they have and what role do they play in actual SWM?
- Are there formal or informal recycling markets and industries? How large or small are they? What items do they handle? What role do they play in actual SWM?
- Is environmental education provided to raise public awareness about waste? In what form is it provided; school education, social education or information campaigns? Are there campaigns for citizens with the aim of reducing waste or cleaning the districts and streets?

- Does the recipient have any systems that are designed to ensure that the opinions of local residents and communities are reflected in politics or government? Are there partnerships between the government, citizens, and private sector organizations such as businesses? Does the recipient have any record of community-based SWM? Does it make efforts to build a consensus with residents concerning waste issues (e.g. landfill siting)?
- Is there social ownership of the implementation of SWM? In other words, are the public willing to work together to solve solid waste problems? Do the mass media take up solid waste issues? Does the society as a whole call for improvements in SWM?

4-3-3 Examples of the application of capacity assessment

In order to implement capacity assessment, it is necessary to prepare a "capacity assessment checklist" specifically for the country, region or city and the sector to be addressed, while referring to the check items for capacity development discussed in Section 4-2. This is closely associated with the four prerequisites discussed in Subsection 4-3-1: (i) background conditions; (ii) needs and issues; (iii) the type of waste to be addressed; and (iv) implementing agency and counterparts.

(1) Capacity assessment in practice

Capacity assessment is usually started by implementation of following two activities. Activity 1 is to implement a survey based on the existing material, including reports and other literature, as well as statements on the achievements of the recipient. In addition, Activity 2, involves carrying out a survey by means of questionnaires, interviews, and consultations with the counterpart agencies in recipient country, is implemented. To date, these two activities have been taken as part of preliminary surveys, ex-ante evaluation surveys or others, rather than independently. This makes it all the more necessary to standardize the questionnaires to be used in Activity 2. Such a need is highlighted especially in an initial baseline survey. For example, the concept describing capacities at the three levels was employed in short-term project formulation surveys done by JICA overseas office in francophonic countries in Africa. In this case, the survey was solely based on interviews and on-site inspections since they can stay in a city only one day on average due to time constraints. In terms of assessing the overall capacity of the recipient, the concept of capacity assessment at the three levels provides a guideline for these surveys and valuable information for considering what should be done after the surveys[5].

These surveys, however, have limitations in terms of assessing the motivation and ownership of the recipient, since they primarily use document-based communication tools. To overcome such limitations, it is necessary to make an overall assessment through addition of an Activity 3 and, in some cases, Activity 4 and/or Activity 5. Activity 3 is to conduct capabilities evaluation based on presentations as well as question and answer sessions in seminars. Activity 4 is to implement an examination[6]. Activity 5 is to implement pre-phase technical cooperation (by short-term experts and/or volunteers). Activities 3, 4 and 5 take relatively longer period than activities 1 and 2. Therefore, to make an overall capacity assessment, it is effective to implement pre-phase technical cooperation activities, such as the dispatch of experts.

Another viable option is to introduce the concept of capacity development using PCM workshops (Figure 4-1). In this option,

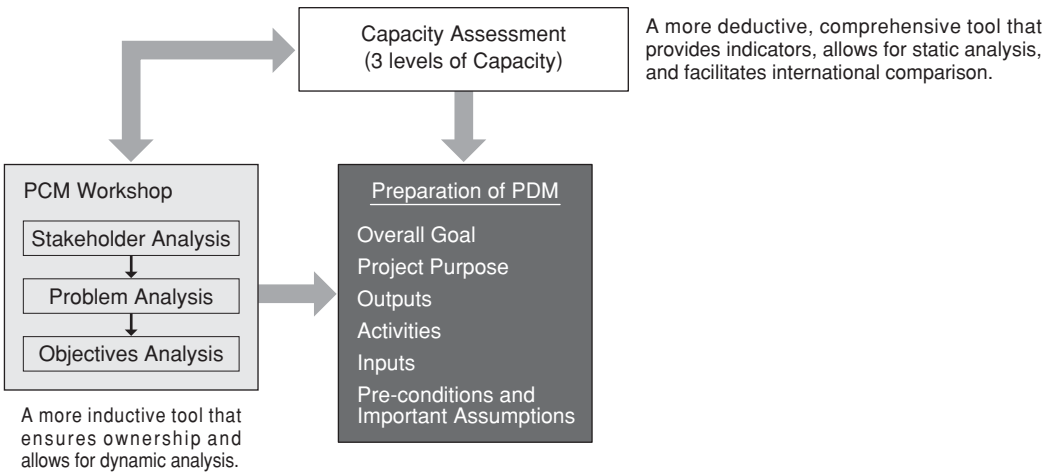
[5] Kawanabe (2005)

[6] The preparatory study on technical cooperation in monitoring pollutants derived from industrial waste in Kazakhstan provides a good example. In this study, JICA asked the implementing agency in Kazakhstan to analyze reference materials on which analytical data is already available. Then JICA examined their data against the accredited values to assess their capacity concerning their analytical skills. JICA (2005a)

facilitators or workshop advisors may organize discussions while taking capacity in SWM into full consideration (Photo 4-2, a workshop in Dhaka).

Capacity assessment is not a novel concept for JICA. As discussed earlier, capacity assessment has been more or less carried out in project formulation surveys, preparatory studies for development studies, and ex-ante evaluation of technical cooperation projects. The problem is that it has been conducted on a case-by-case basis, making capacity assessment incomprehensible at times and diverse in terms of quality. In this sense, capacity assessment checklists provide a standardization tool. Such an attempt to standardize capacity assessment has, to a certain extent, the effect of avoiding subjective judgments and standardizing the processes of project formulation, monitoring and evaluation, which have traditionally been diverse in quality.

Figure 4-1 Introduction of a viewpoint on Capacity Assessment in a PCM workshop



PCM workshop is a capacity assessment process itself. The concept of capacity assessment offers a more comprehensive frame of reference to PCM workshops. PCM workshops, in turn, ensure ownership on the part of the recipient, which should be respected in capacity development. In short, they are mutually supportive.

Source : Compiled by YOSHIDA Mitsuo

Photo 4-2 Capacity Assessment through Participatory Workshops

Participatory workshops provide a quite effective means for capacity assessment. Participants can conduct a stakeholder analysis and problem analysis to form a common understanding of the capacity level of the recipients. These are photos of a workshop JICA conducted in Dhaka for the implementing agency as part of its development study. One of the participants is holding up cards on which the individual's concerns have been written, so that the problems and issues can be identified and analyzed. Members of the study team from JICA served as facilitators and commentators at this workshop.

(2) Application of capacity assessment tables (score tables)

Capacity assessment tables (score tables) designed to provide quantitative indicators may impart a viable option for capacity assessment. Such tables facilitate the screening and priority-setting processes at the project formulation phase. Capacity assessment tables (score tables) have so far been prepared in the Regional project formulation survey in the Oceania Region[7] and the preparatory study on the integrated management of urban solid waste in Santo Domingo National District (development study, Dominican Republic)[8]. Excerpts from these tables are shown in Table 4-2 and Table 4-3.

Capacity assessment tables (score tables) are characterized by the systematic and incremental arrangement of rated criteria. Assessment items and rated criteria vary widely according to the state of the country, region or city and the sector to be addressed. Such tables can take many forms. For example, Table 4-2 shows a capacity assessment table for the collection and transportation aspect of solid waste management (SWM) with five assessment items: "storage and discharge of the waste," "separate collection/recovery," "populations and areas covered by public services," "waste collection frequencies," and "collection vehicle operation plans." For each item, four stages of development are established, and assessment is made as to which stage the current state of affairs represents[9]. For the item "separate collection/ recovery," for example, the four stages are described as:

(i) No separate collection/recovery is being implemented.
(ii) Some types of recyclables are collected/recovered separately, but irregularly.
(iii) A system to separately collect recyclables such as aluminum cans and organic wastes is in place.
(iv) A system of segregated collection to separately collect/recover recyclables, hazardous wastes and bulky wastes is in place.

The stages (i)–(iv) correspond to the scores 1-4: the higher the score, the higher the stage of development in SWM. An attempt has been made to assess the stage the targeted region is in (Table 4-2). Assessment criteria are rather qualitative, although some of them are quantitative, as in the criteria for the item "populations and areas covered by public services" in Table 4-2.

In this way, the total score for the five items provides a numerical measure for the overall capacity of the aid recipient with respect to "collection and transportation."

Such capacity assessment tables (score tables) are expected to be used in three ways. Firstly, they may be used as a tool for the processes of "regional project formulation," "(local) project formulation" and "project appraisal" (screening the candidate projects and evaluating their relative priority). In other words, the lower the score, the higher the priority when it comes to the screening of requested projects in the SWM sector. The second type of use is related to the design aspect of aid projects. Capacity assessment tables may be used as a tool for determining the focus and goals of such projects. Thirdly, capacity assessment tables may provide indicators that are useful for monitoring the progress in capacity development that has been made by a given technical cooperation project. For example, assessment tables make it easier to set specific goals - how much the project should improve the score with regard to the capacity with regard to "collection and transportation." They also serve as a tool to assess the impact of the project.

Hence, using capacity assessment tables

[7] Amano (2004)
[8] JICA (2005b)
[9] This is similar to the concept of the four levels (Levels 1, 2, 3, 4) towards sanitary landfill discussed in Subsection 2-6-5 (Table 2-17). In this concept, assessment is made with reference to the pre-determined stages of technical development towards sanitary landfill.

(score tables) and thus promoting a quantitative rating system in capacity assessment can be useful for the planning, implementation, monitoring and evaluation of a project. However, applications of capacity assessment tables in capacity assessment process are still developing stage, and there are three major issues to be addressed.

The first issue is associated with the nature of capacity assessment tables - they are inevitably oriented toward a certain direction of development. Their application without adequate understanding on the part of the recipient may undermine the very principle that capacity development support is based on the ownership and initiative of the recipient. In other words, capacity assessment tables might even provide a tool for compulsion of value judgment by external parties. Undoubtedly, the assessment items are selected precisely as those capacities necessary to operate SWM systems effectively and efficiently. Therefore capacity assessment tables may provide a certain level of universality when it comes to rather technical items (skills, intellectual assets, physical assets at the level of individuals and organizations). Yet careful attention must be paid to capacity assessment at the level of institutions/social systems in this respect (Table 4-3).

The second issue is the relevance of the rated criteria, in other words, how should the four stages of development be defined. This issue is not so much of a problem when it comes to items that can be expressed quantitatively (for example, the item of "populations and areas covered by public services" in Table 4-2) since they can be assessed objectively. In the case of items that have to be expressed qualitatively (the other items in Table 4-2), any criteria should determine specific and clear phenomena, objective facts, and indicators that call for ownership on the part of the recipient as far as possible. The fact remains, however, that rational description is not always possible for all the capacities[10]. Ratings should be weighted so as to correspond to the stages of development, while striking a balance between the assessment items. As far as qualitative criteria are concerned, however, the basis for such weighting may be unsubstantial.

The third issue is that the further the objectivity of capacity assessment is pursued through such a quantitative rating system, the more likely the risk of undermining the very principle that capacity development support should be based on ownership and initiative on the part of the recipient.

As it stands, the capacity assessment approach with the use of capacity assessment tables (score tables) has both advantages and limitations. Such tables can provide a useful tool when the donor and the recipient work together to define the rated criteria and carry out the assessment based on shared information. In other words, it is essential to have a mutual understanding between the donor and recipient regarding the assessment table and the value of capacity assessment itself. In this sense, it is both difficult and dangerous for a short-term study team from JICA to apply this approach and make an overall assessment. This approach should preferably be adopted as part of pre-phase technical cooperation activities by dispatched experts who stay in the recipient country long enough to be able to work closely with their counterparts.

[10] A viable approach may be to define each criteria based on what kind of technical cooperation is necessary or effective, corresponding to the four phases in the schematic diagram of the step-wise evolution of technical cooperation (Figure 5-1) in the following chapter.

Table 4-2 Example of a Capacity Assessment Table (Score Table) (1)

Assessment target: Capacities at the organizational level
1. Collection and transportation

	Assessment criteria				
Assessment items	1	2	3	4	Score
Storage and discharge of waste	☐ No rules on storage and discharge. No rules on storage containers. Litter on the streets.	☑ No dates or hours have been established for discharge. Storage containers are not standardized. The rules have not been communicated adequately to the citizens.	☐ Dates and hours are established for discharge and communicated to the citizens. Storage containers are standardized.	☐ Rules on the discharge procedures, including the storage containers and the discharge dates/hours are adequately communicated to and observed by the citizens.	2
Separate discharge/ recovery	☐ No separate collection/ recovery is being implemented.	☐ Some types of recyclables are collected/recovered separately, but irregularly.	☑ A system to separately collect recyclables such as aluminum cans and organic wastes is in place.	☐ A system of segregated collection to separately collect/recover recyclables, hazardous wastes and bulky wastes is in place.	3
Populations and areas covered by public services	☐ Collection and transportation services are limited to some parts of the city. Collection services cover 10% or less of the population.	☑ Services are available to less than 40% of the population with priority given to commercial districts.	☐ Collection services are available 2-3 times per week in commercial districts and once or twice a week in other districts.	☐ Collection services are available four times or more per week in commercial districts and twice per week in other districts. The collection plan is decided on and revised based on waste weight surveys.	2
Waste collection frequency	☐ Irregular. Once a month or less.	☐ Once a week in commercial districts. 2-3 times a month in other central districts.	☑ NGOs are active in two or more sectors or areas in communication with the local government.	☐ NGOs are active in many sectors and areas. Their inputs are reflected in SWM policies.	3
Collection vehicle operation plans	☑ The collection vehicle operation plan is determined by the collection workers. The routes and hours are subject to change for their benefit.	☐ The routes and collection hours are established, but they may be subject to change for the benefit of the collection vehicle operator.	☐ The routes and collection hours are established and implemented. The vehicle assignment plan is in place.	☐ The routes and collection hours are strictly observed. The vehicle operation plan and the vehicle assignment plan are reviewed regularly.	1
				Total	11

The table is an excerpt from the complete assessment table that has been prepared on an experimental basis in the preparatory study for the Integrated Management of Urban Solid Waste in Santo Domingo National District. Capacities with regard to the "collection and transportation" of waste are reviewed in terms of five items. There are four rated criteria for each item. The state of affairs is assessed against these criteria and the total score is calculated.

Source : JICA (2005b)

Table 4-3 Example of a Capacity Assessment Table (Score Table) (2)

Assessment target: capacities at the level of institutions and societal systems
1. Social aspects

	Assessment criteria				
Assessment items	1	2	3	4	Score
Social norms	☐ The traditional decision-making process outweighs the administrative system.	☑ The traditional decision-making process and the administrative system coexist, but the former has a greater influence on the latter.	☐ The administrative system outweighs the traditional decision-making process.	☐ The administrative system is in full control. The traditional decision-making process does not exist in practice.	2
Recycling markets	☐ No recycling markets. No systems for collection and export.	☐ Fragile recycling markets. Some types of recyclables are recovered for domestic consumption or irregular export.	☑ A system to recover recyclables is in place. Recyclables are regularly exported to developed countries. Small-scale recycling markets have been established.	☐ Recycling markets have been established in the country. Recyclables are traded with other countries on a permanent basis.	3
Environmental education and information campaigns	☐ No environmental education.	☑ Informal environmental education. Small-scale campaigns are mounted irregularly.	☐ Environmental education is integrated into school education. Campaigns are mounted regularly.	☐ Environmental education is well established in the schools and communities. Nationwide campaigns are mounted regularly.	2
NGO involvement	☐ Few NGOs are involved.	☐ NGO involvement is limited in terms of sector and area.	☑ NGOs are active in two or more sectors or areas in communication with the local government.	☐ NGOs are active in many sectors and areas. Their inputs are reflected in government policies.	3
Public participation	☑ Public awareness about waste issues and the environment is quite low.	☐ Limited public participation. Some communities stage campaigns for waste separation or street cleanup.	☐ The public is proactively involved with a high level of awareness concerning waste issues.	☐ The public and the local government work together. The inputs of the public are reflected in the policies of the local government.	1
				Total	11

This table is an excerpt from the full assessment table that has been prepared on an experimental basis in the preparatory study for the Integrated Management of Urban Solid Waste in Santo Domingo National District. As with Table 4-2, capacities at the level of institutions and social systems are reviewed in terms of five items. There are four rated criteria for each item. The state of affairs is assessed against these criteria and the total score is calculated. Compared with the item "collection and transportation," the criteria for "capacities at institutions and societal systems" are extremely difficult to define and involve subjectivity, since they concern values and thus allow for a greater diversity of interpretations.

Source : JICA (2005b)

Chapter 5 Directions for JICA's Technical Cooperation in the Solid Waste Sector

How should the approach of capacity development support be translated into concrete actions in line with the realities of JICA's projects and programs? What are the priority items among such actions towards which JICA should be directing its major efforts? And what improvements and challenges should JICA be addressing in its future activities? Building upon the reflections and discussions made in the preceding chapters, this chapter presents the directions that JICA should pursue in its future technical cooperation activities in the solid waste sector.

5-1 Approaches to capacity development support

In order to capitalize on the lessons learned and effectively address strategic challenges in JICA's future technical cooperation activities, it is particularly important to take approaches that center on capacity development support. For this purpose, capacity assessment needs to be made proactively with three levels (individuals, organizations and the institution/society) of capacity in mind at the stages of project formulation and preparation (project design). Such capacity assessment will lead to more efficient capacity development support with clearly defined objectives (or focused themes). In the sections to follow, the points to remember and methodologies for capacity development support will be described for the project formulation and preparation stage and the project implementation stage.

5-1-1 Project formulation and preparation stage

To undertake an accurate capacity assessment, it is necessary to conduct a systematic analysis of the counterpart's current capacity related to solid waste management from the broad perspective of the entire society. It is very important to visit the country and conduct a survey through interviews with the issuer of the request and the implementing organization, to search through documents, as well as to directly inspect the site. In doing so, it is also necessary not only to pay attention to the request-issuer and implementing organization, but also to find out the views of the local residents and all other stakeholders in solid waste management and to understand their needs.

In addition, the findings of the capacity assessment should be checked against the aspects of the actual 'solid waste issue' to be solved. This exercise will reveal which of the capacity components are the main cause of the 'solid waste issue,' which other capacity components can be counted on as given, and therefore which capacity components need to be strengthened. This identification must be carried out and shared in common with the counterparts. On this basis, the necessary inputs should then be planned so as to achieve the greatest effect possible in relation to capacity development support. This will ensure appropriate design of the project.

Studies similar to this have indeed been made on-site in the past, though only to a certain extent, during the stage of project formulation studies or through questionnaires and other means during the preliminary stages of development studies or technical cooperation projects. They

were, however, not so comprehensive or systematic as to provide an understanding of the entire spectrum of capacity, and were not intended to be shared with the counterparts either. Specific items and examples of the contents of capacity assessment are shown in Appedix 2 (1) and 2 (2) in the form of checklists. In cases where the target of capacity development support is limited to the solid waste management authorities of the local government, the 'Checklist for the Capacity Assessment of Local Government' listed in Appendix 2 (1) will be helpful. In cases where the support is aimed at a wider range of targets than just the local government, then a more comprehensive capacity assessment as shown in Appendix 2 (2) will be required. Needless to say, these checklists merely present some generalized examples, and the check items and contents must be modified to adapt them to the conditions of the target country or city.

How deeply do the parties involved on the developing country side understand these check items (the current situation of capacity)? If they are not well understood, what are the causes of this lack of understanding? By asking these questions themselves, the Japanese side and the developing country side together will become engaged in a joint problem analysis during the process of capacity assessment. This effort, even though it is made at the preliminary study stage, contributes to deepening the counterpart's understanding of the problems and to fostering ownership. To put it differently, this exercise is itself also a part of capacity development support.

Next, the points to keep in mind at the stage of project formulation and preparation are examined for each of the capacity levels in the solid waste management sector.

Box 5.1 Project formulation by a group of alumni

During the group training course in Japan under the scheme of technical training for overseas participants, participants are often asked to prepare an 'action plan' by themselves as a wrap-up of the course and to present it in a conference. In the 'action plan,' each participant uses the knowledge acquired during the training course to analyze problems back home and then discusses the policy to be adopted as a response. This can be described as an exercise in personal capacity assessment and a capacity improvement plan based on the assessment. While some of these 'action plans' remain as individual improvement plans, some others are developed to the extent that they become proposals for technical cooperation projects.

A case in point is the group of Salvadorian alumni (officials of the environment ministry, health and welfare ministry, local development agency and other central government organizations) who participated in the training entitled 'Waste Management Techniques for Central American Countries' (JICA Sapporo). After their return home, they formed a group on their own initiative and collectively embarked on an analysis of the problems. Eventually a 'Regional Program on Waste Management for Small Municipalities in Central America' was formulated. Then, with assistance from the JICA project formulation officer, they refined their project to the level of a JICA technical cooperation project and persuaded the higher level organizations to submit a formal request to JICA. In a case like this, the request is one step ahead of the usual requests and the project can be formulated effectively, because the problems and challenges have been already clarified by a certain amount of capacity assessment and the ownership is very strong. The project can therefore be formulated more effectively in such a case. This particular project began to be implemented as a FY2004 JICA project. It is hoped that the project will produce significant results [1].

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[1] See also section 3-3-2 (2)

(1) Capacity improvement at the individual level

In order to achieve capacity improvements at the individual level, continual technology transfer and technical guidance and training through the individualized dispatch of experts are effective. The key points to remember at the stage of project formulation and preparation include: whether full-time or nearly full-time counterparts are to be assigned, and whether there is a good match between such counterparts and the dispatched experts with regard to their specialties and mutual communication. One thing to keep in mind in this connection is that it is necessary to develop a technical guidance program (curriculum), commensurate with the human resource level of the target individual. That is to say, capacity assessment at the individual level is needed. In practice, however, sufficient preliminary studies cannot be always made in individual expert dispatch programs. In this case, the formulation of a technical guidance plan that is prepared at the initial stage of the dispatch serves as a survey of the existing circumstances and a capacity assessment.

In the process of training program formulation, country-specific or region-specific courses are often pursued since homogenization of the participants' background conditions and levels raises the efficiency of the training. However, training efficiency is not necessarily increased as much if the participants have different job positions even though they may be from the same country, region or organization. In addition to homogenization of the background conditions according to the countries and regions from which the participants come, the definition of training themes on the basis of capacity assessment with a clear focus on what technologies and skills need to be improved should be made during the stage of project formulation. The most effective means of achieving this objective is to cooperate and exchange information with those involved in the development studies, technical cooperation projects and expert dispatch programs that are ongoing at the actual site.

(2) Capacity improvement at the organizational level

Since the capacity of an organization is improved when it operates as a group or team with clearly defined job responsibilities, a prerequisite for this is to identify the implementing body, which is a fundamental condition for project formulation, as mentioned in the previous chapter. In projects aimed at capacity improvement at the organizational level in the solid waste management sector, well-balanced support in terms of both 'hardware' (physical aspects) and 'software' (non-physical aspects) is the key. This point is most conspicuously presented in the state of the operation and maintenance of machinery and equipment (physical assets). Is the situation that the problems stem from the total depletion of physical assets even though a system for carrying out repairs and other maintenance work without outside help does exist? (In the case of Havana City, the supply of new vehicles was almost entirely discontinued after the collapse of the former Soviet Union. As the vehicle repair shop was functioning well, repair parts were fabricated by the Cubans themselves and used for maintenance purposes. However, even if the technical capability for maintenance is present, aging of the machinery and equipment and normal wear and tear are inevitable.) Or is it that the operating rate of the machinery and equipment is low due to poor operational and maintenance management (Photo 5-1)? Depending on the answers to these questions, the target of project formulation can vary greatly. In the former case, the input of 'hardware' in a way that is compatible with the existing 'software' (non-physical aspects) assets (human resources, knowledge pool, organization and finance) will be effective. Such a 'hardware input' should be ideally accompanied

Photo 5-1 Example of Dhaka, Bangladesh

A scene of a waste collecting vehicle station in Dhaka. Since the operation records of the collecting vehicles are not appropriately managed, all vehicles might not be fully utilized. If the management system becomes more efficient, the transport capability could be improved. As a result, the current collecting rate of 50% or less could also be improved.

by the concept of financial planning for sustained repair and maintenance as well as eventual equipment replacement, since this aspect has not been fully developed in most developing countries. In the latter case, on the other hand, primary 'hardware input' is not effective. Support to improve human resources and technical capability as well as the underlying organizational management skills should be considered before anything else. Workshops and other participatory project formulation techniques are effective in analyzing the problems in such improvement efforts. Project designs featuring OJT (on-the-job training) of the counterparts with the involvement of dispatched experts or study teams are often effective, and good facilitation skills are required on the part of the donor. By carrying out such a study as a joint effort, involving the participation of the counterparts, and preparing the plan as a form of collaboration, the design can be effective as a type of technical cooperation project. It should be noted, however, that this approach requires a somewhat longer time than a normal study. In addition, a combination of schemes such as that described in Section 3-2 concerning the case of Vientiane involving a development study, grant aid and the dispatch of experts is more realistic. A short-term pilot project of some months, as in the case of the development study for Manila referred to in Section 3-1, is not sustainable and the support effect cannot be fully obtained.

(3) Capacity improvement at the institution /society level

Support for the development of an official legal framework and standards can take the form of policy adviser support in parallel to a fact-finding survey on solid waste management. In this case, project formulation work must include the acquisition of information on the current legal framework and standards and its analysis by experts. It is very important to understand the situation of the counterpart country, city and region and then offer relevant advice. Unless sufficient information is already available, such information gathering and analysis should be positioned as an output in the design of the study project. In the case of Manila described in Section 3-1, not only the proposal M/P, but also the pilot projects provided to some extent a contribution towards establishing the policy targets reflected in the adoption of RA9003. Although support for capacity development at the legal system and policy level was not intended at the outset in this particular case, in hindsight the project actually took the form of policy advice.

In projects with the aim of capacity improvement at the level of the society, all stakeholders involved in solid waste management are targeted. The implementing body does not always need to be a government organization. The support is mainly of a participatory type rather than an input type. Therefore, a key point in project formulation is to secure the participation of experts who are capable of taking not only technical but sociological or environmental-sociological approaches[1] and who have the facilitation skills. Grassroots cooperation and collaboration with NGOs should be seriously pursued at the stage of project formulation.

In the capacity development on solid waste

[1] Iijima (2001)

management at society level, CBSWM (Community-based Solid Waste Management) can often be a main subject. There are many kinds of forms of community, and local conditions are all different even within a city. Sometimes it depends on the personality of the leader of the community[2]. In planning a project aiming at CBSWM, therefore, collecting the background information in detail is inevitable as well as conducting capacity assessments. In this sense, it can be effective to conduct survey on local NGOs and consultants in the stage of project formulation and the initial stage of implementation of support project.

During the process of project formulation in this way and in line with the request from the counterpart, the framework for technical cooperation leading to capacity improvement is defined. The extent to which a particular JICA scheme is applicable and the challenges that call for a combination of JICA schemes will also become clear in concrete terms. In the past, JICA has conducted on-site surveys prior to cooperation implementation in order to assess the needs and to design a cooperation program accordingly. In particular, prior assessment has been mandatory with respect to technical cooperation activities (expert dispatches, technical cooperation projects

Box 5.2 A method of capacity development support for legal aspects at the stage of project formulation

Generally, the improvement of capacity at the legal system level can only be achieved if it is accompanied by the understanding and endorsement of high-level government organizations or decision-makers. On the other hand, these types of issues are basically an internal and political matter of the recipient country and the outside donor must be extremely cautious about intervention, however genuine the intentions regarding capacity development support may be. However, in the event that capacity at the legal system level is a critical prerequisite for the success of the project, it is effective to increase the understanding of the decision-makers and encourage their commitment by identifying the issue at the stage of the preliminary survey and incorporating it clearly into the M/M (Minutes of the Meeting that are exchanged officially) or by other means.

A case in point is the technical cooperation for the city of Dhaka, Bangladesh, for the improvement of solid waste management. In this city, the functions of solid waste management-planning, cleaning, transportation vehicles, equipment maintenance, technology, and procurement-were spread among different divisions of the city government. The report written by an expert* sent on an individual dispatch program and the study report of a preliminary survey team for the development study both pointed out that institutional reorganization into an integrated solid waste management division was absolutely essential for the improvement of the city's solid waste management. The working-level engineer of the recipient (the counterpart) came to the same understanding. The need for reorganization was therefore defined as a precondition for the initiation of the project (development study) and was incorporated as such into the M/M. As a result, higher-level decision-makers (the city mayor and others) were persuaded and a tentative organ known as the 'Solid Waste Management Cell' was set up prior to the commencement of the development study. While the development study was in progress, the tentative organ was upgraded to a full-fledged integrated division with its own budget called the 'Solid Waste Management Division.' This episode can be seen as an exemplary case in which suggestions and encouragement at the stage of the preliminary survey using M/M and other tools can persuade higher-ranking decision-makers to take concrete action for capacity improvement at the legal system level.

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* Report by JICA short-term expert, Mr. SATO Keiichi (2000, Bangladesh solid waste management technology)

[2] Kondo et al. (2004)

and development studies) and grant aid cooperation, on the basis of five criteria, namely, relevance, (expected) effectiveness, (expected) efficiency, (expected) impact and (prospective) sustainability. Officials at JICA overseas offices and project formulators are required to make prior assessments in accordance with these criteria. [3]

During the stage of project formulation and preparation, there is a certain idle period between the execution of a formal agreement (Record of Discussions or R/D in the case of a technical cooperation project, and Scope of the Work or S/W in the case of a development study) with the recipient government and the initiation of the project. In cases where de facto capacity development support to the counterpart during the phase of project formulation is found to be effective, measures such as the dispatch of experts (pipeline experts) and/or project formulation officers should be considered so as not to allow the hiatus to dissipate the motivation and morale that were boosted as a result of the capacity improvements. Momentum and timeliness are truly important factors.

5-1-2 Project implementation stage

The key point in the project implementation stage is to implement an effective and efficient project, based on the findings of the capacity assessment that were obtained during the project formulation and preparation stage. The challenges are the 'work plan formulation', 'technical cooperation method', and 'project management'.

(1) Work plan and monitoring

The work plan formulation stage corresponds to the preparation of a 'Work Plan' in the case of an expert's technical cooperation program (to be completed within 3 months of the expert's arrival) and to the preparation of an 'Inception Report or IC/R' in the case of a development study. The prerequisite is that the formulation of such a plan is shared by both the Japanese side and the counterpart. In both cases, therefore, agreement by both parties and exchange of a signed document are required.

In project implementation, it is necessary to be aware of and to continually monitor the stage of capacity improvement support to which the ongoing technical cooperation corresponds. In development studies that involve the input of many components in a limited time period, schedule control determines their success or failure. In addition to schedule control by the survey team or experts who are implementing the technical cooperation, periodical monitoring by the overseas office and the domestic support committee (every quarter in the case of expert dispatch and at proper junctures in the case of a development study, such as the completion of progress reports or interim reports) as well as visits to the project site, as necessary, will be effective for the purpose of schedule control. If a steering committee has been formed with the counterpart for a development study or a technical cooperation project, it should be utilized proactively.

Incidentally, records on the process of technical cooperation for the counterpart or of 'capacity development support' (experiences, lessons learned, evaluation of the level of attainment) have not been given a large amount of space in the reports and other documentation concerning development studies that account for a major proportion of the technical cooperation activities of JICA in the solid waste sector. This is likely to be due to the fact that the objective of a development study has been understood as the completion of an M/P, F/S or other concrete 'products themselves,' and that the process of study and report preparation, even though it is conducted by Japanese consultants, has not been given sufficient weight in the final report. In other words, there is no denying that JICA's objective setting was excessively focused on the 'product' and that it was considered satisfactory as

[3] Office of Evaluation and Monitoring, Department of Planning and Evaluation, JICA (ed.) (2004)

long as an M/P or an F/S was completed[4]. As has been discussed here at great length, such an approach has significant limitations in technical cooperation in the solid waste sector.

In future, it will be particularly important to take a 'process-oriented' approach that emphasizes not only the products themselves, but also the process of surveying and preparing for them. Through such an approach, attention will be paid to the numerous tasks related to the preparation of an M/P, including the surveys, analysis, planning, acquisition of technologies required for these activities, human resources development, organization building, and social and institutional considerations. In this way, a truly sustainable solid waste management system can be established by the developing country itself. Mere labeling as a 'process-oriented approach' is of course not enough; development study projects must have a built-in mechanism that provides for proper 'monitoring' (by the survey team, by JICA and by the counterpart implementing organization) at each project milestone, ensuring that the 'process-oriented approach' is taken up according to the written requirements as well as their spirit. A mechanism should be installed to continually build up a reservoir of experience, both hard as well as fruitful, that is obtained during the process of capacity development support by the study team. Up to now, the project management of development studies has not always been sufficient in this regard. It can hardly be denied that the project advisory committee (domestic support committee) has tended to express opinions after reviewing the technical quality of the study team's report or observing the 'products' on a site tour. The committee should step into the area of 'progress monitoring for capacity development support' which is a more substantial element of a technical cooperation project.

For this purpose, the methodologies of

Box 5.3 Anticipating follow-ups-the making of a "Petit Program"

In the Study on the solid waste management in Dhaka City (development study), JICA proposed an aid project that integrated the follow-up and monitoring component as early as in the preparatory study phase. After this proposal was mutually agreed, JICA launched the project. This approach was based on the bitter lesson that JICA learned from its experience in development studies in various sectors in Bangladesh, which was that any proposed plan for an M/P in a development study is unlikely to lead to the actual improvement of the problem in the sector or the implementation of such a proposed plan.

This particular development study followed the procedures of a typical development study as far as the first two phases (over a period of 16 months) were concerned; Phase I involved a fact-finding survey and analysis, while Phase II comprised the formulation of an M/P and the implementation of a pilot project. Phase III, however, was defined as a one-year follow-up phase in which JICA would provide support for the implementation of the plan and monitoring. Preconditions for Phase III included the buildup of the capacity of the implementing agency (the establishment and development of Waste Management Division within the Dhaka City Corporation, including adequate human resources). JICA decided that it would not go ahead with the follow-up unless these preconditions were met. JICA's judgment as to whether these preconditions were met was based on the findings of an on-site inspection by the JICA Advisory Committee.

The approach of developing an aid plan and setting its preconditions before the development study is implemented allows the implementing agency to make preparations well in advance. In fact, Dhaka City developed an organization for project implementation, including the human resources. This is an effective approach in promoting project implementation after an M/P has been formulated. This can be called a "petit program" approach.

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[4] Perhaps this is the reason for the not particularly great incentive on the part of consulting firms for them to develop technical experts with a talent for facilitation in capacity development support. This echoes with "teachers at a loss" in Footnote 44 in section 2-4-4 (2).

project management and monitoring that have been employed in JICA's previous expert dispatches and technical cooperation projects are of considerable relevance, and consideration should be given to the possibility of also applying them to development study schemes in the future[5]. The study team of a development study naturally faces difficulties and has concerns in the course of its implementation of capacity development support[6]. In parallel to the joint work of formulating specific products, records should be kept on what such difficulties and concerns were, where they came from, what capacities were problematic, what activities each team member carried out in the technical cooperation process, and to what extent the problems were solved as a result of the support. In addition, 'evaluations' at appropriate project milestones should be commonly shared at the interface between the study team member for a specific work area and his/her counterpart, as well as between the survey team and the implementing organization.

The first step for this is to include capacity development as an objective of the development study or as a major component of the M/P. At the initial stage of a development study, a review of the current situation is generally conducted. Capacity assessment should be carried out as a part of such a review, including determination of the counterpart's baseline. Then, targets should be set for capacity development at the institutional /societal level during the implementation of the development study, and, if necessary, also for capacity improvement at the individual level. Monitoring should be carried out using a monitoring sheet for capacity development activities (an example is shown in Appendix 3). Ultimately, a capacity development plan and other related programs should be incorporated into the M/P.

Monitoring sheets like this are not only helpful for the study team to carry out self-analysis concerning the problems and challenges in the process of capacity development support, but they also serve as an invaluable source of information for project control. Each time an overview of the activities is carried out through the preparation of progress reports (PR/R), interim reports (IT/R) or the draft final report (DF/R), a joint evaluation should be made in a participatory format between the survey team and the counterpart or the steering committee. This method of joint evaluation has been employed at the time of terminal evaluation in JICA's project-based technical cooperation, and should be helpful in the project management, monitoring and evaluation of a development study as well.

As has been discussed above, appropriate monitoring is increasingly necessary in capacity development support projects, and monitoring at the project site, as required, by the overseas office and others is a particularly important task in project support.

(2) Methodologies of technical cooperation and characteristics of stepwise evolution

Actual implementation and methodologies of technical cooperation vary widely, depending on the target, the implementing organization and their capacities. However, there are some common directions, insofar as the objective of technical cooperation is to help ensure that capacity development on the part of the counterpart becomes self-supporting.

Generally, technical cooperation evolves in stages. Technical cooperation in the solid waste sector, be it the dispatch of experts or a development study, also evolves together with the progress of the project. This evolution process is schematically presented in Figure 5-1. At the initial 'Technology presentation and demonstration phase', the information is transmitted in one

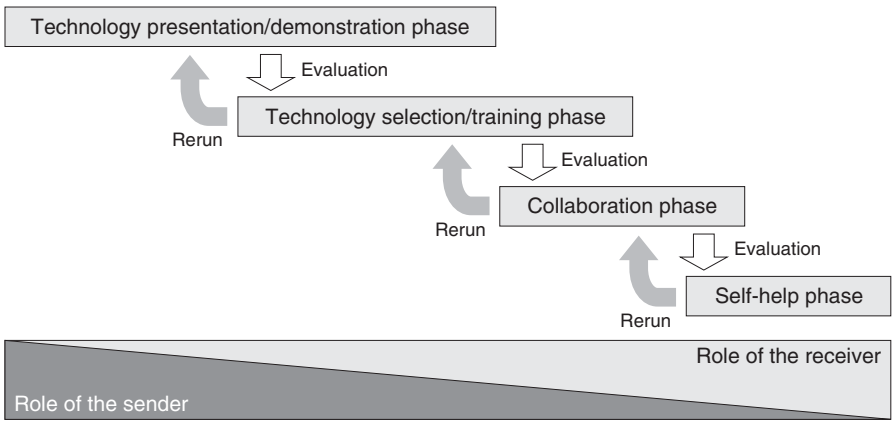
[5] The efforts in the Master Plan Study on Solid Waste Management in Dhaka City, Bangladesh (2003-2005) and the Master Plan Study on Solid Waste Management in Ulaanbaatar City, Mongolia (2004-2006).

[6] There is an incident in which a study team sent to a developing country was once asked about the progress of the project. A member said 'No problem.' To get the reaction 'No problem' was considered a problem. The implementing organization had the notion that problems naturally occur and that the project is being implemented there to solve them.

direction from the expert or the study team, which is the sender. The conveyed information includes the objectives of the project, a description of the individual survey items or the specifics of the technical guidance, or the presentation of examples in Japan. The methods generally used are lectures, seminar presentations and demonstrations. This is a very important phase in which the expert and the counterpart, meeting each other for the first time, get the chance to understand together the specifics of the project implementation. For example, information is provided as to what an M/P for solid waste management is like and what data and studies will be required. The transmission should be made not only to the implementing organization, but also to the counterpart of each expert or study team member in the area of his/her specialty. The recipient side is in a passive position at this stage, but opportunities for positive participation of the counterparts should be set up through presentation of job report and problem analysis. Through these interfaces, the capacity baseline of the counterpart is made clearer than at the time of the initial capacity assessment, and the tasks for capacity improvement support that have been incorporated into the initial plan are more clearly recognized. An individualized capacity improvement plan should be prepared for each counterpart member, as required.

Demonstrations with a readily visible impact, such as a guided tour of a sanitary landfill, or recommendations by the expert or study team for the improvement of an open dump at the actual project site can be effective. It is particularly important to demonstrate visible results at the project site since this leaves the strongest impression not only with the counterpart, but also with the higher-level policymakers, decision-makers and local residents. However, the 'technology presentation and demonstration' phase is after all a presentation of cases in Japan or other countries, and it should not be forgotten that this is no more than a phase for the presentation of examples. If it is considered that 'technology transfer' has been carried out (completed) in the course of this phase, this would be a mistake, since it is in fact a form of imposition with no regard for the realities and front-line conditions of the recipient country, and is thus the opposite of true capacity development support.

Figure 5-1 Schematic diagram of the step-wise evolution of technical cooperation



Technical cooperation and technology transfer generally evolve over time from (i) the technology presentation/demonstration phase, (ii) the technology selection/training phase, (iii) the collaboration phase, to (iv) the self-help phase. In line with this evolution, the role of the donor's expert becomes gradually more limited, while the involvement of the counterpart changes from receptive to proactive.

Source : Yoshida (2004)

The next step is the 'technology selection and training phase,' involving somewhat more concrete actions. (In the case of a development study, however, technology selection has been often conducted during the IC/R phase, and only necessary minor adjustments are made in this phase.) The expert or study team still plays the role of instructor at this stage, and the counterpart is in a receptive position. Guidance is provided, for example, concerning the specific survey method, the measurement and analysis of the solid waste, and first order analysis of the data. So-called 'technology transfer' is the technique most frequently used in this phase. The support impact at this phase depends heavily on the capacity baseline of the individual counterparts. The methods generally employed include: lectures and exercises, training courses, workshops and training-type pilot projects. Through this type of trainings, however, the counterparts generally obtain only a knowledge information being explained in a text, which can rather be explained as simple technological matters than creative ones. At this stage, the counterpart should be required to submit a report without fail or be subjected to an attainment evaluation to see if the person involved is capable of carrying out tasks alone without the help of an expert. As a result, when the selected field of technology is not appropriate or inadequate for the counterpart, "technology presentation and demonstration" phase shall be set back to reselect different field

Box 5.4 "JICA's study changed my life."

Many development studies have been conducted with the aim of formulating an M/P (see Section 1-3). It is also true that often these studies are gradually disregarded and considered unimplementable when the subsequent inputs are discontinued. However, here is a success story; an M/P was turned into a reality without outside help.

The 'Study on a Solid Waste Management Plan for the Municipality of Panama' was completed in March 2003, and there were no active inputs from the JICA side later. Despite budgetary constraints, the Panama authorities have been implementing the components of the plan little by little starting with what they could immediately accomplish. Currently, projects such as the improvement of garbage collection and transportation, the introduction of separate collection, and the expansion of disposal sites are steadily taking shape. What kind of forces are behind this self-help initiative? The following words of Mr. Erick, a lawyer and a member of the Panama Municipality counterpart team in charge of legal and organizational matters, provide a clue.

"JICA's study changed my life. When I was assigned to DIMAUD (the Panama Municipality department responsible for solid waste management), I thought that the job of solid waste management was a temporary thing for me. But the JICA survey team came and while I was working with them on a daily basis, I came to realize how important environment-related jobs are in protecting safe living conditions for the citizenry. Solid waste management is particularly important, and I have decided to make it my life work. The 18 months of study was really tough since I had to work overtime every day to take part in the JICA study on top of my routine official work. But that was an unforgettable time full of excitement." [1]

Study and planning were implemented literally through collaboration between the JICA study team and the counterpart, and in the course of that process, the counterpart, who may not have been so enthusiastic at the beginning, came to learn, deepen his understanding and develop initiative and proactive commitment. It would be fair to conclude that this was indeed one of the factors for the success of the study in Panama.

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[1] Terminal study report by Ms. BUSHIMATA Akiko (of the then JICA Social Development Study Dept.) (February 2004)

before the training is given.

At the following 'collaboration stage', the counterpart becomes engaged in the real technical work of surveying or analysis with the expert on an equal basis. The expert no longer gives one-way training at this stage, but rather mainly gives advice and exchanges opinions as an equal partner in principle. Capacity improvement at the organizational level (management, leadership, etc.) is the challenge that is tested at this stage. The methods employed at this stage include joint surveys, joint implementation of pilot projects, and joint preparation of reports and papers. The stage of "collaboration" is suitable for creative technical learning that needs problem analysis, improvement operation, and planning. Activity in this stage is effective for fostering the counterparts' creativities by sharing "tacit knowledge" including know-how which "explicit knowledge" in training and manuals cannot deliver[7]. Therefore, experts are expected to not only be a collaboration partner but also be a good instructor/adviser. The stages of 'training' and 'collaboration' are sometimes performed collectively in the form of OJT. In such a case, the initial phase is characterized by greater intervention and guidance by the expert, while the latter phase is governed by a more equal partnership. The policy of 'study and planning through collaborative work' that was mentioned in the preceding section refers to the activities anchored in this stage. In this collaboration stage, "technology selection and training phase" shall be set back when the lack of basic knowledge information/technique to restrict the collaboration work is recognized.

When the 'collaboration stage' is successfully over, then comes the 'self-reliance stage.' The self-reliance stage, however, does not mean in any sense a 'perfection stage,' in which the right capacity level has been reached. It is a stage in which the counterparts are basically capable of solving problems alone and continuing to improve their capacity, while it must not be forgotten that the counterparts will still has various weaknesses and capacity limitations. Donor's fundamental task should be monitoring. While respecting counterparts' ownership, donor considers supporting activity for follow-up to solving specific problem as required, and encouragement of larger framework of development by promotion of investments and implementation of SWM plan. For example, systematic 'hardware input' does begin to produce sustained effects at this stage without the input of any other components[8]. In the case of a development study for M/P formulation, this is the stage in which the counterparts acquire the ability to modify the M/P alone in line with changes in the circumstances. This is the time when the donor withdraws, which is the ultimate goal of technical cooperation.

This staged development of the technical cooperation, discussed above, may not proceed lineally at a right pace in actual cooperation project because the development process is just a kind of modeling and simulation. In reality, depending on the capacity of the counterpart's baseline, each starting point of the project is different, and some feedback through a trial and error process comes out. In addition, at the stage of new target setting, higher-level development of technical cooperation, so-called spiral development, may occur. Moreover, the backsliding of the project stage may appear due to the formation change of the counterparts. Therefore, it is essentially important to understand the counterpart's ownership and their problem-solving abilities.

(3) Follow-up

In the case of a development study aimed at formulating a solid waste management M/P, one of the tasks is to ensure that the formulated plan (M/P) is put into action. Usually, however, the

[7] Nonaka and Takeuchi (1996).

[8] 'Hardware input' may be provided even before the 'self-reliance stage' as a necessary tool of technical cooperation. However, large-scale 'hardware input' (such as grant aid cooperation) will be more effective if it is made towards the end of the technical cooperation project for capacity development support, that is, at the 'self-reliance stage.'

development study program as such has ended by this time. However, the end of the program does not necessarily mean withdrawal. Efforts are required in relation to concrete follow-up action to see the plan actually implemented, so as not to allow the plan to be prematurely abandoned. One of such follow-up actions is the provision of 'hardware inputs' based on the plan. Methodologies for this include equipment supply under a linked loan or grant aid project, but this method requires programming in advance from an mid-and long-term perspective, since loan and grant aid are a different schemes of technical cooperation in JICA. 'Hardware inputs' reinforce the equipment, facilities and other physical assets that represent capacity at the organizational level. Even if the provision is partial, its execution at the time when the human resources, planning formulation and other 'non-physical' capacity improvements have progressed will produce visible improvements (results) and have a significant demonstration effect. This is an effective method of motivating sustained efforts to pursue a project to completion as it contributes to the promotion of support by the residents and consensus building, as well as the understanding of the administrative decision-makers (hence, to securing the necessary budget). The following is an example of the programming. In the case of the supporting of M/P development on the development study in Dhaka, Bangladesh, the study team initially incorporate "follow-up phase," which were comprised by the continued support for M/P put into practice and the monitoring after M/P was developed, into the plan at the stage of designing the development study[9]. This study aims at promoting continual measures by recognizing a pilot project not only as a demonstration experiment of a development study but also as the first step for the realization of improvement measures of solid waste management and CBSWM. With respect to funds for the improvement of landfill site, they support an internal government procedure to make them voluntary debt relief.

A second means of follow-up is to nurture the sense of mission and citizen participation for project execution through 'information disclosure' and 'increased transparency of the plan.' Focusing attention on other donors' activities, the case of Regional Solid Waste Management Project (RSWMP-METAP) of Mediterranean Environmental Technical Assistance Program is a good example of the information disclosure. This project encourages the organizers to open each participant' s solid waste management M/P and action plan to repeatedly open the public in the international seminar. This shows that "international pressure and competitive race" can be an incentive for the promotion of each country's governmental policy for actual implementation of the plan[10].

A third means of follow-up is monitoring by the dispatch of experts or volunteers. For example, the short-term expert dispatch in the El Salvador case and the expert and volunteer dispatch in the Vientiane case that were described in Chapter 3 were quite effective from the point of view of providing advice and encouragement for the partial execution of the counterpart's M/P, in addition to the obvious reinforcement of technical aspects. Furthermore, it is reported that the solid waste management performance of Vientiane improved when the city served as host to a third country training program and received Cambodian visitors who were promoting a similar project[11]. Such visits from neighboring countries have the effect of monitoring of a sort and also have a psychological impact which helps ensure that the fruits of technical cooperation have a lasting effect.

5-2 Priorities in the future implementation of technical cooperation

In order to help developing countries establish sustainable solid waste management

[9] JICA (2005c). See also Box 5.3.
[10] METAP Regional Solid Waste Management Project (2003)
[11] See Box 1.4 in Section 1-3-2.

programs, cooperation should be made with the emphasis on the following points, together with due consideration to well-balanced capacity enchancement.

(1) Community-based solid waste management

With the significant progress of decentralization in solid waste management regimes, renewed attention is being given to the role of the respective communities. JICA in the past has almost exclusively considered government agencies and administrative bodies as the targets for support in solid waste management capacity development, based on the concept of government-to-government assistance. To the extent that municipal governments are in most cases the bodies that are principally responsible for solid waste management, this framework and the nature of the support are not expected to change in the future. However, not only the government authorities, but also the local communities have a very significant role to play in improving solid waste management services. With a view to spreading the benefits of JICA's cooperation projects directly to the local residents and increasing their ripple effect, future cooperation should be directed at strengthening the role of administrative bodies in listening more closely to the opinions of the local community. For this purpose, the targets for solid waste management support should be broadened to include the creation of government-community partnerships and direct cooperation with the local community through schemes under the JICA Partnership Program and the dispatch of volunteers. Such attempts have been made through pilot projects as part of development studies (for example, the case of Manila referred to in Section 3-1), but they were of short duration and not really beyond the level of trial and error. In future, collaboration with NGOs and an emphasis on grassroots cooperation should be further strengthened as part of project implementation in order to promote community-based solid waste management. Linkages with the JICA Partnership Program and volunteer dispatch should be pursued proactively. In particular, it is expected that local NGOs will have an important role in reaching out to the local social strata and in capacity assessment. To achieve this, future support will not only cover the technical aspects, but also encompass social considerations and studies. Such support can lead to the development of community-based organizations (CBOs) and microenterprises. It can also contribute to the empowerment of women if their role is properly positioned within such schemes.

(2) Development of resources allocation capacity for short-term improvements

A priority will be given to support for the development of the management capacity of government agencies and solid waste management bodies in grasping costs and manpower requirements and reallocating the available resources (both financial and human) to where improvements are needed. In conjunction with an analysis of collection costs, for instance, collection routes should be reviewed, and the fuel costs and workforce should be reduced. The savings thus made in costs and labor should be reallocated to covering the cost of fuel for heavy machinery and the workforce required for final disposal sites that were previously operated only as open dumps. Such management capacity on resource allocation should be developed. Strengthening the ability to conduct capacity assessments independently and obtain optimized outcomes within the given conditions, while looking at the realities of the assessed capacities, is also a form of support. The task involved is not one of formulating a master plan for urban solid waste management from a medium- to long-term perspective, but rather one of realizing shorter-term improvements in solid waste management operations based on efficiency improvements

through the rationalization of individual business processes and analysis of the costs and labor requirements.

(3) Continual cooperation

In sectors such as solid waste management that tend to be given a low investment priority among municipal services, despite their great importance, it is generally difficult to improve the capacity in a short period of time, and cooperation from a long-term perspective extending over a period of several years is called for. More specifically, cooperation may be designed in such a way that the kind of short-term improvements described in above (2) are repeated. Or support may be rendered in phases with a focus on the improvement of specific capacities that have been identified as requiring reinforcement as a result of the capacity assessment. For example, instead of terminating cooperation with the completion of the M/P formulation, a combination of schemes (grant aid, technical cooperation projects, training, expert/volunteer dispatch) may be offered to help implement the project and/or undertake the necessary follow-up work after M/P formulation. However, the magnitude of such inputs and the form of support will vary according to the progress of the counterpart's capacity development and other conditions. Inputs after a certain interval can also be an effective alternative.

In extending such continual support, the outlook for anticipated subsequent cooperation should be prepared prior to the completion of a (or a set of) cooperation project(s). Planning the actual subsequent cooperation while monitoring it is a useful exercise for determining the optimal set of input components that best match the local conditions.

(4) Contemplating a grand design for support

When initiating support, it is necessary to consider a general design concept for the best input mix to obtain the best possible outcome. The inputs do not mean only those that are applied simultaneously, but also those that are provided as follow-up at appropriate times. Capacity assessment represents the 'entrance strategy' of deciding what support should be extended at each support milestone. In the exercise of preparing a grand design, it is important to give some thought also to an 'exiting strategy' for withdrawing from the capacity development support when a certain phase is reached[12]. However, solid waste management is a highly volatile sector, being susceptible to changes in the social situation. Not only the preliminary capacity assessment that was conducted prior to the support initiation, but also the contemplated subsequent support components must be updated in a timely fashion to reflect changes in the circumstances through the periodical monitoring of capacities. This updating process echoes the idea of phased support described in (3) above.

Such a 'process-oriented' approach is particularly important in capacity development support.

(5) Understanding the social relations of stakeholders and encouraging their participation

A wide variety of stakeholders, including even the informal sector, are involved in solid waste management, and as described in Section 2-4, the solid waste management flow moves through an intertwined net of social relations among these stakeholders. Operational improvements must be promoted with a high degree of awareness of and due attention to the social background and factors. In doing so, participation of these stakeholders is indispensable, and information dissemination and other measures should be taken to encourage it.

JICA revised and put into effect its Guidelines for Environmental and Social Considerations in April 2004. In implementing support, encouragement will be given to ensuring

[12] Kitawaki (2003) calls it a 'withdrawal strategy' and points out its importance.

appropriate and flexible consideration of the environment and society in accordance with these guidelines.

(6) Focus on garbage collection and landfill operations

If the availability of resources for input and support is limited, a selection and focus will need to be made while trying to seek the understanding of the counterpart. From the standpoint of cost-benefit analysis, the focus of support will be placed upon efficiency improvements in garbage collection and transportation, which is the largest cost component in solid waste management, or upon the optimization of landfill operations and management, which could have the greatest environmental impact. Attention can then be directed at the promotion of waste generation reduction, recycling and intermediate treatment, depending on the situation of cost bearing for

Box 5.5 Examples of perspectives and focusing in the consideration of JICA activities and program contents.

For reference purposes in the consideration of cooperation components with the abovementioned points in mind, some examples of focal perspectives for the examination of JICA activities and program contents in the solid waste management sector are given below.

1. Perspectives to identify major challenges
- How do the top leaders (mayor, bureau director) understand the present situation, and how serious do they think the problem is? Do their awareness of the problem and their sense of urgency (or lack thereof) resonate with any assistance from outside?
- Availability of human resources to implement the cooperation program
- Risk factors (e.g. the mayor does not enjoy a council majority, the landfill site selection has become a political issue, non-economically feasible means are requested.)

2. Focusing

(1) Countries with a relatively high economic standard (above grant aid eligibility level)
- Improvement of landfill sites
- Private-sector participation
- Cost analysis about each process
- Improvement of the legal system (e.g. regulations governing private-sector solid waste management, responsibilities of the solid waste generator)

(2) Grant aid eligible countries
- Expansion of the collection area in cooperation with NGOs and CBOs
- Reduction of collection costs and switching to paid services, investment using the funds thus raised (e.g. heavy-duty machinery for landfill sites)
- Improvement of the maintenance of collection vehicles

3. Focus on human resources development
- Development of decision-makers in municipal governments
- Finance
- Development of middle-level managers in municipal governments
- Collection management

4. Focus on cooperation for the municipal and central governments
- Supervision of private firms (conclusion of appropriate contract agreements, management of implementation)
- Central government (improvements in the legal system, financial assistance to municipal governments)

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appropriate garbage collection and landfill operations, as well as the degree of difficulty in securing site.

5-3 Improvement of JICA activities

To put into practice the directions for cooperation that have been discussed in the foregoing sections, JICA's activities should be improved as follows.

(1) Building a knowledge base[13] on technical cooperation in the solid waste sector

Compilation of pertinent materials in the solid waste sector within JICA is inevitable as the initial step. The pertinent materials are: development study reports, project reports, preliminary/subsequent study reports, expert reports, and other related documents. It is also required to accumulate basic information which includes official papers of other donors and development workers in a systematic manner. Based on these collected materials, collecting technical know-how and the extraction of knowledge from both successful/unsuccessful case examples shall be started. Collection and accumulation of the information about appropriate technologies is also necessary. They could be obtained through the series of pilot projects for development studies and expert dispatch programs. These information resources are useful to plan/implement effective technical cooperation in the future, but have not been necessarily shared.

The accumulation of information in the above is the collection/accumulation/sharing and integration of "explicit knowledge." However, the accumulation of "tacit knowledge" is not available by this means because the information has been recorded neither in reports nor other documents. Even so, some kind of accumulation of the useful information belonging to tacit knowledge shall be prepared. in order to carry out JICA' s activities effectively and efficiently. Considering JICA's original task, which is carrying out their aid activities effectively and efficiently, the information on the project design and the preliminary assessment are particularly important, and are to be more centrally focused. As previously noted, the "extraction of knowledge from both successful/unsuccessful case examples" is important. The difference between success and failure can be caused by the adequacy of "capacity assessment," previously explained in chapter 4, or problems of the project design that are referred from the inadequate capacity assessment. Even though the term "capacity assessment" has not been expressly demonstrated in most of the projects, its necessity is factually recognized in particular for the stages of project formulation and preliminary assessment. Accordingly, these types of works have been more or less carried out. It can be said that the "capacity assessment" is recognized as a kind of "tacit knowledge," which determines if a project is successfully operated or not. Therefore, the appropriate assessment of counterparts' capacities and corresponding project designs are essential prerequisites to formulate successful projects. A task force or alternate function on this matter is required in order to study for appropriate capacity assessment and rational project design that utilizes the findings from the capacity assessment. In other words, in terms of knowledge management, this is the process to convert "tacit knowledge," which is owned by experienced staff and consultants who have useful knowledge, to "explicit knowledge," which is to be shared by other staff members. Submitting the monitoring report on the development study, which has been operated as the main project scheme in SWM sector, shall be necessary in order to focus not only the products of the study (M/P, F/S and technical specifications) but also the findings during the study. These report are useful to grasp the activity

[13] Nonaka et al (1996). "Knowledge" here means the integral of "tacit knowledge" and "explicit knowledge" from the ideology in "knowledge management." This is to utilize each group member' s own information and knowledge by sharing them among all the members, and then the creation/utilization of more useful knowledge can be allowed. As a result, the higher organization' s performance is achieved for level up and the quality of operations.

for improvement of counterparts' capacity by the study team. Furthermore, the expertise and lessons learned about support implementation will be drawn up by analyzing the effect that cooperation follow-up activities have had on the support. A knowledge base will be constructed through these measures and will be utilized in future cooperation activities.

Moreover, networking among those with resources in Japan will be promoted and knowledge sharing will be carried out through information exchanges. The first step, for example, may be information dissemination by e-mail. By sharing information on training course lecturers, survey team members, donors, NGOs and academics, JICA can effectively utilize available resources. Through these knowledge base building and information sharing, efforts will be made to develop human resources within and outside JICA for technical cooperation in the solid waste management sector and to thus strengthen the foundation for future cooperation.

(2) Improving individual schemes

1) Development studies, grant aid, and technical cooperation projects

Sufficient time and resources will be allocated to project formulation and preliminary surveys on site to ensure that the necessary capacity assessment can be made prior to project implementation and that an appropriate capacity development support plan can be designed. Based on the accumulation of knowledge, noted above, the process of the approval on preliminary assessments and project framework design at the headquarters should be rationalized so that the whole process can be appropriately shortened.

Concerning development study, not only formulation of M/P, but also action plan type of study with short-term practical objectives will be pursued and the elements of capacity development support will be incorporated into the TOR. Pilot-type activities will have a greater role to play in ensuring that action plans are effective. Rather than taking the implementation of a pilot project for granted, attention will be paid to its relevance in the light of its three basic functions; verification of the plan's effectiveness, extension of the results, and initial partial improvements, and its contents will be designed with the utmost consideration given to the counterpart's own initiatives.

Grant aid is an effective scheme for the improvement of machinery and equipment. Increased attention will be paid to utilization of components for improvement of management, in order to achieve the more effective utilization of machinery and equipment. In addition, follow-up activities through the dispatch of experts or volunteers are effective for this purpose. Apart from grant aid, yen loans provided by the Japan Bank for International Cooperation (JBIC) have a major role to play in providing large-scale inputs of hardware and the upgrading of solid waste management facilities. Collaboration with JBIC schemes will be pursued.

Technical cooperation projects will be designed after considering the findings of capacity assessment and clarifying what capacities are to be targeted.

2) Dispatch of experts and volunteers

Emphasis will be place on the individualized technical transfer and capacity development at the individual level since dispatch of experts and volunteers is a powerful tool for such activities. With respect to dispatching, technical instruction at the required level shall be clearly stated in detail as TOR, based on the stage of development that described in 5-1-2. In determining the qualification of the expert, in this case, not only the adequacy of the individual level of technique shall be figured, but also the facilitation ability shall be treated as an important factor for capacity development assistance with respecting ownership of the counterparts. The repeated dispatch of short-term experts is a cost-effective means of technical transfer. Links with development studies and grant aid projects will be considered.

In addition, the activities of experts and volunteers in cooperation with local NGOs and CBOs are an effective means of achieving 'community-based solid waste management (CBSWM).'

3) Technical training of overseas participants

With respect to the technical training of overseas participants in Japan, efforts will be made to increase the effectiveness of such training through country-specific courses and other measures for having similar backgrounds and capacities of the participants. The focus of training in Japan will be shifted from the presentation of Japan's present situation and general discussions on solid waste management to the learning of knowledge and the study of technologies that can be effectively utilized in the participant's home country. In conjunction with the above, the emphasis will be placed on country- or region-specific (regions of the world) courses, thus making it easier to design training courses that better match the local conditions of the region. In setting up such country- or region-specific courses, links will be made with the ongoing technical cooperation programs (development studies or the dispatch of experts) in that country or region, so as to increase their synergy. There are several training courses in the solid waste sector managed by JICA domestic offices. Therefore, it is also necessary to share training curricula and teaching materials in the solid waste sector in the form of a database with a view to accumulating know-how and utilizing it for mutual benefit. Furthermore, technical transfer with prompt effect will be sought in specific technologies or in relation to regional characteristics by offering focused training themes as demonstrated by the examples of sanitary landfill technology (JICA Kyushu) and solid waste management for islands (JICA Okinawa).

Schemes for third-country group training, third-country individual training and third-country expert dispatch will be made full use of with a view to building networks among developing countries facing a similar situation through the involvement of trainees and counterparts and to promote the broader dissemination of applicable technologies. Considering the effectiveness on demonstration of the improved image in the solid waste management, third-country trainings shall be taken as an important factor.

4) JICA Partnership Program (JPP)

Links with NGOs in Japan will be strengthened, and the JPP scheme will be emphasized as an important tool for the promotion of community-based solid waste management projects and cooperation support to local NGOs. As mentioned above, in addition, the pursuit of linkages with local NGOs and CBOs in the implementation of the programs through the schemes for dispatching experts or volunteers will provide an effective means of achieving community-based solid waste management.

5-4 Challenges ahead

(1) Compiling and systematizing example concerning the methods and techniques of capacity development support

In this paper, it has been argued that the key perspective in the consideration of future directions for technical cooperation in the solid waste management sector in developing countries is capacity development support.

This perspective is considered to be in the same vein as respect for ownership and cooperation for the support of self-help and self-reliance that are known as one of the characteristics of Japan's technical cooperation[14]. In this context, JICA's technical cooperation programs in the solid waste sector in recent years have been implemented with the emphasis on counterpart-led projects in development studies, on collaborative technical cooperation, and on social considerations, thus resulting in an orientation towards capacity development support.

[14] Japan International Cooperation Agency (2003b)

It must be remembered, however, that these practices and experiences are the consequence of trial and error at the front-line as well as case examples, and that no deliberate system or methodology that could properly be called 'capacity development support for solid waste management in developing countries' has yet been established.

This paper has discussed capacity assessment and the project formulation based on it as being understood as a method of 'capacity development support,' and a 'checklist for capacity assessment' (Chapter 4) has been proposed. However, issues such as the detailed methods of actual capacity assessment, the methods of project formulation based on the assessment findings and the methods of determining the most effective combination of schemes and tools in project formulation have yet to be verified in practice. Based on cumulative experience, these methods should be refined to be made more effective. This is a task for the future.

(2) How to deal with the issue of initiative in capacity development

The approach of capacity development support means extending support as an outsider while relying on the endogenous processes of the counterparts, and therefore the initiatives, commitment, determination, passion, and willingness to cooperate are always at issue. From the standpoint of the donor who is an outsider, the key points in the practical implementation of technical cooperation include such questions as how to find the counterpart's commitment and willingness at the individual, organizational and institution/societal system levels, and how to take measures to facilitate such forces out of the counterpart or to help them emerge from within. With regard to possible responses to these somewhat pedagogical or psychological questions, however, there is little accumulation of good practice in the case examples and proven cases. It may be that such practices have been applied piecemeal at the site of individual technical cooperation projects in the solid waste sector, but they have not been compiled or summarized into a method of implementation for common use. It is believed that clues to the answer to this question are provided by the ideas that have been described in this paper with case examples, including 'bottom-up project formulation by trainees,' 'motivation through visible results,' 'involvement of higher-level organizations and decision-makers,' 'timely support,' 'collaboration in development studies,' and 'phased evolution of technical cooperation.' But these hypotheses should be developed and verified through the accumulation of more case examples and amplified in actual practice.

(3) Issues on evaluation for capacity development

Once a project is initiated, the output indices (such as the 'garbage collection rate has increased' or the 'landfill site has improved and environmental contamination has been ameliorated')[15] are set for the attainment of the project objectives, and project evaluation should be made based on these indices. However, these can be considered as 'indices of the outputs.' In the original sense, "capacity development" is to improve counterparts' "handling skill," and is to improve their ability of solving problems. Therefore, the "acquisition and development of the handling skill" will be the most important point for assessing targets of support activities. However, it would be difficult to set the indicator of "development of the handling skill" for the purpose of the assessment, excluding assessing the expansion level of both physical and soft assets as specific capacities. For example, at issue are the factors related to initiatives (determination, commitment, passion and willingness to

[15] A proposal has been made as to the indices of project evaluation for solid waste management in developing countries in which the ultimate objectives of solid waste management are defined as 'improvement of public hygiene, protection of the environment and ecological systems, and enhancement of the resident's health' and the performance goals include the reduction of solid waste and safety management (collection, transportation, treatment and disposal). (Doi, et al. (1998))

cooperate) that are referred to in (2) above, such as that 'the counterpart has become more proactive in solving problems,' 'the counterpart has become capable of making observations about appropriate technology with creative ideas,' 'the counterpart has become to propose more original and creative ideas,' or 'the counterpart has become more self-reliant.' These are important questions to be asked in the actual evaluation of capacity development and are indispensable factors in ensuring sustainable development.

To the extent that capacity development is carried out as a program, it is inevitable that concrete results are asked for in a certain period of time, and our task for the future is to express objectively and to establish index in one way or another the progress of the counterpart's capacity development (or the effect of the support) following the implementation of the technical cooperation project. Since capacity development means proactive, endogeneous improvement of capabilities, support for it has to be more process-oriented than product-oriented. In other words, appropriate evaluation and promotion of the process of technical cooperation for capacity development support are required. While quantitative evaluation would be difficult, a mechanism should be developed to conduct certain qualitative evaluations through submission of capacity monitoring report (Appendix 3) and periodical on-site project monitoring by domestic support committee and to provide appropriate feedback. From this viewpoint, a task for the future is to further improve and strengthen the on-site monitoring methodologies not only by the domestic support committee, but also by overseas offices and other parties.

With the inauguration of the integrated issue management system for development cooperation through the introduction of issue-based departments in JICA in April 2004, the institutional wall between the schemes for 'development studies' and 'technical cooperation projects' has been lowered, and the number of 'development study-type' projects contracted to private-sector consulting firms is on the increase. Development study project focused on an aspect of capacity development, which is implemented by private sector, will also increase in the future. The setting of the TOR's and contents of agreements for such projects contracted to private-sector consulting firms has to be modified to place greater emphasis not only on the results, but also on the process to reflect the importance of capacity development support. This is a task that practitioners at the working level must deal with in their role as program officers.

In our future technical cooperation, the objective of achieving the expected results effectively and efficiently through the adoption of the capacity development support approach in each project will naturally continue to be pursued. Simultaneously, efforts should be made to accumulate and summarize the experiences and lessons from these projects so as to establish a strong 'methodology on capacity development support' that is backed by actual practice. Such efforts will also help lead the way not only to resolving issues of solid waste management, but also to the much broader theme of solving the problems of any given society and its members in developing countries with the proper application of relevant science and technology.

Ultimately, the remaining challenge is one of our own. We are responsible for developing the human resources to be assigned to capacity development support and further build up and strengthen our implementation framework support structure.

Appendices

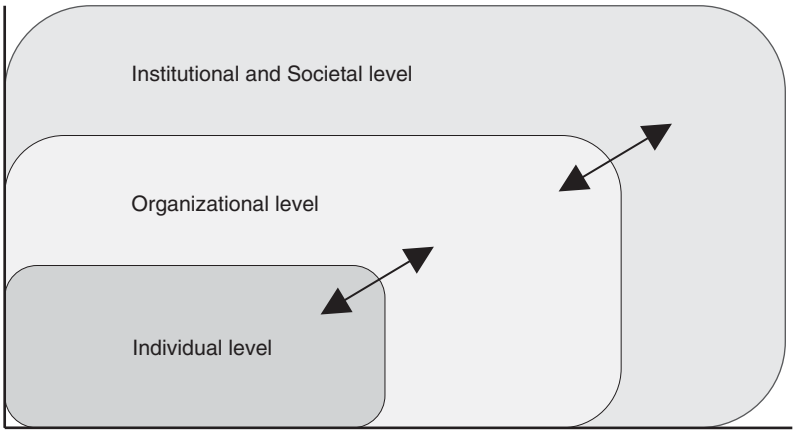
Appendix 1 What is Capacity Development?[1]

1. What is Capacity Development (CD)?

The UNDP defines CD as the process by which individuals, organizations, institutions, and societies develop "abilities" (individually and collectively) to perform functions, solve problems, and set and achieve objectives. This is a widely used concept, although the definition of CD varies slightly from donor to donor. This report follows the UNDP definition.

Within the general CD framework, there are three layers- individual, organizational, and institutional or societal levels. These layers are not mutually exclusive, but rather each level is interconnected in a systemic way. The discussion regarding "how to define capacity in SWM", mentioned in section 4-2 and 5-1 in this report, also follows by this concept.

Figure A-1 The three layers of capacity development (Conceptual Framework)



Box. What is different between "Capacity Building" and "Capacity Development" ?

Capacity development (CD) is not the same as Capacity Building, a term that was used quite frequently. The concept of CD used in this report is as follows (and this concept is also commonly used among donors).

Part of the reasoning behind the word "development" taking the place of the word "building" is to stress the "endogenous development process of partner countries." In other words, since the term "building" connotes "creating something that does not exist", this terminology might increase the tendency to subconsciously underestimate the ownership and potential of the partner country itself. It is vital that we recognize the fact that our role is to capitalize on the possibilities that exist in a partner country without undermining the initiative of the partner country itself. Our role is also to create an enabling environment to contribute to the sustainable development of the partner country.

[1] The Appendix 1is edited by the committee secretariat of this research group to fit the contents of this report based on Task Force on the Aid Approaches, JICA (2004), pp.7-11.

2. Messages from the Concept of CD

Mainstreaming the CD perspective as JICA's basic operational principles of Technical Assistance (TA) Projects will be a big challenge to have a greater socio-economic impact without hindering the endogenous CD process of partner countries. This section presents some of the basic viewpoint and consideration of the CD concept.

1) Basic principle: Outside actors cannot directly develop capacities in a partner country

CD is a process toward achieving objectives through which the people and organizations of a partner country recognize their own problems, develop a vision for solving them, and use their own resources and strengths for overcoming such problems. Although outside actors are able to fulfill roles of facilitators (or catalysts), such actors are not able to directly develop capacities.

2) Ownership by the partner country is vital

All societies have their own local institutions and their own resources including local knowledge and human resources, which can be mobilized for development initiatives. Past experience reveals that an initiative that is not firmly embedded in local institutions cannot produce sustained outcomes. In other words, it implies that the knowledge and institutions developed in a donor country cannot simply be "transferred" or "imposed" on a partner country, which has different socio-economic conditions. A donor-driven approach (from planning to project management) without respecting local knowledge, resources and ownership is not conducive to sustainable CD in the partner country. It is therefore essential for donors to make a conscious effort to help partner countries to strengthen local ownership by promoting local participation and empowerment whenever appropriate.

3) Joint efforts with the participation of stakeholders in the partner country are important

When stakeholders in the partner country join a TA project from its beginning (planning, implementing, and evaluating it) through participatory consensus-building and decision-making involving the various stakeholders, the counterparts (people and organizations) gain a greater understanding of their own problems, the need for and significance of the project. They will also have stronger incentive and motivation to execute the project. The proactive involvement and participation of the local side ensure that every project is carried out in line with local needs.

4) A long-term commitment is required

Since the endogenous process of CD slowly progresses over time in many cases, it is important that development assistance be carried out based on a long-term vision and framework. If donors dwell too much on short-term results, such assistance may jeopardize both the medium to long-term objectives and the sustainability of project outcomes.

5) Creating a sustainable mechanism after project completion

In order to achieve the medium to long-term objectives, it is important to strategically examine the post-project scenario upon JICA's exit and incorporate certain mechanisms for ensuring the sustainability of TA outcomes as early as possible (i.e. strategic communication and partnerships with related organizations and donors, policies and institution-building, fiscal autonomy). In this way, it becomes possible to create an environment in which the TA project can contribute more meaningfully to help partner countries achieve medium to long-term objectives at the national, sectoral, and regional levels. In case mechanisms such as policy dialogue and cooperation with other donors cannot be incorporated into the project design, alternative strategies should be explored.

6) Systemic thinking and program approaches

It is common for JICA's cooperation to be limited to a specific organization within a specific government ministry. In assistance for solid waste management sector, local governments or municipalities are appointed as a counterpart agency in many cases. Although there is no problem with such focus in cooperation; overly narrow focus without sufficient attention to the broader context could lead to unsustainable project outcomes and poor impacts. For this reason, in order to achieve the medium to long-term objectives (program level outcomes and socioeconomic impact) in a sustainable manner, it is vital to design projects with a strategic understanding of the dynamic system and the society of the partner country where various development actors such as the public sector, civil society, and the private sectors are mutually interacting.

At the same time, it is not usually realistic for a single donor alone to cover all the major CD aspects. Here, a Program Based Approach becomes very important. JICA's cooperation is integral to the wider program of the partner country. In addition, the cooperation should respect common regulations and the planning cycle of partner countries, based on strategic partnership, in order to promote CD at the national, sectoral, and regional levels. Development Objective Chart in Chapter 2 and Reference 2 in this report are presented as a tool to consider CD in solid waste sector systematically[2].

7) A flexible approach responsive to the development needs and conditions of each country, issue and sector

The direction and focus of CD vary depending on the status of development in the partner country (i.e. the level of poverty and economic development, the maturity of the market economy, institutions and civil society, as well as the strength of the political, administrative and fiscal systems). Therefore the contents of CD assistance vary accordingly. For instance, the approaches to CD will clearly differ between more developed countries (in which there are well-established administrative bodies and organizational frameworks exist and are functioning, and governments have sufficient revenues) and low-income countries where the administrative and fiscal frameworks are very fragile.

In many low-income aid dependent countries such as Heavily Indebted Poor Countries (HIPCs), aid projects have proliferated without sufficient coordination, which has resulted in administrative and financial burden on the already limited government capacity of the partner countries. In order to mitigate these situations, new initiatives have already started in a number of countries. For example, some partner countries have embarked on a larger scale CD initiative, mostly through PRS (Poverty Reduction Strategy) approaches and SWAps (Sector-Wide Approaches), at the macro and sectoral level with closer coordination between the government and donors.

In other instances, some donors have started to harmonize their procedures among themselves and also begun to align their aid procedures with the administrative and financial mechanism of the partner countries to reduce related transaction costs. In recognizing the importance of these efforts, JICA has also participated in these initiatives in some countries such as Tanzania and Vietnam.

Depending on the situation, various approaches to support CD could be employed such as the creation and provision of knowledge and data, financial support and provision of the equipment and facilities.

8) Measuring and evaluating the long-term CD process

In the context of result-based aid management, which demands a concrete time-

[2] A series of study reports of "Approaches for Systematic Planning of Development Projects" published by the Institute for International Cooperation, JICA, provides useful guidance in this area.

bound outcome, measuring and evaluating CD assistance remains a major challenge. First, the CD process takes a long time to produce tangible development results. Furthermore, strategic elements that form an integral part of the CD process such as the sense of trust, motivation, awareness, creativeness and cooperative spirit are difficult to quantify. As a result, measurement and evaluation represent a challenge to all those involved in CD assistance including JICA. In collaboration with other actors in development aid, the JICA taskforce on CD is planning to undertake a review and a stocktaking exercise to identify indicators and benchmarks that appropriately indicate meaningful changes in the CD process. The table below presents the important elements that characterize the CD process. Table 4-1 in the report is reinterpretation of this table from the standpoint of waste management sector.

Table A–1 Key capacity features and elements to be developed in the three CD levels

Levels of capacity	Key capacity features to be developed	Elements on which the capacity is based at the three levels
Individual	The will and ability to set objectives and achieve them using one's own knowledge and skills	Knowledge, skills, will/stance, health, awareness
Organization	Form of organizations that can optimally utilize assets (human, intellectual, physical), management methods (flat organizations, TQC (total quality control), KM (knowledge management), personnel systems, etc.)	Human assets (capacities of individuals comprising organizations)
		Physical assets (facilities, equipment, materials, raw materials) and capital
		Intellectual assets (organizational strategy, management and business know-how, manuals, statistical information, production technology, survey and research reports, household precepts, etc.)
		The decision-making processes and management systems, organizational culture, and frameworks required to achieve a specific objective
		Leadership
Institution/Society	The environment and conditions necessary for demonstrating capabilities at the individual or organizational level, and the decision-making processes, and systems and frameworks necessary for the formation/implementation of policies and strategies that are over and above an individual organization	Capacities of individuals or organizations comprising a society
		Formal institutions (laws, policies, decrees/ordinances, membership rules, etc.)
		Informal institutions (customs, norms)
		Social capital, social infrastructure

Appendix 2

Appendix 2 (1)

An example of checklist for capacity assessment for municipalities

(Check whether information and data have already been obtained on the following items.)

◎ : Item of special importance

Main item	Sub item	Examples of data and information	Points to Check
Basic information on the target city or area	Population		
	Land area; districts	Residential areas of high and low income communities	Are area characteristics within each district recognized?
	Natural conditions	Temperature and precipitation	◎ Effects on waste characteristics (water content, ash content, etc.)
	Income	Per capita GDP of the city (GDRP)	
	Key industries	Existence of markets, factories, business establishments, etc.	Are waste generation sources other than households understood?
	Maps; GIS		
National policies and systems	National SWM policies		Is there a policy statement on SWM?
	SWM laws	Obligations; penal provisions; controls of hazardous wastes	Are the obligations well understood?
	Budget support	Subsidies; low-interest loans	◎ Are both recipients and conditions for budget support clearly defined?
	Environmental impact assessment (EIA) system	Application of the system to SWM facilities	Are EIA procedures shown to waste-related facilities?
	Land expropriation; compensation procedures	Legal procedures	Are the criteria and procedures clearly defined?
	Power relationship with the central government	Approvals from the central government; calculation of state subsidies	In what case does decision making by the municipality need endorsement from the central government?
Municipal framework	Ordinances	Obligations and penal ordinances	◎ Are the obligations well understood? Are they recognized as rules that must be observed?
	Licensing for private waste service providers	Licensing criteria	◎ Does the municipality keep track of such providers through licensing or other means?
	SWM plans	Current and projected volumes and qualities of wastes; facilities planning	Does the municipality have such plans? If so, are they put to good use?
Finance	Income and expenditure	Budget and the breakdown of expenditure	Are balance sheets prepared? How do municipal finance managers recognize SWM?
	Expenditure and its breakdown (by type)	Expenditure breakdown chart	◎ Can costs of collection and those of disposal be calculated separately? ◎ How detailed is the breakdown?
	Amounts paid to contractors (where applicable)	Basis for calculating such amounts	Are such amounts calculated according to clear rules?
	Income and its breakdown	Consolidated chart of budgeted income breakdown that also includes related budgets (including labor costs, etc. if they are budgeted separately)	Is income base clearly defined? ◎ How detailed is the breakdown?
	Collection fees	Charging basis; fee collection methods; amounts collected; fee collection rates	Is there a fee list for each type of wastes or waste service users? Are collected fees counted as income?
	Landfill tipping fees	Charging basis; fee collection methods; amounts collected; fee collection rates	Is there a fee list for each type of waste or waste service users? Are collected fees counted as income?
Organizations	Awareness level of top management	Issues of high priority	◎ Do top management recognize problems in relation to what needs to be done to solve them (e.g. changing budget allocations)? ◎ How wide is the gap in the perception of problems with middle management and supervisors of waste workers?
	Organizational structure	Organization charts of the municipality and the waste management department	◎ Is solid waste service provided by a single department or more? In the case of two or more departments, is coordination maintained between them?
	Decision-making mechanism	Decision-making regarding human resources, purchase and repair of equipment, outsourcing contracts, and siting of landfills and other facilities.	◎ Are decision-makers integrated? Is the authority for decision-making on minor matters delegated to lower-ranking officials?

Main item	Sub item	Examples of data and information	Points to Check
	Allocation of duties	Different job descriptions for managerial staff, engineers (college graduates), clerical staff, skilled workers, and utility workers.	Does the head office understand the work performance, schedules, etc. of the staff, especially the waste workers? Is job hopping a common practice?
	No. of staff	The number of staff at each section of street sweeping, collection and transportation, or final disposal.	Is the number of staff checked regularly to see if it is appropriate scale?
	Training	Training planning and budget; outside resources for training	Is training provided regularly?
Social aspects	Customs	Customs, historical institutions and norms regarding waste	
	Implications of religion	Existence of certain castes, etc; customs	Are religious taboos well understood?
	Classes	Whether there are certain social classes involved in SWM	◎ Is the relationship between SWM services and classes well understood?
	Social organizations; actors	NGOs, CBOs, universities Unorganized actors	Is each organization active and/or influential? Who (or which organization) is recognized as an important stakeholder?
	Recycling markets	Transaction prices, amounts and material flows of key items	Are recycling practitioners informal or formal?
	Environmental education (EE)	School education (EE providers; the numbers of schools that practice EE); availability of teaching materials	Does the municipality measure how often EE is provided?
		Community education (target districts or groups, methods, media, and scale)	Does the municipality measure how often EE is provided?
	Involvement of mass media	Degree of media exposure	Focuses of mass media
	Partnership among civil society, business and government	Opportunities for seminars, briefings, etc?	Opportunities for discussion?
	Reflection of community input in policies and services	The number of complaints; contact point for complaints; complaint handling systems	◎ Are complaints and responses recorded?
Collection and transportation	Current methods and rules for storing and discharging wastes	Pamphlets	Do residents observe the rules?
	Areas and populations served by collection service	Statistical data	How are the collection areas established? How is the population of each area recorded?
	Primary collection	Door-to-door collection, collection by CBOs, etc., or carrying-in to waste collection points by waste generators; how to establish collection points; types of dustbins; transshipment methods at waste collection points; Condition of collection by waste collectors	What part of waste collection chain is managed by the municipality? Does the municipality know how residents discharge wastes? Are the wastes collected according to the collection calendar? Does the municipality understand the nature and trend of complaints? ◎ Does the municipality assess the efficiency of collection and transshipment work?
	Collection points	How to establish collection points; types of dustbins; transshipment methods at waste collection points; condition of collection by waste collectors	◎ Does the municipality assess the efficiency of collection and transshipment work?
	Plan and method for vehicle operation management	Time-and-motion study; assessment of traffic congestion	Does the municipality review collection efficiency? Does it take traffic congestion into account? Do the drivers understand the vehicle operation plan well?
	Supervisors in charge of appropriate collection and transportation services; the supervising method	Complaint handling procedures; report on collection work and performance	◎ Does the municipality understand the nature and trend of complaints? Is the method of supervision appropriate?
	Intermediate treatment	Intermediate treatment methods; availability of treatment facilities	Is compost put on the market?

Main item	Sub item	Examples of data and information	Points to Check
Final disposal	Landfill design		Have the waste management planners prepared design drawings? Have they confirmed geological features and groundwater?
	Weighing	The weight of waste as measured using a truck scale; the number of incoming collection vehicles; the identity of waste generators who carry in wastes and the numbers of their vehicles	Does the municipality keep track of the haulage volume by type (e.g. of waste generators who carry in wastes)
	Landfill methods	Is the cell method used? The condition and frequency of soil covering.	Is a manual for the employed method available?
	Landfill leachate and gas	Is leachate discharged without treatment? Or is it treated with such facilities as leachate collection pipes and treatment ponds? Are gas collection pipes installed? Is landfill gas collected and used for power generation?	Does the municipality recognize the problems associated with the discharge of leachate without treatment?
	Access road	Is the access road to the landfill in good repairs? Is the onsite road slip-resistant?	Do the waste management planners consider access roads?
	Monitoring framework	Groundwater monitoring; the quality and treatment of leachate	Does the municipality recognize environmental impacts?
	How to cope with waste pickers	The number of waste pickers; their residential conditions; their relationships with local communities	◎ How do the municipality recognize waste pickers?
	Handling of business/ industrial wastes	Does the landfill accept business/industrial wastes? How does it charge?	◎ Does the municipality know the trends in business/ industrial waste volumes in particular?
Public cleansing	Street sweeping, etc.	Department in charge; target streets, etc.	Are job descriptions and costs clearly defined?
	Drainage cleaning	Department in charge; target drainages	Are job descriptions and costs clearly defined? Is communication maintained with the department in charge of drainages?
Outsourcing services to the private sector	Contracts	Contractor selection procedures	Are the procedures made public? ◎ Do contracts stipulate terms of payment and what action to take in the case of poor performance?
	Services under contract	Description of services	Are services clearly defined? Any trouble in the past?
	Monitoring situation	Performance measurement	Are monitoring reports clear? Are the procedures clearly defined?
	Supervision	Procedures to take in the case of poor performance	Are the procedures clearly defined?
	Cost awareness	Expenditure data	Have the costs been compared with the costs incurred if the municipality delivers the services?
SWM equipment	Collection equipment	The number and condition of units by type	◎ Does the municipality know how many units are in [out of] service?
		Availability of garages and workshops	Is the training for maintenance personnel appropriate?
		Spare parts inventory; the frequency, details and costs of repair work	Does the municipality know why some units are out of service?
	Landfill equipment	The number and condition of units by type	◎ Are such units in operation? Does the municipality know how many units are in [out of] service?
		Availability of garages and workshops	Is the training for maintenance personnel appropriate?
		Spare parts inventory; the frequency, details and costs of repair work	Does the municipality know why some units are out of service?
Data and future plans	Volumes; waste flows	Statistical data	Do landfill operators record and report the results of weighting at landfills or the number of incoming collection vehicles by type?
	Generation sources	Survey reports	Does the municipality know the waste generation rate by type of source? Does the municipality keep track of each of the generation sources other than residential generators?
	Waste characteristics	Survey reports	Are data sources clear? At which point (e.g. at generation) was the data obtained and how? Is it wet-based or dry-based?
	Landfill development plans	Remaining life years for each of the existing landfills; candidate sites for new landfills	◎ To what extent, does the municipality assess the demand for new landfills?
		Landfill site selection	Are selection procedures established?
Information sources	Literature	Survey reports and literature	
	Researchers	Lists of researchers	
	Donor trends		Does the municipality understand inputs from donors and their performance?

Appendix 2 (2)

An example of checklist for overall capacity assessment regarding solid waste management

Higher -order item	Middle -order item	Lower-order item	Examples of components
Prior conditions	Existing factors for considering SWM and aid inputs	Population	Density, distribution, change (esp. increase) and migration of population; the number of households; household composition
		Land area; land use	Land use; land ownership patterns; land transaction patterns; housing types (low-rise, mid-rise or high-rise)
		Natural conditions	Temperature; precipitation; existence or non-existence of dry and rainy seasons; geological, topographical and hydrological features
		Economy and key industries	Economic growth rate; existence of markets, factories, business establishments, etc.
		Activities by other donors, etc.	Activities and aid plans by other donors, NGOs, etc. in the SWM sector
Capacities of individuals	Capacities of individuals at implementing agencies	Knowledge and skills	Procedures and appropriateness of work; knowledge on SWM
		Language	Working language; English proficiency; communicative competence
		Awareness	Work attitude; a sense of responsibility
Capacities of organizations	Organizational structures and human resources of implanting agencies	Organizational structure	Organization charts of the municipality and the sanitation department; the number of staff in charge at each department; relationships with central government agencies
		Decision-making mechanism	TOR for each member of staff; functions and division of responsibility; leadership; the level of the sense of responsibility (qualitative assessment); awareness level; and the extent to which awareness of the need for better service is shared (qualitative assessment)
		Coordinating ability	The ability to coordinate with external agencies, including municipal or national agencies at high levels, agencies at similar levels in other sectors, and donors (qualitative assessment)
		Job classification	Managerial staff, engineers (college graduates), clerical staff, skilled workers, utility workers, part-time workers, etc.
		No. of staff	The number of staff, the frequency of personnel change and the employee retention rate at each section of street sweeping, collection and transportation, final disposal, or administration.
		Human resources (HR)	Training descriptions; trainees; HR development curricula; HR evaluation systems; salary systems
	Finance	Financial management	Budgeting mechanisms; fiscal management ability; planning ability; financial management systems; the level of analysis of cost and expenditure flows; budget allocated to the sector
		Costs	Expenditure and its breakdown (by type); amounts paid to contractors
		Income	Income and its breakdown (budget allocations and amounts of fees collected); collection fees (fee-setting, fee collection methods, amounts collected, and fee collection rates); landfill tipping fees (fee-setting, fee collection methods, amounts of fees collected, and fee collection rates)
	Outsourcing services to the private sector	Contract details	Service coverage (in terms of land area, population and waste volume); service details, contract prices; contract periods; terms of payment
		Monitoring	Contract performance monitoring-its situation and method
	Physical assets	Collection equipment	Breakdown of equipment by type; management and details of fleet operation records; ages of service; renewal frequencies; whether a renewal plan is in place; whether spare parts inventory is controlled.
		Collection and treatment facilities	Availability and performance of garages and workshops
		Landfill equipment	Breakdown of equipment by type; ages of service; renewal frequencies; whether a renewal plan is in place; whether spare parts inventory is controlled.
		Final disposal sites	Location, land area and disposal method for each of the existing landfills and its disposal method; remaining life years; facilities at existing landfills (access roads, onsite roads, property boundaries [enclosing bunds and fences], truck scales, land leachate and gas treatment facilities); landfill development plans; progress in landfill site selection
	Intellectual assets	Storage and placement for collection	Current methods and rules for storing and placing waste for collection; reduction and separate placement for collection; lifestyles; weather conditions; waste volumes; consideration of waste characteristics
		Collection	Areas and populations covered by collection service; collection frequencies and methods; collection routing; numbers of trips; review of collection plans; working conditions
		Transportation	Refueling method; plans and methods for fleet operation management; the need for transshipment work; who is responsible for supervision over collection and transportation services; how to supervise them
		Intermediate treatment; facilities for such treatment	Availability of intermediate treatment facilities; waste volumes handled; who is responsible for supervision over such facilities; how to supervise them

Higher -order item	Middle -order item	Lower-order item	Examples of components
		Final disposal	Landfill design; disposal method selection; the condition and frequency of soil covering; operation and maintenance of machinery; framework for monitoring (waste volumes, environmental qualities, etc.); how to cope with waste pickers (including estimating their number and accessing their residential conditions and their relationships with local communities)
		Equipment maintenance	Repair work procedures; methods of inventorying repair parts; levels of repair skills of personnel in and outside of organizations
		Various types of statistical information	Waste characteristics and volumes, the waste generation rate by type of source, and waste flows; methods to assess these items; frequency of statistics collection; accessibility to such data
Capacities of institutions and societies	Institutions	National SWM policies	National SWM planning; the status of SWM in state planning; numerical targets; implementing actors
		Laws and ordinances concerning SWM	SWM basic law; definition of wastes; provisions on who is primarily responsible for management and treatment and those on treatment methods; whether relevant laws and ordinances are appropriate for the realities of the recipient country; whether regulations are too strict or lax; whether they are self-contradictory
		Environmental impact assessment (EIA) system	Whether laws and ordinances regarding EIA are in place; implementing performance; services subject to EIA; EIA procedures
		SWM planning	Are there any SWM plans? If so, do they include SWM goals?
		Land expropriation; compensation procedures	Laws and regulations; land expropriation procedures; compensation procedures; how to reach agreement with affected communities
		Standards regarding environmental impact	Construction standards for treatment and disposal facilities; effluent/emission standards
		Control of hazardous wastes; treatment standards of such wastes	Classification of wastes; rules on handling and treating hazardous wastes
		Law enforcement mechanism	Penal provisions; legal force (against illegal dumping, violations of environmental standards, etc.); cases in which punitive action has been taken
	Whether there are positive or negative social norms; how deeply they are rooted in society	Customs	Customs concerning waste; behavior concerning the placement of waste for collection; lifestyles; historical institutions; norms
		Ethnic groups; classes	Whether there are certain social classes involved in SWM; social statuses of dust collectors and waste pickers and their roles in SWM; income levels and gaps among people
		Religious implications	Existence of certain castes
	Capacities of civil society	Awareness of waste	Willingness to pay; levels of public understanding of waste services; SWM functions of communities; compliance with rules on the placement of waste for collection; trends in public sentiments about SWM; roles of mass media; how far the principle of reduction, reuse and recycling is practiced
		Environmental education	School education (Environmental education providers; the numbers of schools that practice Environmental education; availability of teaching materials); social education (target districts, groups, etc.; methods; media; scales); the use of campaigns
	The state of relevant actors	Informal sector	Involvement and role of the informal sector; recycled items handled; transaction prices and amounts of key items; material flow for each recycled item; market scale; key actors in recycling activity
		Social organizations	NGOs, CBOs and research associations-their numbers, activities, geographical areas of activity and scales
		Private service providers	The numbers and types of recyclers and waste disposers; the types and volumes of wastes handled
	Partnership	Partnership among civil society, business and government	Power relationship among different stakeholders; cases of hostility; cases of cooperation; voluntary agreements; cases of community participation in SWM
		Reflection of input from communities in policies, systems and services	Opportunities to lodge complaints; the number of complaints; complaint handling systems
		Information networks; information and communication technology	Means of communication and the percentages of people with access to such means (especially the Internet)
		Public health; water supply and sewerage	Public health conditions; water supply and sewerage coverage in terms of both population and land area; water and wastewater charges

Appendix 3

An example of capacity development monitoring sheet in development study (sector-specific)

Monitoring period : From (month/day/year) through (month/day/year)

Sector name	The following items are filling examples for the "collection and transportation" sector.
Name of the study team member	
Name of the counterpart in charge (ongoing / new)	
Goal of technical cooperation in the sector	Assessment of the current state of waste collection and transportation for the development of M/P
Baseline capacity and the capacity improvement goal in the project	Learning how to assess the actual state of waste collection and transportation (Enter specific goals for each counterpart as well)
Support provided and methods applied (Describe in chronological order)	・Indoor lecture (participants; theme; reaction) ・Practical training in analyzing waste characteristics (participants; theme; reaction)
Inputs from JICA	
Inputs from the recipient	
Outcomes (specific products)	Report on the relevant part in PR/R
Performance in relation to the capacity improvement goal	・Evaluation of the sector as a whole: ・Achievement evaluation of each counterpart:
Observations by the study team member in charge of technical cooperation and capacity development (where improvements should be made; recommendations, etc.)	・Poor attendance of some counterparts
Tasks ahead (outstanding issues, issues newly identified, modifications to the goal, etc.)	・Providing practical training again on the ground ・The need to consider the possibility of partnership with communities with regard to waste collection
Self-evaluation and recommendations for the study team and its members made by the counterpart	(A necessary item for joint assessment)
Observations by the leader of the team	
Observations by the person in charge from the implementing agency	(A necessary item for joint assessment)
Remarks	

1) The team member in charge of each sector will complete this sheet at the time of submitting "products" or reports.
2) An English version of this sheet will be prepared as necessary to share the understanding and assessment with the counterparts. (PR/R, IT/R, DF/R)
3) The leader of the team will make cross-sectoral and comprehensive assessment separately based on sector-specific assessment.

Terms and Abbreviation

Term/Acronym	Description
3R	Reduce, Reuse, Recycle : Efforts in order of priority that should be taken to construct a recycling-oriented society and reduce the amount of solid waste.
A/P	Action Plan: A plan that is proposed in order to carry out activities to improve familiar matters taking a shorter period than an M/P, especially referred to in development studies. A report that is a summary compiled by the participants of a training course is also called an A/P. In this case, the participants organize their ideas to solve their problems utilizing the knowledge they have gained.
Basel Convention	Formal name is the "Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal." It controls exports of hazardous waste by transboundary movement, and obligates exporters to have approval for exporting hazardous waste, to make advance notice, and to import waste again if inappropriate export or treatment is carried out.
Biohazard	Disaster caused by pathogenic microbe, parasitic worms, etc
BOD	Biochemical Oxygen Demand: The numerically expressed amount of oxygen that is consumed when microorganisms break organic matters. It is used as an indicator of pollution by organic matters in rivers, etc. The higher the value, the more organic matters are contained in the water, and thus the more serious is the water pollution.
BOT	Built-Operate and Transfer: A system of transferring after undertaking projects through lump sum contract. A form of PFI that consists of constructing, operation, and transferring infrastructure by private initiative. In the context of development, it is referred to as an introduction of foreign private capital for the development of infrastructure as a measure taken to compensate for fund shortage of developing countries.
Capacity	In the context of development, it is referred to as the ability of the individual, organization, system or society (individually and collectively) to perform functions, solve problems, and set and achieve objectives (Definition by UNDP (1997))
CBO	Community Based Organization: In the context of international cooperation, it is referred to as an organization that is structured and operated by the community residents' own initiative compared with outsiders regardless of ODA or NGO.
CBSWM	Community-Based Solid Waste Management: An approach taken for a regional community to take the initiative in solid waste management, placing importance on consensus-building in a social aspect and partnership.
CD	Capacity Development: Continuous process in which the individual, organization, system, or society develops the individual's or the group's ability to fulfill its functions, solve problems, set goals, and achieve goals. The central concept that has been used in reviewing technical cooperation by mainly UNDP since the end of the 1990's. For details, see Appendix 1.
CDM	Clean Development Mechanism: One of political measures stipulated in Kyoto Protocol to reduce greenhouse gas. A mechanism in which the credits worked out by the amount of greenhouse gas reduction in the greenhouse gas reduction project carried out in the Non-Annex I parties to the Kyoto Protocol (mainly developing countries) by the Annex I parties (mainly industrialized countries) can be counted as the Annex I parties' own.
CP	Cleaner Production: An approach that continuously applies comprehensive environmental strategies to prevent pollution to production process flow, products and services in order to reduce risks to humans and environment by raising overall production efficiency. In relation to solid waste management, the advantages of reducing solid waste generation and improving production efficiency in a same time are focused on.
D/D	Detailed Design: An act of making detailed design, bill of estimated cost, specification form, process chart, books for public bidding, etc. It forms a part of the construction process in the implementation stage of the relevant project.
EcoISD	Environmental Conservation Initiative for Sustainable Development: Japanese Government's basic policies for environmental cooperation announced in 2002. It clarifies Japan's active intention of carrying out continuous environmental cooperation focusing on ODA.
EIA	Environmental Impact Assessment: In the light of environmental consciousness it is referred to as a pre-implementation activity to investigate environmental impacts of the project implementation as well as to check if the appropriate consideration is given to the environment at the planning stage.
E/N	Exchange of Notes: A kind of international agreement, or a form of explicit consensus among two or more nations or international institutions by clarifying the relationship of rights and obligations under international law through exchanging letters. E/N for assistance programs clarifies the details of assistance to be provided that has been agreed on by the governments concerned. Usually, Japan adopts E/N in order to make an international agreement on Japan's loan aid and grant aid cooperation.
Environmental Labeling	To provide information on environmental aspects of a product. It is a management system to recommend/promote to purchase /use an environmentally-contributing or environmentally-friendly product certificated by a certain standard.
Extended Producer Responsibility	A method proposed by OECD for reducing, reusing, and recycling wastes. The environmental policy approach of extending physical and/or economic responsibility of the producers to the stage after using the product for its life cycle.
F/S	Feasibility Study: An investigation carried out to objectively verify the feasibility of the project in social, technical, and financial aspects. Usually, the project's probability, appropriateness, and investment effectiveness are investigated.

Term/Acronym	Description
Fukuoka Method	Technology for semiaerobic landfill structure developed jointly by Fukuoka city and Fukuoka University. It is structured in order to achieve early settlement of the landfill by discharging leachate quickly from landfill by installing pipes for collecting and discharging leachate in the bottom of the waste disposal site as well as by enhancing aerobic decomposition of solid waste and preventing methane gas generation by taking air from the collecting pipe into the internal landfill by natural ventilation. Compared to the anaerobic structure that excludes external air, load to the global warming stays about a half. It features a simple structure and does not require advanced technology, and can be constructed using local materials. For these reasons, it has been widely adopted in many developing countries.
GDP	Gross Domestic Product.
GEF	Global Environment Facility: A multilateral aid system in which funds are loaned at low interest rate or donated to developing countries in order to assist their global environmental conservation activities. It is jointly managed by the three institutions-the World Bank, UNEP, and UNDP-and targeting the following sectors:prevention of global warming, conservation of biodiversity, prevention of international waters pollution, and prevention of the depletion of the ozone layer, as well as POPs.
GNP	Gross National Product.
IEE	Initial Environmental Evaluation: An investigation of simply estimating the degree of environmental impact by the proposed project. Based on the results of an IEE, the requirements for the implementation of a detailed EIA are determined.
ISD	Initiative for Sustainable Development toward the 21st Century: Japan's basic policy that was formed by summarizing basic philosophy for environmental cooperation with its focus on ODA and action plans that will be the pillar of the future cooperation. It was announced in the United Nations General Assembly Special Session on Environment and Development in 1997.
JOCV	Japan Overseas Cooperation Volunteer: Established in 1965. A program to assist and to encourage overseas activities on the part of young Japanese people who wish to cooperate in the economic and social development of developing countries in cooperation with the local communities, on the basis of requests from these countries.
Manifest System	A system for monitoring and managing solid waste treatment flow by filling in kinds of waste, names of collecting and transporting service providers, name of disposers on the manifesto-a voucher for the purpose of managing the solid waste treatment process such as discharge, transport, intermediate treatment, and final disposal.
MDGs	Millennium Development Goals: Development goals that form a common framework, which was formed by integrating UN Millennium Declaration agreed on by the UN general assembly in 2000 and various international development goals adopted by main international conventions and summits in the 1990's; Setting quantitative goals to be achieved by 2015 and time limit of each goal, and each country's commitment towards the realization of the goals is being demanded.
M/P	Master Plan: An investigation for the purpose of formulating basic plan for various development plans. Usually setting the target years, long-term plans on each level of national, regional and sector are made.
MRF	Material Recovery Facility: A facility for the purpose of recovering valuable resources. In many cases, it consists of composting facility, separating and collecting station for recycling.
NGO	Non-governmental Organization: An organization that carries out activities in the position of being non-governmental and non-profit on behalf of those who are socially and publicly vulnerable.
NIMBY	Not in My Backyard (syndrome): Antipathy to, or hatred of location of so-called annoying facilities such as solid waste disposal sites and sewage treatment facilities in the neighborhood. It is reflecting the social trends of agreeing with the plan in general, but disagreeing with it on details, or the idea that it is required somewhere, but it is not welcome in my neighborhood.
OJT	On the Job Training : On-site training; A method of giving training while the trainees are actually engaging in their work.
Open Dump	A method of disposing solid waste simply on the ground, or a final disposal site where waste is disposed in such a way.
PCE	Perchloroethylene : A chemical substance used for a wide range of purposes such as solvents, cleansing agents, and solvents for dry cleaning. Residues of PCE occur in the natural environment due to its persistency and volatility. Residues of PCE that persist in the natural environment and are released into the atmosphere cause soil and underground water pollution, and also have a negative impact on human health.
PET	Polyethylene Terephthalate: A substance that has high clarity and strength, and used for mainly drink containers, known as PET bottles.
PFI	Private Finance Initiative: Privatization of social infrastructure development. It is based on the idea that public facility improvement that has been exclusively dealt with by the public works sectors of the government and regional government should be efficiently carried out utilizing private funds, capacity and know-how.
P/P	Pilot Project: A smaller-scale project carried out in development studies and technical cooperation projects within the framework of the relevant project in order to consider effectiveness of the plan, collect data, and verify improvement effects by practical technology transfer.
PPP(1)	Polluter Pays Principle: An idea that pollution prevention cost should be paid by those who caused the pollution. It was formed based on the decision adopted by OECD in 1972, and has became a basic philosophy of many countries worldwide.
PPP(2)	Public Private Partnership: A method for efficient public services operation by introducing private consignment, PFI, privatization, and agency system according to the attribution of the public service.
PRS	Poverty Reduction Strategy: A three-year economic and social development plan with comprehensive description of priority development tasks focusing on poverty reduction and its measures, and used as information for deciding if highly indebted country's initiative should be taken and if IDA financing should be applied.

Term/Acronym	Description
Sanitary Landfill	A method for final disposing by taking measures to reduce adverse impact on the environment and society. In some cases, it is classified into level-1 to level-4 according to the degree of the measurement taken. (See Table 2-17 in section 2-6-5). However, definition may differ depending on the nation and institution.
Social Capital	Invisible but useful resources for growth and development, such as trust, rules, and networks. They are regarded as measurable and accumulable capitals in the same way as economic capitals.
Stockholm Convention on Persistent Organic Pollutants	Known as POPs Treaty. The persistent organic pollutant (POP) is a generic term of highly toxic chemical substances that easily persist in the environment and bioaccumulate. Restrictions are stipulated on the production, use, export and import of the twelve POPs, including PCB and DDT (dichlorodiphenyltrichloroethane), as well as a reduction in the discharging of dioxins that are generated by waste incineration.
TCE	Trichloroethylene: A form of organic solvent that is used for a wide range of purposes including synthesized materials for chemical industry products, solvent for coating, and degreasing and cleansing agents. It is toxic and will cause visual, kidney, and liver damages. Infiltration to the soil from discharged water will cause underground water pollution.
Time and Motion Study	A study to obtain information for analyzing waste collection services and for finding points to be improved in the current conditions of collection services. Approaches such as measuring time required for collection and the amount of waste collected by following the waste collection vehicles, and observing residents and collection workers are adopted in the study.
Truck Scale	A facility used in intermediate treatment facilities, transfer stations, and final disposing facilities in order to measure the weight of the accepted solid waste. Usually the weight of the transported waste is worked out by subtracting the weight of a truck as tare mass from the gross weight.
Two-Step Loan	A form of the project-type yen loan. Based the recipient country's financial policy system, funds required for implementation of a certain policy are provided through an intermediary financial institution in the recipient country. This is called so because the funds go through more than two steps in order to reach to the final recipient. Funds are provided to small and medium-sized enterprises in such sectors as manufacturing and agriculture.
UNCED	United Nations Conference on Environment and Development: Also known as the Earth Summit. A conference held in Rio de Janeiro, Brazil, participated by summit-level delegations from about 180 countries worldwide. Among raising concerns for global environmental issues, the conference started adopting statements concerning global environment conservation towards sustainable development including Agenda 21 and the Rio Declaration concerning environment and development, as well as signing the agreements such as the Framework Convention on Climate Change and the Biodiversity Treaty.
Waste Picker/ Scavenger	Those who pick and collect valuable resources from among the solid waste. Recently, it has been more often called them as pickers.
WSSD	World Summit on Sustainable Development: Also known as Johannesburg Summit. For the purposes of reviewing Agenda 21 that was adopted by UNCED in 1992 and discussion for a new challenge, it was held in Johannesburg, South Africa in 2002.
WTP	Willingness to Pay: The maximum amount of money the individual is willing to pay for one unit of goods or services they are gaining. In the context of solid waste management, it is in many cases referred to as the amount payable for garbage collection services if those services are to be charged.

Organizations and Programmes

Acronym	Official Name
ADB	Asian Development Bank
AfDB	African Development Bank
CIDA	Canadian International Development Agency
EBRD	European Bank for Reconstruction and Development
ESCAP	United Nations Economic and Social Commission for Asia and the Pacific
EU	European Union
GTZ	Gesellschaft für Technische Zusammenarbeit
IDB	Inter-American Development Bank
IDA	International Development Association
IETC	International Environmental Technology Centre
IGES	Institute for Global Environmental Strategies
ILO	International Labor Organization
ISWA	International Solid Waste Association
JBIC	Japan Bank for International Cooperation
JICA	Japan International Cooperation Agency
JSWME	Japan Society of Waste Management Experts
METAP	Mediterranean Environmental Technology Assistance Programme
PIF	Pacific Islands Forum

Term/Acronym	Description
SDC	Swiss Agency for Development and Cooperation
SIDA	Swedish International Development Cooperation Agency
UNCHS-Habitat	United Nations Centre for Human Settlements
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNGASS	United Nations General Assembly Special Session
UNIDO	United Nations Industrial Development Organization
UNITR	United Nations Institute for Training and Research
USAID	US Agency for International Development
UWEP	Urban Waste Expertise Programme
WB	World Bank
WEDC	Water, Engineering, and Development Centre, Loughborough University
WHO	World Health Organization

Source : Secretariat of this committee summarized based on the reference material such as International Development Journal Co.Ltd, ed. (2004) *[Glossary of International Cooperation](Kokusai Kyoryoku Yogosyu)*, Overseas management techniques study committee ed. (2003) *[The Japanese-English/ English-Japanese Wordbook for Waste Management and Environmental Engineers](Haikibutsu Kankyo Wordbook)*, Chuohoki Publishers, various reports published by JICA, Website of the Ministry of Foreign Affairs of Japan (http://www.mofa.go.jp/mofaj/annai/pr/yogo)

References

Abe, O. (2004) Feature: The UN Decade of Education for Sustainable Development: From My Point of View. (Tokushu: Kokuren jizoku kano na kaihatsu no tame no kyoiku (ESD) no 10 nen - watashi ha ko kangaeru) *Rural Culture Movement,* (*Noson bunka undo*) 18 (4), Rural Culture Association (Nou Bun Kyo): Japan. (in Japanese)

ADB/AEA Technology in association with GloalWorks, CalRecovery and ENR Consultants (2003) *Metro Manila Solid Waste Management Project* (TA 3848-PHI), Final Report, Report No.l, ADB

Ali, Mansoor and Snel, Marielle (1999) *Lessons from community-based initiatives in solid waste,* London School of Hygiene & Tropical Medicine and WEDC, Loghborough University

Amano, S. (2004) Waste Management Capacity Assessment in South Pacific Islands States, (Taiyoshu shokoku ni okeru haikibutsu kyapasity asesument) Regional project formulation advisor report in December 27th, 2004, Japan International Cooperation Agency. (in Japanese)

Ashford, S.A et al. (2000) Design and construction of engineered municipal solid waste landfills in Thailand. *Waste Management Research,* Oct 2000, vol.18, no.5, pp.462-470 (9)

Augenstein, D., Wise, D.L., Dat, N.X. and Khien, N.D.(1996) Composting of municipal solid waste and sewage sludge: Potential for fuel gas production in a developing country. *Resources, Conservation and Recycling,* Vol.16, No.1, 265-279.

Bartone, C. (1990)World Bank's Cooperation for Developing Countries in the Solid Waste Sector: Their Experience, Implication Learned, and Future Strategy. (Haikibutsu bunya ni okeru sekai ginko no tojokoku kyoryoku: sono keiken, mananda kyokun, kongo no senryaku) *Journal of Japan Society of Waste Management Experts, (Haikibutsu gakkai shi)* 2 (1), 59-65. (in Japanese translated by Sakurai, K. and Sakai, Y.)

Bartone, Carl R. (2000a) Financial Management of Urban Solid Waste Services: Lessons from a Decade of ESCAP (2000) "State of the Environment in Asia-Pacific Region," United Nations: New York.

..... (2000b) Strategies for improving municipal solid waste management. *SKAT Workshop Report 'Planning for Sustainable and Integrated Solid Waste Management'* (ed. Adrian Coad)

Bredariol, C.S. and Magrini, A. (2003) Conflicts in developing countries: a case study from Rio de Janeiro. *Environmental Impact Assessment Review*, 23, 489-513.

Campbell, D.V.J.(1999)" Institutional development for waste management in developing countries." *Waste Management & Research*, 17, 1-3.

Carpenter, D.O., Nguyen, T., Le, L., Kudayakov, R., and Lininger, L.L. (2001) Human disease in relation to residence near hazardous waste site. *Proceedings of the 10th Pacific Basin Conference on Hazardous Waste, Okayama, Journal of the Faculty of Environmental Science and Technology, Okayama University, 2001 Special Edition,* 1-7.

Clapp, J. (2001) *Toxic Exports. The transfer of hazardous wastes from rich to poor countries.* Cornell University Press: Ithaca and London.

Cointreau, S.J. (1982) *Environmental management of urban solid wastes in developing countries, A project guide.* Urban Development Technical Paper No.5, The World Bank: Washington, D.C.

Cointreau-Levine, S. (1994) *Private sector participation in municipal solid waste services in developing countries. Urban Management and the Environment,* No.13, The World Bank: Washington, D.C.

..... and Coad, A. (2000) *Private sector participation in municipal solid waste management - Guidance Pack.* Swiss Centre for Development Cooperation in Technology and Management (SKAT).

Committee for the Promotion of Cooperation on Cleaner Production, JICA (2001) *Report on Promoting Cleaner Production in Developing Countries,* Japan International Cooperation Agency: Tokyo, Japan.

Curi, K. (1985) *Appropriate Waste Management for Developing Countries,* Plenum Pub Corp., NewYork.

Doi, Y., Tanaka, M., Ikeguchi, T., Kawamura, K., Osako, M., Yamada, M. and Inoue, Y. (1998) A Concept and Indicators for Evaluations of Solid Waste Management Projects in Developing Countries. (Kaihatsu tojokoku ni okeru haikibutsu purojekuto hyoka ni kansuru kihon gainen to shihyo ni tsuite) *Journal of National Institute for Public Health, (Koshu eisei kenkyu)* 47, 128-137. (in Japanese)

Dong Suocheng, Kurt W. Tonk and Wu Yuping (2001) Municipal solid waste management in China: using commercial management to solve a growing problem. *Utilities Policy,* 10, 7-11.

Eade, D. (1997) *Capacity-Building: An Approach to People-Centered Development.* Oxfam, Oxford, 226p.

Einsiedel, N. (2000) Critical Considerations of Solid Waste. *Asian Cities in the 21st Century: Contemporary Approaches to Municipal Management, Vol.4: Partnership for Better Municipal Management,* The Asian Development Bank: Manila.

ESCAP (2000) *State of the Environment in Asia-Pacific Region,* United Nations: New York.

ETSU (1997) Evaluation of energy from waste investment opportunities in India. *ETSU B/WM/00542/REP,* Department of Trade and Industry, UK Government.

FASID (2004) *PCM: Project Cycle Management for Development Assistance, (PCM: Kaihatsu enjo no tameno purojekuto saikuru manejiment)* Foundation for Advanced Studies on International Development: Tokyo, Japan. (in Japanese)

Flintoff, F. (1976) *Management of Solid Waste in Developing Countries.* World Health Organization: New Delhi.

..... (1984) *Management of Solid Wastes in Developing Countries. Regional Office for South-East Asia,* World Health Organization: New Delhi.

Furedy, C. (1990) Social Aspects of Solid Waste Recovery in Asian Cities. *Environmental Sanitation Reviews,* No.30, ENSIC/AIT.

Haan, Hans C., Coad, A., and Lardinois, I. (1998) *Municipal Solid Waste Management: Involving Micro-and Small Enterprises -Guidelines for Municipal Managers,* International Training Centre of ILO, SKAT, WASTE.

Hamdi, H., Jedidi, N., Ayari, F., Yoshida, M. and Ghrabi, A.(2003) Valuation of municipal solid waste compost of Tunis (Tunisia) ―Agronomic aspect. *Proceeding of the 14th Annual Conference of The Japan Society of Waste management Experts,* International Session, p.62-64.

Hanashima, M. (1994) *Designing Final Disposal Site and New Technologies, (Saishu shobun jo no sekkei to shin gijutu)* Kogyo Gijyutsu Kai: Tokyo, Japan. (in Japanese)

Harpham, T., Burton, S., and Blue, I. (2001) Healthy city projects in developing countries: the first evaluation. *Health Promotion International,* 16 (2), 111-125.

Hiramatsu, A., Hanaki, K., and Aramaki, T. (2003) Baseline options and greenhouse gas emission reduction of clean development mechanism project in urban solid waste management. *Mitigation and Adaptation Strategies for Global Change,* 8 (3), 293-310.

Hiraoka, M. (1990) Generation and Control of Dioxins in Solid Waste Treatment. (Haikibutsu shori ni okeru daiokishin rui no seisei to seigyo) *Journal of Japan Society of Waste Management Experts, (Haikibutsu gakkai shi)* 1, 20-37. (in Japanese)

Hosomi, M. (2001) Establishment of POPs Treaty and Future Point of Contention. (POPs joyaku no seiritsu to kongo no ronten) *Journal of Japan Society of Waste Management Experts, (Haikibutsu gakkai shi)* 12 (6), 338-347. (in Japanese)

Hoornweg, D., Thomas, L. and Otten, L. (1999) Composting and its applicability in Developing countries. Urban Waste Management Working Paper Series, No.8, The World Bank: Washington, D.C.

Hunt, C. (1996) Child waste pickers in India: the occupation and its health risks. *Environment and Urbanization,* 8, 111-118.

Ibrahim, N., Tarhouni, J. and Yoshida, M. (2003) Distribution characteristics of potentially toxic elements (PTEs) in and around closed solid waste landfill near Tunis, Tunisia. *Proceeding of the 14th Annual Conference of The Japan Society of Waste Management Experts,* International Session, p.92-94.

IGES (2002) Kitakyushu Initiative Seminar on Solid Waste Management (1st Thematic Seminar, 19-20 September 2002), IGES: Kitakyushu, Japan.

Ijima, N., ed (2001) *Study on Environmental Sociology of Waste Problem, (Haikibutsu mondai no kankyo shakaigakuteki kenkyu)* Tokyo Metropolitan University Press: Tokyo, Japan. (in Japanese)

Ikegami, M. (2002) Energy Utilization of Biomass. (Baiomasu no enerugi riyo) *Journal of Japan Society of Waste Management Experts, (Haikibutsu gakkai shi)* 13, 278-287. (in Japanese)

Ikeguchi, T. (1994) Progress in sanitary landfill technology and regulations in Japan: A review. *Waste Management & Research,* 12, 109-127.

Institute for International Cooperation, Japan International Cooperation Agency (1993) *Improving methods of waste management in the cities of developing countries, (Kaihatsu tojokoku haikibutsu kanri no kaizen shuhou)* Institute for International Cooperation, Japan International Cooperation Agency: Tokyo, Japan (in Japanese)

..... (1996) *Handbook for Project type technical cooperation, (Purojekuto houshiki gijutu kyoryoku no tebiki)* Institute for International Cooperation, Japan International Cooperation Agency: Tokyo, Japan. (in Japanese)

..... (2002) *Social Capital and International Cooperation*: Towards Accomplish Sustainable Development, (*Sosharu kyapitaru to kokusai kyoryoku*: Jizoku suru seika wo mezashite) Institute for International Cooperation, Japan International Cooperation Agency: Tokyo, Japan. (in Japanese)

..... (2004) *Handbook for Dispatch of Long-term Experts of JICA, (Choki haken senmonka no tebiki)* Institute for International Cooperation, Japan International Cooperation Agency: Tokyo, Japan. (in Japanese)

..... (2005) *Towards Expansion of Cooperation on Non-formal Education, (Non formaru kyouiku shien no kakuju ni mukete)* Institute for International Cooperation, Japan International Cooperation Agency: Tokyo, Japan .(in Japanese)

Ishikawa, Y. (1995) *Frontier of Elemental Technologies in Waste Management, (Gomi shori no sai sentan yoso gijutsu)* Tokyo Metropolitan University Press: Tokyo, Japan. (in Japanese)

Japan Society of Waste Management Experts. ed. (1996) *Solid Waste Handbook, (Haikibutsu hando bukku)* Ohmsha, Co. Ltd: Tokyo, Japan. (in Japanese)

JICA (1992) *The Study on the solid waste management system improvement project in Vientiane. Final report,* Japan International Cooperation Agency: Tokyo, Japan.

..... (1996) *Basic design study report on the project for improvement of the solid waste management system in the Vientiane urban area in Lao People's Democratic Republic,* Japan International Cooperation Agency: Tokyo, Japan.

..... (1997) *The Report on the Study on Solid Waste Management for Metro Manila in the Republic of the Philippines.*

..... (1999) *The study on solid waste management of the urban area of Tegucigalpa's central district: final report,* Japan International Cooperation Agency: Tokyo, Japan.

..... (2003a) *Basic design study report on the project for waste management improvement planning in the Xian City of the Republic of China,* (Chugoku Xian shi haikibutsu kanri kaizen keikaku kihon sekkei chosa houkokusho) Japan International Cooperation Agency: Tokyo, Japan. (in Japanese)

..... (2003b) *Capacity Development and JICA's Activities,* Japan International Cooperation Agency: Tokyo, Japan.

..... (2003c) JICA's Thematic Guideline: Cleaner Production, (Kadaibetsu shishin: Kurina purodakushon) Japan International Cooperation Agency: Tokyo, Japan. (in Japanese)

..... (2003d) *Report of Preliminary Study on the Solid Waste Management in Dhaka City, (Banguradeshu jinmin kyowakoku dakka shi haikibutsu kanri keikaku chosa jizen chosa houkoku sho)* Japan International Cooperation Agency: Tokyo, Japan. (in Japanese)

..... (2004a) *Follow-up Survey on Assistance for Waste Management in Metropolitan Manila.* Test Consultants, Inc.: Manila.

..... (2004b) *Follow-up Survey on Assistance for Waste Management in Vientiane City.* Earth Systems Lao: Vientiane.

..... (2004c) "Fukuoka Methods" to the island states countries in southern pacific. (Fukuoka houshiki wo taiheiyo no shimaguni he) *International Cooperation, (Kokusai Kyoryoku)* Japan International Cooperation Agency: Tokyo, Japan. (in Japanese)

..... (2004d) *JICA Guidelines for Environmental and Social Considerations,* Japan International Cooperation Agency: Tokyo, Japan.

..... (2004e) *Report of Preliminary Study on the Safety Closures and Rehabilitation of Landfill Sites in Malaysia, (Mareisia kokei haikibutsu genryoka keikaku chosa jizen chosa houkokusho)* Japan International Cooperation Agency: Tokyo, Japan (in Japanese)

..... (2004f) *The study on improvement of solid waste management in secondary cities in Sri Lanka : final report,* Japan International Cooperation Agency: Tokyo, Japan.

..... (2005a) *Report of Preliminary Study on Capacity Development on Pollution Prevention and Control in the Petroleum Industry in the Caspian Sea and its Coastal Areas in the Republic of Kazakhstan,(Kasupi kai hokubu engan sekiyu sangyo kougai taisaku taisho nouryoku koujo keikaku yobi tyosa houkokusho)* Japan International Cooperation Agency: Tokyo, Japan. (in Japanese)

..... (2005b) *Report of Preparatory Study on Integrated Management of Urban Solid Waste in Santo Domingo National District, (Dominika kyowakoku santo domingo tokubetsuku haikibustu sogo kanri keikaku tyosa jizen tyosa houkokusho)* Japan International Cooperation Agency: Tokyo, Japan .(in Japanese)

..... (2005c) *Report of Development Study on Solid Waste Management Plan in Dhaka City, (Final Report) (Bangladeshu koku dakka shi haikibutsu kanri keikaku tyosa saishu houkokusho)* Japan International Cooperation Agency: Tokyo, Japan.

Johannessen, L.M. (1999) Guidance Note on Leachate Management for Municipal Solid Waste Landfills. Urban Development Division Working Paper Series, 5, The World Bank Group: Washington, DC.

..... and Boyer, G. (1999) Observation of Solid Waste Landfills in Developing Countries. Africa, Asia, and Latin America. The World Bank Urban Management Programme Working Papers Series No.4, The World Bank Group: Washington, DC.

Jutting, J. (2003) *Institutions and development: A critical review.* Technical Papers No.210, OECD Development Centre.

Kankyo horei kenkyu kai, ed. (2004) *Six Major Environmental Laws in Japan, Kankyo roppo (Heisei 16 nen ban)* Chuo Hoki Publishers: Tokyo, Japan. (in Japanese)

Kawanabe, R. (2004) Report of Project Formulation Study managed by JICA Tunisia Office on Third Country Training for Francophonic African Countries "Waste Management in Urban Area" in fiscal year 2004 (Heisei 16 nendo JICA Tunisia jimusho shukan zaigai purojekuto keisei tyosa houkokusho- furansu go ken afurika muke daisangoku kenshu "Toshi ni okeru haikibutsu kanri") Japan International Cooperation Agency. (in Japanese) Leitmann, J. (1999) Integrating the environment in urban development: Singapore as a model of good practice. Urban Waste Management Working Paper Series No.7, World Bank: Washington, D.C.

Kgathi, D. and Bolaane, B. (2001) Instruments for sustainable solid waste management in Botswana. *Waste Management and Research,* 19, 342-353.

Kitawaki, H. (2000a) Common problems in water supply and sanitation in developing countries. (Kaihatsu Tojokoku no kankyo eisei ni kakawaru sho mondai) *Journal of National Institute for Public Health, (Koshu eisei kenkyu)* 49 (3), 3-8. (in Japanese)

..... (2000b) Waste management in developing countries and appropriate aid. (Kaihatsu tojo koku no haikibutsu shori to tekisei enjo) JEFMA, 43, pp. 25-31. (in Japanese)

..... (2003) Waste management in developing countries. (Kaihatsu tojo koku no haikibutsu shori) (in Japanese)

Kondo, S., Yoshida, M., Watanabe, T. (2004) Role of community and factors of its effective utilization- Case study from Manila and Vientiane, (Haikibutsu kanri ni oite komyuniti ga hatasu yakuwari to sono kino ga hatsugen suru youin- Manira, Bienchan no rei) *Proceedings of the 15th Conference of Japan Society for International Development,* pp.210-213.

Kusunoki, K. and Shimura, S. (1995) The necessity of implementing pilot projects (waste collection experiment) in solid waste management planning in developing countries. (kaihatsu tojo koku haikibutsu shori keikaku ni okeru pairot purojekuto (shushu jikken) jissi no hitsuyosei) *Proceedings of the 6th Conference of Japan Society of Waste Management Experts, (Dai 6 kai haikibutsu gakkai kenkyu happyo kai kouen ronbun shu)* pp.27-29. (in Japanese)

Mabuchi, S. and Kuwajima, K. (2004) Capacity Development in Developing Countries and Effective Assistance. (Tojokoku no kyapasity deveropument to yuuko na enjo) *International Cooperation Study, (Kokusai Kyoryoku Kenkyu)* 20 (1), 64-72. (in Japanese)

Massoud, M. and El-Fadel, M. (2002) Public-private partnerships for solid waste management services. *Environmental Management,* 30, 621-630.

..... and Abdel Malak, A. (2003) Assessment of public vs private MSW management: a case study. Journal of Environmental Management, 69, 15-24.

Matsufuji, Y. (1997) A Road to Sanitary Landfill. Hagesco Utama Sdn. Bhd.: Kuala Lumpur.

Matsumoto, R. and Matsuoka, S. (1996) Urbanization and waste management problem in developing countries: The case of Bangkok. *Journal of International Development and Cooperation,* Vol.2, No.1, pp.167-179.

Medina, M. (1997) Informal recycling and collection of solid wastes in developing countries: Issues and opportunities. *UNU/IAS Working Paper No.24,* The United Nations University, Institute of Advanced Studies.

Mendes, M. R., Aramaki, T., Hanaki, K. (2003) Assessment of the environmental impact of management measures for the biodegradable fraction of municipal solid waste in Sao Paulo City. Waste Management, Vol.23, Issue 6, 2003, pp.547-554.

METAP Regional Solid Waste Management Project (2003) *RSWMP News No.1.* Mediterranean Environmental Technical Assistance Program (METAP) : Tunis.

Moningka, L. (2000) *Community participation in solid waste management, factors favouring the sustainability of community participation, A literature review.* UWEP Occasional paper June 2000.

Nagaishi, M. and Doi, A. (2002) Effect of Community Participation in the Project for Waste Management Sector: Case Study from the Study on Solid Waste Management of the Urban Area of Tegucigalpa's Central District in the Republic of Honduras. (Haikibutsu anken ni okeru jumin sankagata kaihatsu no koka: hondurasu koku

tegushigarupa shutoken kokei haikibutsu chosa no jirei kara) *Presented Paper to the Conference of Japan Society for International Development in June 2002.* (in Japanese with English abstract)

Nakamura, M. (1993) Seeking Solutions for Hazardous Waste Problems in Developing Countries: Problems Caused by Direct Investment of Developed Countries. (Tojokoku no yugai haikibutsu mondai to taio no mosaku: Senshin koku no chokusetsu toshi ni kiin suru mondai) *Proceedings of the 4th Conference of Japan Society of Waste Management Experts, (Dai 4 kai haikibutsu gakkai kenkyu happyo kai kouen ronbun shu)* pp.957-959. (in Japanese)

Nakamura, S. (1999) Environmental Education on the Science Class in Junior High Schools in Thailand. (Tai koku no chugakko rika ni okeru kankyo kyoiku: Nihon deno kankyo kyoiku tono hikaku kara) *Basic Study on Development Education (Kaihatsu kyoiku no kiso teki kenkyu)* (in Japanese)

Nakanishi, T. (1991) *Economics of Slam*: Informal Sector of the City in the Republic of the Philippines, *(Suramu no keizai gaku: Firipin ni okeru toshi infomaru bumon)* University of Tokyo Press: Tokyo, Japan. (in Japanese)

Nakazato, T.(1999) *Basic Study on Development Education (Kaihatsu kyoiku (Development Education) no kiso teki kenkyu)* (in Japanese)

Nomoto, Y. and Sakumoto N., ed. (1996) *Global Environment and Asian Environmental Law, (Chikyu kankyo to asia kankyo hou)* Series of Development and Environment (Kaihatsu to kankyo sirizu) No.7. Institute of Economic Development, JETRO: Tokyo, Japan. (in Japanese)

..... (1997) *Expansion of Environmental Policies and Law in Developing Countries, (Hatten tojokoku no kankyo seisaku no tenkai to hou)* Series of Development and Environment, (Kaihatsu to kankyo sirizu) No.10. Institute of Economic Development, JETRO: Japan. (in Japanese)

Nonaka, I., Takeuchi, H. (1996) The Knowledge Creating Company (Chishiki sozo kigyo), p.401. Toyo Keizai Inc.: Tokyo, Japan. (Japanese translation from Nonaka, I. and Takeuchi, H. (1995) The Knowledge Creating Company: How Japanese Companies Create the Dynamics of Innovation. Oxford Univ. Press, Oxford, 304p, by Umemoto, K.)

Office of Evaluation and Monitoring, Planning and Evaluation Department, JICA, ed. (2004) *Practical Methods for Project Evaluation, (Purojekuto hyoka no jissen teki shuhou)* Japan International Cooperation Publishing Co., Ltd.: Tokyo, Japan. (in Japanese)

Ogawa, H. (1996) Sustainable solid waste management in developing countries. Paper submitted to the Parallel Session 7 'International Perspective,' 7th ISWA International Congress and Exhibition (Yokohama, November 1996) (http://www.gdrc.org/uem/waste/z-doc.html)

Ojeda-Benitez S. et al. (2000) The potential for recycling household waste: a case study from Mexical, Mexico. *Environment & Urbanization,* 12 (2), October 2000.

Pargal, S., Huq. M. & Gilligan, D., (1999) Social Capital in Solid Waste Management: Evidence from Dhaka, Bangladesh. Social Capital Initiative Working Paper No.16, Washington D.C., World Bank

Phatshwe, J. P. D. (2001) Waste disposal in third world countries - the Botswana experience. *Proceedings of 27th WEDC Conference Lusaka, Zambia,* pp. 261-264.

Plummer and Slater (2001) GHK Working Paper, 442 02.

Post, J., Broekema, J. and Obirih-Opareh, N. (2003) Trial and error in privatisation: Experiences in urban solid waste collection in Accra (Ghana) and Hyderabad (India). *Urban Studies,* 40, 835-852.

Qasim, S.R. and Chiang, W. (1994) *Sanitary Landfill Leachate - Generation, Control and Treatment.* Technomic Publ.: Lancaster.

Rand, T., Haukohl, J., Marxen, U. (2000) *Municipal Solid Waste Incineration - A Decision Maker's Guide,* The World Bank, Washington, DC.

Sajima, T. (1999) *Introduction to Environmental Education: Utilization for the Period for Integrated Study, (Kankyo kyoiku nyumon- sogo teki gakushu ni ikasu)* Kokudosha Co. Ltd.: Tokyo, Japan. (in Japanese)

Sakurai, K. (1990) Solid Waste Management for Lower Income Area within Large Cities of Developing Countries: A Case Study in Guatemala City. (Tojokoku dai toshi tei shotoku chiiki ni okeru haikibutsu kanri- guatemara shi aramedanorute chiku no jirei) *Proceedings of the 1st Conference of Japan Society of Waste Management Experts, (Dai 1 kai haikibutsu gakkai kenkyu happyo kai kouen ronbun shu)* pp.185-187. (in Japanese)

..... (1991) Study on Improving Incentive System for Urban Cleansing Operation in Developing Countries. (Tojokoku seiso jigyo no kaizen insentibu sisutemu no kenkyu) *Proceedings of the 2nd Conference of Japan Society of Waste Management Experts, (Dai 2 kai haikibutsu gakkai kenkyu happyo kai kouen ronbun shu)*

pp.29-31. (in Japanese)

..... (1992) Implications for Solid Waste Management Cooperation Based on the Experiences of Technical Cooperation with ASEAN Countries. (Asean shokoku ni okeru kyoryoku keiken ni motozuku tojokoku haikibutsu kanri heno kyokun) *Proceedings of the 3rd Conference of Japan Society of Waste Management Experts, (Dai 3 kai haikibutsu gakkai kenkyu happyo kai kouen ronbun shu)* pp.175-177. (in Japanese)

..... (1993) Improvement of Municipal Solid Wastes Collection Work Efficiency in Developing Countries. (Kaihatsu tojokoku ni okeru toshi haikibutsu shushu sagyo koritsu no kaizen. *Proceedings of the 4th Conference of Japan Society of Waste Management Experts, (Dai 4 kai haikibutsu gakkai kenkyu happyo kai kouen ronbun shu)* pp.941-943. (in Japanese)

..... (1994) Practice of Introducing Case Examples on Waste Education and Community Participation in Japan to Participants for Training Course. (Nihon no gomi kyoiku, jumin sanka jirei no tojokoku kenshuin heno shokai jissen ni tsuite) *Proceedings of the 5th Conference of Japan Society of Waste Management Experts, (Dai 5 kai haikibutsu gakkai kenkyu happyo kai kouen ronbun shu)* pp.21-23. (in Japanese)

..... (2000) Municipal Solid Waste Management in Developing Countries: Towards more Efficient International Cooperation in Municipal Solid Waste Management Sector. (Kaihatsu tojokoku no toshi haikibutsu kanri-Toshi haikibutsu kanri bunya ni okeru yori koukateki na kokusai kyoryoku no tameni) *Journal of Japan Society of Waste Management Experts, (Haikibutsu gakkai shi)* 11 (2), 142-151. (in Japanese with English abstract)

Sato, H., ed. (2001) *Development Assistance and Social Capital: Capability of Social Capital Theory, (Enjo to shakai kankei shihon- sosyaru kyapitaru ron no kanousei)* Institute of Economic Development, JETRO: Tokyo, Japan. (in Japanese)

Schubeler, P., Wehrle, K. and Christen, J. (1996) *Conceptual framework for municipal solid waste management in low-income countries*. Urban Management Programme (UMP) Working Paper No.9, UNDP/UNCHS(Habitat)/ World Bank / SDC, 55p.

Scheinberg A., Muller M. and Tasheva, E.L. (1999) Gender and Waste. *Proceedings of Integrating gender into community waste management: project management insights and tips from an e-mail conference 9-13 May 1998,* UWEP.

Shekdar, A.V. (1997) A strategy for the development of landfill gas technology in India. *Waste Management & Research,* Vol.15, No.3, 255-266.

Shikura, S. and Harada, H. (1997) Appropriate Technology Option for Municipal Solid Waste Management in Asian Developing Countries - Feasibility of Anaerobic Digestion Technology. (Asia kaihatsu tojokoku no toshi haikibutsu kanri ni okeru gijutsu opushon - kenki sei shoka gijutsu no kanousei ni tsuite) *Environmental Systems Research,* (Kankyo sisutemu kenkyu) 25, 229-238. (in Japanese with English abstract)

..... (2000) A Consideration of Municipal Waste Generation Amount in Developing Countries. (Hatten tojo koku no toshi gomi hassei ryo ni kansuru ichi kosatsu) Proceedings of the 11th Conference of Japan Society of Waste Management Experts, (Dai 4 kai haikibutsu gakkai kenkyu happyo kai kouen ronbun shu) pp. 24-26. (in Japanese)

Shimura, S. and Anai, J. (1995) Experiment of Constructing Sanitary Landfill in Developing Countries. (Kaihatsu tojokoku ni okeru eisei umetate jikken ni tsuite) *Proceedings of the 6th Conference of Japan Society of Waste Management Experts, (Dai 6 kai haikibutsu gakkai kenkyu happyo kai kouen ronbun shu)* pp.632-634. (in Japanese)

Shimura, S., Kato, H. and Kusunoki, K. (1994) Methods of Clarifying Waste Flow for Master Plan Study of Waste Management in Developing Countries. (Kaihatsu tojo koku toshi haikibutsu shori keikaku tyosa ni okeru gomi no nagare no kaimei shuho ni tsuite) *Proceedings of the 5th Conference of Japan Society of Waste Management Experts, (Dai 5 kai haikibutsu gakkai kenkyu happyo kai kouen ronbun shu)* pp.51-53. (in Japanese)

Shinoda, T. (1995) *Study on Sanitation Worker Caste in India, (Indo no seiso nin kasuto kenkyu.)* Shunjusha Publ. Co.: Tokyo, Japan. (in Japanese)

Social Development Study Department, JICA (2002) *Study on Economic Evaluation Methods in Development Study*: 12. Waste, *(Kaihatsu chosa ni okeru keizai kaihatsu shuhou kenkyu: 12. haikibutsu)* Japan International Cooperation Agency: Tokyo, Japan. (in Japanese)

South Pacific Forum (2003) *The Okinawa Initiative: Regional Development Strategy for a More Prosperous and Safer Pacific,* The Pacific Leaders Summit Between Japan and Members of the Pacific Islands Forum, Okinawa, Japan, May 16-17 2003.

Syamlal (1992) *The Bhangi: A Sweeper Caste- Its socio-economic Portraits,* Popular Prakashan, Bombay 1992.

Takatsuki, H. (1991) Study on Appropriate Disposal of Hazardous Wastes. (Yugai haikibutsu no tekisei shori ni kansuru kenkyu) *Journal of National. Institute for Public Health, (Koshu eisei kenkyu)* 40(2), 152-163. (in Japanese)

Tanaka, M. (1996) Health Risk Related to Waste Disposal; For Reductions of Dioxins/Furans. (Haikibutsu shori ni okeru kenko risuku- daiokishin sakugen ni mukete-) *Journal of National Institute for Public Health, (Koshu eisei kenkyu)* 45(4), 378-387. (in Japanese)

Tanaka, N., Kakuta, Y., Matsuto, T. and Tojo, Y. (2003) *Basic Knowledge of Waste Management Technology for Recycling and Appropriate Disposal, (Risaikuru, tekisei shobun no tameno haikibutsu kogaku no kiso chisiki)* Gihodo Shuppan Co., Ltd.: Tokyo, Japan. (in Japanese)

Tanaka, N., Matsuto, T. and Lee, D. (1991) Estimation for leakage potential of hazardous organic chemicals from solid waste landfills. (Haikibutsu umetate shobun jo ni okeru yugai kagaku bussitsu no kyodo moderu) *Journal of National Institute for Public Health, (Koshu eisei kenkyu)* 40(2), 164-175. (in Japanese)

Task force on Aid Approach, JICA (2004) *Capacity Development Handbook for JICA staff: For Improving the Effectiveness and Sustainability of JICA's Assistance,* Japan International Cooperation Agency: Tokyo, Japan.

Thapa, G.B. (1998) *Lessons learned from solid waste management in Kathmandu, Nepal,* Habitat International, 22, 97-114.

Third World Network (1989) *Toxic Terror - Dumping of hazardous wastes in the third world.* Third World Network, Penang, Malaysia. Training Centre of ILO, SKAT, WASTE.

UNDP (1997) *Capacity Development,* UNDP Technical Advisory Paper 2.

..... (2000) *Millennium Development Goals (MDGs.)*

..... (2003) *Clean Development Mechanism: A User's Guide,* Energy and Environment Group, Bureau for Development Policy, UNDP: New York.

United Nations (2002) *Report of the World Summit on Sustainable Development,* Johannesburg, South Africa, 26 August- 4 September 2002, United Nations.

United Nations Environment Programme (2001) *Stockholm Convention on Persistent Organic Pollutants.*

Urban Development Sector Unit, East Asia and Pacific Region (1999)"What a Waste: Solid Waste Management in Asia," The International Bank for Reconstruction and Development/The World Bank: Washington, D.C.

Van de Klundert, A. and Anshutz, J. (1999) Integrated sustainable waste management: the selection of appropriate technologies and the design of sustainable systems is not (only) as technical issue. Paper prepared for the CEDARE / IETC Inter-Regional Workshop on Technologies for Sustainable Waste Management, held 13-15 July 1999 in Alexandria, Egypt, Waste UWEP.

..... (2000) The sustainability of alliances between stakeholders in waste management. Working Paper for UWEP/CWG, 30 May 2000.

Van de Klundert, A. and Lardinois, I. (1995) Community and private (formal and informal) sector involvement in municipal solid waste management in developing countries. Background Paper for the UMP Workshop in Ittingen 10-12 April 1995.

Vincentian Missionaries (1998) The Payatas environmental development programme: micro-enterprise promotion and involvement in solid waste management in Quezon City. *Environment & Urbanization,* 10 (2), pp. 55-68.

Vrijheid, M. (2000) Health effect of residence near hazardous waste landfill sites: A review of epidemiologic literatures. *Environmental Health Perspectives Supplements,* 108(S1), 101-112.

Wegelin, E. A. and Borgman, K. M.(1995) Options for municipal interventions in urban poverty alleviation. *Environment & Urbanization,* 7(2), 131-151.

WHO (1999) *Safe Management of Wastes from Health Care Activities.* WHO.

World Bank (2000) *World Development Report 1999-2000,* World Bank: Washington. D.C.

..... (2001) *Strategic Planning Guide for Municipal Solid Waste Management* (CD-ROM), Step 4 B-21.

..... (2004) *2004 World Development Indicators,* The World Bank: Washington, D.C.

....., WHO, Swiss Agency for Development and Cooperation, SKAT (1998) *Decision-maker's guide to solid waste landfills: Summary,* World Bank: New York.

Yamamoto, T., Solorzano, G., Cuellar, R. and Guzman, G. (2003) Landfill management improvement in Mexico City: Ground subsidence monitoring and leachate management. *Proceedings Sardinia 2003, Ninth International Waste Management and Landfill Symposium, Cagrliari, Italy; October 2003,* CISA, Environmental Sanitary Engineering Centre, Italy.

Yoshida, F. (1998) *Political Economy of Wastes and Pollutions, (Haikibutsu to osen no keizai gaku)* Iwanami Shoten Publishers: Tokyo, Japan. (in Japanese)

..... (2001) *IT Pollution, (IT osen)* Iwanami Shoten Publishers: Tokyo, Japan. (in Japanese)

Yoshida, M. (2004) Theory for Technology Transfer and Technical Cooperation. (Gijutsu iten ron, gijutsu kyoryoku ron) Lecture note for Intensive Course for Department of Information Sciences, University of Tsukuba (Used in February 2004) (in Japanese)

....., Hamdi, H., Kallali, H., Ibrahim, A.N., Jedidi, N. and Ghrabi, A.(2003) Environmental impacts of open-dumping landfill to lagoon sediments—A case study in Bizerte Lagoon, Northern Tunisia. *Proceeding of the 14th Annual Conference of The Japan Society of Waste management Experts,* International Session, pp.17-19.

....., Jedidi, N., Hamdi, H., Ayari, F., Hassen, A. and M'hiri, A. (2003) Magnetic susceptibility variation of MSW compost-amended soils: In-situ method for monitoring heavy metal contamination. *Waste Management & Reserach,* 21, 155-160.