History and Current State of Waste Management and the 3Rs in Japan

Office of Sound Material-cycle Society, Waste Management and Recycling Department, Ministry of Environment

1. Background and History

Basic Information on Japan

- A crowded island nation with limited land area
  →Difficulty securing sites for final disposal

- A mostly warm and humid climate causing organic matters to decay easily
  →Sanitation treatment is vital.

-In particular, it is extremely difficult to secure final disposal sites in major urban areas, even though that is the very place where huge amounts of waste are generated.

⇒Measures for dealing with waste problems: incineration-based sanitation treatment, 3R initiatives for waste generation reduction, etc.

Metropolitan area

Climate with a lot of precipitation

Islands scattered on the sea

Shibuya Waste Processing Factory built in the city area

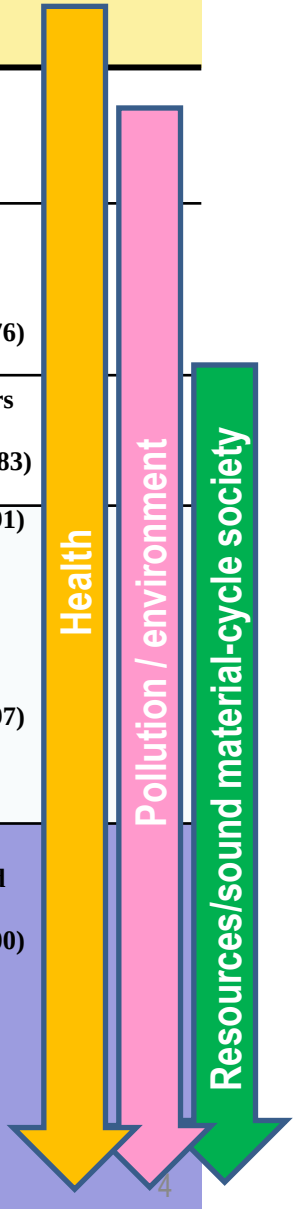
<Nationwide>
●Population: 127.51 million (10th in the world)
●Land area: 377,960 km^2
●Population density: 343.4 people/km^2
<Tokyo>
●Population: 13.23 million
(10% of the nationwide population)
●Population density: 6,015.7 people/km^2
(17 times larger than the national average)

Source: “Japan Statistical Yearbook 2014” by the Statistics Bureau, Ministry of Internal Affairs and Communications

Source:
upper left, upper right :Tokyo Metropolis
lower left :MOE Website
lower right :Clean Association of TOKYO23

History of regulations related to recycling

Period	Contents	Enactment of laws
Post war - 1950s	- Waste treatment as a measure for environment and health protection - Conservation of healthy and comfortable living environment	- Public Cleaning Act (1954)
1960s - 1970s	- Amount of industrial waste increases along with the high economic growth and the problem of pollution comes to the fore. - Waste treatment as a measures for environment conservation	- Act on urgent measures for improvement of living environment (1963) - Waste Disposal and Public Cleansing Act (1970) - Amendment of the Waste Disposal and Public Cleansing Act (1976)
1980s	- Improvement of waste treatment plants is promoted - Environment conservation along with the waste treatment	- Act on Bay Area Marine and Environment Consolidation Centers (1981) - Law for Combine Household Wastewater Treatment Facility (1983)
1990s	- Waste disposal control and promotion of recycling - Establish various recycling systems - Countermeasures for hazardous substances (incl. dioxin) - Introduction of systems for proper waste treatment, to accommodate a large variety of kinds and characteristics of waste	- Amendment of the Waste Disposal and Public Cleansing Act (1991) - Act on Promotion of Development of Specified Facilities for the Disposal of Industrial Waste (1992) - Basic Environmental Act (1993) - Act for Promotion of Sorted Collection and Recycling of Containers and Packaging (1995) - Amendment of the Waste Disposal and Public Cleansing Act (1997) - Home Appliance Recycling Act (1998) - Act on Special Measures against Dioxins (1999)
2000 -	- 3R Promotion for building of a sound material-cycle society - Reinforcement of measures of industrial waste treatment - Control enhancement of illegal waste disposals	- Basic Act on Establishing a Sound Material-Cycle Society (2000) - Law for the Promotion of the construction material recycling and Utilization of Recyclable Food Resources (2000) - Amendment of the Waste Disposal and Public Cleansing Act (2000) - Act Concerning Special Measures Against PCB Waste (2001) - End-of-Life Vehicle Recycling Law (2002) - Act on Special Measures concerning Removal of Environmental Problems Caused by Industrial Wastes (2003) - Amendment of the Waste Disposal and Public Cleansing Act (2003 - 2006, 2010) - Small Electrical and Electronic Equipment Recycling Act (2013)



Era of public health improvement
1. Situation subsequent to the Meiji Restoration (late 19th to early 20th centuries)

Domestic situation during this period

- **Waste was collected and treated by waste generators themselves or by private waste treatment operators.**

→Waste was often discarded on roadsides or vacant lots, being piled up in unsanitary conditions.

- **As a result of increasing contact between humans and objects, various infectious diseases spread**.

→Waste dump sites provided breeding grounds for flies, mosquitoes and rats that carried infectious diseases.

⇒**The improvement of public health was gaining attention**.

Measures implemented to solve problems

The Waste Cleaning Act was enacted in 1900.

→The act defined the collection and disposal of waste as the obligation of municipalities to establish a waste administration system.

It stated that waste should be incinerated if possible.

→Since waste incineration facilities were not generally available, waste materials had been burned out in the open.

Era of pollution problems and living environment protection
3. Rapid economic growth period (1960s to 1970s)

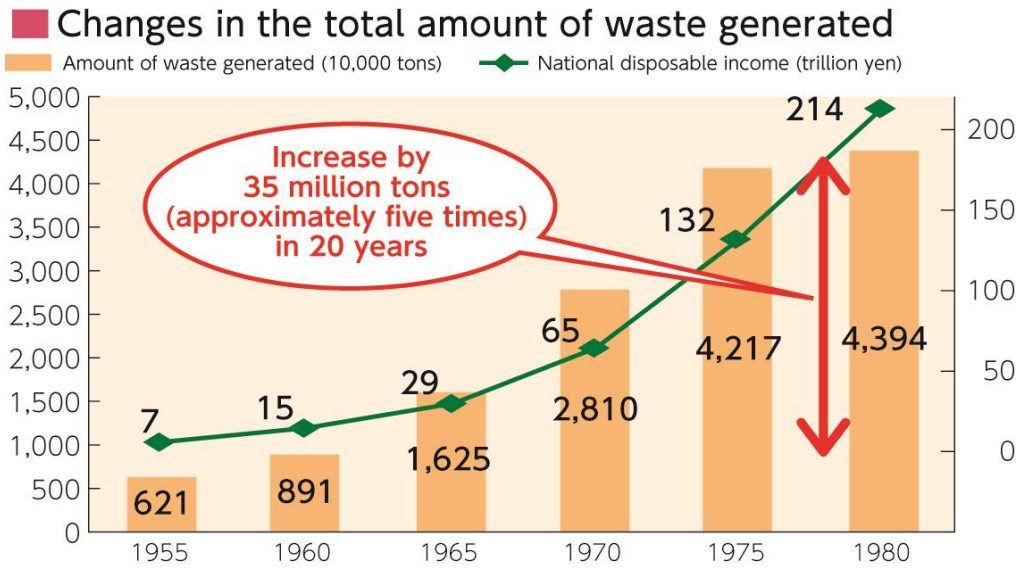
Domestic situation during this period

A rapid increase of urban waste and its diversification resulting from increased income, widespread of home appliances and changes in marketing method and consumer behavior

→A mass production- and mass consumption-based economy progressed.

An increase in industrial waste resulting from active production activities and urban development

→It became more and more difficult to cope with industrial waste problems in the municipal waste management system, pursuant to the Public Cleansing Act.



Source: Compiled from MOE, Waste Management in Japan (annual editions) and Cabinet Office, National Accounts Statistics (annual editions)

Era of pollution problems and living environment protection
3. Rapid economic growth period (1960s to 1970s)

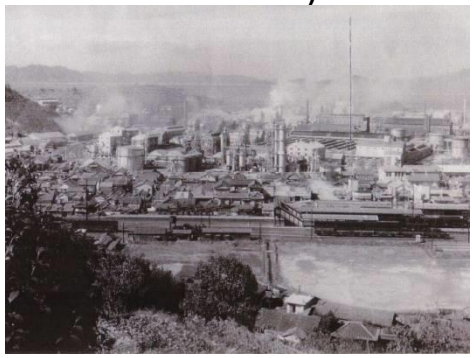
Domestic situation during this period

Emergence of pollution problems

- In the process of rapid industrialization, hazardous substances such as organic mercury and cadmium were discharged from factories.
- Products made of plastics became widely used. → Some plastics generated soot dust, acidic gases, and other hazardous substances during incineration → It produced pollution, seriously damaging the health of residents in surrounding areas.

Minamata disease

The disease was caused by methyl mercury discharged from a chemical factory in Minamata City in Kumamoto Prefecture.
The total number of certified patients was 2,275 (As of October 2013).

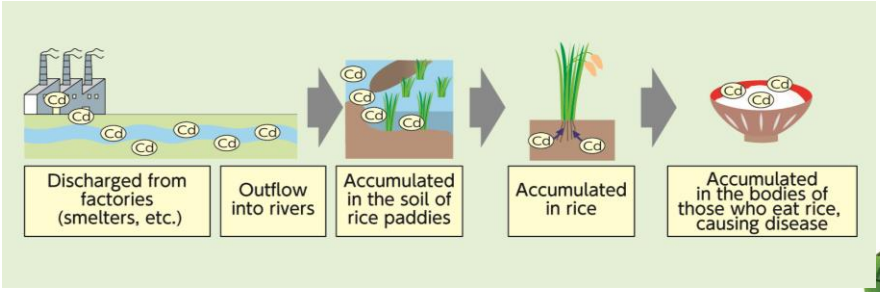


Chisso Corporation Minamata Factory during the 1950s

Photo courtesy of the Minamata Disease Municipal Museum

Itai-Itai disease

Cadmium discharged from the Kamioka Mine in Gifu Prefecture contaminated rice paddies in the lower basin of the Jinzu River, causing disease among those who ate rice grown in that area.
A total of 196 patients were certified (as of the end of 2011).



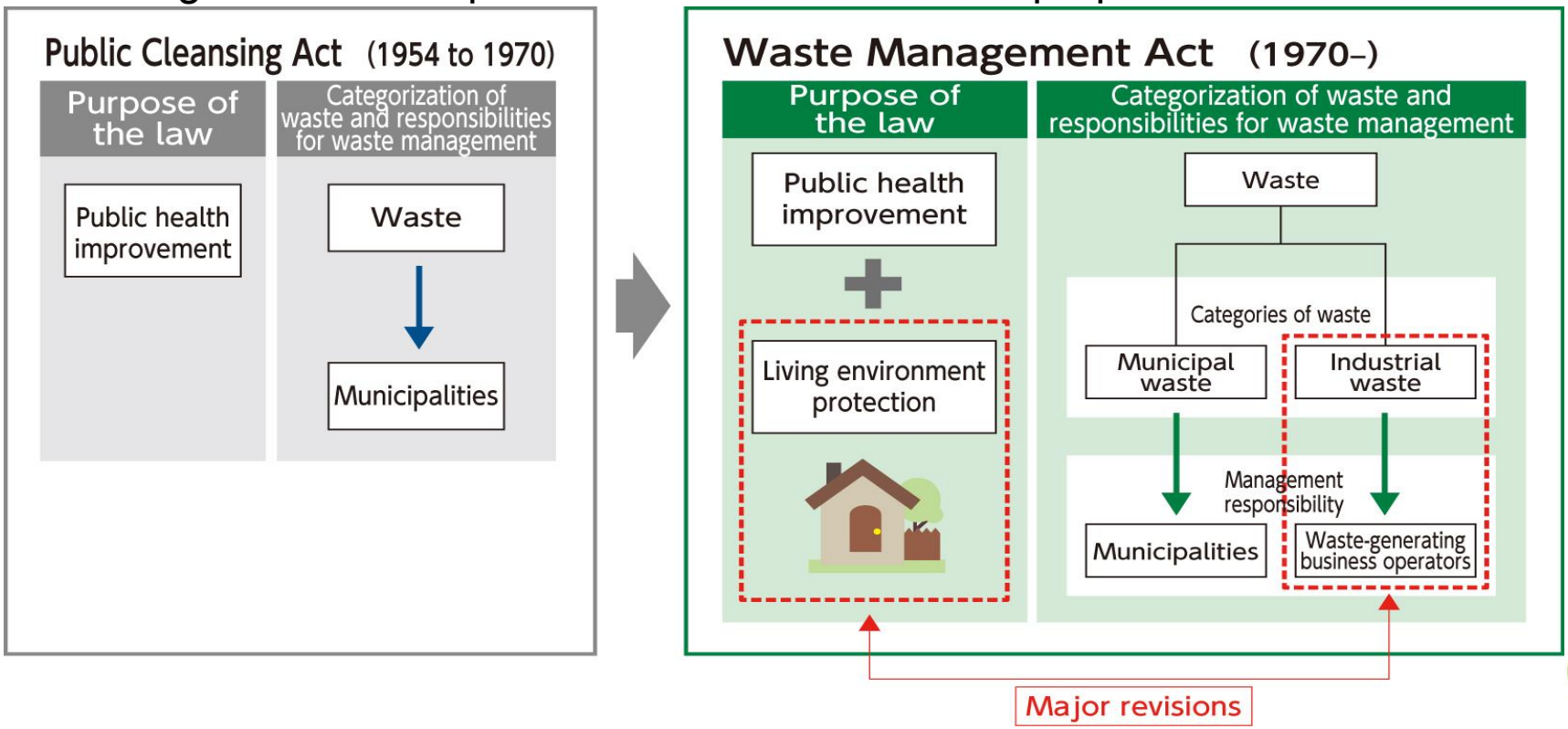
Era of pollution problems and living environment protection
3. Rapid economic growth period (1960s to 1970s)

Measures implemented to solve problems

Development of basic system for waste management

The Waste Management Act was enacted in 1970.

- The act distinguished “municipal waste” from “industrial waste,” and stipulated whose responsibility it was to manage them.
- “Living environment protection” was added to the purposes of the act.



Era of pollution problems and living environment protection
3. Rapid economic growth period (1960s to 1970s)

Measures implemented to solve problems

Basic principles of pollution prevention and definition of the responsibilities of different entities

The Basic Act for Environmental Pollution Control was enacted in 1967.

Regulations on the discharge of hazardous substances

The Air Pollution Control Act was enacted in 1968 and the Water Pollution Control Act in 1970.

The Japanese government also established the Environment Agency in 1971.
→An effort to create a centralized system for environmental administration

■ Regulation values in the Air Pollution Control Act

Soot dust				Sulfur oxides	Hazardous substances		
Soot and other particulate matter					Hydrogen chloride		
1968～1971				1968～	1977～		
Type of facility	Emission standard (g/Nm³)			Emission standards for individual designated areas defined in enforcement regulations based on the K value	Type of facility	Emission standard (mg/Nm³)	
Sewage incineration furnace	0.7				Waste incineration furnace	700 (O^2=12%Converted value)	
Soot dust					Nitrogen oxides		
1971～1982					1977～1979		
Type of facility	Size of facility (amount of exhaust gas)	Emission standard (g/Nm³)			Type of facility	Size of facility (amount of exhaust gas)	Emission standard (ppm)
		General	Special		Waste incineration furnace	40,000 Nm³ or more	250
Continuous furnace	40,000 Nm³ or more	0.2	0.1		＊O^2=12%Converted value		
	Less than 40,000 Nm³	0.7	0.2				
Other furnaces	–	0.7	0.4				

Source: Masaaki Osawa, Waste in Japan Based on Figures and Tables, website of the Japan Environmental Sanitation Center

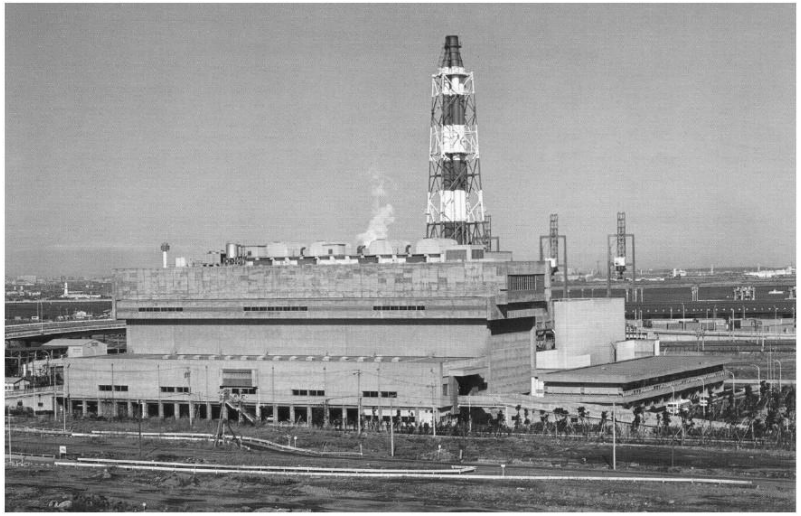
Era of pollution problems and living environment protection
3. Rapid economic growth period (1960s to 1970s)

Measures implemented to solve problems

Promotion of proper waste management

- Establishment of architectural standards for incineration facilities/final landfill sites
- National subsidy system for supporting waste management facilities that meet these architectural standards
- Development of human resources with advanced knowledge and skills

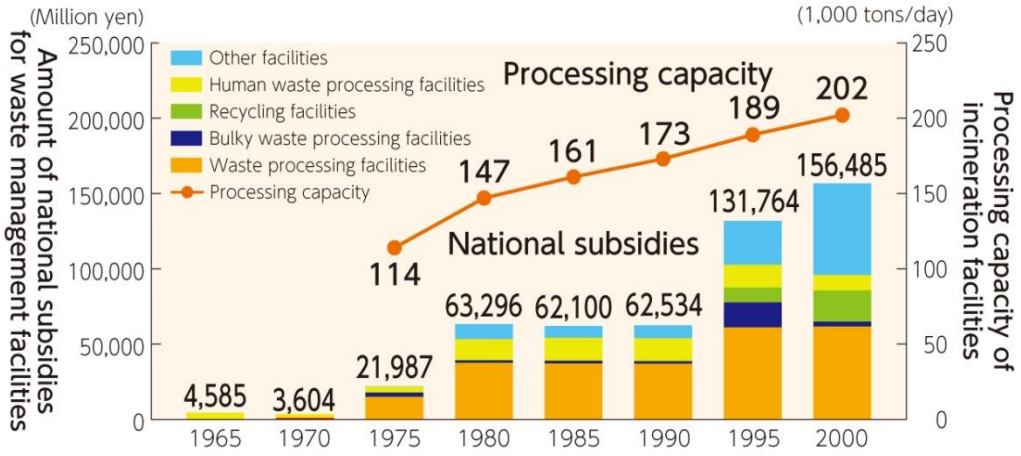
→Spread of waste management facilities that meet legal standards and raising of their processing capability



The Oi Waste Processing Factory constructed in Tokyo

Source: One Hundred Years of Waste Management in Tokyo

National subsidies for waste management facilities and changes in the processing capability of incineration facilities



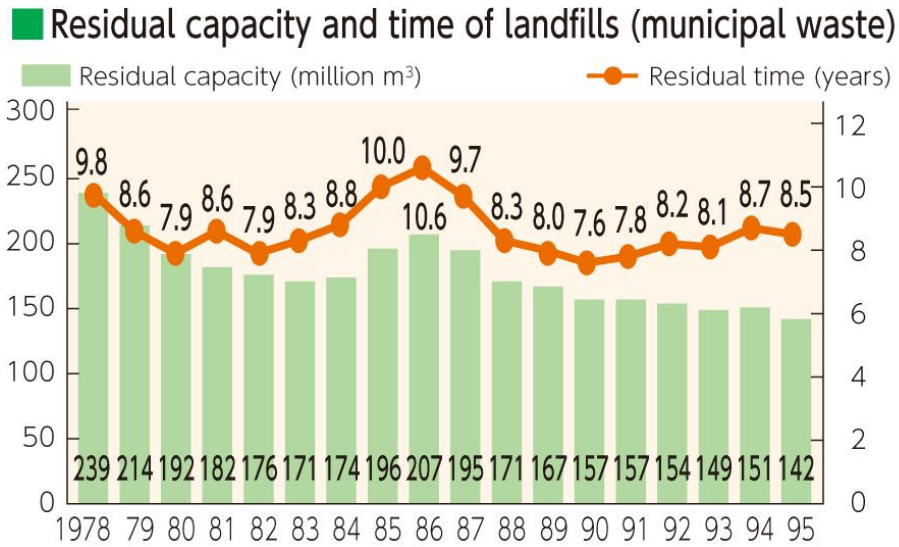
Source: Compiled from MOE, Waste Management in Japan (annual editions) and Japan Waste Management Association, FY2005 Manual for Waste Management Facility Development Operations

Era of the establishment of a sound material-cycle society
4. Rapid economic growth period to the bubble economy period (1980s to early 1990s)

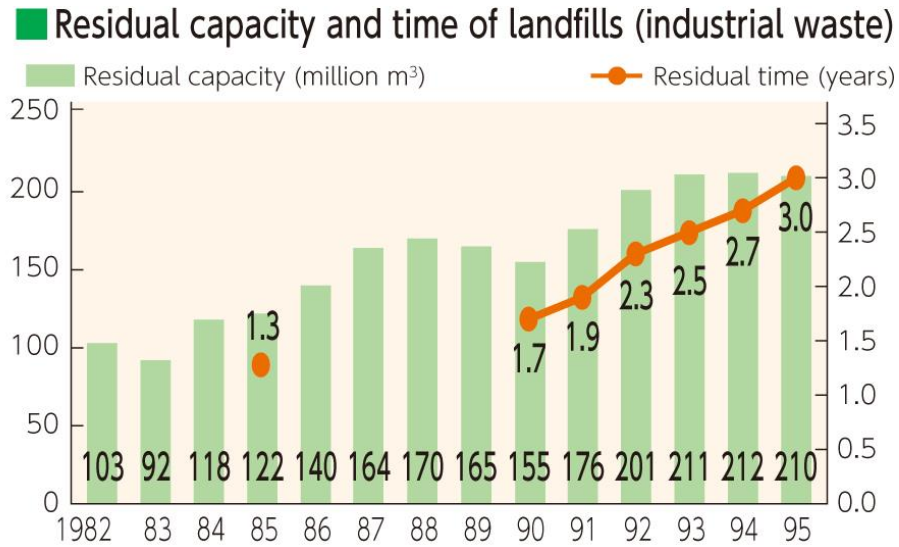
Domestic situation during this period

Serious shortage of landfills

- A rapid increase in the amount of waste and a corresponding increase in delivery of waste to landfills → The residual volume of existing landfills and their remaining capacity expressed in terms of years were reduced.
- Difficulty in obtaining the consent of local residents for the construction of new landfills → A shortage of facilities



Source: MOE, Waste Management in Japan (annual editions)

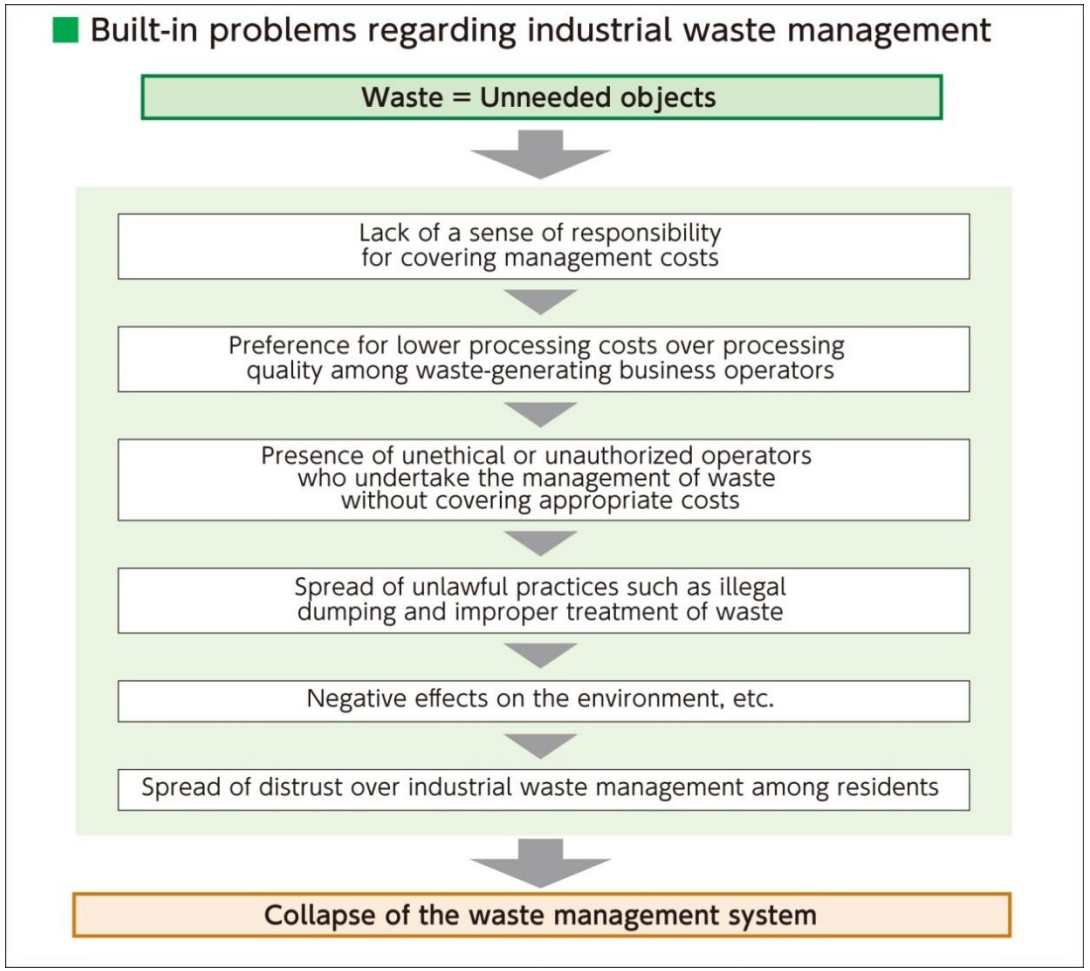


Source: Compiled from MOE, Survey on the Discharge and Disposal of Industrial Waste, and Ministry of Welfare, Survey on Government Organizations for Industrial Waste Management

Era of the establishment of a sound material-cycle society
4. Rapid economic growth period to the bubble economy period (1980s to early 1990s)

Domestic situation during this period

Emergence of large-scale illegal dumping and other problems



Era of the establishment of a sound material-cycle society
4. Rapid economic growth period to the bubble economy period (1980s to early 1990s)

Domestic situation during this period

Emergence of problems regarding dioxins generated by waste incineration facilities

In Japan, dioxins were reportedly detected from fly ash of waste incineration facilities around the end of 1983.
→ Growing public attention

- Effects of dioxins on mothers' milk were reported.
- High-concentration soil contamination was reported in and around waste incineration facilities of Tokorozawa City, Saitama Prefecture.

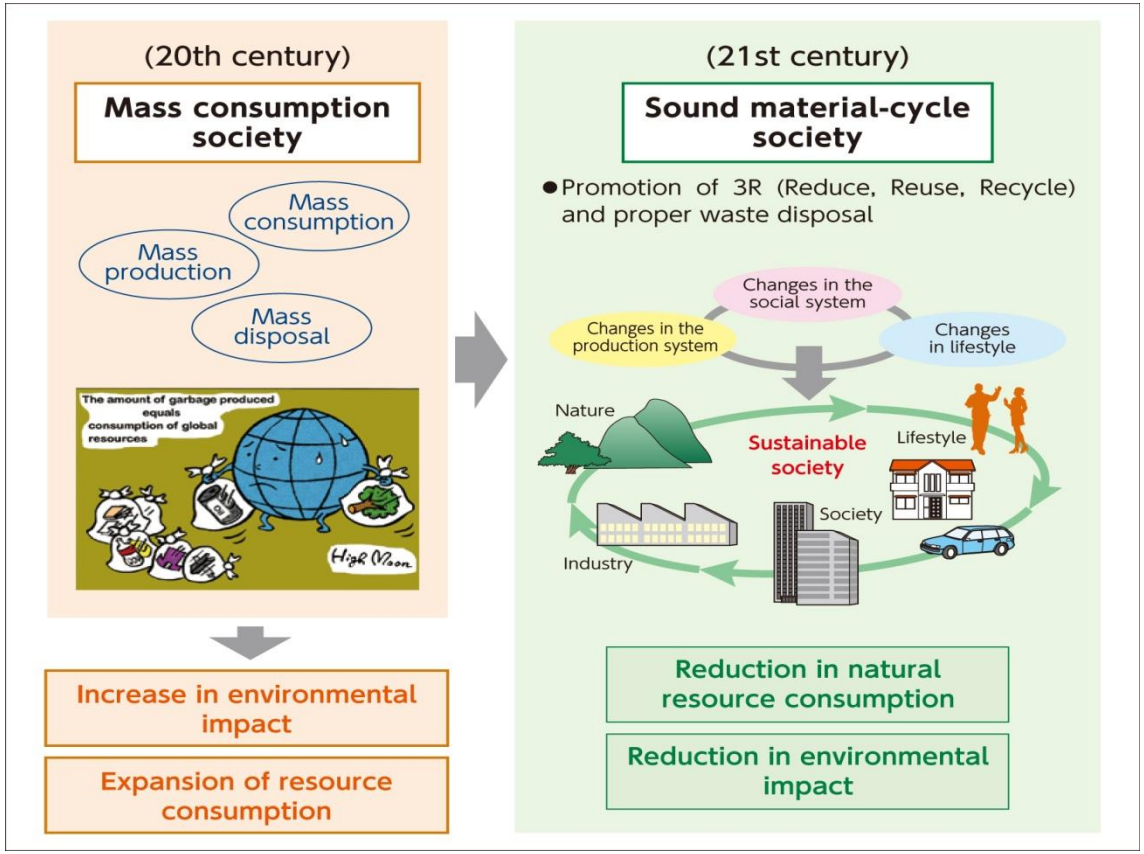
→ Anxiety about dioxins provided impetus to opposition movements against the construction of incineration facilities.

Era of the establishment of a sound material-cycle society
5. 1990s to 2000s

Measures implemented to solve problems

Promotion of the establishment of a sound material-cycle society

In 2000 the Basic Act for Establishing a Sound Material-Cycle Society was enacted to set out the basic principles of a recycling-oriented society, etc.



Source for the illustration: Website of the Miyako Ecology Center

Era of the establishment of a sound material-cycle society
5. 1990s to 2000s

Measures implemented to solve problems

Promotion of understanding among consumers

Government initiatives:

- Waste Reduction Promotion National Conference → Strongly promoting waste reduction initiatives in cooperation with consumers and business operators
- A comprehensive waste reduction strategy → Providing subsidies for sorted waste collection and group collection by resident groups, as well as for recycling plazas

Local government initiatives: Awareness-raising programs for waste reduction

- Large-scale events held with the support of the mass media and campaigns matching the lifestyles of residents
- Joint efforts with residents and business operators to promote recycling

TOKYO SLIM IN DOME

Recycling bazar at the Clean Tokyo Festival

1977 Tokyo Waste Council

Photo courtesy of Tokyo Metropolis

Era of the establishment of a sound material-cycle society
5. 1990s to 2000s

Measures implemented to solve problems

Promotion of understanding among consumers

Local government initiatives:
Recycling programs rooted in local communities

Establishment of recycling centers and recycling plazas
→Raising residents' recycling awareness
Helping to promote recycling activities rooted in the local community

Machida Recycling Culture Center

Exhibition hall on the first floor of the Nakano Environment and Recycling Plaza

Recycling basket for old cloths and clothes installed at the Nakano Environment and Recycling Plaza

Photo courtesy of Tokyo Metropolis

Era of the establishment of a sound material-cycle society
5. 1990s to 2000s

Measures implemented to solve problems

Sorted collection of recyclable waste

Initiatives for promoting sorted waste collection: Cooperation of residents

- Distributed flyers and handbooks to residents to promote their understanding of sorted waste collection.
- Implemented briefings by local government staff for local residents.

Source: Official website of Yokohama City

Era of the establishment of a sound material-cycle society
5. 1990s to 2000s

Measures implemented to solve problems

Sorted collection of recyclable waste

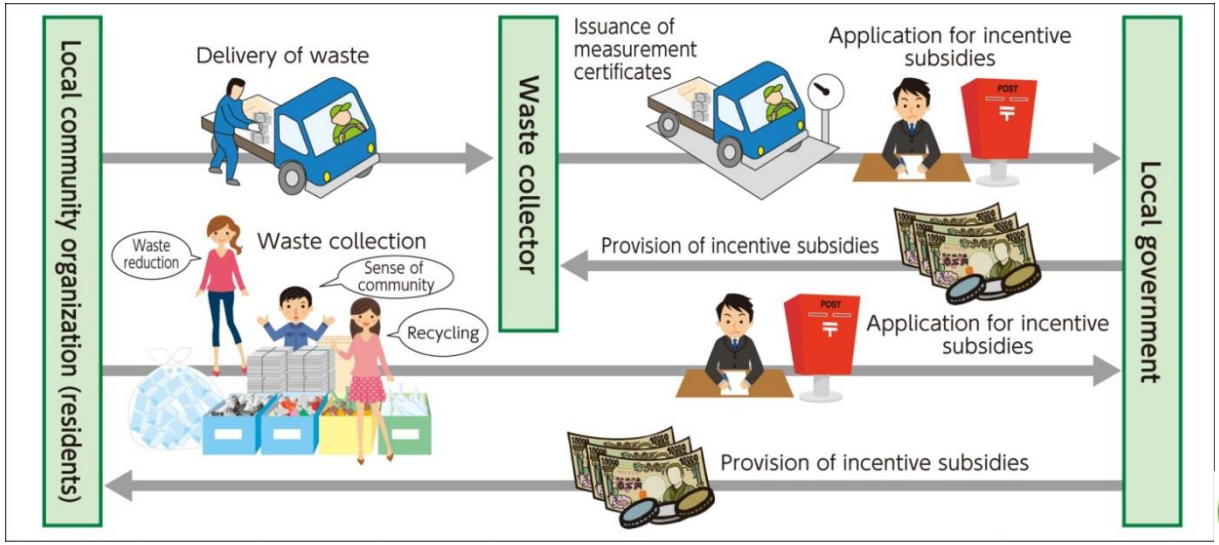
Initiatives for promoting sorted waste collection: Group collection

Informal system of collecting and delivering recyclable waste by voluntary local resident groups to resource recycling operators to recycle as resources.

Photo courtesy of Kawasaki City

Incentive scheme of municipalities

Scheme for providing subsidies/other incentives to group collection



Source: Compiled from a figure on the website of Yokohama City

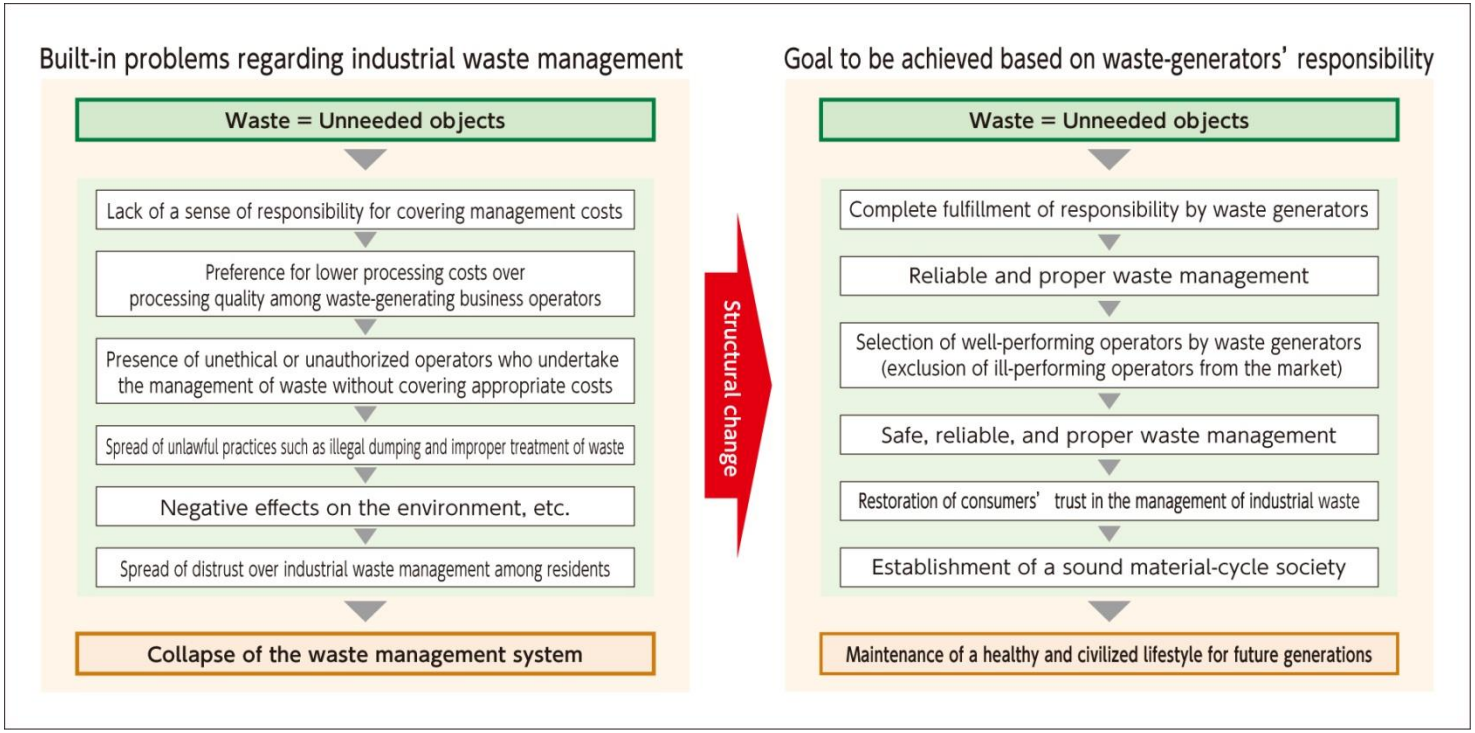
Era of the establishment of a sound material-cycle society
5. 1990s to 2000s

Measures implemented to solve problems

Enhancement of regulations on industrial waste

The Waste Management Act has been revised several times since1997.

→Promoting reform of industrial waste management structure, focusing on effectively ensuring “fulfillment of responsibility by waste-generating business operators,” “prevention of improper waste management” and “securing of appropriate waste management facilities”



Era of the establishment of a sound material-cycle society
5. 1990s to 2000s

Measures implemented to solve problems

Dioxin emission control

Survey research and technological development through industry-academia-government collaboration

- Research and studies to assess the connections between behavior and environmental effects of dioxins and their impact on human health
- Development of a variety of technologies, including for proper waste incineration, purification of contaminated soil, and detoxification and dissolution of dioxins

Exhaust gas emission control and development of waste incineration facilities

1997– Establishment of the Guidelines for the Prevention of Emissions from Waste Management
Revision of the Air Pollution Control Act and the Waste Management Act

1999－Establishment of the Basic Guidelines for the Promotion of Dioxin Control Measures

1999－Enactment of the Act on Special Measures against Dioxins

State-of-the-art equipment for the prevention of pollution, including dioxin emission control, introduced in the Chitose Waste Processing Factory (Tokyo)

Photo courtesy of the Clean Association of TOKYO23

2. Sound Material-Cycle Society

Background of the building of a Sound Material-Cycle Society

(1) Waste generation continues at a high rate.

(2) There is a social demand for further promotion of recycling.

(3) Constructing waste treatment plants becomes more and more difficult in terms of locational restrictions.

(4) Increase of illegal waste disposal

The issues listed above are identified as needing to be urgently solved

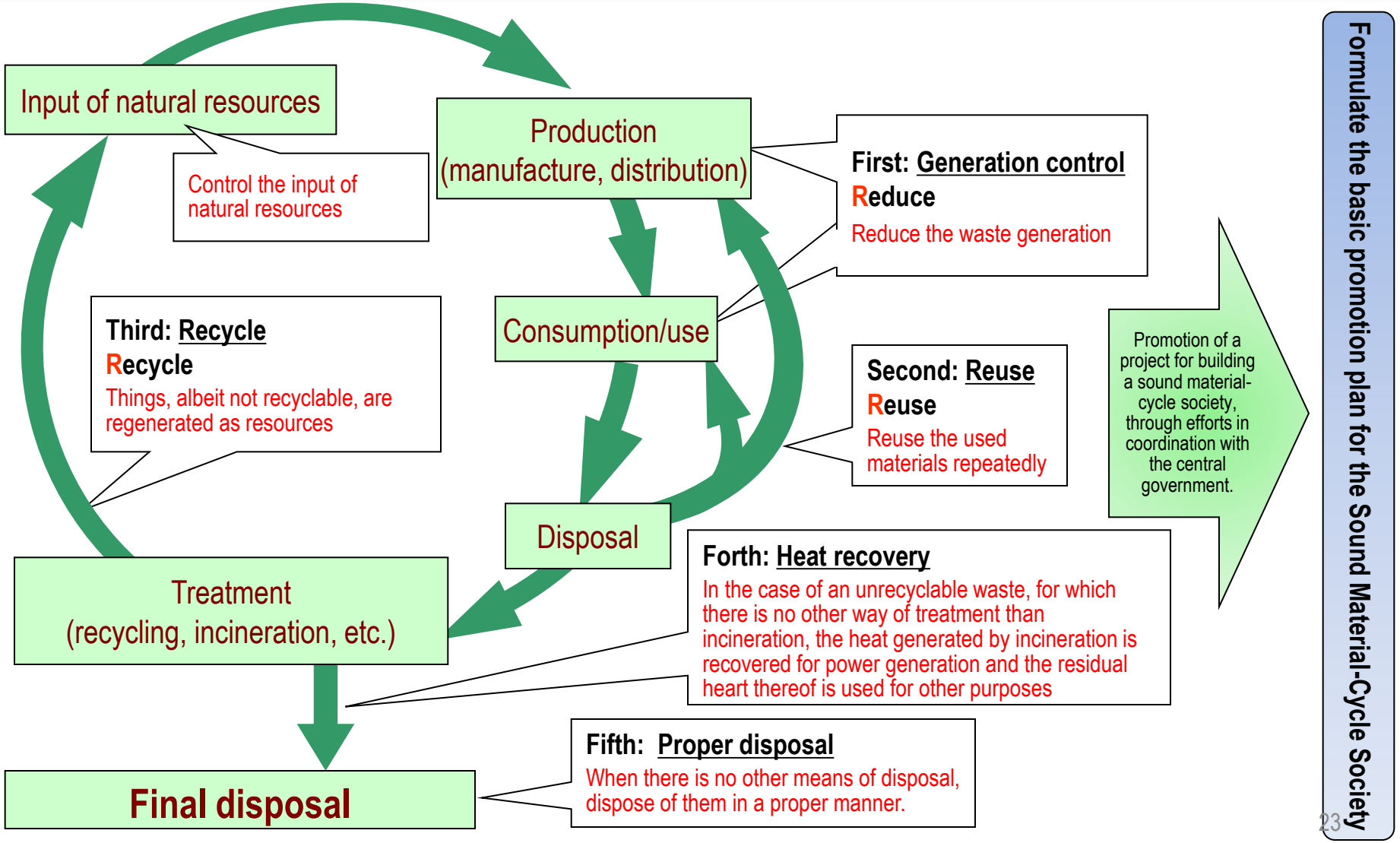
As for a countermeasure,

The approach of "legitimately disposing of the waste each time it is produced", if we depend on it solely, reaches its limits, by allowing one-way flow of materials and an inequitable environmental load in the communities downstream. We now are faced with the need of drastically reforming the social economy system.

In 2000, the Basic Act was enacted in order to build the sound material-cycle society

What is a sound material-cycle society?

"Sound Material-Cycle Society" means a society in which the consumption of natural resources will be conserved and the environmental load will be reduced to the greatest extent possible, by preventing or reducing the generation of wastes, etc. from products, etc., by promoting proper cyclical use of products, etc. and proper disposal of waste. [Basic Act on Establishing a Sound Material-Cycle Society] (Promulgated in June 2000, and put completely into effect in January 2001)



Legal system for building a sound material-cycle society

Basic Environmental Act
Put completely into effect in August 1994

Basic environmental plan
Revised completely and published in April 2012

Basic Act on Establishing a Sound Material-Cycle Society (Basic framework law)
Put completely into effect in January 2001

Maintain proper material cycle of the society
Reduce the consumption of natural resources
Reduce environmental load

Basic promotion plan for the Sound Material-Cycle Society : Fundamentals of other national plans
Published in March 2003
Revised completely in May 2013

＜ Proper disposal of waste ＞

Waste Disposal and Public Cleansing Act
Partially amended in May 2010

① Control waste generation
② Proper treatment of waste (incl. recycling)
③ Regulation on establishment of waste treatment plants
④ Control for waste treatment service companies
⑤ Setting of criteria for waste disposal, etc.

＜Promotion of material recycling ＞

Act on the Promotion of Effective Utilization of Resources
Revised completely and published in April 2001

① Recycling of recyclable resources
② Design and review the structure and materials to easy to be recycled
③ Indicate how to separate waste
④ Promote the effective use of secondary products

Reduce
Recycle → Reuse
Recycle
（１Ｒ）（３Ｒ）

Regulations depend upon characteristics of articles and materials

Act for Promotion of Sorted Collection and Recycling of Containers and Packaging

Put completely into effect in April 2000
Partially amended in June 2006

Bottles, PET bottles, paper/ plastic containers

Home Appliance Recycling Act

Put completely into effect in April 2001

Air conditioner, refrigerator, freezer, TV sets, Washing machine, clothes dryer

Food Recycling Law

Put completely into effect in May 2001
Partially amended in June 2007

Food residue

Construction Waste Recycling Law

Put completely into effect in May 2002

Wooden/concrete/ asphalt materials

End-of-Life Vehicle Recycling Law

Put completely into effect in January 2005

Automobile

Small Electrical and Electronic Equipment Recycling Act

Put into effect in April 2013

Small electrical and electronic equipment

Act on Promoting Green Purchasing (Promoted by the government taking initiative for purchasing of recycled products)

Put completely into effect in April 2001

3-1. Overview of the Waste Management Law

Purpose: Conservation of the life environment through reduction of waste production, proper waste separation, storage, collection, transport, recycling, disposal, etc.

Waste

Garbage and unneeded materials in solid or fluid form

General Waste	Industrial Waste
Non-industrial waste (household refuse, etc.)	Cinders, sludge, waste oil, waste plastics, etc., produced by business activities

Government • Basic policy formulation • Setting of management standards, facility standards, etc. • Emergency measures, etc.

Municipalities

Municipalities: **Management responsibilities**
- Formulation of general waste management plans
- Management in accordance with management standards to ensure that waste within the region does not interfere with life environment conservation

Permit supervision

General waste management contractors
- **Business permits**
- Observation of general waste management standards, etc.

Prefectures

Permit supervision

General waste management facilities
- Installation, transfer permits, etc.

Disposers: **Management responsibilities**
- Voluntary management of industrial waste
- Observation of industrial waste management standards, etc.
- Observation of outsourcing standards

Supervision

Industrial waste management contractors
- **Business permits**
- Observation of industrial waste management standards, etc.

Permit supervision

Industrial waste management facilities
- Installation, transfer permits, etc.

Permit supervision

Prefectures

*A special government-certified system exists for the promotion of wide-area recycling by manufacturers.

Waste incineration facilities in Japan

Shibuya Incineration Plant
Constructed in 2001

Shinagawa Incineration Plant

- Operation under automatic control

- located near Shibuya Station – most densely populated commercial area in Japan
- advanced incineration technology with a capacity of 200t/day
- sophisticated emission control for NOx, SOx, smoke, dioxins and other gases
- equipped with steam turbine generator with a maximum capacity of 4,200kW
- excess electricity being sold to Tokyo Electric Power Company.

Source: Clean Association of TOKYO 23

Subsidy for Establishing a Sound Material-Cycle Society

○Supporting construction of waste treatment facility which municipalities conduct to support people's livelihood.
○Supporting especially renovation to achieve life duration improvement of facilities based on increasing renovation demands.

Many aging and deteriorating facilities which were intensively constructed to measure against dioxin, which leads to insufficient disposal capacity of waste and increased risk of accidents.; (Older than: 20 years – 353 facilities, 30 years – 137 facilities, 40 years – 6 facilities, out of 1,172 facilities nationwide.)

➢ While pursuing appropriate renovation for aging facilities, <u>life duration improvement of facilities ensures safety / security for the local residents.</u>

【 Recipient 】
・Municipalities except specified affected local government (General accounting)
・Municipalities of specified affected local government (Special account for the recovery)

【 Targeted facilities 】
Incinerator, final disposal site, improvement projects of major equipment of existing facilities, etc

【Rate】
One-third of the target expenses. However, a half for some of the advanced facilities.

National government → Municipalities, etc.

Key points of the Third basic plan for a sound society (decided by the cabinet in May 31, 2013)

Current states and issues

Development of 3Rs

- Japan is now **steadily developing the project for a sound material-cycle society**, through 3Rs effort and individual recycling acts; **we could already achieve a significant reduction in final disposition**.

High grade use of recycle resources, and securing of resources

- As the prices of resources spikes up in overseas markets, availability of resources is expected to be restricted further in the world; on the other hand, lots of precious and rare metals are dumped for backfilling as part of wastes.

Securing of safety and security

- **Through experience of the Great East Japan Earthquake, and the incidents of TEPCO Fukushima I Nuclear Power Plant, we Japanese are now highly aware of the necessity for safety and security.**

Necessity of develop projects on a global scale

- With economic growth and increase of population in developing countries, the amount of wastes increases in the world. 40 percent of them are generated in the Asia area. In 2050, it will grow double of 2010.

New goals

- The lesser the input of resources, the larger value we get.
- **The goal for material flow should be heightened further, focusing upon the productivity as top priority.**

	FY 2000	FY 2010	FY 2020 [Goal]
Resource productivity (10,000 yen/t)	25	37	**46** (+85%)
Recycling rate (%)	10	15	**17** (+7 points)
Final disposition (million ton)	56	19	**17** (▲70%)

The value in parenthesis is the one compared to 2000.

Key policies in the Third basic plan for a sound society

Formation of a sound material-cycle society, focusing on the quality

(1)**Building of a social economic society which is designed to advance 2Rs (reduce, reuse)** prior to the recycle.

(2)**Recovery of useful metals from consumed products and promotion of a high grade recycle (horizontal recycle, etc.,),** based upon the effective implementation of the Small Electrical and Electronic Equipment Recycling Act.

(3)**Appropriate treatment of hazardous substance such asbestos,** PCB, etc.

(4)**Formation of a new guideline for disaster wastes treatment measures**, taking into consideration the lessons from the Great East Japan Earthquake

(5)**Conversion of recycle and biomass resources into energy**, considering the environmental aspects of energy.

(6)**Development of the efforts integrating the elements for a low carbon society and a nature-harmonized society, and grade-up of the local recycling network.**

Promotion of global efforts

(1)**We aim at building a global sound material-cycle society through Asia 3Rs Promotion Forum, and supports for overseas development of waste recycle Industries.**

(2)**Enhancement of the waterfront measures for harmful wastes, import of environment resources of high value, albeit difficult to treat adequately in developing countries, export of environment resources which can be hardly treated at home, under a requirement for such resources not to induce environmental pollution.**

Global environment cooperation of 3Rs

Global development of waste/recycle industries

Adequate import and export of environment resources

Response to the Great East Japan Earthquake

(1)**Effective treatment and reuse** of disaster wastes

(2)**Relevant and safe treatment** of radioactive substance-polluted wastes

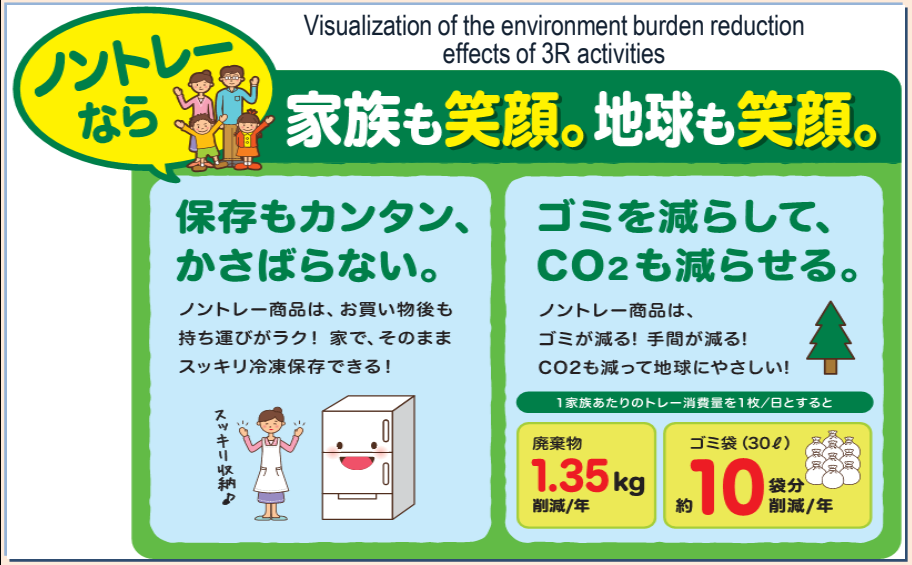
Promotion of 2R, sophistication in the utilization of recyclable waste

○ Promote 2Rs (Reduce & Reuse) initiatives, which had fallen behind recycling, and advance horizontal recycling and other advanced recycling technologies.

☑ Explore possibilities for systematic implementation of 2Rs (Reduce & Reuse) initiatives by people and business operators.

☑ Establish an environment in which consumers can use reused goods with a peace of mind through a thorough implementation of a system for legal compliance for business operators handling reused goods.

☑ Provide, in an easy-to-understand manner, information regarding 3R activities (including recycling) that can be implemented by business operators and consumers and their effects.



Trays

Non-trays (nylon bags)

☑ Implement the following measures with the objective of improving participation and collection ratio of the system for recycling of small electronic and electric home appliances that will be newly launched from FY2013: (1) Support for local public authorities, etc., (2) Popularization and educational activities, (3) Promotion of cooperation among implementation entities.

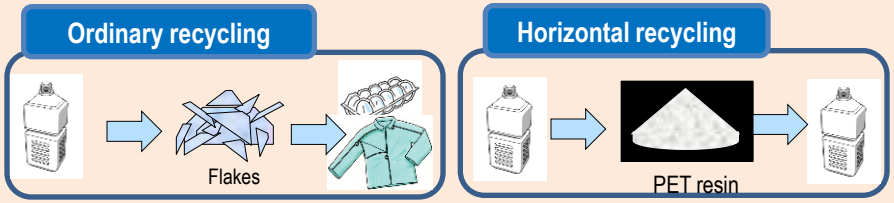
☑ Advance initiatives to secure collection volume of rare metals, etc., and improve recycling efficiency.

Collection

☑ Advance initiatives on the product design stage, such as display of raw materials contained in the product and unitized assembly of components in order to facilitate recycling.

☑ Adequately apply wide-area certification systems, etc., under the Waste Management and Public Cleansing Law for collection of spent goods by manufacturers with consideration to enabling wider-area recycling.

☑ Technological development to enable popularization of horizontal recycling as an advanced and high added-value method for manufacturing of identical products from spent goods.



Strengthening of safety and security initiatives

- **Build systems capable of maintaining smooth disposal of waste even in the event of a large-scale disaster.**
- **Strengthen safety and security initiatives to enable utilization of recyclable waste after thorough processing of hazardous substances, and to share information and enhance communication regarding hazardous substances.**

Impact of the earthquake and nuclear power plant accident

- The Great East Japan Earthquake demonstrated again how nature, which is a source of abundant gifts, may transform into a major threat, posing a variety of problems, such as the task of disposing of large amounts of disaster-generated waste.

- The accident in the Fukushima Daiichi Nuclear Power Plant created a previously unexpected situation in which waste polluted with radioactive substances was generated outside the premises of the plant, triggering an escalation in the nation's awareness regarding waste disposal safety and security.

Situation surrounding hazardous substances

- With regard to PCB waste that has been stored for long periods, it is necessary to improve the disposal system in order to complete disposal as soon as possible.

- In the Strategic Approach to International Chemicals Management (SAICM) adopted by the International Conference on Composite Materials (ICCM), management of hazardous substances within the life cycle of electrical and electronic products was established as an emerging policy issue.

Strengthening of systems for disposal of disaster-generated waste at times of disaster

☑ Thoroughly analyze response, including points of reflection, at the time of the Great East Japan Earthquake, and implement an overhaul of the existing policies for handling of waste at times of disaster and formulate brand-new policies in order to enable implementation of measures that match the scale of the disaster and the actual situation.

☑ Accelerate the following measures in order to enable smooth disposal of disaster-generated waste including through wide-area cooperation: (1) Promotion of cooperation among local public authorities, (2) Collaboration with private operators, etc. , (3) Securing of temporary disposal sites.

☑ In the event of a large-scale disaster, secure sufficient collaboration among the implementing entities, including local public authorities, and provide appropriate and speedy assistance to each entity.

Building of systems for appropriate disposal of waste containing hazardous substances

☑ Improve systems in order to ensure appropriate disposal and management of waste containing asbestos, PCB, or other hazardous materials.

☑ Based on the progress in international conventions for formulation of a mercury treaty , advance examinations of the modalities for environmentally-adequate management and disposal of mercury waste.

☑ Implement exchange of information on hazardous substances, including international trends, and accurate risk communication in order to enable adequate sharing of information and enhance communication among involved entities.

Initiatives integrated with the creation of low-carbon society and nature-harmonious society

○ Aim to create and upgrade local recycling networks through cooperation among implementation entities as part of the comprehensive promotion of efforts for creation of sound material-cycle society , low-carbon society, and nature-harmonious society.

Utilization of recyclable resources and biomass resources as energy sources

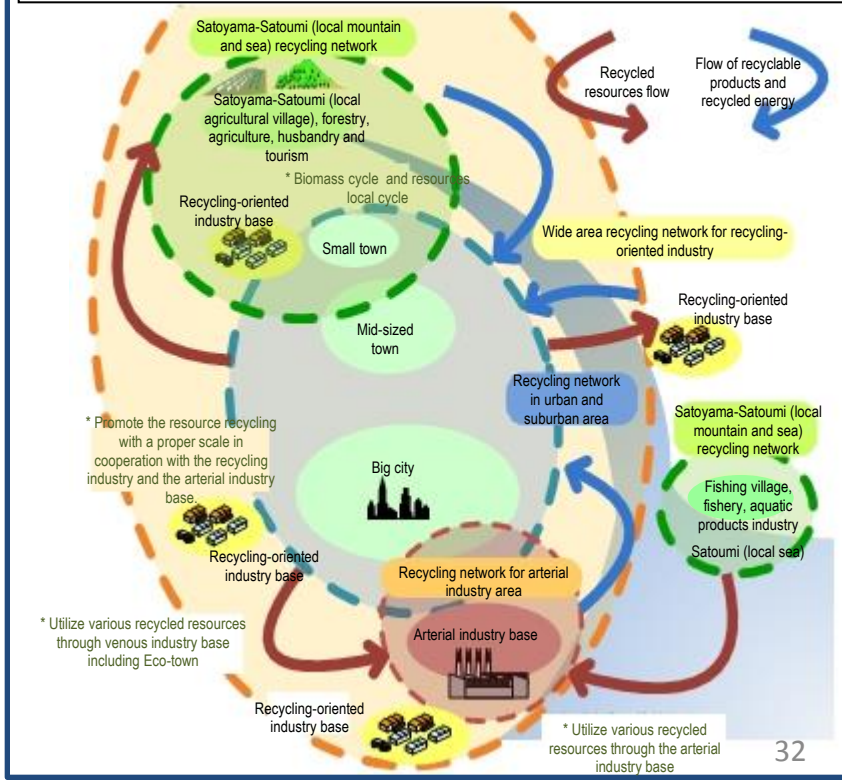
Heat recovery from recyclable waste and biomass resources will expand its role as an energy supply source with view of its properties as an off-grid (dispersed) power source and the potential to secure stable energy supply, thus providing an adequate response to energy and environmental issues.

- ☑ Implement swift efforts for equipment and improvement of high efficiency waste power generation facilities, and environment improvement initiatives in order to boost the utilization potential of fixed feed-in tariffs in power generation from waste.
- ☑ Advance efficient utilization of mid/low heat generated from incineration facilities and industrial processes for heating or cooling purposes in local communities, etc.
- ☑ Advance efforts to expand production of biomass fuels, convert raw waste, etc., into methane gas, utilize timber from forest thinning as wooden pellets, etc.
- ☑ Advance efficient and long-term utilization of resources and take measures to limit consumption of new natural resources from the perspective of reducing the negative effect of resource collection on biodiversity and the natural environment.
- ☑ Promote utilization of biomass resources in order to advance sustainable use of recyclable resources in the natural world.

Sophistication of local recycling networks

Definition of local recycling networks

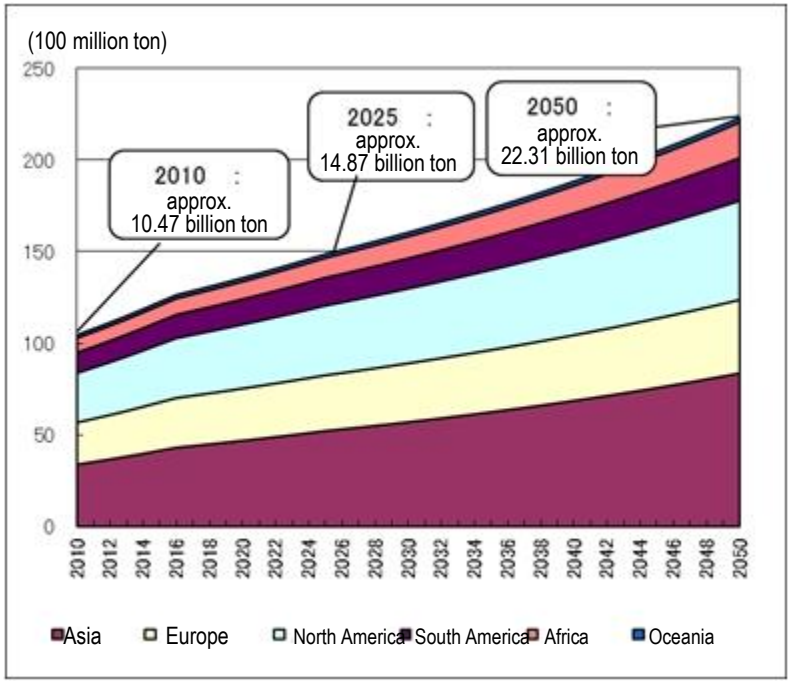
- It is important to organize recycling of resources at an appropriate scale that matches the specific of the local area and the recyclable waste.
- Local recycling networks are based on the concept to recycle resources as much as possible in their area of utilization, and create wide-area systems for resources that cannot be recycled in their area of utilization, thus building multiple-layered local recycling networks.



Domestic and international situation surrounding sound material-cycle society

- **Economic and population growth around the world have resulted in a waste increase. This trend is particularly pronounced in the Asian region.**
- **Escalation in global resource limitations: previously excavated terrestrial resources exceed underground resources, metal resource prices increase.**
- **Great East Japan Earthquake: stable and safe disposal of disaster-generated waste and radioactive materials-polluted waste.**

Projected changes in the global volume of waste

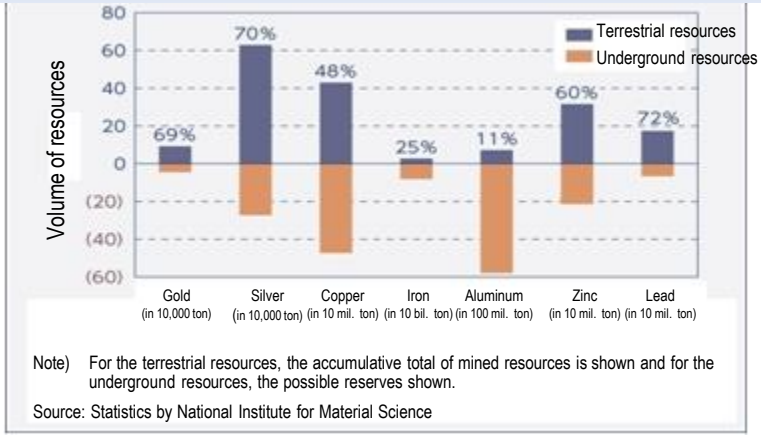


- **<u>Increase in waste volume globally due to economic and population growth</u>**

  The volume of waste generated in the Asian region in particular, accounts for approx. 40% of the overall global volume.

  <u>The volume of generated waste is expected to increase in the future, and reach more than twice the 2010 volume in 2050.</u>

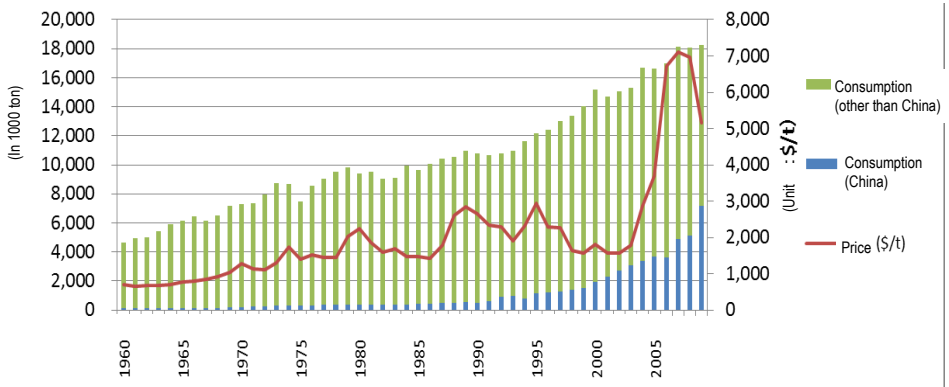
Calculated volume of terrestrial and underground resources of major metals (the % values are the terrestrial resource rates)



Note) For the terrestrial resources, the accumulative total of mined resources is shown and for the underground resources, the possible reserves shown.

Source: Statistics by National Institute for Material Science

Changes in the global consumption volume of copper (bare metal), and copper prices (in USD)



Source: World Metal Statistics for consumption of copper, LME Settlement for the price of copper

* The price of copper is the annual average actual price in the London Market.

Promotion of an international 3R cooperation and response to exports and imports of recyclable waste

○ **Promote in an integrated manner international 3R cooperation and overseas expansion of Japan's recycling industry with the objective of establishing sound material-cycle society in Asia, and implement measures to facilitate procedures for international transportation of recyclable waste in cases when such initiatives would contribute to environmental burden reduction and effective utilization of resources.**

Promotion of international 3R cooperation and overseas expansion of the recycling industry

☑ Advance sharing of information and consensus-building through the Regional 3R Forum in Asia, etc., in order to facilitate formation of sound material-cycle society in the Asian countries that have strong relations with Japan.

☑ Provide support for formulation of national 3R strategies and other policies, improve legal systems, dispatch experts, and expand acceptance of trainees in order to enable the establishment of waste and recycling systems tailored to the specifics of each Asian country.

☑ Provide support for the overseas expansion of Japan's recycling industry (waste and recycling) in order to contribute both to improving the waste disposal and recycling technologies of Asian countries and to the economic development of Japan.

☑ Proactively participate in the initiatives of UNEP and other international organizations, and apply the latest knowledge of Japan regarding 3R and waste disposal.

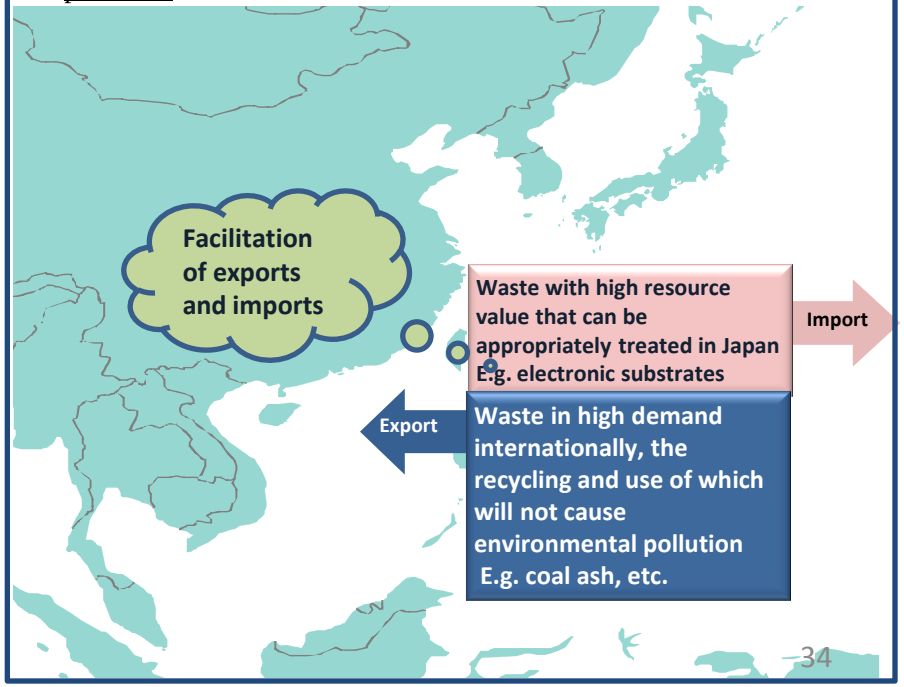
Regional 3R Forum in Asia

Response related to exports and imports of recyclable waste

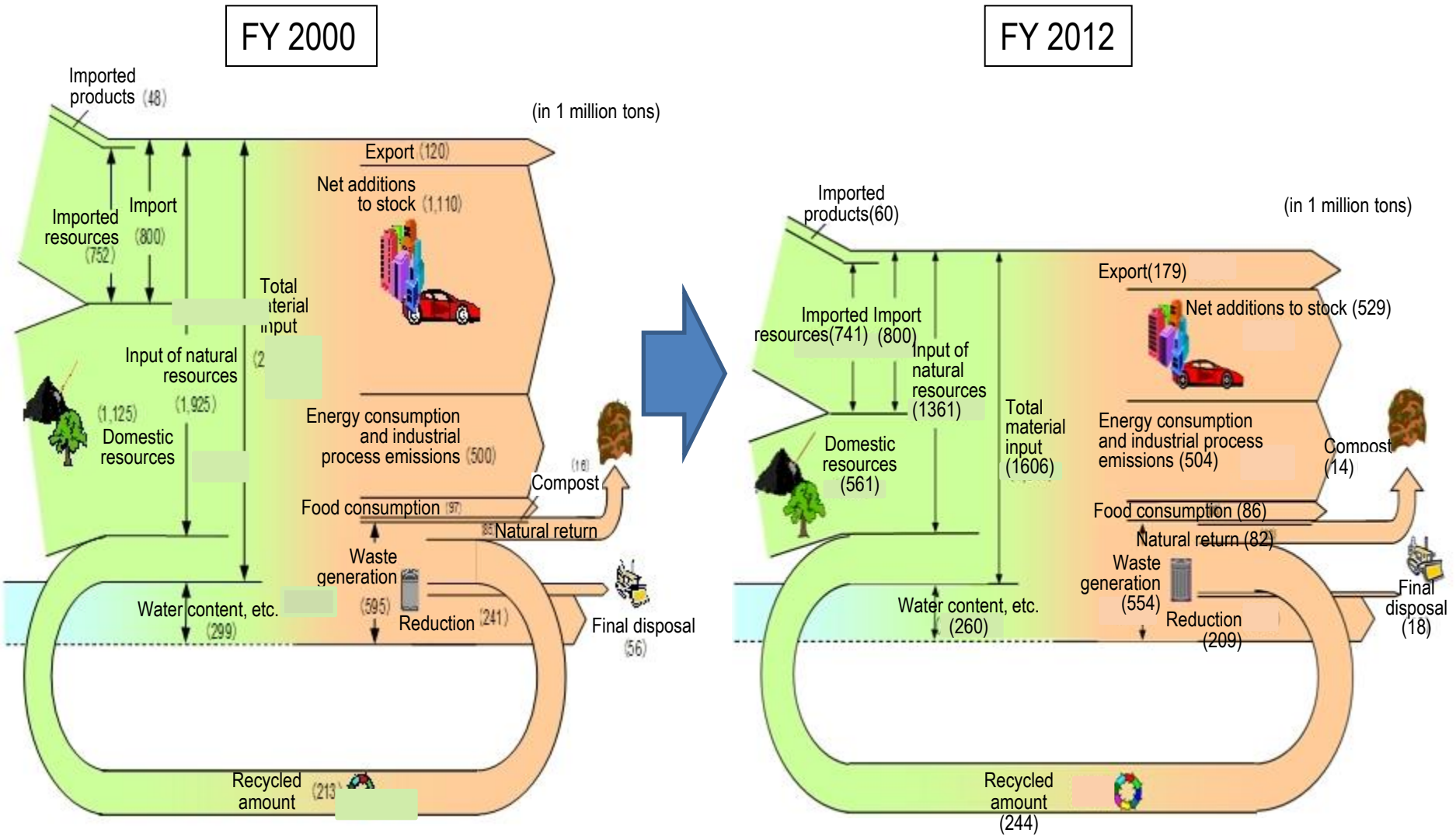
☑ Strengthen border control through enhancing cooperation among relevant countries and institutions in order to prevent environmental pollution due to international transportation of hazardous substances, etc.

☑ Accept, via the means of government institutions, waste, etc., that cannot be appropriately treated at developing countries but that Japan possesses the capacity to treat, and alleviate the negative impact on the environment and health at developing countries and effectively utilize such waste as resources.

☑ Facilitate export of recyclable waste that has only limited utilization domestically and meets the requirement to not cause environmental pollution.



Material flow in Japan



(Note) Water content: water contents of wastes (sludge, livestock's waste, night soil, waste acid, waste alkali) and sludge contingently dumped in the process of economic activities (sludge in mining, construction and in waterworks as well as slag)

Changes in major indexes

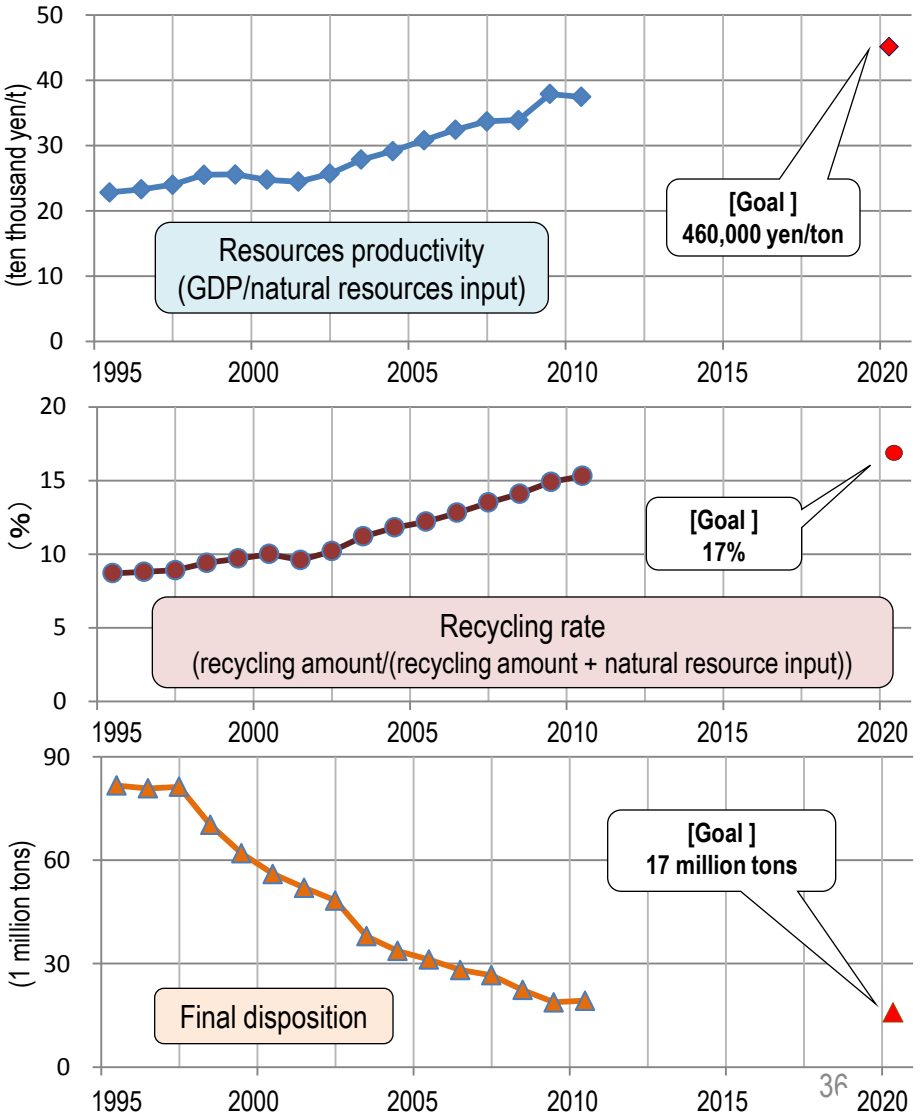
Progress of formulation of sound material-cycle society in Japan (recent 10 years)

		FY 2000	FY 2010	Increase-decrease rate
Resource productivity	☀	248,000 yen/ton	374,000 yen/ton	Approx. 50% up
Recycling ratio	☀	10.0%	15.3%	Approx. 50% up
Final disposition	☀	56 million ton	19 million ton	Approx. 70% down
Illegal dumping cases	☀	1,027	216	Approx. 80% down
Resource input of soil and stones (utilized amount)	☀	1100 million ton	500 million ton	Approx. 50% down
Resource input of materials (utilized amount)	☁	170 million ton	170 million ton	No change
Generated waste (recycled)	☁	590 million ton	570 million ton	No change
Recycled amount	☀	210 million ton	250 million ton	Approx. 20% up
Exports of recycled resources (overseas)	☂	7.29 million ton	25.16 million ton	Approx. 250% up
Amount of collected PET bottles classified by municipalities)	☀	0.12 million ton	0.3 million ton	Approx. 150% up
PET bottles sales amount	☁	0.53 million ton (*1)	0.59 million ton	Approx. 10% up
Used amount of returnable bottles	☂	2.75 million ton	1.25 million ton	Approx. 50% down

* 1 Values of FY 2005

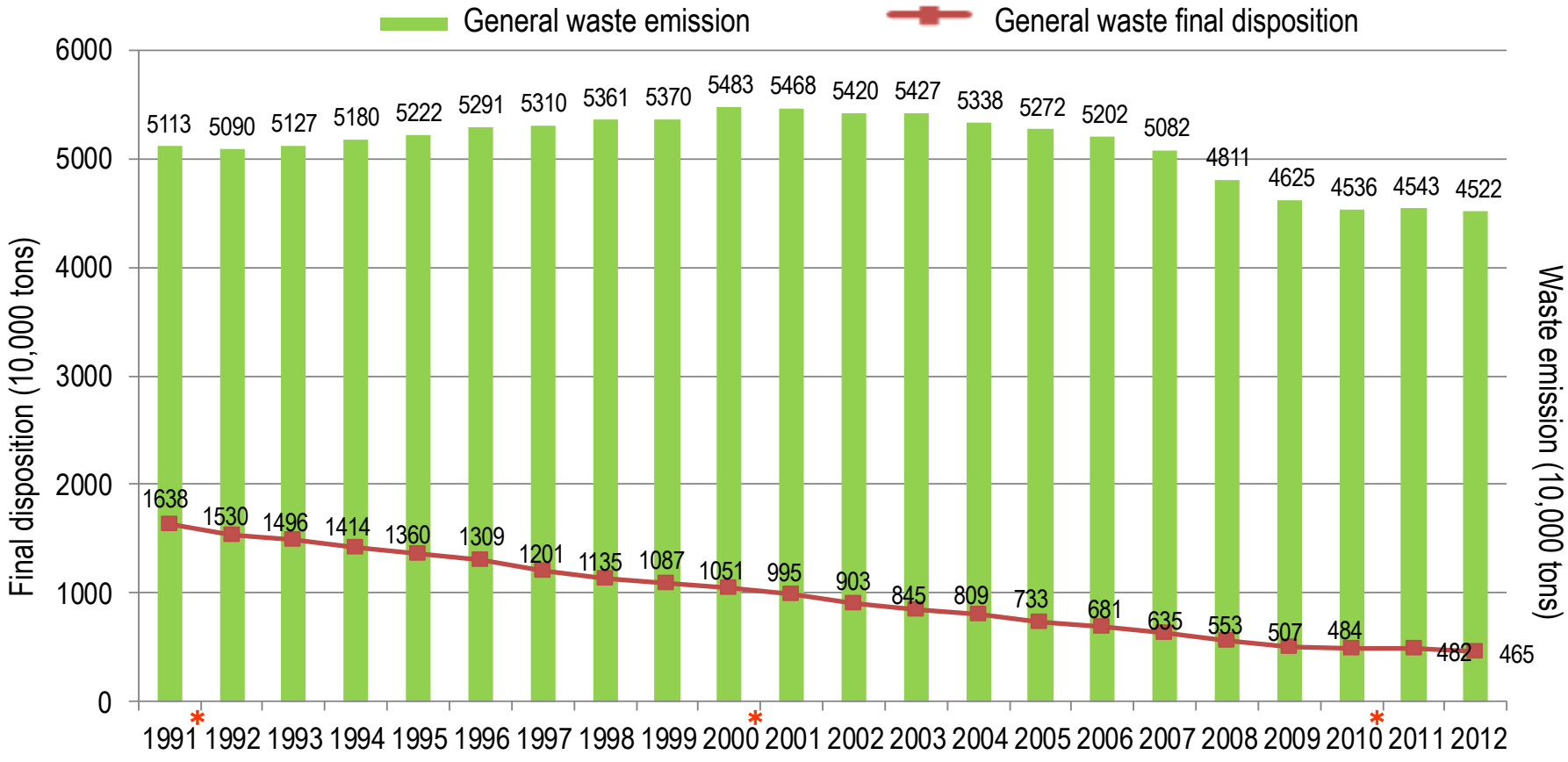
Source: Ministry of Environment (the data on sales of PET bottles is from the Council of PET Bottle Recycling, and the one for the consumption of returnable bottles from the Glass Bottle Recycling Promoter Association.)

Changes of indicators in the basic plan for sound material-cycle society, and goals of the third plan (draft)



Changes in general waste emission and in final disposition

The emission of general waste, after recording a peak of 548.3 million ton in 2010, continues to decrease. The amount of final disposition tends to decrease along with progress in recycling and reduction.

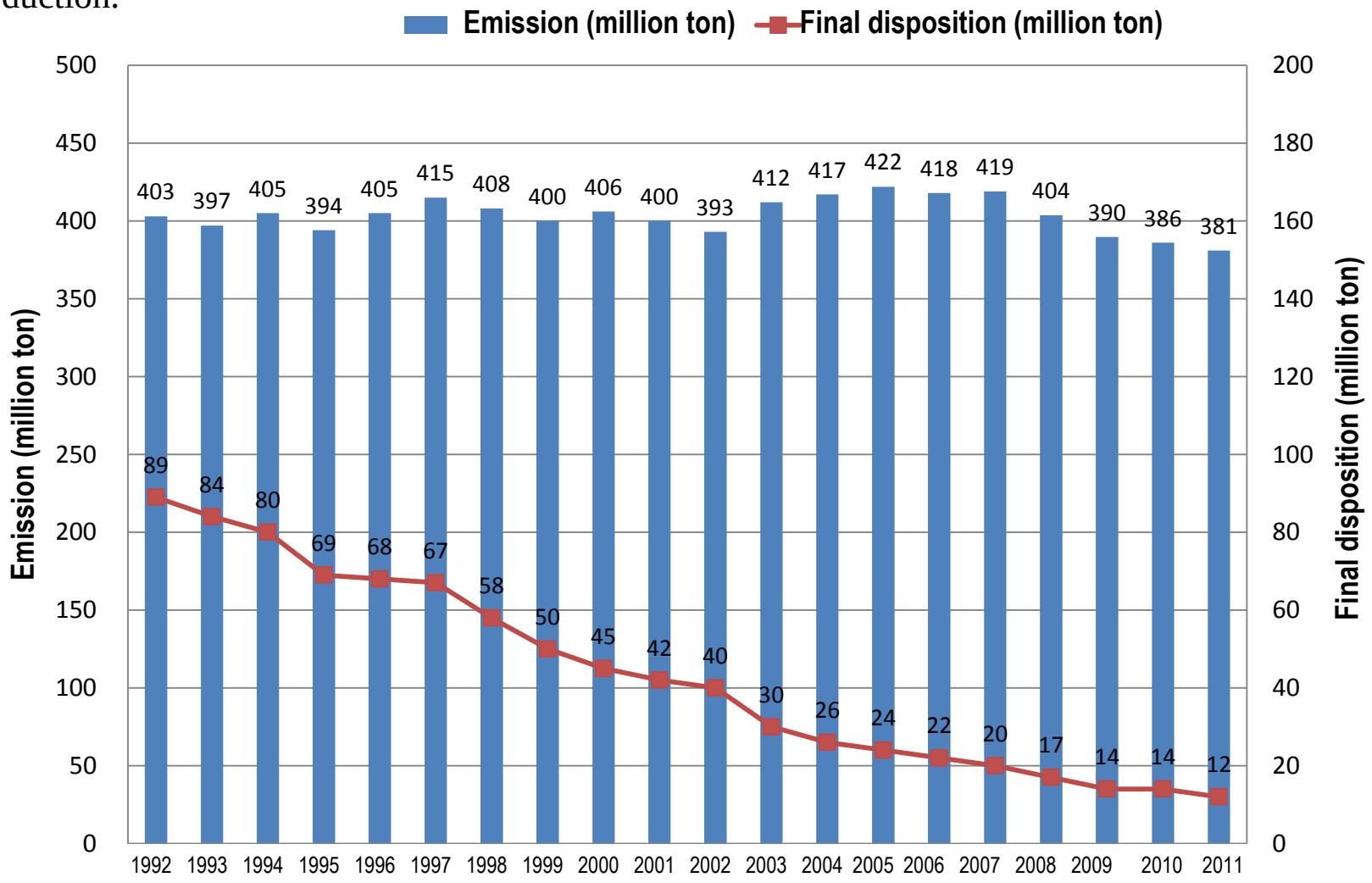


*** Waste emission per day per head (g/man–day)**

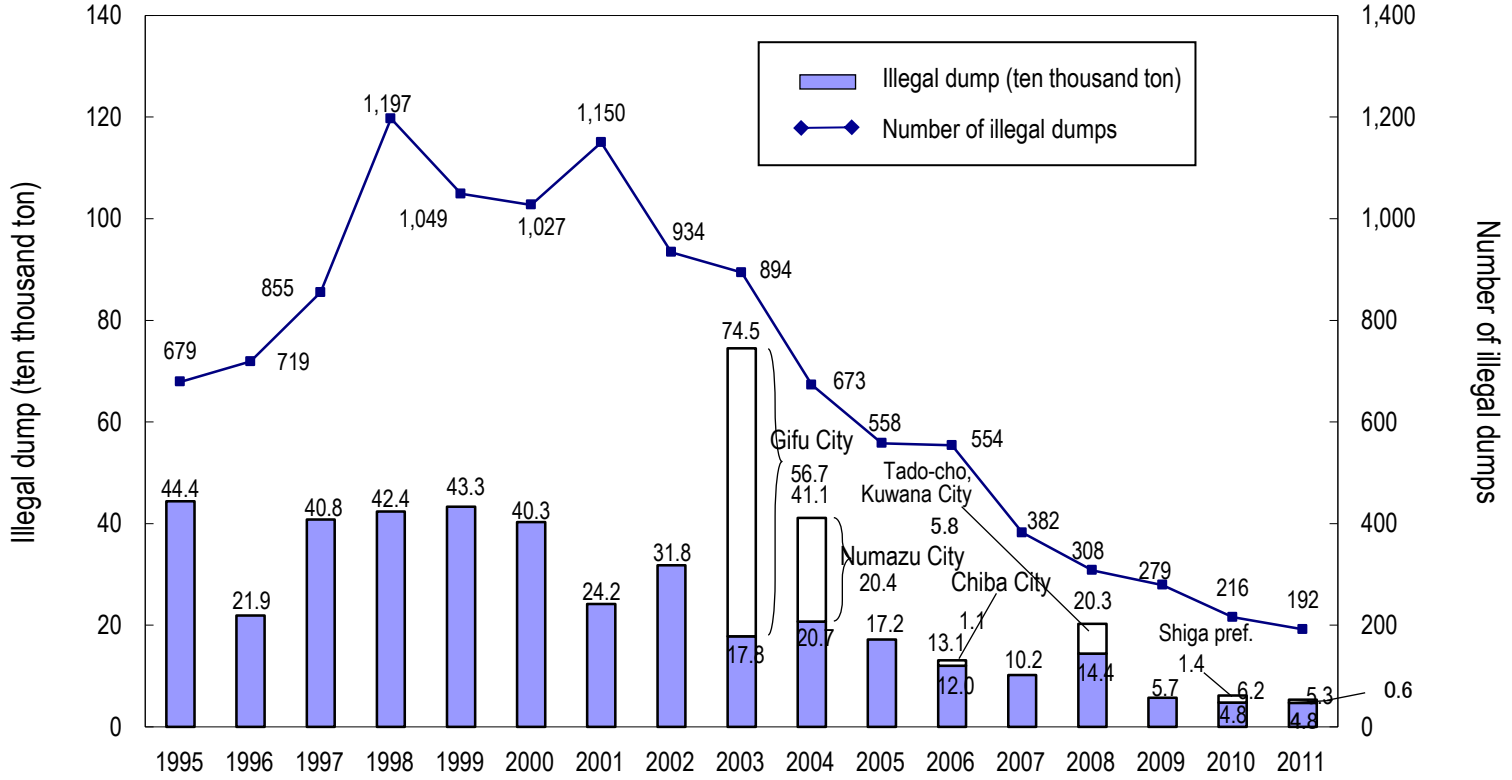
- 1991	**1,118**	**(g/man–day)**
- 2000	**1,185**	**(g/man–day)**
- 2010	**976**	**(g/man–day)**

Changes in industrial waste emission and in final disposition

The total emission of industrial waste in 2010 is 390 million tons, and since 1990, has almost no changes in this level. The final disposition also tends to decrease with progress in recycling and reduction.



Changes in illegal dumping cases and illegally dumped waste
(cases newly identified)



Note)

1. The number and amount of illegal industrial waste dumps, which are tallied by prefectures and government-designated cities, account cases of 10 tons or more (but includes all cases of dumps with special management industrial waste).
2. Of white bars in the graph above, those of Gifu city and Numazu city respectively were identified in 2003 and 2004. However, illegal dumping had been practiced for the preceding years, and in the years marked in the graph, was identified as significant cases.

   The white bar of Chiba prefecture is the one identified in 1998, and reported in 2006.

   The 2008 white bar of Kuwana City was identified in 2006 but reported in 2008.

   The 2010 white bar of Hino-cho, Shiga Prefecture was identified in 2009, but its reporting was made in 2010.

   The white bar of the year 2011 in the above graph includes one case identified in 2001 and 7 cases in 2010, but their report was made in 2011.
3. The survey does not include dump cases of sulfuric acid pitch and "ferrosilt" ; these are treated in a separate report.
   Since August, 2001, about 720, 000 tons of "ferrosilt" had been put in market, and used as backfilling material. This material "ferrosilt" was found to be mixed with hazardous waste liquids, constituting an illegal dump case of industrial waste. Illegal dumping was confirmed at 45 sites in 4 prefectures, and for 42 cases of them, removal has been completed (as of Feb.15, 2008).

* The amounts of dumps are rounded off to the fist decimal; therefore, there are some cases not to reach the exact totals.

International Cooperation towards Sound Material-Cycle Society

- The amount of global waste generation is increasing, with causing environmental pollution, as the economy and population continue to grow, all around the world, especially in Asia.
- It is estimated that the total waste generation in the world in 2050 will be more than double the amount in 2010.

⇒ Promotion of 3R and a waste management and recycling system in developing nations to take the lead in contributing to the establishment of a sound material-cycle society on a global scale

◆Bilateral Cooperation

Memorandum of Cooperation

・Memorandum on environmental cooperation including waste management between Japan and Indonesia, Japan and Vietnam, respectively. Expansion of cooperation with other countries are expected.

Support for Institutional Development

・ Support for developing laws, regulations, waste management plans, and guidelines, regarding 3R and waste management in Vietnam and other countries.

・ Training programs in Japan for capacity building of developing countries' officials (inviting about 40 trainees annually.)

*moreover, technical cooperation and other supports by JICA; collaboration on waste management between municipalities in developing countries and Japanese cities such as Kita-Kyushu City, Tokyo's 23 Wards, Osaka City, and others

◆Multilateral Cooperation

Regional 3R Forum in Asia and the Pacific

・Established in 2009 by Japan's initiative. Co-hosted by Ministry of the Environment Japan and UNCRD.

・Discuss 3R among participants comprising government representatives (incl. ministers) from more than thirty Asia-Pacific countries, international organizations, aid agencies, private sector and other stakeholders.

・The Sixth Forum was held in Malé, Maldives, in August 2015. State Minister of the Environment Ozato attended. (next meeting will be hosted by Australia)

Contribution to International Organizations

・Funding contribution to the UNEP International Resource Panel, and other contributions.

◆International Contribution through Japan's Advanced Technology

・Japanese waste management and recycling industries have established the advanced technologies in 3R and waste management, in order to meet social needs.

・To contribute to reduction of environmental burden and establishment of a sound material-cycle society on a global scale by introducing Japanese advanced technology to developing countries suffering from waste problems.

・Ministry of the Environment Japan promotes Japan's Advanced Technology overseas.

*The market of municipal solid waste in 8 major Asian countries (incl. China, India and Thailand) is estimated to reach 17 trillion yen in 2020

*3Rs: reduce, reuse, recycle.

Regional 3R Forum in Asia and the Pacific

Inaugural Meeting of Regional 3R Forum in Asia (November 2009, Tokyo)

Representatives from 15 Asian countries and 16 international organizations and experts on 3R/waste management took part in the Forum, and the Tokyo 3R Statement concerning Regional 3R Forum establishment in Asia was adopted.

It was agreed that under the Regional 3R Forum in Asia a promotion of high-level policy dialogues take place regarding on 3R issues, support on the implementation of 3R projects in Asian countries, sharing of useful information for 3R promotion purposes and networking amongst the stakeholders.

Oct 2008 （Vietnam）	**East Asia Summit Environment Ministers Meeting** Japan proposed the establishment of “Regional 3R Forum in Asia”
Nov 2009 （Tokyo）	**Inaugural Regional 3R Forum in Asia**
Oct 2010 （Malaysia）	**Second Regional 3R Forum in Asia** Theme: “Transitioning to Green Economy and Resource Efficient Society with the 3R”
Oct 2011 （Singapore）	**Third Regional 3R Forum in Asia** Theme: ”Technology transfer for promoting the 3Rs - Adaptation, Implementation, and Expansion of the appropriate technology - ”
Mar 2013 （Vietnam）	**Fourth Regional 3R Forum in Asia** Theme: “3Rs in the Context of Rio+20 Outcome - The Future We Want – ”
Feb 2014 （Indonesia）	**Fifth Regional 3R Forum in Asia and the Pacific** **Theme:** “Multilayer Partnerships and Coalition as the Basis for 3Rs Promotion in Asia and the Pacific” **Participants:** 33 Asian and Pacific Island Nations (including ministers), international institutions, representatives of NPO private-sector businesses, experts, more than 500 participated. ※Various community based 3R initiatives were discussed at a side event
2015 （Maldives）	**Sixth Regional 3R Forum in Asia and the Pacific scheduled**

Toyama Framework on Material Cycles（Outline）

- Adopted as the Communiqué Annex of “G7 Toyama Environment Ministers’ Meeting” from May 15 to May 16, 2016.
- Setting the goal “Common Vision” as G7 and taking a collaborative approach to ”Ambitious actions” concretely.
- Looking ahead to implementation of Sustainable Development Goals（SDGs）and the Paris Agreement, international framework, what should be called a world advanced case, indicated strong will tackling resource efficiency and the 3Rs with international collaboration.

G7 Common Vision to Enhance Resource Efficiency and Promote the 3Rs

- Our common goal is to realize a society which uses resources including stock resources efficiently and sustainably across the whole life cycle, by reducing the consumption of natural resources and promoting recycled materials and renewable resources so as to remain within the boundaries of the planet, respecting relevant concepts and approaches.
- Such a society not only provides solutions to waste and resource challenges, but also achieves a sustainable low-carbon society in harmony with nature that can create jobs, strengthen competitiveness and realize green growth.

Ambitious actions by G7 Members

Goal 1: Leading Domestic Policies for Resource Efficiency and the 3Rs

- Integrate and promote measures on resource efficiency and the 3Rs, climate change and extreme weather events, hazardous substances, disaster waste, natural environmental conservation in a holistic manner.
- In addition to regulatory measures, make use of measures such as promoting operators’ voluntary actions. Treat appropriately and recycle disaster waste and develope waste treatment facilities resilient to disasters
- Collaboration among diverse local actors (industrial and community symbiosis) in a region and consumer measures.

Concrete Example: Food Loss and Waste Affairs

Accelerate the efforts for minimization and effective and safe utilization of food loss and waste in line with the UN Sustainable Development Goals, such as developing a domestic or regional policy or plan.

Goal 2: Promote Global Resource Efficiency and the 3Rs

- Share with other countries our best practices/Best Available Technologies (BAT), and useful lessons through international cooperation such as the G7-Alliance.
- Assistance for developing countries to build the capacity needed for resource efficiency and resource circulation policies
- Assistance for country or regions that experience significant natural disasters
- Encourage proactive efforts of upstream industries for reuse and recycling, including the utilization of recyclable resources

Concrete Example: Management of E-Waste

- enhance international joint action in order to prevent illegal traffic.
- Recognize that export of hazardous waste, especially by countries without sound management capacity to countries with the capacity could make a positive contribution to the environment and to resource efficiency and circularity

Goal 3: Steady and Transparent Follow-Up Process

- Consider appropriate indicators at the domestic level
- Follow-up of the Framework, through workshops

Future Domestic Policy Development Based on the Framework（Whole）

Reflecting the next review of Fundamental Plan for Establishing a Sound Material-Cycle Society

Toward the realization of ”Toyama Framework on Material Cycles” agreed in the meeting, Reflect the next review of Fundamental Plan for Establishing a Sound Material-Cycle Society.

Note : The cabinet decision will be made in the spring of 2018.

Food Loss and Waste Management Measures

About 17.02 million tons of food waste is generated in one year in Japan. About 6.42 million tons of them are discarded even if it is still edible. It just fall into ”Mottainai” state.

Further promote efforts collaborated with the local government in the future, by implementing of model programs and Public awareness and transmission of good case including recycle of food waste, and by promoting grasp of actual conditions for food loss in the local government which have difficulty understanding it.

Disaster Waste Management Measures

Facilitate environmentally-sound disaster waste management to respond to the frequent occurrence and aggravation of natural disasters by developing waste treatment facilities resilient to disasters, and facilitating the utilization of the facilities as energy supply hubs. In Addition, Assist for disaster waste management measures in Asia - Pacific region.

Making International Transfer of Circular Resource Appropriate

About secondary resources, such as electronic scrap, generated in Japan and abroad , consider regulatory state in Basel law in the year 2016 and take necessary measures in its early stage based on the results in order to take a steady step towards recycling of nonferrous metals by taking advantage of innovativeness of environmental technology that Japan boasts to the world.

International Cooperation

Share good cases with G7,G20 and others through appropriate opportunities of international cooperation such as the G7-alliance on Resource Efficiency, Regional 3R Forum in Asia and the Pacific and bilateral cooperation. Actively participate in the international discussions about promotion of further efforts for next G7 Summit in Italy.