SECTION 2
RECENT REFORM OF WASTE MANAGEMENT AND RECYCLING POLICY TOWARD REALIZING A "SOUND MATERIAL-CYCLE SOCIETY"

Having experienced waste-related crises, Japan has reinforced its policy measures toward tackling waste issues. As it proceeds in this direction, Japan has moved from the development of policy to strengthen its "3R" (recycle, reduce, and reuse) framework and measures over the past dozen years. It has done so by seeing waste not simply as things to be disposed of, but rather as a valuable resource. In this way, Japan is steadily implementing approaches toward the establishment of a "Sound Material-Cycle Society (SMS)" with "circulative resources (CRs)", such as waste that can be properly utilized and treated.

1. The three main trends of waste and recycling measures

Japan's waste management and recycling policy follows three main trends.

The first involves the problem of industrial waste, which makes up the majority of all waste. Although, historically, treatment of such waste was implemented on the concept of "bad money drives out good," successive legal reforms have been reinforced to secure the responsibilities of waste-generating businesses and brought about a shift in waste management systems.

The second involves the formation of recycling policy. Specifically, it is based on the concept of "extended producer responsibility (EPR)", in which product manufacturers assume certain responsibility to secure proper treatment of the waste generated by their products, even at stages following their use.

The last trend involves the problem of municipal waste, which is the waste that is most familiar to people in their daily lives. Given the fact that the close collaboration between municipalities and the central government has resulted in significant successes in the treatment of dioxins, even stronger efforts based on local-national cooperation will be required in the future.

1.1. Reinforcing industrial waste measures based on the responsibility of waste-generating businesses

"Responsibility of waste-generating businesses" refers to the idea that businesses that generate waste should bear responsibility for its treatment through appropriate recycling, final disposal, etc. The foundation of this idea lies in the internationally-established "Polluter Pays Principle (PPP)." It sets forth the waste generator as the originator of environmental loads resulting from waste treatment and places responsibility for reducing the environmental loads on the generator.

1.1.1. Reinforcing responsibility of waste-generating businesses through revision of the Waste Management Law

The Waste Management Law was enacted in 1970 to set up a major division of roles, placing waste treatment responsibility for industrial waste with waste-generating businesses and responsibility for municipal general waste with municipalities. However, because this division of roles did not resolve the problems of continuing environmental pollution caused by improper disposal and large-scale illegal dumping, the Waste Management Law has undergone numerous additional revisions concerning industrial waste, which accounts for approximately 90% of all waste generation. The following subsections overview the main points of these revisions.

The manifest system

The objective of the manifest system is to prevent illegal dumping. This system enables an entity to accurately ascertain and manage conditions throughout the distribution flow of industrial waste and immediately identify the waste-generating businesses having responsibility for the treatment of that waste.

Revisions of the Waste Management Law made this system mandatory for "industrial waste under special control" from April 1993 and for all industrial waste from December 1998. Under this system, a waste-generating business has to fill in a manifest sheet when it consigns industrial waste to a collecting and transporting business. The collecting and transporting business stamps the manifest sheet to confirm that it has received the waste, and returns a copy of the manifest sheet to the waste-generating business.

Reinforcement of licensing conditions for waste disposal businesses

In order to eliminate unreliable treatment businesses, the 1997 and 2000 revisions of the Waste Management Law reinforced disqualifications for industrial waste treatment businesses. These reinforcements included the regulation that disqualifies businesses from receiving licenses for engaging in industrial waste treatment business if they have violated environmental statutes (such as the Waste Management Law) and been sentenced to fines or higher punishments within the past five years, been affiliated with organized crime, etc.

1.1.2. Promotion of appropriate treatment through the reinforcement of regulations to prevent illegal dumping

The three stakeholders of the central government (which is in charge of this system), local governments (which are responsible for the system's precise implementation and management), and waste-generating businesses (which have responsibility for waste treatment) jointly implement effective measures aiming at minimizing the negative environmental effect of illegal dumping that has already occurred.

Measures for rehabilitation to original state

It is extremely important to steadily implement measures to restore the conditions of dumped sites to the state before illegal dumping (rehabilitation to original state).

However, such rehabilitation often comes at great expense. While this expense should be, in principle, compensated under the responsibility of the business that committed the illegal dumping, in many cases the location of the business cannot be identified or the business does not have the financial capacity to afford the expense. This forces the central government, local governments, and other administrative bodies to deal with the situation.

(1) Increased flexibility and facilitation of procedures for rehabilitation to original state

When waste is disposed of in violation of disposal standards, such as illegally dumped waste, authorities are permitted to order the person on corporation that engaged in the disposal to take measures necessary to eliminate or prevent disruption for conservation of the living environment that is caused by the waste (a "restoration order"). However, because the conditions for issuing the restoration order had previously included the "occurrence of major interference in the preservation of living environments, or recognition that there is a possibility that such interference will occur," confirmation of the severity of the disruption was required. In some cases unclear conditions prevented the effective issuance of the orders. These included the fact that specific standards for evaluating the severity of disruption were unclear, and that it was difficult to conserve the living environment without implementing necessary measures prior to ascertaining the severity.

Consequently, the Waste Management Law was revised in 1991 to replace "major interference with the preservation of living environments" with "occurrence of interference with the preservation of living environments."

Moreover, although there is a system under the Administrative Subrogation Law to be applied when a disposing entity does not engage in rehabilitation to the original state despite receiving a restoration order, a 1997 revision of the Waste Management Law established exceptional procedures for the Administrative Subrogation Law and relaxed the conditions in the event that a prefectural governor takes measures to remove the waste. This revision makes it possible for prefectural governors to commence quickly with operations for rehabilitation to the original state.

In addition, the decision was made to fully enforce the principle of the "responsibility of the waste-generating business." When a waste-generating business does not conduct with due diligence the securing of proper treatment in the process of waste generation to final disposal, the business becomes newly subject to a restoration order.

(2) Responsibility for bearing expenses of rehabilitation to original state

In order to ensure that operation of rehabilitation to the original state can be conducted even in cases when the disposing person or waste-generating business cannot be identified, the law was revised to establish a fund made up of contributions from industry and national treasury subsidies. Should illegal dumping of industrial waste occur after the execution of the revised law, financial assistance could be provided through this fund to

cover a portion of the costs that arise when a prefecture issues a subrogation.

Systematic approaches toward eradication of illegal dumping

Furthermore, in order to prevent illegal dumping before it occurs, an "Outline of the Action Plan toward Eradication of Illegal Dumping" was prepared in June 2004 as a comprehensive plan of policy measures against illegal dumping. This plan was prepared based on the need for measures at each stage of waste disposal flow, as well as measures to reinforce existing punishments.

Outline of the Action Plan toward Eradication of Illegal Dumping

■ Improving public awareness in the community

- Strengthening policy measures against littered wastes in the neighborhood (application of the "broken window theory")

* Formulating guidelines for sorted collection, promoting reduction of waste in daily life, etc.

■ Strengthening the system for waste treatment

- Securing treatment bodies and improving transparency of the waste treatment system

* Pasting a notice bill on vehicles carrying waste, exhaustive administrative disposition, improving management system of transboundary movements of waste.
* Enhancing governmental support for efficient preparation of treatment facilities, and reinforcing safety measures for final disposal sites, etc.

■ Developing human resources supporting the system

- Fostering excellent treatment operators and the development of administration system

* Fostering excellent operators through formulating evaluation standards and special tax treatment.
* Human resource development in the central and local governments by dispatching experts and holding seminars on industrial waste treatment.
* Developing and expanding regional environmental offices and preparing prompt response system on the front line, and environmental monitoring (patrolling) system through setting up an illegal dumping prevention hot line.

Source: Ministry of the Environment

Creating a sound market that selects top-quality treatment businesses

Combined with full enforcement of treatment responsibility through regulations, the promotion of efforts to create a sound market in which top-quality industrial waste treatment businesses are fostered and in which these top-quality businesses are appropriately selected by waste-generating businesses is closely linked to the prevention of improper treatment. For this reason, projects aimed at fostering and evaluating such top-quality businesses are underway.

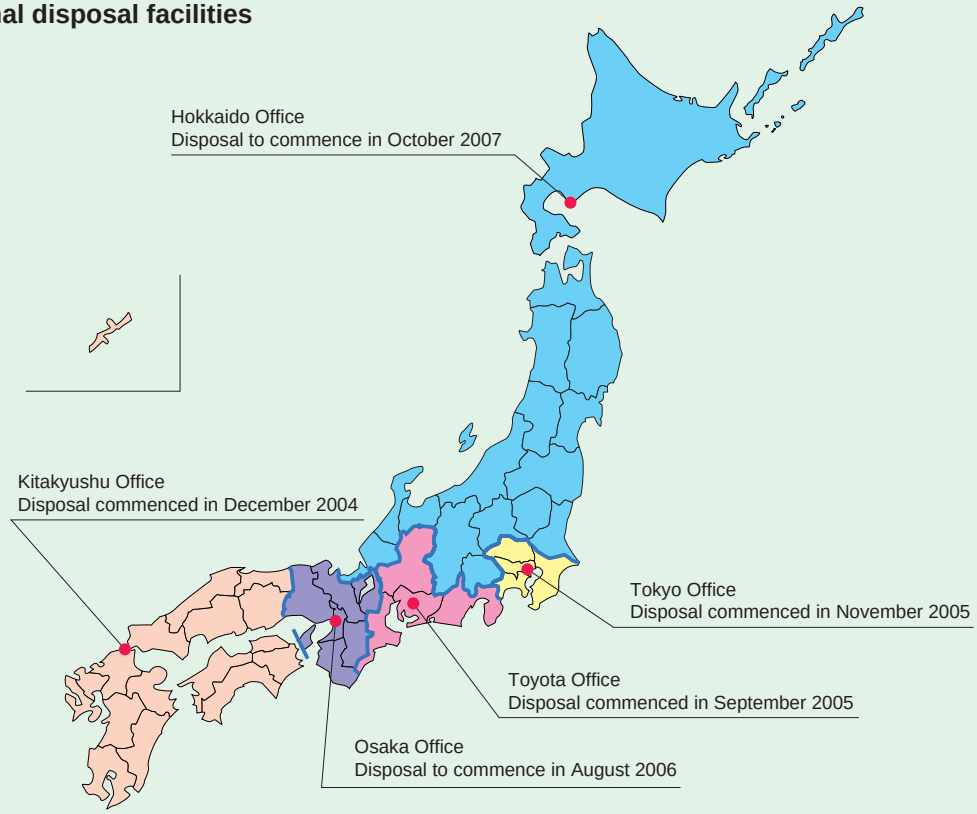
1.1.3. Eliminating adverse legacies under national leadership (disposal of PCB waste)

Because PCB waste has remained in long-term storage, and because, in some cases, its location has become unknown or its storage conditions have deteriorated, the danger of environmental pollution exists.

This situation led to the establishment of the Law Concerning Special Measures against PCB Waste (PCB Special Measures Law) in FY2001, under the initiative of the central government, to build a disposal framework for it and to prepare disposal facilities on a nationwide scale. In concrete terms, regional disposal facilities for PCB waste are being established in five locations nationwide through the Japan Environmental Safety Corporation, which is a special company set up under the law.

Moreover, the central and prefectural governments are collaborating to set up a PCB waste treatment fund. This fund promotes the proper disposal of high-voltage transformers and condensers using PCBs that are stored by small- and medium-scale enterprises that have limited ability to bear their treatment costs.

Progress toward the establishment of Nationwide PCB waste disposal system based on regional disposal facilities



Source: Ministry of the Environment

1.2. Creation and enhancement of recycling measures through extended producer responsibility

In Japan, specific legal systems based on the concept of "extended producer responsibility" — an internationally shared concept studied at the Organization for Economic Cooperation and Development (OECD), such as recycling laws which differ according to the characteristics of items — have been prepared.

1.2.1. Background behind extended producer responsibility

Due to the delay of waste reduction and the shortage of waste disposal capacity, it has been becoming more and more difficult to find new locations for waste disposal. Therefore there is a necessity to take new policy measures aimed at reducing waste volume in the upstream of waste generation. Specifically, internationally recognized as an important issue, primarily in developed countries, is the question of how to transmit the necessary information to consumers to reduce waste generation beginning with the manufacturing stage.

1.2.2. Results of international discussions

Based on this recognition, the concept of extended producer responsibility came to be discussed at an OECD working group, later becoming internationally shared as an important approach in the 1990's. With Japan serving as a core member, an OECD project team commenced study of this approach in 1994. In 2001, a guidance manual for OECD member governments was prepared and published.

Extended Producer Responsibility in OECD "A Guidance Manual for Governments"

1) Definition	An environmental policy approach in which a producer's responsibility, physical and/or financial, for a product is extended to the post-consumer stage of a product's life cycle. Two related features of EPR policy: (1) the shifting of responsibility (physically and/or economically; fully or partially) upstream to the producer and away from municipalities; and (2) the providing of incentives to producers to incorporate environmental considerations in the design of their products.
2) Primary function	The transfer of the financial and/or physical responsibility of waste management from local government authorities and the general taxpayers to the producer
3) Four primary objectives	(1) Source reduction (natural resource conservation/materials conservation) (2) Waste prevention (3) Design of more environmentally compatible products (4) Closures of materials use loops to promote sustainable development
4) Effects	EPR can provide a pressure point to drive upstream changes in material selection and in the design aspects of a product. Appropriate signals can be sent to the producer to internalize substantial externalities from the final disposal of the product.
5) Responsibility	While sharing responsibilities across the product chain is an inherent part of EPR, a key characteristic of EPR is that the producer accepts a significant degree of the physical and/or financial responsibility of products at the post-consumer phase.
6) EPR policy instruments and measures	(1) Product take-back (2) Deposit/refund schemes (3) Material taxes, upstream combination tax/subsidy (4) Advance disposal fees (5) Standards: minimum recycled content requirements (6) Leasing/servicizing

Source: OECD, "*Extended Producer Responsibility, A Guidance Manual for Governments"* (2001), As edited and summarized by the Ministry of the Environment of Japan

1.2.3. Establishment of recycling systems based on extended producer responsibility

The concept of extended producer responsibility is clearly noted in the Fundamental Law for Establishing a Sound Material-Cycle Society[4]. Based on this and other concepts, Japan is establishing recycling systems for containers and packaging, household appliances, construction materials, food, and vehicles, corresponding to the particular qualities of each product.

4 The Fundamental Law for Establishing a Sound Material-Cycle Society stipulates that businesses engaged in manufacturing, sales, etc. of products, containers, etc., are responsible for restraining from becoming wastes the products, containers, etc. concerned, etc., by increasing the durability of the products, containers, etc., concerned and improving the system of carrying out repair work. It also stipulates that said businesses are responsible for the recovery and environment-friendly usage of the containers. (Fundamental Law for Establishing a Sound Material-Cycle Society, Article 11, Paragraphs 2 and 3)

Containers and packaging

"Containers and packaging" refers to bottles, cans, PET bottles, and other forms of product container and packaging that become unneeded after the product is consumed. Such containers and packaging account for approximately 60% of all household waste in terms of volume and approximately 20% in terms of weight.

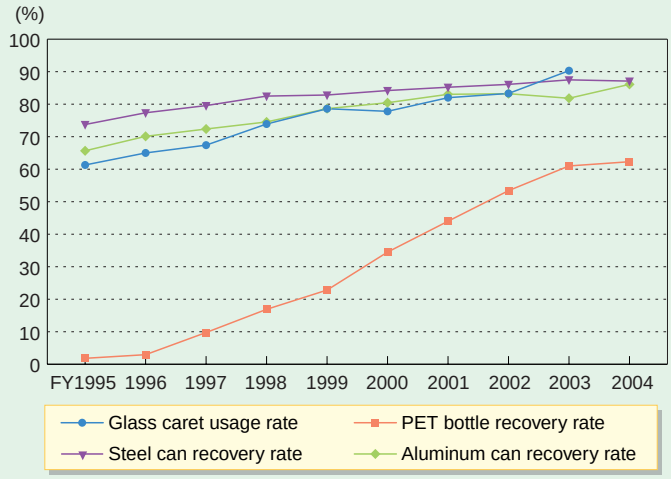
Aiming to reduce waste from such containers and packaging and to promote their effective use as recyclable resources, the Containers and Packaging Recycling Law was enacted in 1995. Efforts are currently underway to build a system for appropriate sorted collection of such containers and packaging as well as their recycling.

(1) Status of the current system

Ten years have passed since the system was first executed. During this time, sorted collection and recycling of waste containers and packaging has been progressing steadily. For example, the recovery rate for PET bottles, which was 9.8% when the system started in FY1997, had climbed to 46.4% in FY2004.

At the same time, businesses are also making efforts that include reducing their use of packaging. While such efforts have had a certain degree of success in reducing waste from containers and packaging, they are also tied to the innovation of new technologies, such as technologies for recycling old PET bottles into new PET bottles.

Changes in recovery and usage rates of packages and containers



Source: Ministry of the Environment

(2) Discussion on the review of the Containers and Packaging Law in the Council

With the Fundamental Law for Establishing an SMS providing fundamental principles for the 3Rs was enacted in 2000 and a series of recycling laws were enacted, the construction of an SMS has made progress. Moreover, because the Containers and Packaging Recycling Law was expected to have a review undertaken in its tenth year following its execution, the Central Environmental Council and Industrial Structure Council engaged in repeated and earnest discussions on how the system should be revised. These discussions continued over one and a half years.

Based on the final conclusions of these councils, the government submitted the "Bill for Partial Amendment of the Law for the Promotion of Sorted Collection and Recycling of

Containers and Packaging" to the 164th Diet (enacted on June 15, 2006).

Home appliances

The Law for Recycling of Specified Kinds of Home Appliances (Home Appliances Recycling Law) was enacted in June of 1998. In order to reduce household appliance waste and contribute to the effective use of resources, this law requires manufacturers and others to engage in recycling that meets or exceeds certain standards for four designated items: air conditioners, televisions, refrigerators and freezers, and washing machines. In addition, the law establishes a division of roles under which retailers are obliged receive these four types of appliances from consumers (waste generators) and to pass them to manufacturers, while consumers are obliged to pay recycling fees ("pay later" system) when they discard such items.

Following the execution of this law, the number of recovered appliances (i.e., the four types of home appliances) has increased year on year, with the total of all four types recovered reaching 11.62 million in FY2004. Furthermore, the recycling rates of recovered appliances greatly exceed the standard set forth under the law.

Electrical home appliance recycling plant

Source: Ministry of the Environment

Construction materials

For promoting the recycling of construction waste, the Law for the Recycling of Construction Materials (Construction Material Recycling Law) was enacted in May of 2000.

This law requires businesses that undertake construction work meeting certain conditions to engage in sorted demolition of construction waste and its recycling. The law establishes that the recycling rate for three items-concrete, wood building materials, asphalt/concrete-shall be improved to over 95% by FY2010.

Food

The Law for Promotion of Recycling and Related Activities for the Treatment of Cyclical Food Resources (Food Waste Recycling Law) was enacted in June 2000.

The law promotes recycling by food-related businesses (manufacturing, distribution, sales, restaurant operation and catering). In the "Fundamental Policy for Promotion of Recycling and Related Activities for the Treatment of Cyclical Food Resources," the law establishes that the recycling implementation rate shall be increased to over 20% by FY2006.

Vehicles

Illegal dumping of end-of-life vehicles is occurring with considerable frequency due to the skyrocketing cost of disposing remnant materials that are generated during the process of the treatment of the vehicles. Such dumping is becoming a major social problem. To address this problem, the Law for the Recycling of End-of-Life Vehicles (Vehicle Recycling Law) was enacted in July 2002.

The law requires vehicle manufacturers and importers to recycle Freon, airbags, and remnant materials (destruction in the case of Freon). Moreover, as recycling goals, the law establishes that the remnant materials recycling rate shall be over 70% and the airbag recycling rate shall be over 85% by 2015.

1.3. Promoting municipal waste measures, etc., through collaboration between local and central governments

Municipal waste is most familiar to people in their daily lives. With regard to municipal waste, it is extremely important that each stakeholder plays its role under an appropriate division of responsibilities: the central government, which leads the management of the formation and reform of the legal system and other national systems, and local governments, which are familiar with actual conditions in their local societies, the consumers and businesses promoting the 3Rs (from product manufacturing to disposal technology).

1.3.1. Results of proper waste treatment through collaboration between local and central governments

Concerns regarding the generation of dioxins from incineration facilities led to both lawsuits being brought by residents demanding the shutdown of incineration facilities and escalating protests against the construction of such facilities.

In response, a framework for countermeasures was set up that included the establishment of the "Fundamental Guidelines for the Promotion of Measures against Dioxins" in March 1999 as well as enactment of the Law Concerning Special Measures against Dioxins in July 1999. As a result of these approaches, the yearly amount of dioxins discharged from incineration facilities throughout Japan, which was estimated to be approximately 5,000g in FY1997, fell by some 98% to approximately 64g in 2004.

1.3.2. Creating a sound material-cycle regions through collaboration between local and central governments

Creation of the Block Grant System for Establishing the 3R Society (3R Block Grant)

In past years, the central government provided financial assistance to municipalities that were establishing general waste disposal facilities (waste incineration facilities, etc.) through respective subsidies. However, after discussions between central and local representatives, the government and ruling parties on November 26, 2004 reached an agreement on an overall vision of the Trinity Reform, which is to be achieved by FY2006. Based on this agreement, it was decided that central government subsidies for the establishment of municipal waste treatment facilities would be reformed into block grants, and that the "Block Grant System for Establishing the 3R Society" would be set up from FY2005.

Heretofore, measures to cope with dioxin generated through waste incineration were promoted through national subsidies toward the preparation of municipal waste treatment facilities. However, taking a new approach that involves further promotion of such measures and creation of an SMS at the regional level, the central government will aim to promote the establishment of regional and comprehensive systems and to shift toward the SMS at the regional and the national level utilizing the 3R block grants. It will strive to achieve this goal by actively cooperating with municipalities while at the same time taking advantage of their autonomy, originality and ingenuity.

Cases of regional efforts to build an SMS at the local level

In FY2005, 87 Regional Plans for Establishing a Sound Material-Cycle Society were approved by the Minister of the Environment. The following is a breakdown of these plans.

Number of "Regional Plans for Establishing a Sound Material-Cycle Society (SMS)" approved by the Minister of the Environment (As of March31, 2006)

Number of plans approved (Unit: No. of plans)

Hokkaido	6	Saitama	2	Gifu	4	Tottori	0	Saga	0
Aomori	0	Chiba	0	Shizuoka	2	Shimane	1	Nagasaki	1
Iwate	1	Tokyo	2	Aichi	3	Okayama	1	Kumamoto	0
Miyagi	1	Kanagawa	1	Mie	3	Hiroshima	6	Oita	1
Akita	2	Niigata	2	Shiga	1	Yamaguchi	2	Miyazaki	1
Yamagata	0	Toyama	1	Kyoto	1	Tokushima	0	Kagoshima	4
Fukushima	2	Ishikawa	2	Osaka	3	Kagawa	0	Okinawa	5
Ibaraki	2	Fukui	1	Hyogo	7	Ehime	4	Total	87
Tochigi	0	Yamanashi	0	Nara	0	Kochi	2		
Gunma	0	Nagano	1	Wakayama	1	Fukuoka	8		

Source: Ministry of the Environment

1.3.3. Future approaches

Further promotion of efforts to establish an SMS at the local level.

When attempting to establish an SMS at the local level, efforts promoting reduced consumption of natural resources and environmental burden must be made through appropriate pursuit of reduction, reuse and recycling of total material input, resource extraction, waste output and energy consumption. At the same time, it is necessary to substantiate these efforts in combination with approaches toward the mitigation of climate change

In particular, because biomass-based waste (such as waste from households) can be utilized as a resource to be recycled in a sustainable manner and serve as a substitute for fossil resources, its utilization as a source of energy should be pursued.

In order to substantiate approaches toward the establishment of an SMS at the local level, municipalities are required to build municipal waste treatment systems based on regional characteristics that cover waste reduction, sorted collection, recycling, heat recovery and final disposal. The central government is currently preparing guidelines and presenting perspectives to municipalities that assist them in smoothly implementing such approaches. These perspectives deal with not only the application of the 3Rs towards waste but also power generation from waste as a means of mitigating climate change, energy recovery (including biomass recovery) and use of biomass.

1.3.4. Formulation of Regional Fundamental Plans for Establishment of an SMS

In the Fundamental Plan for Establishing a Sound Material-Cycle Society (Fundamental SMS Plan)[5], each local government is expected to formulate a unique fundamental plan based on regional conditions. This plan is for the purpose of establishing an SMS in the region.

With regand to the formulation of fundamental plans in 47 prefectures and 14 government-designated cities in FY2004, 14 governments have plans prepared (13 governments in FY2003), 23 governments have other plans prepared which cover related content (16 governments in FY2003), and 24 governments have no applicable plan prepared (31 governments in FY2003).

Preparation of fundamental plans to promote a Sound Material-Cycle Society (SMS plan) at local government level

Preparation	Number of local governments	Numerical targets established	
		Yes	No
1. Plan prepared	14	10	4
2. Other plan prepared which covers related content	23	20	3
3. No applicable plan prepared	24	—	—
Total	61	30	7

Intention to prepare SMS plan		
Intend to prepare SMS plan	Intend to prepare other plan covering related content	Not to prepare
6	15	3

Notes: Survey targets: 61 local governments (47 prefectures and 14 government-designated cities)
Survey period: As of March 31, 2005
Source: Documents of SMS planning division of the Central Environmental Council

5 Based on Article 15 of the Basic Law for Establishing the Recycling-based Society, this plan was prepared for the purpose of comprehensive and systematic promotion of the policies for establishing a material-cycle society. The plan approved by the Cabinet in March 2003.

2. Crosscutting approaches that support the three main trends

When promoting approaches in line with the three trends in waste management and recycling measures, it is important that the utilization of scientific technology and the mind to utilize the inherent value of goods be valued among all three trends. The following presents the overview of such crosscutting approaches.

2.1. Promotion of various technical developments

Recycling systems do not simply aim towards recycling; they also strive to promote the entire 3R spectrum, which includes reduction of the generation and the promotion of the reuse of circulative resources.

2.1.1. "EcoDesign" approach

Efforts to promote the use of EcoDesign-which involves a consistent approach to the design and manufacture of environmentally-friendly products from the product design to the disposal stages-are being seen in a variety of fields. Among them is the preparation of a product assessment manual by the home appliance industries.

Meanwhile, researchers in production/design technologies and other fields as well as managers and technicians from a broad range of industries came together in 2000 to form the "Union of EcoDesigners." The members of this union share information and discuss the results of research and development, new technologies and actual cases of EcoDesign application in order to promote wide implementation of the EcoDesign approach.

2.1.2. Reduction technologies

Innovations in production structure and other developments contribute to reduce the weight of PET bottles and other items by roughly 10 to 40% in weight. Moreover, containers and packaging for soaps and detergents that are disposed of by the consumer are being reduced through the development of condensed and refillable products. And, in addition to making products lighter and minimizing packing materials, the home appliances industry is creating products that are easily decomposed.

2.1.3. Reuse technologies

Because, compared to recycling, reuse involves less additional energy consumption and environmental pollution, it takes priority over recycling. Reuse approaches begin with awareness and actions by each citizen that place value on things. It is true that such approaches in daily life have not been progressed substantially. Thus, in Japan, efforts are underway toward introducing movable dishwashers and promoting reusable cups at event halls.

2.1.4. Recycling technologies

In Japan, the systematization of recycling has spurred the development of waste treatment and recycling technologies as well as design and manufacturing technologies for environ-

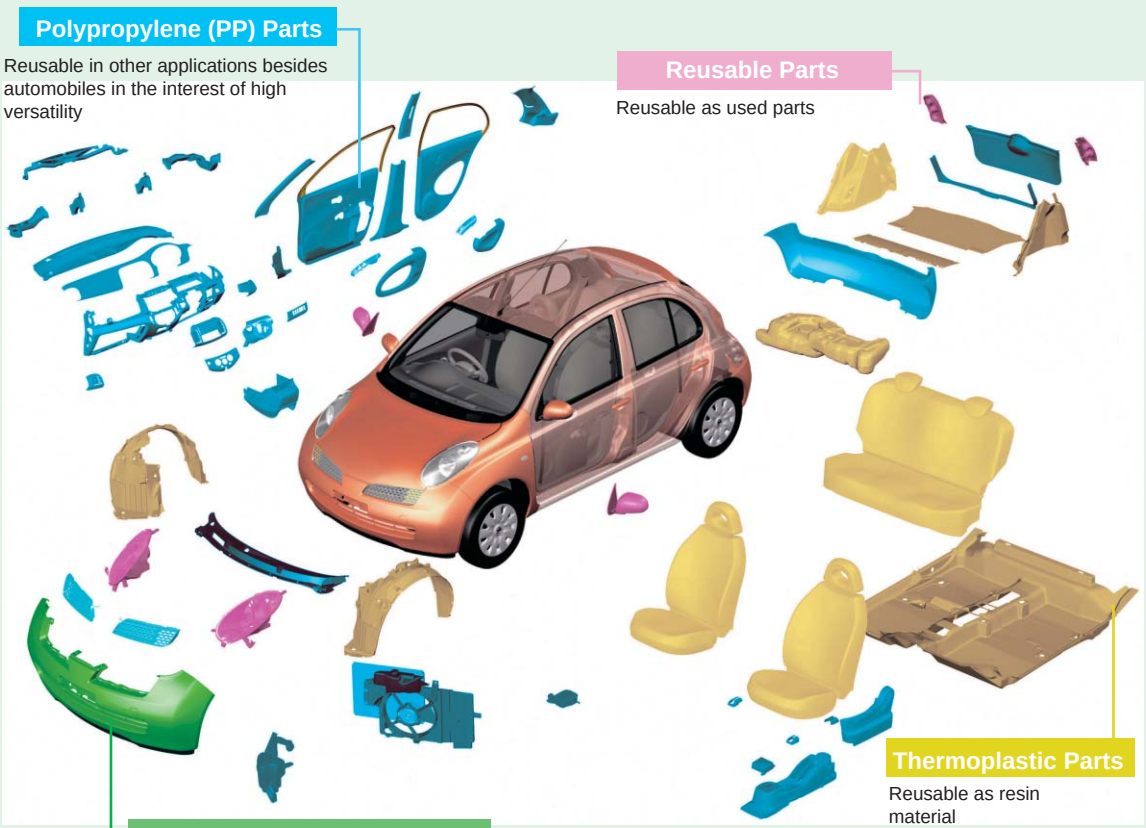
mentally-friendly products. These technologies extend gradually upstream in the product manufacturing process.

For example, at smelting facilities for nonferrous metals, advanced smelting technologies are being utilized to treat in a non-polluting manner substances that can cause environmental load and to recover and recycle rare metals.

Furthermore, practical application of so-called "bottle-to-bottle" recycling technologies-which chemically break down used PET bottles and return them to their basic ingredients-is being realized.

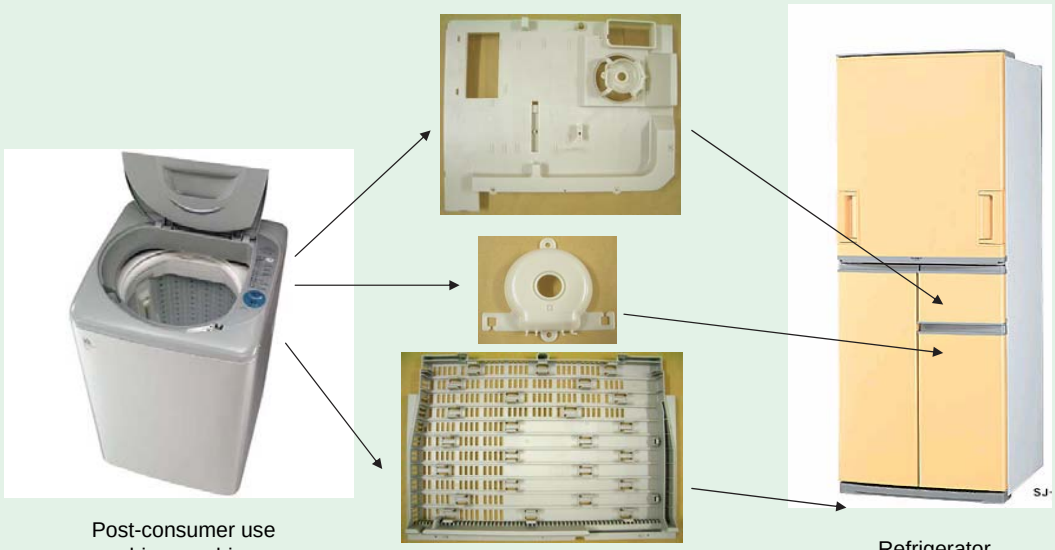
And, technologies for the manufacturing of easy-to-recycle products is also progressing, influenced to some degree by the Home Appliance Recycling Law and the End-of-life Vehicle Recycling Law.

Example of design for the 3Rs: Automobile



Source: Ministry of the Environment

Example of Design for the 3Rs : Washing machine



Source: Documents of SMS planning division of the Central Environmental Council

2.1.5. Incineration technologies

Major advancements have been seen in Japan's intermediate waste treatment technologies. For example, technologies regarding exhaust gases through strict management of incineration temperature are being practically applied, as are technologies to effectively utilize heat generated from incineration for electric power generation. The total amount of electric power generated by waste incineration facilities grew 1.5 times more during the four years from FY2000 to FY2003.

2.1.6. Final disposal technologies

Various efforts are being made with regard to the final disposal of residue that remains even after appropriate treatment and recycling. These include: 1) reducing the amount of final disposal, 2) ensuring that waste delivered into final disposal sites is harmless, 3) upgrading the structure of final disposal sites and 4) upgrading the treatment technologies of effusion from final disposal sites. Moreover, concerns about groundwater contamination caused by the elution of heavy metals have led to the introduction of double-layer seepage control sheets and closed-system disposal sites (roofed disposal sites that do not allow rainwater to penetrate).

2.2. New approaches toward lifestyle change

Establishment of an SMS requires more than just technology. It also needs each citizen to change his or her lifestyle based on the spirit of *mottainai*, which is based on the recognition of the value of things with a sense of respect as well as to make efforts towards specific activities that reduce environmental burden. This represents an important issue for the future.

Given this perspective, it will be necessary to promote changes to new lifestyles that realize a society which is affluent as well as sustainable. Current endeavors in this direction

include the Slow Food movement in Europe and LOHAS (Lifestyles of Health and Sustainability) in the United States.

2.2.1. Lifestyle-based approaches, such as the popularization of the furoshiki

The volume of containers and packaging that are disposed as waste after a single use (such as wrapping materials and plastic shopping bags) reaches some 600,000 tons a year. Among approaches to address this problem is the utilization of the *furoshiki*, which is a traditional product of Japan. The furoshiki has many advantages; it can be reused numerous times, cannot be torn easily, and does not take up storage space. Furthermore, the colors and patterns of the furoshiki can be chosen in accordance with the user and the season. Moreover, it can wrap objects of any size and shape, from fruit to wine or sake bottles. Thus, the furoshiki can be described as a facet of Japanese culture that is rooted in the spirit of mottainai[6] — that is, making full use of the inherent value of items.

Based on this facet of Japanese culture, the Ministry of the Environment is encouraging the shift to lifestyles that do not generate waste in dialy activities. Taking *Mottainai Furoshiki* as a symbol of such a shift in lifestyle the Ministry promotes the popularization of the use of furoshiki and the carrying of reusable shopping bags.

"Mottainai Furoshiki"

Source: Ministry of the Environment

2.2.2. Approaches by citizens in their everyday lives

At the same time, activities that involve collecting recyclable items — old newspapers and magazines, used clothing, etc. — and then handing them over to resource collection businesses can be seen in all parts of the country. This is known as "community-based collection of recyclables" The amount of items collected in FY2003 reached approximately 2.83 million tons, which marked a 150% increase over ten years before. This kind of community-based collection of recyclables is playing a major role in reducing waste by thorough sorting and, according to FY2003 data, the amount collected in this way accounts for 30% of the total amount of recycled municipal waste (approximately 9.16 million tons).

6 The *mottainai* spirit is currently spreading internationally, spurred by its introduction at a ministerial-level meeting of the UN's Status of Women Committee and other venues by Ms. Wangari Maathai, Assistant Minister for Environment and Natural Resources of Kenya and a Nobel Peace Prize Laureate. Ms. Maathai was impressed with this *mottainai* philosophy during a visit to Japan in 2005.

2.2.3. Enhancing education to improved the awareness of future generations

The Ministry of the Environment has prepared a "Junior Eco-Club Program" as an enjoyable means of supporting independent environmental activities and learning among children in their home regions. This program, which is implemented in collaboration with local governments, is a typical example of educational approaches aimed at those who will play a central role in the society of the future-our children.

A Junior Eco-Club can be registered simply by bringing together two or more children with an assisting adult (supporter). Once registered, the club is free to take a variety of actions based on the interests and concerns of the children, including town cleanup activities, nature observations along rivers, and activities aimed at experiencing the natural environment.

2.2.4. New developments in "green" purchasing activities

Approaches from the demand side are progressing based on the "Law Concerning the Promotion of Eco-Friendly Goods and Services by the State and Other Entities" (Law on Promoting Green Purchasing), which was enacted in 2000.

Referring to goods and services that are useful in reducing environmental burden as "eco-friendly goods, etc.," this law stipulates that the central government and other organizations shall formulate and disclose policies toward the further procurement of eco-friendly goods, etc., promote measures toward establishment of specific targets, and publicly announce the extent to which the targets were achieved each fiscal year. In addition, it recommends that local governments and other organizations as well as businesses and private citizens endeavor to choose eco-friendly goods, etc., whenever possible. The details of eco-friendly goods, etc., are being deliberated by the "Commission for the Investigation of Specific Items for Procurement" that is made up of academic experts in the field and others. As of FY2005, 214 items in 17 classifications have been designated as eco-friendly goods, etc.

3. Current status and future targets of waste management and recycling measures based on approaches implemented to date

When looking at conditions in Japan thus far, what first becomes apparent is that the amount of waste generated has increased significantly in line with economic growth, particularly during the period of high economic growth. Even today, the amount of waste generated remains roughly unchanged. Consequently, waste reduction has become an important issue. A second point is that, as various recycling systems are strengthened, more and more resources are being used in a cyclical manner through recycling and other efforts. However, use of such resources has not necessarily reached its peak. Thus, considering the remaining capacity of final disposal sites and other factors, even further efforts will be required to reduce waste.

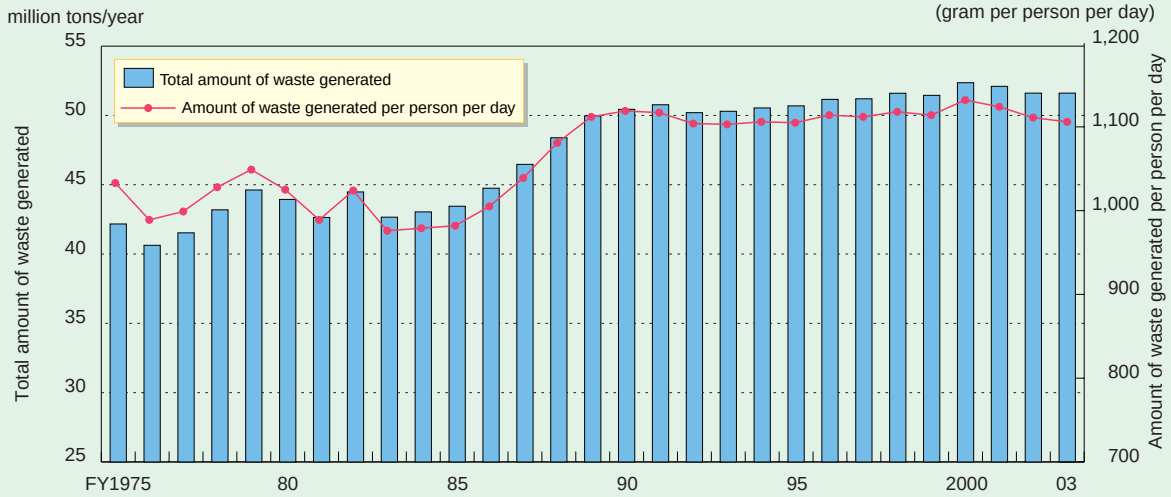
3.1. Arrangement of annual data pertaining to waste and recycling

3.1.1. Changes in the amount of waste produced

Changes in the amount of generated municipal waste

From FY1983 to FY1990, the amount of generated municipal waste increased rapidly. As a result, the Waste Management Law was revised in 1991 to add measures of waste reduction and to reinforce the responsibility of stakeholders. In later years — from FY1991 to FY2002 — the amount of municipal waste generated has remained roughly unchanged at a high daily amount.

Changes in amount of municipal waste generated

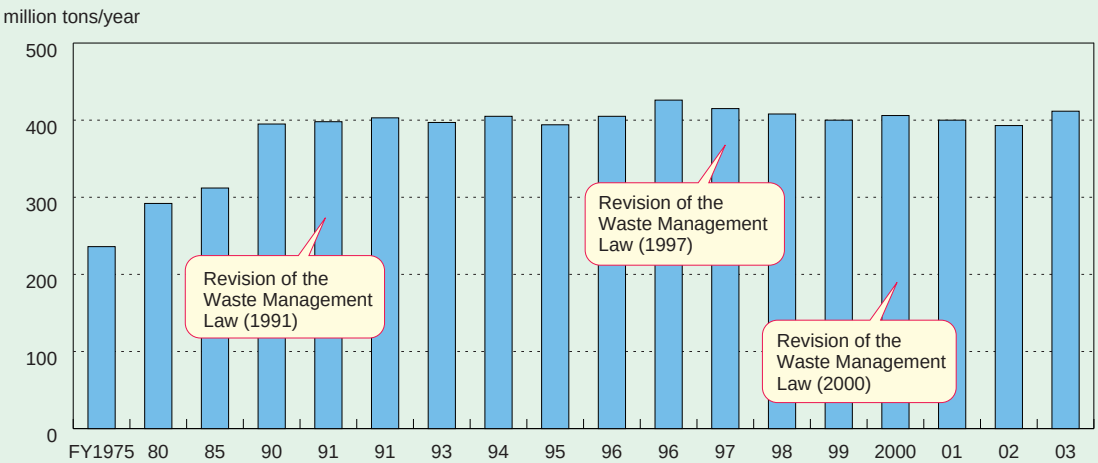


Source: Ministry of the Environment

Changes in the amount of industrial waste generated

Like municipal waste, the amount of industrial waste generated increased rapidly until FY1990. Since then, it has seen no major fluctuations, hovering around the 400 million-ton level. Thus, the amount of waste generated has remained roughly stable since the collapse of the bubble economy.

Changes in amount of industrial waste generated

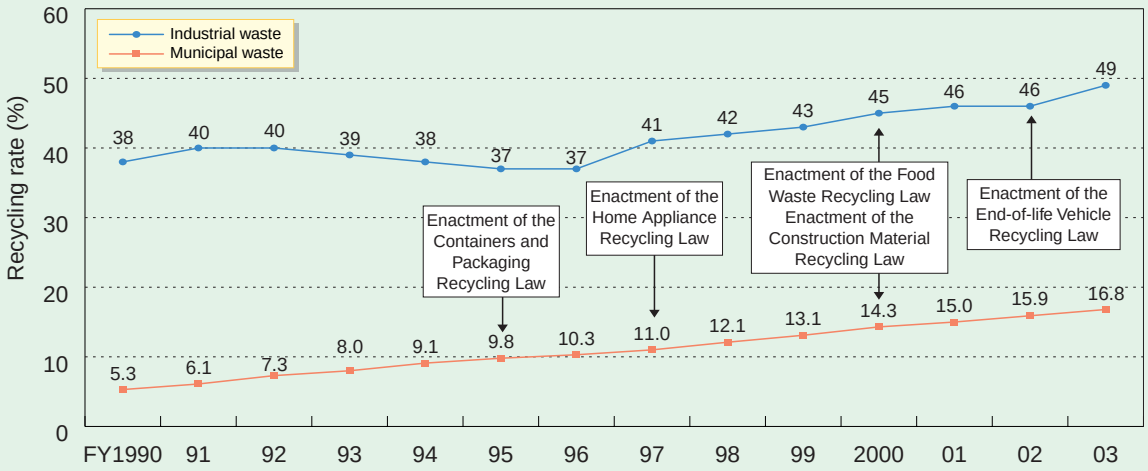


*The Method of calculating generated amount was changed in 1996.
Source: Ministry of the Environment

3.1.2. Changes in the recycling rate

The recycling rate for municipal waste has been rising steadily since FY1990. This trend is thought to have been largely influenced by a number of factors. Among them is the promotion of sorted waste collection by municipalities, based on the concept of sorting and recycling of municipal waste under the Waste Management Law revised in 1991. Another is the enactment of the Containers and Packaging Recycling Law in 1995. Meanwhile, while the recycling rate for industrial waste had declined slightly from FY1990 to FY1996, it has been rising steadily since FY1997.

Changes in the recycling rate

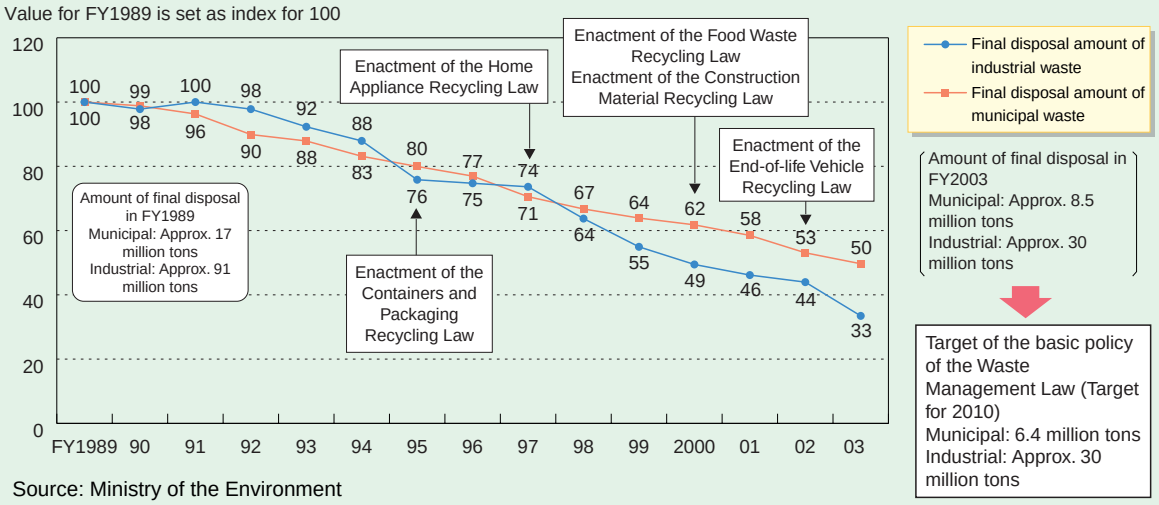


Source: Ministry of the Environment

3.1.3. Changes in final disposal amount

Efforts to reduce the final disposal amount of waste have made great progress over the past dozen years for both municipal waste and industrial waste. The final disposal amount for municipal waste in FY2003 was approximately 8.5 million tons; this is about half of the volume for FY1989, which was 17.0 million tons. Moreover, looking at industrial waste, the final disposal amount for FY2003 was approximately 30 million tons, which was approximately one-third of the volume in FY1989 (approximately 91 million tons).

Changes in amount of final disposal



Source: Ministry of the Environment

3.2. Framework and future targets for establishment of a sound material-cycle society

In Japan, a variety of frameworks have been prepared consistently based on the Fundamental Law for Establishing a Sound Material-Cycle Society (SMS). These include the Waste Management Law and various recycling laws. The government has been setting numerical targets through its Fundamental Plan for Establishing a Sound Material-Cycle Society (Fundamental SMS Plan) and making coherent efforts in order to effectively promote individual measures based on the plan.

3.2.1. Frameworks toward establishment of an SMS

Legal systems and basic fundamentals that are based on the Fundamental Law for Establishing an SMS

The Fundamental Law for Establishing an SMS provides a description of an SMS and sets waste generators' responsibility and extended producer responsibility as the basic concepts for measures. In addition, as directions toward realizing an SMS, the law sets up principles for cyclical use and disposal of circulative resources and establishes the obligations of concerned persons.

Targets under the Fundamental SMS Plan and the status of efforts to achieve them

Individual measures provided for under the Fundamental SMS plan are being implemented steadily following its approval by the Cabinet and report to the Diet in March 2001. The plan seeks to quantitatively ascertain the progress of activities by setting various numerical targets for material cycle flow (material flow) and efforts by stakeholders, setting FY2010 as the target fiscal year.

(1) Material flow indicators

Fundamental SMS plan establishes targets for three material-flow indicators: “input,” “output” and “cycle.”

For “input,” considering the fact that natural resources, etc., utilized in the society lead to environmental burden both in their extraction and after products’ disposal, and that the amount which can be extracted is finite, the “extent of minimizing the amount of natural resource input” can be seen as an important indicator towards the establishment of an SMS. A specific indicator here is “resource productivity,” which is determined by dividing GDP (gross domestic product) by the amount of natural resource input.

Next, for “output,” the indicator used is “final disposal amount” (amount of waste disposed in landfills), which is directly linked to the issue of increasing pressure on securing enough final waste disposal sites.

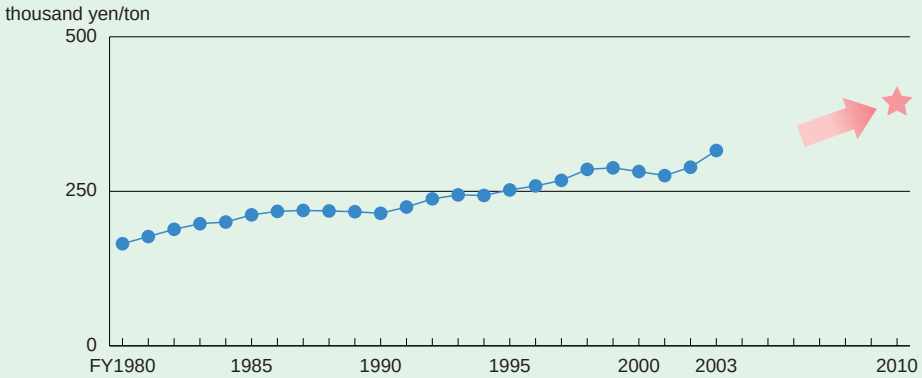
And finally, for “cycle,” “cyclical use rate” is incorporated as an indicator. The 3R approaches are important means of reducing the final disposal amount, and “cycle” is directly connected to these approaches. The “cyclical use rate” expresses the degree to which resources are used cyclically (“reused” or “recycled” in the Fundamental Law for Establishing a Sound Material-Cycle Society) among all resources consumed in society.

Numerical targets with a target year of FY2010 are set for each indicator. The following presents the status of how these targets are being achieved.

① Resource productivity (GDP ÷ amount of natural resources, etc., invested)

The resource productivity target for FY2010 is approximately 390,000 yen per ton (this is roughly twice the figure of FY1990 [approximately 210,000 yen per ton] and represents a roughly 40% improvement over FY2000 [for which the figure was approximately 280,000 yen per ton]. Resource productivity in FY2003 was 316,000 yen per ton.

Changes in resource productivity

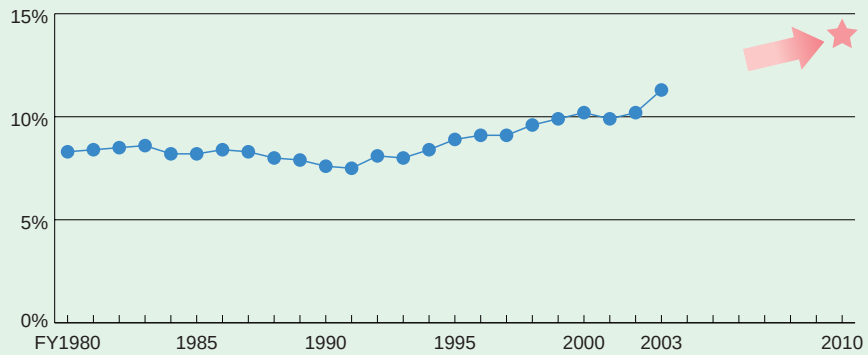


Source: Ministry of the Environment

② Cyclical use rate (cyclical use amount ÷ [cyclical use amount + amount of natural resource input])

The cyclical use rate target for FY2010 is approximately 14% (roughly 80% improved over the FY1990 figure [approximately 8%] and 40% improved over the figure for FY2000 [approximately 10%]). The cyclical use rate in FY2003 was 11.3%.

Changes in cyclical use rate

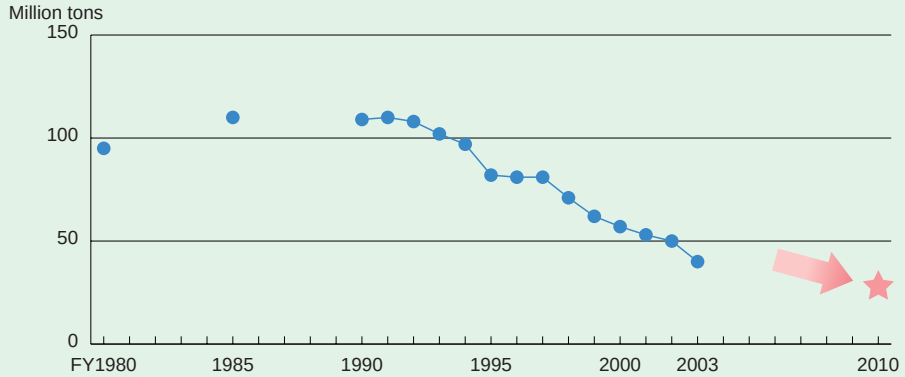


Source: Ministry of the Environment

③ Final disposal amount (amount of waste landfill)

The final disposal amount target for FY2010 is approximately 28 million tons (reduced roughly 75% from the FY1990 figure [approximately 110 million tons] and reduced roughly half from the figure for FY2000 [approximately 56 million tons]). The final disposal amount for FY2003 was approximately 40 million tons.

Changes in amount of final disposal



Source: Ministry of the Environment

(2) Approach indicators

The Fundamental SMS Plan establishes a variety of targets connected with efforts undertaken by stakeholders, such as those appearing in the following chart. Similar to material flow indicators, these indicators have FY2010 as their target year and gauge the progress of specific approaches taken by a range of stakeholders.

Targets of indicators for efforts undertaken

Target year: FY2010

Classification	Indicator for efforts being undertaken	Target of indicators
Change in awareness and behavior a material-cycle society	Percentage of citizens who are aware of the need to reduce waste, use items in a way consistent with a sound material cycle, and engage in "green" purchasing	Approx. 90% (as determined by the results of surveys)
	Percentage of citizens who take concrete actions in these areas	Approx. 50% (as determined by the results of surveys)
Reduction in the amount of municipal waste	Amount of municipal waste generation per person per day by households (not including items that are recovered through recycling)	20% reduction compared to FY2000
	Amount of municipal waste generation businesses per day (not including items that are recovered through recycling)	
Reduction in amount of industrial waste	Amount of final disposal	75% reduction compared to FY1990
Promotion of "green" purchasing	Implementation of organized "green" purchasing	All local governments: 100% Listed companies*1 : Approx. 50% Non-listed companies*2 : Approx. 30% (as determined by the results of surveys)
Promotion of environmental management	Public disclosure of environmental reports	Listed companies: Approx. 50% Non-listed companies: Approx. 30% (as determined by the results of surveys)
	Implementation of environmental accounting	
Expansion of sound material-cycle society business markets	Scale of market Scale of employment	Double scale of 1997

Notes
1. Listed companies: Companies listed on the Tokyo, Osaka, or Nagoya Stock Exchanges (First Section or Second Section)
2. Non-listed companies: Companies or places of business having 500 or more employees and not listed on any of the exchanges listed in Note 1

Source: Ministry of the Environment

3.2.2. Future prospects based on current conditions

Since FY2004, the Subcommittee for the Planning of a Sound Material-Cycle Society of the Central Environmental Council (subcommittee chair: Professor Kazuhiko Takeuchi of the University of Tokyo Graduate School) has reviewed and arranged issues pertaining to the progress of policy measures conducted under the Fundamental SMS Plan each fiscal year, in order to ascertain recent progress and to reflect the discussion for future implementation. These reviews incorporate interviews with stakeholders that include the central government, local governments and businesses.

Status of each indicator

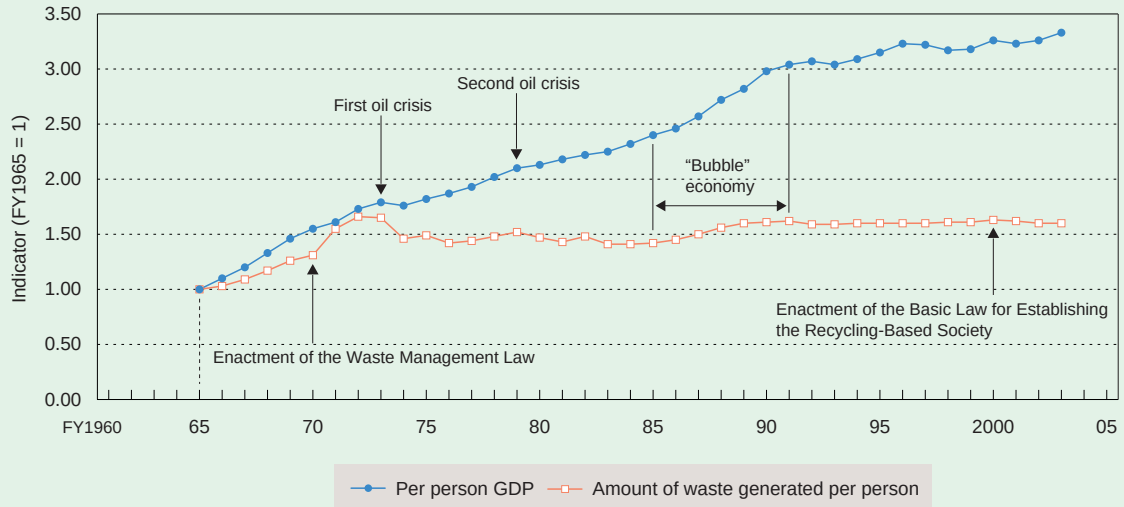
Major issues discussed in the most recent deliberations (FY2005) pertained to the material flow indicators. Although these indicators have been showing increases over the past few years, new innovations in the indicators will be required to evaluate recent and future trends. Moreover, it will be necessary to strengthen further the linkage between specific measures and indicators to determine to what extent the results of government measures and top-caliber business approaches are contributing.

About the indicators of efforts by stakeholders, a further issue involves how to promote shifts in citizens' lifestyles and how to tie these shifts to specific activities, such as efforts to reduce the amount of waste generated by each person, as steps toward establishing an SMS.

Future prospects

Reviewing approaches taken thus far, if, for example, GDP (which indicates economic development) and the amount of waste generated by each citizen are compared with 1975 standards, the per-capita GDP shows dramatic growth, while the amount of generated waste generated shows little change.

Changes in GDP and amount of waste generated per person



Source: Compiled by the Ministry of the Environment based on GDP data, etc., provided by the Cabinet Office.

Furthermore, as for final disposal amount as was demonstrated previously, the amount of industrial waste has fallen by approximately one-third while that of municipal waste has fallen by one-half compared to 1989.

However, from the standpoint of further reducing the amount of waste generated, this situation is not desirable, and further efforts must be made to secure final disposal sites.