Stop Global Warming

Team minus 6%

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THE WORLD IN TRANSITION, AND JAPAN'S EFFORTS TO ESTABLISH A SOUND MATERIAL-CYCLE SOCIETY

Ministry of the Environment
Government of Japan

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THE WORLD HAS REACHED A TURNING POINT IN THE CREATION OF A SOUND MATERIAL-CYCLE SOCIETY, AND JAPAN'S EFFORTS

The World Has Reached a Turning Point in the Creation of a Sound Material-Cycle Society, and Japan's Efforts

Executive Summary

Rapid economic growth associates the generation of huge amount of wastes and short supply of resources. We overview the Japanese efforts to establish a sound material-cycle (SMC) society about both the Fundamental Plan for establishing a SMC Society in Japan and 3Rs Initiative in the world.

Evidence from the Edo era strongly suggests that a sustainable society can be established through comprehensive promotion of a Low Carbon society, a society in harmony with nature and a SMC Society. Because Japan's historical experience such as hygiene recycling system of night soil and raw garbage is very beneficial for modern developing countries, we review the history of establishing a SMC Society in Japan.

SMC blocks have been established at various levels theses days. Cooperation and Collaboration among the different entities play a very important role to build up SMC blocks.

Japan has been making efforts to establish a SMC Society not only in East-Asia but also in the whole world aggressively. It is overviewed that Japan is assessing the needs in East-Asia countries and trying to make well-organized and comprehensive transfer of its technologies and systems to them.

Introduction

Conventional socioeconomic activities based on mass production and mass consumption lead to the creation of mass-disposal societies and hamper environmental protection and the development of sound material cycles. In Japan, about 470 million tons of waste is generated annually. The increasingly diverse nature of wastes produced is making disposal more and more difficult and environmental burdens are increasing due to inappropriate disposal. This situation is further aggravated by the shortage of landfill capacity at final disposal sites, as demonstrated by the fact that the remaining useful life of final disposal sites for industrial wastes averages approximately 7.7 years, across the country, and only about 3.4 years in the metropolitan Tokyo area.
Such socioeconomic activities are also closely related to concerns about the exhaustion of natural resources (especially fossil resources), global warming caused by greenhouse gases, the destruction of nature through large-scale resource extraction, and the disturbance of natural material cycles in the natural world. These activities, along with the global warming crisis and the ecosystem crisis, feed on each other in a vicious circle and represent deteriorating global environmental problems. In particular, waste disposal problems are becoming increasingly serious in developing countries, especially in fast-growing Asian regions. Some estimate that the worldwide amount of waste generation in 2050 will be double the amount in 2000. Furthermore, recent increases in demand for resources, worldwide, and soaring resource prices have raised concerns over the stable supply of resources, adding tighter resource-related constraints not only to resource-scarce Japan but also to other countries in the world.
If human beings continue these socioeconomic activities, we will face constraints on both resource availability and the environmental capacity to accept further waste, which may hinder the sustainable development of society and the economy.

In light of the current situation, there is an urgent need to step up efforts towards a sustainable society and to integrate these activities with efforts towards a low-carbon society and a society in harmony with nature so that a sound material-cycle(SMC) society based on lower natural resource consumption and lower environmental burdens can be successfully established in Japan, as well as in the rest of the world.

With this in mind, we analyze the world as it is approaching a turning point in the establishment of a SMC Society.
It first describes how Japan has taken the initiative in creating a SMC Society and disseminating information on the 3Rs, and describes the kinds of 3R activities that are being carried out in the developed world, including the G8 and the OECD. This provides an overview of the world as it approaches an important turning point in the establishment of an international SMC Society. This chapter also provides as much information as possible on 3R activities discussed at the G8 Environmental Ministers Meetings and the G8 Summit. This year, the Fundamental Plan for Establishing a SMC Society was revised for the first time in five years (decided by the cabinet March 2008) . In line with the revised Fundamental Plan, Japan will take measures to establish a SMC Society mainly through (i) the integrated promotion of efforts toward a low-carbon society, a society in harmony with nature and efforts toward a SMC Society, (ii) the construction of SMC

blocks, (iii) the achievement of newly set numerical targets such as material flow indicators and effort indices, and (iv) international contributions that take account of growing resource consumption and waste generation in Asian countries.

Chapter 2, titled "History of Japan's sound material-cycle society," examines the SMC Society from a historical perspective. Japanese society in the Edo era is believed to have been a SMC Society based on community activities. People in those days were engaged in social activities involving lower carbon emissions and lived their lives with a deeper awareness of being in harmony with nature. Efforts taken during this period clearly suggest that a sustainable society can be established through the comprehensive promotion of a low-carbon society, a society in harmony with nature and a sound material-cycle society. (For example, Edo possessed a safe and sanitary night soil recycling system in which night soil stored in night soil reservoirs was carried to villages around the Musashi no Kuni region in order to be bartered for farmers' agricultural produce.)

Chapter 3 focuses on the establishment of Spheres of SMCs. In recent years, efforts have been made towards establishing a SMC Society by means of various levels of SMC blocks. This chapter describes and examines the concept of SMC blocks, as spelled out in the Second Fundamental Plan for Establishing a SMC Society, and discusses issues from the perspective of the integrated establishment of a low-carbon society, a society in harmony with nature and a SMC Society. By citing specific examples, this chapter illustrates how collaborations among different entities play a critical role in establishing successful SMC blocks.

Chapter 4 examines the prospects for establishing a SMC Society in East Asia, involving Japan's cooperation. This chapter describes how active Japan is in promoting the establishment of a SMC Society with not only East Asia but also the entire international society. Japan has an important role to play in creating a SMC Society in East Asia. Specifically, Japan should understand the detailed needs of East Asian countries, consider country-specific situations, such as the status of economic infrastructure, and determine which of its technologies, systems and experiences are suitable for each country before transferring them in a manner that ensures the protection of intellectual property rights. By highlighting past cooperation results and future prospects, this chapter also outlines Japan's efforts to transfer such technologies and systems in a well-planned manner.

Section 1
THE WORLD IN TRANSITION, AND JAPAN'S EFFORTS TO ESTABLISH A SOUND MATERIAL-CYCLE SOCIETY

The 20th century saw the world move toward economic growth and the emergence of a mass-production and mass-consumption society in developed countries. However, developments in the 20th century also caused the collapse of the primitive sound material-cycle (SMC) society and produced major environmental problems, including pollution and dioxin problems. Japan, which achieved rapid economic growth in the latter half of the century, also faced pollution and other serious environmental problems and sought ways to solve them. In recent years, Japan has dedicated itself to the solution of the waste management problems which followed the previous environmental problems and has been creating a new SMC Society. The nation's new challenge is to take an integrated approach to the establishment of a low-carbon society in order to counter the major problem of global warming, to create a society in harmony with nature that helps conserve ecosystems and will allow people to enjoy the blessings of nature for many years to come, and to establish a SMC Society.

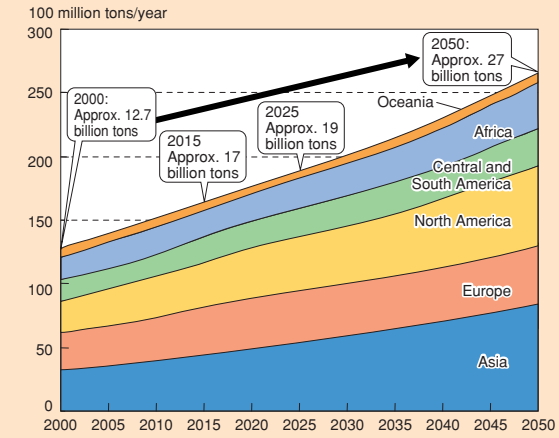
On the other hand, the 21st century, which has been called the century of the environment, is seeing rapid economic growth in developing countries, especially in Asia, and the associated generation of huge amounts of wastes. As waste management problems become more serious, there is a growing need to address problems such as global warming and the security of resources, which are expected to be in short supply as demand increases.

With these developments in mind, we reevaluates the primitive SMC Society that Japan created in the Edo era and examines the process that has been underway since about 2000 to establish a new SMC Society in Japan. The experience gained by Japan has involved the creation of many technologies, frameworks and systems which should have the potential to make a major contribution not only to Japan's future ability to establish a SMC Society but also to its integrated efforts to create a low-carbon society and a society in harmony with nature, in keeping with the mottainai spirit (not being wasteful with goods), and will assist the formulation of future policy measures by other countries, including developing countries.

1 The international situation related to waste management

The amount of global waste generation is increasing as the economy and population continue to grow, all around the world, especially in Asia (Figure4-1-1).

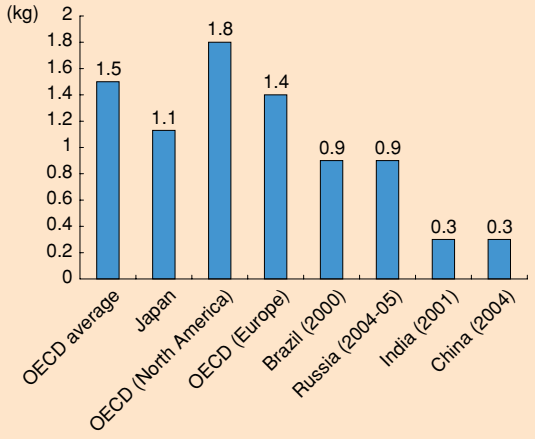
Figure 4-1-1 Future Prospects of World Waste Generation [2000-2050]



Source : A paper written by Prof. Tanaka of Okayama University

A forecast on municipal solid waste generation in the member states of the Organization for Economic Cooperation and Development (OECD) (OECD Environmental Outlook to 2030) estimates that the total waste generation in the OECD member states in 2005 was about 1.7 times the amount in 1980, and that the 2025 amount will be about 2.2 times the 1980 figure (Figure4-1-2).

Figure 4-1-2 Per capita daily municipal solid waste generation in OECD countries (2005)

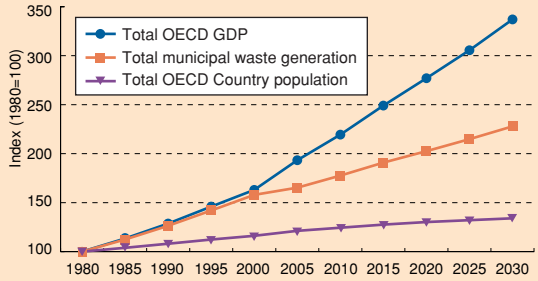


Source : Created by the Ministry of the Environment, based on OECD data

A wider variety of wastes is also emerging, including medical wastes and so-called e-wastes, or electrical and electronic wastes such as TVs, personal computers and refrigerators after which become unusable. Some of these wastes contain hazardous substances or cause infection and must be treated with special care.

In January 2008, a serious incident related to waste management occurred in Naples, Italy. The city's final disposal site reached full capacity and the wastes that had no other "outlet" were left on street corners (Figure4-1-3).

Figure 4-1-3 OECD Country municipal waste generation (1980-2030)

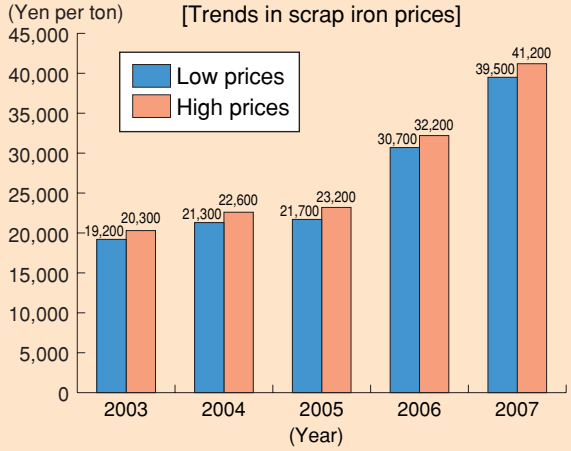


Source : Prepared by the Ministry of the Environment, based on OECD data

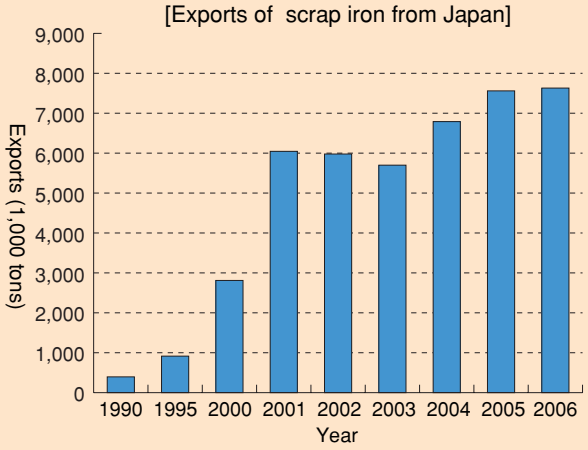
(1) International recycling of waste

Meanwhile, the prices of natural resources are soaring due to increasing demand for natural resources, especially in China. Demand is also growing for certain circulative resources (CRs) distributed for commercial gain, such as metal scrap, used paper and waste plastic, as the economies of China and other East Asian countries develop. As a result, imports of such CRs into these countries have surged recently. For example, steel scrap exports from Japan almost tripled from approximately 2.81 million tons in 2000 to approximately 7.63 million tons in 2006 (Figure4-1-4).

Figure 4-1-4 CR prices and exports



Note : The scrap iron (scrap steel) prices are H2 scrap cash prices (including delivery) for every December.
Source : Japan Iron and Steel Recycling Institute



Source : Ministry of the Environment

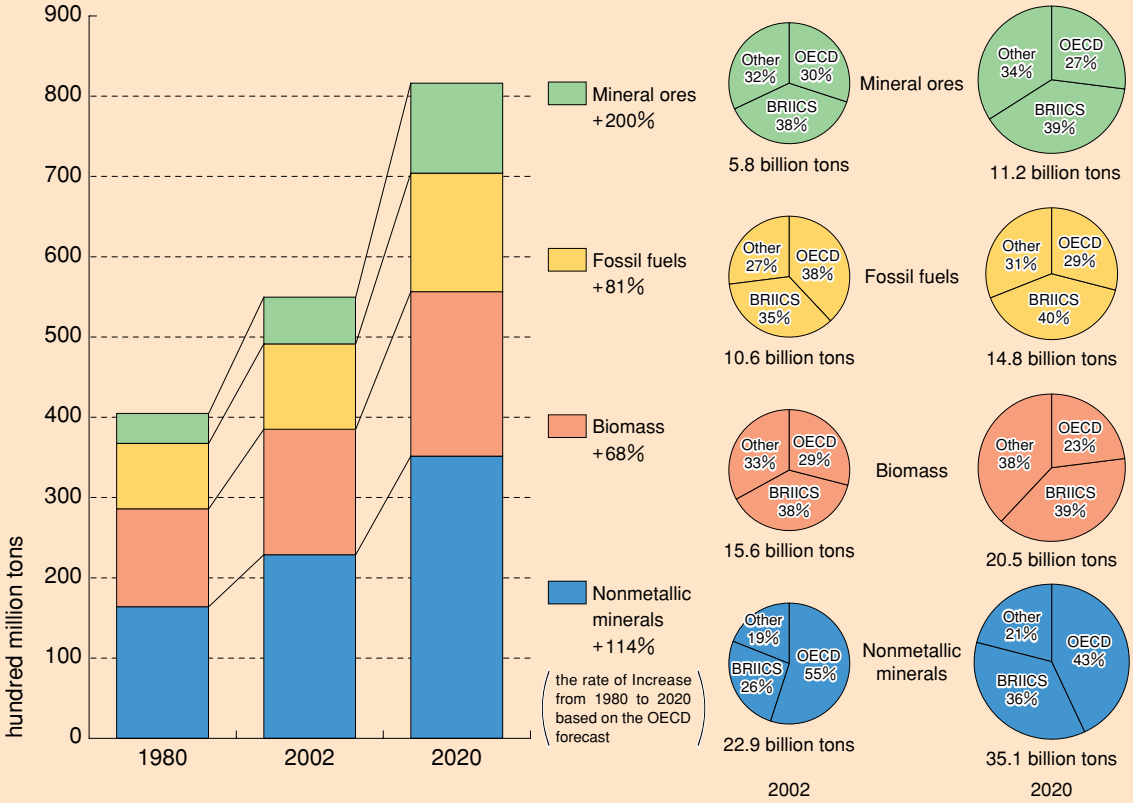
Such increases in the international movement of CRs, especially those from developed countries to developing ones, can be attributed to the following factors : (i) recycling laws enacted in developed countries have helped increase the amount of CRs recovered, establishing new supply sources for CRs ; (ii) as many companies in developed countries have moved their production to developing countries in Asia and other regions, developing countries are finding that the amounts of CRs collected domestically are too great for them to use by themselves ; (iii) as a result of economic growth in importing countries, demand for resources has increased so much that the amounts of CRs generated within the country are no longer large enough to meet demand[1].

[1] International Trade of Recyclable Resources in Asia, Edited by Michikazu Kojima, Institute of Developing Economies

Such transboundary movements of CRs can, as long as they are environmentally sound, enable resources to be reused and recycled more efficiently and inexpensively. They can also foster the development and growth of the recycling industry and can therefore contribute to not only employment creation but also the establishment of a sustainable society in developing countries.

On the other hand, there are several important challenges associated with the transboundary movement of CRs. One of these challenges is that an outflow of resources from a country (in the form of exports of CRs, based on market principles) can lead to a slowdown or a hollowing out of the domestic recycling industry. Some point out that this may hinder Japan's ability to steadily maintain and strengthen its waste management and recycling structures that have been built up over the years. In addition, it is known that some CR importing countries have yet to fully establish a mechanism for responsible waste management and are therefore posing a risk of environmental pollution. Another consideration is that imports of secondhand products and recycled products can be regarded as transboundary movements of potential wastes because these products can turn into wastes after a short time of use, offsetting their availability at low prices in the importing countries and the fact that this allows effective use to be made of resources. Initiatives to establish an international SMC Society should take account of disadvantages such as these (Figure4-1-5).

Figure 4-1-5 Global resource extraction, by region and type of resource (1980, 2002, 2020)



* BRIICS (Brazil, Russia, India, Indonesia, China, and South Africa)
Source : Prepared by the Ministry of the Environment, based on OECD data

(2) Efforts by the international community and Japan

Japan faced serious waste management problems in the 1990s, such as a shortage of final disposal sites and large-scale illegal dumping cases, all of which raised concerns about environmental pollution. However, radical policy reforms implemented in the early stages of these problems allowed Japan to become a world leader in the establishment of a SMC Society by the early 21st century.

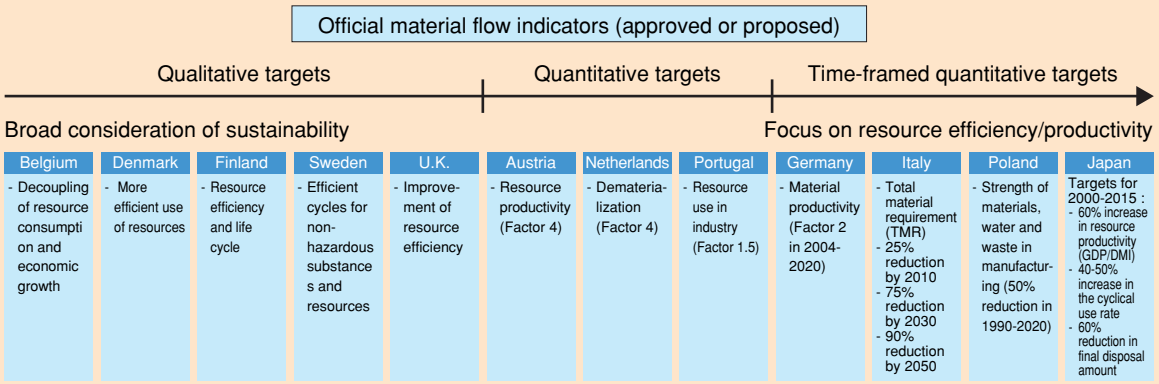
Based on such experience, at the G8 Sea Island Summit in 2004, Japan proposed the "3R Initiative," aimed at internationally promoting the establishment of a SMC Society through 3R activities. The 3Rs refer to restraining generation (Reduce), reuse (Re-use) and regeneration (Recycle), and represent the concept of balancing environmental conservation and economic growth through the effective use of resources. The G8 leaders endorsed this proposal and adopted it as the G8's new initiative, which led to the announcement of the "Science and Technology for Sustainable Development : '3R' Action Plan and Progress on Implementation."

Following on from this, the Ministerial Conference on the 3R Initiative was held in Tokyo in April 2005 to officially launch the 3R Initiative. On this occasion, Japan announced "Japan's Action Plan for a Worldwide Sound Material-Cycle Society through the 3R Initiative" (also known as "Japan's Action Plan to Promote Global Zero-Waste Societies"). Japan put forward another proposal at the G8 Summit in Saint Petersburg, Russia, in 2006, and the G8 countries all agreed that they would set appropriate targets, taking account of resource productivity, furthering efforts to optimize the resource cycle. In addition to its involvement at summit meetings, Japan has also been leading international discussions on 3R promotion and fostering political dialogue and information sharing through the Senior Officials Meetings on the 3R Initiative, held in March 2006 and October 2007.

Japan's leadership in other international discussions, not just those of the G8, can be observed in its involvement with the OECD's ongoing project on material flows and resource productivity and in the fact that a Japanese delegate serves as the chair of the Working Group on Environmental Information under the OECD Environment Policy Committee. From the viewpoint of promoting the 3R Initiative, Japan also supports the International Panel for Sustainable Resource Management, which was organized by the United Nations Environment Programme (UNEP) in 2007 for the purpose of scientifically evaluating the environmental effects of the use of natural resources.

In April 2008, the OECD-UNEP Conference on Resource Efficiency was held in Paris, bringing together relevant ministers, senior government officials in charge, experts, businesses, NGOs and the like from around the world. The participants affirmed the importance of sharing best practices on national initiatives and continuing efforts to improve resource efficiency. The meeting of OECD Environmental Ministers that took place following the above conference also reaffirmed the perception that 3R activities and resource productivity improvement are of major importance with regard to restricting natural resource consumption and reducing environmental burdens (Figure4-1-6).

Figure 4-1-6 Examples of material flow information and their relation to policy targets



Source : Prepared by the Ministry of the Environment, based on OECD data

To provide guidelines for Japan's contribution to building a future framework for the world, the Cabinet endorsed "Becoming a Leading Environmental Nation Strategy in the 21st Century ~ Japan's Strategy for a Sustainable Society" in June 2007, setting out the direction of the environmental policies that Japan should implement in cooperation with other countries. This document cites "the construction of a sound material-cycle society through 3R activities" as one of the eight priority strategies to be rolled out within the next year or two. Specifically, this centers on two goals : efforts to construct a SMC Society in Asia and the promotion of the 3R Initiative, proposed by Japan, within the G8. In order to achieve the first goal, the national strategy stipulates that Japan should carry out the following actions : disseminate Japan's 3R systems, technologies and experience to the international community and establish an international information center on the 3Rs along with common rules on the 3Rs ; integrate Japan's accomplishments on sustainable resource circulation with the formulation of the East Asia Sound Material-Cycle Society Vision, which spells out the basic concept and targets for establishing an East Asia SMC Society, and thereby seek to create a sound and smoothly functioning resource cycle across East Asia.

With respect to the Asian region, Japan has been supporting Asian countries' activities since the launch of the 3R Initiative, in line with Japan's Action Plan to Promote Global Zero-Waste Societies. This support includes assisting counties in developing a 3R plan or strategy and providing information on 3R systems, technologies and experience. Such activities have laid the groundwork for the establishment of an East Asia SMC Society.

In addition, the Asia 3R Conference was held in Tokyo in October 2006. This was the first conference that brought together policymakers from Asian countries to discuss waste management and 3R promotion. The participants agreed on the importance of promoting the 3Rs. The conference convened for the second time in March 2008 in order to share updates on the recent progress of each country's 3R policies and exchange opinions on effective measures for promotion, directed towards future expansion. The results of the conference have provided valuable input to etc, G8 Environment Ministers Meetings, held in Kobe in May 2008.

Japan has made up Kobe 3R Action Plan as a chair at G8 Environment Ministers Meetings. This is very significant because it is going to promote each country set some targets such as Resource Productivity matched to particular each circumstance.

Abstracts of Chair's Summary G8 Environment Ministers Meeting
Kobe, Japan
May 24-26, 2008

The 3Rs

Progress of the 3R Initiative

31. The contributions of the 3R Initiative in advancing 3Rs activities in each G8 member country and other countries since its proposal at the G8 Sea Island Summit in 2004 were recognized. It was also recognized that the 3R Initiative has provided a platform for sharing information and exchanging views and experiences on 3Rs-related policies among the G8 and other countries. It was noted that the 3R Initiative has demonstrated the G8 countries' determination to contribute to the establishment of a sustainable society.

Prioritized implementation of 3Rs policies and increases in resource productivity

32. It was observed that the promotion of the 3Rs and increases in resource productivity are important for achieving sustainable development in both the G8 and other countries. Towards that end it was also observed that comprehensive policies comprising both regulatory and market-based tools, and addressing the full life-cycles of products are needed. Furthermore, the need for policies to further stimulate technological development and innovation and to create markets for resource-efficient products was acknowledged. However, it was also recognized that governments alone cannot produce the necessary changes and that the contribution of all actors and sectors of society is crucial.

33. In addition to environmentally sound waste treatment and recycling, high priority was placed on waste reduction. Several efforts to reduce the use of disposable plastic bags and other single-use consumer products were described. Japan observed that China, Japan, and the Republic of Korea will jointly call for other countries to follow suit. It was noted that substantial reductions of waste generation and resource utilization require fundamental changes in awareness and lifestyle.

34. It was noted that both G8 and non-G8 countries recognize that strong linkages and the co-benefits exist between the promotion of environmentally sound waste management and the 3Rs, and the reduction of greenhouse gas emissions. In addition, the views from non-G8 countries emphasizing the importance of developing and disseminating technologies for the promotion of the 3Rs in accordance with national circumstances were also noted.

35. The progress and achievements of the work by the OECD on material flow analysis and resource productivity and the contributions on sustainable resource management by UNEP were welcomed.

Establishment of an international sound material-cycle society

36. The occurrence of severe health and environmental problems related with improper recycling of end-of-life products, such as e-waste, as well as with improper ship dismantling, in developing countries were considered. However, the potential resource value of such materials was also recognised. The hope was expressed that further collaboration between the 3R Initiative and the Basel Convention[2] will both promote capacity building for environmentally sound waste management in developing countries and facilitate sound international resource circulation.

Confirmation of the significance of collaboration for capacity development in developing countries

37. The importance of technical and financial support toward capacity development for the 3Rs in developing countries, building on existing frameworks, was observed. It was also observed that there is a need for improved coordination of international assistance related with the 3Rs and better syn-

chronization of development agencies' activities in this field were called for. Furthermore, it was noted that effective capacity development requires a multi-stakeholder approach, involving the private sector, local governments and NGOs.

Agreement on Kobe 3R Action Plan
38. G8 Ministers agreed on the Kobe 3R Action Plan and to report the progress in 2011. Finally, Japan observed that it has launched its "New Action Plan towards a Global Zero Waste Society," which it hopes will stimulate further international co-operation in the spirit of the Kobe 3R Action Plan.

2 Japan's efforts directed towards establishing a SMC Society

(1) The outline of the Fundamental Plan for Establishing of a SMC Society

The Fundamental Plan for Establishing a SMC Society approved by the Cabinet in March 2003 (hereinafter referred to as "the First Fundamental Plan") was modified, and the revision (hereinafter referred to as "the Second Fundamental Plan") was approved by the Cabinet in March 2008.

A major event related to Japan's environmental policy since the formulation of the First Fundamental Plan was the establishment of the Third Basic Environment Plan (approved by the Cabinet on April 7, 2006) and the 21st Century Environment Nation Strategy (approved by the Cabinet on June 1, 2007). The previous three reviews of the First Fundamental Plan's progress had highlighted the need for a more accurate assessment of material flows ; a greater effort to raise public awareness ; the promotion of SMC-based community development ; and stronger measures to incorporate international perspectives in order to address the situation in which international movements of materials are increasing and waste generation and demand for resources are expanding, worldwide.

This was also the time when Japan was expected to take the initiative in rolling out 3R activities across the international community, with the G8 Hokkaido Toyako Summit scheduled for the following year.

In light of these developments, the Central Environment Council released, on August 24, 2007, a document titled "Detailed Guidelines for the Formulation of a New Fundamental Plan for Establishing a SMC Society." This document spelled out priority considerations to be addressed when developing specific measures needed for the formation of a SMC Society.

The guidelines suggested four issues on which further discussion should take place and specific measures should be set forth : (i) integrated efforts toward a SMC Society, a low-carbon society and a society in harmony with nature, to assist the creation of a sustainable society ; (ii) formulation of the quantitative vision for a SMC Society, including the redefinition of target levels and introduction of new supplementary indicators, as needed ; (iii) establishment of SMC

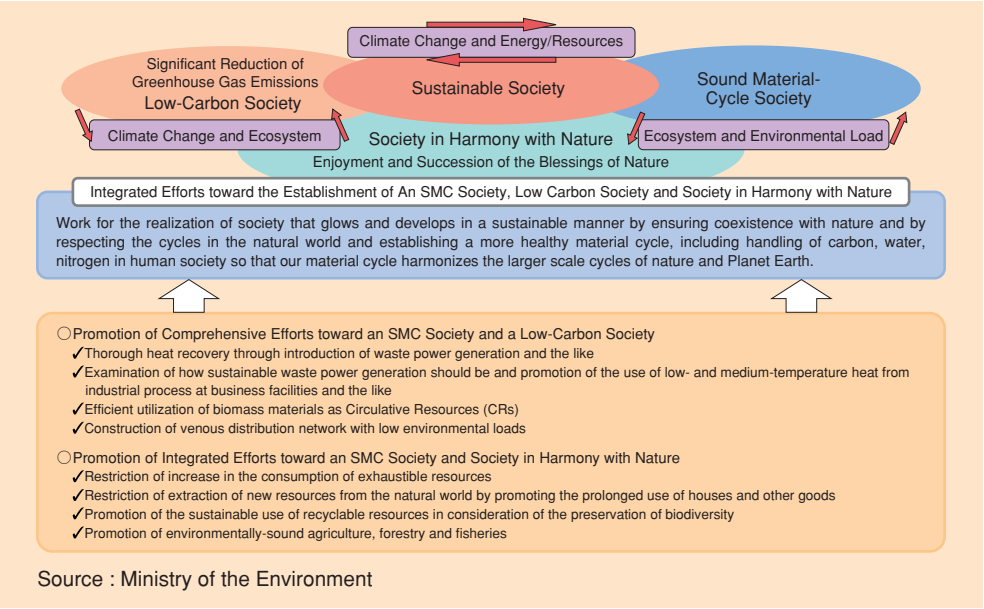
[2] The United States is not a party to the Basel Convention.

blocks, in which resource cycles of optimal size are formed in accordance with the region's characteristics and the properties of the CRs available, and the waging of a national campaign to promote the 3Rs involving increased efforts to reduce and reuse waste ; (iv) dissemination of Japan's systems, technologies and experience related to 3R promotion to the international community and the implementation of measures to ensure correct resource circulation in East Asia, from an international viewpoint.

The Second Fundamental Plan, which was formulated in line with the above guidelines, sets out the basic direction of the national efforts. Since the natural material cycle, and the material cycles in socioeconomic systems that are part of it, are inseparable, the government will need to take both into account in order to ensure an environmentally sound water cycle and foster the appropriate cycling of nitrogen and other materials in nature. The plan's details are described below (Figures4-1-7, 4-1-8, 4-1-9, 4-1-10).

Pursuant to this Second Fundamental Plan, the government will comprehensively implement various other related measures.

Figure 4-1-7 Deployment of Integrated Efforts toward A Sustainable Society



Source : Ministry of the Environment

Figure 4-1-8 Overview of the 2nd Fundamental Plan for Establishing a Sound Material Cycle Society (decided by the Cabinet on March, 2008)

Current situation and Issues

- All three indicators ;"resource productivity", "cyclinical use rate" and "final disposal amount" improves towards year 2010 targets set by the 1st fundamental plan and are expected to achieve the targets. However, reduction of household waste progresses rather slowly.
- Need to respond to global environmental issues such as worldwide resource limitation as well as global warming

  Thus, it is necessary to further develop sound material cycle societies both domestically and internationally by implementing the 3Rs thoroughly

Mid-to-long term image of SMS

- Realize "Sustainable Society" by integrating with activities to realize "low carbon society" and "nature harmonious society"
- Realize "Stock-based Society" by stocking and utilizing goods to achieve wealthy society

Regionally-characteristic SMS (Spheres of sound material cycle) , Lifestyle along the concept of Mottainai, Collaboration and partnership between stakeholders, and dissemination of the 3Rs into economic activities including manufacturing

Activities of stakeholders

○Partnership and Collaboration

Mutual collaboration of every stakeholders to establish sound material cycle society

○Citizens
- Campaign of life style change such as "my chopsticks" and "my bag"

○Businesses
- Prevention of illegal dumping and implementation of the 3Rs
- Advanced waste management, inter-industrial collaboration

○NGO/NPO and Universities and others
- Interface of collaboration and partnership
- Accumulation of knowledge and reliable information

○Local governments
- Partnership with stakeholders and implementation of nation-wide activities

○National government
- Partnership among stakeholders and implementation of nation-wide activities

①Integrated efforts with low carbon and nature-harmonious society (waste power generation and biomass utilization),

②Establishment of "spheres of sound material cycle", ③National campaign on the 3Rs, ④Promotion of sound material cycle business through various measures such as green purchasing, ⑤Development of 3R mechanisms focusing on reduction, ⑥Advanced 3R technology and system, ⑦Information gathering and development of human resources,

⑧Establishment of international sound material cycle society based on action plan to promote global zero waste societies, East Asia vision of sound material cycle society, or improving resource productivity

Source : Ministry of the Environment

Figure 4-1-9 Enhancement of material flow indicators and effort indices

Enhanced Indicators in the New Fundamental Plan (Material flow indicators)

Directions

1. Establish new numerical targets with FY 2015 as the target year.
2. Measure the progress of the integrated development of the efforts toward a low-carbon society and a sound material-cycle society.
3. Assess imports and exports of CRs as well as the environmental loads generated overseas through the extraction and use of resources by incorporating international viewpoints into the indicator system.

1 Indicators for which Quantitative Targets are Set

(1) "Inlet" : Resource Productivity (=GDP/Natural resources and the like input)
(2) "Cycle" : Cyclical Use Rate (=Amount of cyclical use/Total material Input)
(3) "Outlet" : Final Disposal Amount (=Final disposal amount of waste)

2 Supplementary indicators for which quantitative targets have been set

(1) Resource productivity excluding earth and rock resources input
(2) Coordination with efforts toward low-carbon society
[1] CO_2 emission reduction in the area of waste
[2] Greenhouse gas emissions from waste and greenhouse gas emissions from fossil fuel, which can be replaced by recycling of waste into raw fuel, waste power generation and the like (measurement)

3 Indicators to monitor changes

(1) Resource productivity of fossil resources
(2) Biomass resources input rate
(3) TMR (Total Material Requirement) as a hidden flow
(Measurement example: About 21 times the import of metallic resources)
(4) Indicators based on international resource cycles
(5) Resource productivity by industry area

4 Issues to be examined

Development of inventory concerning the computation of environmental loads and conversion factor that can be share internationally should be clearly defined as agenda to be examined in the future.

Source : Ministry of the Environment

Enhanced Indices in the New Fundamental Plan (Effort Indices)

1. Enhance and strengthen effort indices by dividing them into Indices for which targets are set and Indices to monitor changes.
2. Define Indices to promote reduce and reuse, e.g., reduce in general waste and the rate of refill products shipped.
3. Strengthen Indices to measure efforts by local governments, which play a key role in establishing an SMC society, e.g., municipalities most active in promoting the 3Rs and the number of environmental workshops and mutual exchange sessions held.

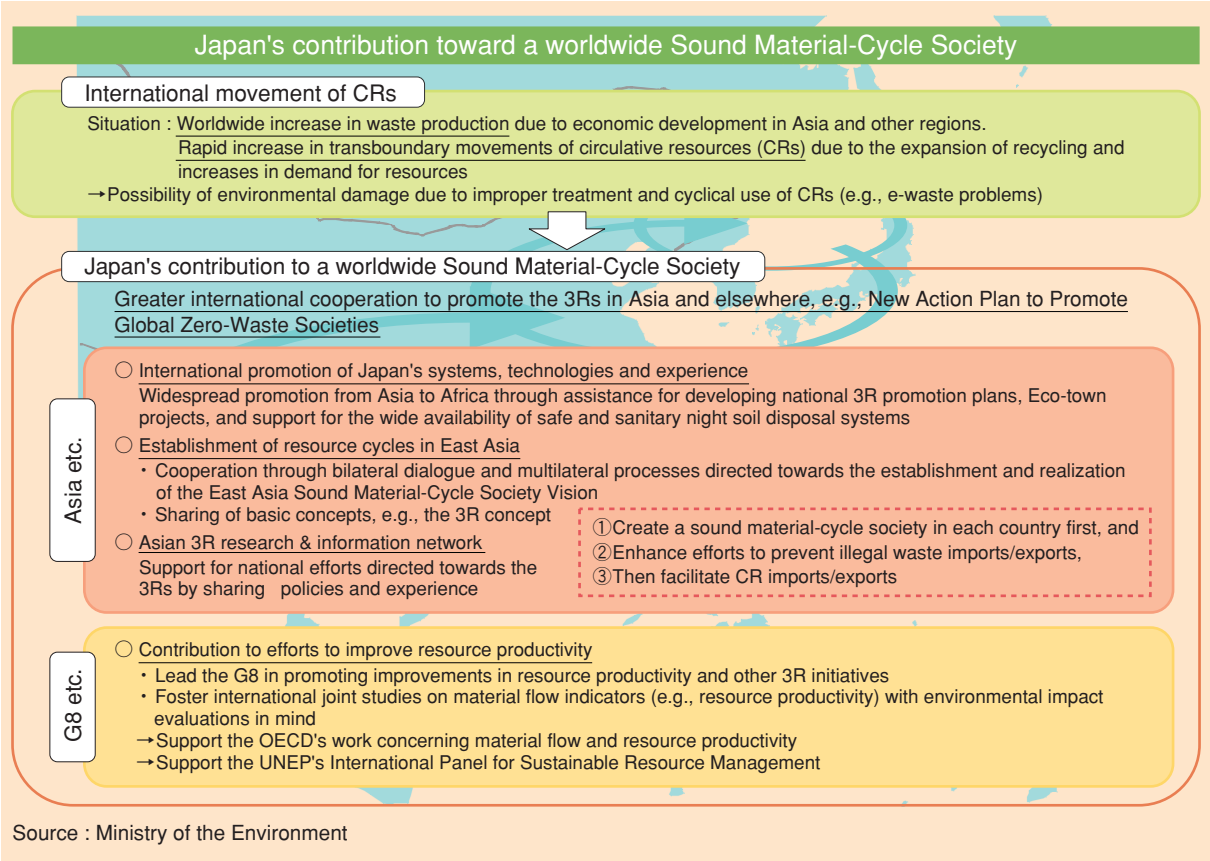
1 Indices to set a target

(1) Reducing the Quantity of Waste
a. Reducing the quantity of municipal solid waste
b. Reducing the amount of industrial waste
(2) Changes in awareness of and attitude toward an SMC society
(3) Promoting SMC Society Businesses
a. Promoting green purchasing
b. Promoting environmental business management
c. Expanding SMC society business market
(4) Steady implementation of individual recycling laws and the like

2 Indices to monitor changes

(1) Size of the market for rental and lease businesses and the shipping rate for refill products
(2) Rate of refusal of free plastic shopping bags (rate of "bring my own shopping bags") and the volume of sales of disposable products (e.g. imported chopsticks)
(3) Size of the market for secondhand goods and the rate of use of returnable bottles
(4) Number of stadiums introducing "reusable cups" and the like
(5) Number of fundamental plans for sound material cycles and the like at local levels
(6) Percentage of local governments that are implementing paid garbage collection and top municipalities in terms of waste reduction efforts
(7) Number of resource recovery facilities (recycle plazas and the like)
(8) Rate of recycling of municipal solid waste, total amount of waste collected, top municipalities in terms of recycling efforts, percentage of local governments that are implementing sorted collection, and amount of sorted collection by municipalities by item, and the like
(9) Number of environmental learning and exchange meetings held by local governments and the like, and number of applications to the "Assistance Program for local communities Establishing an SMC Society"

Figure 4-1-10 Outline of the establishment of a worldwide Sound Material-Cycle Society



Source : Ministry of the Environment

(2) Indicators and numerical targets for establishing a SMC Society

To quantitatively evaluate progress in the development of a SMC Society, the Second Fundamental Plan defines material flow indicators and effort indices.

Effort indices are used to measure the progress of measures and initiatives being implemented by different entities to assist the establishment of a SMC Society.

A. Material flow indicators

Intensive discussions were held in order to define material flow indicators during the 10 meetings of the Material Flow Study Group (chaired by Dr. Itaru Yasui, former vice-rector of the United Nations University), from June 2006 to January 2008. In addition, the government and the OECD jointly hosted an international seminar on material flows and resource productivity, at which the general chair was Dr. Yuichi Moriguchi from the Research Center for SMC and Waste Management, the National Institute for Environmental Studies. The aim of this seminar was to bring together experts in indicators and statistics from OECD member states, China, India and Russia. The indicators were improved and enhanced by means of these processes, based on cutting-edge knowledge from Japan and abroad.

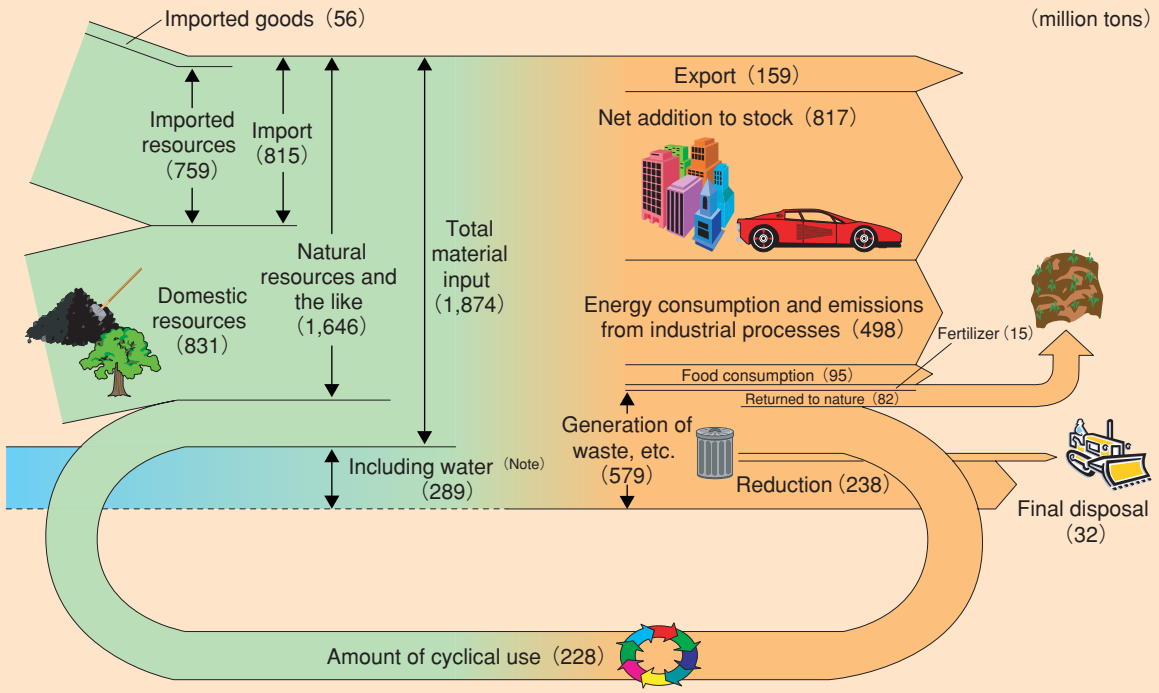
When establishing a SMC Society, it is essential to know what kinds of waste are generated where, and in what quantity. The accurate acquisition of this information allows the causes of waste generation to be identified and facilitates both restraining generation and the cyclical

use of waste.

Such information is not only applicable to the waste generation process but is also useful for promoting the efficient use of the total material input to a society. Japan should, therefore, first clarify its nationwide material flows. This will then be of great help in future policymaking.

The government has created a diagrammatic illustration of material flows (Material Flow Chart) by calculating the material flows that encompass all movements of materials in an economic society and then collecting data that show how much resources were input into the Japanese economic society, how much were reserved in society, consumed as energy, or turned into waste, and how much of the generated waste was recycled or disposed of in final disposal sites (Figure4-1-11).

Figure 4-1-11 Material flow in Japan (FY 2005)



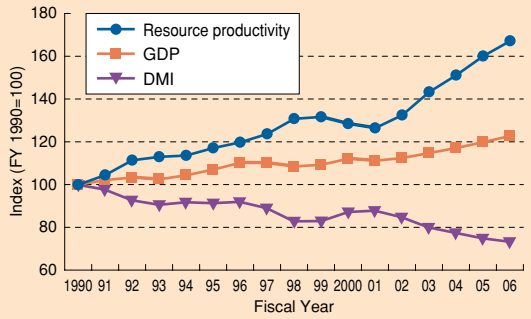
(Note) Including water : Input of water included in waste and the like (sludge, animal manure, human waste, waste acid, waste alkali) and sediment and the like associated with economic activities (sludge from mining, building and water works and tailing from mining)
Source : Ministry of the Environment

The Second Fundamental Plan sets targets for three indicators – resource productivity, the cyclical use rate, and the final disposal amount – referring to the "inlet," "cycle," and "outlet" aspects of Japan's nationwide material flow, respectively. These targets are to be pursued through the joint efforts of the government and other concerned parties. The target year for the Second Fundamental Plan is FY 2015, envisaging a society even farther ahead, in FY 2025.

The target for the inlet has been set by resource productivity : approximately ¥420,000 per ton in FY 2015. This indicator is designed to comprehensively measure how effectively industries and people are using products. Since natural resources are exhaustible, generate environmental burdens associated with extraction, and eventually turn into wastes, this indicator should be

increased so that adequate gross domestic product (GDP) can efficiently be achieved from smaller inputs of resources. The target figure is double the rate in FY 1990 (approximately ￥210,000 per ton) and roughly 60% higher than the rate in FY 2000 (approximately ￥260,000 per ton) (Figure4-1-12).

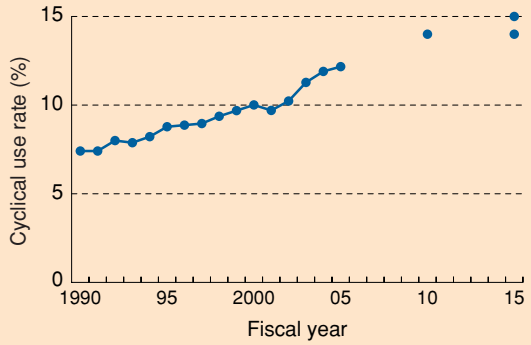
Figure 4-1-12 Trends of Resource Productivity



Source : Ministry of the Environment

The target for the cycle has been set by the cyclical use rate : approximately 14-15% in FY 2015. In principle, this indicator should be increased so that appropriate cyclical use can be expanded in order to reduce the amount of final disposal. The target figure is about 80% higher than the rate in FY 1990 (approximately 8%) and about 40-50% higher than the rate in FY 2000 (approximately 10%). Note that the total input in an economic society is the sum of the natural resources input and the amount of cyclical use (Figure4-1-13).

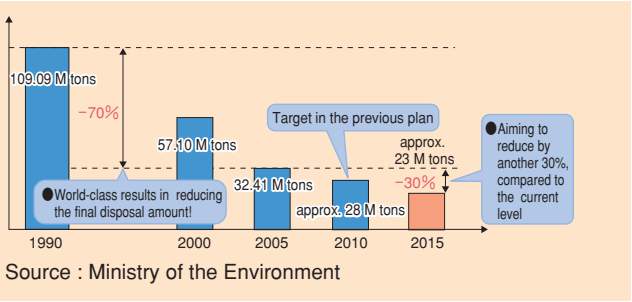
Figure 4-1-13 Trends in the cyclical use rate



Source : Ministry of the Environment

The target for the outlet has been set by the final disposal amount : approximately 23 million tons in FY 2015. The final disposal amount is an indicator that is directly linked to the urgent problem of a shortage of final disposal sites. Being expressed as the sum of the final disposal amount of municipal solid waste and industrial waste, this indicator should be reduced. The target figure is about 80% lower than the amount in FY 1990 (approximately 110 million tons) and about 60% lower than the amount in FY 2000 (approximately 56 million tons) (Figure4-1-14).

Figure 4-1-14 Trends in the final disposal amount of waste, since 1990



Source : Ministry of the Environment

In addition to these three indicators, above, two supplementary indicators were also set as targets : (i) resource productivity excluding the input of earth and rock resources and (ii) coordination with efforts directed towards a low-carbon society.

As a result of a progress review of the First Fundamental Plan, it was pointed out that, as far as resource productivity is concerned, the input of non-metallic mineral resources (earth and rock resources) has a large impact on the total natural resources input. This point was addressed by setting an additional target that supplements current resource productivity, namely, (i) resource productivity excluding the input of earth and rock resources. The target figure is about ¥770,000 per ton in FY 2015, which corresponds to 30% improvement compared to approximately ¥590,000 per ton in FY 2000.

In order for the indicator to measure (ii) coordination with efforts directed towards a low-carbon society, a target for emission reduction measures in the waste sector was set in line with the revised Kyoto Protocol Target Achievement Plan : a reduction of 7.8 million tons of CO2 by FY 2010. In the future, it would be desirable that a target be set for net greenhouse gas emissions from the waste sector (calculated by subtracting greenhouse gas emissions derived from fossil fuels for which waste power generation and wastes recycled as fuels or raw materials is to be substituted). However, since there is no internationally recognized and agreed common method of calculation available, including that for sector-specific distribution, Japan will just collate this data for the time being.

The Second Fundamental Plan also introduced the following indicators to monitor changes for use as reference indicators for future policy implementation.

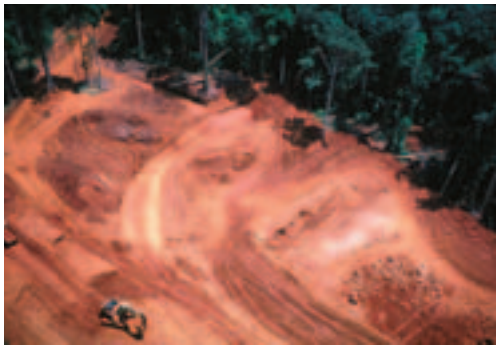
One of these indicators is the resource productivity of fossil resources. This is a noteworthy indicator from the viewpoint of anti-global warming measures, considering that fossil resources are exhaustible and therefore need to be used efficiently.

Total material requirement (TMR), or the hidden flow, was included as an additional indicator to help increase awareness of global environmental problems. TMR includes hidden flows such as materials that are extracted in conjunction with target resources during resource extraction and are then removed as waste. TMR is considered as a quantitative measure of the sustainability of resource use and the global environmental burdens derived from resource

use. Reducing new resource extraction from nature and promoting cyclical use of metallic resources will help reduce the domestic and overseas environmental burdens caused by resource use in Japan. This indicator can also be used to evaluate progress in the recycling of rare resources (difficult to measure simply by weight). An example of TMR measurement can be seen with regard to imported metallic resources, which are closely related to 3R measures. Estimates show that the TMR associated with Japan's imports of metallic resources is approximately 2.1 billion tons, which is 21 times the amount of actual pure metal imported (about 0.1 billion tons).

When measuring TMR, accurate information needs to be gathered on the grade of ore collected from each mine for the extraction of metallic resources. However, since Japan imports most of the metallic resources in demand, it is not very easy for Japan to gather accurate information on ore grades and so on from overseas mines. Therefore, those who make use of this indicator must be aware that a significant proportion of all the source data are just estimates. Another point that should be taken into consideration is that the value of TMR is not a direct representation of the impact on environmental destruction. There are initiatives underway to minimize environmental burdens by planting trees in order to restore the modified environment after resource extraction.

Securing a stable supply of metallic resources from overseas is vital for Japan. However, overseas mines are experiencing degradation in ore grades and the deepening of ore deposits, and these trends can have an impact on TMR values. To address such changes, Japan should continue collecting and accumulating data at the global level.



[An example of resource extraction with a high impact on the environment]

[An example of resource extraction followed by afforestation]

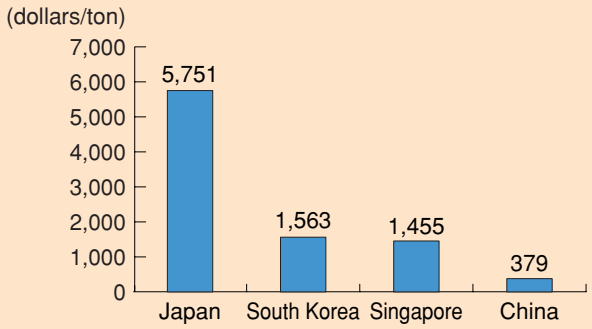
Source : Masatsugu Taniguchi, United Nations University

For resource productivity purposes, the government has decided to keep track of not only nationwide indicators but also industry-specific resource productivity. This focuses on resource-intensive goods and services in order to obtain estimates for each industry sector, and allows a more accurate analysis of the factors affecting change. In the future, it is hoped that industry-specific resource productivity will be measured in many countries so that international comparisons can be made of the effectiveness of resource use.

The Second Fundamental Plan also identified various issues that need to be examined further.

One of these issues is the development of material flow indicators that allow international comparisons to be made so that Japanese data can be compared with those of other developed countries and other Asian countries. This requires the establishment of common calculation methods and the construction of relevant databases. With this in mind, Japan will make a proactive contribution to the international accumulation of knowledge. In particular, Japan will assist Asian countries in collecting and organizing statistics on resource productivity, the cyclical use rate, and the final disposal amount (Figure4-1-15).

Figure 4-1-15 Resource productivity in Asian countries (2004)



※1 : Natural resource input does not include nonmetallic minerals.
※2 : GDP data are real GDP figures based on purchasing power parity in 2000, cited from the "World Development Indicator" of the World Bank
Source : Created by the Ministry of the Environment, mainly based on UN statistics

On the other hand, there is also a concept called environmental efficiency, which measures the relative efficiency between environmental burdens and the added value of goods and services by using the corporate or product value instead of GDP, and by using environmental burdens instead of resource consumption, such as natural resources input. Using this concept, the government will be able to collect and analyze the information needed for the quantitative assessment and evaluation of environmental burdens associated with resource extraction and the use of resources and products, and will create inventories relevant to the calculation of these environmental burdens. In particular, the government will seriously consider promoting joint research projects between Japanese research institutes and between Japanese and foreign research institutes or international organizations.

In the case of conversion factors that involve statistical imperfections or a lack of international consensus, the government will continue to contribute to discussions in the OECD and the UNEP directed towards the definition of internationally shared conversion factors and will make good use of the results.

B. Effort indices

When establishing a SMC Society, it is essential that not only the government but also all the entities concerned play their respective parts. Unlike the material flow indicators, which are designed to measure the entire country's progress in creating a SMC Society, the effort indices deal with measures taken by the entities concerned in order to establish a SMC Society. These

indices are used to set targets for the activities of these parties and to help expedite their activities. By making it possible to carry out quantitative assessment and evaluation, these indices also help achieve a SMC Society.

The effort indices need to be flexibly modified and expanded in accordance with the results of annual reviews and analyses, in order to ensure that activities carried out by individual entities contribute to steady progress, overall. Given the possibility that new and more ambitious indices may be developed at the local and regional level, these effort indices are also expected to serve as a reference point when setting regional targets.

(An excerpt from "Effort indices" in Chapter 2, Section 2 of the Second Fundamental Plan)

1 Indicators for target setting

(1) Reduction of waste

a. Reduction of municipal solid waste

(a) The target for both the public and enterprises is a reduction of approximately 10% from the FY 2000 level in the effort index of per capita daily waste generation (calculated from the amount of municipal solid waste as the sum of the wastes collected through scheduled collection and group collection and the wastes carried in).

The target set by the First Fundamental Plan concerning both per capita daily residential waste generation and per capita daily commercial waste generation was a reduction of approximately 20% from the FY 2000 levels. This was a target that could be achieved by reducing waste generation and fostering cooperation on sorting and resource collection.

In addition to the indices used to evaluate cooperation on sorting and other efforts directed towards resource recovery, which followed on from the previous plan, the Second Fundamental Plan also defined targets directly concerning the reduction of waste generation. These indices are related to the "Reduce" component of the 3Rs, and the restriction of waste generation. It is hoped that efforts to "Reduce" (the most important factor in establishing a SMC Society) will be enhanced, as a result.

(An excerpt from "Effort indices" in Chapter 2, Section 2 of the Second Fundamental Plan)

2 Indicators used to monitor changes

(2) Rate of refusal of free plastic shopping bags (rate of shoppers bringing their own shopping bags) ; volume of sales of disposable products (imported disposable wooden chopsticks)

As indices of the public's efforts to reduce waste, the government will monitor the rate of refusal of free plastic shopping bags (rate of shoppers bringing their own shopping bags) and the volume of sales of disposable products (imported disposable wooden chopsticks).

As indices of the public' efforts to reduce waste, the government will measure the rate of refusal of free plastic shopping bags (rate of shoppers bringing their own shopping bags) and the volume of sales of disposable products (imported disposable wooden chopsticks).

It is essential that the government assesses and examines certain factors in detail for each type of product used by people in their everyday lives. This includes reductions in usage, the

amount reused, and environmental burdens throughout the life cycle of a product (life cycle assessment (LCA)), from resource extraction through to disposal.

(An excerpt from "Effort indices" in Chapter 3, Section 2 of the Second Fundamental Plan)

2 Indicators to monitor changes

(6) Percentage of local governments charging for garbage collection ; municipalities most active in promoting waste reduction

As indices of local governments' efforts to reduce waste, the government will monitor the percentage of local governments charging for garbage collection and identify those municipalities which are most active in promoting waste reduction.

As indices of local governments' efforts to reduce waste, the government will measure the percentage of local governments charging for garbage collection and identify those municipalities which are most active in promoting waste reduction.

Since local governments play a key role in establishing a SMC Society, the government will use a broad range of indices to monitor changes and keep track of their activities. This will include those municipalities which are most active in promoting recycling, and the number of recycling centers and other resource recovery facilities.

Section 2
HISTORY OF JAPAN'S SOUND MATERIAL-CYCLE SOCIETY

History shows that Japan did once successfully create a society in harmony with nature, as did other countries and regions, based on "*mottainai*," the spirit of avoiding being wasteful with goods and a desire to keep things clean. This white paper calls this the primitive sound material-cycle (SMC) society and examines it in detail.

This chapter looks back on the Edo and later eras to analyze what kinds of systems Japan formed as part of this primitive SMC Society. In the Edo era, there were systems that are still applicable to modern society and can still serve as useful models for certain countries today.

The later part of the chapter describes Japan's 21st century path to a new SMC Society, while looking back over how Japan has, since the Meiji era, moved towards a mass-production and mass-consumption society in order to achieve economic growth.

1 The Edo era and its systems for a sustainable society

It is believed that, in the Edo era, Japan had a SMC Society driven mainly by community activities. Compared with the modern world, people in those days were engaged in social activities involving lower carbon emissions and they lived their lives with a deeper awareness of being in harmony with nature. Evidence from this period strongly suggests that a sustainable society can be established through the comprehensive promotion of a low-carbon society, a society in harmony with nature and a sound material-cycle society.

(1) Edo's sanitary material-cycle system

The city of Edo is believed to have been more sanitary than any other city in the world at that time in history. This is because its social system was centered on rice-growing and all organic matter such as night soil and kitchen garbage was recycled as fertilizer and returned to the soil in rural villages so that it never remained in urban areas. Modern European cities failed to take such effective measures to dispose of night soil and, consequently, infectious diseases like the plague and cholera became rampant. In Japan, such diseases were relatively rare because night soil, which could potentially transmit pathogens, was made good use of and never left uncontrolled and unattended.

The concept of "SMC blocks," spelled out in the new Fundamental Plan for the Establishing a SMC Society, emphasizes the significance of forming a material cycle of optimal size, in accordance with the regional characteristics and properties of circulative resources (CRs). In light of this, the following sections outline how Edo successfully created a SMC Society, establishing regional SMC blocks based on the characteristics of the communities and products

involved.

A. Establishment of SMC blocks that take advantage of the characteristics of the communities and products involved

People in the Edo era considered it important to make the most of the characteristics of their local communities and products. For example, they used the expression "*sanri shiho*," which means that you can stay healthy and live longer if you eat vegetables grown within a radius of three ri (approximately 12 kilometers). There seems to be some variation in the travel distances cited for vegetables, as demonstrated by similar expressions such as "*shiri shiho*" (within a radius of four ri) and "*gori shiho*" (five *ri*) in other regions. However, these expressions all stress the importance placed on the characteristics of local communities and products. This concept has been passed down over generations and still exists in the modern expression of "local production for local consumption."

In the Edo era, night soil and ash from urban areas were effectively used to fertilize the soil in farmland and to grow vegetables. These wastes were not only accepted by farmers but also traded and bartered for money or vegetables. As well as helping suburban farmers fertilize their farm soil, such practices even fostered the development of SMC blocks between cities and the surrounding farm villages, contributing to both the farmers' economic self-reliance and to urban development. This was a good example of a virtuous circle for both the economy and the environment.

[A farmer carrying night soil buckets]
Source : Yowatari Fuzoku Zue (Collected Genre Paintings of the World)

B. SMC blocks, as demonstrated by the use of night soil as a fertilizer for rice and vegetable cultivation

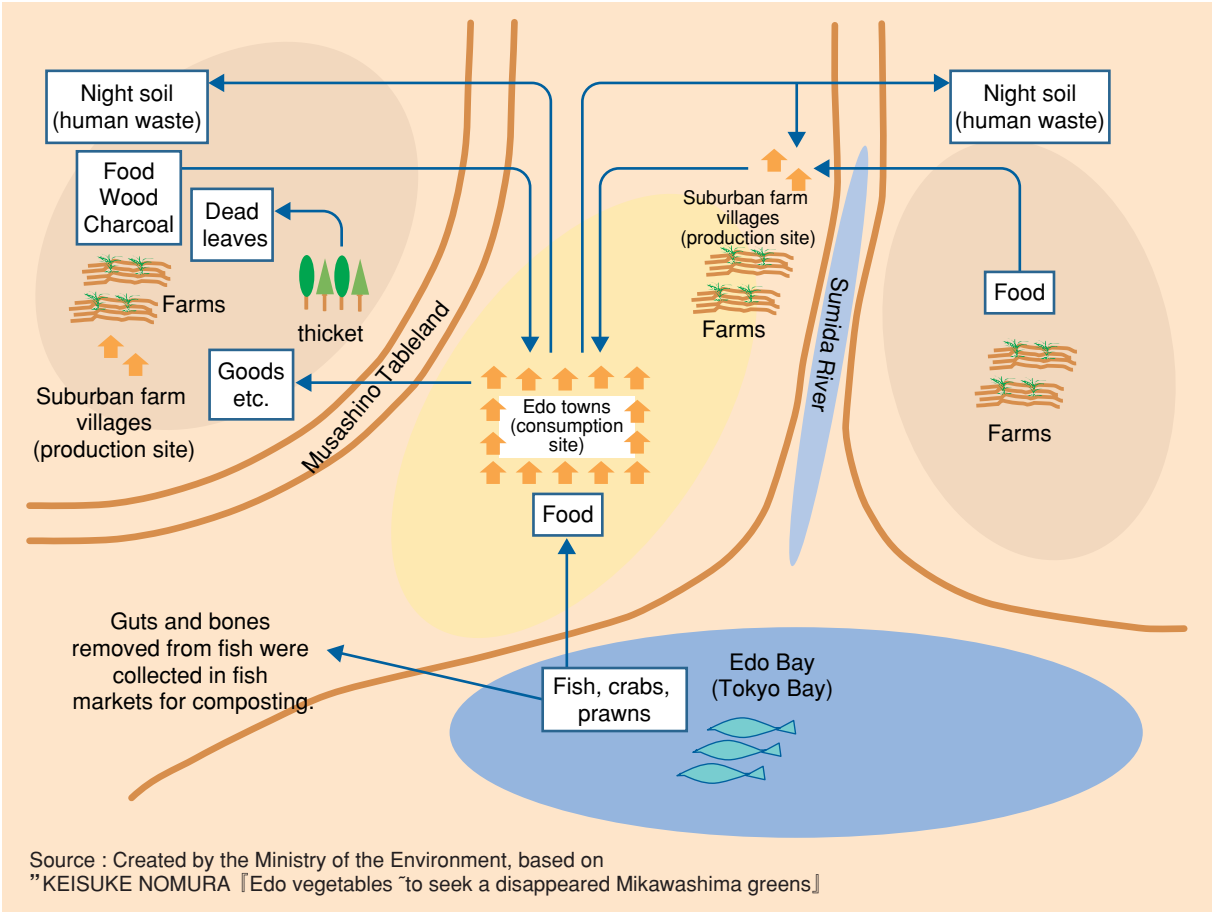
Since rice production capacity was the key to political power in the Edo era, the shogunate government and domain governments considered the implementation of measures to develop new fields and improve rice production capacity a high-priority policy.

As a result, the cultivated area for rice increased from about 1.6 million hectares in the Keicho period (1596-1614) to about 3 million hectares in the Kyoho period (1716-1735). This means that an 80% increase in production area was achieved in about a century. Over the same period, the accumulation of experience and new technologies also contributed to improvements in rice productivity. For example, *Nogyo Zensho* (Encyclopedia of Agriculture, Yasusada Miyazaki,

1696), a leading agricultural book in the Edo era, includes descriptions of advances in fertilizer research : "There is an urgent need to put night soil on infertile land. Farmers must build a shack to store night soil. This should be used to store everything from rotten food to kitchen wastewater and bathing wastewater, and to fully ferment them for use as fertilizer. Cattle and horse feces should be stored in layers. Pile them up if you have too much. There are many kinds of fertilizers. Good fertilizers can be made by mixing night soil with oilcake, dried sardines and residues from whale processing." Other technologies developed in this era included the use of water wheels to pump irrigation water and sluices and dikes for stream management.

Such advances in agriculture were, in fact, closely related to the issue of how to secure adequate amounts of fertilizer for use on the fields. One solution to this was allowing large amounts of night soil and ash, generated in urban areas, to be effectively used in surrounding farm villages as fertilizer. As mentioned earlier, during the Edo era, a material cycle existed so that farmers could obtain the valuable urban night soil and ash, spread it on their fields as fertilizer, then grow rice and vegetables which provided food for the people in the city of Edo. Urban communities promoted a material cycle in which both they and the rural villages each played their respective roles and maintained relatively high sanitary levels as a result. Night soil (human waste) was even a source of financial gain for urban citizens (Figure4-2-1).

Figure 4-2-1 Night soil use



Source : Created by the Ministry of the Environment, based on
"KEISUKE NOMURA『Edo vegetables ~to seek a disappeared Mikawashima greens』

Night soil remained a valuable organic resource throughout the Edo era. Night soil produced in the city of Edo, a megalopolis with an estimated population of 1 million, was transported to suburban farms and stored in special night soil reservoirs. These night soil reservoirs made use of the heat generated by fermentation to sanitize the night soil and produce good quality manure which was then used for suburban vegetable farming.

Toilets in the Edo era (called *koka* in Edo and *secchin* in the Kamigata region, including Kyoto and Osaka) were usually shared between several families in cities, where terrace houses called *nagaya* were common. Toilets were designed so that night soil could be easily collected from them.

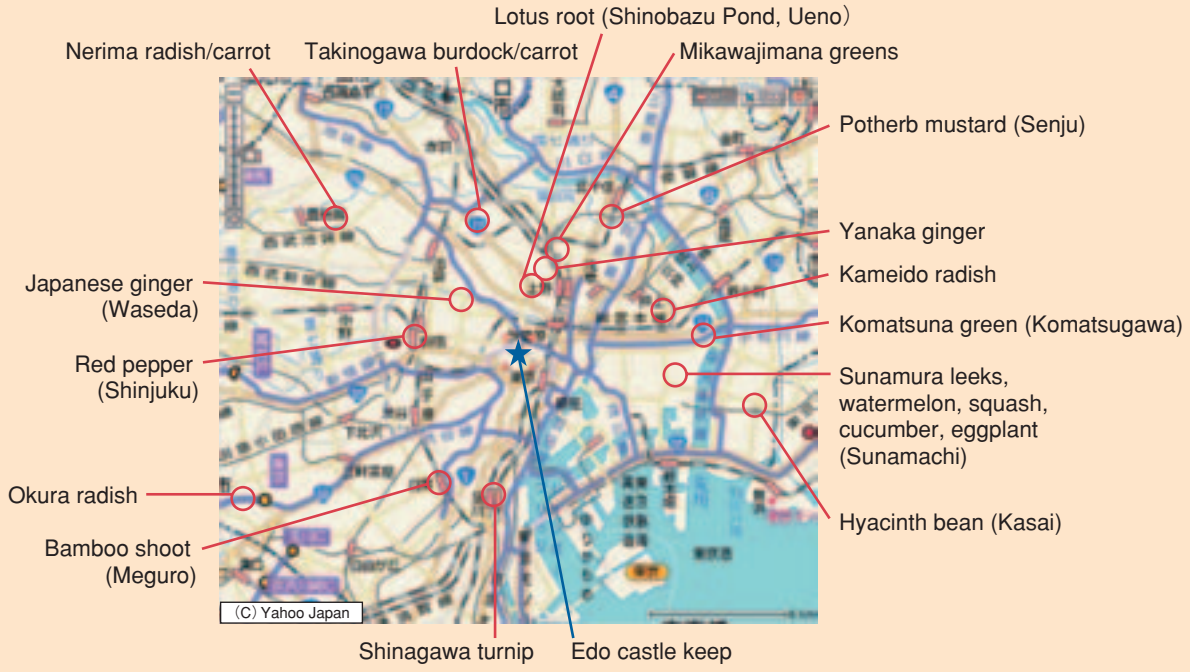
To ensure an adequate supply of night soil for manure production, farmers in the suburbs of Edo contracted with the owners of samurai residences and nagaya houses in order to obtain the rights to collect night soil in exchange for money or goods. In the mid-Edo era, brokerage groups emerged to arrange night soil trading between urban citizens and farmers, boosting night soil use. The late Edo era even saw instances of farmers in Tokyo suburbs facing serious financial difficulties due to increasing night soil prices, and petitioning the shogunate government. This shows just how important the use of urban night soil for fertilizer production was for farmers.

Large amounts of ash were also produced during the Edo period because people used wood for cooking. This ash was also used as fertilizer by local farmers. Urban citizens accumulated their domestic ash, which was then collected by ash brokers who sold it on to farmers for use as fertilizer. Although ash had many other uses, it is a good example of CRs that were circulated between cities and rural villages.

[Cooking stoves in Edo]
Source : Ehon Edo Murasaki (Illustrated Book 'Edo Violet')

Many local products and specialties emerged during the Edo era. Vegetables were cultivated in and around Edo as local specialties. Nerima radish, Komatsuna greens (produced around Komatsugawa) and Takinogawa burdocks are examples of “Edo vegetables” which satisfied the appetite of Edo people in terms of both quality and quantity. The ability to produce large amounts of this sort of local produce was a major benefit resulting from the effective use of night soil as fertilizer (Figure4-2-2).

Figure 4-2-2 Edo vegetable-producing districts



Source : Ministry of the Environment

Column

Safe and sanitary night soil reservoirs in Japan

Rice cultivation was introduced to Japan from China during the Yayoi era. Initially, cultivation technologies were developed under the technical guidance of settlers from the Korean Peninsula. However, original irrigation technologies and farming methods, more suitable for the climate and the natural features of Japan, were also developed by the Japanese people themselves. In the early years of rice cultivation, fertilizer was available in the form of young leaves and weeds or ash from slash-and-burn agriculture. As the population grew and paddy fields expanded, farmers began using cow and horse manure. Later, when the double-cropping of rice and wheat began, during the Heian era, people also began using night soil as fertilizer.

However, there is a problem associated with handling night soil in that it can harm the living environment and has a bad odor if left untreated. If any live pathogenic bacteria or parasitic worm eggs are present, night soil can even spread infectious diseases. Another problem is that, if used as fertilizer without any treatment first, night soil may damage plant roots because it generates heat and releases hazardous gases such as ammonia during decomposition.

Hence, before being used as a fertilizer, night soil needs to be chemically or biochemically stabilized in order to prevent decomposition and it must be processed to ensure sanitary safety and prevent infectious diseases spreading throughout society. The key question here is how people, long ago,

were able to stabilize night soil and make it safe to use.
The answer is the night soil reservoir. Night soil reservoirs are facilities to ferment night soil and convert it into fertilizer. These facilities could be as simple as a hole dug beside a field and covered with a lid.
Farmers mixed rice straw into the night soil inside the reservoir. When night soil, which is a mixture of carbohydrate, fat, nitrogen compounds and many other organic substances, is stored in an airtight chamber with the lid closed (under anaerobic conditions) and with rice straw added, it then decomposes into substances with a relatively simple structure (such as organic acids, fatty acids and amino acids) as a result of the metabolic activities of various anaerobic bacteria. Subsequently, methane bacteria then generate gases such as carbon dioxide, methane, hydrogen, nitrogen, ammonia and hydrogen sulfide. Eventually, night soil is stabilized and rendered free of almost all roundworms, which are killed by the heat generated during the fermentation process.
In the Edo era, the shogunate government ordered all citizens to install a large cesspool with each toilet, in order to efficiently store all night soil. This led to the installation of cesspools in rural and urban houses alike. The night soil stored in these tanks underwent partial anaerobic decomposition before being collected and transported to suburban farms by boat or by horse or ox-drawn wagons. This night soil was then stored in night soil reservoirs for stabilization and sanitation before being spread on the fields as fertilizer.
During the Edo era, Japan therefore had a true SMC Society in which night soil was sanitarily treated for effective use without affecting the living environment, thereby making the best possible
use of the limited resources available. People today, who no longer make use of night soil, can learn a great deal from the sanitary recycling of night soil in the Edo era. It is important that Japan should share the benefits of its experience with developing countries, especially from the perspective of hygiene education and village development.

[Sanitary use of the night soil reservoir]
Source: Ministry of the Environment

Column

Night soil prices

In the Edo era, a price was placed on night soil for trading purposes, and these prices varied depending on the person's class in society. Since the nitrogen and phosphorus contents were an essential determinant of fertilizer quality, it is believed that the value placed on night soil as a fertilizer was determined by the person's diet.
An analysis of night soil in the early Showa period (performed by Dr. Kerner, professor of the School of Agriculture and Forestry (now the Faculty of Agriculture, the University of Tokyo)) shows that the nitrogen and phosphoric acid contents of night soil differed between people with different jobs, such as farmers and soldiers.

Composition of night soil (%)

Contents \ Class	Farmer	Tokyo citizen	Middle class gov. official	Military person
Water	95.4	95.4	94.5	94.6
Organic matter	3.03	3.18	3.89	4.07
Nitrogen	0.55	0.59	0.57	0.80
Phosphoric acid	0.12	0.13	0.15	0.30
Potassium	0.30	0.29	0.24	0.21
Soda	0.51	0.41	0.45	0.26
Lime	0.01	0.02	0.02	0.03
Magnesium	0.03	0.05	0.06	0.05
Sulfuric acid	0.07	0.04	0.05	0.07
Chlorine	0.70	0.55	0.61	0.51
Silicic acid & sand	0.04	0.10	0.11	0.04
Iron oxide & aluminite	0.03	0.02	0.06	0.06

Source : Kazue Kurokawa, "A Study of Soil Fertilizers since the Meiji Era in Japan"

C SMC blocks, according to regional characteristics

Efforts to create a SMC in accordance with regional characteristics were also observed in regions outside Edo. In the Kamigata region, including Osaka and Kyoto, night soil was also utilized and fostered the formation of intraregional material cycles well-suited to regional characteristics. For example, farmers in Settsu and Kawachi contracted with urban dwellers in Osaka in order to collect night soil for use as fertilizer. Another example of the utilization of night soil was found in the domain of Kaga (governed by the Maeda clan).

As shown by these selected cases, SMC blocks were established in many parts of Japan in a way that took full advantage of regional characteristics.

Column

"*Kudaranai*" and SMC blocks for local production for local consumption

Compared with high-grade sake transported from the Kamigata region, local sake in Edo was cheaper and therefore called "*kudaranai*" sake, literally meaning sake not brought down from Kamigata. Some believe that the expression "*kudaranai*" in the modern Japanese language, meaning worthless, is derived from this.

However, this word also demonstrates that products from Kamigata had become easily available in Edo as a result of economic growth in areas around Edo. The fact that the word *kudaranai* and economic growth, two seemingly opposite elements, were actually more like two sides of the same coin suggests that things regarded as *kudaranai* today may have a more complex background than first thought and could actually be of some use.

(2) Systems for appropriate waste disposal

A typical example of waste disposal in the Edo era, and one that may still be applicable to today's society, is the system by which government-authorized contractors collected waste and carried it to final disposal sites in order to ensure its appropriate disposal. Establishing such a system for the correct disposal of waste is a necessary prerequisite to forming a SMC.

A. Edo's waste disposal system

The initial waste disposal method used in Edo was the dumping of waste within the grounds of each residence or in empty lots, rivers and moats. Another dumpsite was a place called the "*kaisho-chi*," which was a vacant lot that each district of Edo had at its center and which was used partly as a dumpsite. However, dumping in these places had harmful effects, such as obstructing roads, waterways and firebreaks and bothering neighbors with bad odors, mosquitoes and flies.

In light of this unsatisfactory situation, the magistrate's office issued an official town notice banning the dumping of waste in *kaisho-chi* in 1649 and designated a place named Fukagawa Eitaiura as a dumpsite in 1655. In 1662, disposal companies were designated, leading to the establishment of a mechanism in which wastes were gathered in designated places ready for disposal by these disposal companies. As a result of these efforts, the three key processes involved in waste management, namely collection, transport and disposal, were all successfully organized in Edo .

[Collection and transport in Edo]
Source : Yowatari Fuzoku Zue (Collected Genre Paintings of the World)

Policies such as these were adapted to people's real lives at the time they were implemented. The town magistrate sometimes even consulted members of the public over the acceptability of an ordinance before issuing it. Edo citizens are said to have been very good at integrating government ordinances into their daily lives. This sort of "community wisdom" probably contributed to Edo's success in establishing an effective waste disposal system at such an early date.

There were also many ordinances banning the dumping of waste in non-designated areas. By about 1699, ordinances were in place that banned the dumping of waste in rivers and required disposal companies to carry waste to disposal sites in an appropriate manner. Edo already had a responsible waste disposal mechanism that somewhat resembles today's measures used to prevent illegal dumping.

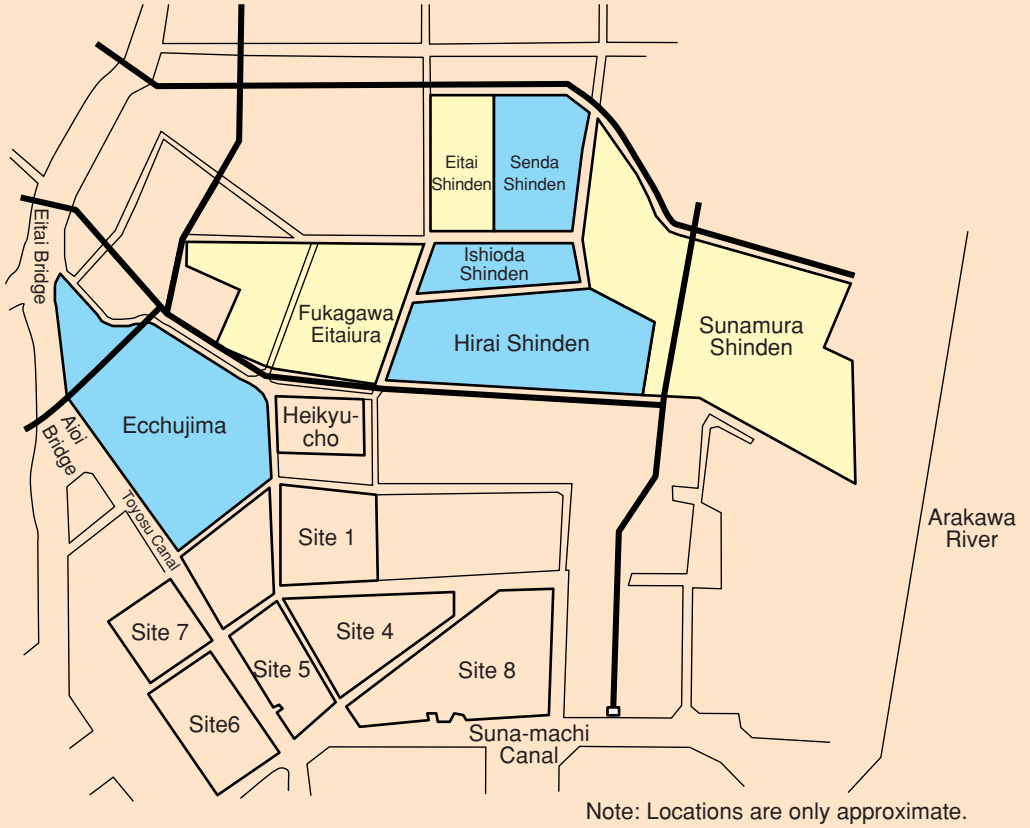
B. Development of new agricultural land

The wastes carried to Eitaiura for final disposal were primarily household kitchen garbage and soil combined with the rubble removed from fire sites, all of which decomposed naturally in about a year. Since Eitaiura was originally a wetland, rubble and soil dumped there as waste eventually formed new land. The shogunate government, which was developing new farmland, found this reclaimed landfill site valuable and used it for agriculture.

Records show that, starting with the reclamation project in Fukagawa Eitaiura, the government reclaimed at least 10 sites, including Eitaijima Shinden and Sunamura Shinden (49.5 hectares), during the Edo era.

By the late 18th century, over 380,000 tsubo (approximately 1,254,000 square meters) of land had been reclaimed (Figure4-2-3).

Figure 4-2-3 Major landfill sites in the Edo



Note: Locations are only approximate.

Name	Current place name	Landfill period		Size of landfill	Notes
		Start	End		
Fukagawa Eitaiura	Around Tomioka, Fuyuki and Kiba, Koto Ward	Nov. 25, 1655	1724		Became the property of the shogunate in Dec. 1733.
Eitai Shinden (Eitaijima Shinden)	Around Ishijima and Sengoku, Koto Ward	Jun. 30, 1681	July 1730		
Sunamura Shinden	Around Minami-suna, Koto Ward	Jun. 30, 1681		495,900m^2	
Senda Shinden (Juman-tsubo Tsukiji)	Around Senda, Sen-goku and Kaihin, Koto Ward	1704	1711	330,600m^2	Became the property of the shogunate in Dec. 1733.
Ishioda Shinden (Rokuman-tsubo Tsukiji)	Around Toyo, Koto Ward	1725		198,360m^2	Same as above
Hirai Shinden	Around Toyo and Minamisuna, Koto Ward				
Fukagawa Ecchujima	Around Ecchujima, Botan and Furu-ishiba, Koto Ward	1730		495,900m^2	

Source : Created by Ministry of the Environment, based on “Tokyo Seiso Jigyo Hyakunen Shi”

Column

The Edo era and people's own efforts

People in the Edo era used their goods with care, in keeping with the spirit of *mottainai*. This is something that modern society can use as a guide in promoting new initiatives to establish a SMC. For example, as many as 1,000 organizations were engaged in recycling in the city of Edo and there were activities aimed at creating a SMC in all four classes of the population : warriors, farmers, artisans and tradesmen.

The expression "*shisso kenyaku*" (living a simple and frugal life), which also symbolizes the life of samurai, reflects the samurai's lifestyle of not wasting things. *Keizai Zuihitsu* (An Essay on Economy), a book describing the rules of the samurai lifestyle in those days, introduces tips on how to practice *mottainai* : "When buying clothes, buy those with the same pattern for all family members so that they may later be used for patching each other's clothes" ; "Waste threads can be used as a wick".

[Used clothes store]
Source : Edo Shokunin Uta-awase (Edo Artisan Poetry Contest)

One piece of literature that describes how samurai and their rulers fostered the *mottainai* spirit is Seiryoki, written by a medieval general in the Iyo-Uwajima region. This book explains how people in his fief made effective use of night soil.
Even castles were built in keeping with the *mottainai* spirit. The Hikone Castle used some recycled construction materials for the castle keep, turret and walls. Castles like this are well-preserved and still exist today.

Since farmers in those times mostly cultivated rice, they used many common tools derived from rice cultivation. For example, rice straw left behind after harvest (and still used as fertilizer and feed today), was a necessity in every aspect of life, including food, clothing and shelter. This straw had many uses. It was used to make clothing, such as woven hats, rain capes and *zori* sandals. It was used to make rice bags, fermentation packets for *natto* (fermented soybeans), and for livestock feed. It was also used for shelter, providing roofing and mats, as well as handicrafts to decorate the house for the New Year. Even when these household goods made from rice straw were no longer useful and were discarded, farmers still gathered them up and used them as fertilizer.

[Waraji sandals dumped at the roadside]
Source : Edo Meisho Zue (An Illustrated Book of the Sights of Edo)

Artisans and tradesmen also worked in a way that saved resources.

The industrial products in the Edo era were all made manually by artisans. This manufacturing process, although requiring a great deal of time and labor, minimized the wastage of resources. For example, in the color plate-making and printing processes used to create *nishikie* colored woodprints, the surface of each used wood-block was shaved flat so that it could be reused. Artisans making metal products used iron scrap as a raw material because, in those days, the process of refining metals from ores required advanced technology and much energy.
Many tradesmen in the Edo era were engaged in businesses corresponding to today's reuse and repair

industries. For example, as "artisan-tradesmen," they ran shops to repair broken bowls and other kinds of china (by gluing the pieces back together), pans and pots, wooden tubs and barrels (by rebinding them with new hoops), umbrellas and paper lanterns (by re-covering them). In addition, most kimonos, shoes and other sundry items were also reused. Tradesmen such as these are believed to have gone from door to door looking for business and are thought to have played an important role in supporting Edo's SMC. Furoshiki, the cloth wrappers that these peddlers used for carrying goods, have found new roles in today's modern Japan and are commonly used in many different ways .

[Edo artisans]
Source : Hokusai Manga (Sketches by Hokusai)

Other tradesmen specialized in purchasing used metal products. They bought every kind of iron product, including old kitchen knives and pans that were no longer useful, and other metal products made of copper, brass and so forth in order to recycle them as raw materials. Ash from cooking stoves was collected by "ash men" for use as potash fertilizer by farmers (see Section 1. (1). B) as well as for papermaking, dyeing and many other useful purposes. Haiya Joeki, a wealthy merchant and a well-known man of culture in the Edo era (and the person on whom the leading character in the novel *Koshoku Ichidai Otoko*, written by Ihara Saikaku is thought to be based), was engaged in the ash recycling business. "Haiya," which literally means "the ash store," was his popular name. In the Edo era, ash from cooking stoves was collected in order to produce fertilizer or for use in indigo dyeing, sake brewing and papermaking. This shows that recycling activities had developed much momentum in these fields.

The book rental business also boomed during this period. Records from 1808 indicate that book rental shops formed regional groups (*kumi* or *gumi*) and that Edo had 12 such groups, including Nihonbashi Minami-gumi, Honmachi-gumi, and Kanda-gumi, consisting of approximately 650 members in total. Osaka also had about 300 people running book rental shops. A document titled *Edo Hanjoki* (A Sketch of Edo's Prosperity), written in the 1830s, states that there were 800 book rental shops in Edo, indicating the popularity of this business. A typical shop had a clientele of 170-180 households and Edo, alone, is assumed to have had as many as 100,000 readers of rented books.

Some other examples of cooperation and collaboration are found in the *nagaya* terrace houses in Edo, which, although small in size, were the focus of ordinary people's daily lives. For instance, each *nagaya* building had a shared well (*ido*), which was a key area for the residents. As represented by the word "*idobata*" (well-side), the residents gathered around the well to carry out kitchen chores. *Nagaya* also had a shared dumpsite and shared toilets (mentioned earlier) that were jointly maintained by the residents. Another example, this time in the field of child education, is that textbooks for the students of *terakoya* private elementary schools were shared among siblings and relatives, with some books used for over 100 years as they were passed on from one child to the next.

[Umbrella-covering artisan]
Source : Wakoku Shoshoku Ezukushi (A Book of Drawings of Japanese Artisans)

2 Japan's history of responsible disposal of waste, from the Meiji to Heisei eras

This section provides an overview of the history of Japan's responsible waste disposal activities, from the Meiji to Heisei eras(Figure4-2-4).

Figure 4-2-4 Japan's history of appropriate waste disposal

Legislation and policy formulation	Organizational change	Changes in systems and technology	Per capita GDP (in US dollars)	
1954 Public Cleansing Law			1960	477
1967 Basic Law for Environmental Pollution Control				
1970 Waste Management Law	1971 Environment Agency established	(1970) Improvement in hygiene	1970	1,963
1976 Amended Waste Management Law		(1980) Measures against hazardous substances	1980	9,170
		(1990) Recycling	1985	11,381
1991 Amended Waste Management Law			1990	24,815
1995 Containers and Packaging Recycling Law			1995	41,952
2000 Fundamental Law for Establishing a SMC Society	2001 Ministry of the Environment established (waste management administration transferred from Ministry of Health and Welfare)	(2000) 3Rs	2000	36,790
2003 1st Fundamental Plan for Establishing a SMC Society			2005	35,675
2008 2nd Fundamental Plan for Establishing a SMC Society				

Source：Ministry of the Environment

(1) From the Meiji to early Showa eras

As Japan entered the Meiji era, with large-scale industries and urban areas starting to develop, the government clarified the methods of waste disposal to be used. Although waste disposal during this period was much the same as that in the Edo era, the *mottainai*-based lifestyle gradually changed as Western cultures were imported. People began throwing away goods that had once been effectively reused or recycled, resulting in an increase in both waste quality and quantity. It was about this time that the government began promoting the construction of large-scale waste disposal sites.

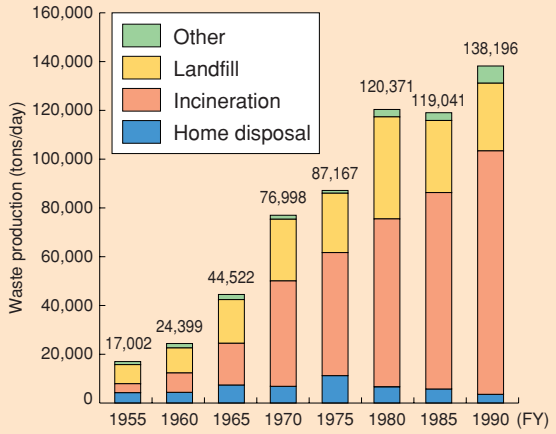
Also, as Japan's exchange with foreign countries increased, infectious diseases such as cholera and the plague were brought into Japan from overseas. The plague epidemic at the end of 1887 prompted the country to address the issue of waste and night soil disposal from the viewpoint of public hygiene. Consequently, the Unsanitary Substance Cleaning Law was instituted in 1900 in order to assign responsibility for waste disposal to municipal governments. In accordance with this law, the Tokyo City Government started collecting waste generated in central

Tokyo. Records show that the daily amount of waste produced in Tokyo was approximately 800 tons, which translates into a per capita amount of approximately 290 grams, given that the population at that time was about 2.75 million.

(2) The Post-World War II period (before the period of high economic growth)

After World War II, farmers stopped using night soil as fertilizer because of the widespread availability of chemical fertilizer and because of the major changes in farm villages triggered by the process of agrarian reform. With the loss of the traditional disposal methods, night soil disposal posed a problem. Waste disposal became another serious problem as the Japanese economy entered the postwar recovery period, accelerating urban development. In those times, waste and night soil were dumped in the ocean or in landfills. Many landfill sites were unsanitary and bred large numbers of mosquitoes and flies (Figures4-2-5).

Figure 4-2-5 Trends in waste disposal methods



(Note) The data for FY 1970 and before are total waste production in the special cleaning districts under the Public Cleaning Law. The FY 1975 data do not include waste directly brought in, such as waste associated with house-moving.
Source：Ministry of the Environment

Japan instituted the Public Cleansing Law in 1954. With the stipulated aim of improving public hygiene, this law was intended to enhance the waste disposal system by making the municipal governments responsible for providing sanitation services and defining disposal zones through the establishment of a special sanitation zone system. In other words, following on from the concept of the Unsanitary Substance Cleaning Law, this new law defined waste and night soil as “unsanitary substances” and sought to dispose of them for public hygiene reasons so that a sanitary and comfortable living environment could be maintained.

In the Showa 30s (1955-1964), the production of chemical fertilizer increased as the economy grew. The widespread availability of chemical fertilizer throughout Japan led to falling demand for night soil on farms, forcing municipal governments in urban areas to address the problem of developing new waste and night soil disposal technologies. This was a time of great difficulty for the municipal administration for waste management because major changes in both the quantity and quality of waste produced during this period of rapid economic growth distorted

the traditional frameworks that had previously been used for waste disposal.

In 1963, the government set up the First Five-Year Plan for Development of Living Environment Facilities, presenting the principles of its new urban waste disposal policy involving incineration, with residues disposed of in landfills. This prompted municipal governments in urban areas to construct incinerators. By defining incineration and residue landfill as the basic method for urban waste disposal, the government aimed to both stabilize waste in a sanitary manner and reduce the volume of waste.

Column

The history of composting

Since ancient times, Japanese farmers had been using waste as fertilizer, either incorporating kitchen garbage into the soil through plowing, for example, or distributing incineration ash over the fields. Even in the postwar era, urban waste was still used as fertilizer in rural farming villages until the Showa 30s (1955-1964) because only small amounts of plastic and metal were included in the waste in those days.

However, as more rapid changes occurred, such as the outgrowth of cities, the widespread use of chemical fertilizers, and the aging and exhaustion of farming villages, urban waste management reached a major turning point.

In Japan, a mountainous country with little spare land for landfill use and a climate often characterized by high temperature and high humidity, incineration became more common in the Showa 40s (1965-1974) for the sake of sanitation and to reduce the volume of waste. There was also a move by municipal governments towards the machine composting of kitchen garbage (a process also known as fast composting) so that the compost produced could again be used by rural farmers, as before. Many such composting facilities were built and operated by municipal governments in the Showa 40s to 50s (1965-1984).

However, composting projects involving urban waste, especially household waste, encountered several problems, as described below. As a result, no users could be found for the compost produced and it had to be eventually disposed of in landfills, forcing municipal governments to withdraw from those projects.

(i) Foreign substances

As living standards rapidly improved in the Showa 30s to 40s (1955-1974), consumers started to buy a wider variety of goods. This resulted in the inclusion of greater amounts of foreign substances in waste, such as glass from glass bottles, metals from cans, and plastics from containers and other sundry items. Since the idea of sorting wastes was not common in those days, compost made from waste inevitably contained foreign substances. Farmers noticed that a field fertilized with compost made from such waste glittered in the sunlight. As a result, farmers began to avoid using compost made from waste.

(ii) Odors

Since Japan has a hot, humid climate, kitchen garbage easily goes rotten. For this reason, composting requires that appropriate measures be taken to minimize odors. Since insufficient measures to control odors were taken at composting facilities during this era, local people often regarded these facilities as an annoyance.

(iii) Farmers' labor

The Showa 30s to 40s (1955-1974) was a period in which young workers moved from rural to urban areas, leaving behind an aging population of farmers. Although the farmers knew that organic fertilizer was needed for sustainable agriculture, they found it increasingly difficult to apply organic fertilizer because of the heavy workload required. Older farmers preferred to use chemical fertilizer because it

was then easier to distribute only those substances actually needed.
There has been little promotion of composting since then, except by certain municipalities in rural farming regions, but composting again began attracting attention in recent years as a means of biomass use. In 2000, the Food Waste Recycling Law was instituted and recycling targets were set. In 2007, this law was amended, mainly to define exceptions in those cases where "a recycling loop" is created by all parties concerned. Supported by these frameworks, new efforts towards composting have now been launched in many regions. While solving the problems described in (i) and (ii), above, these projects are also attempting to address the problem described in (iii) by establishing a face-to-face relationship with farmers in order to encourage collaboration.

(3) The post-high economic growth period

As its economy grew, Japan faced problems such as increases in the amounts of waste generated by business activities and the amount of water pollution caused by illegally dumped waste oil. During the so-called Pollution Diet session in 1970, the Public Cleansing Law was revised and renamed the Waste Management and Public Cleansing Law (Waste Management Law). This law defined the differences between municipal solid waste and industrial waste and, while holding municipal governments responsible for the disposal of municipal solid waste, as before, assigned the responsibility for the disposal of industrial waste to waste-generating businesses, based on the Polluter Pays Principle.

With respect to the disposal of hazardous industrial waste, particularly strict standards were imposed on the final disposal of sludge and slag containing mercury, cadmium and other harmful substances following the entry into effect of the Waste Management Law in 1971, aimed at safeguarding people's health.

Disposal facilities were also enhanced, following the institution of the Waste Management Law. On the other hand, negative effects of economic growth surfaced in connection with various waste disposal issues. One of these was the so-called Tokyo Waste War, a waste disposal dispute that started in 1971 between a municipal government and local residents over waste disposal. This became an issue of serious public concern. In those days, since the final disposal site within metropolitan Tokyo only had a limited incineration capacity, some domestic kitchen garbage was carried to a final disposal site in Koto Ward. Meanwhile, while Suginami Ward had a plan to build new incineration facilities in order to reduce the volume of waste, it could not implement this plan because of community objections against the construction project. The Suginami Ward Government had no other choice but to continue to carry waste to the final disposal site in Koto Ward. The Koto Ward Government, which regarded this act as forcing it to accept unwanted waste, began refusing to accept waste from Suginami Ward and this issue then developed into a serious public dispute. It is safe to say that this incident was the very first formative experience from which Japan leaned valuable lessons on how to select a site for waste disposal facilities and how to cope with local residents opposing the project.

After overcoming the first and second oil crises, Japan achieved a level of economic growth driven by many technological innovations, leading to the production and consumption of a wide variety of products. This also brought about changes in the composition of urban waste

and created concerns over the emission of hydrogen chloride and other hazardous substances from incinerators, an issue that attracted attention as an emerging environmental problem. This was the starting point for Japan's efforts to ensure that waste incineration facilities had adequate environmental conservation capability, including measures against dioxins. To address the problem of night soil disposal, an advanced system for sanitary night soil disposal was established for traditional Japanese vault toilets, while sewage systems and johkasoh were made widely available in order to meet the needs of flush toilets. In particular, as a result of technological advances, new johkasou were developed which were small enough to be installed in homes yet still had the same capability for high-quality treatment as public sewage systems. These tanks are now widely used.

Column

Introduction of sorted waste collection (Hiroshima City)

In the postwar high economic growth period, Hiroshima City experienced a sudden increase in waste generation, as did many other cities throughout Japan. In Hiroshima City, kitchen garbage, categorized as "Hiroshima garbage", was once used for fertilizing farmland in islands and other rural areas of the city. However, demand fell as chemical fertilizers came into general use. The existing waste disposal system was abolished in 1960. With no other place to go, most of the waste in the city was disposed of in landfills in the Showa 30s to 40s (1955-1974), but the city government increasingly found it more and more difficult to secure enough landfill sites. At Hesaka Junior High School, which was built on a former landfill site, there was even an incident in which methane erupted from the school yard.

In response, the Hiroshima City Government declared a state of waste disposal emergency in 1975 and urged the public to consider the waste disposal issue as their own problem. In an effort to reduce waste generation, in the following year (1976) the city introduced the sorted collection of waste for the first time in Japan. In this collection system, everyone was required to separate their own garbage into five categories : (i) combustible waste, (ii) non-combustible waste, (iii) recyclable waste, (iv) large-sized waste, and (v) hazardous waste. Although people were confused at the beginning, the new collection system gradually became established and has since come to be widely known throughout Japan as "the Hiroshima system". This has now become a landmark in the history of waste disposal and a pioneering example demonstrating that even a big city like Hiroshima can operate a sorted waste collection system by gaining the understanding and support of its citizens.

Column

The semi-aerobic landfill structure (the Fukuoka method)

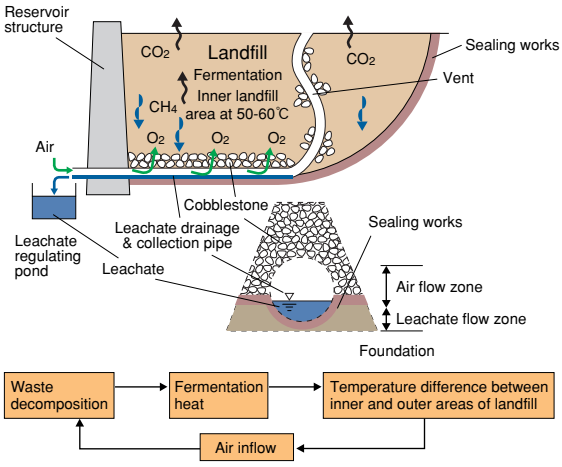
One of the landfill systems now used for final disposal sites is the semi-aerobic landfill structure (the Fukuoka method), which was first proposed in the second half of the Showa 40s (1970-1974) by Fukuoka University and the Fukuoka City Government. Because of its ease of construction and maintenance and its ability to quickly stabilize waste and improve the quality of the leachate, this landfill structure was adopted by the former Ministry of Welfare as the national standard and has been used by many municipal governments when constructing their landfill sites.

This structure uses large-diameter leachate collection and drainage pipes installed at the bottom of the landfill site in order to drain out the leachate and allow outside air to naturally flow into the inner landfill through these pipes via convection induced by the heat of waste decomposition. This design increases the decomposition capacity of the aerobic bacteria present and thereby improves the quality of the leachate. The ease of construction and maintenance is another advantage of this method, and

there is no need to mechanically pump air into the landfill.

Since the semi-aerobic landfill structure allows cheaper construction and faster waste stabilization than the anaerobic landfill system promoted in the West, and since it can even restrict methane generation, it has recently attracted the attention of many developing countries as a sustainable technology and a suitable technology with which to help prevent global warming.

Conceptual image of the semi-aerobic landfill structure



Source : Fukuoka University and Fukuoka City Government

Column

The hexavalent chromium problem and the amendment of the Waste Management Law

The Waste Management Law, enacted in 1970, provided a clear definition of industrial waste and positioned it within the legal framework. However, because of the lack of an appropriate mechanism to accurately keep track of activities concerning industrial waste disposal, the monitoring and directions provided by the authorities were incomplete, leading to problems such as the frequent occurrence of illegal dumping and other violations, along with failures by the waste-generating businesses in exercising their responsibility. In addition, as the shortage of final disposal sites worsened, a growing number of companies simply piled up their waste out in the open, within their factory premises.

In the summer of 1975, an inappropriate disposal site for slag containing hexavalent chromium was found at a Tokyo factory that manufactured hexavalent chromium compounds, such as bichromate of soda. Environmental pollution was also discovered in the area around this site, along with potential health hazards to local residents. This incident developed into an issue of major public concern since pollution from hexavalent chromium slag was identified in many other regions following this initial discovery.

In light of public concern over waste disposal problems, the government amended the Waste Management Law in 1976. This amendment was mainly aimed at tightening regulation and supervision in order to ensure responsible final disposal.

Specifically, these amendments included redefining final disposal sites as waste disposal facilities, instituting a registration system, and introducing prior assessments based on technical standards. To enforce appropriate outsourcing practices concerning waste disposal, the amended law set up standards for the outsourcing of disposal work and banned companies from subcontracting any disposal work they have undertaken to another company. To keep track of industrial waste disposal activities and provide appropriate supervision and instructions, the amended law obliged enterprises and disposal companies to create and maintain disposal records, and added provisions on restoration orders to be issued in the event of any incident harmful to the conservation of the living environment.

This hexavalent chromium problem awakened Japan to the need to take environmental effects into consideration when addressing the final disposal of any waste, including industrial waste. It was also the starting point for efforts that have since led to Japan's success in reducing the amount of waste disposed of in final landfill sites by about 70% since the 1990s.

Column

Past initiatives

Prompted by the oil crises in the 1970s, pioneering initiatives such as recycling were started in many parts of Japan.

(1) Urban-Rural Environmental Connections Plan (URECs Plan)

In 1980, Toyohashi City started mandating its residents to separate their household garbage into five categories in order to facilitate the effective use of waste. In the same year, the following five plants were built on a single site to enable the integrated treatment of waste : (i) a waste incineration plant, (ii) a composting plant, (iii) a sorting and crushing plant, (iv) a chicken feces drying plant, and (v) a night soil disposal plant. The heat generated from the incineration of combustible waste and residues from the composting plant was used for heating in an adjacent greenhouse complex and for generating electricity for the internal facilities. The overall plan also involved the production of compost from combustible waste and night soil disposal sludge for use by local farmers to fertilize their farmland.

However, the usage of plastic by local residents increased year after year, eventually making it impossible to produce good-quality compost from combustible waste. Although Toyohashi was therefore unable to accomplish the plan's original goals, its attempt to construct a mechanism in which urban waste is used on rural farms while the food produced in rural farms is supplied to urban communities, in return, had something in common with today's concept of constructing a recycling loop under the Food Waste Recycling Law, and can be regarded as a pioneering attempt to establish SMC blocks.

(2) Stardust 80 Plan

In 1973-1980, to cope with the problems of urban waste disposal and the exhaustion of natural resources, the then Agency of Industrial Science and Technology, part of the Ministry of International Trade and Industry, working in cooperation with the Yokohama City Government, constructed and operated a research/demonstration plant for a resource recycling system centered on material recovery. In this system, mixed waste was divided into three groups : (i) garbage, glass and rubble, (ii) paper, and (iii) plastic and metal, so that resources could be recovered from each group by using (i) fast composting equipment, (ii) purifying and pulping equipment, and (iii) thermal decomposition and gasification equipment. However, limitations in the capability of the machine sorting stage for mixed waste prevented the production of good-quality compost and pulp and increased costs. Although the system did not, therefore, come into general use, the project raised awareness of the importance of sorting by waste generators and contributed to the improvement of more appropriate technologies, including those for waste gasification.

(3) Vacuum transport system for waste

Garbage is usually collected by a sanitation truck, but this method involves problems such as foul odors and pests released from the exposed garbage, and the mess made on the streets. To counter such problems and to meet the growing needs of the public for a better living environment and amenities, some municipalities constructed a system that combined waste incineration facilities and vacuum transport pipelines for the waste.

This system provided benefits such as (i) allowing citizens to throw away garbage whenever they liked, (ii) preventing odors and therefore improving sanitation, (iii) not marring the street appearance, and (iv) requiring less labor for waste collection and transport. However, it also had disadvantages such as the need for huge initial investments, long transport distance, a lack of flexibility, and the fact that it made people less motivated to reduce waste because of the "invisibility" of the waste. This attempt served as an unsuccessful example from which the 21st century, "the century of the environment," can learn a great deal on how to plan and implement more eco-friendly approaches such as

reduced waste generation, sorted collection and recycling.

Although the above projects all had to be closed down without delivering as good a result as initially expected, Japan has leaned many lessons from them and has now developed new capabilities to convert its society into a SMC one.

(4) The Heisei period (from 1989 to the present)

A. Amendment of the Waste Management Law and related efforts

The Japanese economy continued to grow, even after the high-growth period, creating a society with a high degree of material affluence. On the other hand, the country underwent social changes that led to the increased adoption of a lifestyle based on mass consumption and the throwaway principle. These changes resulted in an increase in the amount and the diversity of waste and made it harder to dispose waste appropriately. These developments have led to several phenomena and incidents such as municipal solid waste in the Kanto region being carried to the distant Tohoku region for disposal because of lack of incinerating facilities and the difficulty of securing final disposal sites ; a large amount of industrial waste, primarily shredder dust, being illegally dumped in Teshima, Kagawa Prefecture ; and a large amount of industrial waste, primarily waste oil, being illegally dumped in an abandoned mine in Fukushima Prefecture.

Since the beginning of the Heisei era, Japan has improved its framework for responsible waste disposal by amending the Waste Management Law and introducing a range of other initiatives to cope with a situation in which the waste disposal issue needs to be addressed not only as an environmental conservation problem but also as the more fundamental problem of how to deal with the wastes that are produced each and every day.

In order to become a member of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, Japan amended the Waste Management Law in 1992, in addition to enacting the Law for the Control of Export, Import and Others of Specified Hazardous Wastes and Other Wastes. This amended law stipulated that, in principle, all wastes should be disposed of within Japan, and imposed the necessary regulations on waste imports and exports (e.g., the introduction of an export confirmation system and an import permit system). Rules on the international movement of wastes were also established pursuant to this law.

There were other developments concerning measures to be taken against domestic hazardous substances as well. One of them concerned batteries containing mercury. In 1983, the Kurashi no Techo (A Note of the Life) magazine pointed out the risk of environmental pollution from the mercury contained in waste batteries. In the same year, the Tokyo Metropolitan Research Institute for Environmental Protection announced that waste batteries could cause environmental pollution in the process of incineration and landfill. This issue became a major public concern.

In order to improve the management of the mercury contained in batteries, the government

subsequently promoted source-oriented measures and recycling in cooperation with all parties concerned.

One of these source-oriented measures was stopping the use of mercury for manganese batteries (April 1991) and alkaline batteries (January 1992) through joint efforts with the Battery Association of Japan. This has enabled significant reductions to be made in the amount of mercury used in batteries sold in Japan.

Japan has also established a collection and recycling system to prevent the mercury contained in household batteries, as well as the mercury in waste fluorescent lamps, from being released into the environment. Many municipal governments now participate in the Liaison Meeting for the Amalgamated Treatment of Waste Batteries, etc., organized by the Japan Waste Management Association, and jointly collect waste batteries and fluorescent bulbs (by means of sorted collection) and then dispose of them (through mercury recovery and recycling).

As these examples show, one effective measure to minimize the release of the hazardous substances contained in these products is to establish a system for environmentally responsible recycling, in conjunction with other source-oriented approaches. It is also essential that countries with no appropriate disposal facilities at hand consider a wide-area recycling system in which hazardous wastes can be exported under the Basel Convention and then recycled overseas. (For example, Japan imports mercury-containing wastes from Thailand, the Philippines and other countries and recycles them.)

Column

The PCB waste problem

Polychlorinated biphenyls (PCBs) are industrially synthesized compounds. Because they are resistant to heat, have high electrical insulation properties, and are chemically stable, they are often used as insulating oil in high-tension transformers, high-tension capacitors and voltage regulators, as well as the heating medium for heat exchangers. However, the Kanemi Oil Poisoning Incident in 1968 became a turning point, after which the toxicity of PCBs became widely recognized. In 1972, administrative guidance was given to PCB manufacturers to stop producing PCBs and collect them instead. In addition, the Law Concerning the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc., was enacted in 1974, principally to prohibit PCBs from being manufactured, imported and used from that year onward. Later, in 1976, standards for disposal by high-temperature incineration were introduced. However, some PCB wastes have been held in storage by domestic companies without being disposed of for over 30 years because of the opposition from neighbors, except for about 5,500 tons of liquid PCBs that were disposed of by high-temperature incineration at the Takasago plant of Kanegafuchi Kagaku Kogyo K.K. from 1987 to 1989. There was some concern that the negative legacy of these PCB wastes might cause environmental pollution in the event of loss or leakage during long-term storage.

In response, the government instituted the Law Concerning Special Measures against PCB Waste (PCB Special Measures Law) in July 2001 with the aim of ensuring and fostering the reliable and responsible disposal of the PCB wastes stored in Japan for long periods. The law stipulated the necessary regulations on PCB waste storage and disposal. In line with this law, the government took the initiative in constructing wide-area PCB waste disposal facilities to serve as key disposal centers, assisted by the Japan Environmental Safety Corporation (formerly Japan Environment Corporation), while the national

and prefectural governments formed PCB waste disposal funds to reduce the financial burdens associated with disposal by small- and medium-sized enterprises. Through the use of these measures, Japan is striving to fundamentally eliminate the negative legacy posed by PCBs.

B. Introduction of recycling laws

As shown above, the government set out specific policies to address increasingly complex and serious waste disposal problems. However, the government also realized that it needed to address the situation in which a significant proportion of the ever-increasing amount of recyclable resources was being disposed of without being recycled. To meet this need, the Law for the Promotion of Utilization of Recycled Resources was enacted in 1991 to oblige manufacturers to promote the effective utilization of recyclable resources. On the other hand, municipal governments, especially big city governments, found it more and more difficult to secure sufficient final and other disposal facilities for solid waste, leading to the problem of "reverse-charging," or paying fees in order to hand over certain wastes (as in the glass bottle recycling system, for example, which had previously worked well). This raised the need for further recycling of containers and packaging, which accounted for a large part of all municipal solid waste. To meet this need, the Containers and Packaging Recycling Law was enacted in 1995. This law mandated manufacturers to engage in recycling activities and obliged municipal governments to introduce well-planned efforts to foster sorted collection. This law, which can be regarded as an example of early adoption of the concept now known as extended producer responsibility, has helped the development of full-fledged recycling systems by involving more members of the general public and attracting greater public attention.

In 1998, the Home Appliance Recycling Law was introduced, requiring home appliances to be disposed of by manufacturers, mainly by means of recycling. In 2000, the government also enacted the Construction Waste Recycling Law which obliges demolition companies that carry out demolition projects larger than the specified criteria to sort and recycle construction waste, and the Food Waste Recycling Law, which requires restaurant and distribution businesses to recycle food waste. To further enhance the legal framework for recycling, the End-of-life Vehicle Recycling Law was established in 2002, obliging automakers to collect and recycle shredder residues from end-of-life vehicles.

C. The first year of the establishment of a SMC Society

Based on experience gained over the years, the government designated 2000 as the first year of the establishment of a SMC because this was the year when the Fundamental Law for Establishing a Sound Material-Cycle Society (hereinafter referred to as "the Fundamental Law"), the Waste Management Law, the Law for the Promotion of Effective Utilities of Resources and a number of recycling laws were enacted or revised. This year, Japan took a large step toward establishing a SMC Society.

The Fundamental Law defines a SMC Society as one in which the consumption of natural resources is curbed and the burden on the environment is minimized, by means of :

1) Preventing products from becoming waste ;

2) Promoting appropriate and cyclical use of CRs that have been generated ; and
3) Ensuring that CRs which are not subject to cyclical use are disposed of appropriately.

In other words, a SMC Society is a sustainable development-oriented society in which the following concepts are adopted as the basic socioeconomic principles : socioeconomic activities and people's lifestyles based on the 20th century model of mass-production, mass-consumption and mass-disposal are reviewed ; resources are used efficiently ; waste generation is minimized ; unavoidable wastes are recycled as resources ; and wastes for which no means of recycling can be found are responsibly disposed of.

D. Suggestions to put Japan's experience to good use

This chapter has described Japan's path to a SMC by providing an overview of the systems used from the Edo era through to the present. Although Japan already had an established SMC Society in the Edo era, as it later opened itself to the world and tried to model the country upon Western nations, the Japanese way of thinking about goods and production styles changed. The country moved towards a mass-production and mass-consumption society. A variety of products produced in and after the 1970s caused many waste disposal problems, but systems and technologies for the responsible disposal and effective use of wastes also developed gradually over the same period. Progress towards a SMC Society gained momentum through the amendment of the Waste Management Law and the establishment of recycling laws in the 1990s and, since 2000, Japan has been recognized as a world leader in forming a SMC Society.

Developing countries are now in the midst of economic growth just like that experienced by Japan during its period of high economic growth. The inappropriate disposal of waste is common in these countries, and this includes the open dumping of waste, often industrial waste, and the open-air burning of waste. Electrical and electronic appliances imported from overseas, nominally for the purpose of reusing and recycling them, are also often subject to inappropriate treatment, posing a threat to the local living environment.

[Open-air burning of waste in developing countries]
Source : Website of the Japan Industrial Waste Technology Center

With resource conservation programs in these rapidly developing cities still far from complete, developing countries are nowhere near being able to deal with issues of global concern, such as resource problems and global warming problems. Japan needs to help them by sharing its

experience.

Japan's accumulated experience must be of help in solving many of the problems these Asian countries are faced with. Bearing in mind the history of Japanese systems described in this chapter, Japan should expand its program of assistance to other countries, especially in Asia, and help promote the establishment of a SMC Society, worldwide.

Section 3
COMMUNITY-LOCAL-BLOCKS-NATIONAL- INTERNATIONAL - BASED SMC ESTABLISHMENT

1 Establishment of SMC blocks

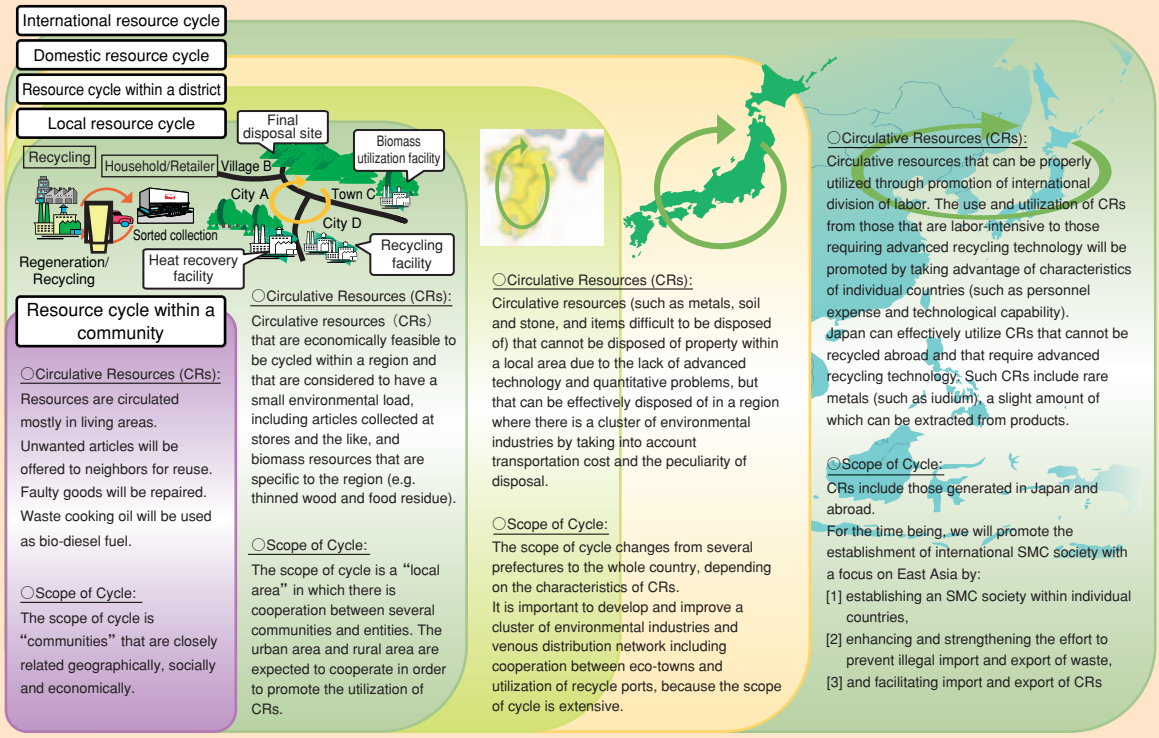
(1) Significance of SMC blocks

The First Fundamental Plan for Establishing a SMC Society defined material flow indicators, which measure the macroscopic progress of SMC formation, and effort indices, which measure progress in terms of the efforts made by different entities, and set numerical targets for both. Since the formulation of this plan, progress has been reviewed in every fiscal year. The review results have been used for the development of the new fundamental plan, which has again defined material flow indicators and effort indices and introduced supplementary indicators as well as indicators for trend monitoring. By defining national-level indicators and numerical targets, the new fundamental plan has provided clear motivation for the establishing a SMC Society and is now capable of evaluating the results.

A new concept introduced to the second Fundamental Plan is the establishment of SMC blocks, in which a material cycle of optimal size is formed in accordance with the characteristics of the region and the properties of its CRs. With appropriate waste management as a precondition, the idea of SMC blocks is aimed at establishing the optimal size of material cycle for each type of CR by considering regional characteristics from an environmental perspective (e.g., anti-global warming, biodiversity conservation), a resource perspective (e.g., scarcity, utility), and an economic perspective (e.g., transport efficiency, treatment costs). For example, circulation within the region would be suitable for biomass CRs, which are characterized as being generated in specific areas and are easily decomposed, whereas wide-area circulation would be more desirable for CRs requiring advanced treatment technology,etc. (Figure4-3-1).

Figure 4-3-1 Various Spheres of SMC

➢An image of Spheres of SMC classified by CRs their characteristics and areas.
➢The following is rough classification of CRs and the scope of cycle, although the scope of cycle differs depending on economic rationality and technical feasibility and the like.



Source : Ministry of the Environment

(2) A vision for SMC blocks

Chapter 2 of the Fundamental Plan provides a medium- to long-term vision for the establishment of a SMC Society. This is a specific medium- to long-term vision of how a SMC is to be formed by around 2025, focusing on the creation of a sustainable society, and serves as a basis for cooperation and collaboration among the different entities which are essential for the establishment of a SMC Society. A particularly important component of this vision is the idea of creating a SMC in such a way that it makes the most of local and regional characteristics.

This basic concept underlying SMC blocks involves establishing a more customized and more effective SMC by forming SMC blocks of optimal size. The optimal SMC block can be based at the community level, the regional level, the special block level, the national level, or even the international level, in accordance with CR properties and regional characteristics. This concept is expected to become a driving force for local community revitalization based on self-reliance and mutual cooperation.

The following sections describe some of the concepts related to SMC blocks, as proposed by the Fundamental Plan as part of its medium- to long-term vision for the establishment of a SMC Society.

A. Communities

At the community level, unwanted articles are reused through exchanges between neighbors

or through their sale at flea markets. Broken-down products are repaired in order to extend their useful lives as much as possible. In addition to the reuse and recycling of goods through recycling centers, recycling activities involving citizens and NGOs/NPOs are also conducted, mainly at municipal recycling facilities that also have the capability to educate the public, leading to the development of community businesses. With regard to transport, contributions are made to the development of communities with low environmental burdens through initiatives such as the effective use of bicycles.

B. Agricultural, forestry and fishing villages

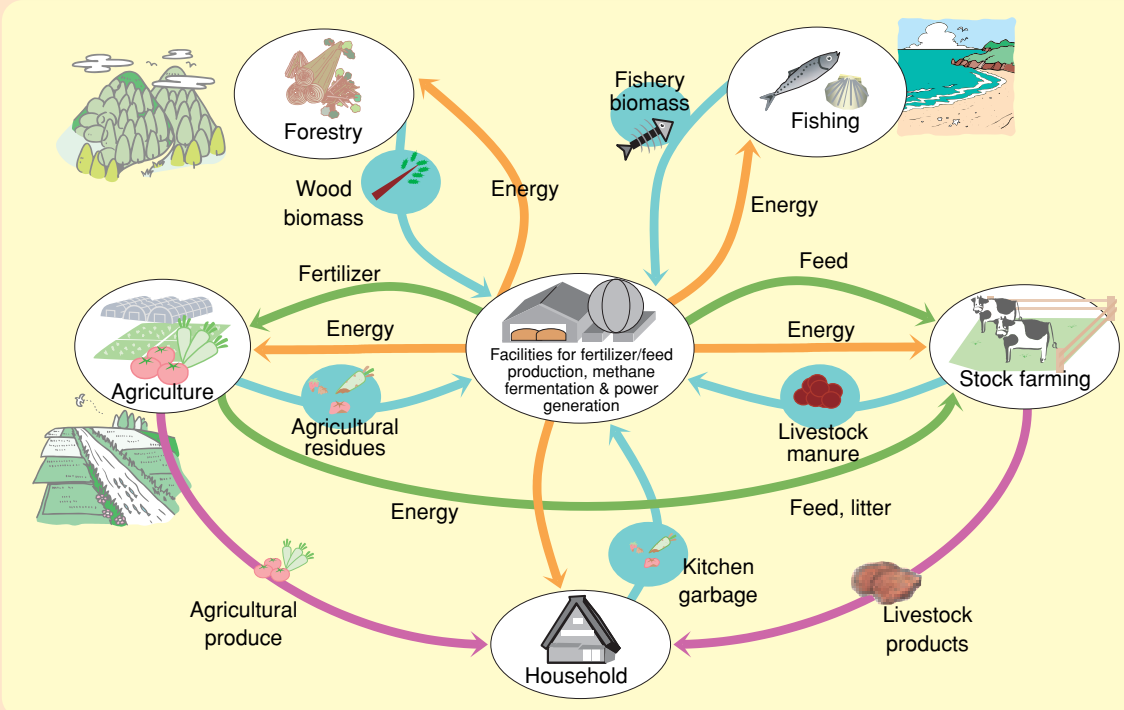
CRs generated in agricultural, forestry and fishing villages include lumber from thinning, livestock manure, shells, and kitchen garbage subject to sorted collection. As biomass CRs, they are converted into fertilizer and feed which are then used for agriculture, stock farming and fishery, the products of which are then consumed within the same area. This forms a material cycle based on local production for local consumption. The formation of this type of material cycle, based on local production for local consumption, and other such efforts directed towards sustainable agriculture, forestry and fishery all contribute to the conservation of satochi-satoyama, which are community-based nature areas serving as habitats for wildlife (Figure4-3-2).

Figure 4-3-2 Material cycle in agricultural, forestry and fishing villages

Agricultural, forestry and fishing villages

A conceptual image of a SMC based on community size and characteristics is described below.

- CRs produced in agricultural, forestry and fishing villages include lumber from thinning, livestock manure, and shells, as well as kitchen garbage, which is collected separately from other municipal solid wastes.
- These CRs, together with other CRs, are used as biomass resources for energy recovery through methane fermentation and the production of fertilizer, feed, soil conditioners, etc.
- This forms a material cycle in which agricultural products produced using this fertilizer are consumed within the same region (local production for local consumption)

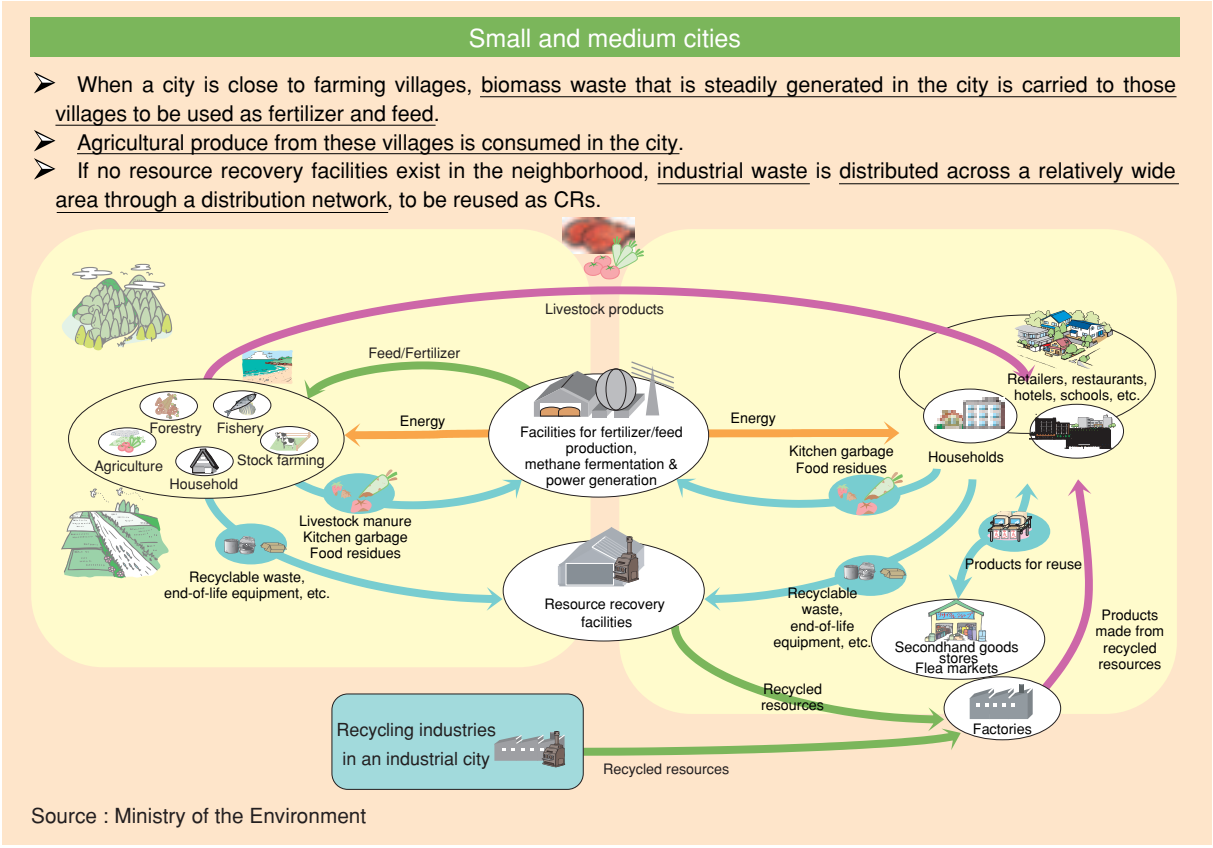


Source : Ministry of the Environment

C. Small and medium cities

Small and medium cities, if they are close to farming villages, form material cycles that connect urban and rural areas. In such a cycle, biomass CRs which are constantly generated in cities are carried to farming villages to be used as fertilizer and feed in agriculture and stock farming so that the resultant agricultural and stock farm products can be consumed in the cities. The use of such CRs as energy sources is promoted in accordance with local characteristics. If no facilities exist in the neighborhood, industrial waste is distributed elsewhere in order to be reused as CRs across a relatively wide area by means of a distribution network (Figure4-3-3).

Figure 4-3-3 Material cycle in small and medium cities

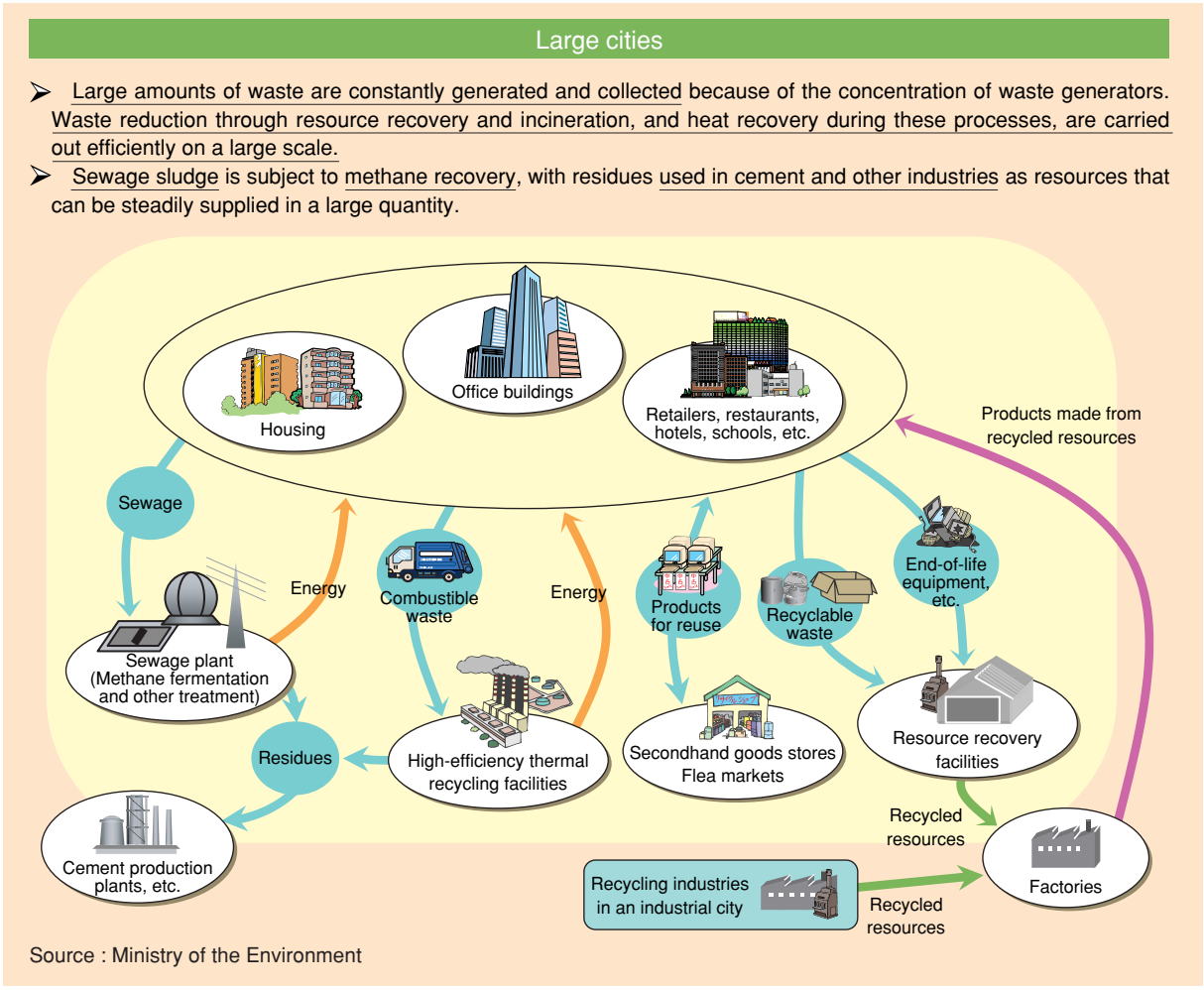


Source : Ministry of the Environment

D. Large cities

In large cities, large amounts of wastes are constantly generated and collected because of the concentration of waste generators. Extensive resource recovery, waste reduction (by incinerating non-recyclable wastes) and heat recovery during these processes can therefore be carried out efficiently on a large scale. For example, the multi-stage, large-scale use of wastes can be implemented fully and efficiently through the recycling of residues from the primary cyclical use of biomass CRs and plastics or through heat recovery (Figure4-3-4).

Figure 4-3-4 Material cycle in large cities



Source : Ministry of the Environment

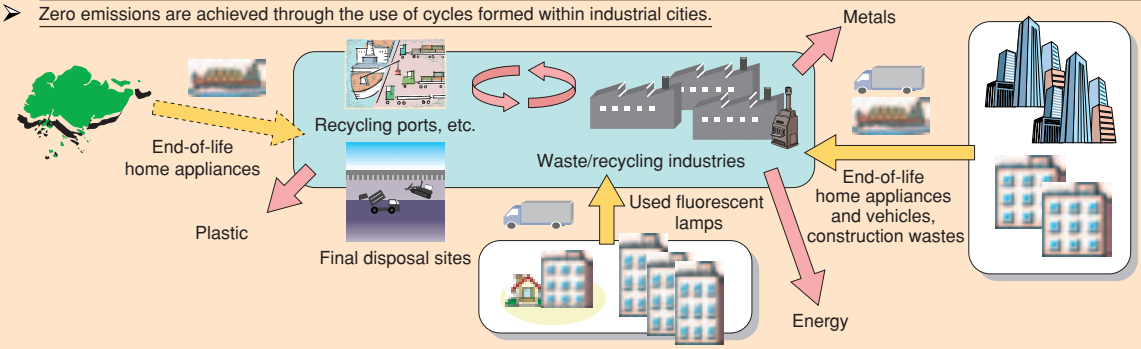
E. Intra-block and national circulation

In SMC blocks formed within special blocks or at the national level, the material input required for production activities is strictly restrained in the industrial cluster at the center of the material cycle. Also, as recycling industries concentrate around these activities, the wide-area collection of CRs can be carried out by means of land and marine transportation, and the efficient use of CRs is facilitated by economies of scale and mutual cooperation within the cluster. Efforts directed towards zero emissions are intensified through the application of technologies, infrastructure and the expertise of arterial industries. In particular, CRs can be more efficiently utilized by means of new technologies, such as those used for recovering valuable CRs that are present in only limited amounts (e.g., rare metals) and those used for detoxifying hazardous wastes (Figure4-3-5).

Figure 4-3-5 Intra-block and national circulation

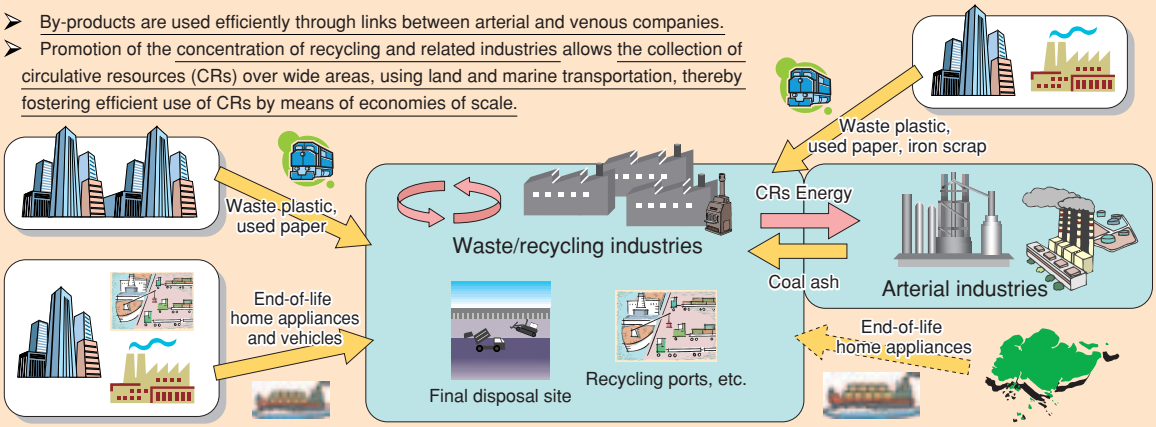
Industrial city (wide-area collection & high-efficiency disposal)

- Concentration of recycling and related industries allows the collection of circulative resources over wide areas, using land and marine transportation.
- Zero emissions are achieved through the use of cycles formed within industrial cities.



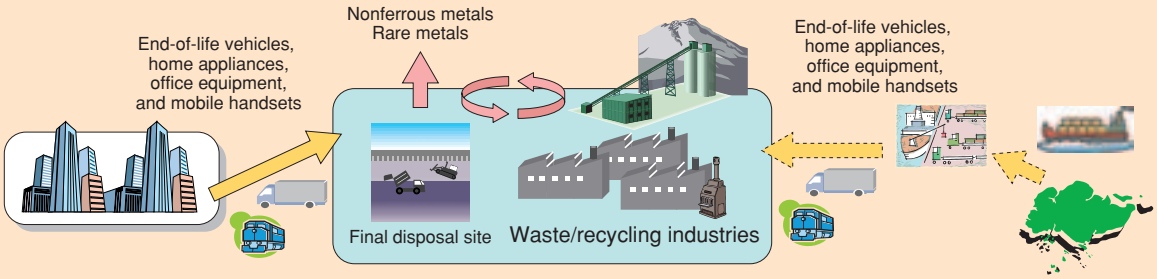
Industrial city (arterial-venous links)

- By-products are used efficiently through links between arterial and venous companies.
- Promotion of the concentration of recycling and related industries allows the collection of circulative resources (CRs) over wide areas, using land and marine transportation, thereby fostering efficient use of CRs by means of economies of scale.



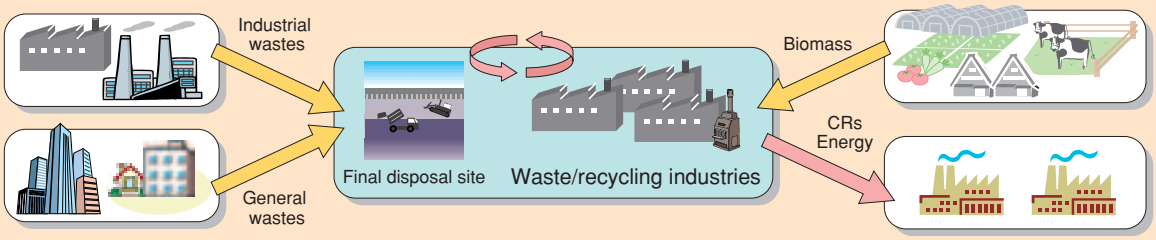
Industrial city (nonferrous metal treatment technology)

- Existing technologies, such as arterial industries' techniques, infrastructure and expertise, are applied in order to ensure the efficient use of CRs.
- A contribution is made to the creation of a sound material-cycle society based on original technologies, for example, by collecting high-value-added CRs, even if the amount available is limited.



Industrial city (total waste treatment)

- Both general and industrial wastes are widely accepted for disposal purposes. With industrial wastes, in particular, both biomass-type wastes and industry-derived wastes are accepted for large-scale treatment if the disposal facilities are located halfway between urban and rural areas.
- The recycled CRs and the collected energy are reused for industrial activities, minimizing the amount of final disposal.

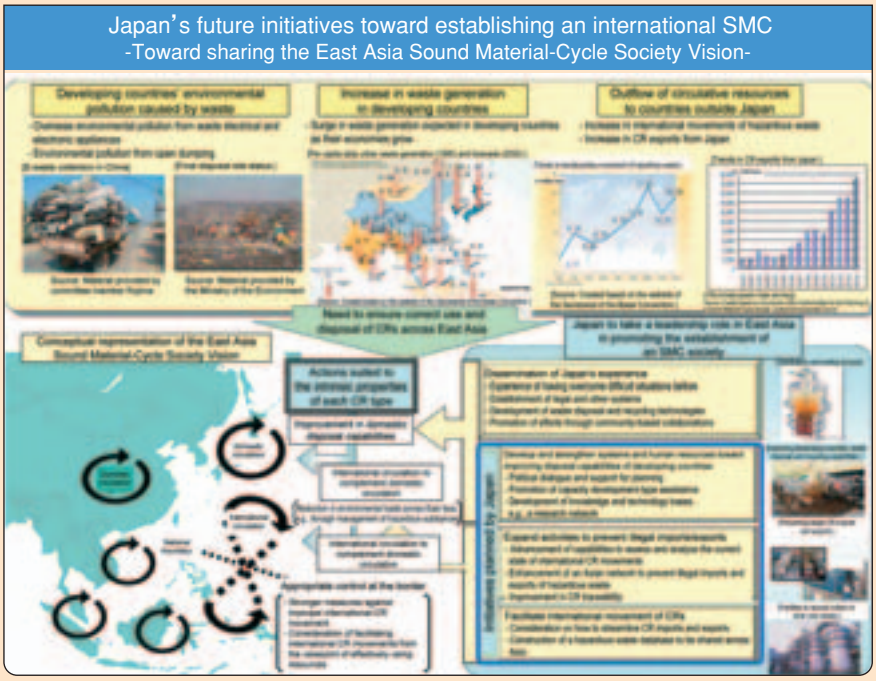


Source : Ministry of the Environment

F. International resource circulation

In international SMC blocks, CRs are utilized in a way that makes the best use of each country's characteristics. Japan uses CRs that require advanced recycling technologies and are therefore difficult to recycle in other countries. First, a domestic SMC Society is formed in each country, followed by the enhancement of measures to prevent illegal imports and exports of wastes and the establishment of traceability procedures to monitor the transboundary movements of wastes. Consequently, transboundary movements of CRs are facilitated in consideration of a division of labor between the countries involved (Figure4-3-6).

Figure 4-3-6 international resource circulation



Source : Ministry of the Environment

2 Resource circulation in SMC blocks～Examples that have led to successful revitalization of local communities

(1) Community-based and local resource cycles

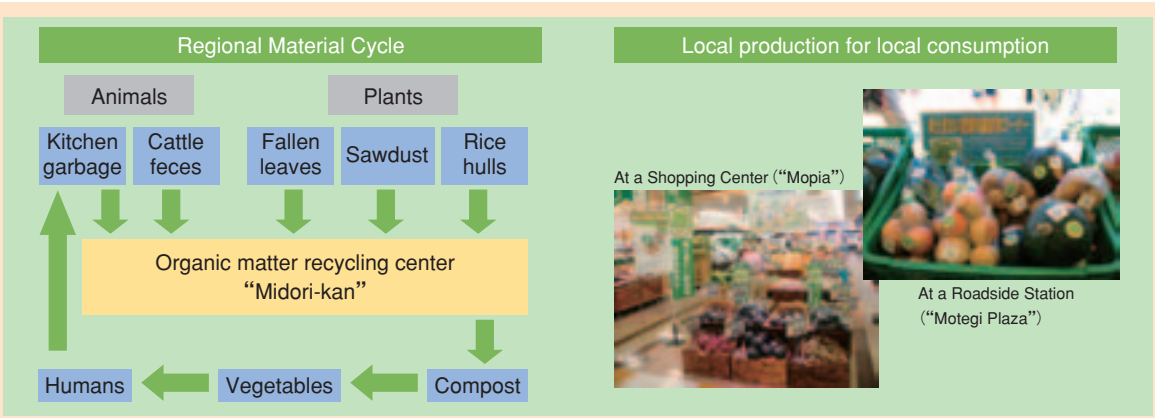
A. Rape Blossom projects

Rape Blossom projects are currently underway in many communities and involve collaboration between farmers and members of the public. In these projects, rapeseed oil is extracted from rape blossoms grown on land converted from paddy fields. The oil produced is used for cooking at schools (for school meals), restaurants and homes, while oilcake is used to make animal feed and compost, which is then returned to the rape blossom fields as fertilizer. Waste cooking oil is collected for use as biodiesel fuel. Some projects aim at a higher level of local involvement by incorporating beekeeping, advertising rape blossom fields as a tourist attraction, and providing environmental education programs for elementary, junior high and high schools. Efforts such as these, directed towards community development and focusing on resource circulation and energy independence, are being carried out in many parts of Japan .

B. Motegi Town

In the town of Motegi (Motegi-machi), kitchen garbage (collected separately from other waste) is mixed with fallen leaves from forests and livestock manure to produce compost at Midori-kan, the town's organic matter recycling center. Composting not only helps reduce incineration costs and hazardous substance generation, but also allows the restoration of traditional agriculture, involving soil improvement with compost and the promotion of eco-friendly agriculture which uses no chemical fertilizers or pesticides. This initiative aims to produce safe, high-quality agricultural produce. The town has established both a mechanism for local production for local consumption, in which the agricultural products produced are consumed by local people, and a system to supply food products for use in school meals, with the aim of providing better nourishment for children's minds and bodies (Figure4-3-7).

Figure 4-3-7 Regional Material Cycle



Source : Documents provided by the Central Environmental Council

C. Shibushi City

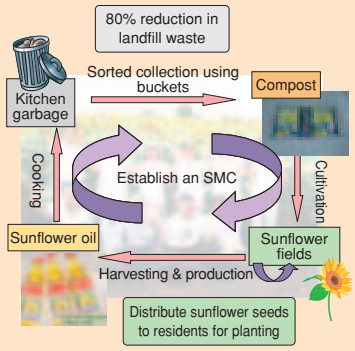
With no incinerating facilities of its own, Shibushi City has to dispose of all its wastes in landfills. By means of the sorted collection of wastes into 28 categories, the city government has successfully reduced the amount of landfill wastes by 80%. This was achieved by forming organizations called residents' sanitation associations and by enforcing sorted collection in cooperation with the public under the slogan of "Promotion of tiresome things." To deal with kitchen garbage, the city also implements the "Sun Sun Sunflower Plan," which produces sunflower oil from kitchen garbage as part of its efforts to achieve zero landfill wastes through regional collaboration (Figure4-3-8).

Figure 4-3-8 Efforts in Shibushi City

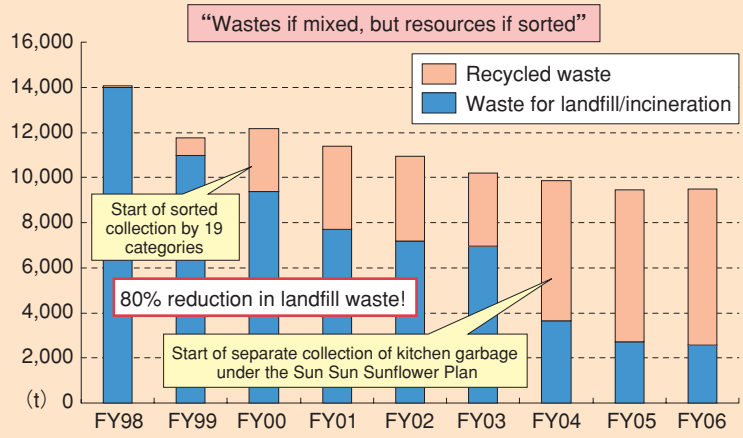
Promotion of waste sorting and collection for otherwise 'difficult-to-recycle' objects

"Sun Sun Sunflower Plan"
- Efforts to make sunflower oil from kitchen garbage and even improve health -

○Full explanation to participants
○Production of compost from kitchen garbage, which used to be disposed of in landfills
○The compost produced is used to grow sunflowers so that sunflower oil can be made from them and used for cooking. The kitchen garbage generated as a result is collected again.
○All households receive sunflower seeds. The city succeeded in reducing waste.
○Participants are pleased as their kitchen garbage is collected three times a week, instead of just once a week.



Wastes in Shibushi City



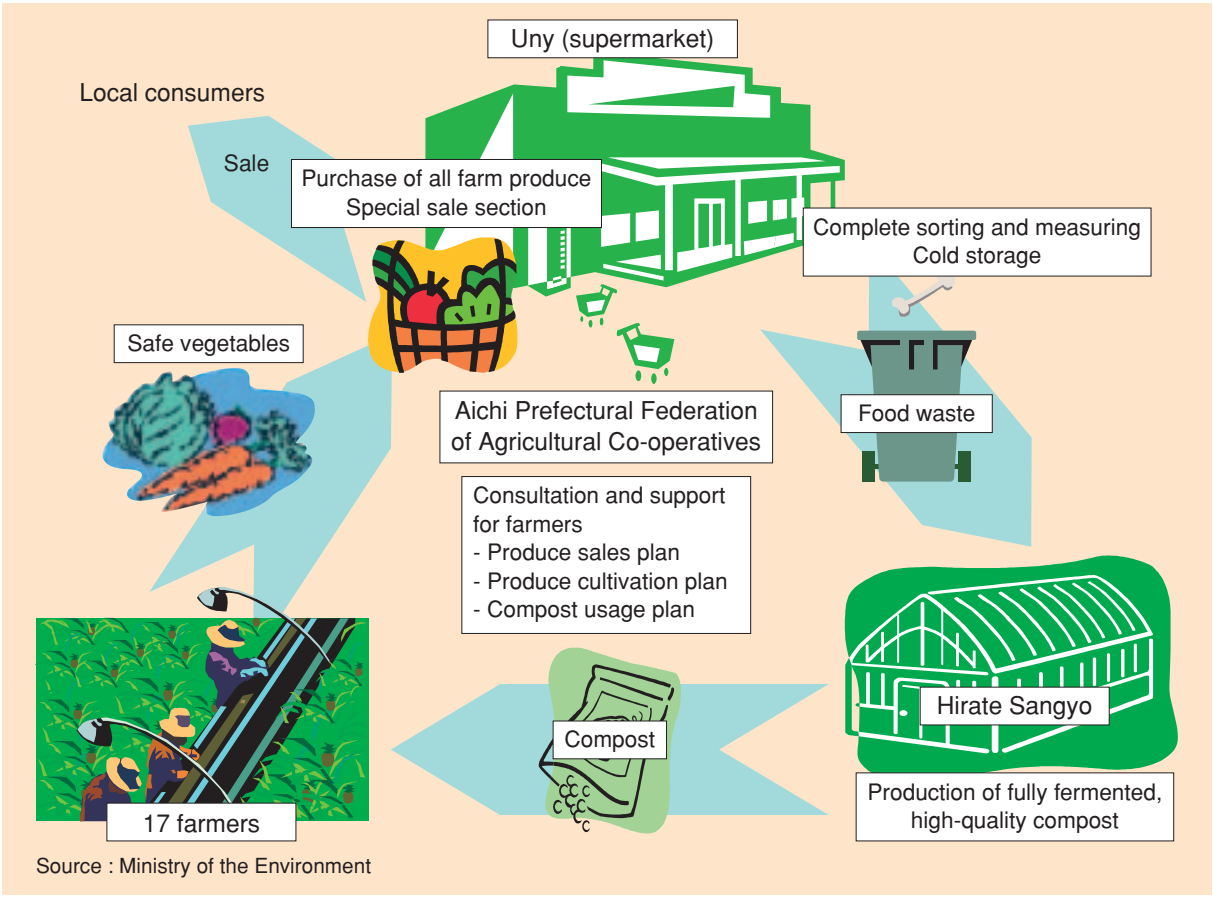
Source : Documents prorided by the Central Environmental Council

D. Aichi Prefectural Federation of Agricultural Co-operatives (together with Uny Co., Ltd. and Hirate Sangyo Ltd.)

These three entities have established a food recycling loop. Uny Co., Ltd., a food retailer, completely separates all food residues on the basis of category, then grades them and keeps them in cold storage in order to maintain quality until they are delivered to Hirate Sangyo Ltd., a food waste recycler. From these wastes, Hirate then produces fully fermented, good-quality compost that farmers can use. Aichi Prefectural Federation of Agricultural Co-operatives, while serving as a contact point between the various entities in the loop, also provide guidance on controlling the quality of recycled compost and producing and selling agricultural products. All the vegetables grown with recycled compost are purchased by Uny and then sold in its stores.

This is a successful example of a food recycling loop involving steady and continuous high-reliability inputs (Figure4-3-9).

Figure 4-3-9 Aichi Prefectural Federation of Agricultural Co-operatives



Source : Ministry of the Environment

Column

Rate of food losses

Food losses refer to leftovers and other wasted food. A food loss survey of households and restaurants (conducted by the Ministry of Agriculture, Forestry and Fisheries in FY 2006) shows just how much food Japan wastes in the form of leftovers and garbage (only leftovers were surveyed in the food service industry). When compared with the number of people in each household, the rate of food loss can be seen to be highest (6.4%) in single-member households and only 3.5-4.0% in households with two or more members. In the food service industry, the percentage of food left uneaten in cafeterias and restaurants (3.1%) is greatly exceeded by banquet halls used for wedding receptions (22.5%) and facilities used for other parties (15.2%). When the data are examined on the basis of food type, beverages can be seen to account for over half the amount of the total leftovers. An analysis of leftovers in cafeterias and restaurants, based on the type of dish served, indicates that pickled vegetables are the type of food most often left unfinished, accounting for 11.0% of all leftovers. Based on the type of restaurant, those serving traditional Japanese cuisine account for the largest percentage (4.3%) of uneaten food.

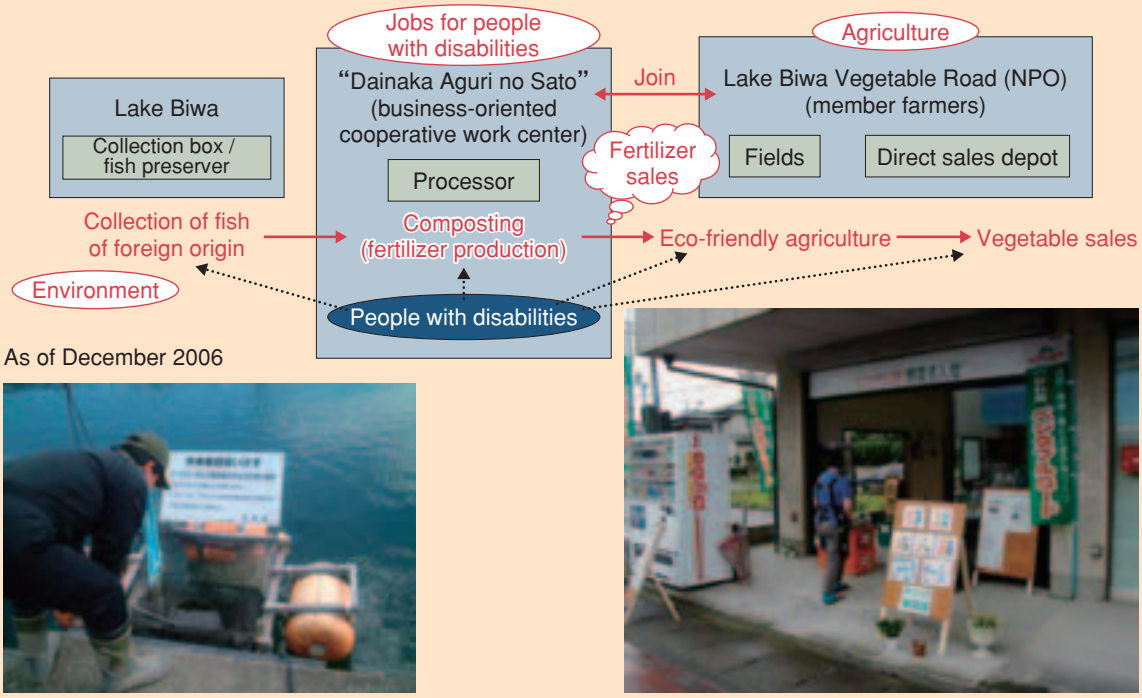
What kinds of measures should be taken to reduce such food losses? When families were asked about those things they took into consideration when purchasing food, the majority (72.5%) of respondents answered that they choose products carrying more recent dates of manufacture or those with longer shelf lives. However, overemphasis on food freshness can lead to an increase in waste at the retail stage. The First Food Consumer Monitor Survey in FY 2005, a survey of Food Consumer Monitors (selected from ordinary consumers living in major cities) conducted by the Ministry of Agriculture, Forestry and Fisheries, shows that what consumers want most is for restaurants to clearly explain on

the menu, or by some other means, that customers can choose their preferred serving size, allowing them to finish all their meal (as cited by 45% or respondents). It is hoped that efforts to reduce food losses will expand in homes and restaurants alike.

E. Effective use of fish of foreign origin

Shiga Prefecture has set up the "Lake Biwa Rules" to assist the restoration of Lake Biwa's diverse ecosystem. A policy to prevent the release of any fish of foreign origin (bluegill and black bass) caught in the lake is promoted as part of this initiative. Fish of foreign origin collection receptacles and collection boxes are placed around the lake and anglers are requested to cooperate in the no-release policy. All fish of foreign origin that anglers place in the collection receptacles are carried to the Dainaka Aguri no Sato (a business-oriented cooperative work center) for composting. The compost produced is used for eco-friendly vegetable farming and is sold as fertilizer, ensuring its effective use (Figure4-3-10).

Figure 4-3-10 Joining together welfare, agriculture and environmental conservation



Source : Shiga Prefectural Center for Support of Employment, Living and Participation

(2) Wide-area resource circulation at the block, national and international levels

The previous section focused on efforts directed towards community-based and regional circulation of biomass CRs. However, there are also wider-area resource cycles formed in accordance with the characteristics and the uses of CRs and the location of the facilities that process and use them.

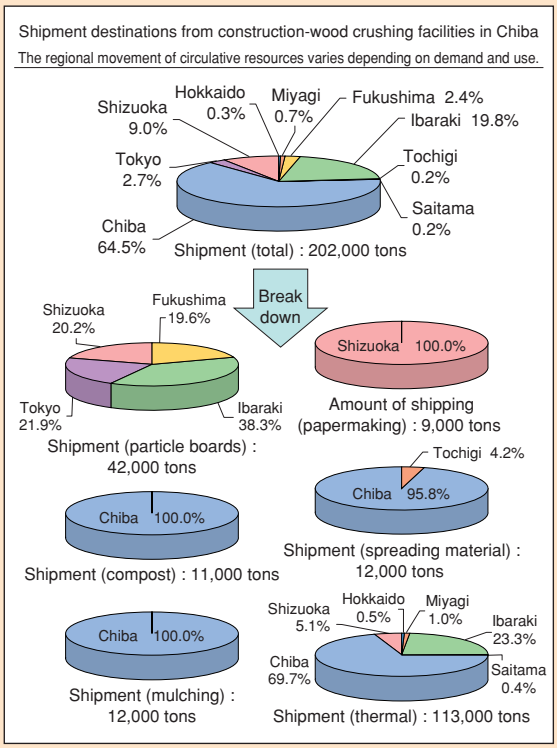
For example, the destinations (prefectures) of CR shipments from construction-wood crushing facilities in Chiba Prefecture vary widely, depending on the intended use. This is also the case with receiving facilities. For example, a recycling plant for a city located in northern Saitama

Prefecture receives rubble, wood waste and waste plastic from a different range of areas because of the difference in weight between these wastes (Figure4-3-11).

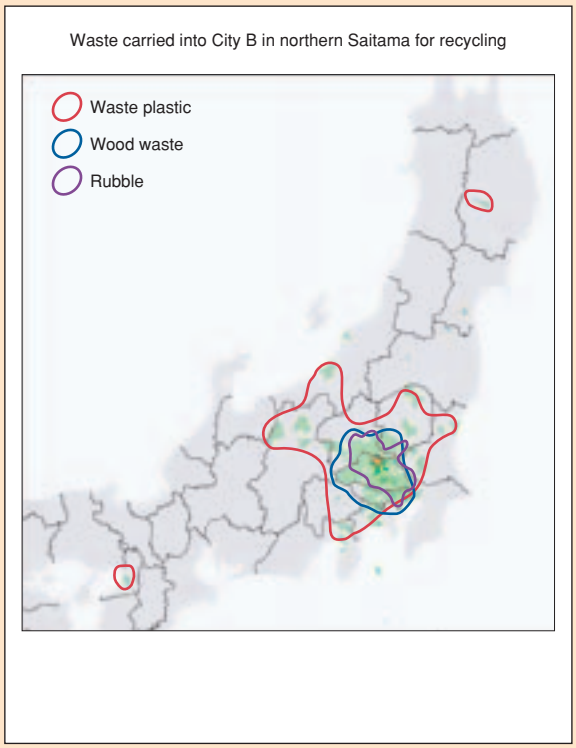
Figure 4-3-11 Examples of intra-block resource cycles

Examples of intra-block resource cycles

● Cyclical use of by-products from construction



Source：Action Plan to Promote Construction Wood Recycling in Chiba (Ministry of Land, Infrastructure and Transport)



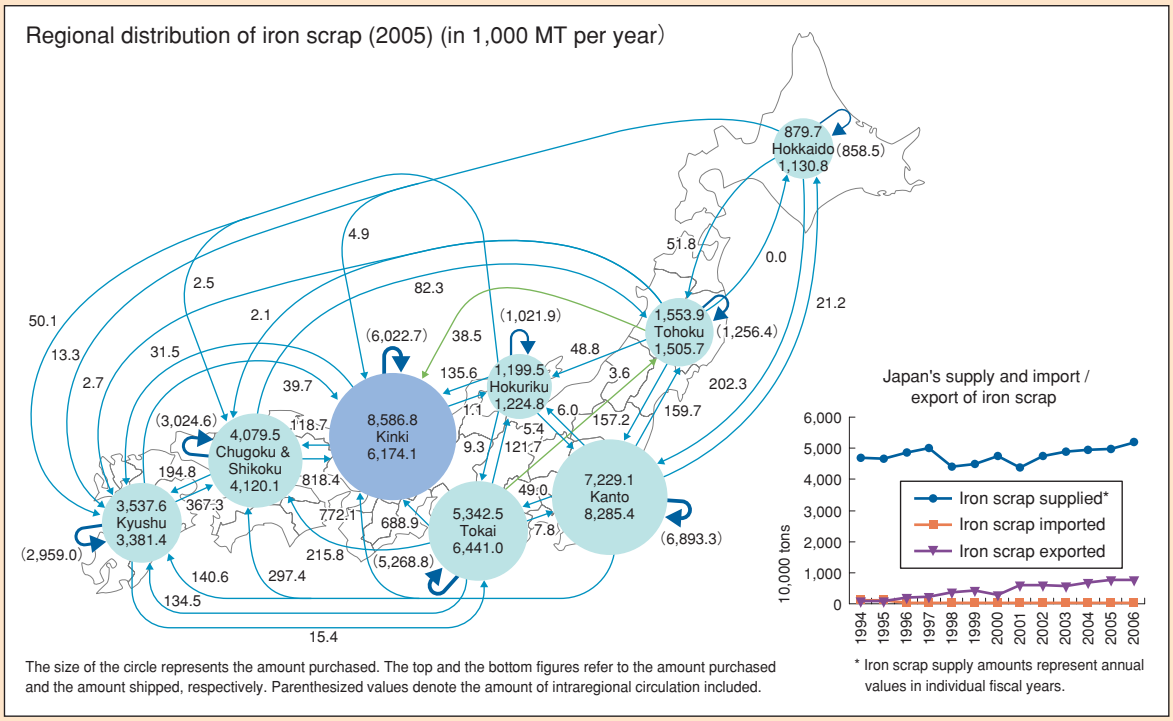
Source：National Institute for Environmental Studies

An analysis of the circulation of iron scrap, by region, suggests that the majority of iron scrap generated is used within the same regional block, both for economic reasons and because of the presence of electric furnaces that use iron scrap. Interregional circulation is observed only on a complementary basis (Figure4-3-12).

Figure 4-3-12 Circulative use of iron scrap

Examples of domestic resource cycles

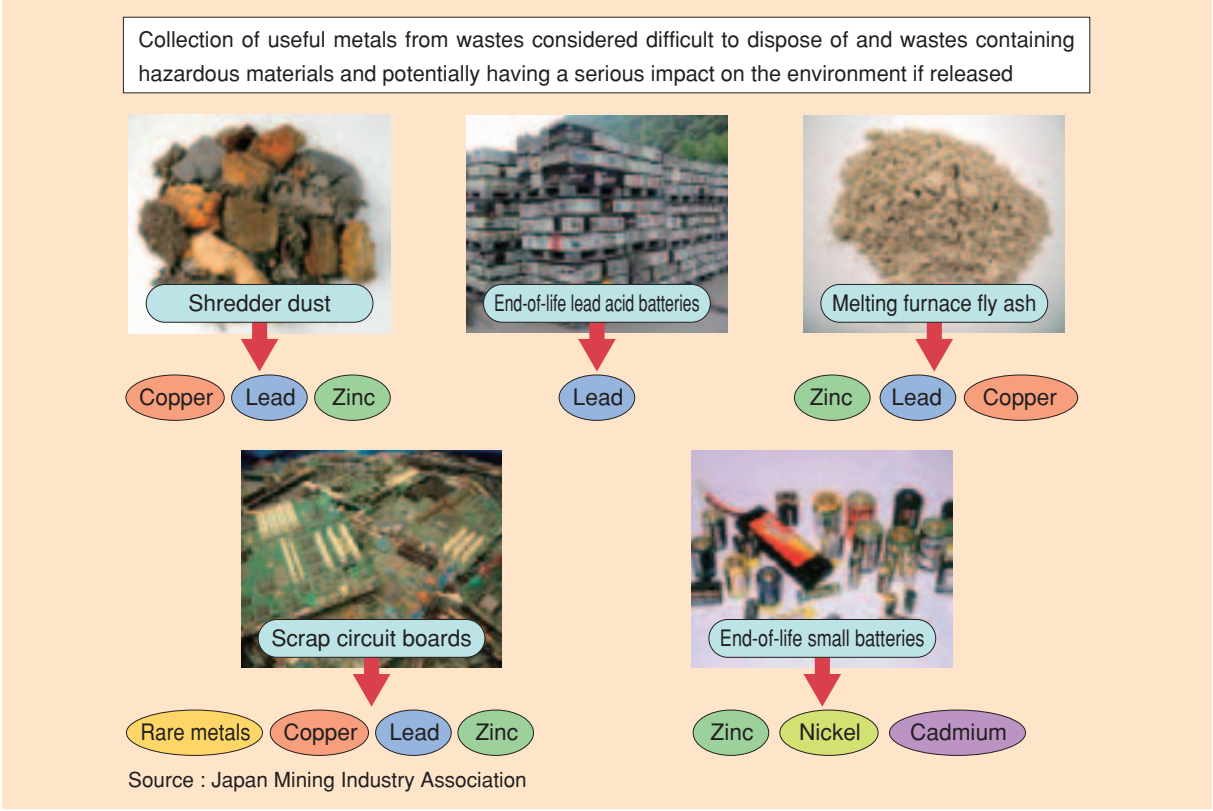
Circulative use of iron scrap



Source : Left : Japan Ferrous Raw Materials Association; Right: Annual reports on steel, nonferrous metal and ferrous metal products, and trade statistics

There are also attempts underway to recover valuable resources from hazardous or hard-to-treat wastes by using advanced technologies. Since the number of facilities capable of treating such CRs is limited, wider-area resource cycles should be formed to allow them to be used most effectively (Figure4-3-13).

Figure 4-3-13 Examples of waste disposal and collected items



Source : Japan Mining Industry Association

A. Northern Akita Prefecture

In the northern part of Akita Prefecture, which was once one of the world's richest mining areas, a project to recycle metals by making use of the local mines and refineries is now underway. Based on the zero-emissions concept, which aims to completely eliminate waste by using all industrial waste as raw materials in other sectors, the region has been approved under the Eco-town program which seeks to create communities in harmony with the environment while also fostering regional development. The region now serves as a wide-area recycling center for metals, including rare metals (Figure4-3-14).

Figure 4-3-14 Eco-town projects

Eco-town projects

This is a program based on the zero-emissions concept, which aims to completely eliminate waste through the use of all waste from industry as raw materials in other sectors. Eco-town projects seek to create communities in harmony with the environment while fostering regional development. To date, 26 regions have been approved.

One project related to rare metals is the "Northern Akita Prefecture Eco-town Plan" (approved in November 1999), which intends to promote metal recycling in a region that was once one of the world's richest mining areas, by using its mine and refinery facilities.

〈Outline of the Northern Akita Prefecture Eco-town Plan〉

Facilities	Operating entity	Project description
Home appliance recycling facilities	Eco-Recycle Co., Ltd.	◆Recycles four types of home appliances pursuant to the Home Appliance Recycling Law, along with office equipment (6,000 t/yr in throughput) Four types of home appliances, etc. → Disassembly & crushing /sorting by material type → Ferrous & nonferrous metals / Cullet
Nonferrous metal collection facilities	Ecosystem Kosaka Co., Ltd.	Shredder dust / Waste circuit boards → Metallic vapor collection furnace → Gold, silver, copper, lead, etc. ◆Collects metals from circuit boards containing valuable metals (removed from end-of-life home appliances) by using them as recycled raw materials in a refinery (50,000 t/yr in throughput)
Facilities for manufacturing new building materials from waste plastic	Akita wood Co., Ltd.	◆Mixes waste plastic with waste wood to produce energy-efficient construction materials by extrusion molding.
Coal ash and waste plastic recycling facilities	Akita Eco Plash Co., Ltd.	◆By using wastes such as plastic containers and packaging, produces secondary plastic products (materials for electrical facilities and construction materials)

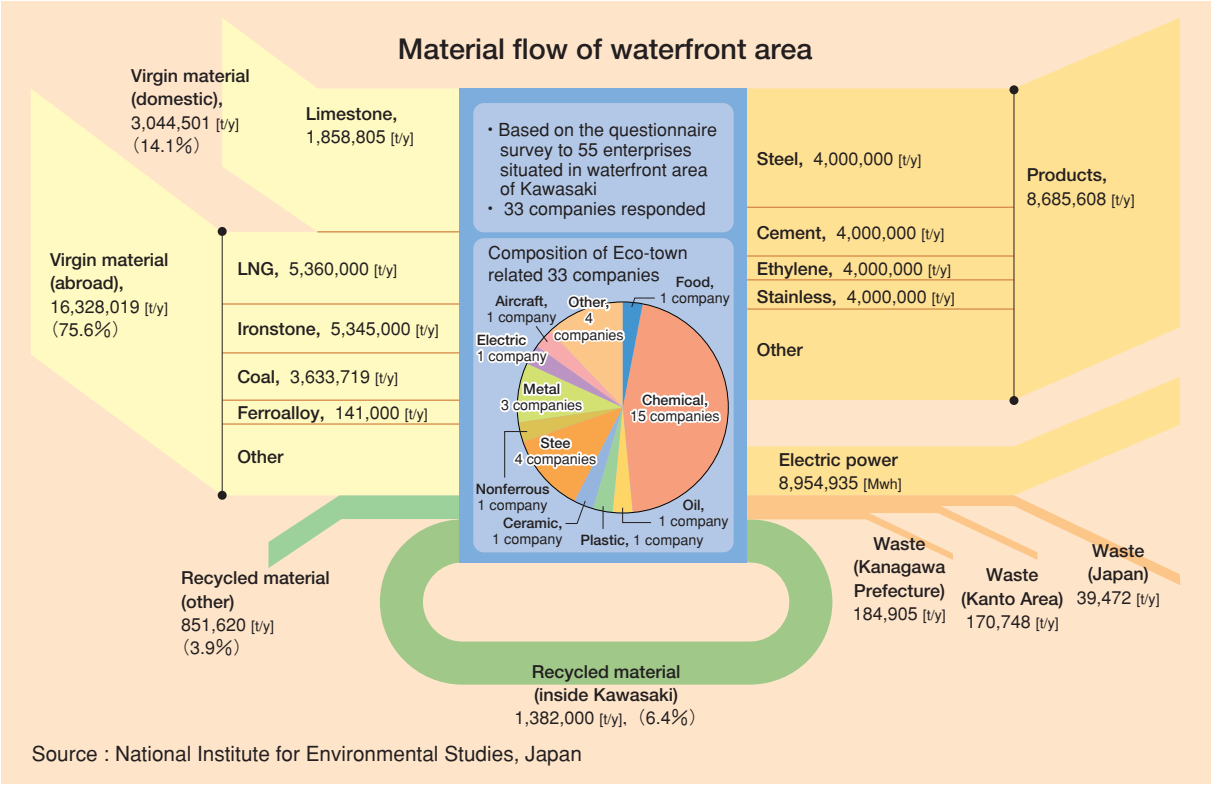
Source : Ministry of the Environment

A private enterprise initiative in this region, carried out in cooperation with the Secretariat of the Basel Convention and participating Asian countries, is planning a project to collect used mobile phones from Asia and recover resources from them.

B. Kawasaki City

Kawasaki City has developed its coastal "Kawasaki Eco-town," which aims to minimize environmental burdens on the region and create a sustainable society in which industrial activities are in harmony with the environment. In this Eco-town, local companies seek to reduce environmental impact factors in every aspect of their activities, from production through to the disposal of their products. As well as promoting such company-level efforts, the Eco-town strives to establish a regional resource cycle through collaboration among companies and the use of recycling facilities. The material flow in Kawasaki Eco-town indicates that cyclical use has increased within Kawasaki (Figure4-3-15).

Figure 4-3-15 Material flow of waterfront area

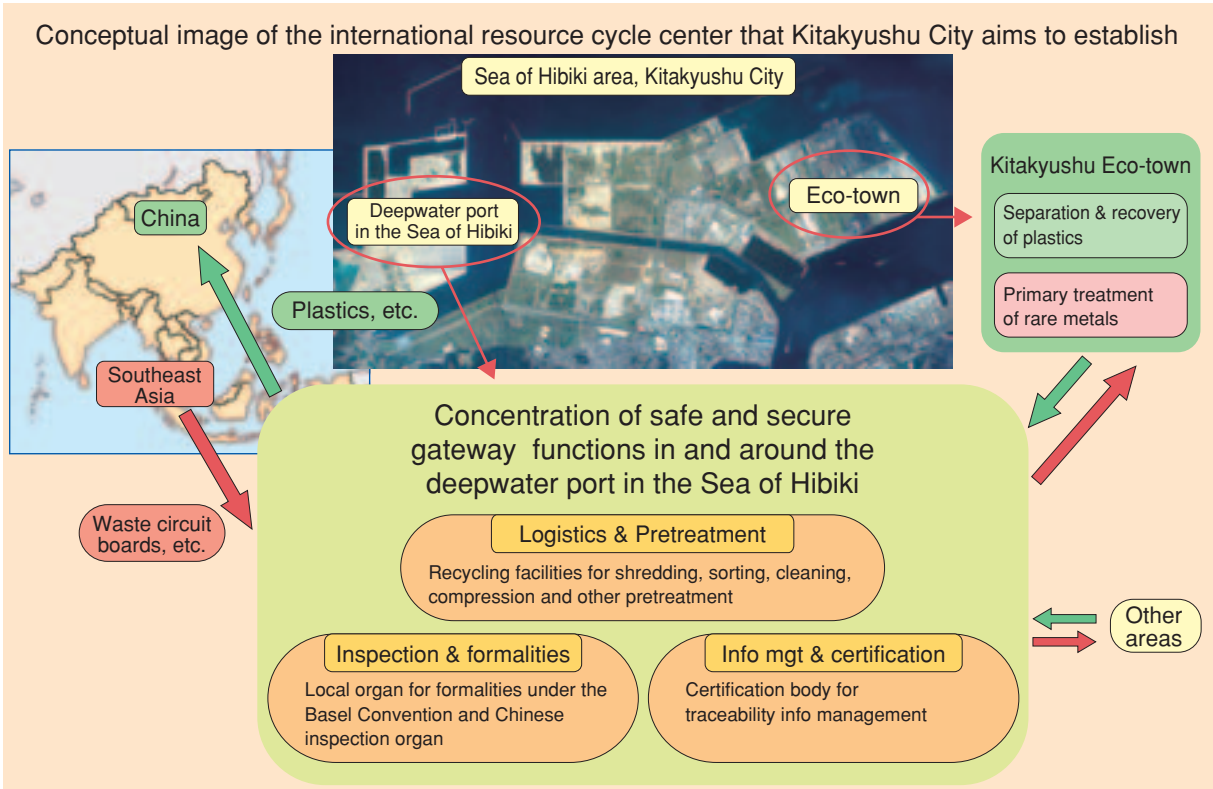


Source : National Institute for Environmental Studies, Japan

C. Kitakyushu City

Based on its experience in overcoming serious pollution problems, and having already implemented Eco-towns and other projects for the establishment of a SMC, Kitakyushu City has been cooperating with other Asian regions on environmental issues. In an effort to construct a mechanism for international resource circulation, the city is conducting a field trial for waste tracking using IC tags. In this trial, waste circuit boards are imported from Asian countries for advanced recycling, while waste plastics are exported back to those areas. The city is also acting as a center for international resource circulation in other ways, considering such things as the inclusion of safe and secure gateway functions in its Eco-town and port, including inspection and formality execution and the certification capability needed for traceability information management (Figure4-3-16) (Table 4-3-1).

Figure 4-3-16 Kitakyushu City's efforts



Source : Documents provided by the Central Environmental Council

Table 4-3-1 Major regional efforts (based on a hearing survey by the Subcommittee for the Planning of a Sound Material-Cycle Society of the Central Environment Council, after the formulation of the First Fundamental Plan)

Region	Major efforts
Hokkaido Prefecture	Formulated the Hokkaido Prefectural Fundamental Plan for Establishing a SMC Society to launch efforts to create a Hokkaido-style SMC, and strives to enact a municipal law as an institutional framework.
Yamagata Prefecture	Formulated the Yamagata Prefectural Fundamental Plan for Establishing a SMC Society (Zero-Waste Yamagata Promotion Plan), and takes measures to develop recycling-oriented industries and reduce the amount of final disposal to zero, with the aim of becoming the prefecture with the smallest amount of waste generation in all Japan.
Kawasaki City	Formulated the "Kawasaki Challenge 3Rs" policy, which addresses the transformation of industrial structures and the concentration of R&D-oriented industries, and set up a kitchen garbage recycling plan that takes account of regional characteristics.
Kyoto City	Formulated the Kyoto Waste Management Strategy 21, which incorporates a variety of numerical targets such as effort indices for the public, enterprises and government, and takes measures to address the upstream processes of waste management, sorting and recycling, and responsible disposal.
Kamakura City	Achieved the highest recycling rate for two consecutive years (in FY 2004 and 2005) among those cities with a population of 100,000 to 500,000, through the sorting of waste into 20 categories.
Hachinohe City	Works toward the goal of "creating a Hachinohe model for an eco-friendly city based on the establishment of a SMC Society" by making use of Eco-town and recycling port projects, and by becoming designated as a Special Zone for Aomori Prefecture Environment and Energy Industry Creation.
Shibushi City	Successfully reduced the amount of landfill waste by 80% after enforcing the sorting of waste into 28 categories.
Motegi-machi, Tochigi Prefecture	Seeks to achieve regional circulation based on local production for local consumption, by promoting eco-friendly agriculture which starts from the soil improvement stage, using compost produced at the organic matter recycling center.
Takigawa City	Seeks to reduce waste, mainly by making use of one of Japan's largest kitchen garbage biomass plants.
Funabashi City	Promotes recycling based on local production for local consumption and the reuse of unwanted articles, and has proposed the use of gift boxes that eliminate the need to use wrapping paper.
Ikeda-cho, Fukui Prefecture	Promotes advanced ecological farm communities by capitalizing on farm communities' capabilities through activities such as soil improvement by means of compost made from kitchen garbage, the sale of the products of organic farming, and an eco-point program to encourage consumers to bring their own containers.
Kamikatsu-cho, Tokushima Prefecture	Promotes zero waste, e.g., by declaring that the town will reduce the amount of landfill and incineration waste to zero by 2020, through the sorted collection of waste into 35 categories, and by means of other programs.
Fukushima Prefecture	Promotes a society in harmony with nature, a zero-waste society, and a society based on the mottainai spirit, in line with the municipal law for establishing a SMC Society and a plan for the establishment of a SMC Society.
Kyoto Prefecture	Formulated the Kyoto Prefectural Plan for the Establishment of a SMC Society, which sets specific targets over a wide variety of areas, and promotes enterprise efforts through certification and registration systems.
Aichi Prefecture	Aims to create recycling businesses that take advantage of the local concentrations of industries and technologies, in line with the Aichi SMC Society Establishment Plan and its action plan, the Aichi Eco-town Plan.
Nagasaki Prefecture	Working towards "zero-waste Nagasaki", and has established promotion and implementation plans and 221 actions to be taken as part of these plans.

Source : Ministry of the Environment

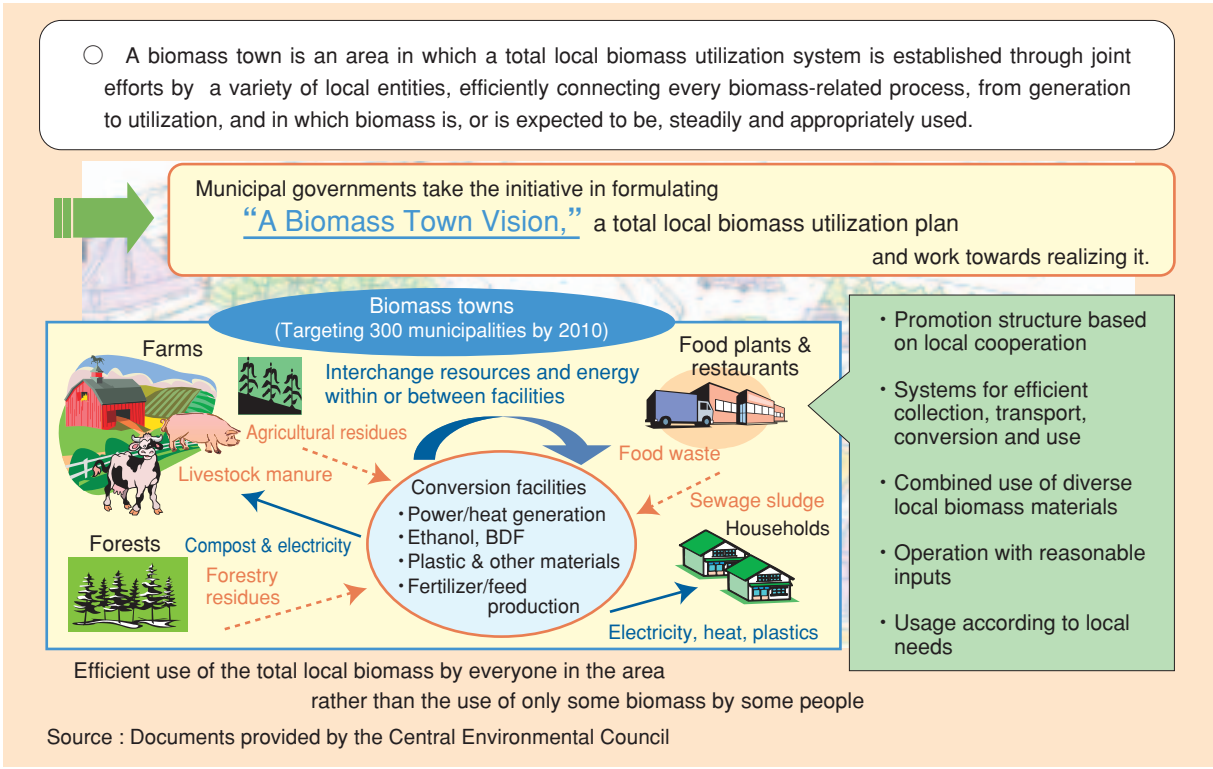
3 Implementing more effective measures

(1) Organic combination of institutional frameworks and support measures

The optimal size of a SMC block depends on the properties of the CRs involved. Therefore, when establishing a SMC block (with appropriate waste management as a precondition), the government will determine the optimal size for each type of CR by considering regional characteristics (e.g., the state of waste generation, the location of relevant treatment facilities) from an environmental perspective (e.g., anti-global warming, biodiversity conservation), a resource perspective (e.g., scarcity, utility), and an economic perspective (e.g., transport efficiency, treatment costs). On the other hand, the government will also follow the procedures described below in establishing SMC blocks whose optimal size is already fairly obvious. These include SMC blocks for biomass CRs, for which intraregional circulation is suitable because biomass is generated in specific regions and decomposes easily, and those for CRs requiring advanced treatment technology, for which wide-area circulation is more desirable.

In the case of biomass CRs, Biomass Town projects are already underway in many municipalities, in line with the Comprehensive Biomass Nippon Strategy, and based on community-based or local circulation. As of the end of April 2008, 141 municipal governments have announced their Biomass Town projects. A biomass town is an area in which a total regional biomass utilization system is established through joint efforts by a variety of regional entities, efficiently connecting every biomass-related process from generation through to utilization, and in which biomass is, or is expected to be, steadily and appropriately used. It is hoped that these towns will contribute to regional revitalization (Figure4-3-17).

Figure 4-3-17 Biomass town vision



Source : Documents provided by the Central Environmental Council

As part of this strategy, the government will develop structures for local production for local consumption in the fields of food and energy, in accordance with regional characteristics (e.g., large cities vs. provincial towns) and through collaboration among the various entities concerned. One example is a program to certify food recycling loops under the Food Waste Recycling Law. The government will also foster the development of so-called local community businesses, continuously engaged in for-profit recycling activities such as the composting of kitchen garbage collected and disposed of by municipal governments or private enterprises and the production of feed or biofuel from waste oil. The effective use of biomass materials such as livestock manure and sewage sludge will also be promoted.

CRs derived from products and CRs containing exhaustive resources will be fully subject to measures under the recycling laws and the Law for the Promotion of Effective Utilities of Resources, with a view towards wider-area circulation. The wide-area certification and recycling certification programs under the Waste Management Law will also be appropriately used for these CRs. Through inter-industry collaborations, the multi-stage recycling of CRs will be fostered by further restricting the resource input into supply chains and by promoting the

wide-area use of materials. In particular, in order to ensure the appropriate and strategic use of valuable resources contained in CRs, the government will take measures to make recycling technologies and systems more sophisticated, to expand collection structures, and to strengthen joint efforts with consumers while improving credibility.

Column

Promoting the collection of mobile handsets

With the appearance of lighter, cheaper and more capable handsets, mobile phones are now so common that over 100 million people use them in Japan. Since mobile handsets contain gold, silver copper and rare metals such as palladium at concentrations higher than those found in natural ores (see "Valuable metals contained in mobile and PHS handsets"), they need to be appropriately recycled and disposed of from the viewpoint of effectively using resources.

For this reason, a voluntary collection and recycling system has been established by mobile and PHS carriers (the Mobile Recycling Network) in order to promote recycling (see "Changes in collected mobile handsets in number and weight").

Valuable metals contained in mobile and PHS handsets

Type of mineral	Valuable metals contained in mobile and PHS handsets	Reference: Average content in ore
Gold (g/t)	400	0.92
Silver (g/t)	2,300	93
Copper (%)	17.2	1.2
Palladium (g/t)	100	181

Source : Created by the Ministry of the Environment, based on the FY 2001 Annual Report for Establishing a Sound Material-Cycle Society and issued by the Ministry of Economy, Trade and Industry

Changes in collected mobile handsets, by number and weight

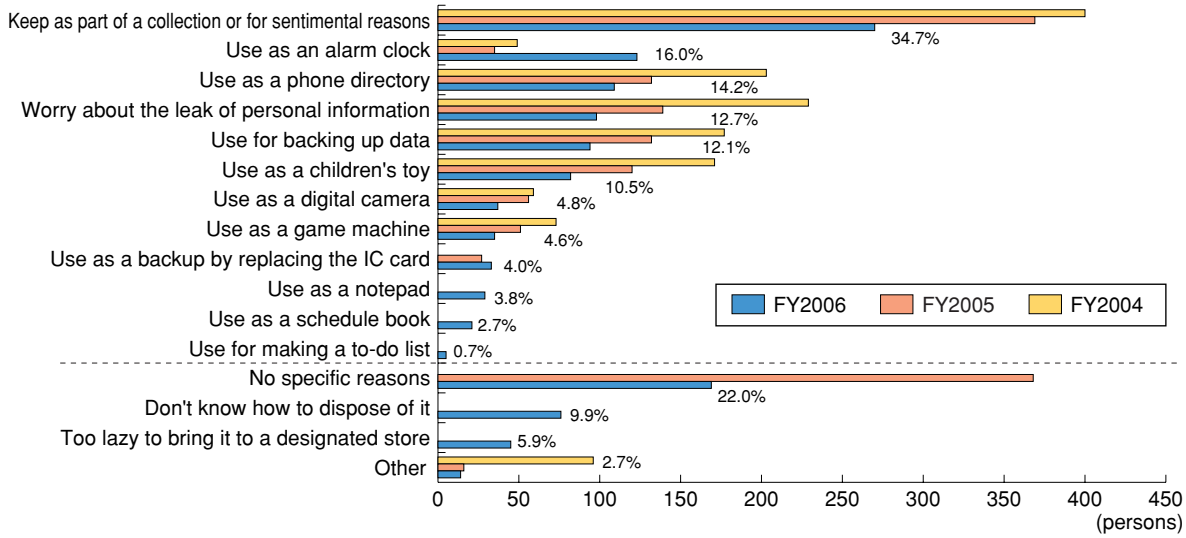
by fiscal year

		Before MRN	After the Mobile Recycling Network					
		FY 2000	FY 2001	FY 2002	FY 2003	FY 2004	FY 2005	FY 2006
Collected bodies	Number in 1,000 units	13,615	13,107	11,369	11,717	8,528	7,444	6,622
	Weight in tons	819	799	746	821	677	622	558
Collected batteries	Number in 1,000 units	11,847	11,788	9,727	10,247	7,312	6,575	6,133
	Weight in tons	304	264	193	187	159	132	125
Collected battery chargers	Number in 1,000 units	3,128	4,231	3,355	4,387	3,181	3,587	3,475
	Weight in tons	328	361	251	319	288	259	234

Source : TCA and CIAJ

However, the number of handsets collected has actually been declining over the years. Approximately 6.6 million units were collected in FY 2006, while about 50 million units were shipped to the domestic market in the same fiscal year. The factors behind this can be observed in the results of a consumer questionnaire. When asked about the reasons for keeping their old handsets, most respondents cited their desire to keep the phone as part of their personal collection or for sentimental reasons, while others answered that they still use their handset for purposes other than making telephone calls. On the other hand, 22.0% of respondents (a smaller percentage than in the previous fiscal year) cited no specific reasons, suggesting that many people hold onto their mobile phones for no valid reason. The percentages for those who did not know how to dispose of the handset (9.9%) and those who were too lazy to bring it to a store (5.9%) were also high. There is a need to publicize the collection system to consumers and enhance the current collection structure (see "Factors behind the reduction in the number of mobile handsets collected).

Factors behind the reduction in the number of mobile handsets collected



*The survey was conducted among 2,000 people over the Internet in May 2007. The respondents were allowed to choose multiple answers.
Source : TCA and CIAJ

The Eco-town program should be effective for such wide-area SMC blocks. This program was instituted in FY 1997 with the aim of promoting advanced community development projects, in harmony with nature, by using the zero-emissions concept (completely eliminating all kinds of wastes through the use of all industrial wastes as raw materials in other sectors) as the basic concept for communities trying to establish an eco-friendly economy and society, and by fostering this concept as the key to regional development. To date, 26 Eco-towns have been approved. They are expected to act as centers for wide-area regional circulation.

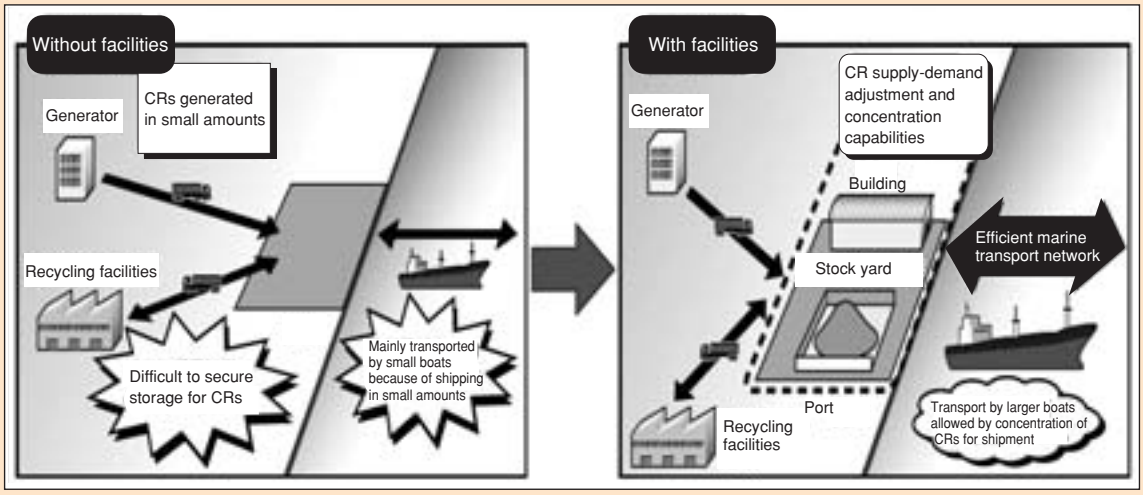
With regard to the medium- and long-distance transport of CRs, the government will work towards implementing a venous distribution network that has a low impact on the environment, by making the most of rail and marine transport. In particular, more efficient marine transport will be pursued through the promotion of recycling ports (Figure4-3-18).

As a major precondition for these initiatives, the government will ensure the correct use and disposal of CRs (e.g., correct waste disposal) and the conservation of the living environment. Considering the potential presence of regions where the amount of CRs, the availability of facilities to handle them, and demand for recycled products are not in balance, the government will also foster regional alliances based on appropriate information.

Figure 4-3-18 Subsidy program to support circulative resource handling (other facilities expenses) [established in FY 2005]

FY 2006 : Outlaid as part of 800 million yen government expenditures
FY 2007 : Outlaid as part of 1 billion yen government expenditures

- Eligible entities: Any legal person which a local government invests in or finances (e.g., third-sector companies)
- Rate of assistance by subsidies : One third of the total project costs in any region
- Eligible projects
  Projects which construct facilities to warehouse or store circulative resources in order to facilitate the efficient handling of CRs at ports designated as recycling ports.



Source : Documents provided by the Central Environmental Council

(2) Advances in technologies and systems

The establishment of SMC blocks, as mentioned above, calls for the development of suitable technologies to underpin them. By advancing the development of 3R-related technologies and systems, the government will promote efforts to achieve the 3Rs across the entire product life cycle and the entire supply chain, which will then contribute to the formation of SMC blocks. This requires effectively forging ahead with the R&D and commercialization of 3R technologies and systems, as well as the development and commercial application of 3R-oriented business models, with product life cycles and supply chains also taken into consideration.

During the manufacturing phase, it is important to decide priorities based on the toxicity of the materials to be used and the rarity of the metals and other substances present, and to further the advancement of those technologies and systems needed to design and manufacture DfE (Design for Environment) products in accordance with the functionality and properties of each product.

In the recycling phase where end-of-life or used products are subject to cyclical use or appropriate disposal, it must be ensured that product/component reuse, material recycling, raw material recycling, energy recovery and use, and correct disposal are all conducted step by step.

As well as focusing on each individual stage, including the reuse, recycling, energy recovery/use, and disposal stages, it is essential that technologies and systems be improved in

order to reduce the impact on the environment associated with the cyclical use and disposal of materials. Strategically advancing technologies and systems to make the most of regenerable biomass materials is, therefore, just as important.

Furthermore, by integrating technologies that can evaluate the effects of the above 3R technologies and systems with other individual technologies, systems and social systems, the government will strategically promote the development of design technologies to implement a 3R-oriented production and consumption system (Table 4-3-2).

Table 4-3-2 Major technologies to support a SMC Society

Technology		Description
Improvement in hygiene	Johkasoh	A purification tank for treating night soil and miscellaneous domestic waste water to discharge treated water
	Mechanical collection vehicle (packer truck)	Packer trucks to efficiently collect and transport wastes without any leakage or spillage
	Intermediate treatment (incinerator)	Incineration technology, suitable for use under Japanese conditions (during hot, humid summers and in areas where final disposal sites are scarce), to reduce the volume of waste and kill bacteria
	Intermediate treatment (gasification and melting furnaces)	Melting technologies that will reduce dioxin generation: ensuring complete high-temperature combustion, rendering incineration ash harmless by melting and solidification, and allowing the effective use of molten slag
	Final disposal	Technologies for the final disposal of the waste residue remaining after intermediate treatment
	Manifest control	A manifest control system that will improve transparency and accuracy when monitoring and managing waste flows, and the adoption of electronic manifest control technology
Measures against hazardous substances	Measures to reduce waste mercury levels	Recycling technologies for waste batteries and fluorescent bulbs
	Measures to reduce waste dioxins levels	Systems and technologies to reduce the amount of dioxins generated during waste incineration
	Measures to reduce waste PCBs levels	Methods and programs to ensure the responsible disposal of polychlorinated biphenyls (PCBs)
	Measures to reduce waste asbestos levels	Systems, final disposal methods, and studies concerning the responsible management of asbestos
	Measures to reduce infectious waste	Incineration for infectious waste from medical facilities
Technologies to support 3R	Container and packaging reductions	Measures to reduce waste through the use of thinner PET bottles, the development of refillable bottled products, and the adoption of replacements for bottled products (e.g., liquid soap, detergent)
	Home appliance -related reductions	Technologies to reduce the number of component parts, produce smaller parts, reduce weight by means of modularization, and extend the useful life of PCs
	Vehicle-related reductions	Technologies to reduce vehicle body weight through the increased use of aluminum, and extend the useful life of engine oil by increasing designated replacement intervals
	Reuse of copiers	Initiatives to reuse exterior components through the development of improved cleaning technologies, in addition to the drive unit and other interior components, which have already been used.
	Reuse of slot machines	Initiatives to reduce the amount of resources needed to manufacture new models of "pachislo" slot machines by encouraging their reuse
	Reuse of vehicles	Initiatives to restore and recondition vehicles by replacing worn or broken components with new ones based on parts removed from end-of-life vehicles
	Eco-design home appliances	Designs incorporating "ease of decomposition," using product assessment projects and washing machines as pilot cases
	Eco-design vehicles	Adoption of recycling-conscious resources, such as recycled materials and recyclable resources, and the use of the "Easy Disassembly Mark" labeling system
	Recycling of waste containers and packaging	Material recycling and chemical recycling for waste plastic and PET bottles
	Recycling of end-of-life vehicles	Recycling for aluminum wheels, shredder dust, and waste tires
	Recycling of end-of-life home appliances	An end-of-life home appliance recycling flow, and the utilization of recycling to provide more added value (closed recycling)
	Recycling of construction waste	Technologies to sort mixed construction waste and recycle construction sludge
	Recycling of food waste	Technologies to produce compost and eco-feed and to recycle food waste for other uses, such as fuel
	Paper recycling	Technologies to manufacture pulp from used paper in order to produce recycled paper
	Recycling technology for non-burnable waste and large discarded articles	Technologies to crush/shred and sort non-burnable waste and large discarded articles in order to effectively recycle valuable waste
	Recycling of incineration ash	"Eco-cement," manufactured mainly (50%) from wastes such as urban waste incineration ash and sewage sludge
	Waste power generation	Waste power generation systems utilizing the waste heat from waste incineration facilities
	Biomass power generation	Power generation systems using biomass materials such as wood chips and bagasse (sugarcane chaff)
	RDF	Refuse-Derived Fuel (RDF), produced by shredding and drying burnable waste and removing any impurities
	RPF	Refuse-derived paper and plastic Fuel (RPF), produced mainly from the used paper and waste plastic (difficult to recycle) included in industrial waste
	Biodiesel fuel	Biodiesel fuel (BDF) as a substitute for light oil in automotive diesel engines
	Bioethanol	Bioethanol, produced mainly from waste construction wood with other wastes such as waste paper and food residues added
Metallic resource circulation technology	Iron, copper, aluminum	Technologies and material flows to recycle iron, copper and aluminum scrap
	Rare metals, heavy metals	Technologies to recover and recycle rare metals and heavy metals from waste, as an extension of existing smelting technology

Source : Ministry of the Environment

(3) Development of basic infrastructure

The government will implement measures to develop basic infrastructure for CRs. An example of this will be to provide support for regional model projects that help create a SMC and for the formulation of recycling-oriented community visions, with the aim of sharing and disseminating information to communities across Japan regarding outstanding contributions made by key contributors to recycling-oriented community development, such as municipal governments, NPOs and enterprises. Since FY 2005, the government has been implementing an assistance program that provides subsidies to promote the establishment of a SMC rather than the construction of waste disposal facilities, in order to support municipalities developing systems for the efficient recovery of resources and energy from wastes by building disposal facilities for municipal solid waste, based on their own voluntary and creative efforts. In addition to this, assistance will be provided for projects aimed at establishing SMC blocks. This will include active financial support for projects to build facilities for the effective use of regional waste-derived biomass.

Human resources for promoting a SMC will also be enhanced in terms of both quality and quantity. Specifically, this will involve prompting industry, academia and government, including enterprises, universities, research institutes, central and local governments and NGOs/NPOs, to foster people-to-people exchanges as well as information exchange. In particular, the development of coordinators will be promoted through the nurturing of young researchers at universities, through the transmission of technologies in industries and universities from one generation to the next, and through people-to-people exchanges between NGOs/NPOs. In addition, the government will foster improvements in the capabilities of leaders, including central and local government officials and teachers engaged in environmental education and learning, by expanding their training programs.

As mentioned in Chapter 2, a prerequisite to the establishment of SMC blocks is that every entity involved plays its part through cooperation and collaboration with all others (linking ability). In particular, in order to strengthen such collaboration, local governments play a key role in promoting the establishment of regional SMCs and are expected to act as an essential coordinator between different entities. For example, they are expected to foster cooperation between companies from different sectors and provide a framework for their collaboration. To be more specific, the prefectural government should take the lead in aligning the efforts of the municipal governments and other entities involved, approaching the issues from a broad perspective. The municipal government should play its role as the fundamental governing body closely related to citizens' lives by carrying out activities such as the construction of a local circulation system. At the same time, the prefectural and municipal governments all need to work in close cooperation.

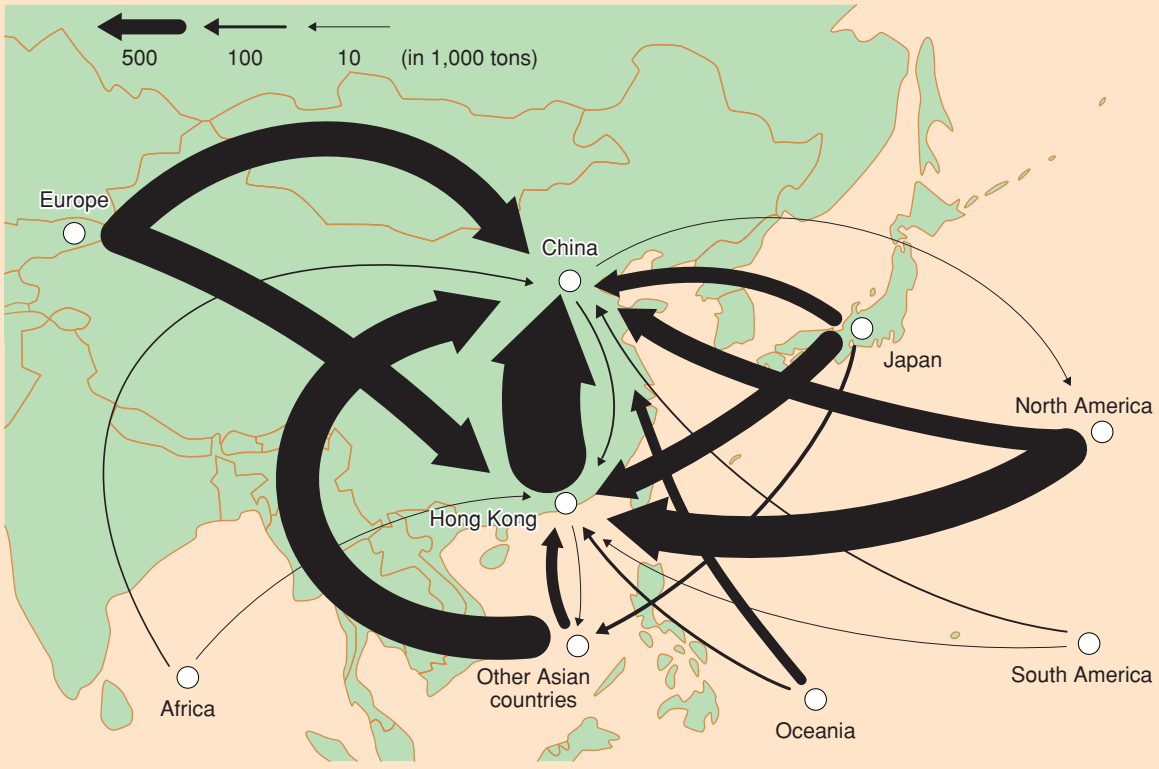
There are many kinds of information to sive the base of each entity's efforts : domestic material flows, the amounts of different types of waste generated, the cyclical use and disposal of different types of waste, future prospects, technical data on wastes (e.g., materials, composition, design), and the environmental effects of the use and disposal of wastes. It is essential that a system to gather all this statistical information be immediately reviewed and improved so that accurate information can be obtained swiftly.

SECTION 4
PROSPECTS FOR ESTABLISHING A SMC SOCIETY IN EAST ASIA, AND JAPAN'S COOPERATION

1 Formulating an East Asia Sound Material-Cycle Society Vision

As explained in Chapter 1, the world is facing worsening waste management problems, a shortage of resources and energy, and an associated increase in the transboundary movement of CRs (Figure4-4-1). These all emphasize the need to create an international sound material-cycle (SMC) society as soon as possible.

Figure 4-4-1 International resource circulation



Waste plastic material flows between Japan, China and Hong Kong in 2007 (only showing flows of at least 5,000 tons)
Source : National Institute for Environmental Studies , Japan

Japan's Fundamental Law for Establishing a Sound Material-Cycle Society defines a SMC Society as one in which natural resource consumption is curbed and the burden on the environment is reduced, and which can be created by ensuring that (i) products are prevented from becoming waste, (ii) any wastes generated are used appropriately as resources whenever possible, and (iii) wastes with no uses at all are disposed of responsibly. An international SMC Society can be considered as a SMC Society established at the global level. The basic principles involved in the creation

of an international SMC are :

1) Creating a domestic SMC Society in each individual country first,
2) Enhancing efforts to prevent illegal waste imports and exports, and then
3) Facilitating imports/exports of CRs.

These principles were agreed among Asian countries at the Second Asia 3R Conference in 2008.

Creating a SMC Society in East Asia in line with these basic principles, with the properties of CRs also taken into consideration, is not only beneficial to East Asian countries but also meaningful in the context of sustainable development across the region. In addition, an East Asian SMC Society designed to allow optimal movements of CRs can also contribute to combating global warming and solving resource and energy issues. To achieve results such as these, Japan should share its experience with other countries and effectively and efficiently promote relevant efforts by combining initiatives to improve East Asian countries' capability to responsibly use and process CRs with initiatives to ensure the appropriate transboundary movement of CRs.

If this approach fails, the closely interrelated societies and economies of the East Asian region could face crises such as the expansion of environmental pollution and the exhaustion of resources. East Asian countries therefore share a common destiny and need to work in cooperation in order to realize a scenario for the responsible use and disposal of CRs in line with a common vision to establish a SMC Society.

Japan therefore plans to formulate an East Asia Sound Material-Cycle Society Vision by 2012, stipulating the basic principles and targets for the development of an East Asian SMC, as set forth in the Fundamental Plan for Establishing a SMC Society.

To achieve this goal, Japan is implementing several measures designed to improve East Asian countries' internal capability to responsibly use and process CRs. These measures include (i) support for the formulation of national 3R plans and strategies, (ii) policy dialogue, (iii) establishment of 3R-related information center and research networks, (iv) technology cooperation on the 3Rs and waste management and assistance for the development of associated infrastructure, and (v) international dissemination of 3R and waste management technologies. Japan is also working to ensure the appropriate transboundary movement of CRs by (i) strengthening the enforcement structure for Japanese regulations regarding illegal imports and exports, and clarifying which items are subject to regulation, and (ii) supporting joint initiatives with Asian countries to foster information exchange and improve the relevant authorities' enforcement capacity. The details of these initiatives are described in the following sections.

2 Establishing a SMC Society in Asia and provision of cooperation tailored to the needs

It is essential that Japan contribute to the improvement of Asian countries' capability for CR use and processing so that they can implement the 3Rs and responsible waste management as a step

towards establishing a domestic SMC Society. A major challenge for many developing countries is how best to manage waste appropriately, for example, by establishing a public waste collection system or by ensuring the sanitary disposal of wastes. In contrast, rapidly growing economies, such as those of many typical East Asian countries, are faced with the need to curb waste generation and recycle waste materials because the amount of waste has increased, even when waste collection and disposal systems have already been developed, especially in urban areas. In addition, concerns about soaring resource prices and constraints on resource supply are creating a growing need to use resources more effectively. This means that an essential challenge for Asian countries is to step up their efforts toward responsible waste management, while also promoting the 3Rs. Another important approach to the urgent issue of global warming is to take measures that bring about co-benefits (measures that can benefit both public hygiene and global warming issues) by promoting CDM (Clean Development Mechanism) projects and other initiatives directed towards responsible waste management and the 3Rs in order to prevent global warming.

Japan's new Fundamental Plan for Establishing a SMC Society stipulates that Japan should address the international dissemination of its systems, technologies and experience as follows :

"Japan will make its accumulated knowledge of advanced schemes and outstanding technologies and systems regarding the 3Rs and waste management, as well as the experience accumulated by domestic entities by means of relevant activities and collaborations, available to other countries. This will include rapidly developing Asian countries and potentially emerging African countries, and will thereby support these countries' establishment of a domestic SMC Society. This accumulated knowledge will be provided in the form best suited to each country's needs, such as assistance in formulating national 3R promotion plans, cooperation to help develop sound material-cycle cities modeled after Japanese Eco-towns, and support to help increase access to safe and sanitary night soil disposal systems. To this end, each country's situation and needs will be assessed so that Japan's 3R technologies/systems and training programs can be tailored to each country's actual needs. Furthermore, Japan will foster international collaboration not only at the national level but also at a variety of other levels, including the public, enterprises and local governments."

Japan has already been helping other countries solve their problems by engaging in policy dialogue and addressing their needs through frameworks such as the Tripartite Environment Ministers Meetings between China, Japan and Korea. Now that countries in Asia, especially in East Asia, are enhancing their waste management policies by introducing the concept of the 3Rs, in accordance with their social and economic situations, Japan should explore a specific vision of international cooperation that meets these countries' needs. In this way, Japan can offer East Asian countries the benefits of its experience, gained through past reforms for the promotion of waste management and recycling, and let these counties make use of this information as a valuable resource (Table 4-4-1).

Table 4-4-1 Examples of 3R initiatives in Asian countries

Bangladesh	Community-based composting (operated by Waste Concern (an NGO)) Project results -Employment creation (predicted to be able to create jobs for 90,000 people across the nation) -Involvement of informal workers in the compost production process
China	Promotion of a sound material-cycle economy as a priority issue for the government Integrated activities directed towards the realization of a sound material-cycle economy in the new five-year social-economic development plan at national and local government levels. Circular economy law (under consideration)
	Stricter management of end-of-life electrical and electronic appliances (establishment of laws, regulations, policies, etc.) Regulations to prevent pollution caused by home and information appliances (March 2007) National regulations regarding the management of electrical and electronic appliances in China (draft)
	Environmental industrial park policy Established about 20 pilot eco-industrial parks. Designated eight regions as pilot regions for establishing sound material-cycle economies at the regional level.
India	Formulation of national environmental policy (2006)
	Draft regulations on entities engaged in recycling, reprocessing and hazardous waste handling Environmental (Protection) Law (1986)
	Development of plastic recycling Amount recycled : 1.7 million tons (2004-2005)
Indonesia	National action plan (2008-2015) Establishment of regulations : Plans to institute new regulations over the next two years after establishing the municipal waste management law.
	Activities among SMEs Of the total amount of hazardous waste produced by industry, 35% was reused or recycled. There are excellent practices in place, such as clean production in the tofu manufacturing industry (reuse, waste/residue recycling).
	Composting subsidy program The composting/recycling rate increased by 2% as a result of composting subsidies allocated to 19 cities. Under this program, 217 tons of compost was produced per day, exceeding the target of 200 tons.
Malaysia	National recycling program (2000) Long-term goals to make recycling common practice
	National strategic plan for solid waste management (2005) Comprehensive efforts to promote the reduction, reuse, and collection of solid waste
	Establishment of a master plan to minimize national waste (2006)
Philippines	National-level legislation: National 3R policies Set the goal of achieving a waste conversion rate of at least 25% by 2006.
	Backyard composting and organic waste disposal Of the total amount of waste available for composting, 25% was collected and recycled as organic fertilizer.
	Initiative to improve the collection and recycling rates of waste lead-acid batteries Set the goal of collecting 3,600 tons of waste lead-acid batteries annually (amount collected in 2004 : 398 tons).
South Korea	Food waste minimization and recycling Improvement in the recycling rate : 2.1% (1995), 41.1% (2000), 93.8% (2005) Extended the useful life of final waste disposal sites from 7 to 11 years.
	Charge system based on the amount of waste produced The amount of solid waste produced in urban areas was reduced by 0.62% in the period between 1994 and 2004.
	Extended producer responsibility (EPR) Improvement in the recycling rate for EPR items (end-of-life electrical and electronic appliances and end-of-life vehicles)
Singapore	Recycling The recycling rate in 2006 was 51%, up 2% from 2005. The recycling of construction and demolition waste, wood waste and plastic waste is being promoted.
	National recycling program -Launched a household recycling program in 2001. -Installed collection boxes for recyclable items in public places. -Promotes the recycling of construction and demolition waste (achieved a recycling rate of over 90%)
	Disposes of 90% of burnable waste at four incineration facilities. Disposes of 10% of non-burnable waste at an off-shore sanitary landfill site.
Thailand	Program to collect used products In 2005, 85% of all waste lead-acid batteries were collected. A program to collect fluorescent lamps was carried out in cooperation with the Japanese government.
	Initiative to create a recycling-oriented society Over 200 communities practice 3R, with some municipalities having successfully achieved a 30-50% reduction in the amount of waste produced.
	Industrial waste exchange program Over 450 industrial sectors are registered members (as of 2005).
Vietnam	3R-related policies and legislation 2005 Environmental Protection Law : 14 provisions were added in order to promote 3R and other related activities.
	3R national strategy 3R targets through 2020 : Thirty percent of the total waste collected was recycled. Thirty percent of household waste and 70% of all commercial waste was sorted by source.
	Has identified a need to improve the recycling system in rural villages dependent on the handicraft industry

Source : Created by the Ministry of the Environment and the Institute for Global Environmental Strategies, based on materials provided at the Senior Officials' Meeting on the 3R Initiative in October 2007.

The FY 2007 White Paper on a Sound Material-Cycle Society mentioned Japan's outstanding technologies, policies and systems. Japan can make a significant contribution by making the most of its superior technologies and systems to assist other countries in establishing waste management mechanisms and formulating 3R promotion plans and visions.

Japan also needs to help other countries develop human resources and form organizations to implement technologies and systems related to responsible waste management and the 3Rs, through the use of existing technology development and training programs carried out by the Japan International Cooperation Agency (JICA) and other organizations. Japan should also pursue co-benefits to global warming prevention through CDM or similar projects, construct a network of researchers and experts through which to share the scientific knowledge and technical information needed to formulate and implement 3R policies, and promote initiatives implemented by local governments and NGOs/NPOs, which will play major roles in a SMC Society.

(1) Support for the formulation of national 3R plans and strategies

In order for each country to effectively and efficiently implement 3R initiatives, it is essential that the government declare its intention to promote the 3Rs as a national policy and formulate a plan or strategy that takes account of the existing legal framework for waste management and the regional status of waste management and recycling. Japan has been assisting countries such as Vietnam and Indonesia in developing 3R plans and strategies in accordance with their individual situations, in cooperation with the United Nations Centre for Regional Development (UNCRD), the United Nations Environment Programme (UNEP) Regional Resource Centre for Asia and the Pacific, and the Institute for Global Environmental Strategies (IGES). In providing such assistance, the approach taken by the Japanese government is to develop each plan or strategy with as much open consultation as possible by liaising with the recipient's environment ministry and involving all parties concerned, including the local governments in charge of waste disposal, as well as related ministries and NGOs. For example, Japan is trying to extend the results of, and the experience gained through, the development of Vietnam's national 3R strategy to other countries in the Mekong basin by coordinating its assistance with the support of the Asian Development Bank (ADB). JICA is also active in supporting the formulation of 3R-related plans. For example, it is assisting Malaysia to develop a plan to reduce solid waste.

(2) Policy dialogue

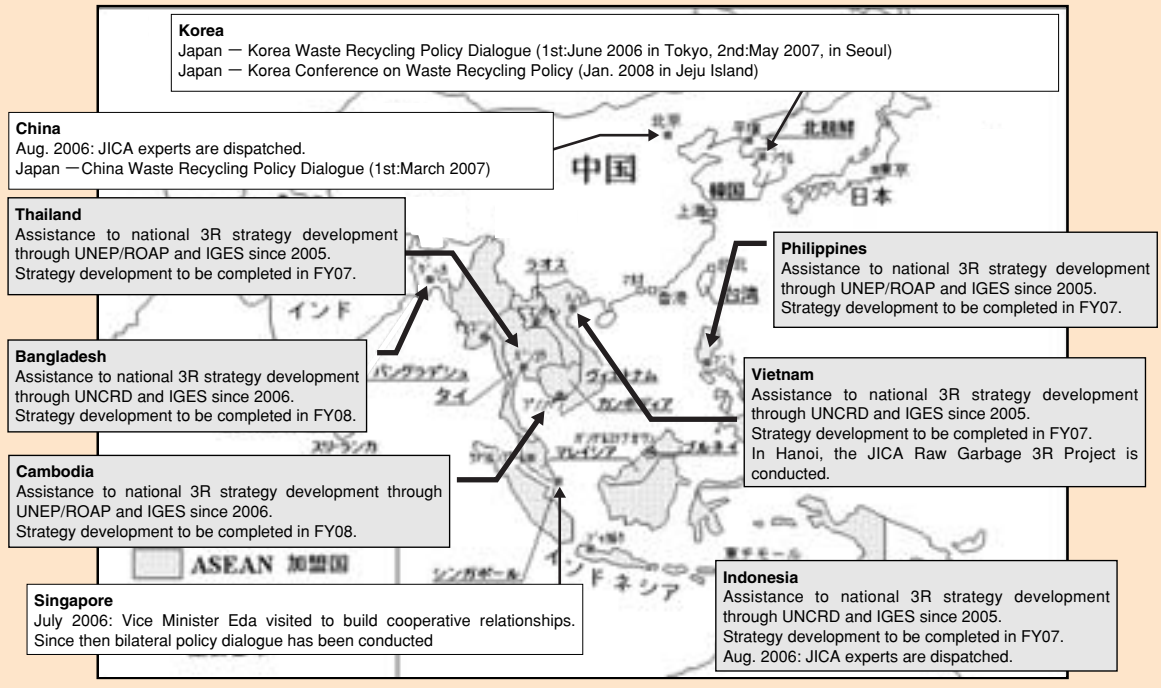
Japan has been engaging in policy dialogue with the government bureaus responsible for waste management and the 3Rs in various countries seeking to enhance their domestic systems for 3R promotion and implement relevant policies in a well-planned manner. In the case of South Korea, the Japan-Korea Policy Dialogue on Waste Management and Recycling was conducted between director-general level officials from Japan and the Korean Ministry of the Environment in June 2006 in Tokyo (the first time) and in May 2007 in Seoul (the second time). With South Korea's law on the recycling of electrical and electronic waste (e-waste) and end-of-life vehicles set to come into effect in 2008, both countries exchanged information and opinions on their respective policy developments, including the current state of recycling for these wastes and each country's associated experience.

In the case of China, the Japan-China Policy Dialogue on Waste Management and Recycling

was conducted between director-general level officials from Japan and the Chinese Ministry of Environmental Protection (formerly the State Environmental Protection Administration) in March 2007 in Beijing (the first time) and in March 2008 in Tokyo (the second time). The two counties discussed the importance of bilateral cooperation on measures to counter hazardous waste and waste import and export controls. Japan also conducted talks at a similar level with China's National Development and Reform Commission in the Second Japan-China Policy Dialogue on the 3Rs in June 2007 in Beijing. The two sides discussed cooperation on the creation of SMC cities based on Eco-town projects in Japan.

Japan also promotes dialogue with China and Korea through the annual Tripartite Environment Ministers Meetings between China, Japan and Korea and the exchange of opinions on SMC Society establishment. At the ninth such meeting, held in Toyama in December 2007, the three countries agreed that sharing a single vision is essential to promoting the establishment of a SMC Society in each East Asian country and across this region, and all participating countries increased their understanding of Japan's proposal to formulate an East Asia Sound Material-Cycle Society Vision. China and Korea, along with Singapore, with which Japan has been conducting a separate dialogue, are all expected to join Japan in playing a leading role in establishing a SMC Society across East Asia. The Ministry of the Environment will continue strengthening the cooperative relationship with these countries (Figure4-4-2).

Figure 4-4-2 3R-related bilateral cooperation with Asian countries



Source : Ministry of the Environment

In order to establish a framework for policy dialogue across the Asian region, the Ministry of the Environment hosted the Asia 3Rs Conference in October 2006 in Tokyo, bringing together director-general level officials from 19 Asian countries and related international organizations to discuss the comprehensive promotion of the 3Rs and measures to manage kitchen garbage, e-waste and medical waste. Another example of policy dialogue is the Environment Congress

for Asia and the Pacific (ECO ASIA 2007), which was held in September 2007 in Fukuoka. Environment ministers and other representatives from Asia and the Pacific freely exchanged opinions at this meeting. The participants recognized the significance of creating national and Asia-wide SMCs and agreed that, in order to achieve this goal, they should work in cooperation to more actively foster policy dialogue on the 3Rs and to disseminate information on 3R-related policies, technologies and good practices in order to develop regional visions.

In East Asia, the Regional Forum on Environment and Health was organized in August 2007 with the aim of promoting collaboration between environment ministries and health ministries in order to improve the regional capability to cope with local environmental and health problems. The forum comprises 14 countries, namely, 10 Southeast Asian countries and Japan, China, South Korea and Mongolia. For about the next three years, the forum will conduct its activities through six thematic working groups (TWGs), one of which is the TWG on Solid and Hazardous Waste, chaired by Japan. Focusing on urban and medical waste, this TWG will collect and share good practices from different countries and compile recommendations for regional initiatives to tackle the common challenges facing member countries. The first meeting of the TWG was held in February 2008 in Singapore to share updates on national initiatives and good practices for medical waste management and to develop a future work plan. Japan expects that this TWG will conduct continuous follow-ups on the urban and medical waste problems discussed at the Asia 3R Conference and improve information sharing.

(3) Construction of information centers and research networks for the 3Rs

It is critically important that Asian countries adopt technologies and develop systems that are suitable for their own situations. To establish a SMC Society in Asia, it is also necessary to efficiently accumulate and provide 3R-related knowledge and technical information. Therefore, the Ministry of the Environment supports content creation for the 3R Knowledge Hub, an information center established and operated as part of an initiative led by the ADB and the UNEP Regional Resource Centre for Asia and the Pacific.

The Japanese government also assists the activities of the Society of Solid Waste Management Experts in Asia & Pacific Islands (SWAPI), organized under the leadership of the Japan Society of Waste Management Experts, in the expectation that this organization will develop as a network of Asian researchers and experts in waste management and the 3Rs. At the Third East Asia Summit in November 2007, Prime Minister Yasuo Fukuda announced "Japan's Environmental Cooperation Initiative," which states that Japan will "establish an 'Asia 3Rs Research and Information Network' with a view to assisting 3Rs-related activities in each country through the sharing of policies and good-practices." It declares Japan's determination to help foster coordination between the 3R Knowledge Hub and SWAPI and between these frameworks and each country's competent authorities.

(4) Technology cooperation and infrastructure development for the 3Rs and waste management

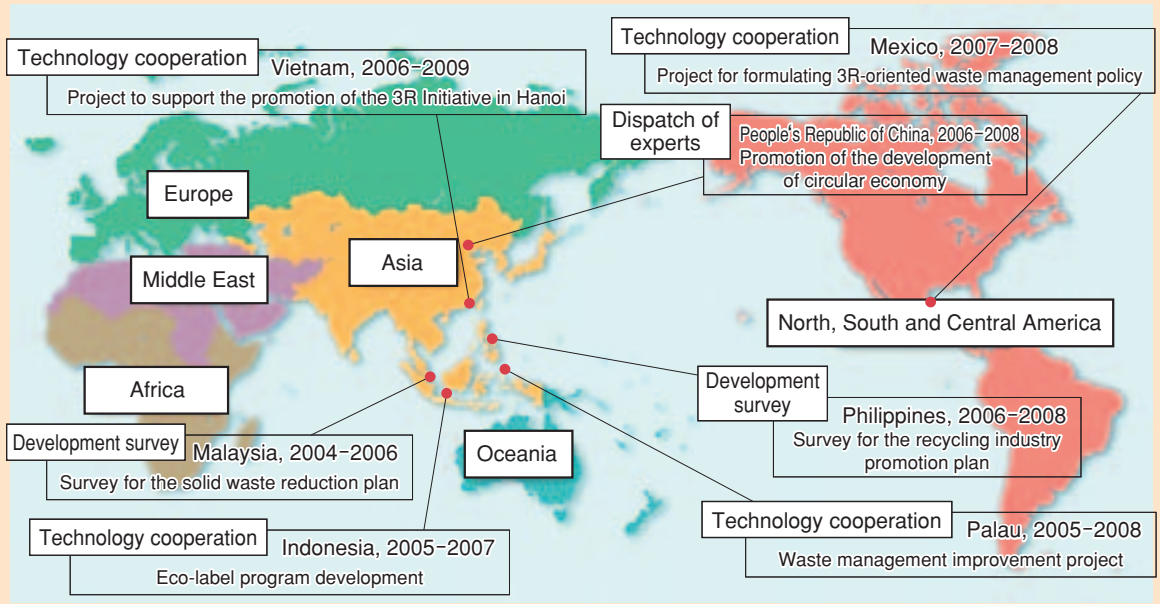
As part of official development assistance (ODA) to developing countries, JICA provides technology cooperation aimed at capacity building and improving coordination of the central government, local governments and the private sector. Assistance to the central government includes

supporting the establishment of a legal framework to promote the 3Rs and waste management at the national level and helping to formulate and implement a fundamental policy and plan for implementing legislation. Assistance to local governments includes helping them raise public awareness and develop a mechanism to promote the reduction of waste generation and sorted collection in cooperation with the public. For the private sector, support is provided for the study and formulation of policies such as green purchasing and the eco-label system in order to foster efforts by individual businesses and promote the growth of the recycling industry.

Japan also supports a variety of programs that invite engineers and government officials from developing countries to learn about waste management and the 3Rs. Some of the many training courses provided by JICA are the SMC Establishment course, a regional training program for environment officials from Asian countries to share information on related legislation, administration and technologies, and the 3Rs and Recycling of Waste course, a group training program for engineers engaged in the disposal and recycling of industrial waste.

In addition, financial assistance is also provided in the form of grants and loans for improving infrastructure, including waste management equipment and disposal facilities (Figure4-4-3).

Figure 4-4-3 Support provided by JICA in 3R-related fields



Source : JICA

(5) International promotion of 3R and waste disposal technologies

Disseminating Japan's 3R and waste disposal technologies internationally can constitute the central part of Japan's international cooperation for establishing an international SMC Society. Japan should step up 3R and waste management measures, some of which can even contribute to the prevention of global warming.

Companies in Japan have developed world-leading technologies in the fields of eco-friendly design and production, product reuse and recycling, and the recovery and use of energy from

waste. These technologies can make a major contribution to the establishment of an international SMC Society, if they are disseminated through the promotion of the 3Rs across the entire life cycle or supply chain of the products moving across national boundaries.

In light of this, the government will take actions to allow such technologies to be adopted, where appropriate, by countries in Asia and elsewhere. With due consideration to the protection of intellectual property rights, the government will foster bilateral and multilateral policy dialogue and information exchange in order to assess each country's technology needs, while proactively providing and disseminating information on 3R and waste disposal technologies.

Here are some examples of such efforts with regard to night soil disposal. At a session on "johkasou" systems during the Third World Water Forum, held in March 2003 in Kyoto, lectures were presented describing Japanese johkasou, including their history, technologies, maintenance and institutional systems. This was followed by an exchange of opinions. At this forum, the Portfolio of Water Actions was compiled by collating information on water-related initiatives and specific actions taken to solve world water problems, from around the world. One of the Japanese water actions listed in this report was the "transfer of low-cost waste-water treatment technologies that allow installation to be carried out in a short period of time."

Information on Japan's johkasou technologies has been effectively publicized at events such as the Asia-Pacific Water Summit, held in Oita Prefecture in December 2007 ahead of the start of International Sanitation Year 2008, the Asia Water Environment Partnership (WEPA)'s workshop in Jakarta on johkasou in March 2004, and the 12th session of the Commission on Sustainable Development (CSD-12) held in New York in April 2004.

Furthermore, at the Japan-China Policy Dialogue in June 2007, the two countries agreed to implement joint projects to create SMC cities through cooperation between Kitakyushu City, which conducts an Eco-town project in Japan, and Qingdao City, and between Hyogo Prefecture and Guangdong Province. In September 2007, Kitakyushu and Qingdao started a joint survey and other preparations for further cooperation.

(6) Measures taken to address specific issues (using sanitation improvement as an example)

Japan's experience, technologies and systems can be of great help in establishing responsible waste disposal systems in Asian countries. However, these systems may not always be appropriate because the situation varies from one developing country to another, including differences in each country's needs and the properties of the waste generated there. For example, since sanitation is closely related to the sanitary use of water, the form of support provided needs to take account of each country's water system and usage, which are often very different from that in Japan.

One report shows that, as of 2004, 2.6 billion people (41% of the total world population of 6.4 billion) had no access to improved sanitation[1]. There are many areas where less than half the pop-

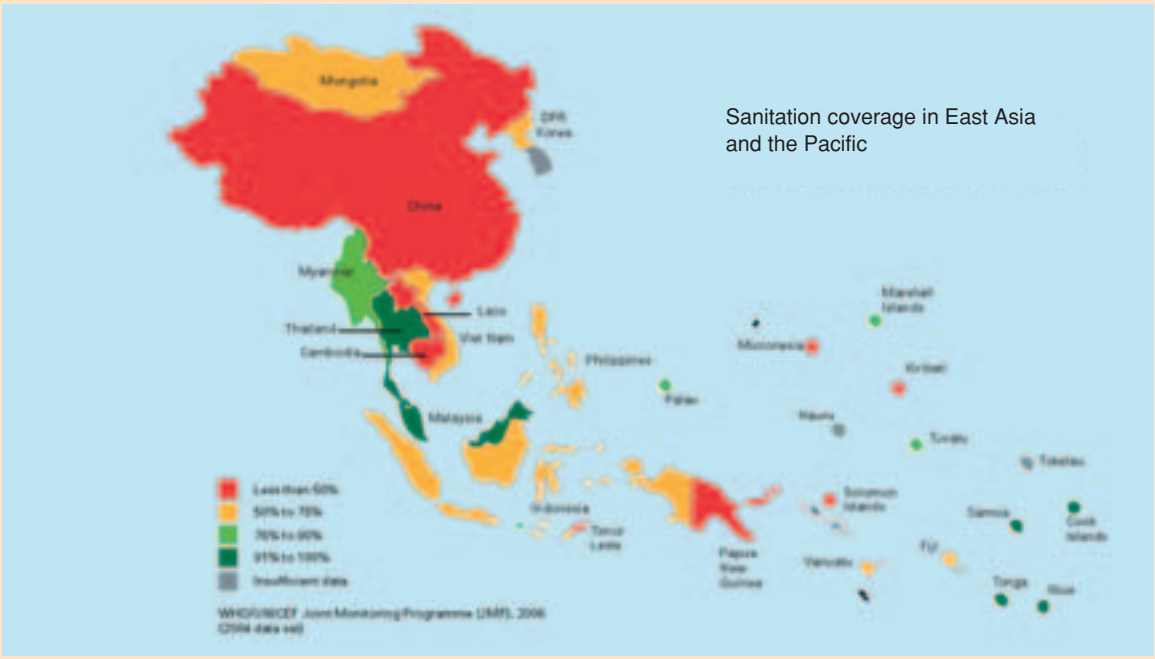
[1] This refers to sewage systems, johkasoh, flush toilets and power-flush (PF) toilets connected to pits, ventilated improved toilets, enclosed toilets, and composting toilets.

ulation is provided with adequate sanitation, especially in Asia and Africa (World Water and Sanitation facilities, edited by WHO and UNICEF).

Lack of sanitation not only creates water pollution and an unsanitary environment, increasing the risk of disease among infants and pregnant women, but can also destroy the local ecosystem, exert a negative impact on fisheries and agriculture, and reduce the value of tourism resources.

In 2008 (International Sanitation Year), the need to improve sanitation coverage is expected to rise and Japan will consider how it can best make a contribution (Figure4-4-4).

Figure 4-4-4 Sanitation coverage in East Asia and the Pacific



Source : UNICEF 『Wash for Children』

Support for night soil treatment has to take the form of a comprehensive approach that encompasses every process from the installation of toilets through to the disposal of sludge. The design of the disposal system must also give careful consideration to geographical, economic and social factors in the target area.

Since assistance for toilet installation is closely related to the issue of subsequent sewage and sludge treatment, taking the treatment process into consideration when selecting the type of toilet to be installed will help facilitate efficient night soil treatment and reuse. There are three steps that follow the installation of toilets : (i) sewage and sludge collection, (ii) sewage and sludge treatment, and (iii) release or reuse of the treated water and final disposal or reuse of the sludge. If these steps are followed and a system is constructed in accordance with regional characteristics, the region will most likely succeed in achieving sanitary night soil treatment and reuse.

There are various types of toilet, such as vault, power-flush, urine separation, composting, and flush toilets. The collection and treatment of sewage and sludge can be divided into two types : on-site treatment, in which waste water is treated on the spot, and off-site treatment, in which waste water is collected and carried to treatment facilities elsewhere. Methods of final disposal or reuse include landfill and recycling for uses such as composting, production of combustion improver through carbonization, and energy recovery after methane collection.

One effective measure to improve sanitation coverage is to provide recognizable benefits to users. Policy packages that can make the most use of sludge play an essential role in increasing access to sanitation.

When integrating efforts directed towards a low-carbon society, sludge recycling projects that can be coordinated with CDM projects should be promoted.

Column

Waste water treatment in mountainous areas

Waste water treatment in mountainous areas provides a valuable insight into some of the problems encountered when considering assistance for developing countries, raising issues such as the urgent need for improvement and the difficulty of maintenance.

There are many different initiatives underway to install eco-friendly toilets in mountainous areas in Japan. For example, bio-toilets (which use biological treatment) and toilets operated by natural energy (such as solar energy and wind power) have been built and have proven highly effective in terms of ease of maintenance.

[Waste water treatment in mountainous areas]
Source : Ministry of the Environment

3 Efforts to prevent illegal waste imports and exports

To supplement the above initiatives in order to improve East Asian countries' capability to responsibly use and process CRs, the government should expand its efforts to prevent illegal waste imports and exports.

(1) Trends in waste imports and exports

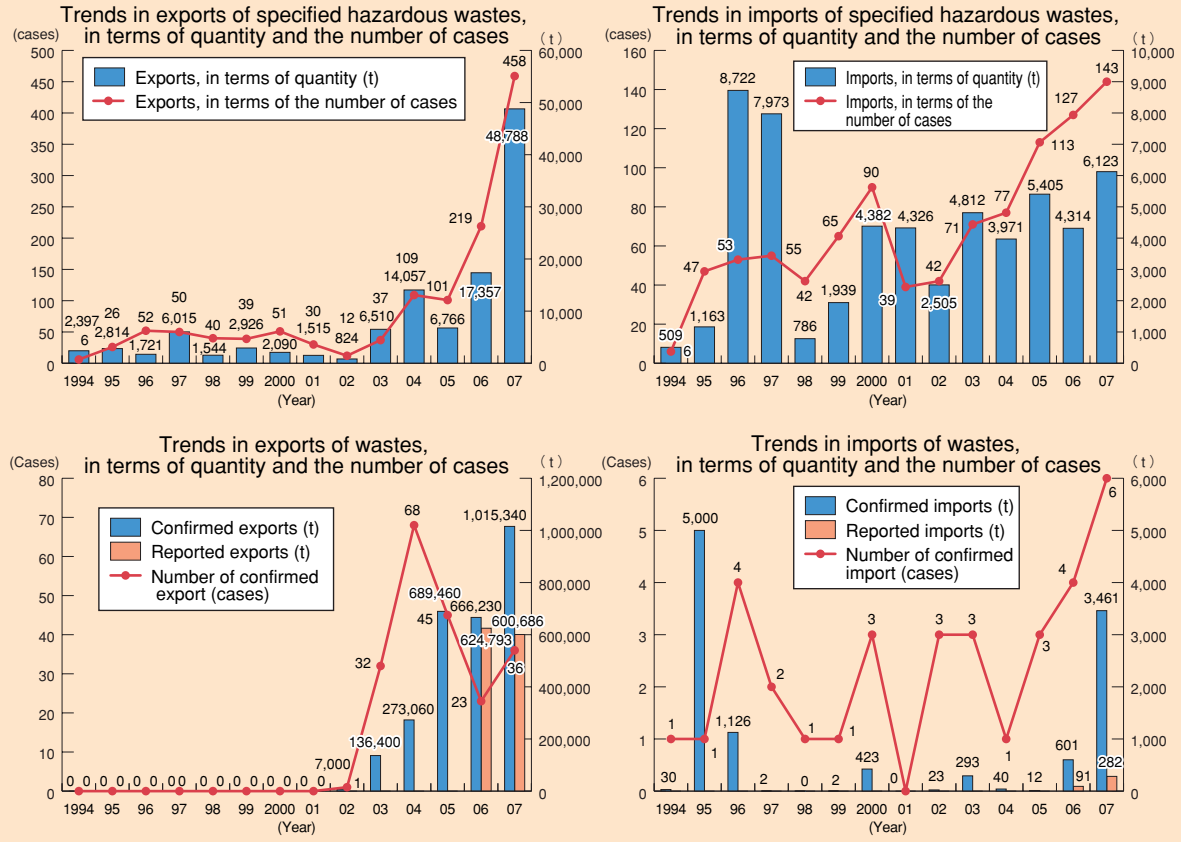
In Japan, imports and exports of goods that are designated as specified hazardous wastes by the Law for the Control of Export, Import and Others of Specified Hazardous Wastes and Other Wastes (the Basel Law) or are designated as wastes by the Waste Management Law are subject to various statutory formalities.

Statistics on Japan's imports and exports of specified hazardous wastes under the Basel Law show that exports primarily consist of lead acid batteries bound for developed countries for use in metal recovery, and that none of these wastes are exported to developing countries. Imports mainly consist of metal-containing sludge and scrap electronic parts from Asian coun-

tries for use in metal recovery.

On the other hand, statistics on Japan's waste imports and exports under the Waste Management Law show that exports consist of coal ash exported to South Korea for cement production, and that the volume of these exports is growing. In the case of imports, only a few cases have been reported, primarily consisting of mercury-containing waste batteries and fluorescent lamps from Asian countries, destined to be treated and recycled (Figure4-4-5).

Figure 4-4-5 Trends in waste imports and exports



source : Ministry of Economy, Trade and Industry. Ministry of the Environment

(2) Efforts to prevent illegal imports and exports

To control imports and exports of wastes, especially hazardous wastes, many Asian countries have put relevant laws in place pursuant to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention). However, there are still problematic practices such as exporting hazardous wastes without conducting the necessary formalities, and different countries having different definitions of the hazardous wastes controlled under the Basel Convention. One example of this can be seen in cases where wastes determined to be exempt from control in the exporting country are found to be subject to control in the importing country and are consequently rendered illegal.

To address such problems, the government should take action to strengthen the enforcement structure for the relevant regulations, and take domestic and international measures to clearly

define which items are subject to control.

A Domestic efforts

(a) Enforcement structure for regulations

The Japanese government is taking measures to ensure appropriate implementation of the Basel Law and the Waste Management Law in an integrated manner, and to strengthen the enforcement structure. This includes hosting explanatory sessions for businesses, providing preliminary consultation on individual import/export cases, and imposing stricter controls at the border through coordinated efforts by the customs authorities and agencies responsible for the enforcement of the Basel Law and the Waste Management Law.

a. Explanatory sessions on the Basel Law

A prerequisite to constructing an appropriate structure to control waste imports and exports is to ensure that businesses engaged in imports and exports are familiar with the Basel Convention and all other related laws. With this in mind, the Ministry of the Environment (MOE) and the Ministry of Economy, Trade and Industry (METI) have been jointly hosting explanatory sessions on the Basel Law and other related laws in order to help companies understand the key points of the legislation concerning waste imports and exports and to prompt them to import and export regulated goods in an appropriate manner. These sessions provide an overview of the Basel Convention, the Basel Law and the Waste Management Law and explain the statutory formalities associated with all imports and exports. In FY 2007, these sessions were held in 10 places throughout Japan.

[An explanatory session on the Basel Convention]
Source : Ministry of the Environment

b. Preliminary consultation on individual import/export cases

MOE and METI provide preliminary consultation services for companies planning to import or export wastes. Companies can receive advice on whether the goods being imported or exported are designated as specified hazardous wastes under the Basel Law or as wastes under the Waste Management Law.

Companies applying for this consultation service are expected to fill out a designated preliminary consultation form and submit this along with related documents, including the invoice, the contract, the domestic transaction voucher, a photograph of the whole

item and, where necessary, an analysis of the components and a photograph of the analysis sample. The submitted documents are then used to decide whether the item in question is subject to control under the Basel Law or the Waste Management Law.

c. Stricter controls at the border

The customs authorities conduct careful examination and inspection at the point from which CRs are shipped overseas, in order to prevent any items regulated under the Basel Law or the Waste Management Law from being exported without compliance with the necessary formalities. A variety of measures have been introduced, such as improving the capacity to collect and analyze information and the upgrading of inspection equipment. For example, a large x-ray container inspection system has been installed at 16 sites across Japan in order to improve the speed and accuracy of container inspection. In the event of discovery of a suspicious cargo during customs examination or inspection, the customs authorities are required to work in close cooperation with MOE and METI to inspect the cargo and take strict measures pursuant to the law.

MOE and METI also cooperate with the customs authorities in the implementation of this policy by proactively providing information and periodically exchanging opinions.

(b) Clear definition of regulated goods

The Basel Convention allows each country to set up its own criteria for defining the hazardous wastes subject to control, including criteria for deciding toxicity and separating wastes from non-wastes. Therefore, the definition of regulated goods may differ between the importing and exporting countries. To avoid such situations, each country should provide as much objective information as possible in order to decide whether an item being imported or exported is subject to control.

In light of this, the government has provided a list of both regulated and non-regulated items in the form of an official notification based on Basel Convention Annexes VIII and IX. For certain items such as waste lead batteries and waste PET bottles, the government has defined key considerations to be taken into account when determining whether an item should be categorized as waste or specified hazardous waste and has made this information available to both importers and exporters.

To prevent household appliances which are no longer useful from being exported for the nominal purpose of second-hand use, the government will conduct studies to clarify the criteria for identifying exports for second-hand use under the Basel Law.

The government has announced key considerations to be taken into account when distinguishing wastes and determining the toxicity of each category of waste, such as waste lead batteries and waste PET bottles, and has been publicizing this information.

In the future, the government will consider setting the criteria for exports for second-hand use under the Basel Law in order to prevent discarded household appliances that contain hazardous substances and are inappropriate for second-hand use from being exported for

this purpose.

B International efforts

To combat the illegal transboundary movement of waste, Japan has been joining forces with other Asian countries, promoting information exchange for the prevention of illegal waste imports and exports and supporting initiatives to improve the authorities' enforcement capacity.

(a) Asian Network for Prevention of Illegal Transboundary Movement of Hazardous Wastes

In 2003, Japan proposed the idea of establishing an Asian Network for Prevention of Illegal Transboundary Movement of Hazardous Wastes to serve as a framework (network) for improving the capacity to implement the Basel Convention and to foster information exchange between the countries concerned. Since then, Japan has, in cooperation with other Asian countries, been taking various measures to prevent illegal imports and exports, including the hosting of workshops, making country-specific regulatory information available on the web, and exchanging information on illegal exports. In addition, Japan plans to strenuously implement the following measures : collecting information on the state of each country's ongoing initiatives to prevent illegal imports and exports of hazardous wastes ; identifying other countries' definitions and criteria for hazardous wastes and reporting the results in order to narrow differences in the criteria used to identify items controlled under the Basel Convention ; and sharing information on good practices for implementing the Basel Convention in order to enhance each country's implementation capacity.

[Asian Network for the Prevention of Illegal Transboundary Movement of Hazardous Wastes]
Source: Ministry of the Environment

(b) Partnership on the Environmentally Sound Management of Electrical and Electronic Wastes for the Asia-Pacific Region

Japan provides funds for the Partnership on the Environmentally Sound Management of Electrical and Electronic Wastes for the Asia-Pacific Region, an ongoing project within the framework of the Basel Convention. As part of this initiative, Japan supports projects conducted by the Basel Convention Asia-Pacific Regional Centre, including surveys on the criteria used to separate e-wastes (e.g., end-of-life TVs, PCs and refrigerators) from appliances for second-hand use and the creation of e-waste inventories.

(c) Collaboration under multilateral and bilateral frameworks

Japan exchanges information with its major CR trading partners on initiatives aimed at pre-

venting illegal waste imports and exports.

One example of multilateral frameworks is the Tripartite Environment Ministers Meeting held between China, Japan and Korea (TEMM), which promotes information exchange concerning the measures used to prevent the inappropriate import and export of e-wastes and other hazardous wastes, and also hosts workshops addressing this issue.

Japan has also established bilateral frameworks with China and South Korea in order to exchange information on legal systems concerning waste exports and imports to and from these countries, and the mechanism needed to implement these systems.

4 Establishing an East Asian SMC block

As shown in the previous sections, the 3R Initiative proposed by Japan has expanded geographically to include not only the G8 countries but also OECD member states and Asian countries. As the global situation changes, this scheme is being adopted, worldwide, as an effective measure to address waste management issues and to improve resource productivity. Global 3R initiatives are entering a new phase (Table 4-4-2).

In light of the discussions held regarding the past G8 processes, initiatives in Asia, and the Second Fundamental Plan for Establishing a SMC Society, Japan has recognized the issues it should tackle in its role as a world leader. They include resource conservation through 3R activities, the pursuit of co-benefits to greenhouse gas emission reductions, and stronger international partnerships to help developing countries build their capacity for waste management and implementation of the 3Rs.

Japan plans to launch full-fledged initiatives to establish an East Asian SMC block. The first step will be to formulate an East Asia Sound Material-Cycle Society Vision by 2012 and help create a sustainable material cycle in Asia.

Table 4-4-2 Examples or progress in 3Rs-related efforts in the G8 member Countries and by the European Commission

Canada	✓ Waste diversion (recycling and composting) per person in 2004 improved by 24%, compared to 2000. ✓ Implements green purchase programs at the national and state level, along with an extended producer responsibility program for specific waste flows. ✓ Makes international contributions, as part of the OECD, to the development of environmentally responsible waste management guidelines and other activities. ✓ Has successfully established links between improvements in energy efficiency through the promotion of recycling and reductions in greenhouse gas emissions, and addresses these issues in cooperation with neighboring countries.
European Commission	✓ Formulated a thematic strategy on waste reduction and recycling (2005) and a thematic strategy on the sustainable use of natural resources (2005). ✓ Established targets for the End-of-Life Vehicle Directive (ELV) as a result of WEEE and RoHS reviews in 2008. ✓ Established an international panel on sustainable resource management, in collaboration with the UNEP. ✓ Proposed the Waste Framework Directive. ✓ Proposed action plans on sustainable consumption/production and sustainable industrial policies.
France	✓ Formulated the National Plan for Waste Prevention (2004). ✓ Has undertaken various awareness campaigns. ✓ In addition to enforcing EU recycling-related laws, has applied extended producer responsibility to waste tires (2004), unsolicited flyers (2007), etc. ✓ Grenelle de l'Environnement (environmental policy program) —Aims to reduce waste production by 5 kg per person, annually, over the next five years. —Aims to improve the recycling rate (e.g., collect organic materials) ✓ Promotes sustainable production and consumption (by economic instruments, e.g., bonuses) and has broadened the applicability of extended producer responsibility to include household hazardous waste, waste furniture, etc.
Germany	✓ As a result of the introduction of recycling laws, the rate of resource recycling from waste increased from 13% in 1990 to 58% in 2006. Landfills lacking intermediate treatment were banned in 2005. ✓ The waste management sector is expected to contribute 10% of the greenhouse gas reduction target under the Kyoto Protocol. ✓ Established the goal of doubling resource productivity by 2020, compared to 1994 levels.
Italy	✓ Established original targets for the sorted collection of urban solid waste: 50% by the end of 2009 and 60% by the end of 2011. ✓ Established the goal of reducing total material requirements by 25% by 2020, 50% by 2030, and 90% by 2050. ✓ Active in introducing various market mechanisms under the new financial law of 2007. Uses environmental indicators and target setting (incl. waste production and management targets) when distributing EU Structural Funds.
Japan	✓ Formulated the Fundamental Law for Establishing a Sound Material-Cycle Society as the framework law and the Fundamental Plan for Establishing a Sound Material-Cycle Society as an implementation program. Established targets to be achieved by 2015 for resource productivity (¥420,000/ton, gross domestic product (GDP)/direct material input (DMI)), cyclical use rate (14-15%, amount of cyclical use/(amount of cyclical use + DMI)), and the amount of final disposal (23 million tons in landfill). ✓ The 21st Century Environment Nation Strategy, established in 2007, positions 3R activities as a key environmental strategy. ✓ Revised recycling-related laws for the further promotion of waste recycling (e.g., the Containers and Packaging Recycling Law, and the Food Waste Recycling Law). ✓ Actively promotes 3R through close cooperation with international organizations and diverse activities such as policy dialogue and capacity building.
Russia	✓ Waste from mineral extraction processes accounts for 90% of the total waste generated. ✓ Forty percent of all municipal solid and industrial wastes are collected as resources and subject to treatment. ✓ Working on draft laws for 3R promotion, including a federal law on circulative resources. Enacted a permit system for hazardous waste management.
U.K.	✓ Formulated a new waste strategy in 2007, setting stricter targets for recycling and household waste composting: 40% by 2010, 45% by 2015, and 50% by 2020. ✓ Set new targets for reducing the amount of household waste (waste not subject to reuse, recycling or composting): a 29% reduction by 2010, compared to 2000 levels, and a 45% reduction by 2020. ✓ Introduced economic incentives such as landfill tax. Plans to raise the rate of this tax from £32/te to £48/te in 2010. ✓ In addition to setting targets for key waste materials (used paper, food, glass, aluminum, wood, plastic, fabric), conducts various activities to achieve sustainable consumption and production. ✓ Under the framework of the Basel Convention, strives to prevent the illegal transboundary movement of hazardous wastes.
U.S.	✓ Issued presidential directives in January 2007 to strengthen federal control of the environment, energy and traffic by incorporating the 3R concept. ✓ The EPA has set a recycling rate target of 35%. ✓ Promotes 3R principles through various activities, including product stewardship, e-waste reuse and recycling, and the promotion of remanufactured products.

Source : Ministry of the Environment