

Topic 5. Modern Trend of Waste Management

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1 Main Issues of Waste Management in Japan

Japan has been tackling waste management issues for a long time, with the principle aim of improving the sanitary living environment of the country's residents. During this process, various challenges were confronted and efforts have been exerted to overcome them, such as pollution problems.

These waste management challenges have become more pronounced with the high economic growth the country has experienced and include; illegal dumping; hazardous wastes such as mercury and PCBs which are contained in various products, and asbestos which has been widely used as a convenient construction material; dioxins which are generated from incineration facilities that play an important role in prolonging the lifespans of landfill sites and improving sanitary conditions; and disaster waste generated in large quantities when earthquakes or floods occur. Efforts are continuously being made to improve waste management systems by changing conventional insights.

It may be very useful for government officials and managers engaged in waste management in developing countries to learn about the continuous efforts of Japan in this sector in order to find ways to solve issues that they are currently facing or to prevent or control issues that may occur in the future.

Topic 5 will provide information about specific waste management issues that Japan is continuously working on and countermeasures that have been adopted to address them.

At the same time, this topic will introduce global trends and the efforts of Japan to deal with the global issue of marine plastic wastes which needs to be urgently addressed.

2 Illegal Dumping

In the management of waste, illegal dumping is a critical issue that is of concern to many countries around the world including developing countries. This section will introduce the necessary countermeasures together with the challenges of implementing them, by reviewing past cases of large-scale illegal dumping in Japan and the current status of illegal dumping countermeasures.

2.1 Cases in the Past

In managing waste, illegal dumping is strictly forbidden in Japan and the law prescribes penalties will be described in this section. However, in the process of industrial development, illegal dumping occurs repeatedly, and it is extremely difficult to discover and control it in a timely manner. The specific conditions of two cases of large-scale illegal waste dumping that occurred in Japan in the past are introduced hereafter, together with the challenges encountered, activities implemented, and other related information.

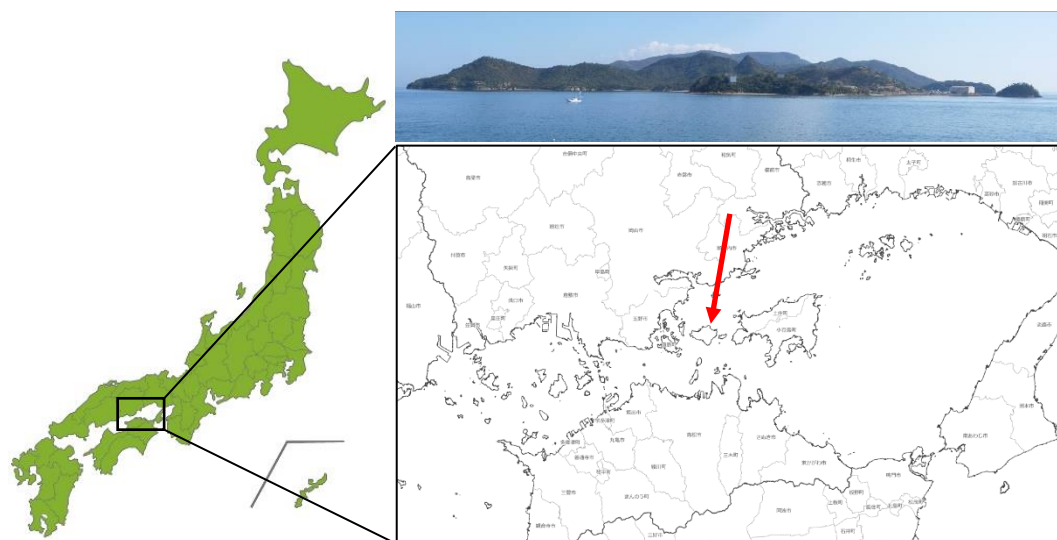
(1) Illegal Industrial Waste Dumping Case in Teshima, Kagawa Prefecture



The illegal dumping of industrial waste in Teshima, Kagawa Prefecture in the 1990s is one of the largest cases of illegal dumping that occurred in Japan.

Triggered by this case, responses to illegal dumping in Japan became stricter and government officials and citizens have since been cooperating to establish a system to prevent illegal dumping.

The Seto Inland Sea is one of the most representative closed water bodies in the world and is located in the southwestern part of Japan, surrounded by western Honshu, Shikoku, and Kyushu. Teshima island of Kagawa Prefecture is located in the northeastern part of the Seto Inland Sea and was once an island blessed with rich nature. The current population (as of 2021) is about 780 and depopulation is continuing. Teshima is mainly dependent on primary industries such as agriculture, forestry and fisheries, and is located somewhat away from the centers of secondary and tertiary industries.



Source: GSI “Geographical Survey Institute Map,” <https://maps.gsi.go.jp> (accessed January 20, 2022) (lower right of map)

Yachiyo Engineering Co., Ltd. (upper right of Photo)

Figure 5-1 Location of Teshima

Table 5-1 describes the background of illegal industrial waste dumping case in Teshima.

Table 5-1 Background of Illegal Industrial Waste Dumping Case in Teshima

Year	Kagawa Prefecture (Municipality)	Residents	Business Operator
1965			Began mass excavation of sand at Mizugaura, located in the northern part of Teshima.
1975		Campaign against the construction of a landfill for hazardous industrial waste.	Applied to the prefecture for a permit to engage in industrial waste treatment business handling hazardous industrial wastes, etc.
1977	The prefecture expressed its policy to permit the project implementation with conditions on the type and amount of industrial waste.	Filed a lawsuit demanding an injunction against the construction of the landfill.	Applied for a permit with a revised business description: “Vermicular (worm) farming using wood waste, food sludge, and other industrial wastes.”
1978	The prefecture permitted the industrial waste treatment business.		
1978 ~ 1989	During this period, the prefecture conducted on-site inspections, but failed to certify the waste types and failed to issue cautions and warnings to the business operator.	Residents began suffering from asthma and other health problems as a result of open burning of waste.	The business operator continued to bring in large quantities of shredder dust and industrial waste for burning in the field and other activities.
1990	After the police exposed the wrongdoing of the business operator, the prefecture conducted a fact-finding investigation and revoked the business license.		The business was exposed by the Hyogo Prefectural Police and effectively discontinued.

Year	Kagawa Prefecture (Municipality)	Residents	Business Operator
1993	The prefecture ordered the business operator to take measures to prevent environmental pollution based on the results of on-site inspections that had been conducted since 1992.	Based on the <i>Act on the Settlement of Environmental Pollution Disputes</i> , an application for arbitration was filed by 438 Teshima residents against the prefecture, business operator, and industrial waste generators.	Did not carry out the action order.
1994	The prefecture charged the business operator with violating the order. At the 4th meeting of the arbitration committee, a plan was presented to consider the removal of waste and other materials and the cost of environmental preservation.		
1995			Received a summary order from the court to pay a fine of JPY 500,000.
1996		Residents applied to the government for pollution arbitration.	
1997	The prefecture considered environmental preservation measures without making any changes to the current status of the waste at the disposal site, but based on the request of the arbitration committee and financial support from the government, the prefecture decided to base the decision on intermediate treatment such as melting, and an interim agreement was concluded with the residents.		
1999	The prefecture received the final report of the technical study committee established in response to the interim agreement, and the method of intermediate treatment was established. The prefecture proposed that the waste be treated on Naoshima Island.		
2000	The mayor of Naoshima Town expressed his acceptance, and the arbitration was concluded.		

From around 1965, a business operator who owned the land started to collect a large amount of earth and sand at Mizugaura, located in the northern part of Teshima, and in 1975 construction of an industrial hazardous waste disposal facility was planned on the site, however the residents organized a large opposition movement and the project came to a standstill.

The business operator applied for a business license stating they would “cultivate earthworms utilizing industrial waste of wood chips, food waste, etc.” and Kagawa Prefecture approved the business license in 1978.

However, the operator soon started to illegally dump industrial wastes not covered in the license in the site, such as waste oil, paper mill sludge, shredder dust, and ragger ropes and burn them in the open area. Due to this illegal disposal of industrial waste, local residents started to suffer from health hazards such as asthma. However, the Kagawa Prefecture government did not monitor the situation adequately and virtually left it unattended, resulting in increased environmental pollution and health hazards.

The Hyogo Prefectural Police cracked down on the company on suspicion of “illegal dumping of industrial waste under the false pretense of cultivating earthworms” in November 1990.

From November 1993, when the residents of the island filed for pollution arbitration, discussions were continuously held between Kagawa Prefecture and the residents under the mediation of the arbitration committee. Starting with a 150-day protest in front of the Kagawa Prefectural Government Office, the residents organized “grassroots activities” such as a protest caravan to Ginza, an upscale shopping area in Tokyo, round-table talks at 100 locations in Kagawa Prefecture seeking understanding and support, and others.

In July 1997, an interim agreement was reached between Kagawa Prefecture and the residents. After that, the Kagawa Prefectural Teshima Waste Treatment Technology Review Committee, which was established based on this agreement, discussed suitable technical methods for treating the waste in Teshima that was mixed with harmful substances, without incurring technical or environmental/safety problems.



Source: GSI “Geographical Survey Institute Map” <https://maps.gsi.go.jp>
(accessed January 20, 2022)

Figure 5-2 Location of Illegal Dumping Site

During the detailed discussion for constructing the treatment facility, various challenges, such as necessary site for locating the facility, securing operational resources of electricity/water/fuel, residences for laborers, and carry-in routes were identified and a decision was reached to negotiate with neighboring Naoshima Town located west of Teshima in order to address those challenges. In the interim agreement reached in 1997, the possibility of taking environmental preservation measures at the disposal site without changing the current situation of the waste was considered, but it was finally decided to adopt melting and other intermediate treatment methods as the basic approach in order to preserve the environment around the disposal site and resolve the problem as soon as possible. Naoshima Town put forward four conditions during the negotiations; (1) The intermediate treatment facility should not be a source of secondary pollution, (2) The facility should contribute to revitalization of Naoshima Town, (3) Measures should be taken to prevent harmful rumors and the like, and (4) Agreement of the townspeople of Naoshima Town should be secured. Furthermore, the local fishery cooperative expressed concerns about safety of ships navigation and the tarnishing of the brand of local fishery products due to harmful rumors and called for suitable responses to those concerns.

In response to those conditions, Kagawa Prefecture proceeded with detailed studies and proposed the construction of an intermediate treatment facility on the premises of a private company in Naoshima Town. The related people jointly and sincerely worked together to provide detailed explanations to local residents to obtain their understanding for the intermediate treatment facility construction and operation. As a result of these successful efforts, in March 2000 Naoshima Town accepted the proposal. Furthermore, in May of the same year the final terms of arbitration were

presented by the arbitration committee. Kagawa Prefecture confirmed that the terms met the conditions for providing the required waste treatment and management and made a comprehensive decision to accept the arbitration.

Based on this agreement, the work to restore the site to its original state started in 2000 with public funding and removal and treatment of the industrial waste was completed in July 2019. The total amount of waste treated was reportedly over 900,000 tons. Furthermore, regarding groundwater, the expert meeting held in July 2019 confirmed that the effluent standards were achieved in the entire landfill site.



Photo 5-1 Polluted Situation in Teshima



Photo 5-2 Campaign by the Residents

Source: Material for Teshima Residents' Council of Countermeasure for Waste Treatment (Photo 5-1 taken in 1990, Photo 5-2 taken in 1996)

While implementing the project of restoring the site to its original state (the restoration project), Kagawa Prefecture made ensuring safety and environmental conservation their top priorities in order to prevent harmful rumors and made efforts to gain the trust of the local fishery cooperative in Naoshima Town by holding periodical meetings. Furthermore, a fund was established to support any measures that may become necessary to deal with harmful rumors that would affect the livelihoods of fishermen and others, but the fund was not utilized because, fortunately there were no harmful rumors. In total the more than JPY 80 billion spent for the restoration project, was basically paid by Kagawa Prefecture under the financial support of the Ministry of the Environment. To prevent a recurrence of similar cases, Kagawa Prefecture established “the Kagawa Prefecture industrial waste illegal treatment prevention liaison council” composed of the prefecture, prefectural police, central government, municipalities, and others intending to strengthen the surveillance system for illegal dumping and others and has been conducting scheduled air surveillance activities, and information exchange between the relevant people. The prefecture has also engaged security companies to conduct patrols at night and during holidays, set up a “waste emergency call” system utilizing telephone message recorders and facsimile, and established an Environmental Management Office in the public health and welfare offices of four areas in Kagawa Prefecture to conduct on-site inspection for approved companies, respond to reports, and take other measures. Concerning surveillance of illegal dumping,

the prefecture has also called for cooperation from private organizations for the purpose of early detection of illegal dumping. Specifically, in 2004, an agreement with Shikoku Electric Power Co., Inc. to provide information on illegal dumping was concluded and similar agreements with four new private organizations were concluded in 2017. The commercial vehicles used for private organizations (about 5,400 vehicles in total) are affixed with the “Monitoring Illegal Dumping” stickers created by the prefecture and meetings with persons in charge of private organizations are held regularly to exchange information and encourage the provision of information on illegal dumping.

Through this case, Kagawa Prefecture learned the following lessons:

- The prefecture should take a firm stand on compliance with laws and regulations.
- The prefecture should prepare the necessary response emphasizing what is actually being done and not taking notices from the central government and others superficially.
- The prefecture should take a thorough hands-on approach.
- The prefecture should respond as an organization.
- The prefecture should work on prevention before occurrence, early detection, and early response to illegal dumping.
- The prefecture should promote the reduction of waste and increased recycling.

In order to put these lessons into practice, Kagawa Prefecture is ensuring that the prefectural personnel have sufficient knowledge and understanding of the Teshima case through opportunities of personnel training.

At the national level, taking the occurrence of this incident as an opportunity, the central government worked to strengthen both the legal system to control illegal dumping and partnership with persons concerned, as outlined in the countermeasures described in section 2.2.



**Photo 5-3 General View of Teshima
(November 2021)**



**Photo 5-4 Bird's Eye View of the Illegal
Dumping Site (November 2021)**



**Photo 5-5 Illegal Dumping Site
(November 2021)**



**Photo 5-6 Illegal Dumping Site
(November 2021)**

Source: Yachiyo Engineering Co., Ltd.

(2) Illegal Industrial Waste Dumping Case at the Border Between Aomori Prefecture and Iwate Prefecture

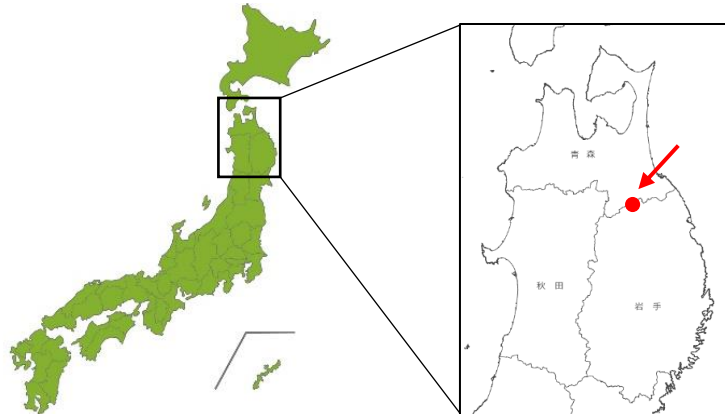
This case occurred at the border between Aomori Prefecture and Iwate Prefecture in the 1990s, during the same period as the illegal industrial waste dumping case in Teshima, Kagawa Prefecture. The illegal dumping site straddled the two prefectures, and both prefectures cooperated in conducting a joint investigation by their respective prefectural police departments. This is a case where two prefectures worked together in investigating the problem and cooperated in taking measures to resolve the issue.

In developing countries, there is the possibility similar situations may occur where illegal dumping sites is located between two or more administrative regions or authorities, and this case study may serve as a good reference. The history of this case provides important insights into how related officials and parties in two prefectural governments successfully collaborated to smoothly investigate and take necessary actions to remedy the situation.

In 1995, as the amount of waste continued to increase in Japan, there was an urgent need to develop countermeasures to mitigate against environmental problems such as dioxins, and at the time it was difficult to construct new treatment facilities. Under these circumstances, a large amount of 790,000 m³ of incinerated ash, sludge, waste oil, and other industrial waste was dumped illegally by multiple private companies on a vast 27-hectare land straddling Takko Town, Aomori Prefecture, and Ninohe City, Iwate Prefecture, in the Tohoku region. Most of the dumped industrial waste was transported from the capital area.

The case came to light when Ninohe Public Health Center conducted on-site inspection and collection of reports based on information provided by the Iwate prefecture's Agricultural Policy Planning Department. Illegal waste dumping was suspected and the results of investigation and surveillance activities conducted over a period of time were reported to the Iwate Prefectural Police. After that, based on information provided by residents and former employees, the Iwate and Aomori

Prefectural Police departments set up a joint investigation headquarters and conducted a compulsory investigation on suspicion of violating the *Waste Management Act*, which revealed the details of the illegal dumping and led to the arrest of the suspects involved in May 2000. The two private companies responsible for the illegal dumping were fined JPY 30 million in total with prison sentences and the companies closed. Since 2000, the two prefectures have successively issued orders to the polluters responsible for the illegal dumping to remove the waste. However, from 2002 the two prefectures decided to jointly conduct the waste removal by proxy since the polluters were not expected to take any major action in this regard. Furthermore, since 2001, the two prefectures conducted an investigation of the actual state of pollution, a monitoring survey for the surrounding environment, a soil investigation, as well as other surveys. In 2002, a joint study committee meeting was held by both prefectures with the attendance of others, where the policy to restore the site to its original state (site restoration) was discussed.



Source: GSI “Geographical Survey Institute Map” <https://maps.gsi.go.jp> (accessed January 20, 2022)

Figure 5-3 Location

In 2003, the “Council for Promotion of Measures for Prefecture Border Dumping Site Restoration to Original State” was established, which included representatives from the two prefectures, as well as academic experts and residents. The Council held repeated discussions and determined that the highest priority of the site restoration policy was the prevention of adverse environmental impacts on the Mabechi-gawa river system and the removal of all the waste and polluted soil.

In 2004, with the approval of the Minister of the Environment the council drew up the restoration site project execution plan, and the actual removal works commenced from December 2004.

Along with the removal work, the necessary measures for reutilizing the site after restoration were considered. The Council drew up the “Environmental regeneration plan for the illegal dumping site at the border between Aomori Prefecture and Iwate Prefecture” in 2010. The environmental regeneration plan aimed to pass on to the next generations the restored site as a valuable asset that had been realized through the restoration project, as well as the experiences gained from the project, and to convey a

strong message that such an illegal dump site should never be allowed to happen again. The restored site was planned to host nature regeneration projects such as trees planting and facilities where environmental education would be conducted for local residents.

In Aomori Prefecture, waste and polluted soil were all removed on December 19, 2013. It was decided that the polluted groundwater that would remain at the site after completion of the waste removal would be actively pumped and treated and that the site restoration project would be completed by 2022.



Photo 5-7 Overview of Illegal Dumping (2000)



Photo 5-8 Situation of Illegal Dumping (2012)

Source: Labor Union of Iwate Prefecture Website “Representative Report’s Current situation of illegal dumping of industrial waste on the border between Iwate and Aomori prefectures”
<https://www.pref.aomori.lg.jp/soshiki/kankyo/hozen/archive-syashinkan.html> (accessed December 13, 2021)

2.2 Current Status of Measures

In Japan, various measures have been taken against illegal dumping, such as enactment of necessary laws, strengthening cooperation between the central government and municipalities, strengthening the surveillance system, improving the reporting system, and others and, as a result, the number of newly detected illegal dumping sites has greatly decreased compared with the respective numbers during the peak period of the late 1990s.

(1) Organization

In order to prevent illegal dumping, the Ministry of the Environment is actively engaged in strengthening surveillance activities in cooperation with prefectures and providing them with advice through dispatching specialists familiar with relevant laws, regulations, and others. The close cooperation between the Ministry of the Environment and the prefectures has made it possible to both prevent the emergence of large-scale illegal dumping sites through early detection and prevent their expansion through early response. In addition, the Ministry of the Environment has established a financial support system to cover the costs of measures taken by prefectures and municipalities to facilitate the conservation of the living environment caused by illegal dumping.

(2) Legal System

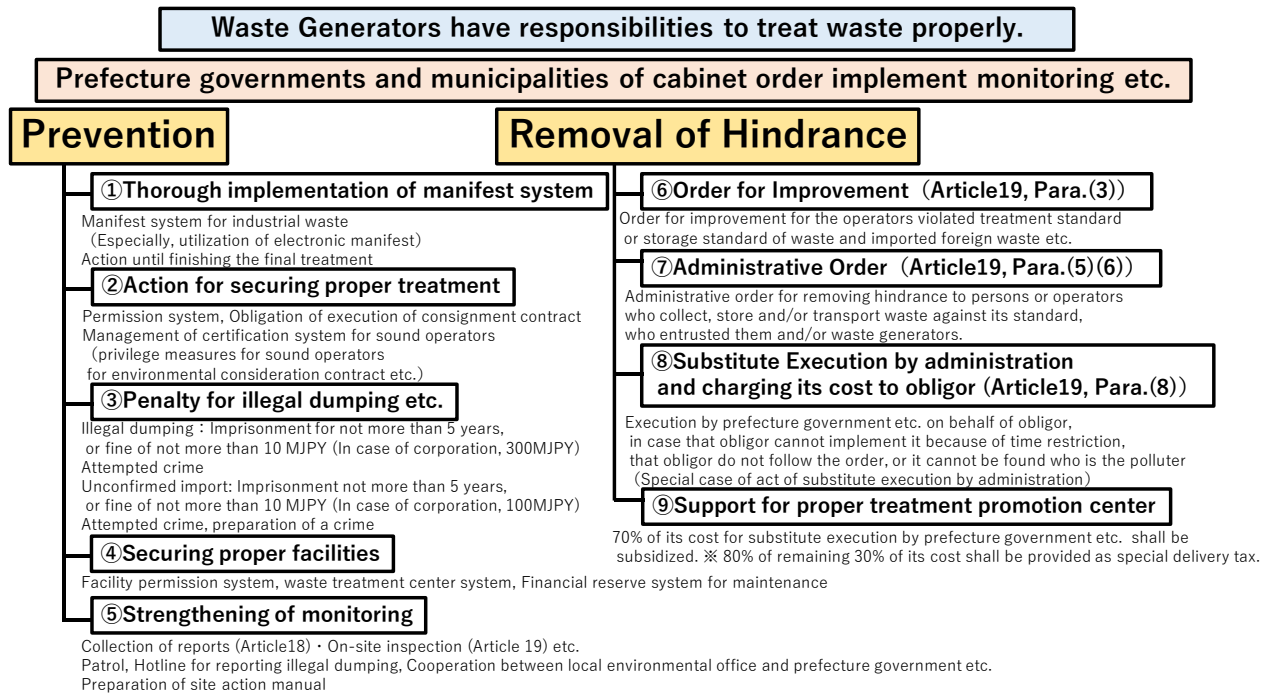
Revisions to the Waste Management Act were enacted in 1997 and 2000 to address the large-scale illegal dumping activities that grew in the 1990s, and introduce stronger measures to prohibit the inappropriate disposal of waste.

The details of the revisions to the act are discussed in this section in order to understand the legal system necessary to prevent illegal dumping.

The 1997 and 2000 revisions to the *Waste Management Act* have strengthened measures against improper disposal of industrial waste, while ensuring that waste generators are responsible for the proper disposal of their waste.

Specifically, it includes strengthening of the manifest system, strengthening of remedial action orders (expansion of eligible persons), strengthening of requirements for permission to establish waste management companies and facilities, strengthening of disqualification requirements, imposition of heavier penalties, and the establishment of a fund, in addition to others.

The system diagram of measures against illegal dumping cases in Japan is shown in Figure 5-4.



Source: Ministry of the Environment “Study Group Document on Prevention of Disasters Caused by Embankments (Response to Illegal Dumping Cases under the Waste Management and Public Cleansing Law)” (2021)

Figure 5-4 System Diagram against Illegal Dumping

When the *Waste Management Act* was enacted, the penalty for improper disposal (illegal dumping) was a fine of up to JPY 50,000. The penalties for illegal dumping have been strengthened as various cases of illegal dumping were discovered. Currently, the maximum term of imprisonment is five years, the maximum fine is JPY 10 million, both imprisonment and a fine may be imposed, and a fine of up to JPY 300 million may be imposed on a corporation if the violation is committed in the course of the corporation's business. In addition, the amendment to the law in 2003 made attempted illegal dumping also punishable (attempted illegal dumping), and the amendment to the law in 2004 made the collection or transport of waste for the purpose of illegal dumping also punishable (crime of preparing to commit an offense).

Table 5-2 shows the changes in penalties for illegal dumping.

Table 5-2 Changes in Penalties for Illegal Dumping

Penalties (Illegal Dumping) Revised Year	Penalties
1970 (<i>Waste Management Act</i> enacted)	A fine not exceeding JPY 50,000
1976	Up to 6 months imprisonment or a fine of up to JPY 300,000
1991	Up to 6 months imprisonment or a fine of up to JPY 500,000
1997	Up to 3 years imprisonment or a fine of up to JPY 10 million (JPY 100 million for corporations)
2000	Up to 5 years imprisonment or a fine of up to JPY 10 million (JPY 100 million for corporations)
2003	Attempted illegal dumping
2004	Penalties enhanced. Deliberate crime (imprisonment for not more than 3 years or a fine of not more than JPY 3 million) established.
2010	Tougher penalties. Maximum corporate fine increased to JPY 300 million.

Source: Japan Environmental Sanitation Center “Waste Technical Manager Training Course Textbook” (2019)

(3) Activities by the Central Government, Municipalities and Residents

At the national level, an annual survey of the status of inappropriate disposal cases of industrial waste is conducted and the results are published. Inter-municipal cooperation in waste management is expanding. Continuous monitoring and inter-municipal cooperation are essential for preventing illegal dumping.

In addition to the efforts described in “(1) Organization”, the Ministry of the Environment, with the cooperation of prefectures and municipalities annually investigates and publishes the status of newly detected illegal dumping sites nationwide, the number of illegal dumping cases as of the end of the fiscal year, and other related data with the aim of using this information as basic materials for policy formulation related to measures against illegal dumping of industrial waste.

Inter-municipal cooperation is also spreading as a countermeasure against illegal dumping of

industrial waste. For example, in November 2000, at the call of the Tokyo Metropolitan Government, the “Wide Area Liaison Council for the Prevention of Improper Disposal of Industrial Waste” (commonly referred to as “Industrial Waste Scrum 21”) was established. After that, 16 local governments joined, and now the council consists of 37 local governments in 12 prefectures (including Tokyo Metropolis) and 25 cities (ordinance-designated cities and core cities).

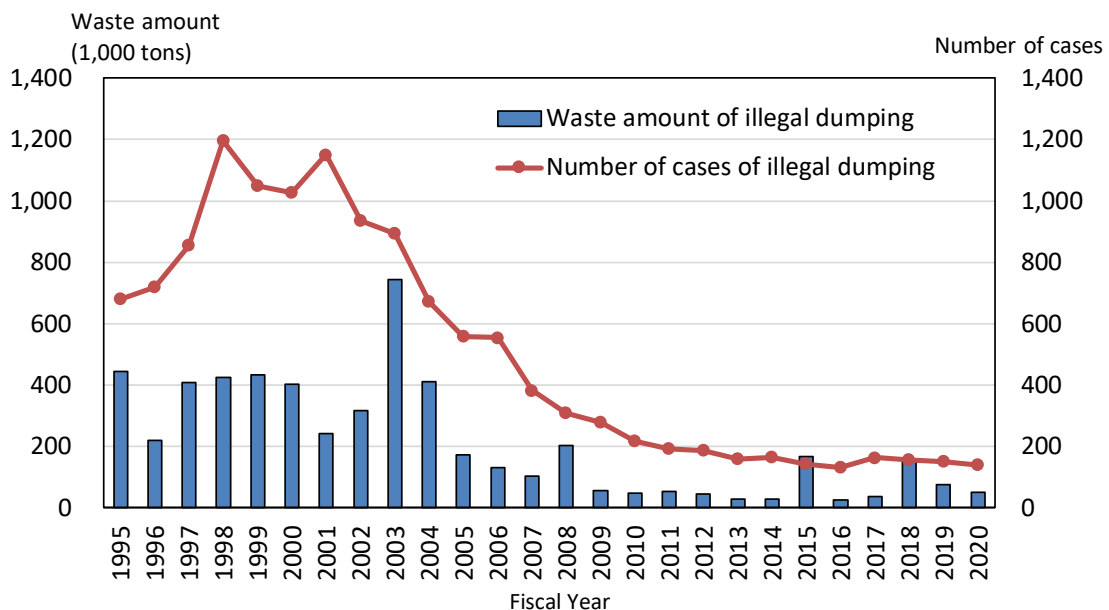
In addition, several local governments have established their own unique measures. Aomori Prefecture has setup a “Construction material waste reception completion report system”, Chiba Prefecture has setup a “night-time ban on carrying waste into and out of its disposal sites” and defined “clarification of the obligations of land owners, etc. related to illegal dumping”, and Niigata Prefecture has a “Monitoring by unmanned aerial vehicles (UAVs)”, Fukuoka Prefecture has “visualization of monitoring (mapping system)”, and Fukuoka City has “reward system for reporting illegal dumping”.

Residents are required to be aware that “illegal dumping is unacceptable” and to have sufficient concern to report any illegal dumping they may encounter to the police and local governments.

2.3 Challenges and Considerations for Taking Measures

Concerning illegal dumping, it is important to foster the social recognition that “illegal dumping is a crime” and continue to communicate related information to the public and businesses.

Figure 5-5 shows that the number of cases of illegal dumping of waste, especially industrial waste, is decreasing every year since 1998 when it reached its peak. Japan aims to eradicate illegal dumping by properly and continuously employing various measures, as described above against illegal dumping.



Source: Ministry of the Environment “Survey results of illegal dumping, etc. (FY2020)” (2022)

Figure 5-5 Transition of Number and Amount of Newly Discovered Cases of Illegal dumping

In situations where the responsible party for illegal disposal, the polluter is not in a position to remove the illegal waste dumped and restore the site, then the related prefectural government will by proxy, either directly, or engage a third party to, remove the waste and restore the site. The costs for waste removal and restoration should be borne by the polluter. However, when it is difficult to force the polluter to cover the costs for any reason, then the related prefecture can obtain financial support from a fund established jointly by the government and industries. But unfortunately, in recent years there has been a growing challenge to maintain the fund as the share shouldered by the industries has been annually decreasing.

With regard to this, the study group meeting in 2020 adopted a policy to expand cooperation from the industry sector, and currently support is being sought from various enterprises and organizations.

Concerning illegal dumping, it is important is to foster social recognition that illegal dumping is a crime, and to continue communication of related information to the public and businesses. In the past there have been cases of illegal dumping where early detection prevented them from expanding, and therefore it is essential for local governments to collect information on illegal dumping cases and act firmly and swiftly in cooperation with the police against pernicious operators.

Fostering consciousness about beautifying towns among people, business operators, and administrations is important to avoid having an unclean city where “waste attracts waste”. In that respect, it is necessary to continue activities such as cleanup events and the like, and encourage residents to participate.

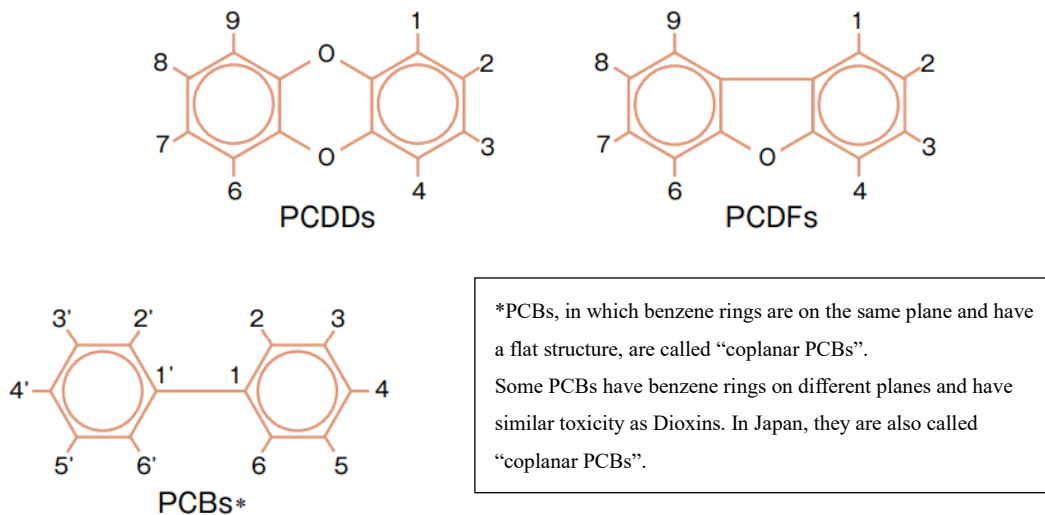
3 Dioxins Problem

Dioxins are substances that are unintentionally generated during the combustion of materials, and there are many types of facilities that may generate them. They hardly decompose in the environment and are likely to accumulate in an organism. There are many uncertainties about the extents of chronic toxicity in an organism. However, there are particular concerns on the effects of dioxins on the next generation including reproductive effects, and further research is necessary. With regard to waste management, concerns were raised in the past about dioxins emitted to the atmosphere during waste incineration and strenuous efforts have been exerted to develop the required technologies needed to solve this problem. This section presents the current status and issues related to the countermeasures against dioxins employed in Japan, countermeasures that will be required in the future, and matters to be considered when implementing the countermeasures.

3.1 What are Dioxins

Dioxins are generic term for Polychlorinated dibenzo-p-dioxins (PCDDs) and Polychlorinated dibenzofurans (PCDFs). Although the substances that show toxicity like dioxins such as coplanar-polychlorinated biphenyl (coplanar PCB) are called dioxin-like compounds, dioxins in this document refer not only to PCDDs and PCDFs but also coplanar PCB in accordance with the definition in *Act on Special Measures concerning Countermeasures against Dioxins* enacted in 1999.

Dioxins have basically a structure where two benzene rings are combined with oxygen and chlorine is attached there, as shown Figure 5-6. There are 75 types of PCDD, 135 types of PCDF, and dozens of types of coplanar PCB since the shape varies depending on the number of attached chlorine and where they are attached, and only 29 types of them are regarded as toxic.



Source: Brochure shared with related ministries “Dioxins” (2012)

Figure 5-6 Molecular Structure of Dioxins

3.2 Measures Taken against Dioxins in Japan

In Japan, there were reports about the effect of dioxins on the human body, and in 1999 the Dioxins Measures Promotion Basic Policy and the *Act on Special Measures concerning Countermeasures against Dioxins* were established. As a result of implementing the measures defined in the policy and act, the environmental standards have been satisfied at most of the measurement points for atmosphere, water quality, and others.

In the 1970s, reports that dioxins were having an adverse effect on the environment were being seriously discussed worldwide, and damage reports were issued one after another. In Japan, emission of dioxins to the environment became notable from the 1960s to the 1980s and the main cause was considered to be the use of agricultural chemicals that contain highly concentrated dioxins (pentachlorophenol, chloronitrofen). The effect of dioxins on environmental contamination began to be widely reported by the media in 1980s, and various researches and investigations covering different topics including dioxins effects on the human body were conducted. In the 1990s, the effects of dioxins on breast milk and contamination of food including vegetables and other foodstuffs were reported, which led to prompt the need for urgent measures to be taken. During this period, although the usage of agricultural chemicals which were causing the emission of dioxins ceased, the emission of dioxins from operation of incinerators gradually became more conspicuous. For this reason, based on the Dioxins Measures Promotion Basic Policy and the *Act on Special Measures concerning Countermeasures against Dioxins* formulated in 1999 with the aim of preventing environmental pollution caused by dioxins, the central government, municipalities, business operators, and citizens worked to implement various pollution prevention measures. As a result, the total amount of emission of dioxins to the environment was reduced by 90% at the end of 2002 compared with 1997. With regard to atmosphere, water quality, and others, the environmental concentration steadily decreased and the environmental standards have been satisfied at most of the measurement points. Furthermore, with regard to sediments and soil, pollution control measures and others are currently implemented individually for each identified contaminated location.

3.3 Current Status of Measures

(1) Organization

The central government agency responsible for enforcing the *Act on Special Measures concerning Countermeasures against Dioxins* is the Ministry of the Environment, and the ministry's structure is stipulated in the Order for Organization of Ministry of the Environment. The "Environmental Management Bureau" of the ministry is mainly responsible for enforcing that act.

Furthermore, each municipality conducts periodical measurements of dioxins in the air. As an

example, for Tokyo the “Environmental Improvement Division” and the “Natural Environment Division” in the Bureau of Environment are in charge of air monitoring, and the monitoring results are publicized in their web site.

(2) Legal System

With regard to dioxins, the *Order for Enforcement of the Waste Management Act* was revised in 1997 and regulatory standards for gas emissions at waste incineration plants were established. Furthermore, the *Act on Special Measures concerning Countermeasures against Dioxins* was established in July 12, 1999, and based on which regulations for gas emissions as well as those for wastewater, soot and dust, incinerated ash, and others at waste incineration plants began to be applied. Furthermore, “the Dioxins Measures Promotion Basic Policy” was formulated at the meeting of cabinet members in charge of dioxins measures held on March 30, 1999 (and revised on September 28, 1999), and the entire government has been deeply committed to both implementing and facilitating implementation of various measures for drastically lowering the emission amounts of dioxins.

The environmental standards concerning air pollution, water pollution, and soil pollution were stipulated in the Ministry of the Environment Notification No. 68 in December 1999 and were applied from January 2000. Table 5-3 shows the outline of the environmental standards.

Table 5-3 Outline of Environmental Standards

Medium	Standard value	Measuring method
Air	0.6pg-TEQ/m ³ or less	Method of measuring a sample collected with the air sampler where the sampling tube with attached polyurethane foam is attached to the subsequent part of the filter paper with high-resolution gas chromatography-mass spectrometer
Water quality	1pg-TEQ/L or less	Method specified in Japanese Industrial Standard K0312
Sediment at the bottom of water	150pg-TEQ/g or less	Method of measuring the dioxins in the sediment at the bottom of water obtained by the Soxhlet extraction method with high-resolution gas chromatography-mass spectrometer
Soil	1,000pg-TEQ/g or less	Method of measuring dioxins in the soil obtained by the Soxhlet extraction method with high-resolution gas chromatography-mass spectrometer

Source: Ministry of the Environment “The environmental standards related to air pollution, water pollution (including pollution of bottom material of bottom of water), and soil pollution” ((Notified in 1999, amended in 2009))

(3) Activities by the Central Government and Municipalities

In Japan the “Plan for reducing the amount of dioxins emitted in relation with business activities in Japan” was formulated and is under implementation. The first plan was formulated in September 2000, followed by the second plan in June 2005, and the third plan in August 2012. Based on these plans long-term efforts are being taken to reduce risks of dioxins considering their characteristic such as low

degradability and accumulating property.

The second plan also reflected the contents of the “Stockholm Convention on Persistent Organic Pollutants” that became effective in May 2004.

The reduction target set in the first plan was 90% by the end of 2002 compared with 1997, but an actual reduction of 95% was achieved. Similarly, the reduction target set in the second plan of 15% by 2010, compared with 2003 was surpassed by the achieved reduction rate of 59%. This was achieved through the serious efforts jointly made by the private and public sectors. It should be noted that in the third plan, the target amount was set but the target year was not specified.

Furthermore, guidelines for emission reduction measures for dioxins related with waste treatment were drawn up in 1990 and revised in 1997. Dioxins emitted from waste incineration plants are said to be generated by incomplete combustion and synthesized by catalytic action on the surface of dust when the gas temperature reaches about 300°C in flue gas treatment facilities. For this reason, the guidelines call for the following measures to be taken at incineration facilities to ensure proper combustion management: (1) ensure continuous operation of the facility for as long as possible, (2) maintain the combustion temperature at 800°C or higher (850°C or higher is desirable), (3) install gas cooling facilities, exhaust gas treatment facilities and devices, etc. Based on these guidelines, each municipality is considering utilization and expansion of inter-municipal facilities in waste treatment, and installing and operating full continuous type incineration plants that meet the criteria of the guidelines.

3.4 Challenges and Considerations for Taking Measures

Dioxins require long-term risk management, and it is important for all the parties concerned to continue to work together and take the necessary countermeasures.

Research on the health effects of dioxins has progressed and, at present there are concerns about the possible effects on reproduction, the brain, and the immune system even at minute amounts, rather than carcinogenicity and lethal toxicity that were major problems in the past. Since such effects are considered to be most dangerous for fetuses, infants, and toddlers, their exposure to dioxins may have a bad effect on the next generation. Furthermore, it is necessary to continue paying close attention to effects by similar compounds such as brominated dioxins and the risk for people who eat a lot of fish. The World Health Organization (WHO) recently started a review of toxicity equivalency factor, and it is possible that in the future they will start a review of the tolerable daily intake. For this reason, it is necessary to take a long-term approach regarding issues related to dioxins, such as paying close attention to trends in domestic and international risk assessments and taking proactive measures based on those trends.

Although the amount of emission of dioxins has been drastically reduced, since dioxins are

substances that are unintentionally generated during the combustion of materials, there is a possibility that unidentified generation sources or new generation sources will be discovered in the future. For this reason, related parties in Japan are steadily implementing current countermeasures, such as monitoring the source of emissions, grasping the total amount of emissions, monitoring the state of environmental contamination, thoroughly implementing countermeasures at high-concentration contaminated points, and smoothly dismantling obsolete incinerators. Emissions need to be managed over the long term so that at least current emissions levels are not exceeded. Additionally, it is necessary to proactively develop pollution prevention measures in future through the progress of scientific knowledge and reflection of that progress in countermeasures while observing the latest trends in risk assessment such as efforts for reviewing the tolerable daily intake.

As mentioned earlier, with regard to issues of dioxins, long-term risk management is necessary and it is required that the central government, municipalities, business operators, and citizens should continue to jointly take measures against dioxins pollution.

4 Hazardous Waste

Waste generated by industries, businesses, and our daily life contains hazardous waste that is difficult to treat. For the purpose of this section, mercury, PCB, and asbestos have been selected as major hazardous wastes to be discussed; an overview of their properties and toxicity is presented, together with current countermeasures in Japan, and past cases of pollution caused by these wastes. Through the description of actual cases, the necessary measures and the challenges for their implementation are also introduced.

4.1 Mercury

Mercury has an effect on living organisms, which is a disorder due to “corrosive action of inorganic mercury compounds” and “uptake of methyl mercury”. Minamata disease is widely known as the most famous disorder that has occurred in Japan from mercury pollution. Globally, research was conducted by the United Nations in 2000s and the Minamata Convention went into effect in 2017. Japan ratified this convention and is engaged in developing and applying the countermeasures.

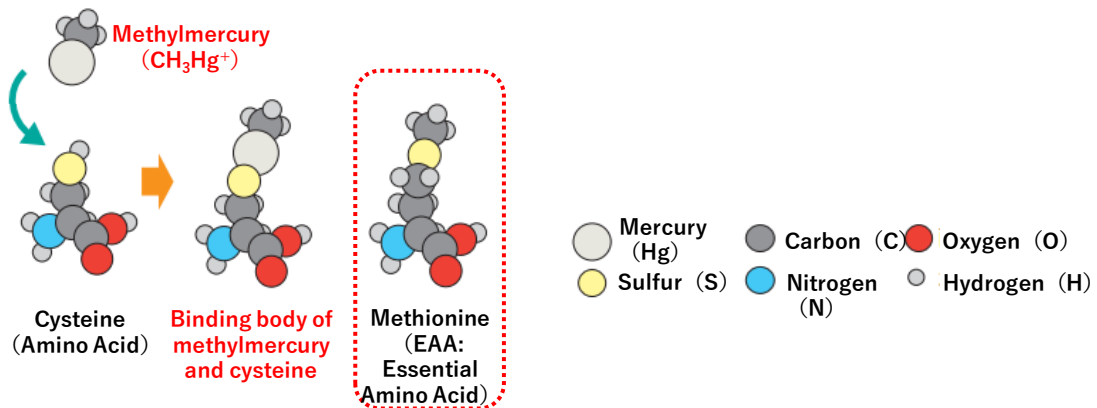
In addition to learning about the mechanisms by which mercury affects human bodies, the need for countermeasures and issues in their implementation will be presented in this section by learning about Minamata disease cases and countermeasures in Japan.

In Japan, "Guidelines for Mercury Waste" have been established to explain the considerations on the handling of mercury waste, and its collection, transportation, and disposal.

Mercury is the only metallic element that is liquid under both normal temperature and pressure, and as shown in Figure 5-7, mercury in the environment can be largely divided into 3 chemical forms; metallic mercury, inorganic mercury compound, and organic mercury compound (mainly methyl mercury).

Mercury is believed to affect living organisms mainly through two mechanisms. One is the corrosive action of inorganic mercury compounds. This is caused by the mercury ions of inorganic mercury compound, which have an effect of inflaming cells when they come in contact with either the inner or outer surfaces of living organisms. Therefore, if taken orally, they cause disorders in the kidneys.

The second mechanism is the disorder caused by an uptake of methyl mercury, which caused the Minamata disease. Methyl mercury combines with “cysteine”, which is amino acid, and a highly toxic combined-body is generated. Since the structure of this combined-body is similar to that of “methionine”, which is a necessary amino acid, it is synthesized as partial protein in the body’s process for absorbing and transporting necessary amino acids, and inhibits the normal functions of the protein.



Source: Ministry of the Environment “A wonder story of Mercury (version 2)” (2021)

Figure 5-7 Conjugating of Methylmercury and Cysteine

Regarding exposure to mercury, in addition to its chemical form, the amount taken into the body and how it is absorbed and metabolized are important.

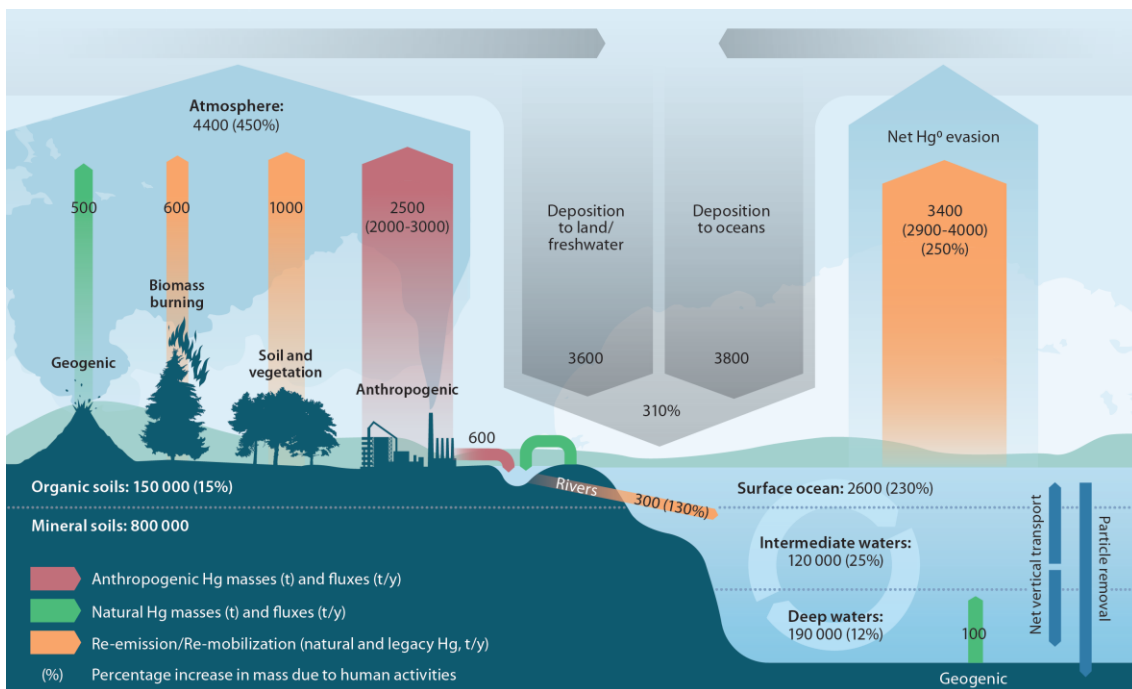
Metallic mercury exerts little action on organisms, and, if accidentally swallowed, it is considered not to cause serious effect because it is usually excreted as is, with little absorption from the digestive tract. However, if it becomes mercury vapor, it is absorbed in higher efficiency than the gas exchange function of the lungs and circulates in the body carried by the blood stream. Furthermore, it passes through the protective barrier, referred to as the blood-brain barrier and reaches the central nerve including the brain. After entering the brain, if metallic mercury becomes mercury ions by the metabolism of the organism, expression of the disorder occurs according to each region due to the corrosive action of inorganic mercury compounds mentioned earlier.

Methyl mercury is mainly taken orally from food and is absorbed at a high efficiency through the digestive tract. Although methyl mercury is also gradually oxidized and excreted, since part of it is mistaken for amino acid and transported and creeps into protein, a disorder due to mercury occurs according to each region and the level of denaturalization.

With regard to inorganic mercury compounds, since the toxicity is different depending on their chemical stability, the action on organisms is also different. Since mercuric sulfide is low in aqueous solubility and is the safest chemical form of mercury, stabilizing treatment into sulfureting mercury in advance might be required in the final disposal of waste mercury. When inorganic mercury compounds are discharged into the aquatic environment, they may be methylated by bacterial metabolism under anaerobic conditions to form methylmercury, which is highly toxic. Special attention should be paid to the disposal of wastes containing mercury, even inorganic mercury compounds, because high concentrations may accumulate in large fish through the food chain in the natural world.

With regard to global action, the United Nations Environment Programme (UNEP) started research activities concerning global mercury pollution in 2001 and issued the report titled “Global Mercury

Assessment” in 2002 summarizing the effects on people and the contamination status. The report was then revised several times and the 2018 version is the latest revision (as of 2021). The actual state of global mercury cycle described in this report is shown in Figure 5-8. The report states that it is crucial to reduce artificial discharge of mercury to reduce the amount of mercury circulating in the environment in the future.



Source: UNEP “Global Mercury Assessment 2018” (2018)

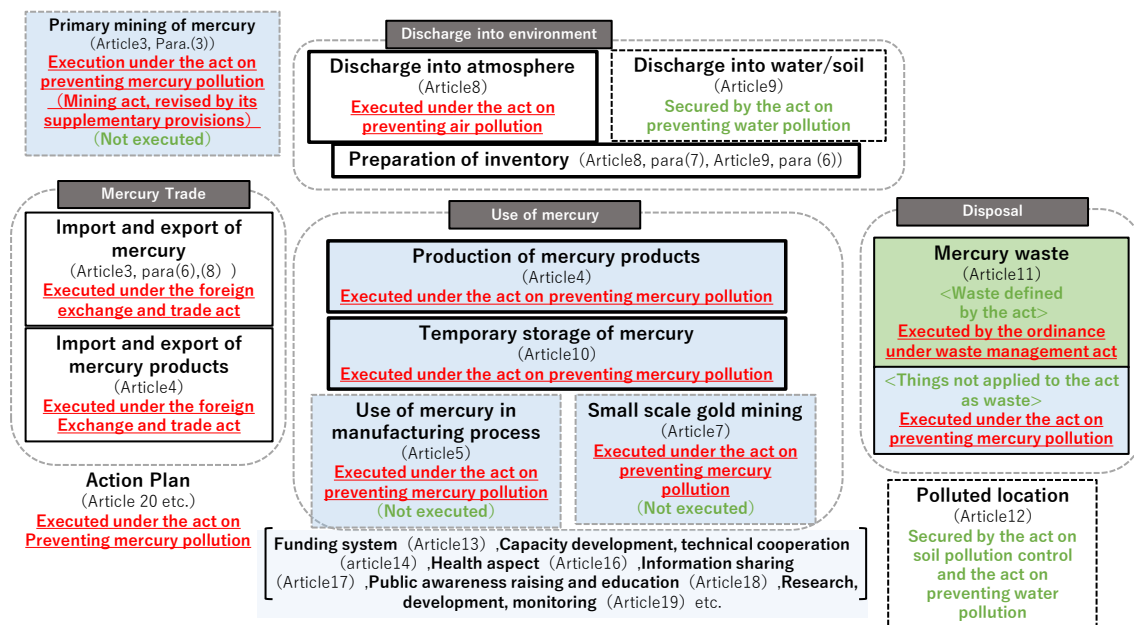
Figure 5-8 Global Circulation of Mercury

“The Minamata Convention on Mercury” (hereinafter referred to as “Minamata Convention”), which was adopted at the diplomatic conference in October 2013 and is influenced by the aforementioned UNEP report, aims to recognize mercury, which has potential for long-range environmental transport, circularity/persistency in the environment, and bio-accumulation potential, as a chemical substance that causes a global concern for the protection of health and environment of people from artificial discharge and emission of mercury. Table 5-4 shows the chronology until Minamata Convention went into effect, and Figure 5-9 shows the configuration of Minamata Convention and relation to collateral measures.

Table 5-4 Chronology until Minamata Convention Went into Effect

Period	Event
October 2013	“Diplomatic Conference for the Minamata Convention on Mercury” was held in Minamata, Kumamoto Prefecture. “Minamata Convention on Mercury” was adopted unanimously.
2015	Towards ratification of the convention, enactment of <i>Act on Preventing Environmental Pollution of Mercury (Mercury Pollution Prevention Act)</i> , revision of <i>Air Pollution Control Act</i> and Order for Enforcement of the Waste Management Act, etc.
February 2016	Japan ratified the convention.
May 2017	The number of signatory countries reached 50, which is a requirement for the convention to go into effect.
August 16, 2017	The convention went into effect.

Source: Ministry of the Environment “Revision of the Order for Enforcement of the *Waste Management Act* (for proper management of mercury waste)” (2017)



Source: Ministry of the Environment “Revision of the Order for Enforcement of the *Waste Management Act* (for proper management of mercury waste)” (2017)

Figure 5-9 Configuration of Minamata Convention and Relation to Collateral Measures

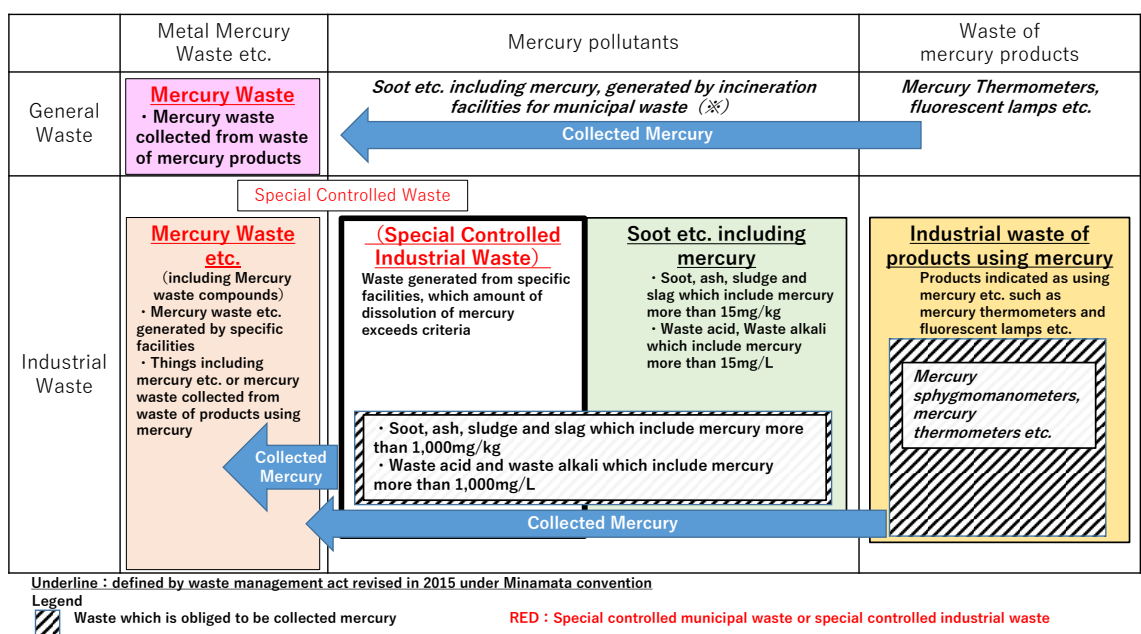
The Ministry of the Environment has drawn up guidelines for ensuring the appropriate treatment of mercury waste and the latest version as of now (year 2022) is the 3rd version published in March 2021. The background and the goals are extracted from the guidelines as below:

As an activity for achieving the goal of the convention, Minamata Convention Article 11 (mercury waste) requests signatory countries to take appropriate measures so that mercury waste should be managed in a way appropriate for the environment, and the Order for Enforcement of the Waste Management Act was revised based on the treatment of mercury waste appropriate for the

environment shown in “Mercury waste measures in future based on Minamata Convention on Mercury” submitted by the Central Environment Council in February 2015. The guidelines were created for the purpose of ensuring appropriate treatment for mercury waste by specifically describing new considerations for treatment, collection, transportation, disposal, or others of mercury waste based mainly on the revised order for enforcement.

Source: Ministry of the Environment “Guidelines for Mercury Waste, Version 3” (2021)

In addition, the classification of mercury waste in the guidelines is shown in Figure 5-10.



*: Soot discharged from incineration facilities for municipal waste with treatment capacity of more than 5 tons per day is regarded as “Special controlled municipal waste”.

Source: Ministry of the Environment “Guidelines for Mercury Waste” (2021)

Figure 5-10 Classification of Mercury Waste

Metallic mercury waste, etc.

Waste metallic mercury, etc. is waste that was originally mercury or chemical compounds of mercury, and is designated either as “waste mercury, etc.” under specially controlled industrial waste, or “waste mercury”, under specially controlled municipal waste. When disposing or recycling of “waste mercury”, or landfilling of “waste mercury, etc.”, the waste must be sulfurized and solidified as specified in the “Standards on solidification, etc. of waste containing metals, etc.” notified by the Environment Agency (currently the Ministry of the Environment). Furthermore, disposal of “waste mercury, etc.” and other treated materials are prohibited in landfills developed on reclaimed land in the sea, and if the result of the elution test, specified as assay method does not satisfy the landfill criteria described in Table 5-5, the waste must be disposed in a sealed-type landfill site. On the other

hand, if the criteria are satisfied, the waste can be disposed at a controlled final landfill site after taking additional measures, such as constructing a container structure where the waste is contained and rainwater entry is prevented from coming into contact with it.

Table 5-5 Landfill Criteria

Target	Contents
Alkyl mercury compound	Alkyl mercury compound is not detected
Mercury or chemical compound of mercury	0.005 mg or less of mercury per 1 liter

Source: Ministry of the Environment “Guidelines for Mercury Waste, Version 3” (2021)

Mercury-contaminated Matter

Mercury-contaminated matter is matter that was contaminated with mercury or chemical compounds of mercury and has become waste. Mercury-contaminated matter is defined in the guidelines as follows:

- Specially controlled industrial waste or specially controlled municipal waste
- Soot and dust, ash, sludge, waste acid, waste alkali, slag, paper waste, wood waste, waste textile, and others that contain mercury or chemical compounds of mercury
- Soot and dust, ash, sludge, waste acid, waste alkali, and slag that are industrial waste but are not specially controlled industrial waste and contain mercury or chemical compounds of mercury whose concentration is more than a certain value are regarded as “soot and dust and others that contain mercury”

When conducting disposal or recycling of “soot and dust and others that contain mercury”, it is required to take necessary measures in order to prevent scatter of mercury or chemical compounds of mercury. Furthermore, when conducting landfill disposal of “soot and dust and others that contain mercury” that are one of soot and dust, ash, or sludge and do not satisfy the landfill decision criteria, it is required to treat them in advance so that they satisfy the landfill criteria or conduct cement solidification in a specified method. If “soot and dust and others that contain mercury” or those that have been treated satisfy the landfill criteria, they can be disposed of at a controlled final landfill site.

Mercury-using-product Waste

Mercury-using-product waste is waste that was original a mercury-using product, for example, fluorescent tubes, mercury-containing dry cell batteries, mercury thermometers, etc. Manufacturers or importers of mercury-using products are obligated to make efforts to provide information such as notices about usage of mercury and others in mercury-using products they produce or import so that consumers can properly separate and discharge a mercury-using product when the product becomes waste. When disposing or recycling mercury-using-product industrial waste, it is required to take

necessary measures in order to prevent scatter of mercury or chemical compounds of mercury. Before disposing mercury-using-product industrial waste at the landfill, the waste should be treated, such as insolubilization. It is prohibited to dispose of mercury-using-product industrial waste at an inert landfill site.

In Japan, mercury waste from municipal solid waste became a problem in the early 1980s, and municipalities began to implement separate collection of dry cell batteries and fluorescent lamps. Many municipalities separate and collect mercury-containing wastes such as batteries and fluorescent lamps from other waste as noncombustible and hazardous wastes. After collecting the mercury-containing wastes, the mercury is recovered through inter-municipal treatment (through the inter-municipal treatment route designated by the government) or consignment to private companies by each municipality.

Column: Minamata Disease

Minamata disease is a toxic nervous disease that occurred among residents who routinely ate much seafood - such as fish, shrimps, crabs, and shellfish that absorbed methylmercury compounds discharged by a chemical factory producing acetaldehyde into the sea and rivers, directly from gills and the digestive tract or had them in the body accumulated with a high concentration through the food chain.

The disease occurred along the coast of Yatsushiro Sea centering on the surrounding area of Minamata Bay and was treated at first as a nervous disease of unknown cause. The first patient was reported in May 1956, and 52 patients were identified by the end of that year.

Furthermore, the patients with the same symptoms were identified along the Aganogawa river in Niigata Prefecture in May 1965, and 26 patients were identified in July 1965.

A variety of symptoms occur in patients of Minamata disease clinically, but the main symptoms are sensory disorder of the distal portion of the extremities, cerebellar ataxia, central ocular motility disorder, and central deafness. Furthermore, fetal Minamata disease has also been confirmed as a result of mothers being exposed to methylmercury during pregnancy.

Minamata disease is a typical byproduct of pollution where contaminated substances, which are generated incidentally by industrial activities that bring a life of affluence, eroded human bodies through the environment. The certification and compensation for patients of Minamata disease are being continued by the central government and the municipalities even now.

4.2 PCB

In Japan, although PCB was used for various uses in the past, at present orders were issued for discontinuing production, collection, and prohibition of importation. Collected PCB is treated by the Japan Environmental Storage & Safety Corporation (JESCO).

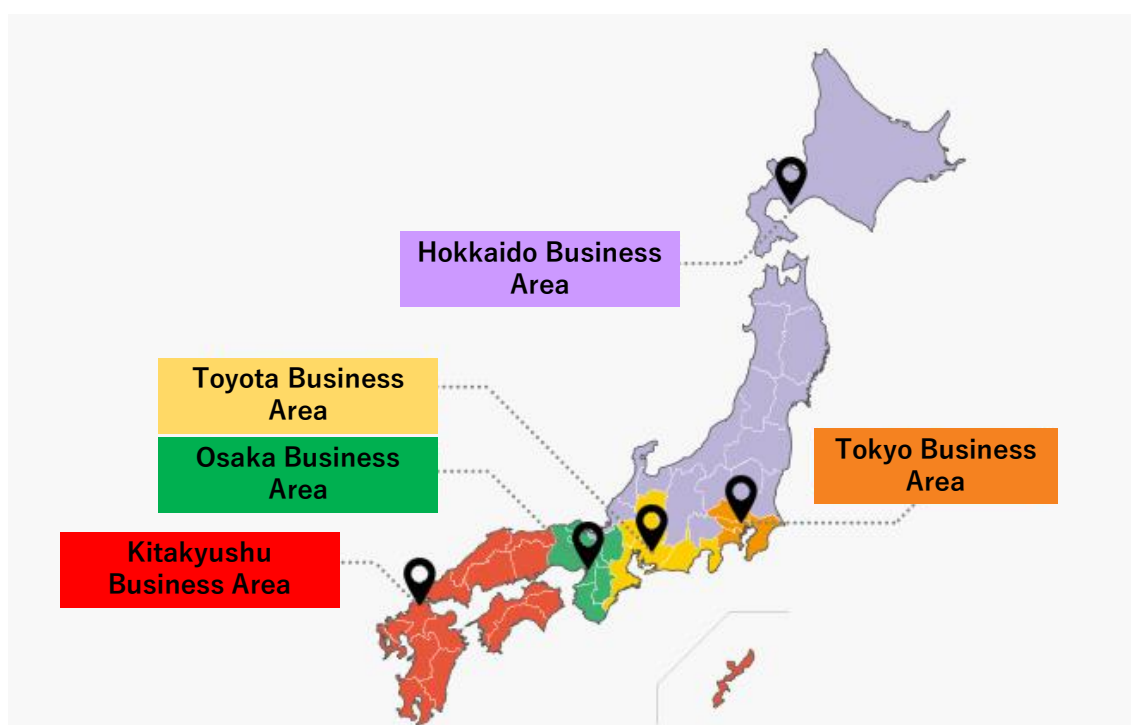
This section introduces the harmful characteristics of PCB and the measures taken against PCB in Japan to underline to developing countries the importance of taking similar measures.

PCB (Poly Chlorinated Biphenyl) is the abbreviation of poly chlorinated biphenyl and is a chemical substance made artificially. Since PCB has chemically stable characteristics such as difficulty to dissolve in water, high boiling point, difficulty to decompose by heat, incombustibility, and excellent electrical insulation, it was used for various purposes such as insulating oil for electric equipment used on daily basis, heat medium for heat exchanger, no-carbon paper, and others.

Typical electric equipment that used PCB included transformers, capacitors, and stabilizers. Transformers and capacitors containing PCB were used as equipment in such as old factories and buildings and stabilizers were used for fluorescent light component in old factories and schools amongst others.

Since PCB is easily dissolved in fat, it is reported that chronic intake results in gradual accumulation in the body and causes various symptoms. In the 1960s, PCB became a popular media topic triggered by the Kanemi Oil Poisoning Incident in 1968 (refer to the Column: Kanemi Oil Poisoning Incident) promoting the government to take countermeasures. Based on the administrative guidance issued by the Ministry of International Trade and Industry in 1972, orders were issued for production discontinuation, collection and others, and at present importation is prohibited.

For 30 years after the discontinuation of PCB production, attempts were made to construct a treatment facility under a private sector initiative but it was not possible to reach a decision on siting the facility because of difficulty in gaining surrounding residents approval. Because of the prolonged storage of the collected PCB waste there were increased concerns of potential loss or leakage occurrences which would result in environmental pollution. In order to deal with this situation, the *Act on Special Measures concerning Promotion of Proper Treatment of PCB Wastes (PCB Special Measures Law)* was promulgated on June 22, 2001 and came into force on July 15 of the same year for the purpose of promoting secure and appropriate treatment. Furthermore, the *Act on Japan Environmental Safety Corporation* came into force in 2003, and based on this act, the Japan Environmental Storage & Safety Corporation (JESCO) was established as a wholly owned subsidiary of the central government. Through this company, treatment facilities were developed at 5 locations in Japan, as shown in Figure 5-11 and operation of the Kita Kyushu treatment facility commenced in 2004.



Source: Ministry of the Environment Website “Information website for early treatment of poly chlorinated biphenyl (PCB)”

<http://pcb-soukishori.env.go.jp/about/pcb.html> (accessed February 1, 2022)

Figure 5-11 Locations of Region-based PCB Waste Treatment Facilities Established by JESCO

Business operators who are storing PCB waste are obligated to both notify on the status of storage and disposal every year, and dispose of the waste within the period prescribed in the Cabinet Order. This period was initially stipulated to be until July 2016, but in light of the fact that a large amount of electrical equipment was found to be contaminated with minute amounts of PCBs, and that JESCO’s disposal was behind schedule, in December 2012, the Cabinet Order was amended to extend the period to the end of March 2027.

Furthermore, the *PCB Special Measures Law* was revised in 2016. The outline of the revision was as follows:

(a) Cabinet decision on the PCB waste treatment basic plan

In order for all the concerned government bodies to implement the plan together, the PCB waste treatment basic plan will be established by cabinet decision.

(b) Disposal of high concentration PCB waste is made mandatory.

It is mandatory for storage business operators to dispose of the waste with high concentration of PCB before the due date of planned treatment completion, and an improvement order can be issued for the violation of this obligation. Penalties are imposed on violation of order.

(c) Strengthening of authority for collection of reports and on-site inspections

Strengthen the authority of prefectural governments and municipalities to collect reports

from business operators and conduct on-site inspections regarding high-concentration PCB wastes for which no notifications had been issued, and which would be in violation of the *PCB Special Measures Law*.

(d) Execution by proxy for disposal of high concentration PCB waste

If the storage business operator is unknown or not in a position to dispose of the PCB waste stored, prefectures and municipalities will be able to carry out proxy execution related to the disposal of high-concentration PCB waste.

Table 5-6 Events Related to PCB Waste

Month and Year	Event
1954	Domestic production of PCB started.
1968	The Kanemi Oil Poisoning Incident occurred.
1972	Due to administrative guidance by the Ministry of International Trade and Industry, production discontinuation/collection and others were ordered.
1973	Electrical Insulator Treatment Association started attempts for siting of a treatment facility.
2001	<i>Act on Special Measures concerning Promotion of Proper Treatment of PCB Wastes</i> was enacted.
	<i>Japan Environment Corporation Law</i> was revised - PCB treatment project was added as one operation of this corporation that was engaged in the business of construction and transfer of pollution control facilities and others.
2003	Act on Japan Environmental Safety Corporation was enacted.
2004	Japan Environmental Safety Corporation (currently JESCO) was established.
2011	A study committee concerning promotion of proper treatment of PCB waste was held.
2012	The study committee report on the promotion of proper treatment of PCB waste “Promotion of Proper Treatment of PCB Waste in Future” was compiled.
	The period prescribed in the Cabinet Order referred to in the <i>PCB Special Measures Law</i> was postponed to March 31, 2027.
October - November 2013	The local governments related to the JESCO treatment facilities were requested to study the revision of the PCB waste treatment basic plan.
May 2014	The revision (draft) of the basic plan was agreed to at the study committee concerning promotion of proper treatment of PCB waste.
May 2016	<i>PCB Waste Special Measures Law</i> was revised.
July 2016	The PCB waste treatment basic plan was revised.
December 2019	The PCB waste treatment basic plan was revised.

Source: Ministry of the Environment Website “Poly chlorinated biphenyl (PCB) early treatment information site” <http://pcb-soukishori.env.go.jp/about/background.html> (accessed February 1, 2022)

Furthermore, on the global scene, international activities calling for regulation of PCB waste were growing as cases of the expansion of pollution from some areas where PCBs were used to areas where PCBs were not used at all, were being reported. As a result of these activities, the Stockholm

Convention on Persistent Organic Pollutants (POPs Convention) went into effect in May 2004.

The POPs Convention calls for abolishing the use of PCBs by 2025 and the proper management of PCB waste by 2028. Japan ratified this convention in August 2002.

Column: Kanemi Oil Poisoning Incident

The Kanemi oil poisoning incident is a food-poisoning incident caused by rice oil (rice bran oil) produced by a private company, which occurred across a wide area centered in western Japan in 1968.

The incident occurred because PCB was used as heat medium, and polychlorinated dibenzofuran (PCDF) which is a type of dioxins, and others were mixed into the product during the deodorization process in the production process of rice oil.

Patients showed various symptoms such as cutaneous symptoms including pustule and pigmentation, nervous symptoms, joint symptoms, respiratory symptoms, anemia, and bone deformity, which often became serious. Improvement in symptoms took a long time, and, for example, the symptoms of one patient still persist even after the passing of 50 years. Effects on fertility of women and on newborn babies were also reported.

Since 1969, victims who suffered health problems have filed a series of class action lawsuits against the relevant private company and the central government seeking compensation for damages, but it took a long time before the judgement was finalized in 2015. Discussions about relief for the victims is still continuing.



Photo 5-9 Health Hazard Caused by Kanemi Oil Poisoning

Source: Yukiaki Kawano



Photo 5-10 Class-Action Lawsuit by Sufferers of Kanemi Oil Poisoning

4.3 Asbestos

Asbestos that is taken into the human body and remains there causes diseases such as lung fibrosis, lung cancer, and malignant mesothelioma. Its use is regulated in Japan and at present is not imported into the country.

In some developing countries, asbestos is not properly regulated, and many people do not understand its harmfulness. In this section the necessity for countermeasures is shown by understanding the actual condition of asbestos' harmfulness and the damage it inflicts over a long period of time.

Asbestos is “sekimen” in Japanese, and it is a natural ore, which is made when serpentinite and amphibole are transformed and become fibrous. Asbestos is the generic name of inorganic fibrous mineral. Asbestos is fine and the diameter (chrysotile 0.02 to 0.08 μm , crocidolite 0.04 to 0.15 μm , amosite 0.06 to 0.35 μm) is thinner than that of human hair (40 to 100 μm). It consists of extremely fine fiber that cannot be seen by the naked eye. Therefore, when scattered, it is apt to be suspended in the air and is easily inhaled into the lungs and deposited in the alveoli of the lung.

Part of inhaled asbestos is mixed into phlegm as a foreign substance and is discharged out of the body, but other part remains long in the tissue of the lungs since asbestos fibers are tough and stable. Asbestos that remains in the body sometimes causes diseases such as lung fibrosis, lung cancer, and malignant mesothelioma. Finer and longer asbestos fibers are considered to be more harmful. It is thought that the reason is that macrophages, a kind of leucocyte, try to remove the asbestos fibers that remain in the lungs, but long fibers are difficult to remove and can remain in the body for long periods. Furthermore, carcinogenicity differs depending on the type of asbestos and the carcinogenicity of amphibole (crocidolite and amosite) is considered to be higher than that of chrysotile.



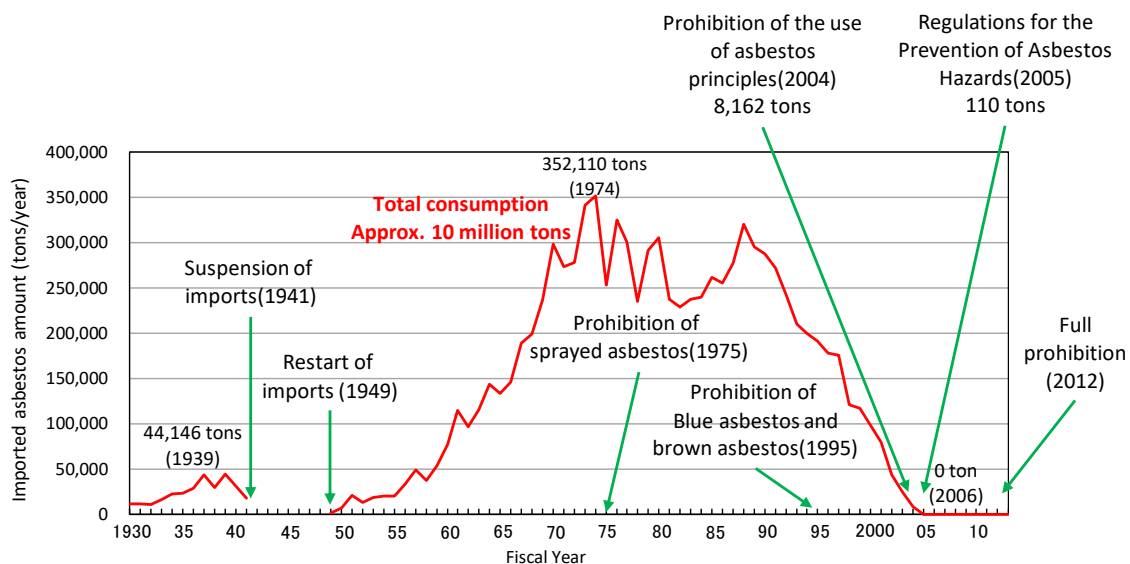
Source: Environmental Restoration and Conservation Agency (ERCA) Website
<https://www.erca.go.jp/asbestos/what/whats/whatAsbestos.html> (accessed February 1, 2022)

Figure 5-12 Types of Asbestos and their Degree of Carcinogenicity

A correlation is recognized between the amount of inhaled asbestos and the occurrence of diseases such as mesothelioma and lung cancer, but what amount of asbestos needs to be inhaled and how long it needs to be inhaled for the occurrence of mesothelioma are not clear.

In Japan, importation of asbestos started in the 1890s and, although it was temporarily stopped during the Second World War, importation was immediately resumed after the war. The imported amount peaked in the 1970s and more than 300,000 ton of asbestos was imported almost annually during that decade. At that time, asbestos was utilized as a lagging material or a heat insulating material in the construction of buildings and structures, slate material, brake lining, soundproof material, as well as other uses.

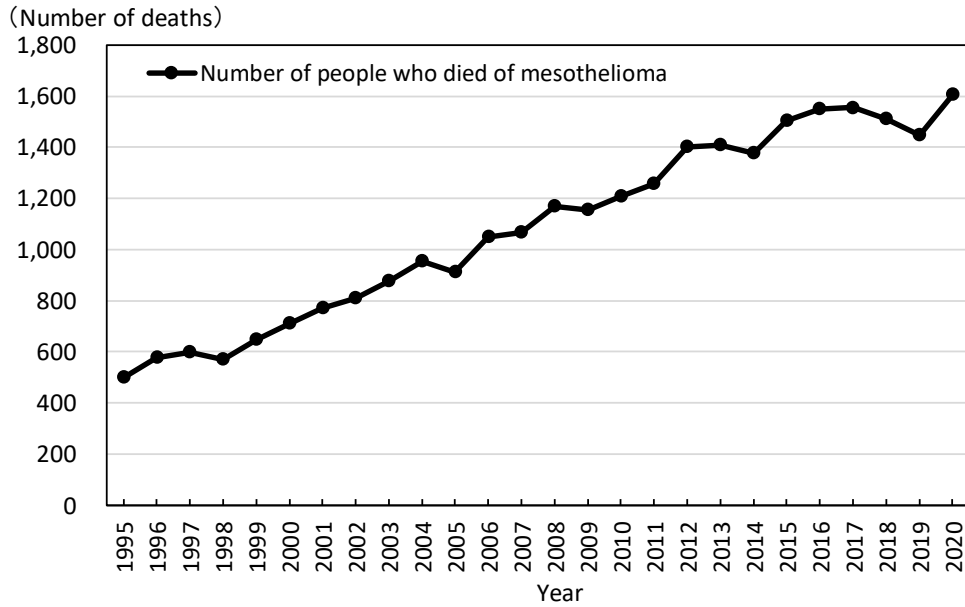
After that, since effects on health and others were pointed out and the use was regulated, the amounts imported sharply decreased and at present no asbestos is imported. Afterwards, its use was regulated due to the increasing awareness of its effects on health, and imports decreased sharply. Presently asbestos is no longer imported.



Source: Environmental Restoration and Conservation Agency Website (ERCA) "Asbestos and its health hazard" (2021)

Figure 5-13 Transition of Import Amount of Asbestos and History of Regulation

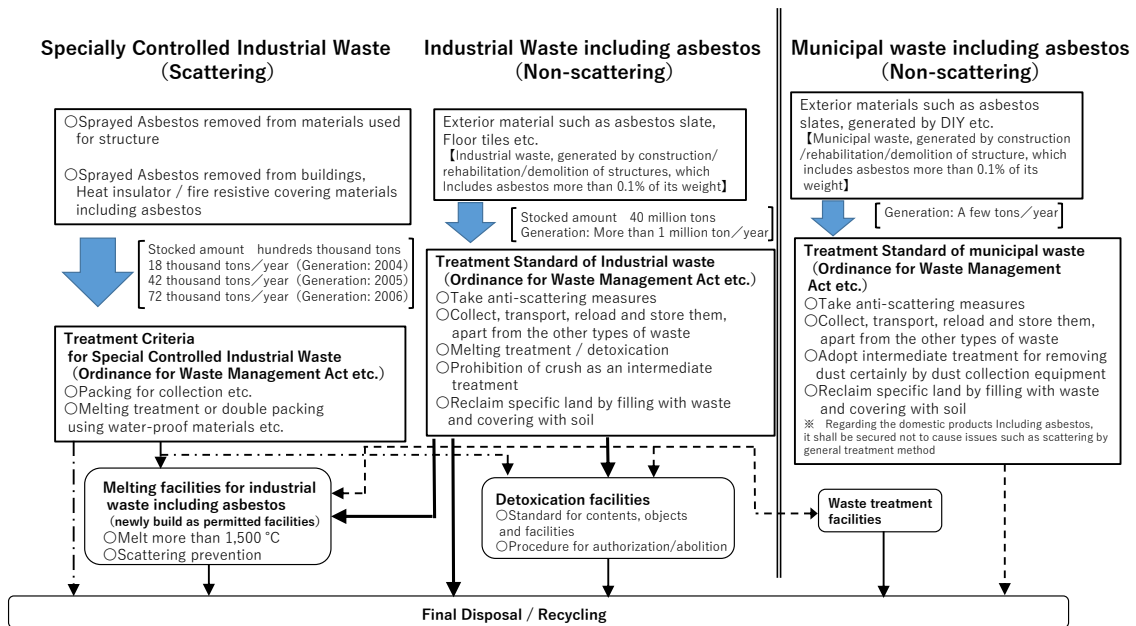
On the other hand, as shown in Figure 5-14, the number of patients with mesothelioma, which is said to be an illness caused by asbestos, continues to increase year by year. According to population survey reports released by the Ministry of Health, Labor and Welfare, the number of patients increased rapidly since the 2000s, which coincides with the latent period (about 40 years on average) after the 1960s when the amount of imported asbestos had increased. The number of people who died of mesothelioma in 2020 reached 1,605, which is more than three times as many as 1995.



Source: Ministry of Health, Labour and Welfare “Prepared based on the data listed in ‘Transition of estimated number of people who died of mesothelioma in prefectures from 1995 to 2020’” (2021)

Figure 5-14 Transition of Number of People who Died of Mesothelioma in Japan

Waste that contains asbestos can be largely divided into “waste asbestos and others”, “asbestos-containing industrial waste”, and “asbestos-containing municipal waste” and is required to be treated appropriately in accordance with the law. The current regulations related to asbestos-containing waste in Japan are shown in Figure 5-15.



Source: Ministry of the Environment “Management Guideline for Waste including Asbestos (ver.3)” (2021)

Figure 5-15 Current Regulation of Waste Including Asbestos in Japan

The types of waste containing asbestos and their disposal methods are defined according to their characteristics as shown in Figure 5-16.

Sprayed asbestos and asbestos heat-retention (thermal insulation) material are friable asbestos that can be easily dispersed into the air and must be disposed of as specially controlled industrial waste (hazardous waste) as defined in the *Waste Management Act*. Specifically, the business operator is required to take temporary measures such as spraying the waste with water to prevent dispersal of asbestos until it is transported, and then solidify the waste or stabilize it with chemicals in advance and double pack it with water-resistant materials to prevent it from dispersing into the atmosphere. The waste must be landfilled at a controlled landfill site. If the waste is melted or detoxified as specially controlled industrial waste and loses its properties, it can be landfilled in an inert landfill site.

On the other hand, asbestos fiber board are non-scattering asbestos waste that is not easily dispersed into the atmosphere when it becomes waste. It can be collected and transported as industrial waste that is not specially controlled industrial waste, and can be disposed in an inert landfill site if anti-scattering measures are taken at a certain location.

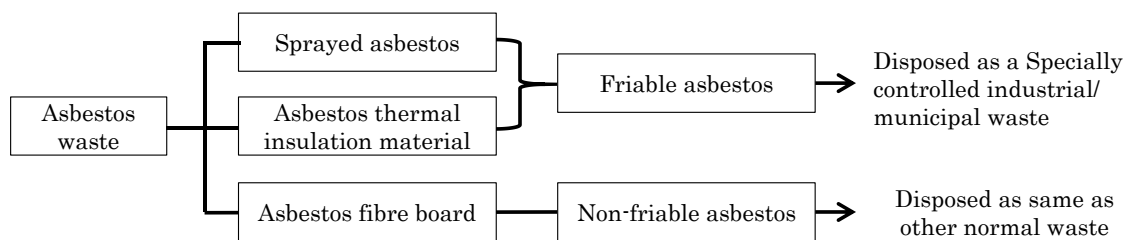


Figure 5-16 Types of Asbestos Wastes and Respective Disposal Methods

5 Disaster Waste

Due to its location, geography, geology, climate, and other natural conditions, Japan frequently experiences typhoons, severe rainstorms, earthquakes, and other natural disasters. The percentage of global disasters that Japan accounts for is 20.8% of earthquakes with a magnitude over 6, and the percentage of disaster damage costs is 18.3%. As Japan accounts for only 0.25% of the world's land area, these figures are very high.

When a disaster occurs, vast quantities of waste are immediately generated and they must be speedily disposed of to help the residents recover.

If disaster waste is left unattended, it not only interferes with the residents' daily lives, but can also cause various problems such as sanitary issues due to its decomposition, and safety issues due to burning, etc. However, it is difficult to sort the waste generated by disasters and in many cases, it is difficult to treat it as well.

This section introduces the disaster waste measures practiced in Japan and their related issues. The measures that each country should consider, the potential challenges in implementing these measures, and the current state of international cooperation regarding disaster waste are discussed as well.

5.1 Changes in the System

Disaster waste measures are positioned as part of Japan's national resilience policies, and the Disaster Waste Countermeasure Guidelines were established in 2014.

Japan revised the disaster waste management system each time the country experienced a major disaster. It is important to have a flexible system and continuously improve upon it as the situation demands.

Based on the lessons learned from the Ise Bay Typhoon of 1959, the *Disaster Countermeasure Basic Act* was enacted in the same year and has been revised several times since then. The purpose of the act is to protect the lives, health, and property of the citizens from disasters and thereby contribute to maintaining social order and assuring public welfare.

In 2011 Japan was struck by the Great East Japan Earthquake, and once more the lessons learned in that disaster led to the establishment of the *Basic Act to Strengthen National Resilience to Contribute to Disaster Prevention and Alleviation to Achieve Strong and Flexible Citizens' Lives* (hereinafter referred to as the *Basic Act to Strengthen National Resilience*) established in 2013, and activities have since been carried out based on the concepts of this act.

Based on these laws, the Basic Plan to Strengthen National Resilience was established in June 2014, and "situations to be avoided" was defined as "situations in which recovery and reconstruction are delayed due to stagnation in the treatment of the vast quantities of waste produced by disasters". Therefore, countermeasures for disaster waste were included as part of the policies to strengthen national resilience.

Furthermore, the Waste Treatment Facilities Improvement Plan that was revised in 2013 clearly includes “strengthening of disaster countermeasures”. In March 2014, the Disaster Waste Countermeasure Guidelines was developed.

5.2 Current Situation of Disaster Waste Management

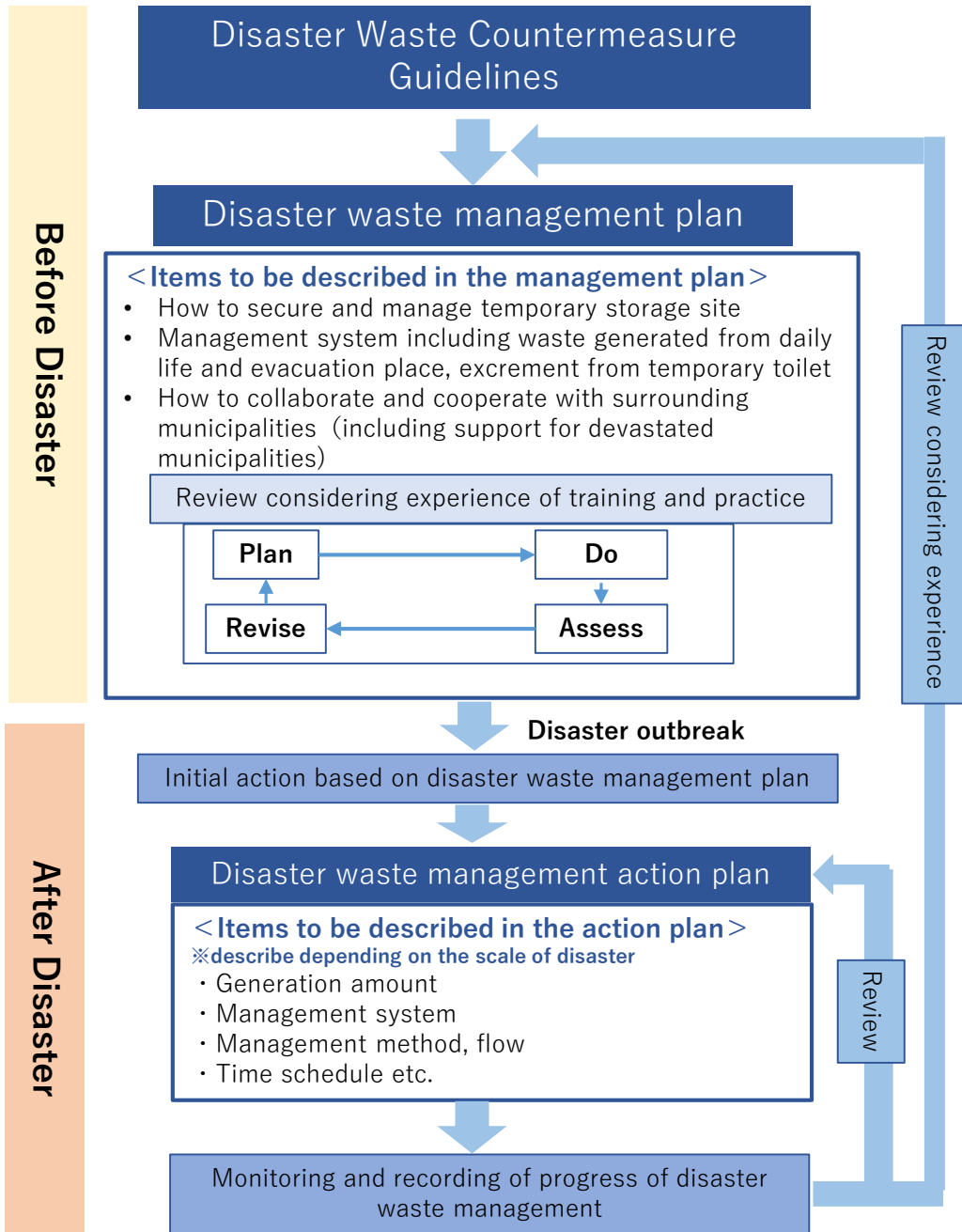
(1) Organization

Countermeasures for disaster waste must be considered separately; countermeasures for normal times before a disaster strikes and those needed after the disaster has struck. It is important that the related organizations make efforts to establish working relationships under normal conditions so they can smoothly work together during disasters and their aftermath.

The Disaster Waste Countermeasure Guidelines (Revised Edition) developed by the Ministry of the Environment states that disaster waste systems must be prepared during normal conditions.

The guidelines state that the prefectures must assist their various municipalities to formulate and review their disaster waste management plans according to the respective conditions of each municipality after sufficiently considering the Waste Treatment Facilities Improvement Plan (2013), the aforementioned guidelines, and action guidelines. The prefectural governments and municipalities need to ensure that the formulated plans are consistent with regional disaster plans and other disaster related guidelines and that the plans are based on the *Disaster Countermeasure Basic Act*. Additionally, during emergency situations, the prefectures must proactively communicate and adjust actions with the related groups and organizations while quickly creating implementation plans for the management of disaster waste. At the same time, they must also cooperate with the related groups and organizations to manage the progress of overall treatment within their jurisdictions.

The municipalities must make sure that their local disaster prevention plans and other disaster related guidelines and plans made under prefectural disaster waste treatment plans and the *Disaster Countermeasure Basic Act* are consistent with the national Waste Treatment Facilities Improvement Plan (2013), the aforementioned guidelines, and action guidelines. At the same time, the municipalities must include the measures related to disaster waste countermeasures made in preparation for disasters in their municipal waste treatment plans according to their local situations. The municipalities must also formulate disaster waste treatment plans in preparation for disasters and review them as appropriate. Furthermore, during disasters, the municipalities need to quickly assess the degree of damages according to the disaster waste treatment plan, prepare disaster waste management implementation plans, and based on the plans manage the disaster waste.



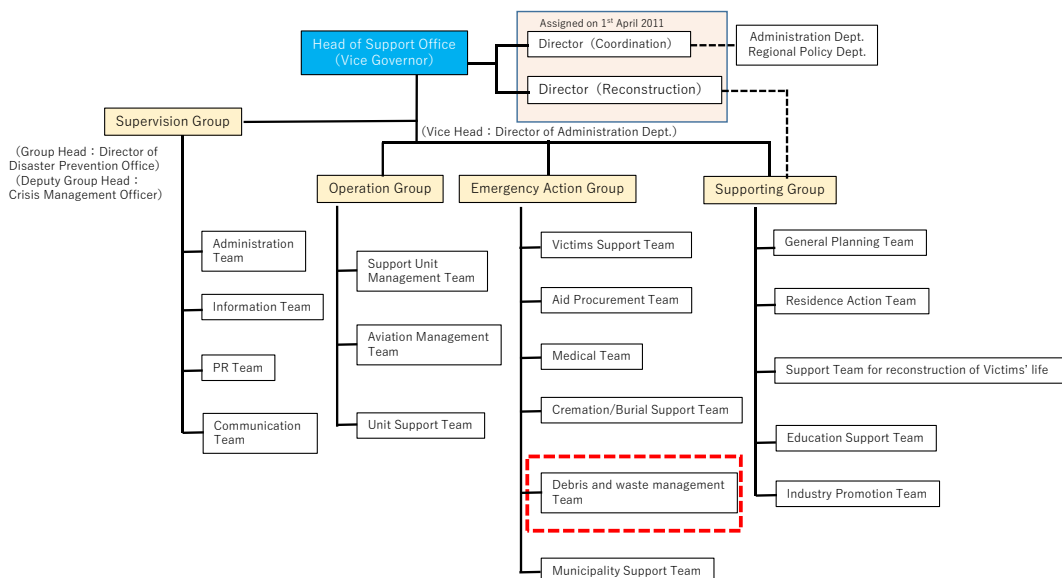
Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (revised edition)” (2018)

Figure 5-17 Relation between Disaster Waste Management Plan and its Action Plan

Column: Example of a Disaster Waste Management System

The following is an example of a disaster waste management system in Iwate Prefecture during the Great East Japan Earthquake of 2011. Iwate Prefecture was one of the hardest hit prefectures by the Great East Japan Earthquake and subsequent tsunami, with a total of 5,794 people killed or missing. This example is included as an attachment to the Disaster Waste Countermeasure Guidelines (Revised Edition).

Management of disaster waste in Iwate Prefecture was handled by the Resources and Environment Promotion Section of the Environment and Life Department as part of the prefecture’s Disaster Countermeasures Headquarters. Immediately after the disaster, it helped with the related office functions for the municipalities. Initially, the prefecture’s Disaster Countermeasure Headquarters was using a team system for handling the support and recovery work of municipalities under a larger framework. However, because the work was so diversified, it reviewed the system on March 25, 2011. The individual work was assigned to various teams and the Debris and Waste Countermeasures Team was set up. After that, to execute the vast amount of work in a suitable manner and provide technical assistance to the municipalities, it acquired civil engineering related manpower and clerical personnel with detailed knowledge about contract work and waste treatment laws from both inside and outside the department. However, the acquired manpower and personnel were still insufficient. Through the Ministry of the Environment, it received temporary human resources from other local governments who were knowledgeable about waste management work to reinforce its organization. On April 1, 2012, it was renamed the Waste Special Countermeasures Office, Environment and Life Department. Additionally, as human resources assistance from the central government, the Iwate Prefecture Support Team of the Local Disaster Countermeasures Headquarters of the Ministry of the Environment was assigned at the prefectural capital on June 3, 2011.

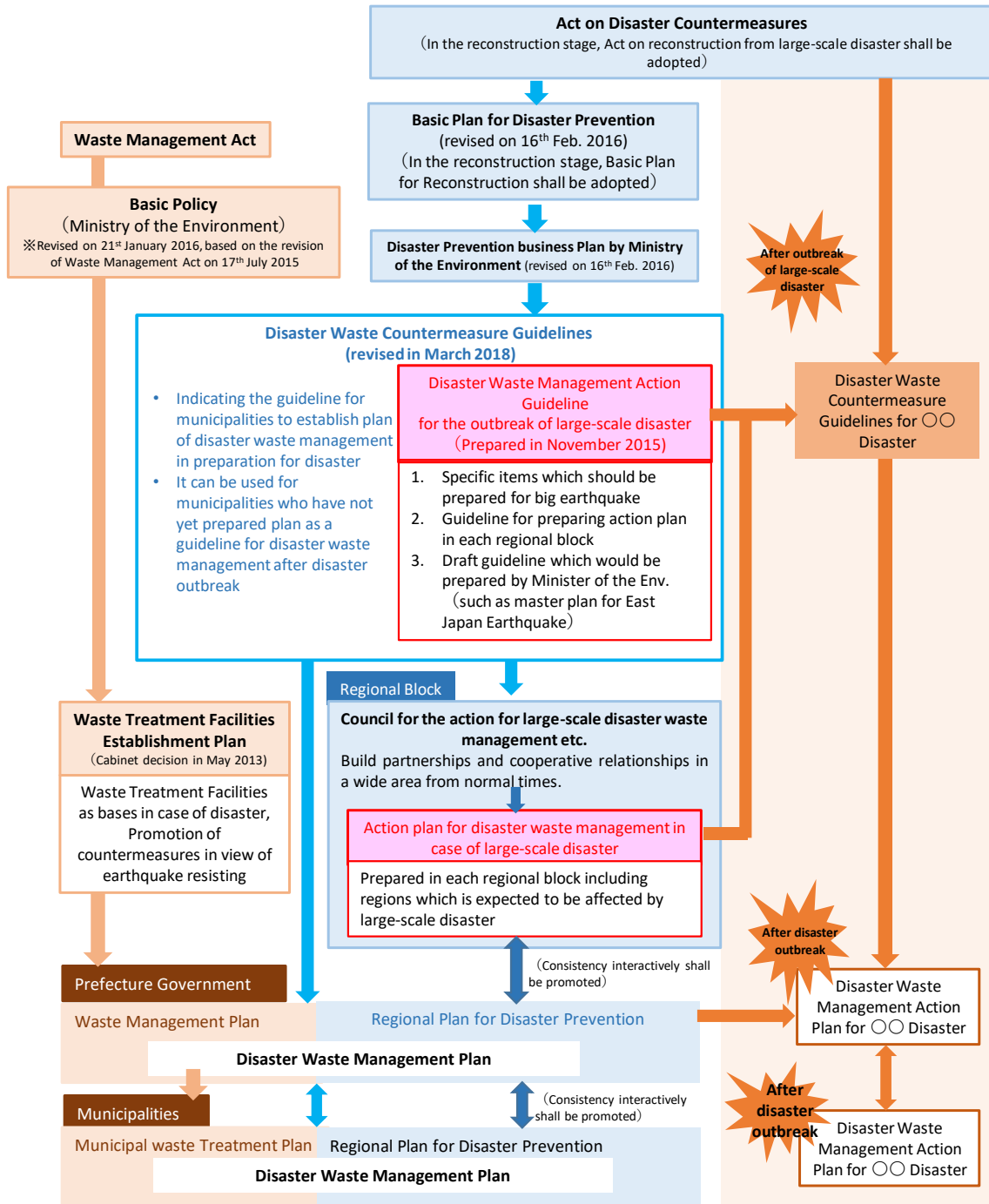


Source: Ministry of the Environment “Disaster Waste Management Guideline (revised)” (2018)

Figure 5-18 Structure of Supporting Office in Iwate Prefecture

(2) Legal System

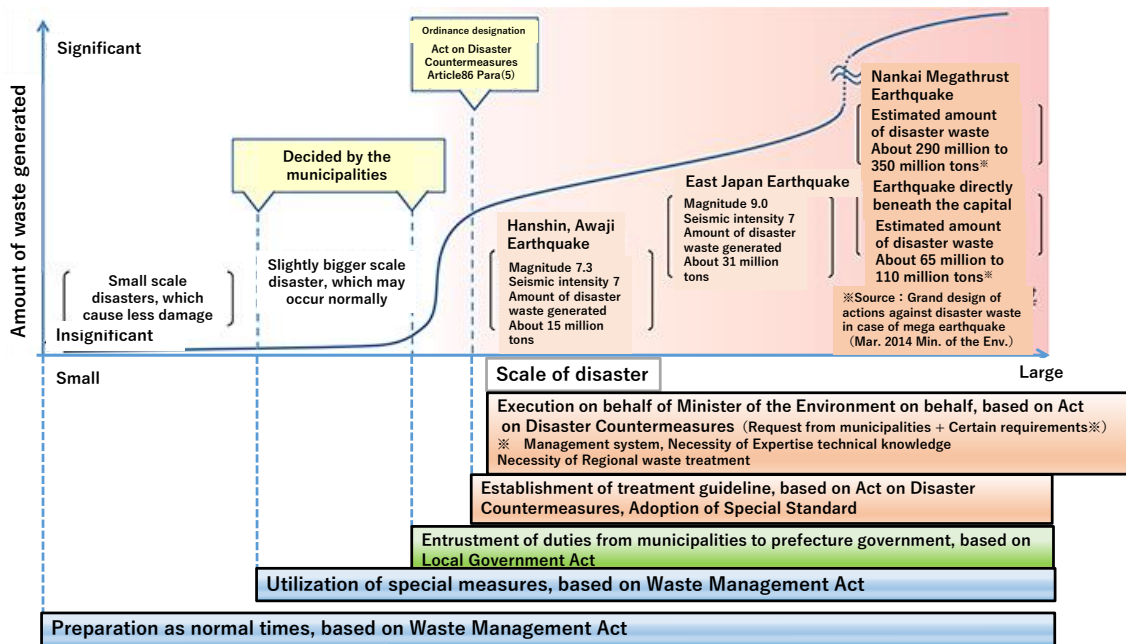
As described earlier, the “Basic Plan to Strengthen National Resilience” established in 2014 based on the *Disaster Countermeasure Basic Act* and the *Basic Act to Strengthen National Resilience* has positioned disaster waste countermeasures as part of the national resilience strengthening policy, and this is the legal foundation for the current disaster waste countermeasures practiced in Japan.



Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (revised edition)” (2018)

Figure 5-19 Laws and Institutions Related to Disaster Waste Management in Japan

As shown in Figure 5-20, the scale of the disaster and the measures to be applied in Japan’s disaster waste management are based on the size of the disaster according to the amount of waste generated.



Source: Ministry of the Environment website (Disaster Waste Management Information) “Outline of the Act for Partial Revision of the Waste Disposal and Public Cleansing Act and the Disaster Countermeasures Basic Act” (Viewed on February 15, 2022)

Figure 5-20 Scale of Disasters and Related Countermeasures Applied in Japan

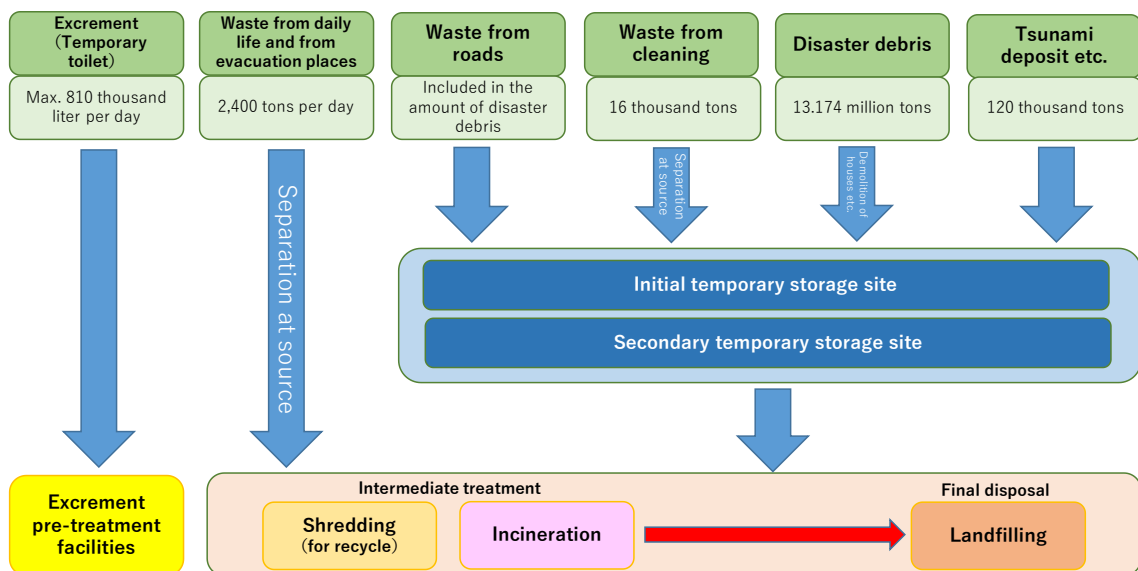
Article 9, Clause 3, Item 3 of the *Waste Management Act* stipulates, “Special exceptions for the establishment of municipal waste treatment facilities related to disasters”. However, many local governments have not established the necessary ordinances required for these special exceptions.

As a result, the Ministry of the Environment created the “Ordinance Formulation Examples for Local Governments regarding the Special Exception Measures for Disaster Waste Treatment according to Article 9, Clause 3, Item 3 of the *Waste Management Act*, and is promoting the enactment of the necessary ordinances by the local governments.

(3) Treatment Flow

In Japan, in accordance with the Disaster Waste Countermeasure Guidelines, the municipalities are obliged to prepare a treatment flow for disaster waste.

The Ministry of the Environment’s Disaster Waste Countermeasure Guidelines (Revised Edition) describes the basic flow of disaster waste management after a disaster has occurred. In principle, disaster waste is managed according to the descriptions in the guidelines. Furthermore, regarding the treatment flow for disaster waste, the guidelines state that “Local governments shall create a process flow for the methods and quantities of sorting, intermediate treatment, final disposal, and recycling based on the disaster waste treatment guidelines, the quantity of waste, and treatment capacity”. Figure 5-21 shows the disaster waste treatment flow of Yokohama city, which is the biggest city in Kanagawa prefecture, next to Tokyo, and has a population of about 3.8 million people.



Source: Yokohama City “Disaster Waste Management Plan in Yokohama City” (2018)

Figure 5-21 Disaster Waste Treatment Flow in Yokohama City

The following is an overview of the basic flow of disaster waste management that is described in the guidelines.

System Development and Support

- The local government must make efforts to understand the scope of the disaster and create a system to manage the waste while considering the roles of other departments and the aid from other agencies.
- The central government and the respective local government must confirm the scope of the disaster, and provide assistance according to the needs while coordinating their mutual actions as best as possible.

Disaster Waste Management

- Depending on the amount of disaster waste produced, the local government will arrange locations for temporary waste dumping sites.
- The local government will consider methods for the collection and removal of disaster waste, and notify the residents of those methods together with sorting methods.
- Disaster waste is sorted, removed/collected from the disaster sites, transported to the temporary waste dump site, and sorted for storage. Additionally, sorting of collected waste is promoted and accepted at the temporary waste dump sites. Handling of disaster waste from destroyed homes and the like will go into full swing after disaster damage certificates are issued to the related victims.
- Hazardous waste and dangerous items will be given collection priority after safety has been assured.
- From the point of view of preventing the deterioration of public hygiene, perishable waste will be given collection priority.
- Disaster waste that is accepted at temporary waste dump sites will be shredded and separated according to how it will be processed or treated, shipped out, and then go to intermediate treatment, recycling, or final disposal.
- To prevent secondary disasters during treatment, environmental countermeasures, monitoring, and fire countermeasures will be implemented.
- In order to implement this plan, there must be an understanding of the amount of each waste category based on the disaster information and treatment results. A process flow must be made that designates the treatment and disposal sites by category and this must be included in an action plan.

Treatment of Household Waste, Evacuation Center Waste, and Human Waste from Temporary Toilets

- The local government must confirm the damage conditions of the treatment facilities and secure the treatment functions.
- The local government must consider the collection methods for household waste, evacuation center waste, and human waste from temporary toilets, etc., and notify these to the residents.
- The local government must know where household waste, evacuation center waste, and human waste from temporary toilets and the like are being generated, and collect, and deliver them to treatment facilities.

Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (Revised Edition)” (2018)

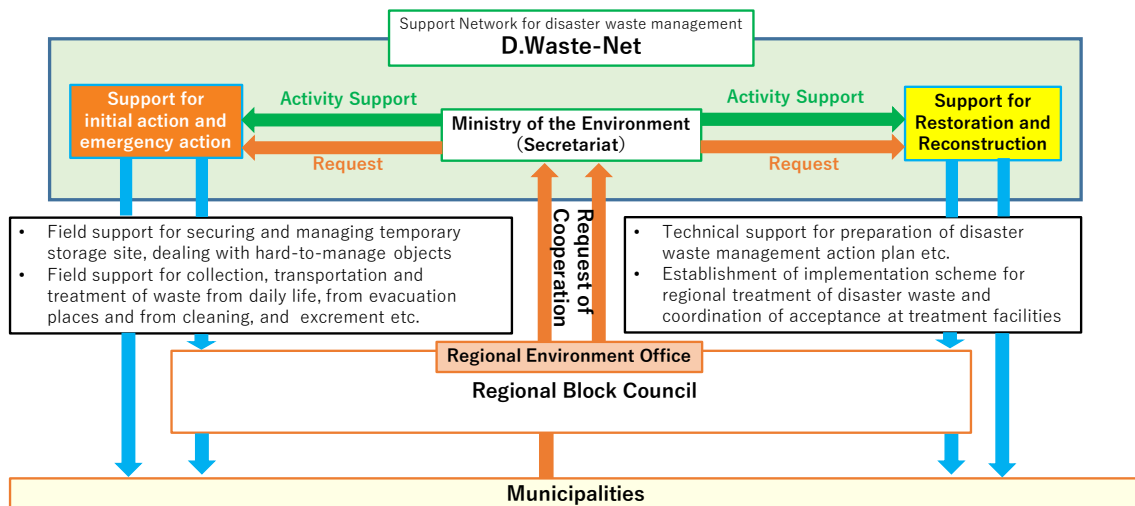
(4) Measures Taken by the Central Government and Municipalities

In Japan, the Ministry of the Environment has developed the D.Waste-Net system to provide aid during disasters. Persons from the government, industry, and academia took part in developing this system. D.Waste-Net also archives the management of waste from past disasters and makes the information available to the public. It is important that related persons work together and past experiences in disaster waste management are archived.

The Ministry of the Environment is at the center of national level disaster waste countermeasures in Japan. Specifically, the ministry formulates legislation, basic plans, and guidelines as described earlier in this section. The ministry also monitors the efforts by the various local governments, makes suggestions as necessary, and at the same time, it archives information about waste from past disasters and makes it available to the public through its “Disaster Waste Countermeasures Site”.

The Ministry of the Environment also operates the Disaster Waste Treatment Assistance Network (D.Waste-Net: http://kouikishori.env.go.jp/en/d_waste_net/) as a secretariat to support disaster waste management implemented by local governments. Numerous research and specialized organizations, as well as municipal waste related organizations, are members of D.Waste-Net.

Figure 5-22 shows how D.Waste-Net provides support during disasters.



Source: Ministry of the Environment Website (Disaster Waste Management Information) “D.Waste-Net” http://kouikishori.env.go.jp/action/d_waste_net/ (accessed February 1, 2022)

Figure 5-22 Supporting Structure of D.Waste-Net

Table 5-7 shows the functions and roles of D.Waste-Net during normal times and during disasters.

Table 5-7 Functions and Roles of D.Waste-Net

Normal times	
Assist local governments in making disaster waste management plans, etc., and assistance for development of human resources, disaster training, etc.	
Passes down records, verifications, and knowledge about various actions related to disaster waste countermeasures.	
Maintenance and improvement of disaster response through meetings and exchange of information between D.Waste-Net members.	
Initial response during disasters	
Research and specialized organizations	Dispatching specialists and engineers to local governments where disasters occur; constructing treatment systems; notifying others about how to eliminate and sort household waste and cleaned-up waste; securing and operating primary temporary waste dump sites according to the initial estimates of cleaned-up waste; stench and pest countermeasures; local support for difficult-to-treat waste items; etc.
Municipal waste related organizations	Dispatching waste collection vehicles and workers to local governments hit by disasters; collecting and transporting household waste, human waste; evacuation center waste, and cleaned-up waste; providing local support about treatment; etc. (Includes cooperation with volunteers depending on the circumstances.)
Recovery and reconstruction actions - mid- to long-term measures	
Research and specialized organizations	Estimating information about disaster conditions and disaster waste quantities; making disaster waste management execution plans; technical support to local governments hit by disasters in the form of securing secondary waste dump sites, and intermediate treatment and final disposal sites.
Waste treatment related organizations; Construction related organizations; transport related organizations	Management of disaster waste treatment systems; making implementation plans for wide-range treatment of disaster waste; adjusting the reception at treatment facilities; etc.

Source: Ministry of the Environment Website (Disaster Waste Management Information) "D.Waste-Net"
http://kouikishori.env.go.jp/action/d_waste_net/ (accessed February 1, 2022)

The National Institute for Environmental Studies has made a disaster waste information platform on the Internet where it makes the following information available: disaster archives; progress reports by local governments on their management plans; examples of human resources development; emergency response reports; etc.

At the local government level, prefectures and municipalities are preparing disaster waste management plans according to the central government guidelines, but the progress varies among local governments.

5.3 Treatment Technology

The transport, storage, and treatment of disaster waste must be conducted more carefully when compared with regular waste treatment. Additionally, there are difficult aspects, so some unique technologies have been adopted. In this section the main considerations and technologies concerning disaster waste treatment in Japan are introduced.

(1) Collection and Transport

The Disaster Waste Countermeasure Guidelines highlights the importance of carefully considering the following aspects related to the collection and transport of disaster waste.

- During disasters, there are instances when the amounts of waste will overwhelm the collection system, especially immediately after the disaster. In such cases, perishable waste, hazardous waste, and dangerous items should be given priority for collection and transport.
 - Consider securing fuel, consumables such as tires, and measures to take when vehicles break down so that collection and transport of disaster waste are assured.
 - Be aware of weather conditions and evacuate collection and transport vehicles before a disaster strikes.
 - Study flooding hazard maps and consider possible transportation routes after a disaster.

Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (Revised Edition)” (2018)

Regular dump trucks and waste collection trucks (compactors and waste container trucks) are used for actual collection and transport, but liquid transport trucks may be used depending on the type of waste.

(2) Storage Facilities

During normal times before disasters occur it is important to select suitable temporary waste dump site candidates, for efficient waste management during disasters. When selecting temporary storage sites in developing countries, it is necessary to consider effectiveness of the sites.

Temporary storage sites for disaster waste should generally be located within a distance where residents can transport disaster waste on their own, and it is expected that it may take several years to manage the stored waste. For example, it may be appropriate in some cases to temporarily store the waste next to the disposal site and set up a sorting yard next to it. The impact of long-term storage on residents in the vicinity should be fully considered. Consideration should also be given to the accessibility of large vehicles for transportation, and whether or not the site is close to the activity base of emergency response personnel or to a planned site for temporary housing.

If large quantities of disaster waste are generated during a disaster and the residents collect the disaster waste without any plans, this can cause unsanitary environmental conditions, such as odor, and also safety issues, such as the possibility of fires erupting in the collected disaster waste.

Therefore, it is important that local authorities select suitable temporary waste dump sites during normal times, before disasters strike. Efficient disaster waste processing during disasters is possible if suitable temporary waste dump sites are designated. The Disaster Waste Countermeasure Guidelines explain aspects related to temporary waste dump sites; how the sites will be used, calculation method to determine the required dumping area, and criteria for selecting the candidate sites. The following is an overview.

- Local governments shall designate temporary waste dump site candidates during normal times and for that purpose they must consider the usage of these sites before designating them.
- Temporary waste dump sites can be divided into temporary waste dump sites for the temporary storage of waste (at which waste may also be separated) and temporary waste dump sites mainly used for the shredding and sorting of disaster waste.

Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (Revised Edition)” (2018)

Table 5-8 Examples for Utilization of Temporary Waste Dump Sites

Use	Description
Temporary waste dump sites	<ul style="list-style-type: none"> ✓ Temporary waste dump sites for the emergency removal of disaster waste that is blocking roads, etc. ✓ Temporary waste dump sites to which residents deliver waste.
Shredding work areas	<ul style="list-style-type: none"> ✓ Areas where temporary shredders and treatment work (sorting, separation, etc.) can be conducted.
Storage areas	<ul style="list-style-type: none"> ✓ Areas where delivered disaster waste exceeds available intermediate treatment capacity can be stored. ✓ Areas where waste that exceeds the landfill operation capacity and/or the available capacity to transport the waste to the landfill, can be stored. ✓ Temporary sites where concrete blocks, tsunami debris, and other reconstruction materials can be stored until they are transported to where they will be used. ✓ Temporary storage for incinerator ash, hazardous waste, etc. (including dangerous items) ✓ Storage sites for recycled items that have accumulated because there is more than needed. However, this does not include sites that only store items for recycling.

Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (Revised Edition)” (2018)

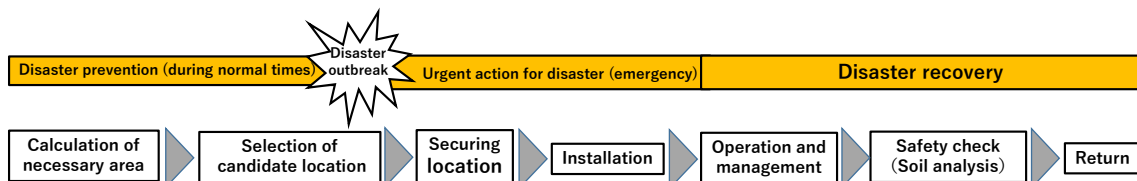
Calculating the Area Needed for Temporary Waste Dump Sites

- Local governments should calculate the necessary area of temporary waste dump sites according to the estimated scale of disasters.
- Because stacking too much disaster waste can lead to fires, the necessary area should be calculated by keeping the height of the waste to 5 meters or less. Moreover, distance should be kept between stacks of waste to prevent the spreading of fire and for firefighting activities so that immediate action can be taken if a fire should start.

Selecting Temporary Waste Dump Site Candidates

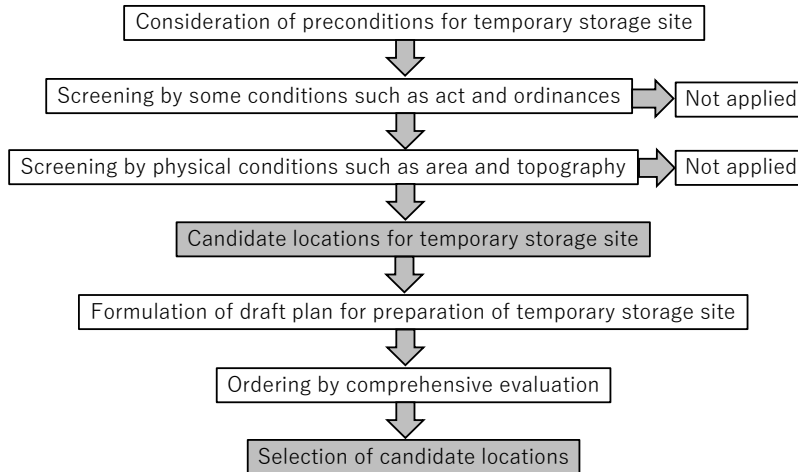
- Temporary waste dump site candidates must be selected with the understanding that evacuation centers and emergency temporary housing will have priority for open space during disasters. When selecting candidate sites, decisions should be made after consulting with local residents as necessary.

Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (Revised Edition)” (2018)



Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (Revised Edition)” (2018)

Figure 5-23 Flow for Selection of Temporary Storage Site (Example)



Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (Revised Edition)” (2018)

Figure 5-24 Condition for Selection of Temporary Storage Sites

(3) Treatment, Recycling and Disposal

Considering treatment and recycling of disaster waste after a disaster occurs, efforts should be made to separate and sort the waste as much as possible. However, it is best to be flexible and operate according to the actual circumstances of each location.

After disaster waste is temporarily stored at the aforementioned temporary waste dump sites, they are transported to treatment facilities. The Disaster Waste Countermeasure Guidelines describe the precautions regarding treatment facilities for disaster waste. The following is an overview.

- Even during emergency situations, waste should be separated as much as possible when considering future treatment and recycling.

Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (Revised Edition)” (2018)

Table 5-9 describes the treatment methods and precautions for each type of waste during emergencies.

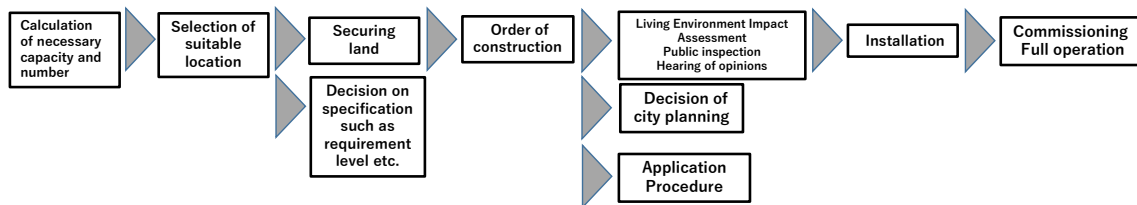
Table 5-9 Treatment Methods and Precautions for Each Type of Waste during Emergencies (Excerpts)

Type	Precautions
Automobiles, ships, etc.	Automobiles and ships that obstruct movement are transported to temporary waste dump sites. Because they may be damaged when they are being transported and there are legal suit risks, the intentions of owners should be confirmed.
	When handling vehicles with high voltage batteries, such as electric and hybrid vehicles, the workers should use insulated protective gear (masks, protective glasses, insulated gloves, etc.), high voltage lines should be cut, and other safety measures taken during transport because of the danger of electrocution.
Batteries	Be careful of electrocution, and use insulated gear, such as cloth or rubber work gloves and long rubber boots.
	If there is a danger of electrocution, do not carelessly come into contact with the battery, and follow the instructions of an electrical technician and a specialist from the manufacturer.
Perishable waste	Perishable waste, such as fisheries waste and food waste, should be treated first starting with items that were not frozen.
Removal of destroyed homes, etc.	For buildings that still maintain some of their structure on their plots, the basic principle is to confirm the wishes of owners or other interested parties. However, if the concerned parties cannot be contacted and there is the danger of further damage, then a land and house inspector should be consulted and if the damaged building has no value, then it should be removed (and dismantled if necessary). In such cases, the state of the building should be recorded in photographs, etc.
	Any valuables, such as precious metals and the like, and items with sentimental value for the owners, such as mortuary tablets and photo albums, should be stored in a temporary or separate location until they can be returned. When the owners of the property cannot be identified, they should be handled according to the <i>Lost Goods Act</i> . All items other than the above should be removed and discarded.

Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (Revised Edition)” (2018)

- Consider the specifications of the necessary temporary treatment facilities based on the estimated quantity and quality of the disaster waste.
- If it is difficult to treat the disaster waste at municipal shredding facilities, then the installation of temporary shredding machines (portable or fixed) should be considered according to the quantity of disaster waste that needs to be handled.
- When there are large quantities of mixed disaster waste, either mechanical separation or manual sorting must be considered.
- The local government that experienced the disaster must consider the need for temporary incinerators depending on the quantity of disaster waste that requires treatment, the treatment period, and the necessary costs.
- If the local government that experienced the disaster decides that temporary incinerators are necessary, then they must consider the treatment capacities and the number of incinerators necessary for efficient treatment after considering the necessary costs.

Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (Revised Edition)” (2018)



Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (Revised Edition)” (2018)

Figure 5-25 Example of Installation Procedure for Temporary Incinerator, etc.

- When dismantling and removing temporary incinerators, the applicable laws must be followed, the dismantling and removal methods should be considered after consulting with a Labor Standards Supervision Office and related parties.
- Because temporary incinerators themselves might be polluted with dioxins and other harmful substances, the surrounding environments must be monitored for dioxins and other toxic matter before, during, and after dismantling and removal.

Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (Revised Edition)” (2018)

Table 5-10 shows the treatment methods and precautions for each type of waste during disaster recovery and reconstruction.

Table 5-10 Treatment Methods and Precautions for Each Type of Waste for Disaster Recovery and Reconstruction (Excerpts)

Type	Precautions
Mixed waste	The removal of hazardous waste and dangerous items from mixed waste should be given priority. Then, the mixed waste should be treated in stages. First, recyclable wood scraps, concrete debris, and metal scraps should be removed. After separating any soil or sand with trommel screens, the mixed waste should be shredded to a uniform size, sorted (magnetic sorting, specific gravity sorting, manual sorting, etc.).
Wood scraps	In treating wood scraps, it is important to first use a trommel screen to remove any soil or sand. If any soil is attached to the wood scraps, they might not be recyclable and have to be disposed of. When incinerating wood scraps with soil attached or moist wood scraps, the heat generation (calories) of incinerators falls, so that addition of combustion improvers or heavy fuel oil may be necessary to maintain the treatment standard (800°C or higher).
Concrete debris	Sort the debris and crush it if necessary so it can be recycled. In order to facilitate recycling, it might be necessary to confirm the safety of the concrete debris by conducting physical characteristics tests, such as strength tests, and environmental safety tests.
Home appliances	After a disaster, products that come under the <i>Small Home Appliance Recycling Act</i> (televisions, refrigerators, air conditioners, washing machines) should be separated from other waste and recovered. In general, they are returned to the manufacturer and recycled according to the <i>Small Home Appliance Recycling Act</i> . In this case, the handling fees that the local governments pay to the manufacturers are covered by government aid. In the case of the Great East Japan Earthquake, products subject to the <i>Small Home Appliance Recycling Act</i> that were significantly deformed by the tsunami, etc. were shredded and incinerated.
	When processing refrigerators and freezers, any food or drink inside them must be removed before treatment to thoroughly separate any kitchen waste.
	Refrigerators and other appliances that use freon gas must be thoroughly separated and stored for recovery of the freon gas.
Tires	Tires can be recycled as fuel by shredding them into chips. Precautions must be taken for fire and the like when processing.
Plasterboard, slate panels, and other construction material	Items that contain asbestos must be appropriately processed and disposed of. Items that do not use asbestos are recycled.
	Determine the treatment method by checking the year the construction material was made and whether it has any marking indicating the use of asbestos.
	For some destroyed construction materials, it will be hard to determine if they are plasterboard. The material that cannot be identified should not be mixed with other waste and it should be stored separately or other measures should be taken.
Asbestos	Destroyed homes should be checked for asbestos before they are removed (or before they are dismantled if necessary). If asbestos is discovered, it should be removed appropriately so that it is not mixed with other disaster waste, and it should be disposed of in a suitable manner for waste asbestos or waste containing asbestos.

Type	Precautions
	In principle, waste asbestos should not be delivered to temporary waste dump sites. If items that might contain asbestos are found in the disaster waste stored in a temporary waste dump site, they should be analyzed for confirmation. During destroyed home removal (and dismantling if necessary) and shredding work at temporary waste dump sites, workers should wear suitable masks and water should be sprinkled to prevent exposure to asbestos.
Fishing nets	Because fishing nets have weights using lead and other metals, they must be separated beforehand. Fishing nets are either incinerated or put in landfills. However, there are cases in which lead is used in the fishnet wires. So, if fishnets are incinerated, the main ash, fly ash, and slags are analyzed for their lead content and monitoring must be continued during the process.
Fishing gear	Because fishing gear is difficult to shred, the gear from some areas hit by the Great East Japan Earthquake were manually shredded and incinerated.
Fertilizer, feed, etc.	If fertilizer or feed is exposed to water, then the producers should be asked to process and dispose of it.
Marine waste	After the Great East Japan Earthquake, marine waste was treated according to the “Treatment Guidelines for Disaster Waste that Went Out to Sea during the Great East Japan Earthquake” (November 2011). If a large-scale disaster occurs, the involved parties should follow the government's policy.
PCB waste	PCB waste should not be treated by the local governments, but should be transferred to the PCB storing enterprises.
	When removing a destroyed home which had used or stored PCBs or when PCB equipment is discovered during removal, it should be separated from other waste and stored.
	Transformers, capacitors, and other equipment for which it cannot be determined if PCBs are used should be separated as if they are PCB waste.
Batteries	Beware of electrocution, and use insulated gear, such as cloth or rubber work gloves and long rubber boots.
	Follow the instructions of an electrical technician and a specialist from the manufacturer.

Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (Revised Edition)” (2018)

- In order for local governments to dispose of disaster waste that cannot be recycled or incinerated, it is important for them to secure landfill sites. If landfill sites cannot be secured, then the waste must be handled as part of a wide-area (or inter-municipal) treatment system. If any landfill sites have been secured as part of an agreement, then procedures must be taken to start transportation.
- If a landfill site has not been secured, economic measures and methods should be used to secure sites to which disaster waste can be transported.

Source: Ministry of the Environment “Disaster Waste Countermeasure Guidelines (Revised Edition)” (2018)

5.4 Challenges and Considerations for Taking Measures

It is difficult to get people to focus on disaster waste countermeasures during normal times but if the measures are not sufficient, then the living environment and sanitation of the disaster areas will be adversely affected, and these could become obstacles to recovery and reconstruction. Therefore, the

local governments must take the lead to prepare so that they can take quick and suitable actions, especially in the early stages when a disaster occurs. It is also necessary to inform residents of the suitable actions to take during normal times so they can take suitable action, such as sorting and transporting waste, during the confusion of a disaster without having to wait for instructions from the authorities.

To those ends, local governments should make disaster waste treatment plans and conduct disaster training during normal times. They should also consider situations in which local treatment is difficult and cooperate with other local governments and related organizations. To promote these activities, the central government is currently making guidelines and manuals for local governments and revising the systems. Although over 60% of local governments have formulated disaster waste treatment plans as of 2021, the current challenge is improving this figure. Another challenge for the future is to improve the practicality of plans so that waste can be processed according to the plans during disasters, and so that each local government can take suitable actions according to their plans during disasters.

With regard to actions after a disaster occurs, a system of subsidies from central government for the management of disaster waste by local governments has been established through legislation. This assures the implementation of disaster waste treatment by local governments and is an important foundation for their promotion.

5.5 Japan's International Cooperation

As an example of Japan's international cooperation related to disaster waste, the debris treatment support provided to Nepal after the major earthquake that struck that country in 2015 and the creation of the "Asia-Pacific Disaster Waste Management Guidelines" are introduced in this section.

From April to May 2015, earthquakes of a maximum magnitude of 7.8 struck the municipality of Gorkha which is about 77 km northwest of the capital city of Kathmandu. Over 50,000 homes were destroyed and there were over 8,000 casualties. In response, the Japanese government, through the Japan International Cooperation Agency (JICA) dispatched an international emergency relief team and provided about JPY 25 million of emergency relief supplies (tents, blankets, etc.) as humanitarian support for the victims. In addition, based on requests from the government of Nepal and the United Nations Environment Programme (UNEP), the Ministry of the Environment provided technical support for formulating disaster waste treatment plans centered on the recycling of the bricks from the buildings destroyed in Nepal.



JICA's Support for Nepal's Earthquake Recovery -Build Back Better

On 25th April 2015, a devastating earthquake of magnitude 7.8 (source: USGS) struck Nepal with its epicenter in the Gorkha District which is approximately 77 km northwest of Kathmandu, the capital city of Nepal. Followed by several major aftershocks, tremendous impacts were caused on various aspects of the Nepalese society. Nearly 9,000 people were killed and 22,000 injured. Over half a million houses were fully or partially damaged, with 3 million people rendered homeless. Further, the earthquake not only damaged infrastructure such as housing, schools, hospitals, cultural heritages, roads and so on, but also severely impacted people's livelihood options and the local economy.

Japan International Cooperation Agency (JICA), being a long-time development partner for Nepal, has been supporting the Government of Nepal and its people in the post-earthquake recovery and reconstruction, by pursuing the principle of Build Back Better (BBB).

Build Back Better (BBB)

"Build Back Better" is the guiding principle to use a disaster as a chance to rebuild resilient society by integrating disaster risk reduction into development measures, making nations and communities more resilient to future disasters. It aims to improve living, environmental and livelihood conditions, not to recreate the same vulnerability through the reconstruction process.

(UNISDR, Working Text on Terminology, 2016)

OUR FOCUS AREAS

- 1 Rehabilitation and Reconstruction of Rural Housing, Schools, Hospitals, Cultural Heritages and Other Infrastructure
- 2 Quick Impact Projects (QIPs) to restore small public facilities and improve livelihood of earthquake victims
- 3 Development of the Kathmandu Valley Resilience Plan and District Reconstruction Plans
- 4 Disaster risk assessment and enhancement of Nepal's disaster risk reduction capacity

Source: JICA "Build Back Better-Supporting Nepal for Earthquake Recovery" (2017)

Figure 5-26 Brochure for Introducing the Project for Supporting Nepal for Earthquake Recovery, Prepared by JICA

At the G7 Toyama Environment Ministers' Summit in May 2016, the "Toyama Material Cycle Framework" was adopted for the field of disaster waste management. The G7 countries agreed to provide support for nations and regions in the Asia-Pacific region that experienced natural disasters.

Based on this agreement, from fiscal 2017, the Ministry of the Environment examined the natural disasters occurring around the world, centering on the Asia-Pacific region, and the treatment of disaster waste, then it organized the issues and lessons learned. Based on the Japanese know-how on disaster waste countermeasures and the needs of other countries that were identified through the aforementioned study, in October 2018 the Ministry of the Environment created the "Asia-Pacific Disaster Waste Management Guidelines" to describe the points necessary to accurately, smoothly, and quickly process disaster waste.

The guidelines consist of a broad overview of disasters and disaster waste in the Asia-Pacific region, then describe the necessary disaster waste countermeasures and disaster waste management policies. Information on how to take countermeasures against disaster waste, what kind of institution is necessary for disaster waste management and the preparations that should be taken during normal times are identified.



Source: Ministry of the Environment “Disaster Management Guideline for Asia and the Pacific (Japan Society of Material Cycles and Waste Management)” (2018 English ver.), (2019 Indonesian ver.)

Figure 5-27 Front cover of Disaster Waste Management Guidelines for Asia and the Pacific

The English, Indonesian, Thai, and Nepalese versions of the guidelines were published and made available on the Ministry of the Environment's Disaster Waste Management Information Site¹ and the Japan Society of Material Cycles and Waste Management website² for free download.

The guidelines assert the importance of making plans before disasters strike. It asserts that thorough discussions and considerations by the related parties are necessary in order to formulate plans that are realistic and practical. The guidelines especially emphasize that during the initial period immediately after a disaster strikes, there must be specific instructions, including the selection of temporary waste dump sites. Additionally, the guidelines note that after the plans are formulated, it is important that the plan contents are shared among all parties involved and regularly reviewed.

In addition to the above, Japan's Ministry of the Environment believes that suitable waste treatment in normal times is important to protect the environment from the scattering and discharge of waste. Therefore, the ministry is conducting in-person and online training courses for persons in charge of waste management in other countries that are related to Japan's policies and legislation for waste management and help them gain a better understanding of the waste treatment technology in Japan. At the same time, the Ministry of the Environment is conducting courses and human resource

¹ http://kouikishori.env.go.jp/action/international_organizations_cooperation/

² https://jsmcwm.or.jp/international/?page_id=2187

development training so that people in the interested countries can learn the knowledge necessary for introducing waste treatment facilities.

5.6 Cases in the Past

The combination of the earthquake and tsunami caused by the Great East Japan Earthquake in 2011 created approximately 2,000 tons of disaster waste. Due to the cooperation among the various organizations and their quick responses, this waste was treated according to plan by 2014.

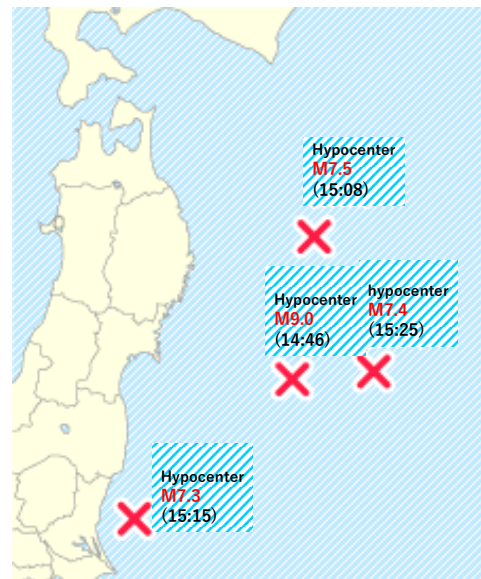
An overview of the management of the disaster waste generated from the Great East Japan Earthquake that struck in March 2011 is introduced below as an example of disaster waste management in Japan. It should be noted that the Ministry of the Environment has its “Disaster Waste Treatment Archives” at its Disaster Waste Countermeasures Information Site with records about recent disaster waste cases that are available to the public.

In March 2011, an earthquake with a maximum magnitude of 9.0 struck off the Sanriku coast. This earthquake caused unprecedented human and material damage of 19,630 dead, 2,569 missing, and 6,230 injured. The tsunami that resulted from this earthquake increased the damage.

A vast quantity of disaster waste resulted from the earthquake and tsunami. A gross tonnage of about 20 million tons of disaster waste was generated in 239 municipalities in 13 prefectures. In addition, a gross tonnage of about 11,000 tons of tsunami deposits was confirmed in 36 municipalities in six prefectures.

After the Great East Japan Earthquake struck, the prime minister headed the Emergency Disaster Countermeasures Headquarters that was established under the *Disaster Countermeasures Basic Act*. Additionally, the Deputy Minister of the Cabinet Office headed the Local Countermeasures Headquarters located at the capital of Miyagi Prefecture, and Local Government Contact Offices were installed in the capitals of Iwate and Fukushima Prefectures.

Immediately after the earthquake, the Ministry of the Environment established its own Emergency Disaster Countermeasures Headquarters with the Minister of the Environment at the head. In addition, it installed its Ministry of the Environment Local Countermeasures Headquarters at the Tohoku



Source: Ministry of the Environment Website (Disaster Waste Management Information)
http://kouikishori.env.go.jp/archive/h23_shinsai/damage_situation/
 (accessed February 23, 2022)

Figure 5-28 Hypocenters of the Great East Japan Earthquake

Region Environment Office located in Sendai City, and it dispatched Ministry of the Environment employees to the capitals of Iwate, Miyagi, and Fukushima Prefectures. Furthermore, the Ministry of the Environment established the Disaster Waste Countermeasures Special Headquarters under the Ministry of the Environment's Emergency Disaster Countermeasures Headquarters for the coordination of disaster waste treatment for the entire region.

This earthquake caused considerable damage to both movable and immovable properties and the tsunami carried much of the properties to distant locations creating vast quantities of movable and immovable properties with unknown owners. The handling of the ownerships of these properties was an emergent and important issue in treatment of the disaster waste, so the related government ministries held the Review Meeting regarding the Legal Problems related to the Treatment of Disaster Waste. On March 25, the prefectures were notified of the "Guidelines related to the Removal of the Homes Destroyed in the Tohoku Region's Pacific Coast Earthquake".

In May of the same year, the "Treatment Guidelines (Master Plan) for Disaster Waste related to the Great East Japan Earthquake" was created and disaster waste management was to be implemented on the basis of these guidelines.

At the local government level, the three most affected prefectures - Iwate, Miyagi, and Fukushima - established the Disaster Waste Treatment Countermeasures Council made up of persons from the central government's local departments, prefectures, municipalities, and related organizations to comprehend the quantity and quality of the disaster waste, consider systems to process it, clarify the different roles, and formulate and manage the treatment plans. The Council formulated the Disaster Waste Treatment Execution Plan as a concrete treatment plan that was based on the central government's guidelines.

The basic policy in the central government's guidelines was follows: (1) Roughly sort the waste where it was generated, then deliver it to temporary waste dump sites to reduce the amount of mixed waste as much as possible. Also, separate the combustible, non-combustible, and recyclables at the temporary waste dump sites and process in suitable ways to reduce costs and the quantity requiring final disposal. (2) Create treatment process flows by type of waste and using these as a basis, recycle as much as possible. At the same time, the guidelines mentioned the need for more wide-ranged, or inter-municipal treatment.

Based on these guidelines, an overview of the treatment plans made by Iwate and Miyagi Prefectures is shown in Table 5-11. Of the three prefectures most seriously damaged by the earthquake, a separate *Special Measures Act* was enacted for Fukushima Prefecture due to the effects of the environmental pollution caused by the radioactive materials from the damage to the nuclear power plants. The *Special Measures Act* designated the central government to treat the disaster waste in the evacuated areas of the prefecture so that Fukushima Prefecture did not make its own plans.

Table 5-11 Overview of the Disaster Waste Treatment Plans in Iwate and Miyagi Prefectures

Prefecture	Contents of the treatment plan
Iwate	The initial plan estimates based on the number of houses destroyed were 3.98 million tons of disaster waste, 1.85 million tons of tsunami deposits for a total of 5.83 million tons.
	The prefecture was assigned comprehensive authority to handle the administrative matters for the 12 coastal municipalities that suffered the greatest damage and treatment was conducted jointly with specific measures taken by the individual municipalities.
	The cement plants in the prefecture were positioned as central treatment facilities and the existing waste treatment facilities, including private facilities, were utilized to the maximum.
	Two temporary incinerators (195 ton/day) and secondary temporary waste dump sites with shredding and separating facilities for each district (9 locations) were established. After maximizing treatment within the prefecture, any excess was sent to wide-area treatment facilities.
Miyagi	The initial estimates based on the number of destroyed houses and excluding tsunami deposits was approximately 15.5 to 18.2 million tons of waste.
	Excluding Sendai City and Rifu Town which had their unique treatment facilities, the prefecture was assigned comprehensive authority to handle the administrative matters for the 13 coastal municipalities, and it divided the prefecture into four blocks.
	In the four blocks and Sendai City, the prefecture installed a total of 29 temporary incinerators (total capacity about 4,600 ton/day), nine secondary temporary waste dump sites, three delivery stations, and 12 shredding and sorting facilities.
	In order to decrease the quantity headed to landfills, treatment in the prefecture was maximized by means such as solidifying incinerator ash into pellets for recycling, and only any excess was sent to wide-area treatment facilities.

Source: Ministry of the Environment Website (Disaster Waste Countermeasures Information Site) "Disaster Waste Disposal Details" http://kouikishori.env.go.jp/archive/h23_shinsai/implementation/contents/ (accessed February 23, 2022)

As a result of these countermeasures, as of the target date of the end of March 2014, disaster waste treatment was completed in 231 municipalities in 12 prefectures (excluding Fukushima Prefecture) so the target was mostly met.



Photo 5-11 Conditions of Temporary Storage Site (Ishinomaki City, November 2012)

Source: Ministry of the Environment Website (Disaster Waste Management Information) “Before and after completion of temporary waste dumps” http://kouikishori.env.go.jp/archive/h23_shinsai/photo/ba/ (accessed January 29, 2022)



Photo 5-12 Temporary Incinerator (Koizumi Region, May 2013)

Source: Ministry of the Environment Website (Disaster Waste Management Information) “Kesenuma City, Miyagi Photo Archive” http://kouikishori.env.go.jp/archive/h23_shinsai/photo/area_miyagi_kesenuma.html (accessed January 29, 2022)

6 Marine Plastic Waste Issue

Recently, the marine plastic waste issue has been reported through various media outlets and is increasingly attracting attention globally. This section describes the global situation of the marine plastic waste issue, the approach taken by Japan on this issue, and the countermeasures to be taken by each country through the current situation of international cooperation relating to the marine plastic waste issue.

6.1 Global Situation

Since having been reported in the World Economic Forum in 2016, the marine plastic waste issue has become a global issue that needs to be addressed, and the 2018 Charlevoix G7 Summit Communique was formulated making the global approach more active. This issue is being addressed by the private sector also, mainly among the global enterprises.

Since the introduction of plastic products around the 1950s, their applications have expanded due to the ease of processing and stable non-corrosive characteristics, and the gross production amount so far is said to exceed 8.3 billion tons. Of this, 6.3 billion tons are disposed of as waste, much of which is landfilled or dumped in the ocean. Recently, large amounts of plastics were found from the stomachs of dead seabirds and whales in various regions around the world. A video showing a scene in which a plastic straw was removed from the nose of a turtle was aired in the media and this image galvanized global attention to the marine plastic waste issue. The issue of marine plastic waste is now being addressed as a global scale.

According to the report³ of the World Economic Forum in January 2016, 90% or more of plastics are not recycled and at least 8 million tons of plastics, mainly plastic containers and packaging materials, flow out to oceans annually. In one estimate marine plastic waste is inflicting damage on the marine ecosystem, fishing industry, and tourism of about 13 billion dollars annually. In addition, the impact of the plastic pollution is concerning in terms of not only the health of marine organisms but also the health of human beings as microplastics - plastics with a diameter of 5 mm or less - are ingested into human bodies through the food chain.

³ World Economic Forum “The New Plastics Economy - Rethinking the future of plastics”
https://www3.weforum.org/docs/WEF_The_New_Plastics_Economy.pdf

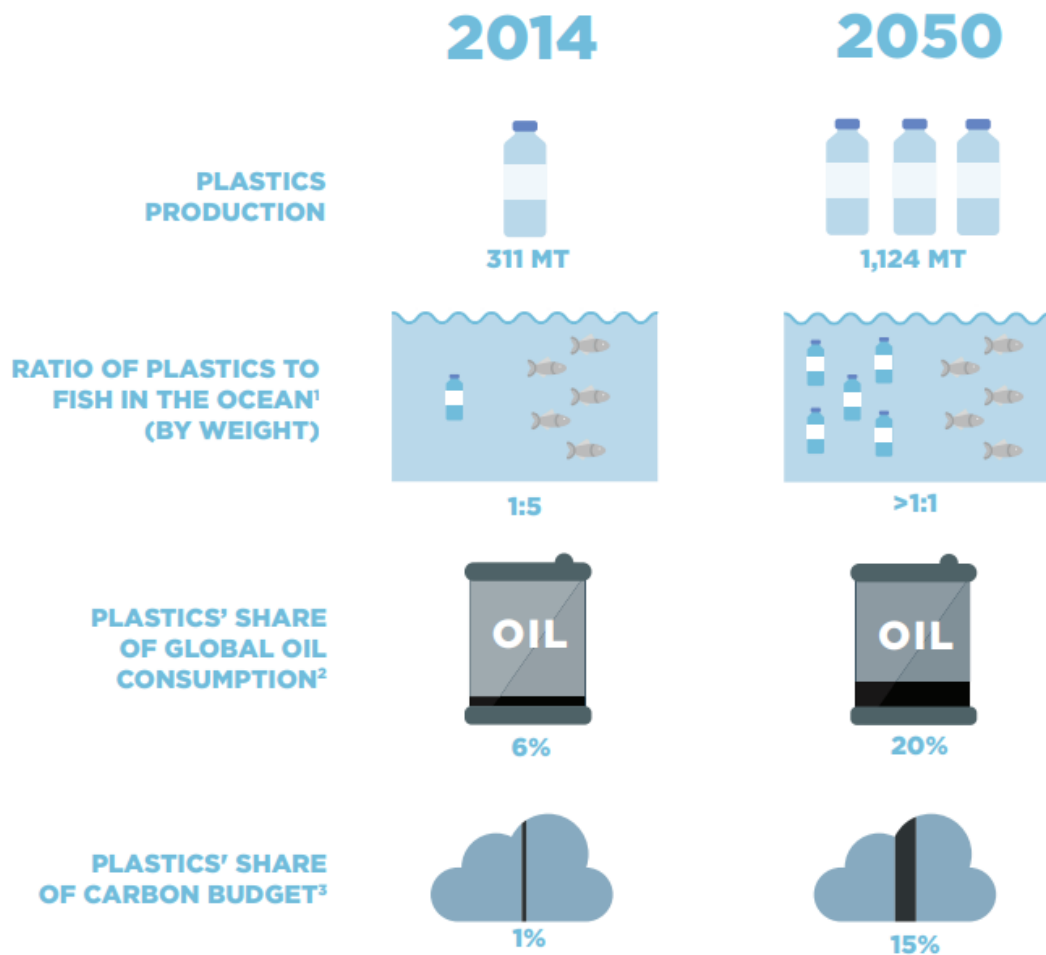


Photo 5-13 Plastic Waste on the Beach



Photo 5-14 Sea Turtle and Plastics

Source: DigArt “Plastic bottles and waste washed up on a beach by the incoming tide, covering the entire beach at Umkomaas in KZN, South Africa” (Photo 5-13), Willyam Bradberry “Water Environmental Pollution Problem Underwater animal Sea turtle eating Plastic” (Photo 5-14)



Source: World Economic Forum “The New Plastics Economy - Rethinking the future of plastics” (2016)

Figure 5-29 Expected Increase of Plastics under BAU Scenario

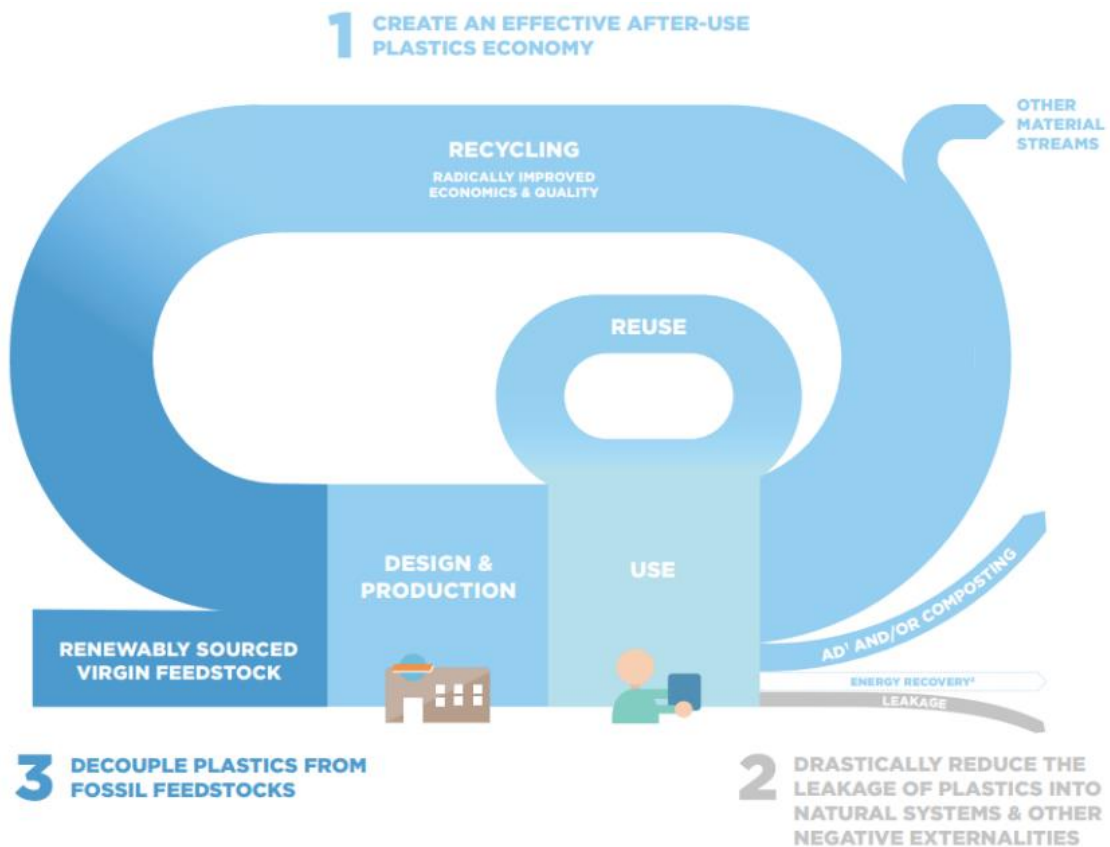
Figure 5-29 was included in the report titled “New Plastics Economy”, that was presented by the World Economic Forum in 2016. This report indicates that the amount of plastic waste generated

annually was 0.3 billion tons in 2014 and the amount is expected to increase to 1.1 billion tons annually by 2050, which is equal to the weight of all the fishes in all of the oceans.

Governments and businesses across the world are accelerating their efforts to address this plastic pollution on a global scale. A group of seven advanced countries (G7: France, USA, UK, Germany, Japan, Italy, and Canada) reconfirmed the actions on the marine plastic waste in the Declaration of the Japan G7 2016 Ise-Shima Summit. In the Italy G7 Bologna Environment Ministers' Meeting in 2017, the concerns regarding the marine plastic waste issue and the microplastics issue were expressed and the members reconfirmed further promotion of the accord of science-based indicators and methods for monitoring and assessment and the innovative reduction of disposable plastics and microplastics to avoid the outflow of plastic waste to the marine environment.

In the Charlevoix G7 Summit that was held in Canada in 2018, the Communique, "Charlevoix Blueprint for Healthy Oceans, Seas, and Resilient Communities" was adopted with the recognition of the urgency of the threats towards the ecosystem as well as the commitment to shift to the more resource efficient and sustainable plastic management approach. In addition, Canada, France, Germany, Italy, and UK, and the EU leaders signed "The Ocean Plastics Character", for the cooperation of the private sector and Governments to recycle or reuse 50% of plastic packaging by 2030 and recover all the plastics by 2040.

In the private sector, the efforts are progressing mainly among the global companies. Coca-Cola Company declared "Zero Waste Initiative" in 2018, where all the plastic bottles and empty cans are collected across the world and recycled by 2030. At the same time, the company tackled adaptation of 100% recyclable packaging materials under the "World Without Waste" program and developed the World's first 100% plant-based plastic bottles in 2015. Pepsi-Cola Company also committed, in October, 2018, to an increase of the recycled material ratio for plastic container production to 25% by 2025, and in particular, for plastic bottles, an increase up to 33%. In the Davos Forum in January 2019, plastic waste was addressed as the main theme and P&G and Pepsi-Cola announced their efforts for sales and distribution of the products that use glass and stainless containers to be reusable for up to 100 times. While the marine plastic waste is gathering more attention in this way and the urgency for handling the issue is being cried out, the 4th United Nations Environmental Assembly (UNEA4) was held in Nairobi, Kenya from March 11 to March 15, 2019. With this international momentum, the issue of marine plastic waste was taken as the main agenda. In UNEA4, in addition to the ministerial declaration titled "Innovation Solutions for Environmental Challenges and Sustainable Consumption and Production" that includes remarks on marine plastic waste, a total of 23 resolutions were adopted, including the resolution relating to "Marine Plastic Waste and Microplastics" based on the joint proposal by Japan, Norway, and Sri Lanka and the resolution relating to the "Innovative Pathway to Achieve Sustainable Consumption and Production".



Source: World Economic Forum “The New Plastics Economy - Rethinking the future of plastics” (2016)

Figure 5-30 New Plastics Economy which the World Should Aim for

6.2 Current Situation in Japan

At the G20 Osaka Summit in 2019, Japan called on all countries to be involved in the “Osaka Blue Ocean Vision”, and the “MARINE Initiative” was launched in August 2021 to support global measures. This initiative supports developing countries to promote marine waste collection and innovation.

Strongly encouraged by this international momentum, Japan is also promoting countermeasures to combat plastic pollution.

The Ministry of the Environment has continuously conducted surveys and published the results on marine debris, including drifted and adrift litter and marine bed litter, since 2006, in consideration of their impacts on the environment, including the degradation of coastal functions and ecosystems, hindrance to safe vessel navigation, damage to the fishing industry, and secondary disasters caused by drifting medical waste, as well as the damage to the seashore scenery. According to the FY2020 report, most of the microplastics observed in the sea area are polyethylene and polypropylene, and the particle size varies depending on the location of the observation. In addition, based on the results

of these surveys, a “Study Group on Understanding the Actual Condition of Marine Litter and Effective and Efficient Marine Litter Recovery” has been convened and experts are now studying the issue.

At the G20 Osaka Summit that was held in Osaka on June 28, 2019, as the chair country Japan promoted “Osaka Blue Ocean Vision” to each country as a universal global vision. The aim is to completely eliminate extra pollution caused by marine plastic waste by 2050 through the comprehensive approach to life cycle including the reduction of the outflow of plastic waste caused by poor management. This is to be achieved by the improvement of waste management and innovative solutions that are achieved while recognizing the important role of plastics in the society.

In this Summit, Japan also announced the country’s intention to support capacity building and infrastructure development relating to waste management in developing countries. To achieve this objective, the Japanese Government established the “Marine Initiative” to support effective global countermeasures for marine plastic waste, by focusing on (1) waste management, (2) recovery of marine waste, (3) innovation, and (4) capacity enhancement. The Japanese Government supports capacity enhancement of developing countries to promote waste management, recovery of marine waste, and innovation through the following specific policies under this initiative.

Table 5-12 Specific Policies to be Implemented Under the Marine Initiative

Policy	Specific content
International cooperation including bilateral ODA and support via international organizations	Provide a variety of support factors including the support through ODA and international organizations to developing countries through bilateral and multilateral cooperation for the introduction of high-quality environmental infrastructures and related human resource development. Such infrastructures include (1) Capacity building and institution building for waste management and 3R promotion including waste legislation and separation and collection systems (2) Formulation of an action plan by each country relating to marine waste (3) Waste treatment facilities including recycling facilities and waste power generation facilities.
	Globally, train 10,000 waste management personnel by 2025
	Provide ASEAN countries with support based on the “ASEAN + 3 Marine Plastics Debris Cooperative Action Initiative” towards improvement of awareness of non-governmental entities including communities, citizens, and business sectors and formulation of an action plan by each country for marine waste, proper waste management including waste power generation infrastructure, and capacity building relating to 3R.
Promote International development activities by Japanese companies, NGOs, and communities	Provide support to the South-East Asian region for the monitoring of marine plastic waste and develop human resources.
	Promote international development activities by Japanese companies, NGOs, and local public bodies through the development of international businesses associated with industries and collaboration with NGOs and local public bodies for the export of infrastructure such as waste treatment related facilities and support of innovations and technology introduction relating to substitutes for plastics and recycling technology.
Demonstrating/sharing of best practices	Promote international cooperation by the industrial sector such as support for improvement of plastic waste management in the emerging Asian countries through the Japan Initiative for Marine Environment (JaIME) that was established by the chemical industry group of Japan and the prevention of dispersion and outflow of pellets based on the Memorandum of Cooperation of the industry related to Japan-China plastic processing.
	Demonstrate and share best practices (experience, knowledge and technology) in the approaches by the Japanese public and private sectors relating to the waste management and collection of marine waste through the related international conferences (United Nations Marine Conference, Regional 3R Forum in Asia and Pacific) and initiatives.
	Promote the sharing of knowledge relating to countermeasures for marine plastic waste to ASEAN countries through the establishment of “Marine Plastic Waste Knowledge Center”.

Source: Ministry of Foreign Affairs Website “MARINE Initiative toward Realization of the Ocean Blue Vision”
https://www.mofa.go.jp/mofaj/ic/ge/page25_001919.html (accessed February 17, 2021)

(1) Organization

In June 1989, two directors from the Ministry of the Environment, one responsible for the ministry bureau⁴ in charge of proper waste treatment, environmental regeneration and resources recycling and the other heading the section⁵ charged with marine environment at the ministry's Bureau of Environment Management, recommended the establishment of systems for marine plastic waste treatment in each prefecture. A notice of this recommendation regarding the development of a management system for drifting waste was issued to the directors responsible for municipal waste management and coastal debris countermeasures of each prefecture. Under this notification, the prefectures were requested to examine the need to develop a system for treatment of drifting waste, which is collected through the collaboration of municipalities and fishery industry organizations within the jurisdiction of each prefecture, as well as for circulation of the information to the municipalities within the respective prefecture's jurisdiction, in order to address the conservation of the marine environment and conservation of the living environment. The central government also requested the municipalities to proactively examine the treatment of drifting waste including the utilization of treatment facilities available to the municipalities. Associated with this request, the central government also requested that prefectures and municipalities work together, participate in the coastal debris countermeasures promotion council, and coordinate between the prefecture regional plan and the waste treatment plan.

At the same time, the Notification, "Regarding the promotion of collection and disposal of drifting waste" was issued from the Fisheries Agency to the Fisheries Departments of Prefectures and the National Federation of Fisheries Cooperatives, and the Japanese Fisheries Association.

In addition, based on the regulation, *Coastal Debris Treatment Promotion Law*, that is described later in this section, the Coastal Debris Disposal Promotion Meeting (Article 30, Paragraph 1) and the Coastal Debris Countermeasure Meeting (Article 30, Paragraph 2) are held regularly. These meetings are utilized for liaison and coordination for the promotion of comprehensive, effective, and efficient coastal debris countermeasures by the related administration organizations and also to reflect on advice of the experts relating to coastal debris.

⁴ Ministry of the Environment, Environmental Reclamation and Resource Recycling Bureau, Waste Proper Management Division

⁵ Ministry of the Environment, Marine Environment Office, Water Environment Division, Water and Air Environment Bureau

(2) Legal System

In Japan, marine environment conservation and marine plastic waste countermeasures are implemented based on the *Coastal Debris Treatment Promotion Law* and “Plastic Resource Recycling Strategy”.

The legal system regulating the marine plastic pollution countermeasures in Japan is based on the *Law Concerning Promotion of Good Landscape and Environment on the Coast to Protect Beautiful and Rich Nature and Disposal of Coastal Debris Related to Conservation of Marine Environment* (hereafter referred to as the *Coastal Debris Treatment Promotion Law*) which was enacted in July 2009. This law was partially amended in June 2018 and renamed the *Law Concerning Promotion of Good Landscape and Environment on the Coast to Protect Beautiful and Rich Nature and Disposal of Coastal Debris Related to Conservation of Marine Environment*.

In accordance with this law, the basic policies were approved by the Cabinet Meeting in March 2010 and as a result of the amendment of the law, the change was approved by the Cabinet in May 2019.

This law applies the following as the basic principles for conservation of good coastal landscape environment and the marine environment: (1) Conservation and regeneration of comprehensive marine environment, (2) Clarification of responsibilities and promotion of smooth waste treatment, (3) Effective control of the generation of coastal debris by 3R promotion, etc., (4) Conservation of marine environment (including microplastics countermeasures), (5) Ensuring appropriate role sharing and collaboration among the diverse bodies, and (6) Promotion of international cooperation.

In addition, based on the 4th Fundamental Plan for Establishing a Sound Material-Cycle Society that was approved by the Cabinet in June, 2018, the Plastic Resource Recycling Strategy was established in 2019. This strategy promotes infrastructure improvements and includes (1) reduction of plastic waste, (2) promotion of recycling (3) promotion of utilization of recycled materials and bioplastics, (4) countermeasures to prevent marine plastic waste, (5) promotion of international development, and (6) technology development, collaboration, and cooperation. Therefore, the central government has adopted the reduction in discharge of plastic waste as a national policy.

In May 2015, “Marine Plastic Waste Countermeasure Action Plan” was formulated at the “Ministerial Meeting on Marine Plastic Waste Countermeasure Action Plan”. In the plan, specific countermeasures have been outlined and promoted, various guidelines relating to marine plastic waste are provided, and their utilization is recommended. The main guidelines are listed in Table 5-13.

Table 5-13 List of Various Guidelines Related to Marine Plastic Waste

Title	Intended organization	Purpose/target	Expected utilization method
Guidelines for surveying the actual conditions of scattered waste	Survey bodies/operators that conduct surveys based on orders received from municipalities or local environmental research centers	Checking the actual conditions of the waste scattered over land areas, riverbanks, and riverbeds	Use for long-term monitoring of sites where scattered waste countermeasures are under implementation, setting targets and course of actions, verification of effects of measures taken, and effects of countermeasures
Collection of reference materials for surveying river waste		Checking the actual condition of floating waste through rivers from land areas to sea areas (in principle, 25mm or more in length)	Check the actual condition of river waste and obtain long-term assessment indicators of the targets and course of actions of the countermeasures, indicators of specific measures, and specific countermeasures that were taken.
Guidelines for surveying river microplastics		Checking the actual condition of microplastics in river water within the microplastics flowing out from land areas to sea areas	Promotion of countermeasures for microplastic generation sources through collaboration between municipalities and related organizations and residents based on the survey results.
Guidelines for surveying drifting waste composition		Checking continuously the actual conditions of the drifting waste amount and composition over a long term and changes of these conditions over time.	Obtaining the targets and course of actions of drifting waste countermeasures, indicators of specific countermeasures, and indicators of long-term assessment of the countermeasures that were taken
Guide for creating regional plan based on the <i>Coastal Debris Disposal Promotion Law</i>	Prefectures	Formulation or change of the regional plan based on the Coastal Debris Disposal Promotion Law	Comprehensive and effective promotion of countermeasures for coastal debris in respective regions
Casebook of measures to control the generation of marine debris	Municipalities, NPOs, and self-governing associations	Effective implementation of marine waste generation control measures	Promotion of control of new marine waste and its collection

Source: Ministry of the Environment Website “About Various Survey Guidelines for Marine Plastic Waste”
http://www.env.go.jp/water/marine_litter/post_118.html (accessed February 20, 2021)

(3) Treatment Flow

With regard to marine plastic waste that has drifted ashore, the *Coastal Debris Treatment Promotion Law* stipulates that the responsibility for the treatment of that waste lies with the administrator of the beach where the waste has drifted ashore. At the same time, beach occupants who are not coast administrators are obliged to make efforts to clean up the waste. Municipalities are also required to cooperate with coastal administrators.

On the other hand, when it is clear that much of the coastal debris has flowed from areas of other prefectures, the governor of the prefecture where the waste has flowed in may request the governors of those prefectures where the waste flowed from to dispose of the coastal debris, as well as other related actions. According to the regulation, when a problem in the environmental conservation in the region is identified due to debris from overseas, the Minister of Foreign Affairs is to take the appropriate action.

The collected marine plastic waste is appropriately treated as municipal waste at the treatment facility of the municipality within which the coast is located, however, the treatment may vary depending on the municipality.

(4) Approaches Taken by the Japanese Government and Municipalities

The Japanese Government established the Marine Plastic Waste Countermeasure Action Plan in May, 2019 for the implementation of marine plastic waste countermeasures. The Government, municipalities, and related organizations are implementing the countermeasures based on this Action Plan. The Action Plan is outlined in Table 5-14.

Table 5-14 List of Various Guidelines Relating to Marine Plastic Waste

Purpose	Main organizations in charge of the countermeasures at the Government level
Thorough collection and proper treatment and disposal by the waste management system, etc.	<ul style="list-style-type: none"> • Containers, packaging, and products (land area) Ministry of the Environment and Ministry of Agriculture, Forestry, and Fisheries • Plastic products used in sea areas such as fishing equipment Ministry of the Environment, Ministry of Agriculture, Forestry, and Fisheries, Ministry of Land, Infrastructure, Transport and Tourism
Prevention of littering, illegal dumping, and unintentional outflow to the ocean	<ul style="list-style-type: none"> • Containers, packaging, and products (land area) Ministry of the Environment, The National Police Agency, Japan Coast Guard, and Ministry of Internal Affairs and Communications, Ministry of Land, Infrastructure, Transport and Tourism, Ministry of Agriculture, Forestry, and Fisheries, and Ministry of Economy, Trade, and Industry • Plastic products used in sea areas such as fishing equipment Ministry of Agriculture, Forestry, and Fisheries, and Japan Coast Guard
Collection of litter and illegally dumped waste	Ministry of the Environment, Ministry of Land, Infrastructure, Transport and Tourism, Ministry of Education, Culture, Sports, Science and Technology, and Japan Coast Guard
Collection of plastic waste that has flowed into the ocean	Ministry of the Environment, Ministry of Agriculture, Forestry, and Fisheries, and Ministry of Land, Infrastructure, Transport and Tourism
Innovation such as development and conversion of alternative materials	Ministry of Economy, Trade, and Industry, Ministry of the Environment, Ministry of Agriculture, Forestry, and Fisheries, and Ministry of Education, Culture, Sports, Science and Technology
Collaboration of related parties for promotion of the approaches	Ministry of the Environment, Ministry of Agriculture, Forestry, and Fisheries, Ministry of Economy, Trade, and Industry, Consumer Affairs Agency, Ministry of Education, Culture, Sports, Science and Technology, Cabinet Office, and Ministry of Land, Infrastructure, Transport and Tourism
International contribution to promote measures in developing countries	Ministry of Foreign Affairs, Ministry of the Environment, Ministry of Economy, Trade, and Industry
Understanding the actual situation and accumulating scientific knowledge	Ministry of the Environment, Japan Meteorological Agency, Ministry of Agriculture, Forestry, and Fisheries, and Ministry of Education, Culture, Sports, Science and Technology

Source: Ministry of the Environment Website "About Marine Plastic Waste Countermeasure Action Plan" (2019)

6.3 Monitoring

In this Action Plan, indicators are set to effectively implement the activities and check the progress each year. Table 5-15 shows the indicators and monitoring organizations.

Table 5-15 Indicators and Implementation Organizations

Indicator	Implementation organization
Amount of plastic waste properly treated domestically	Ministry of the Environment
Amount of plastic waste littered, illegally-dumped, and scattered that is collected from land areas	Ministry of the Environment
Amount of marine plastic waste collected	Ministry of the Environment
Production capacity and utilization amount of alternative materials (biodegradable plastics, paper, and so on)	Ministry of the Environment and Ministry of Economy, Trade, and Industry
Amount of “properly treated waste” that is increasing through international cooperation	Ministry of Foreign Affairs and Ministry of the Environment

Source: Ministry of the Environment Website “About Marine Plastic Waste Countermeasure Action Plan” (2019)

6.4 Challenges and Considerations

The marine plastic waste countermeasures that were established in 2019 according to the Action Plan are currently being implemented. It is important to maintain flexibility in revising the countermeasures when required according to the situation.

Countermeasures to prevent marine plastic waste in Japan have just commenced, and it is expected that they will be actively promoted in the future, along with countermeasures to manage coastal debris that have been under implementation for some time.

Basically, the countermeasures are implemented according to the contents of the Action Plan that was established in 2019. However, this Plan also needs to be reviewed regularly through deliberations among the concerned parties and surveys and monitoring of the actual conditions.

In Japan, by formulating the “Plastic Resource Recycling Strategy” in 2019, controlling of plastic waste generation itself is progressing through the reduction of the use of one-way plastic, promotion of recycling, and so on.

It is expected that such efforts will gain momentum within the society and lead to solutions of the marine plastic waste issues.

6.5 Japan's International Cooperation

In terms of countermeasures to prevent marine plastic waste, it is important for the world as a whole, including developing countries, to promote efforts to curb the outflow of plastic waste into the ocean. Accordingly, the Japanese Government is promoting effective support for developing countries through the “MARINE Initiative” and other programs mentioned earlier. Examples of surveys and technical cooperation activities recently implemented by JICA are provided in Table 5-16.

Table 5-16 Examples of International Cooperation by Japan Relating to Marine Plastic Waste Countermeasures

Project name	Period	Target region/country
The Project for formation of a center of excellence for marine plastic pollution studies in the Southeast Asian seas	2019 to 2024	South East Asia region
Information collection and confirmation survey on the understanding of the actual conditions of marine plastic waste and utilization of Japanese technologies associated with resource recycling	2019 to 2020	Global
Information collection and confirmation survey on marine plastic issues in the Caribbean region	2020	Caribbean region
Information collection and confirmation survey on the marine waste monitoring and waste power generation towards the sound-material-cycle society of Thailand	2020 to 2021	Thailand
Adviser for marine plastic waste countermeasures in the Caribbean region	2021 to 2023	Jamaica and other countries, Caribbean region

The basic policy of the “Marine Initiative” is to disseminate the knowledge of marine plastic waste countermeasures to ASEAN countries through the establishment of “Marine Plastic Waste Knowledge Center”.

Topic 6. Efforts of the Municipalities in Japan

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1 Overview of Municipalities

Each municipality in Japan has developed its own distinctive approach to waste management based on the national policy. In Topic 6, one municipality is selected from each of large-, medium-, and small- scale municipalities of Japan, and the important points related to waste management in each of the selected three municipalities are highlighted by detailing the experience and knowledge of waste management of that municipality.

This topic introduces the waste management practices of the following three municipalities, selected based on their size and characteristics: the 23 special cities of Tokyo representing a large municipality, Fujisawa City a medium-sized municipality, and Shibushi City a small municipality.

The 23 special cities of Tokyo (hereinafter refer to as Tokyo 23 Cities), the capital of Japan, located at the center of Tokyo, have experienced the challenges of waste management while Tokyo was developing into the large-scale metropolitan capital city of today, and have finally established their current waste management system. Tokyo 23 Cities have also led Japan's waste management program and assisted other municipalities. Local governments in developing countries, especially in capitals and large cities with similar conditions as that of Tokyo, can benefit from the lessons learnt from Tokyo 23 Cities and their experiences.

Fujisawa City is a medium-scale municipality with a population of 430,000. Medium-scale municipalities are suitable for helping to understand the comprehensive system adopted by Japan's municipalities to manage waste. Fujisawa City has from early on actively engaged the private sector in waste recycling and facilities improvement activities. Thus, Fujisawa City is selected as a representative of medium-scale municipalities. Furthermore, Fujisawa City has maintained records of their waste management efforts for many years, and there are many lessons to be learned from the city's experiences for municipalities in developing countries aiming to build a comprehensive waste management system including intermediate treatment in the future.

The third municipality selected here, Shibushi City does not have incineration plants and is known for its high recycling rate. Although it has a short history of waste treatment, the city has reduced the amount of waste disposal at landfill by implementing multi-item sorted waste discharge and separate collection to support recycling, and thereby the life of landfill sites has been successfully extended. The case in Shibushi City may be thought-provoking for municipalities of developing countries that are either planning to promote, or are already engaged in recycling. The Shibushi case study demonstrates how the city reached an agreement with its residents and obtained their cooperation during the development process of their multi-item waste recycling system as well as overcoming other issues.

Note that the history of waste management and recycling from the past to the present in the Tokyo 23 Cities and Fujisawa City is summarized in a chronological table at the end of their respective sections in this topic.



Figure 6-1 Position Map of the Selected Three Municipalities

Table 6-1 Basic Information and the Characteristic of the Selected Three Municipalities

No.	Item	Tokyo 23 Cities	Fujisawa City	Shibushi City
1	Population (person)	9,561,576	434,568	31,160
2	Area (km ²)	627.53	69.56	290.28
3	Collection method (Direct/Contract out)	Direct/Contract out	Contract out (60%)	Contract out
4	Number of Incineration Plants	21	2	0
5	Number of Recycling Plants	3	1	2
6	Number of landfill Sites	2 (adjacent)	1	1
7	Amount of Waste Generated (ton/year)	3,264,286	137,371	9,644
8	Recycling Rate (%)	16.2	29.4	75.1
9	Landfill Amount (ton/year)	298,667	361	2,479
10	Distinctive points, events and initiatives	<ul style="list-style-type: none"> • War on waste • Tokyo Model 	<ul style="list-style-type: none"> • Resource Recovery by Fujisawa Method • WtE Construction by DBO 	<ul style="list-style-type: none"> • Recycling (Shibushi Model) • Qualified Compost

*: Data is of 2019 and the area is as of October 1, 2021.

Source: Based on Ministry of the Environment Website “2018 Actual Situation Survey Result of General Waste” (2021) https://www.env.go.jp/recycle/waste_tech/ippan/r1/index.html (accessed January 1, 2022)

Ministry of Land, Infrastructure, Transport and Tourism “2021 Area survey by prefecture, city, town, and village nationwide (As of October 1, 2021)” (2021)

2 Waste Management Efforts Made by the 23 Special Cities of Tokyo



From 1900 to the present, the 23 special cities of Tokyo have overcome various waste management problems in changing historical backgrounds. The waste management measures taken in each time period are introduced in this section.

Having an area of approximately 2,194 km² (as of 2017), Tokyo is the capital of Japan which is Japan's political, administrative, and economic center. Tokyo, consisting of 23 special cities, 26 cities, 5 towns, and 8 villages, has a population of 14,000,000 (as of 2017) of which the population of the 23 special cities is 9,500,000. The Tokyo Metropolitan Government (hereinafter referred to as TMG) has published “One Hundred Years of Waste Management in Tokyo” on the occasion of the 100th anniversary (2000) of the enactment of the *Waste Cleaning Act* in 1900 and the transfer of the administration of waste management from TMG to Tokyo 23 Cities due to the expansion of self-government. This section summarizes the struggles of Tokyo to improve the unsanitary living environment during the hardships of the Great Kanto earthquake (1923) and World War II, the efforts of people involved in waste management, and the history of Tokyo 23 Cities that have overcome municipal waste problems.

With reference to “One Hundred Years of Waste Management in Tokyo” and information from the “Clean Authority of TOKYO”, this section describes the history of waste management in Tokyo 23 Cities, the war on waste, current waste management efforts, and international contributions.

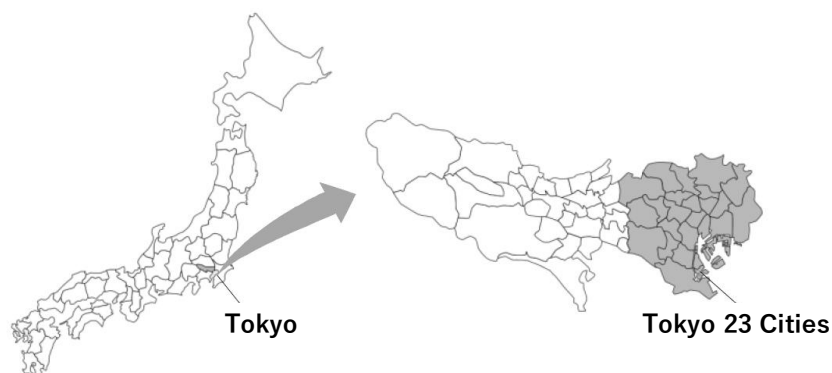
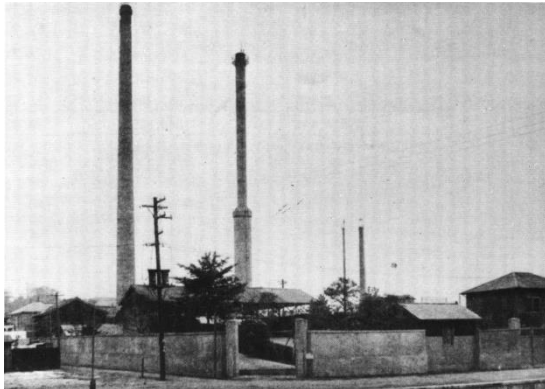


Figure 6-2 Location of Tokyo and Tokyo 23 Cities

2.1 History of Waste Management in Tokyo

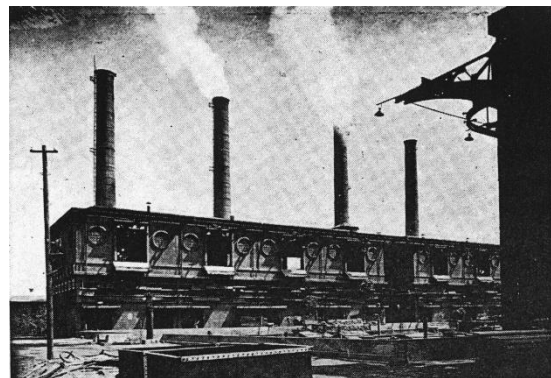
(1) Dawn of the Waste Problem, 1900 - 1955

In the latter half of the 19th century, cholera and plague pandemics were spreading globally and taking measures to protect public health became an issue in Japan as well. The TMG had identified unsanitary conditions as one of the causes of the spread of these infectious diseases, and recognized that prompt and proper disposal of waste and human waste was essential to improve the situation. In 1900 the government of Japan enacted the *Waste Cleaning Act* and municipalities assumed responsibility for waste management. In response, Tokyo introduced a waste collection system and started to contract out collection services to business operators. However, in 1908 problems of unreliable waste collection by business operators arose and TMG reversed its decision of contracting out collection and returned to directly-managing waste collection. Furthermore, to cope with the rapidly increasing amount of waste associated with urbanization, Tokyo constructed the first waste incineration plant in Osaki in 1924 and a municipal waste treatment plant in Fukagawa in 1929.



**Photo 6-1 Osaki Incineration Plant
(Completed in 1924)**

Source: TMG Archives



**Photo 6-2 Fukagawa No 2 and No 3
Incineration Plant (Completed in 1933)**

(2) Period of High Economic Growth - Escalation of the Waste Problem, 1955 - 1973

During the war years, Tokyo's population declined sharply to about 2.5 million. Because of the extreme scarcity of food and other daily commodities, waste generation significantly decreased and around 1945 waste collection was discontinued and residents disposed of their waste by themselves. After the war, however, Tokyo's population grew due to the return of evacuees and military personnel, and sanitary conditions worsened, underlining the urgent need to implement drastic waste management countermeasures.

In 1954, the central government enacted the *Public Cleansing Act*. The act stipulated; (1) the central government sets administrative standards and each municipality is responsible to implement these standards, (2) the concept of simply disposing of waste is replaced by an obligation to manage

the waste in a sanitary method from the standpoint of prevention and environmental sanitation, (3) the responsibilities of the central and prefectural governments and the obligations of municipalities are clarified, and residents are also obliged to cooperate. In response, Tokyo improved the related ordinances and organization. During this period, the mechanization of waste collection progressed. The previous waste collection operation using handcarts was gradually becoming unable to cope with the rapid increase in waste generation. In addition, it was becoming difficult to secure sufficient manpower due to more attractive jobs created by the economic growth. The use of handcarts became less desirable because of the associated poor environmental hygiene and low efficiency, and handcarts were replaced by direct collection and transport by vehicles.

Furthermore, in 1963, a subsidy system was introduced to support the development of the increasingly required larger waste treatment facilities. The *Waste Management Act* was enacted in 1970, and Tokyo revised the waste ordinances to clearly specify the responsibility of business operators who generate business waste and the importance of obtaining the understanding of residents on the waste management system. During this period, mass consumption and increased waste disposal emphasized the need for more efficient waste collection and transport. In 1963, Tokyo abolished the separate collection of kitchen waste, which was introduced in 1931, and returned to mixed waste collection. Mixed waste collection caused many incinerators to shut down because the organic acids corroded the incineration equipment. Therefore, the construction of many new incinerators began. At that time, the amount of waste discharged was increasing and the waste composition was changing due to the increase in plastic waste, making it impossible to treat the waste properly. Under these circumstances, in 1971, the Governor of Tokyo declared a “war on waste” at the Tokyo Metropolitan Assembly and promoted the development of incineration technology and treatment.

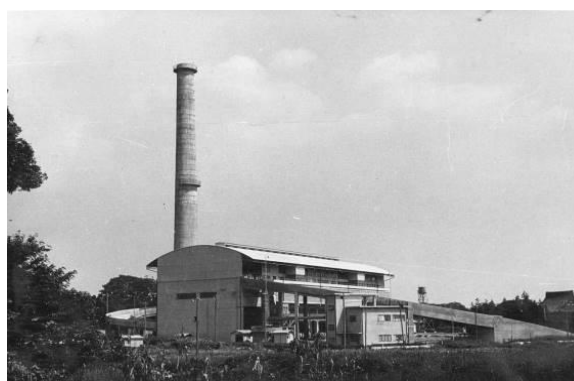


Photo 6-3 Kamisyakujii Fifth Incineration Plant (Completed in 1957)

Source: TMG Bureau of Environment



Photo 6-4 Itabashi Incineration Plant (Completed in 1961)

(3) Period of Stable Economic Growth - Addressing the Environmental Problem, 1973 - 1985

Following the enactment of the *Waste Management Act* by the central government in 1970, Tokyo revised the ordinance to clearly specify the responsibility of business operators who generated business waste. As the necessity for reuse and recycling of waste increased, recycling activities and group waste collection were promoted, and thorough discussions were conducted with local residents through explanatory and consultative meetings. In 1985, incineration plants were in operation at only 13 locations and in order to ensure that the combined incineration capacity was sufficient, source separation and separate collection of combustible and incombustible waste were started.



Photo 6-5 Separate Discharge of Recyclables in Omorideragou Town (1977)



Photo 6-6 Separated Recyclables at the Collection Station in Omorideragou Town (1977)

Source: TMG Bureau of Environment

(4) Significant Increase of the Amount of Waste, 1985 - 1990

Rapid economic growth led to redevelopment in Tokyo and a rush to construct new buildings and condominiums. People's lifestyles also changed resulting in generation and disposal of large amounts of waste and increased variation in waste compositions. TMG reacted by calling for waste reduction and recycling.

(5) Introduction of a Sound Material-Cycle Society, 1990 - Present day

With the revision of the *Waste Management Act* in 1991, promotion of waste reduction and recycling heightened. After the central government enacted the *Act on the Promotion of Effective Utilization of Resources* in 1991, Tokyo started to fully charge for bulky waste collection in the same year and for business waste collection in 1996. Tokyo also established a new ordinance that strictly promoted the reduction of waste generation and reuse of waste in 1992. In 1997, TMG started resource recovery and collection of PET bottles from stores.

More efforts were needed to achieve waste reduction and coming closer to developing a sound material-cycle society, and these included the expansion of waste treatment plants. In the 1990s,

dioxins generated from incineration plants by the incomplete combustion of waste became a major social problem in Japan. Tokyo was under pressure to respond to the dioxins problem. Incineration plants were reconstructed, upgraded or altered and new technologies were introduced. During the period from 2002 to 2008 gasification fusion furnaces and ash melting facilities were improved, by 2009 all waste plastics that were not recycled were fully incinerated accompanied by heat recovery, and by 2015 all the ash produced in the incineration plants were reformed into raw material for use in the cement production industry.

2.2 Noteworthy Experience: War on Waste

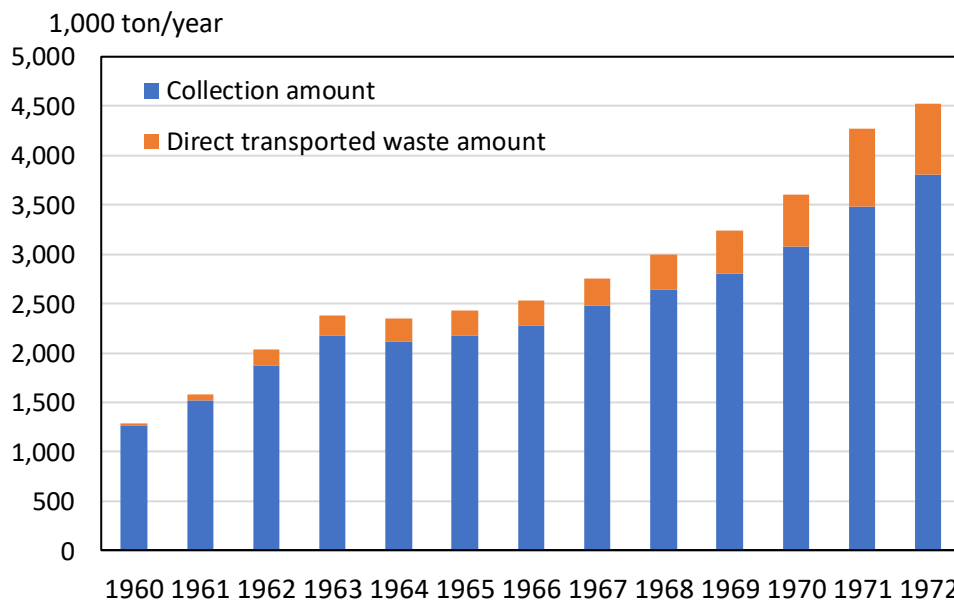
“War on Waste” refers to disputes over the treatment and disposal of waste in the Tokyo 23 Cities, particularly those between Koto City and Sugunami City from the late 1950s through the 1970s, which erupted into protests and court battles involving local residents over the construction of an incineration plant. In response to the rapid increase in waste amount, TMG continued to landfill waste in the bay area, and attempted to promote the construction of an incineration plant without the full understanding of local residents. In this background, this was an opportunity to reaffirm the importance of dialogue and cooperation between the local governments and residents regarding the operation of waste management, a common practice today, and the “Principle of waste treatment within the administrative boundary where the waste was generated”.

(1) Rapidly Increasing Amount of Waste Generation and Waste Management Dependent on Landfill During the Period of High Economic Growth

The period of high economic growth ushered in changes in the lifestyle of the people towards mass production of products and goods, their increased consumption and early disposal. As a consequence, the waste generated by the citizens of Tokyo increased as shown in Figure 6-3. In addition, the composition of the generated waste became much more diverse. The increase in waste plastics, bulky waste, and hazardous industrial waste was making the waste management significantly difficult.

Tokyo was not capable of sufficiently managing such waste and mostly depended on waste disposal in land reclamation in the sea in Koto City. Confronted with the problems of flies from the disposal site, traffic jams caused by approximately 5,000 vehicles a day transporting waste, increased accidents and traffic jams, and scattering of waste and the presence of polluted water on the access road to the landfill, Koto City made repeated requests to TMG to take appropriate countermeasures. In response to those requests, TMG decided to establish a waste incineration system capable of treating the entire amount of combustible waste by 1970, and attempted to move forward with a plan to construct a waste incineration plant. However the plan did not go ahead due to opposition from local residents in various areas. The strongest opposition occurred in Sugunami City, where the opposition group campaigned for a blanket withdrawal of the construction plan, which had been unilaterally announced without prior explanation. The opposition group filed a lawsuit with the court, and TMG initiated legal proceedings based on the *Land Expropriation Act*. Meanwhile, waste management conditions in Tokyo significantly worsened, the incineration plant construction project was greatly delayed, and the amount of incinerated waste, designated in the ten-year plan of Tokyo, reached less than a half of the target value of 8,000 tons per year. Under such circumstances, Koto City took a tougher line, and in September 1971, the Koto City assembly announced its opposition to accepting waste from outside Koto City. In response, on September 28, 1971, the governor of Tokyo declared the “War on Waste” at the metropolitan assembly stating that: “A looming crisis of waste is now threatening the lives of the residents in Tokyo. Taking measures to address this issue is

most urgent. Delay of even one day now will lead to an irreversible consequence in the future. I declare the War on Waste and commit to introducing appropriate waste management”.



Source: Akio Ishii “Journal of the Japan Society of Material Cycles and Waste Management (Vol.17, No.6)” (2006)

Figure 6-3 Changes of Collection and Direct Transport waste Amounts in the Tokyo 23 Cities

(2) Opposition Movement against Construction and Principle of In-city Treatment

The principle of waste treatment within the administrative boundary where the waste was generated was born during the “War on Waste”. This principle remains a basic policy of waste management in Tokyo 23 Cities even at present. In some instances a treatment facility in one special city accepts waste from a neighboring special cities. In such instances adjustments are made to distribute the burden of nuisance impartially amongst the 23 cities.

On September 27, 1971, the Koto City Assembly decided to send an open letter of inquiry to TMG and the other 22 special cities, demanding the observance of “the principle of in-city treatment of waste” and “fair distribution of burden of nuisance”. The concept of principle of waste disposal within the administrative boundary was a natural concept under the laws and regulations that set municipalities as responsible for disposal. Since TMG was responsible for the wide-area waste management within the 23 cities of Tokyo at that time, it was necessary for all concerned to reconfirm the basic matters so that the burden would not be concentrated in some districts. In July 1972, the Tokyo 23 Cities advisory board was established consisting of representatives of Sugunami City and experts, and held meetings several times in that year to discuss a site for constructing an incineration plant.

However, local residents of the areas selected as candidate sites immediately opposed the construction of the plant in their areas. Reasons for the opposition were the method of selecting the site, road conditions, and traffic pollution expected to be caused by collection vehicles. As Koto City became aware of the slow progress of selecting a site in Sugunami City, Koto City began to stop receiving waste from Sugunami City. As the result, the advisory board rushed to select a site for the incineration plant and determined it to be the Takaido district in Sugunami City. In August, 1973, after the site for Sugunami plant had been determined, TMG met for the first time with the opposition group. However, the opposition group maintained their strong opposition and eventually sued TMG in the Tokyo District Court.



Source: TMG Bureau of Environment
Photo 6-7 Planned site of Sugunami Incineration Plant

(3) Path toward Reconciliation and the Terms of Settlement

The Sugunami Incineration Plant construction problem was resolved after a long process spanning eight years since the Takaido district was first announced as the planned site in November 1966. The basic determining factors of the settlement were the acknowledgement of the need for reliable pollution control and the importance of residents' participation from the planning phase. Since then, when facilities are to be developed, resident participation is ensured from the planning phase.

In February 1974, the Tokyo District Court provided recommendations for reconciliation concerning the lawsuit filed by the opposition group to cancel the land expropriation proceedings, and opinions of both sides were to be confirmed by April 30. On April 30, after confirming that both parties intended to reconcile, the Tokyo District Court started to mediate a reconciliation settlement.

The Tokyo District Court heard the opinions of both sides and established the council for organizing the reconciliation conditions concerning the Sugunami Incineration Plant construction, and thus launched discussions for specific reconciliation conditions.

Reconciliation discussions proceeded based on the "principle of residents' requests" presented by the plaintiff and the verbal note shown to the residents by TMG in June 1973. The verbal note, indicating TMG's basic policies, stated that: [1] the scale of the plant will be changed from 900 tons to 600 tons, [2] resident participation is basically ensured during both the construction and operation phases of the plant, [3] access roads used by waste trucks are to be located underground. Focal points of discussion were [1] pollution control, [2] beneficial facilities and countermeasures for neighboring areas, [3] a resident participation system, and [4] the scale of the incineration plant. Local residents were most concerned about point [1] and it dominated the discussions. After continuing the reconciliation discussions for six months, both sides came to a settlement in November, 1974. The terms of reconciliation acknowledged the thoroughgoing pollution control and the local residents' participation from the planning phase. Thus, as the result of reconciliation, construction of the Sugunami Incineration Plant started.



Photo 6-8 Sugunami Incineration Plant



Photo 6-9 Underpass of Sugunami Incineration Plant (1982)

Source: TMG Bureau of Environment

(4) Lessons Learned - Changes in Tokyo Residents' Awareness of Waste Treatment

The Governor of Tokyo's declaration of the "War on Waste" drastically changed the awareness of the people of Tokyo regarding the waste problem. It created an awareness that waste treatment was not only a municipal matter for the TMG, but also a problem that residents should tackle together with the government.

The background of the movements against the construction of incineration plants that took place in various regions during the era of the "War on Waste", was local residents' concerns about pollution and that the importance and seriousness of municipal waste management were not fully shared with the local residents. Since the declaration of the "War on Waste", the awareness of Tokyo residents regarding the waste problem changed dramatically through the blocking of waste coming into Koto City and the problem of constructing Sugunami Incineration Plant. Although waste management is one of the most fundamental urban issues, along with urban planning and water and sewerage systems, the people of Tokyo did not necessarily have such awareness. Rather, they were more conscious of avoiding waste. The declaration of the "War on Waste" greatly changed such conception and raised awareness that waste is a very serious problem. It also led to the realization that it is important for project implementers to repeatedly communicate the necessity and safety of the facility and promote the understanding of local residents. Since the "War on Waste", the construction of waste treatment facilities has been conducted with the participation of local residents, including careful explanation and incorporation of their requests from the planning stage. In addition, agreements were signed with representatives of residents' groups to operate the facility in compliance with laws and regulations and self-imposed limits, disclose various data on the facility's operations and provide tours of the facilities.

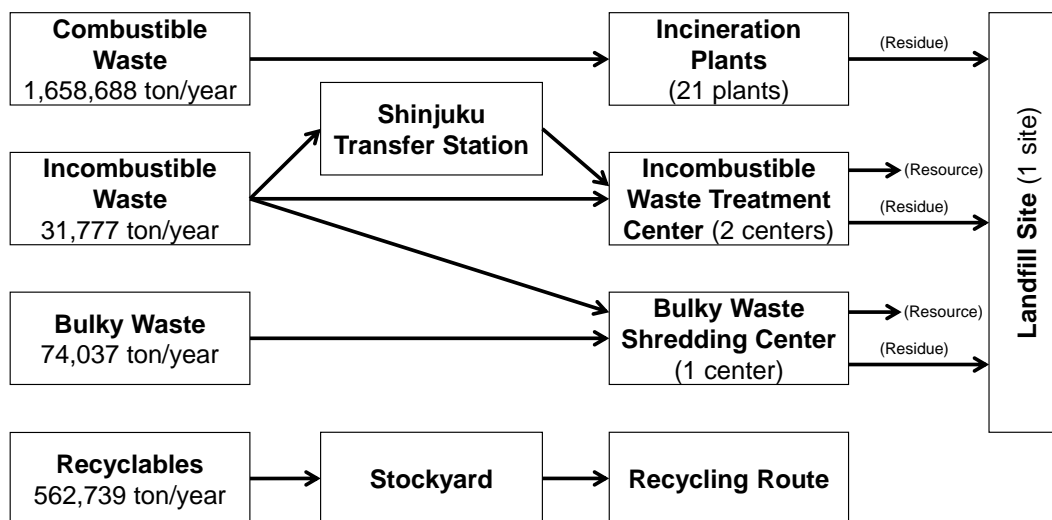
2.3 Current Waste Management in the Tokyo 23 Cities

In the previous section, the history of waste management in the Tokyo 23 Cities and the noteworthy experience garnered from the “War on Waste” was described. This section will provide a description of the waste management flow formed on the basis of that experience.

(1) Waste Management Flow in the Tokyo 23 Cities

The municipal waste management flow in Tokyo is shown in Figure 6-4 for each of the four waste categories of combustible waste, recyclables, incombustible waste, and bulky waste. Combustible waste is incinerated in the incineration plant of each of the 23 special cities. Incombustible waste and recyclables are transported to the incombustible waste treatment centers located in two places within the Tokyo 23 Cities. As the special cities of Shibuya, Shinjuku, Nakano, Suginami, Toshima, and Nerima are far away from either of the incombustible waste treatment centers, incombustible waste and recyclables generated from those cities are transported to the Shinjuku transfer and recycling center where the waste is then transferred into larger trucks for further transport to the incombustible waste treatment centers. At the incombustible waste treatment center, resources are collected and residue is transported to the landfill site for disposal. Bulky waste is transported to the bulky waste shredding center, located in one place within the 23 cities. At the center the bulky waste is shredded, and after the resources are collected, the residue is transported to the landfill site for disposal.

In addition to the municipal waste, private businesses that are licensed by the 23 cities directly transport their business-related combustible waste to the incineration plants.



Source: Clean Authority of TOKYO, “Outline of Projects” (2022)

Figure 6-4 Waste Management Flow in Tokyo 23 Cities

(2) Operating Bodies for Solid Waste Management and their Responsibilities

In the Tokyo 23 Cities, each city mayor is responsible for the municipal waste management in the city. Each city is responsible for the waste collection and transport, but due to the limited number of intermediate treatment facilities, the 23 cities have established the Clean Authority of TOKYO to jointly manage intermediate treatment. A clean authority is an organization established by several local governments or special cities for the purpose of jointly providing a portion of administrative services.

The final disposal site is established and managed by TMG. The Clean Authority of TOKYO uses the final disposal site under a contract with TMG. Because multiple responsible entities are involved and the responsibilities are complex, it is important for all the entities to work together to ensure proper waste management.

Table 6-2 Operating Bodies in the 23 Cities of Tokyo Responsible for Waste Management and their Individual Responsibilities

Category of waste management	Responsible operating body	Responsibility
Waste treatment planning	Each of the 23 cities of Tokyo	Development of waste treatment plans for each city
Sorting and separate discharge Cooperation for waste reduction	Residents, business operators	<ul style="list-style-type: none"> ▪ Waste discharge by properly separating waste according to instructions of each city ▪ Maintaining financial resources of each city by paying city taxes
Collection, transport, and recycling	Each of the 23 cities of Tokyo	<ul style="list-style-type: none"> ▪ Waste collection by direct management of each city and transport of the waste to intermediate treatment facilities according to categories of waste ▪ Payment of assessed share (tax) according to the amount of waste treated etc.
Incineration (Thermal recycle)	Clean Authority of TOKYO	<ul style="list-style-type: none"> ▪ Improvement and operation of 21 incineration plants, 2 incombustible waste treatment centers, and one bulky waste shredding center to extend the final landfill sites lifetime by reducing the amount of waste to be landfilled. ▪ Paying landfill tipping fees
Final disposal	Each of the 23 cities of Tokyo	<ul style="list-style-type: none"> ▪ Final disposal using a final disposal site established and managed by TMG (under contract out).

Source: Clean Authority of TOKYO, "Tokyo Model (general version)" (2018)

(3) Main Measures for Separated Waste Discharge

Tokyo 23 Cities have taken major measures from 1989 to 2000 to promote and strengthen waste reduction and recycling based on the 3Rs principle, as shown in Table 6-3. Until 1999, TMG was responsible for deciding on the policy of sorting classification and separate discharge. However, this responsibility has shifted to each city since 2000.

Table 6-3 Main Measures Based on the 3Rs Principle

Year	Description
1989	<p>Start of the TOKYO SLIM campaign</p> <ul style="list-style-type: none"> • Promotion of waste reduction and recycling through mass media • Start of the “Tokyo waste conference” with the participation of citizens of Tokyo, business operators, and the municipal administration • On-the-spot guidance by waste inspectors at premises of business operators to promote waste reduction and recycling <p>The Tokyo Waste Conference annually held from 1991 to 1998 was attended by tens of thousands of participants each time, attracting attention to waste management.</p>
1991	<p>Charge for bulky waste collection</p> <ul style="list-style-type: none"> • Bulky waste weighing less than 200 kg was charged in 1991.
1996	<p>Charge for business waste</p> <ul style="list-style-type: none"> • For approximately 560,000 business operators, business waste weighing less than 10 kg a day was charged. The Tokyo Rules prescribing the roles and responsibility sharing were proposed. • Tokyo rule I - Setup of weekly municipal resource recovery • Tokyo rule II - Promotion of collection of containers etc. by manufacturers etc. • Tokyo rule III - Collection of widely used PET bottles from stores after use <p>Business operators discharged waste with a sticker indicating the paid waste fee affixed on it.</p>
2000	<p>Resource recovery operators dealing in used paper, bottles, and cans</p> <ul style="list-style-type: none"> • Combustible waste collection was reduced from three times to twice a week, and collection of resources - used paper, bottles, and cans - was newly scheduled once a week.

Source: Clean Authority of TOKYO, “Tokyo Model (outline)” (2018)

(4) Public Awareness and Environment Education Intended for Separated Waste Discharge

The Tokyo 23 Cities have been providing environment education for a long-period of time and have endeavored to enhance awareness and foster habits to support recycling, through thorough face-to-face communication and education of the next generation of waste generators.

Regarding waste discharge practices, ongoing promotional activities are conducted through public relations newsletters on a daily basis to ensure that the rules for sorting and discharging of waste are followed. If the rules are not followed, guidance is stepped up through door-to-door visits. When existing rules are changed, or new rules are established, sufficient time is spent on carefully informing residents of the changes or new rules to ensure a smooth transition. Specifically, face-to-face communication is emphasized and a variety of awareness-raising and educational tools, such as the distribution of multilingual leaflets are utilized so that foreign residents can understand the information.

In addition, facility tours are actively arranged. Visitors facilities have been enhanced, and social study tours for elementary schools, group tours and private tours are implemented. Facilities are open to public during environmental events held in each city. Altogether 60,000 people participate in tours annually. As facility tours allow residents, pupils and students to see the facilities with their own eyes, tours are very effective to enhance awareness on waste management.

(5) Group Collection

In the Tokyo 23 Cities, residents are proactively conducting the following activities to recyclables by means of group collection.

- Voluntary resident groups, each consisting of more than 10 families, collect resources generated from homes and hand them over to resource recovery operators. The model project of TMG's "Waste Reduction and Recycling Movement", launched in 1955, was the prototype for this movement.
- Municipal administrations support these activities by providing financial incentives according to the collected recyclables amounts, providing information about resource recovery operators, and supplying or lending work tools and equipment.

The amount of resource recovery by group collection amounts to approximately 35% of the entire amount of resource recovery in the 23 cities. It also amounts to approximately 8% of the entire amount of waste and resources generated from households (2016).

(6) Waste Collection and Transport

As shown in Table 6-4, various measures have been taken to ensure 100% waste collection in the Tokyo 23 Cities. FUREAI collection is a waste collection support initiated by the municipalities to help elderly people and others who have difficulty in taking out waste by themselves. This service is expected to increase from now on.

Table 6-4 Various Measures to Ensure Waste Collection

Planning	Efficient Waste Collection	FUREAI Collection
<p>Creation of plans for waste collection and transport</p> <ul style="list-style-type: none"> Based on the estimated waste amount, waste discharge rules, population density and other data, and on-site conditions, plans for distribution of personnel and vehicles and plans for transportation routes, etc. are integrated into the general work plan. 	<p>Waste compactor trucks</p> <ul style="list-style-type: none"> More than 1,500 waste trucks collect waste from approximately 440,000 stations. About 70% of waste trucks are small compactor vehicles that can turn in a small radius and achieve high waste compaction rates. Affixing stickers on unseparated waste and uncollectible waste to promote observance of correct waste separation and discharge. 	<p>FUREAI collection</p> <ul style="list-style-type: none"> Visiting elderly people and impaired people who have difficulty in taking out waste by themselves, to collect their household waste.

Source: Clean Authority of TOKYO “Tokyo Model (outline)” (2018)



Photo 6-10 Waste Collection



Photo 6-11 Waste Collection Crew Directly Collecting Waste from Elderly People

Source: Yachiyo Engineering Co., Ltd.
Clean Authority of TOKYO “Tokyo Model (outline)” (2018)

(7) Recycling

Table 6-5 summarizes the transport destination of recyclables, incombustible waste, bulky waste, and combustible waste collected through municipal collection and the methods for recycling of each waste category.

Table 6-5 Optimal Waste Recycling Suitable for Waste Categories and Treatment Levels

Separation Category	Transport Destination	Recycling Method
Recyclables	Incombustible waste treatment center	Recycling and merchandising by private collection operators
Incombustible waste	Incombustible waste treatment center	Collection and reuse of iron, aluminum, etc.
Bulky waste	Bulky waste shredding center	Same as above
Combustible waste	Incineration plant	Effective use of thermal energy Forming incineration ash into raw material for cement production

Source: Clean Authority of TOKYO “Tokyo Model (outline)” (2018)



Photo 6-12 Overview of Incombustible Waste Treatment Facility and Bulky Waste Treatment Facility

Source: Yachiyo Engineering Co., Ltd.



Photo 6-13 Aluminum Collected at Incombustible Waste Treatment Facility and Bulky Waste Treatment Facility

(8) Incineration and Thermal Recovery

The Clean Authority of TOKYO incinerates municipal waste generated from the Tokyo 23 Cities at 21 incineration plants owned by those cities. In case of shutdown of all furnaces in one city, incineration plants in a neighboring city receive and treat that city's waste. In times of emergencies such as the occurrence of the Great East Japan Earthquake in 2011, Clean Authority of TOKYO accepted to treat disaster waste generated from outside the Tokyo 23 Cities. This was made possible by the understanding of the local management council with which the clean authority had an agreement for the operation of the facility. Plastics, which were once excluded from incineration before the total incineration system for combustible waste was established, were later made eligible for incineration (except for plastics that can be recycled) in order to extend the life of final disposal sites and make effectively utilize resources. The energy recovered from incineration is used within the facility, sold to electric utilities and heat suppliers, and returned to local communities such as through use in schools and homes. Furthermore, selling electric power to electricity producers is conducted according to the feed-in tariff (FIT) system. As of the end of FY2000, eleven (11) plants were selling electricity under the FIT system (eight (8) plants were not eligible, total operating plants at the time were 19 plants). In addition, electricity is supplied to nearby public facilities, such as botanical gardens and swimming pools, either free of charge or for a fee. Some of the plants are operated directly and others are outsourced to private operators.

(9) Final Disposal

In Tokyo, from 1927 to the present, 100,000,000 tons of waste were disposed of in seven (7) landfill sites. In addition to intermediate treatment residue, industrial waste generated by small to medium-sized business operators in Tokyo is also sent to landfill sites. As of around 2006, the service life of the new maritime landfill site currently being utilized was expected to be available for about 30 more years. However, the subsequent implementation of thermal recycling of plastic waste and the slag formation from the incineration ash have increased the service life of the landfill to more than 50 years from the present.

After the completion of disposal in a landfill, the site is utilized in a variety of ways as shown in Table 6-6 and Figure 6-5.

Table 6-6 Land Use after Closing of Landfill Sites in Tokyo

Name of landfill site	Service period (year)	Area (ha)	Use of the land
① No. 8 Site	1927 - 1962	36.4	Park, residential area, railway station
② No. 14 Site	1957 - 1966	45.0	Park, tropical plant garden, baseball stadium, incineration plant
③ No. 15 Site	1965 - 1974	71.2	Industrial area, park, camp site
④ Central Breakwater Inner Landfill Site	1973 - 1986	78.0	Park
⑤ Central Breakwater Outer Landfill Site	1977 - present	199.0	In service
⑥ Haneda Offshore Landfill Site	1984 - 1991	12.4	Airport
⑦ New Sea Surface Disposal Site	1998 - present	319.0	In service

Source: Clean Authority of TOKYO "Tokyo Model (outline)" (2018)



Photo 6-14 Landfill

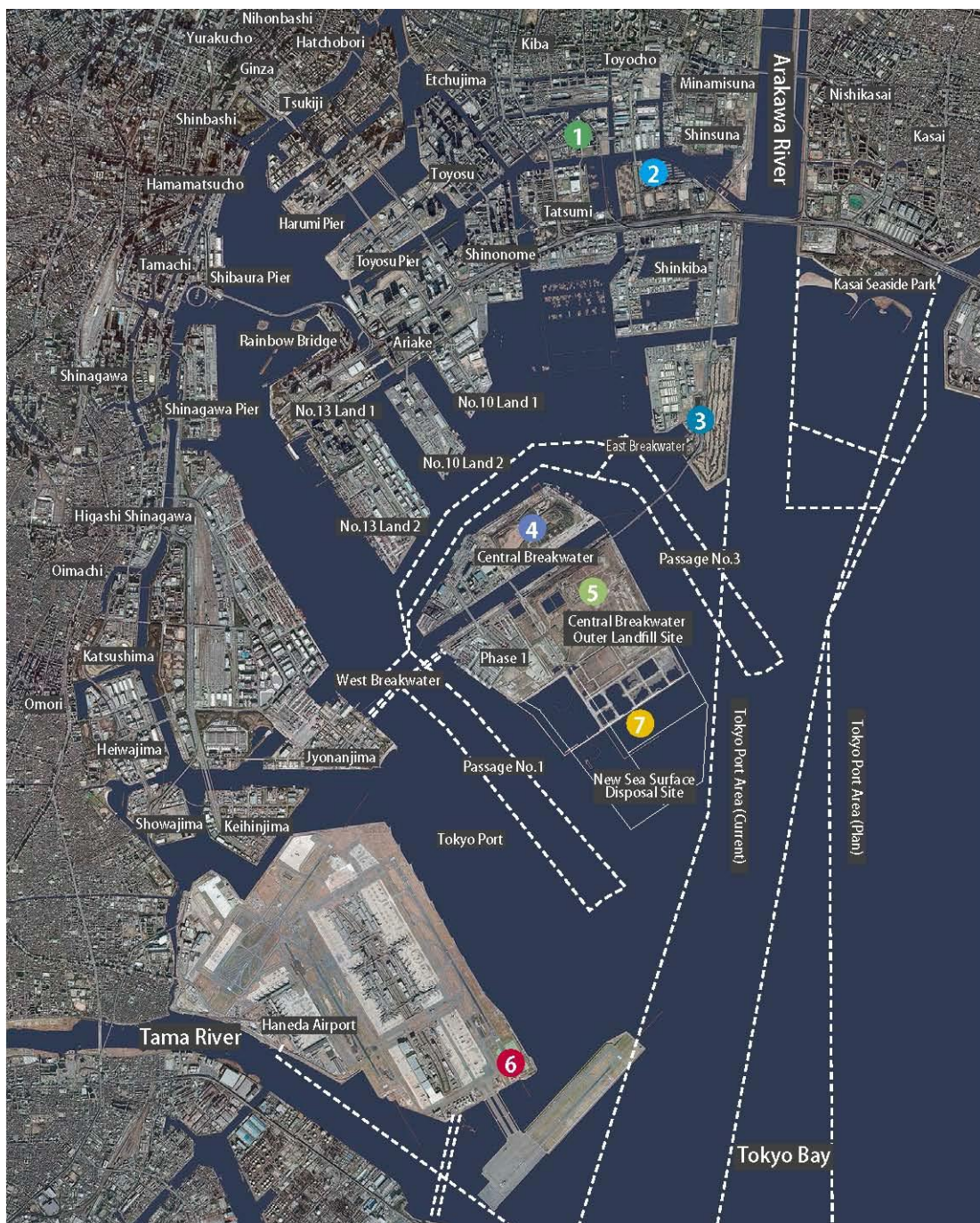
(⑤ Central Breakwater Outer Landfill Site)



Photo 6-15 Landfill of Incinerated Ash

(⑤ Central Breakwater Outer Landfill Site)

Source: Yachiyo Engineering Co., Ltd.



*: Dotted lines indicate port area boundaries and shipping channels.

Source: TMG Bureau of Environment “Tokyo Metropolitan Government Waste Landfill Site” (2020)

https://www.kankyo.metro.tokyo.lg.jp/data/publications/resource/pamphlet_list.files/english_pamphlet2021.pdf

Figure 6-5 Final Disposal Sites in Tokyo

2.4 International Cooperation

In overcoming a large number of waste problems, Tokyo has accumulated rich and diverse knowledge and experience on waste management. Tokyo has been engaging in international cooperation activities concerning waste management and recycling in order to share the city's experience and knowledge with developing countries that are facing serious waste problems, and to develop overseas the waste technologies that can contribute to the reduction of the global environmental load. Table 6-7 shows specific international cooperation projects in which Tokyo has been involved.

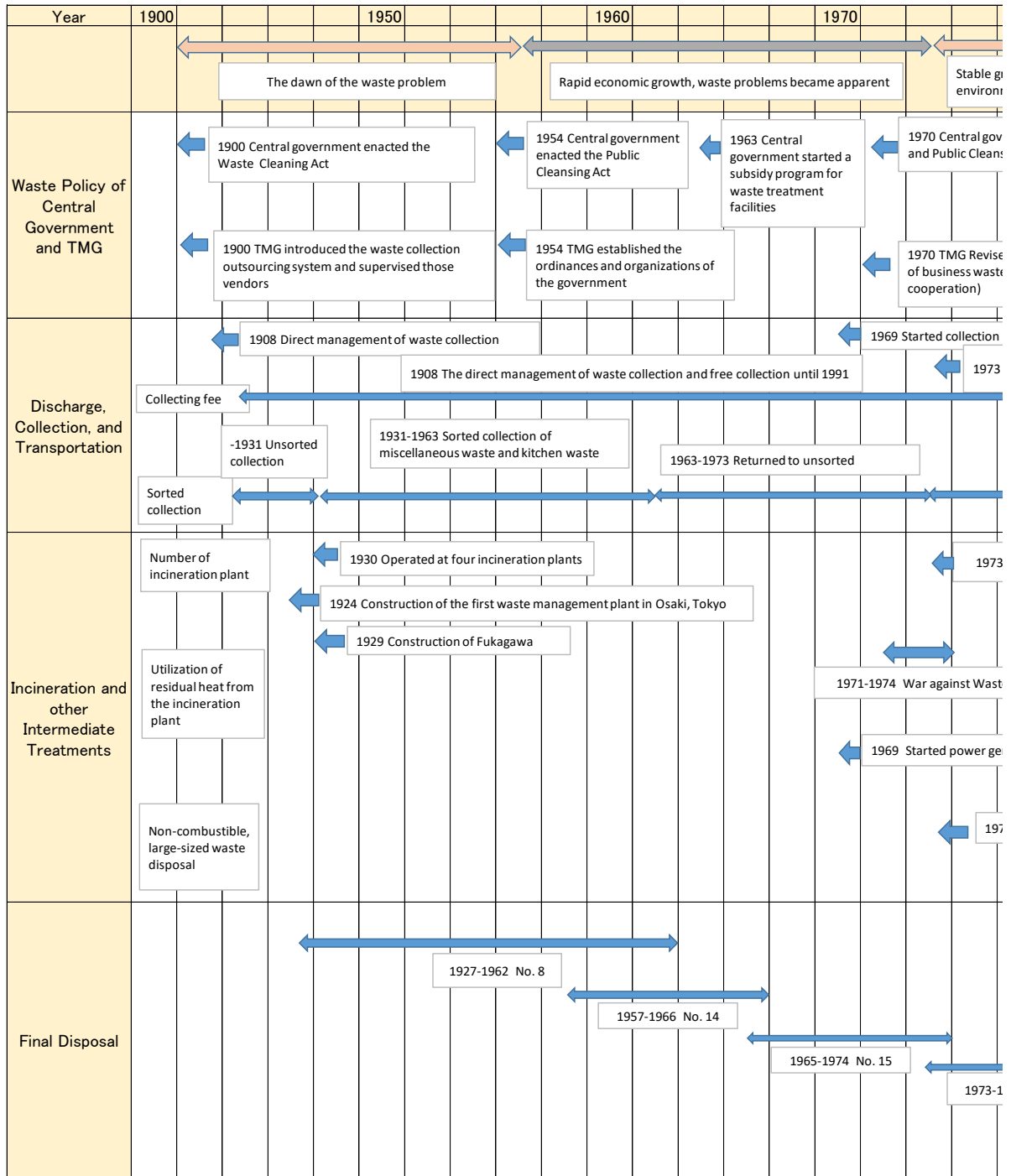
Table 6-7 Examples of Tokyo's International Cooperation Projects

FY	Results of Initiatives
2018	<p>< Technical Advice to Foreign Cities ></p> <ul style="list-style-type: none"> • Ministry of the Environment “Overseas CO₂ Reduction Support Project through Strategic International Development of Japan's Recycling Industry” Dispatched staff to the state of Telangana, India, to provide technical advice on the contents of a feasibility study on the project. • Asian Development Bank (ADB) “Capacity Building Program for Urban Waste Management in the Maldives” In cooperation with the Ministry of the Environment, TMG, Katsushika City, and other related organizations, ADB conducted site visits and lectures in Japan for administrative officials and others in the Maldives. In addition, staff members were dispatched to the Maldives to provide technical advice on local issues. • Ministry of the Environment: “Survey on Bilateral Cooperation for 3Rs and Appropriate Treatment in the Asian Region” Staff members were dispatched to Jakarta, Indonesia and Doha, Qatar to give lectures at workshops and other events on the theme of the experiences of the 23 cities of Tokyo regarding waste treatment. <p>< Support for the Education and Training of Foreign Personnel ></p> <ul style="list-style-type: none"> • JICA “Technical Capacity Building on Waste Management for Introduction of Waste Power Generation” Accepted Vietnamese government officials and others as trainees, and in cooperation with Sugunami City, conducted observation tours and lectures on waste separation and collection, recycling, intermediate treatment, etc. at collection sites and the Sugunami Intermediate Treatment Plant.
2019	<p>< Technical Advice to Foreign Cities ></p> <ul style="list-style-type: none"> • Ministry of the Environment “Overseas CO₂ Reduction Support Project through Strategic International Development of Japan's Recycling Industry” Dispatched staff to Hanoi, Vietnam, to provide technical advice on the contents of the project feasibility study. • Ministry of the Environment “Survey on Bilateral Cooperation for 3Rs and Appropriate Treatment in Asia” Dispatched a staff member to Hanoi, Vietnam to give a lecture at the Japan-Vietnam Joint Committee and workshop on the experience of waste disposal in the Tokyo 23 Cities. • Ministry of the Environment “Commissioned work for identifying projects for the Climate Technology Center Network (CTCN), etc.” Dispatched a staff member to Hanoi, Vietnam to assist in the preparation of request forms for CTCN projects in Vietnam, and provided technical advice on the contents of the forms.

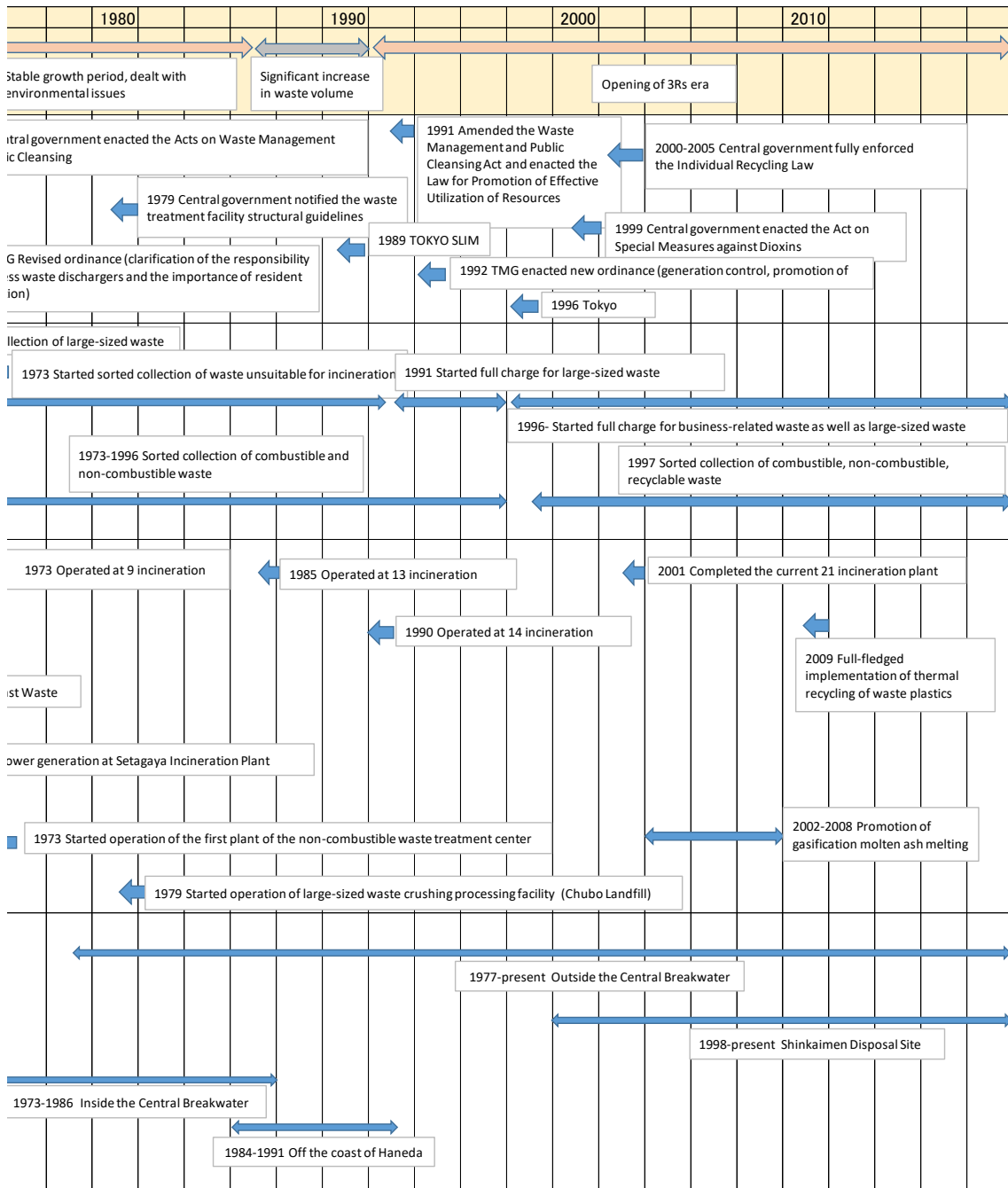
FY	Results of Initiatives
	<p>< Support for the Education and Training of Foreign Personnel ></p> <ul style="list-style-type: none"> • JICA “Project for Promotion of Waste Management Improvement in Kolkata Metropolitan Area, India” Received local government officials and others from the Kolkata metropolitan area in India as trainees, and conducted observation tours and lectures on waste separation and collection, recycling, intermediate treatment, etc. at the Arakawa Recycling Center and Adachi Waste Disposal Plant in cooperation with Arakawa City.
2020	<p>< Technical Advice to Foreign Cities ></p> <ul style="list-style-type: none"> • “The 10th Asia-Pacific 3R and Circular Economy Promotion Forum” Co-hosted by the Ministry of the Environment and the United Nations Center for Regional Development Attended the forum, which was held in online format, and shared information on 3Rs and circular economy promotion with a wide range of stakeholders, including governments, international organizations, and research institutes. <p>< Support for the Education and Training of Foreign Personnel ></p> <ul style="list-style-type: none"> • Ministry of the Environment “Training Program to Promote Overseas Development of Japan's Recycling Industry” Accepted trainees from six countries in an online format. In collaboration with Minato City, lectures and question-and-answer sessions were held for administrative officials from Mozambique on waste separation and collection, recycling, and other topics. In addition, the system of a waste treatment plant was introduced and a question-and-answer session was held for five other countries, including Indonesia. • JICA “Technical Capacity Building on Waste Management for the Introduction of Waste Power Generation” JICA provided materials and a question-and-answer session to assist in the implementation of on-demand training for multinational government officials and others.

Source: Clean Authority of TOKYO “Business Overview FY2021” (2021)

Attachment 1 History of Solid Waste Management of Tokyo 23 Cities



Source: Japan Environmental Sanitation Center



3 Waste Management Efforts Made by Fujisawa City

This section describes how Fujisawa City, an average medium-size Japanese city, has solved waste management issues in various periods from the 1940s up to the present date. Specifically, the focus is on the city's experience in managing recyclables starting from the early 1970s. Based on the experiences, the sound material-cycle waste management system was established.

Established as a city in 1940, Fujisawa City has been incorporating neighboring towns and villages and is still developing as a major urban city in the Shonan region, and presently has an area of 69.56 km² and a population of 430,000. From 1955 to the late 1960s, during the period of high economic growth, many large companies developed factories in the city almost turning it into an industrial city. However, the early half of the 1970s commercial facilities were developed in the city and Fujisawa City became the commercial heart of the Shonan region. In recent years, Fujisawa City has become a city with a wide variety of characteristics, including that of an educational city.

The waste treatment system is based on a recycling system known as the Fujisawa Model, which is supported by one facility for pulverization and recycling, two incineration facilities, and one final disposal facility that promotes recycling, utilizes incineration energy, and reduces the load on the final disposal facility.

Fujisawa City has summarized the present waste management situation in a document titled the "Outline of Waste Management". In this document, the activities for waste management from the 1940s to the present day are outlined to describe the history of the city's waste management.

This section will overview Fujisawa City's efforts in waste treatment with reference to the "Outline of Waste Management (2019: Fujisawa City)".



Source (Photo): Fujisawa City "Overview of Waste management in Fujisawa City (JICA Training Text)" (2019)

Figure 6-6 Location of Fujisawa City

3.1 History of Waste Management in Fujisawa City

Fujisawa City has developed its waste management along with the times, from the improvement of waste collection to the full-scale introduction of 3Rs, and the period from the 1945s to the present is divided into four periods.

(1) Period of Seeking a Better Waste Collection Method, 1945 - 1964

The history of waste management in Fujisawa City began in this period. Waste collection carried out by private sector operators started in 1947 and three years later, the collection operation was changed to direct management by the city. Late in this period, the amount of generated waste significantly increased due to the expansion of the urban district, increase in population, and enhanced standards of living. Accordingly, door-to-door collection was changed to station collection, and use of mechanized collection vehicles was promoted.

Table 6-8 Waste Management Related Events from the 1945 to 1964 Period

Storage and discharge	From 1950, plastic containers were used for discharging municipal waste.
Collection and transport	From 1947, waste collection was carried out by private operators using two-wheeled carts, general carts, etc. From October, 1950, waste collection was conducted for a fee by tricycles and carts under the direct management of the city mainly in the urban area which was a special cleaning district designated by the former <i>Waste Cleaning Act</i> of 1900. Around 1961, the collection system was enhanced and mechanical power was actively introduced. In 1964, conventional door-to-door collection was changed to collection at stations and the system of “discharge of waste using containers at stations on fixed dates” was adopted. Also, to increase waste collection and transport efficiency, special vehicles - waste trucks - were introduced into operation.
Recycling	No records
Intermediate treatment	Collected waste was incinerated at the Ishinazaka incineration plant (fixed batch furnace, 15t/8h, 2 units) built in 1955.
Final disposal	Collected waste was previously buried in agricultural land, dry riverbeds, etc. After the waste incineration plant was built, incineration residue (ash) and some kitchen waste were disposed. As a result, the amount of waste disposed decreased.

Source: Fujisawa City “Outline of Waste Management FY2019” (2021)

(2) Period of Seeking Proper Waste Treatment for Bulky Waste, 1965 - 1974

Accompanied by the high economic growth, consumption styles diversified and discharging of bottles, cans, and home appliances in the waste increased. Both the quantity and quality of waste significantly changed. In addition, the central government thoroughly revised its former *Public Cleansing Act* and enacted the *Waste Management Act* with the aim to secure and preserve

appropriate living environment, and regulate waste management from a broad perspective, thereby fundamentally addressing waste management issues throughout the entire municipality.

Table 6-9 Waste Management Related Events from the 1965 to 1974 Period

Storage and discharge	No records
Collection and transport	In this period, bulky waste increased in both quantity and size. It became difficult to incinerate such waste, and separate collection of bulky waste was introduced in 1970, through contract out. From 1970 to 1979, bulky waste was directly disposed of at the Ishinazaka landfill site. From 1973, municipal waste was collected twice a week on designated days of the week throughout the entire city.
Recycling	No records
Intermediate treatment	Separate collection of bulky waste began in 1970, and from then on only municipal waste was incinerated in the incineration plants. However, with the increase of the municipal waste amount and changes in the waste quality, the capacity of incineration facilities was enhanced. The Ishinazaka incineration plant was expanded; 2 units of 40t/8h in 1965, + 1 unit of 40t/8h in 1968. To address further anticipated increase of waste in the near future, the North Waste Management Center (incineration plant) was constructed with a mechanical furnace of 150t/24h installed in 1970, and a second furnace of 150t/24h installed in 1973.
Final disposal	With the increase of incineration residue (ash), it became necessary to secure a long-term final disposal site. In cooperation with a land owner, a landfill site was constructed in Chogo Kamiyadai in 1972.

Source: Fujisawa City “Outline of Waste Management FY2019” (2021)

(3) Dawn of 3Rs and Period for Development of Intermediate Treatment Facilities, 1975 - 1994

During this period, the amount of waste continued to increase and the contents of waste were diversified as well. Consequently, it became difficult to conduct proper treatment and disposal of waste collected based on only two categories: municipal waste and bulky waste. To find an effective means for waste reduction, the “Fujisawa City Waste Reduction Promotion Office” was established in April, 1977, and waste reduction and recycling measures were regularly discussed. Fujisawa City invited citizens to participate in the discussions at the early design phase of the waste management system instead of asking citizens for their cooperation after the system had been designed. As a result, a waste separation system was successfully established. It was favorably accepted by the citizens. In October 1990, Fujisawa City established the “Fujisawa City Waste Control Conference” with the participation of four parties: citizens, business operators, academic experts, and municipal administration officials. The Conference proposed measures to reduce the amount of waste by 20% by the year 2000, to the mayor of Fujisawa City in October 1991.

Table 6-10 Waste Management Related Events from the 1975 to 1994 Period

Storage and discharge	In 1978, along with the recycling of municipal waste, paper bags designed for municipal waste discharge were allowed in addition to the conventional plastic containers. Thus, two methods for discharging waste became permissible.
Collection and transport	No records
Recycling	Fujisawa City started to implement a waste reduction and recycling policy. The “Fujisawa City Waste Reduction Promotion Office” was established and waste reduction and recycling measures were regularly discussed. As a result, in February, 1978, collection of recyclables - bottles, cans, metals, fabric, paper – was initiated jointly by three parties; the city, citizens, and the Shonan Branch of the “Kanagawa Resource Recovery Merchant Cooperative Association” (the name was changed to the “Fujisawa City Resource Recovery Cooperative Association” on April 1, 1989). Thus, waste was collected according to three categories: municipal waste, bulky waste, and recyclables. History of the recyclables collection (Fujisawa method) will be described in section 3.2, hereafter “Noteworthy experience: Recycling of recyclables - Fujisawa method”.
Intermediate treatment	Construction of the bulky waste shredding facility (50t/5h) was launched in 1978 to improve direct landfill of bulky waste. Reconstruction of the aging Ishinazaka incineration plant started in 1979 and was completed after three years, and operation commenced from 1981. The Ishinazaka waste management center (currently Ishinazaka Environment Center, an incineration plant) was constructed in 1983 (fluidized-bed system 130t/24h x 3 units) and started operation in 1984. For this facility, strict environmental quality standards, such as double-structured side walls of the plant building, etc., were required because urbanization of neighboring areas progressed and residential areas expanded while the former furnaces were in operation. Furthermore, renovation of the incineration facility (furnace No. 1, 150t/24h x one unit) of the North Waste Management Center and construction of the bulky waste shredding facility (30t/5h) were launched in 1984. Those facilities were completed and started operating in October, 1986. In addition, renovation of the shredding facility of the Kiri-hara Waste Management Center was launched in 1986 and the facility was completed in March, 1989. Renovation work for the waste incineration facilities in the North Waste Management Center was launched in 1987 and completed in March, 1989.
Final disposal	The Chogo Chubun first landfill site was constructed in 1973, and the Yane landfill site and Kuzuhara landfill site were constructed in 1979. The Ishinazaka landfill site (city-owned land) that had been used since 1970 was transformed into a lush green park and opened to the public in 1981. The Yane landfill site which had fulfilled its role in 1986 was transformed into a multipurpose ground in April, 1988. The Chogo Chubun second landfill site had also fulfilled its role in 1986. To replace the Kuzuhara landfill site, which had been used along with the Yane and Chogo Chubun landfill sites and would soon reach its disposal capacity, construction of the Kuzuhara second landfill site started in 1987 and was completed in 1989.

Source: Fujisawa City “Outline of Waste Management FY2019” (2021)

(4) Period of Full-Scale 3Rs Introduction, after 1995

The amount of generated waste nationwide began to increase in the 1980s. Municipalities hastened to improve landfill sites, and started to seriously engage in waste management based on the 3Rs policies, and increased source separation and separate collection activities for some recyclables. In 1999, the collection of PET bottles was initiated citywide, followed by source separation and separate collection of miscellaneous waste paper resources in 2001. In the same year, with the implementation of the *Small Home Appliance Recycling Act*, four home appliance items were excluded from the general collection, and the separate collection of plastic containers and packaging was introduced in 2002.

In 2014, the Recycle Plaza Fujisawa was completed. The Recycle Plaza incorporated a recycling facility and a public educational facility, thereby greatly contributing to public awareness of waste management. This type of recycle plaza has been constructed nationwide since 1990.

Table 6-11 Waste Treatment Related Events after 1995

Storage and discharge	No records
Collection and transport	In 1998 the South Waste Management Center construction started and was completed in February, 1999. Since 1999 waste has been collected and transported to two centers: one in the north and the other in the south.
Recycling	Intermediate treatment of resources was conducted in recycling facilities. However, the adjacent shredding facility of the Kirihara Environment Center deteriorated with age, and from 2010 the facility was renovated into a material recycle facility as a four-year project. At the time of construction the tentative name of this facility was the Fujisawa City Recycle Center. The waste treatment building equipped with a shredding facility was built in March, 2013, and the environmental education building was built in January, 2014, to enhance public awareness of environmental problems. In February, 2014, it was decided to name those facilities the Recycle Plaza Fujisawa.
Intermediate treatment	Regarding waste treatment facilities, the North Environment Center was improved to ensure that its functions are properly maintained, and the exhaust gas advanced treatment (dioxin reduction) facility of Ishinazaka Environment Center was also improved as a three-year project from 1997 to 1999. Furthermore, at the North Environment Center, furnace No. 2 was modified in 2002 and 2003, and furnace No. 1 was upgraded as a three-month project in 2004. This construction was done by the DBO (develop-build-operate) system.
Final disposal	The Kuzuhara second landfill site that had been used since 1989 was expected to become full in 2003. Accordingly, construction of the Onnazaka landfill site started in 1994 as a three-year project to be used as the next landfill site. It was completed in March, 1997.

Source: Fujisawa City “Outline of Waste Management FY2019” (2021)

3.2 Noteworthy Experience: Recycling of Recyclables - Fujisawa Method

The “Fujisawa method” has two features: [1] it was the nation’s first project of this kind, and [2] it was a project in which citizens, municipal administration, and collection operators were jointly engaged. The citizens followed the sorting and separate discharge instructions provided by the municipal administration together with the waste collection operators, and as a result it became possible to obtain recyclables of the quality required by the recycled goods market.

In the 1970s Japan's major municipalities became involved in separated waste collection. At the time the objective behind separate waste collection was to support the proper treatment of waste, and was not for the promotion of recycling. In those days, incineration was the main method of waste treatment and therefore, incombustible waste and bulky waste that could interfere with the incineration process were separately collected and not taken to incinerators. Many municipalities started to separate recyclables for the purpose of recycling in the 1990s. However, Fujisawa City was engaged in recycling of recyclables earlier, in the 1970s through the joint activities of citizens, municipal administration, and collection operators. This method was referred to as the “Fujisawa method” which attracted countrywide attention.

Column: Waste Reduction and Background of the Movement to Recycle Waste

(1) Rapid Increase of Bulky Waste

Sorted collection of bulky waste started in 1970 and continued as usual for a while at the time of the oil shock in 1973. To promote resource saving, during that time, Fujisawa City was striving to provide leadership training for local children’s associations, residents’ associations, and women’s associations to initiate voluntary group collection of recyclables for recycling. However, the amount of bulky waste began to significantly increase from around 1975 by 10 to 20% a year and the cost of collection increased accordingly.

(2) Saturation of Landfill Sites

Since the start of waste separation in 1970, collected bulky waste was directly disposed of in city-owned land (area of 37,000 m²) located in the center of the city. However, around 1977 the landfill capacity was filling up as a result of urbanization in neighboring areas. As it was difficult to secure alternative landfill sites, proper treatment of bulky waste became necessary considering environmental conservation and effective utilization of landfills.

(3) Composition of Bulky Waste

Fujisawa City conducted field investigation of its landfill sites and at stations where the bulky waste was delivered. Results of the investigation revealed that approximately 60% of bulky waste - such as large furniture units, large electric home appliances, bottles, cans, metals, cardboard, etc. - could be recycled or reused, and separating bulky waste would help reduce such bulky waste, extend the service life of the city's landfills, conserve the environment, and benefit recycling of waste.

(4) Establishment of the Waste Reduction Promotion Office

In April 1977 Fujisawa City established the “Waste Reduction Promotion Office” to address the urgent needs, specifically; to cope with the increase in bulky waste amount and filling up of landfills, reducing waste, promoting waste recycling, and implementing proper treatment. The

investigation research group, which was a subordinate organization of the Office, researched and discussed specific measures. The investigation results showed that large quantities of bottles, cans, metals, paper, and fabric were contained in conventional municipal waste and bulky waste. Since separation of such waste would be an easy process to implement, an outline of the measures was roughly developed as follows. The city, working jointly with residents and waste collection operators would implement a waste collection system. In that system, routes for collecting recyclables would be newly established, and local residents would sort out their waste before discharge and bring the separated waste on designated dates and to designated containers placed at designated locations. Waste collection operators would then collect the separated waste. Such a collaboration system was considered to be appropriate.

(5) Trial Collection in Model Districts and Expansion throughout the Entire City Area

Based on discussions by the investigation research group, three model districts were selected; a housing complex, an independent housing district, and a mixed district having both residences and shops. Separate waste collection trials were performed in the three districts for three months from September, 1977. The results of the trial collection were favorable.

The results confirmed that considerable advantages could be expected from this waste collection method. It was also confirmed that the waste collection could be satisfactorily introduced if sufficient efforts were made to promote the understanding of residents and public awareness about the implementation method, and give proper instructions. Accordingly, the “Operating procedure for Fujisawa City waste reduction and recycling activities” was created, and while proceeding with the improvement of the city’s advisory system and promoting public awareness of the new system in public relations publications, Fujisawa City launched the step-by-step implementation of the waste collection project. The first phase commenced implementation in February, 1978, the second phase started in August, 1978, and the third phase in February, 1979. Upon the expansion of the model districts, city staff were mobilized under administration-wide coordination to instruct citizens on source separation and separated waste discharge. The citizens eagerly cooperated. Thus, it took only one year to expand the collection system throughout the entire city area from the time the collection was first implemented in the first district.

This method, referred to as the “Fujisawa method”, where citizens, municipal administration, and collection operators worked together, attracted countrywide attention.

Source: Fujisawa City “Outline of Waste Management FY2019” (2021)

3.3 Experience of Construction and Renovation of Incineration Facilities

Construction of waste incineration facilities requires the understanding and agreement of local neighborhood residents through having a dialogue with them. When the new plant, Ishinazaka Environment Center was constructed at the site of the old Ishinazaka incineration plant in Fujisawa City, the neighboring areas were crowded residential areas and strict environmental measures were required. Furthermore, as the service life of incineration facilities is long, ranging from 30 to 35 years, it was necessary to respond to changes both in waste quality, as well as in laws and regulations during the long operation period. Fujisawa City also took countermeasures against high-calorie heat generation and dioxins.

Construction and improvement of waste incineration facilities presented significant challenges for all municipalities in Japan. During the period of high economic growth, waste quality dramatically changed, and facilities failed to properly manage such waste, causing unexpected problems. Also, during renovation of old facilities, strict environmental measures were required due to the urbanization of neighboring areas and spread of crowded residential areas around the facilities since they were first constructed. Landfill sites were confronting similar conditions. Developed urban areas were expanding to a level where there was no longer any surplus land in the city, and it was becoming difficult to find sites for constructing new landfill sites. These are usual challenges in many countries.

In 1981, a new Ishinazaka Incineration Plant (capacity of 390 ton/day) was constructed as a facility of the Ishinazaka Environment Center in Fujisawa City on the site of the old waste treatment facility. The areas around the site had been developed into residential areas. Thus, the site of the incineration plant was located in what had become a residential area, and accordingly strict environmental measures had to be taken. When a new waste incineration facility is constructed at a site where there used to be a facility, it is necessary to give due consideration to residents in neighborhoods adjacent to the new plant even if those affected neighborhoods developed after the old incineration facility had been built and was in operation.

From 1986 to 1990, renovation works were carried out at the North Waste Management Center to deal with the high-calorie heat generation.

Subsequently, the North Waste Management Center and Ishinazaka Environment Center have undergone dioxins reduction modification works.

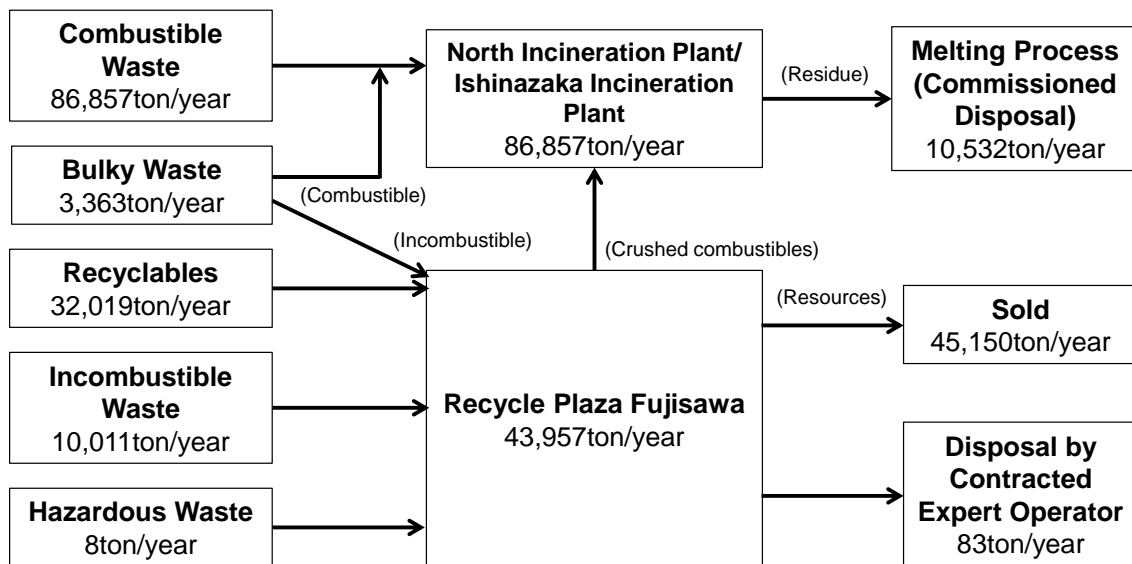
When the No. 1 furnace at the North Waste Management Center was renewed between 2004 and 2007, various privatization methods were considered to meet the needs for cost reduction and leveling due to the financial difficulties at the time. As a result, DBO (Design-Build-Operate) method was adopted for the construction work.

3.4 Current Waste Management in Fujisawa City

In Fujisawa City, based on efforts in recycling of recyclables, and construction and improvement of incineration facilities, the consumption of natural resources has been reduced, and a resource-recycling waste treatment system was established with the aim of realizing a society in which the burden on the environment is minimized as much as possible.

(1) Waste Management Flow in Fujisawa City

As shown in Figure 6-7, the waste management flow in Fujisawa City starts with waste being collected according to the following categories: combustible waste, bulky (large-sized) waste, incombustible waste, recyclables, and hazardous waste. After collection, combustible waste and combustible bulky waste are incinerated at the North Incineration Plant and the Ishinazaka Incineration Plant, and incineration residue is treated by melting. Incombustible bulky waste, incombustible waste, and recyclables are shredded and sorted at the Recycle Plaza Fujisawa, and resources are then sold and shredded combustibles are incinerated. Incineration residue is disposed of in a landfill. Hazardous waste is temporarily kept at the Recycle Plaza Fujisawa and then disposed of by the contracted expert operators.



Source: Fujisawa City "Outline of Waste Management FY2019" (2021)

Figure 6-7 Waste Management Flow in Fujisawa City (FY2020)

(2) Source Separation and Separate Waste Discharge, Collection, and Transport

In 2007, Fujisawa City changed the waste collection system from station collection to door-to-door collection. The reasons for changing from the highly-efficient station collection to the door-to-door collection were to eliminate waste stations that may detract from the local scenery and to clarify the responsibility of waste generators who discharge waste. Door-to-door collection while lower in terms of collection efficiency, is expected to achieve the major goal of reducing the amount of combustible waste by encouraging individuals to thoroughly sort out their own waste.

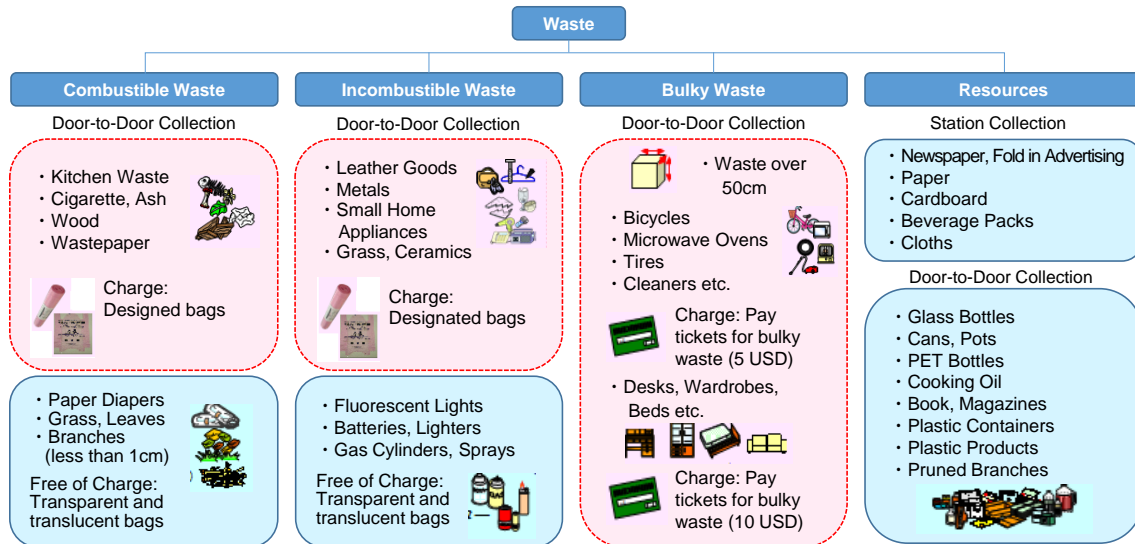
Since 1992, Fujisawa City had been collecting the four waste categories of combustible waste, incombustible waste, bulky waste, and recyclables by station collection method. However, with the objective to further reduce the waste amount, in April, 2007, the station collection system was changed to the door-to-door collection system throughout the entire city; and waste was sorted according to the items shown in Figure 6-8, with the exception of some recyclables. In contrast to station collection, which does not clearly identify the waste generators, door-to-door collection, in which waste is collected in front of the home, clearly identifies the waste generators. Therefore, it was expected that door-to-door collection would lead to greater responsibility felt by waste generators and motivate them to better sort their waste at source, which in turn would lead to waste reduction (for more details on station collection and door-to-door collection, refer to “Topic 4-1.2 Collection Methods”). In addition, in October of the same year, the city started to charge for the collection of combustible and incombustible wastes by requiring residents to purchase and use designated waste bags so as to further promote waste reduction (for more details on charging fees, refer to “Topic 3-3.4 (4) Charging Fees on Waste Management”).

Combustible waste discharged in designated bags from each household is collected twice a week by small compactor vehicles of two-ton capacity and lightweight trucks belonging to the North Environment Center and the South Environment Center. Since April, 2012, contracted collection operators have been collecting combustible waste in about 60% of the city area.

Collection of bulky waste is done by contracted collection operators. Bulky waste discharged in front of each house is collected by compactor vehicles and dump trucks every other day in each area and transported to the Recycle Plaza Fujisawa (shredding facility). Furthermore, to respond to an aging society, a waste collection support was started from April, 2015, by helping elderly people and others who have difficulty in discharging waste from their homes.

Incombustible waste is discharged in designated bags from each household two or three times a month on designated days. Collection of incombustible waste discharged from about 40% of the city area is directly managed by the city, and incombustible waste discharged from the remaining 60% of the city area is collected by contracted collection operators. All of the collected incombustible waste is transported to the Recycle Plaza Fujisawa.

Recyclables are discharged at stations once every other week in cooperation with local residents' associations etc. and is collected by the Fujisawa Resource Circulation Cooperative Association.



Source: Fujisawa City “Solid waste management in Fujisawa City (JICA training text)” (2019)

Figure 6-8 Waste Sorting Items

Table 6-12 Prices of Designated Waste Bags

Type	Types of bags		Price	
	Object	Size	10 bags in 1pack	5 bags in 1pack
Household Waste	Bags for combustible and incombustible wastes (Pink color)	Mini (5 L)	100 JPY	-
		Small (10 L)	200 JPY	-
		Medium (20 L)	400 JPY	-
		Large (40 L)	-	400 JPY
	Bags for combustible waste only (Yellow color)	Mini (5 L)	100 JPY	-
		Small (10 L)	200 JPY	-
		Medium (20 L)	400 JPY	-
		Large (40 L)	800 JPY	-
Business Waste	Bags for combustible and incombustible waste (Blue color)	Medium (20 L)	1,500 JPY	-
		Large (40 L)	3,000 JPY	-

Source: Fujisawa City Website “Types of Designated Collection Bags and Handling Stores”

<https://www.city.fujisawa.kanagawa.jp/kankyo-j/kurashi/gomi/wakekata/shushubukuro.html> (accessed February 9, 2022)

(3) Recycling

The Recycle Plaza Fujisawa was built in 2014 by combining a shredding and recycling treatment building with an environmental education building aiming of promoting public awareness through the display of environmental systems and provision of experiential activities. Recycle Plaza Fujisawa receives and recycles the entire quantity of bottles, cans, and PET bottles and some part of plastic containers and packaging. Recyclables that is not received at the Recycle Plaza Fujisawa is recycled by the Fujisawa Resource Circulation Cooperative Association and private business operators. Thus, under the management of the city, private business operators utilize their own recycle routes to increase the recycling rate.



Source: Fujisawa Eco Website “Recycling Plaza Fujisawa”
<https://fj4.city.fujisawa.kanagawa.jp/recycleplazafujisawa/> (accessed January 24, 2022)

Photo 6-16 Recycling Plaza Fujisawa

(4) Intermediate Treatment by Incineration

Combustible waste is received at the Ishinazaka Environment Center and the North Environment Center and then incinerated.

The Ishinazaka Environment Center is equipped with continuous-firing type fluidized-bed system incineration furnaces (130t/24h x 3 furnaces). As the amount of collected waste was reduced due to the benefits of using the paid-for designated bag system, since 2008 operation of furnace No. 1 has been discontinued, while furnace No. 2 and furnace No. 3 are in operation.

The North Environment Center is equipped with firing type stoker furnaces (150t/24h x 2 furnaces). Furnace No. 1 was demolished because of deterioration due to age, but furnace No. 2 was upgraded using the DBO method and is currently in operation.



**Photo 6-17 North Incineration Plant
(150t/24h×1 unit)**



**Photo 6-18 Ishinazaka Incineration Plant
(130t/24h×3 unit)**

Source: Fujisawa City “Outline of Waste Management FY2020” (2022)

(5) Environmental Education and Public Services

Fujisawa City provides an experiential learning program for the fourth grade elementary school pupils and kindergarten children by visiting their schools and kindergartens. For the purpose of promoting waste reduction and recycling so as to extend the service life of its landfill sites, children can begin to acquire knowledge about waste management and become aware of the present circumstances from childhood. Furthermore, the “quick call FUREAI collection” is being implemented. This service is intended for households with aged or disabled residents who are not able to take out their household waste (except for bulky waste) and recyclables to the stations. A city staff member announces their offer to help at the entrance of the house and helps the residents who need assistance to discharge their own waste.



Photo 6-19 School Visit Program



Photo 6-20 FUREAI Collection Vehicle

Source: Fujisawa City “Solid waste management in Fujisawa City (JICA training text)” (2019)

(6) Final Disposal

The Onnazaka landfill site, constructed in 1997, is currently Fujisawa City's only landfill site. Initially, the landfill operation was scheduled to end in 2008, but as a result of construction of expansion works, the landfill operation period was extended to 2036.

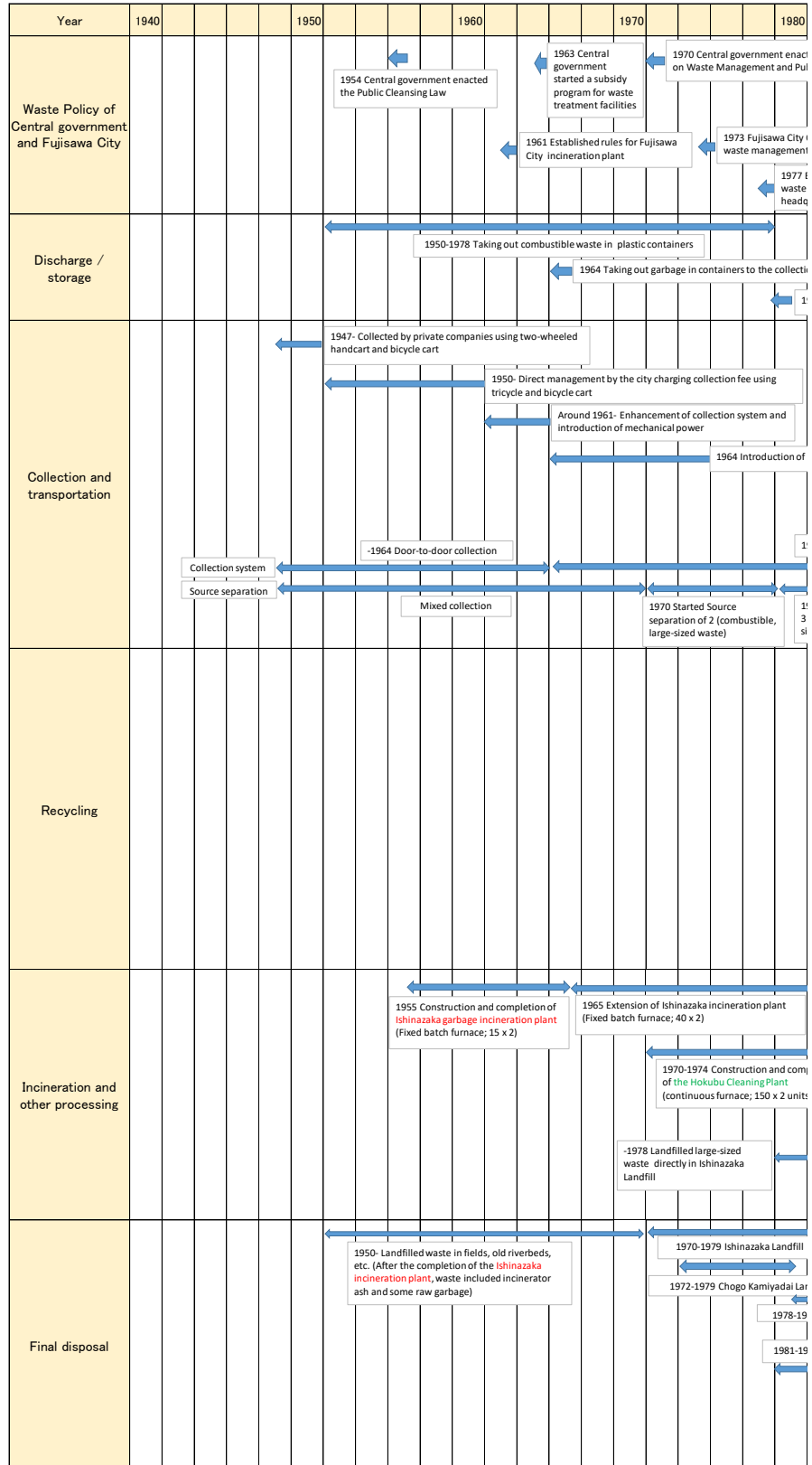
As it is extremely difficult to secure a site to construct a new landfill in the city, further waste reduction is required. The city is striving to effectively utilize the waste items intended for landfill so as to reduce the amount of waste entering the landfill and thereby extend the life of the landfill site.



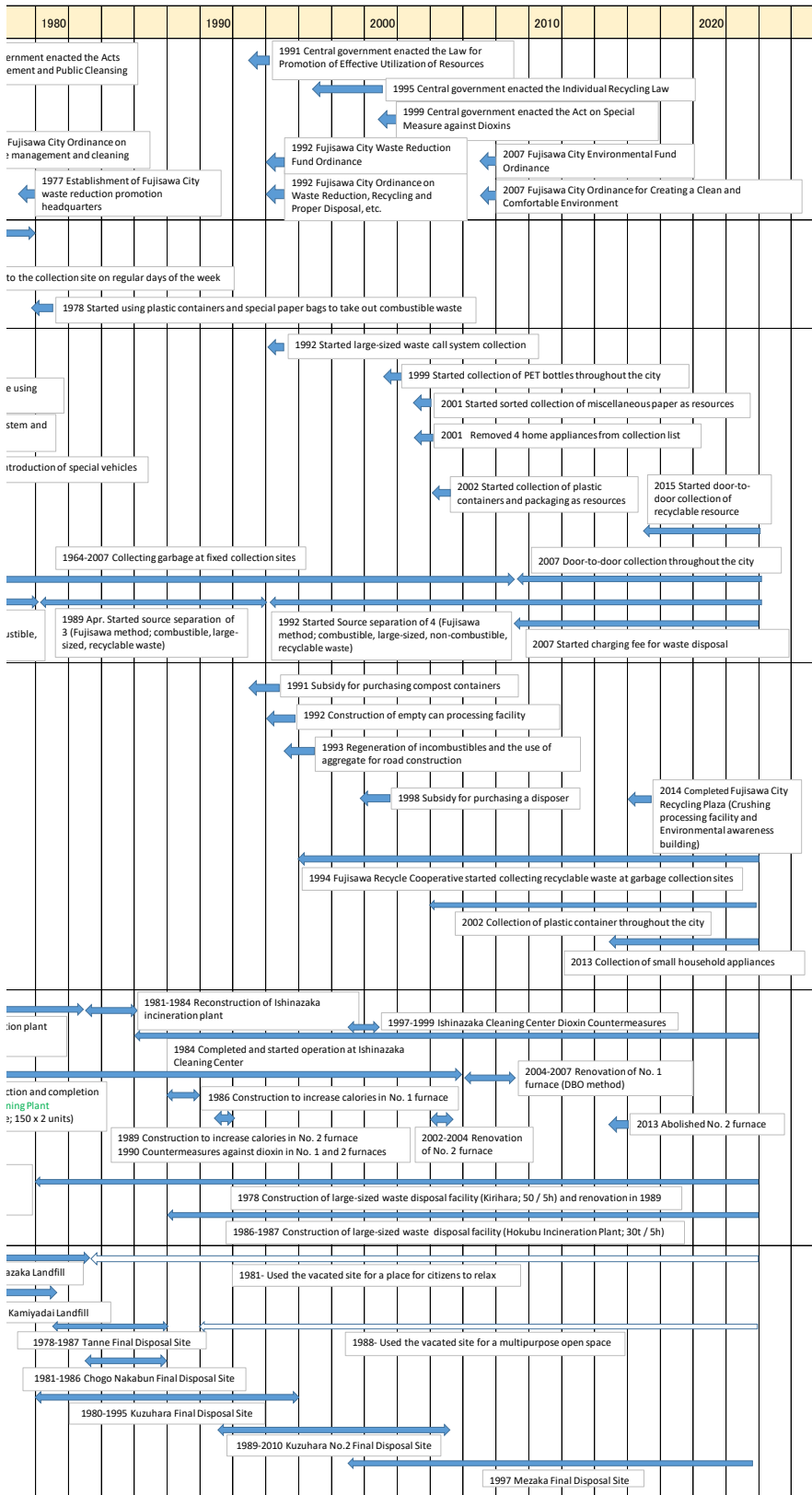
Source Fujisawa City “Solid waste management in Fujisawa City (JICA training text)” (2019)

Photo 6-21 Onnazaka Landfill Site

Attachment 2 History of Solid Waste Management of Fujisawa City



Source: Japan Environmental Sanitation Center



4 Waste Management Efforts made by Shibushi City



Shibushi City is a municipality that does not have a waste incineration facility, which is rare in Japan, and has worked to reduce and recyclables through thoroughgoing separation of household waste. In complete contrast to previously implemented mixed waste collection, the introduction of source separation and separated waste collection of multiple waste items successfully achieved a large reduction in final waste disposal to one-eighth. The experience of Shibushi City provides an understanding of needed design of the waste management system and how to obtain residents' cooperation in order to make recycling successful.

Shibushi City was established in January 2006 through the merger of former Shibushi town, former Ariake town, and former Matsuyama town. The city has a fan-shaped area measuring approximately 23 km from east to west and 18 km from north to south and has a total area of 290.28 km² which is approximately 3.2% of the total area of Kagoshima Prefecture. Table 6-13 shows the population and the number of households according to the national population census of 2020.

Taking advantage of a vast expanse of farmland and genial climate and utilizing large-scale dry field irrigation, the city has developed into one of the prefecture's most productive and specialized agricultural areas for growing tea and vegetables.

Source: Shibushi City Website "Why don't you start agriculture in Shibushi City"
<https://www.city.shibushi.lg.jp/soshiki/10/2170.html> (accessed January 24, 2022)

Table 6-13 Population and Number of Households in Shibushi City (2020)

Item	Matsuyama District	Shibushi District	Ariake District	Total Shibushi City
Number of households (household)	1,580	7,293	4,368	13,241
Population (male)	1,721	7,480	4,797	13,998
Population (female)	1,886	8,233	5,212	15,331
Population (total)	3,607	15,713	10,009	29,329
Population per household (person)	2.28	2.15	2.29	2.22

Source: Bureau of Statistics, Ministry of Internal Affairs and Communications "Results of 2020 national population census" (2021)



Source (Photo): Yachiyo Engineering Co., Ltd.

Figure 6-9 Location of Shibushi City

4.1 History of Waste Management - Waste Recycling Project around the Time Shibushi City Was Established

Shibushi City, which does not have an incineration facility, began its own waste recycling efforts in response to the growing need to reduce the amount of waste disposed at landfill. These efforts were completely new for both the municipality and residents.

The former towns of Shibushi, Ariake, and Matsuyama did not have any incineration plants and the collected waste was discarded in a landfill located in a depressed area surrounded by mountains. However, with the rising concern for environmental problems, it became impossible to continue discarding waste in this location. Accordingly, in 1990, the South Soo Welfare Association, consisting of the former towns of Shibushi, Ariake, and Osaki, constructed a controlled-type landfill site with a landfill capacity of 720,000 m³ to directly receive waste generated from those three towns without separating waste items. Since waste was simply dumped in the landfill site, the site became a breeding ground for flies, mosquitos, rats, and crows, causing an offensive odor, and as a consequence a large number of complaints from neighboring residents were lodged with the South Soo Welfare Association. Furthermore, estimates showed that the landfill site would become full in 1998 if direct landfill continued without separating waste items. Thus, waste reduction became an urgent issue. From that time, Shibushi City started to actively work on the recycling. Table 6-14 shows Shibushi City's efforts in waste management from the inauguration of the city to the present date.

**Table 6-14 Shibushi City's Efforts in Waste Management
from the Inauguration of the City to the Present Date**

Start year	Event and project
1990	The former towns of Shibushi, Ariake, and Osaki (South Soo Welfare Association) constructed a controlled-type landfill site with a landfill capacity of 720,000 m ³ .
1998	Source separation of cans, bottles, and PET bottles started using designated bags.
1999	Started the sorting process of the above at the Soo Recycle Center, which was completed in 1999.
1999	Collection of 19 items of resources was started at 500 stations in the city.
2003	Started the source separation of 24 items.
2004	The source separation of kitchen waste started three times a week at 600 stations in the former town of Shibushi and Ariake. Composting started in the Soo Recycle Center.
2006	Shibushi City was established through the merger of 3 towns. The source separation of kitchen waste started at the former town of Matsuyama.
2007	The door-to-door collection of bulky waste started.
2011	JICA Partnership program (Grass-roots technical cooperation) project (Fiji)
2013	Collection of small home appliances started. The number of items to be separated became 27.
2018	The source separation of disposable diapers started in model districts.
2019	The model districts for the sorted collection of disposable diapers were expanded.

Source: by interview to Shibushi City

4.2 Noteworthy Experience: History of Separation of 27 Waste Items - Shibushi Model

The city drastically changed its stance on the waste collection method from “It is OK to put anything in a black bag.” to “Write your name on the waste bag and discharge it responsibly”. The tireless efforts of city staff in charge led to the success of recycling. The staff provided opportunities for all residents to express their opinions which were carefully listened to, and thoroughly explained the new system. This attitude encouraged the residents to cooperate.

The three former towns of Shibushi, Ariake, and Osaki constructed a full-scale final disposal facility in 1990. However, as the amount of waste brought in increased year by year, it was estimated that the facility would become full by 2004, even with the introduction of separate collection of cans, bottles, and PET bottles. Although construction of full-scale incineration facilities was discussed, there was concern that costs for construction, maintenance, and management of incineration facilities would become a huge burden on the city in the future. As a result, Shibushi City decided to carry out a thoroughgoing recycling for the purpose of waste reduction so as to extend the life of the landfill site.

This decision was one in which the municipality top officials were heavily involved. At the time, a wide-area waste treatment plan was underway to process waste from neighboring cities and towns in one large incinerator, and the three towns had the option of participating in this plan. However, in

light of the environmental and health impacts of incineration and the social trend toward a sound material-cycle society, the leaders and officials at that time decided to promote recycling by separation of waste. It was a decision made by the administrative leaders who considered the impact of incineration on the health of citizens and the risk of environmental pollution at that time.

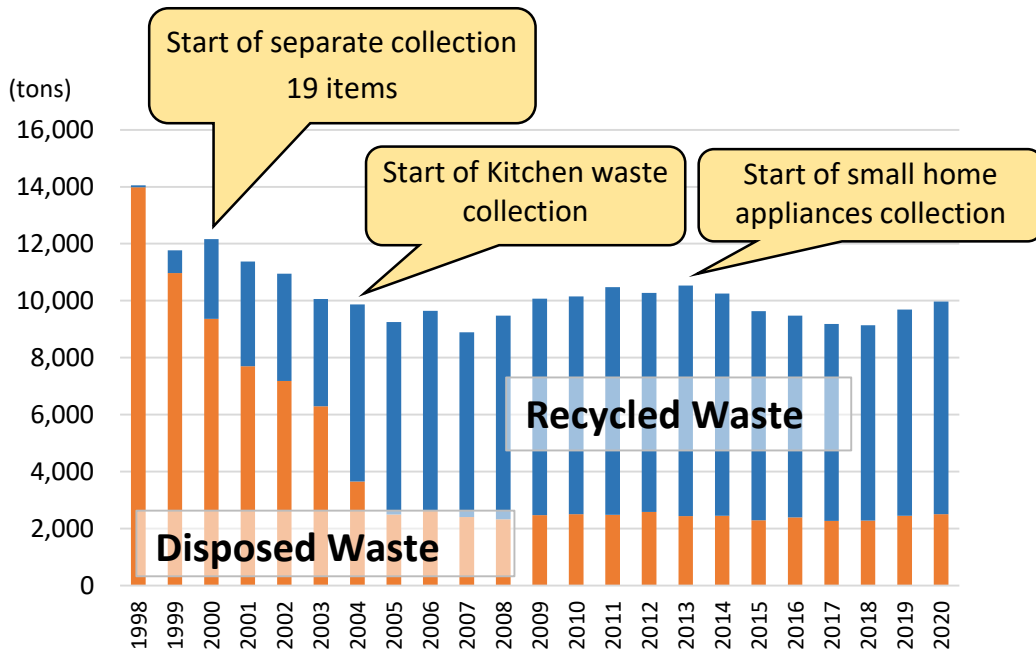
In order to promote effective recycling, separation of multiple waste items is effective; therefore, the number of separated items was increased to 27 items by 2013. No other Japanese municipality had ever experienced the sorted collection of as many as 27 items. However, through thorough and painstaking dialog between the administration and citizens, sorted collection of 27 waste items is now a part of life in Shibushi City as shown in photos 6-22 to 6-25.

In contrast to the previous stance of “It is OK to put anything in a black bag”, municipal personnel in charge visited neighborhoods to explain to residents to “Write your name on the waste bag and discharge it responsibly”. The black plastic bags with no names on them were not designed to raise awareness that the person putting out the waste should be responsible for separating it properly, as long as it was impossible to tell who put out what and what was put out.

The city actively promoted public awareness activities. Briefing sessions with residents were frequently held to provide an opportunity for each resident to express an opinion. In briefing sessions, the current conditions of the landfill site and the necessity of recycling were explained in detail. Some residents objected on the grounds that it was troublesome to separate waste, but administrators visited them and respectfully explained the reasons for change. In addition, environmental education programs were implemented 76 times in 2016 and altogether 1,868 people participated in the programs.

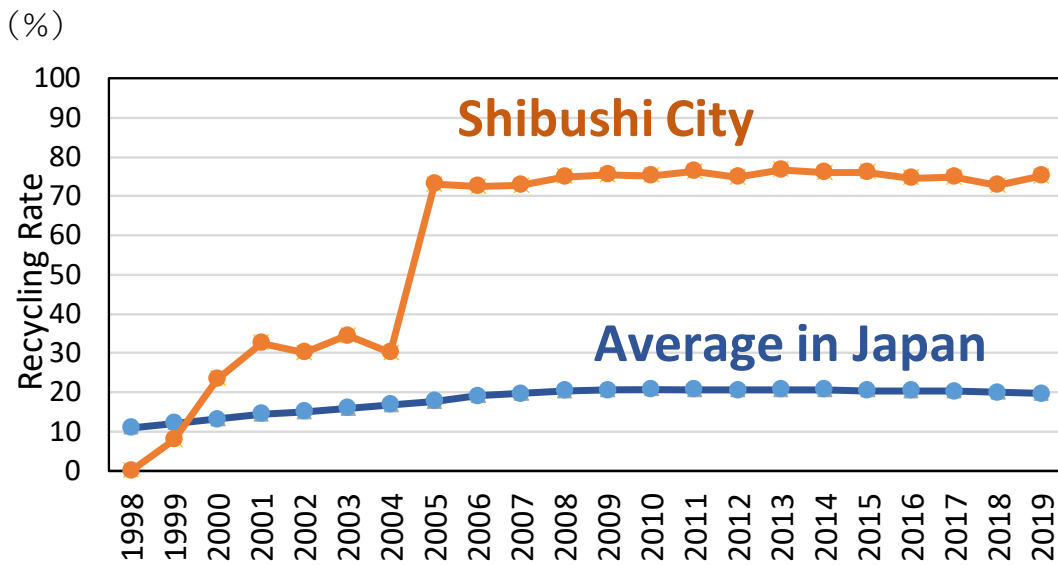
The city’s painstaking efforts changed residents’ consciousness about waste management. It seemed that the attitude of sorting waste being “troublesome” changed into an attitude of “gratitude”. This was because residents do not need to store the kitchen waste at home.

As shown in Figure 6-10 and Figure 6-11, the city successfully reduced waste to be disposed of in the landfill by 80% in 2008 and the recycling rate remained very high in comparison with the national average. The landfill site significantly changed because kitchen waste was not being landfilled there anymore. The offensive odor, flies, crows, and rats disappeared. The reduction of the amount of waste being deposited into the landfill made it possible to extend the life of the landfill site.



Source: Shibushi City Website “Please cooperate in the separate collection of waste”
<https://www.city.shibushi.lg.jp/soshiki/6/1826.html> (accessed January 20, 2022)

Figure 6-10 Waste Treatment and Disposal Amount Trends in Shibushi City



Source: Ministry of the Environment Website “Results of the survey on municipal waste management (FY1998 to 2019)” http://www.env.go.jp/recycle/waste_tech/ippan/index.html (accessed January 24, 2022)

Figure 6-11 Annual Trend of Recycling Rate in Shibushi City



Photo 6-22 Collected Recyclables at Collection Area (1)



Photo 6-23 Collected Recyclables at Collection Area (2)



Photo 6-24 Waste Discharge by Resident



Photo 6-25 Resource Collection by Businesses

Source: Yachiyo Engineering Co., Ltd.

4.3 Current Waste Management in Shibushi City

(1) Waste Management Flow in Shibushi City

Figure 6-12 shows the waste management flow in Shibushi City. Waste is collected according to four categories: kitchen waste, recyclables, bulky waste, and municipal waste. The separate collection of 27 sorted items is based on these four categories. Kitchen waste and recyclables are brought by each family to the waste station, then the waste collection and transport operators transport the waste to the compost center and the recycling center, where composting is implemented and recyclable resources are separated and sold. Bulky waste is collected door-to-door and transported to the recycle center. At the recycling center, the waste is separated into resources and residue; resources are sold, and residue is disposed of in the landfill. Municipal waste is brought by each household to the waste station, directly transported to the landfill site and disposed of in the landfill.

With this system, which does not have incineration facilities, the annual waste management cost per capita in Shibushi City is around JPY 11,000 (in FY 2019), which is about JPY 5,000 lower than the national average of about JPY 16,000. In addition, part of the profit from the sale of recyclables is returned to citizens through subsidies for the cost of holding environmental study sessions by citizens and managing the waste stations.

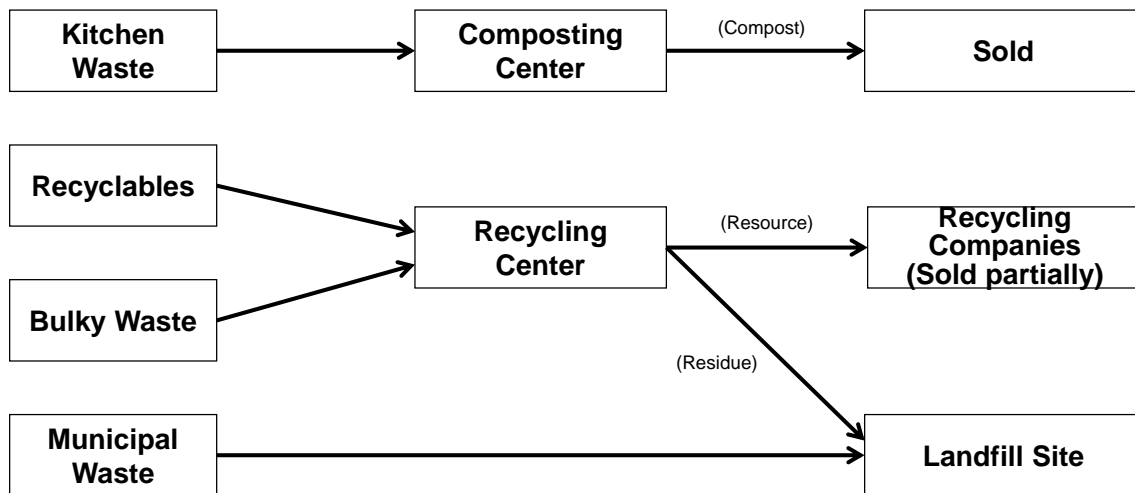


Figure 6-12 Waste Management Flow of Shibushi City

(2) Composting

Since Shibushi City has no incineration facility, the most feasible waste reduction method is composting. Successful composting is a matter of greatest importance. To produce good compost without generating odor from the facility, the proper handling of kitchen waste is essential throughout the process from the time it was discharged from each household to the time it arrives at the facility. Although making good compost is not a final goal, good compost is highly marketable and the production process functions as a waste treatment process.

In Shibushi City, kitchen waste separately collected from each household is transported to the compost center (Matsuyama organic plant of the Soo Recycle Center), established in 1999, so as to be converted into compost. An overview of the process is described below.

1) Collection, Transport to the Facility, and Shredding

Kitchen waste is discharged into a covered 50-liter container placed at the dedicated kitchen-waste station (Photo 6-26). Woodchips are laid at the bottom of the container. The woodchips are generated by shredding tree branches (Photo 6-27) purchased from a timber mill. The utilization of woodchips also reduces the generation of odors caused by composting.

Kitchen waste is collected three times a week, but citizens are allowed to discard kitchen waste at any time into this container; therefore, they do not need to store the kitchen waste in their homes. The collected kitchen waste is manually put into a hopper (Photo 6-28). The emptied container is cleaned by woodchips without washing with water (Photo 6-29), woodchips are then laid at the bottom of the container (Photo 6-30) and the container is returned to the station. Kitchen waste loaded into the hopper is mixed with woodchips at a ratio of 1:1, and then loaded into a shredding machine.

The amount of kitchen waste converted into compost at this facility is approximately one ton (50 containers worth) a day. The cooperation of the residents is essential in order to collect good, raw compost material.

2) Production of Compost

Kitchen waste is mixed with shredded woodchips at a ratio of 1:1 and stored in a concrete yard for six months. One lot of the concrete yard has the capacity to generate one-month worth of compost (Photo 6-31). During the six-month storage period, the waste mixture is agitated once a week (Photo 6-32). The agitation frequency depends on when the temperature of the waste pile becomes less than 30°C. Typically, agitation is performed once a week.

3) Completion and Packaging

After six-month of maturing (Photo 6-33), the mature waste mixture is strained through a sieve twice. It is first strained through a 30-mm vibrating sieve (Photo 6-34) and then put through a 10-mm rotating sieve. Oversized particles captured in the 30-mm sieve are returned upstream (shredded kitchen waste). Particles that have passed through the 10-mm rotating sieve are then packed in bags. There are two types of bags, 15 kg (300 JPY \approx 3 USD) and 5 kg (100 JPY \approx 1 USD). The compost packed in these bags is finally sold (Photo 6-35).

The above description is the compost treatment process in this facility. The kitchen waste is handled effectively, and no foul odor is emitted from any process, thereby generating ideal compost. About 80% of the compost produced is sold over-the-counter, and 20% is distributed free of charge twice a year at community centers and other locations to give back to local residents. Shibushi City has a thriving agricultural industry, which provides a stable source of sales for the compost produced, making the compost business possible.



Photo 6-26 Containers for Organic Waste Placed at Stations



Photo 6-27 Branches before Shredding



Photo 6-28 Waste Carried into the Plant



Photo 6-29 Cleaning of Containers

Source: Yachiyo Engineering Co., Ltd. , Japan Environmental Sanitation Center



Photo 6-30 Container with Woodchips (Sawdust) Laid at the Bottom



Photo 6-31 Concrete Composting Yard



Photo 6-32 Mixing of Compost by Heavy Equipment



Photo 6-33 Matured Compost



Photo 6-34 Final Processing Process after Maturing



Photo 6-35 Packaged Compost

Source: Yachiyo Engineering Co., Ltd. , Japan Environmental Sanitation Center

(3) Sorting Waste for Recycling

Recyclables which have been collected through separate collection are split and sorted again at the recycling center, thereby making it possible to sell waste items that would normally be disposed of. A stable system has been established in which waste collection operators accept all of the 27 items of sorted waste.

As described earlier, Shibushi City asks residents to separate 27 items of waste, and the separated recyclables are transported to the Soo Recycle Center (Photo 6-36).

As shown below, at the Soo Recycle Center, waste is separated according to item with resorting as required, compressed, solidified, carefully selected, and stored until shipment. In Shibushi City, waste that cannot be recycled is classified as “municipal waste” and is disposed of in the landfill.

For a year when the sorted collection system was being introduced, municipal administrators and instructors visited waste stations once a month on a designated day to instruct local residents to separate waste. Before the change to sorted collection, measures were taken to mainly reduce the amount of waste. At the start of the significantly changed way of collecting sorted waste, local residents were confused about the new procedure. However, municipal administrators regularly visited the stations and carefully explained the process to residents, which encouraged the residents to participate in the new waste collection system.

1) Recycling of Spray Cans and Cassette-type Gas Cylinders

Spray cans and cassette-type gas cylinders are collected as they are (Photo 6-37). Such waste is compressed in the Soo Recycle Center and then shipped (Photo 6-38).

2) Metal Lids, Pots, Kettles, etc.

The degree of impurity removal and waste quality vary, and recycle value is low. However, such waste is successfully shipped from this facility (Photo 6-39).

3) Bottles

Bottles are collected and stored according to color (Photo 6-40).

4) Ceramics

When ceramics only are pulverized, they become a valuable material. Ceramics are pulverized by a dedicated pulverizer (Photo 6-41).

5) PET Bottles

PET bottles are commonly collected and recycled nationwide. Caps and labels are removed. The compressed PET bottles are evaluated as high-value product (Photo 6-42, 43).

6) Plastics

In addition to “other plastics” as specified in the *Containers and Packaging Recycling Law*, all kinds of waste plastics are collected in this facility. This is different from other municipalities. In

many other municipalities, plastic product waste, with the exception of PET bottles, is considered as combustible waste. Impurities are removed in this facility and then transported to a steelworks company to be used as a reducing agent for blast furnaces (Photo 6-44, 45).

7) Waste Oil

Two hundred liters of waste oil are collected daily and recycled oil is generated in the reproduction equipment. The operating capacity of this equipment is 200 liters a day, and 150 liters of recycled oil is refined from 200 liters of waste oil by means of one batch operation per day. Recycled oil is used as a fuel for vehicles in the recycle center (Photo 6-46).

8) Disposable Diapers

The sorted collection of disposable diapers started in 2018 in the model districts which were expanded in 2019.

9) Other Items

Volume reduction of polystyrene foam and the separation of fluorescent lamps and small home appliances are also implemented (Photo 6-47, 48, 49).

The Soo Recycle Center engages 40 workers and 10 seniors to perform the above work. Waste management is conducted based on two policies: to separate waste that can be sold as the result of separation, and to adequately treat waste that cannot be sold so as to reduce disposal cost.

As for recycling items, business operators who will accept the resources are first determined and then resource items to be separated are determined. As a result, there is no problem with collected resources remaining untreated. In FY2021, Shibushi City earned approximately JPY 13 million from the sale of separated resources to private companies. A portion of the income was then returned to the public by using it to manage waste collection points and to hold environmental study sessions.



Photo 6-36 Overview of Soo Recycle Center



Photo 6-37 Spray Cans and Cassette Cylinders

Source: Yachiyo Engineering Co., Ltd.



Photo 6-38 Compressed Cans



Photo 6-39 Metal Lids, Pans and Kettles



Photo 6-40 Bottles



Photo 6-41 Ceramics



Photo 6-42 Compressed PET Bottles (Grade A)



Photo 6-43 Compressed PET Bottles (Grade B)



Photo 6-44 Sorting Process of Containers and Packaging Plastics



Photo 6-45 Compressed Containers and Packaging Plastics

Source: Yachiyo Engineering Co., Ltd.



Photo 6-46 Waste Oil



Photo 6-47 Volume Reduced Styrofoam



Photo 6-48 Fluorescent Lamps

Source: Yachiyo Engineering Co., Ltd.



Photo 6-49 Small Size Home Appliances

4.4 International Cooperation

Shibushi City has been accepting trainees from overseas since 2009, and from 2011, a JICA Partnership program (grass-roots technical cooperation) project (regional proposal type) titled “Promotion of Shibushi Model (Waste Minimization without incineration) from Fiji to Pacific Island Countries” was implemented (Photo 6-50). The Shibushi Model to implement thoroughgoing waste recycling without having an incineration plant is expected to become a most suitable model for countries that do not have incineration facilities.



Source : Shibushi City

Photo 6-50 Compost Making Practice in a JICA Project Conducted in Shibushi City

5 Suggestions Based on the Waste Management Efforts of the Three Municipalities

As described in the previous sections, administrators in charge of waste management of three municipalities that represent large-, medium-, and small-scale municipalities in Japan were confronted with hardships but eventually overcame the problems. In this section, the kinds of problems municipal administrators were confronted with and how they addressed the problems will be described; section 5.1 will highlight the efforts of each municipality, and section 5.2 will address the identification of future issues.

5.1 Waste Management Efforts Made by Each Municipality

(1) Tokyo 23 Cities

Formulation of TMG Ordinances and Measures in Conjunction with Enactment of National Legislation

- Following the enactment of the *Waste Cleaning Act* by the central government in 1900, Tokyo introduced a contract out waste collection system and in the same year started to enter into contracts with business operators.
- Following the enactment of the *Public Cleansing Act* by the central government in 1954, Tokyo improved the waste management ordinances and the organization.
- The *Waste Management Act* was enacted in 1970, and Tokyo revised the ordinance by clearly specifying the responsibilities of business operators who generated business waste and the importance of gaining the cooperation of local residents.
- In conformity with the revised *Waste Management Act* in 1991 and the establishment of the *Effective Resources Utilization Promotion Act* in 1991 by the central government, Tokyo established a new ordinance that strictly promoted the reduction of waste generation and reuse of waste in 1992.

Citizen's Participation and Consensus-building among Residents

- With the experience of the “War on Waste”, citizens’ awareness about the waste problem significantly changed in Tokyo. They became aware that waste problem is not only the administration’s problem but is an issue for both residents and administration to mutually resolve.
- In order to gain the understanding of residents, Tokyo also focuses on public relations. In particular, Tokyo accepts about 60,000 facility tours annually and takes advantage of the facility tours to repeatedly explain the necessity and safety of the facilities.

Intermediate Treatment

- Since the first incineration facility was built in Tokyo in 1924, incineration has been the main intermediate treatment method, but during those early years of incineration treatment, there were technical issues such as incomplete combustion due to excessive moisture. For this reason, for a while kitchen waste was separated from the waste treated at the incineration plants.
- Presently, there are two types of management methods for waste incineration plants: direct management and outsourcing to the private sector.
- Currently, the DBO (Design-Build-Operate) method is not used for the incineration plants. This is because centralized management of the operating 21 plants provides economies of scale and facilitates uniform improvement in technology.

- When a new incineration plant was planned and built, a trilateral treaty was concluded among the residents, city administration where the facility is located, and Clean Authority of TOKYO. Although contents of the treaty vary by city depending on discussions with residents, the basic points are the voluntary criteria for pollution control, the amount of waste to be received, the number of service vehicles accessing the area, access route, etc. In addition, operation council meetings are periodically held to receive and discuss reports on operating conditions of furnaces, pollution control data, furnace operation planning, etc.
- In principle the new incinerator plants are constructed, or re-built on the same sites as existing plants. This is because it is difficult to secure sites for construction of new plants in a large city like Tokyo.

Principle of Waste Disposal within the Administrative Boundary and Inter-municipal Waste

Disposal

- In principle, each of the 23 cities of Tokyo treats waste within its own city area at a waste treatment plant owned by the city. Currently, in response to the decrease in the amount of waste, each city, regardless of whether it has a plant or not, mutually cooperates and collaborates with each other cities to ensure a stable intermediate waste treatment system within the 23 cities under the responsibility of the 23 cities as a whole.
- In case of shutdown of all furnaces of a certain incineration plant, etc., waste is sometimes brought to an incineration plant located outside the city where the waste is treated. This cooperation between the Tokyo 23 Cities is made possible owing to the understanding of local residents and the local operating council for joint waste treatment.
- Concerning wide-area (as well as inter-municipal) treatment of waste in the event of a disaster, Tokyo received disaster waste from districts outside Tokyo at the time of the Great East Japan Earthquake. This was done because the local operating council understood the difficult of the situation. Thus, in the Tokyo 23 Cities, while the principle of disposal within each area is observed, flexible waste treatment management has been conducted as necessary.

(2) Fujisawa City

Waste Collection

- Fujisawa City changed the waste collection system in 2007 from station collection to door-to-door collection. Reasons for abandoning the highly-efficient station collection in favor of door-to-door collection were to improve the local scenery and to clarify the responsibility of people who discharge waste. However, there was concern that the clarification of each resident's responsibility could lead to an increase in illegal dumping. Patrols in the city were enhanced; however, there was no particular increase of illegal disposal associated with the door-to-door collection.
- The city charged for the waste collection when the door-to-door collection was introduced, and the revenue was applied to part of the collection cost that increased as the result of implementing the door-to-door collection.
- Fujisawa City determined that the implementation of door-to-door collection was successful because: (1) the local scenery was improved, (2) responsibility of each resident was clarified and the recycling rate increased, and (3) many other municipalities started to introduce the door-to-door collection after Fujisawa City first implemented the system.

Recycling

- In the 1970s, Fujisawa City became the first city in Japan to undertake the collection of recyclables through the joint activities of citizens, municipal administration, and collection operators. This was due to (1) a rapid increase in bulky waste, (2) a shortage of final disposal facilities, and (3) a survey of bulky waste composition that revealed the presence of many recyclable resources.

Intermediate Treatment

- Through the DBO (Design-Build-Operate) system, a new incineration plant was constructed from 2004 to 2007. At the time of construction of the new incineration plant, cost reduction and leveling were required due to financial difficulties at that time and various privatization methods were discussed. As a result, it was decided that the project for the construction of a new incineration plant was to be implemented by the DBO method. Since the start of facility operation, the municipality has been monitoring the private sector operator's performance in operating and maintaining the plant. Specifically, the municipality confirms the operating conditions of the facility and also inspects the facility from the aspect of business operation.
- The North Waste Management Center was reconstructed from 1986 to 1990 to handle high-calorie heat generation. This countermeasure modification work was carried out because the calorific value of waste had increased significantly compared to the time of construction.
- Subsequently, the North Waste Management Center and Ishinazaka Environment Center have undergone dioxin reduction modification work.

Consensus-building with Residents

- At the time of rebuilding Ishinazaka Environment Center (incineration plant), the neighboring areas had more developed into crowded residential areas than when the former facility was constructed years before. The construction planning was shared with local residents at an early phase of planning, and the rebuilt facility was planned and constructed to provide social benefits to the society in addition to its waste treatment function.

(3) Shibushi City**Sorted Collection of Kitchen Waste**

- When separate collection of kitchen waste was introduced in 2004, the municipality conducted verification testing in model districts before expanding the system in the city. The implementation result indicated that the sorted collection of kitchen waste was well received by residents because they did not have to keep kitchen waste at home for many days.
- When separation of kitchen waste was started, eight administrators in charge explained the waste management system to the residents for a three-month period. Municipal administrators and instructors visited each of the waste stations once a month on a designated day to instruct local residents on separating waste.

Recycling

- In 1998, the three towns decided to change from mixed collection to separate collection. Under the leadership of the mayors of the three towns, consideration of the incineration option was stopped and the recycling process was initiated.
- In 1999, the three towns started collecting 19 recyclable items at 500 stations in the city.
- In 2013, the city started collecting small home appliances, bringing the total number of sorted items to 27.
- In 2018, the city started sorted collection of disposable diapers.

Consensus-building with Residents

- The city is aware that to obtain the understanding and cooperation of citizens, it is important for administrators in charge to have direct conversations with each local resident. In those days, it was possible for representatives of the community to explain the circumstances to local residents. However, instead of doing so, the city frequently held briefing sessions joined not only representatives but also by residents to provide opportunities for each resident to express their opinion. Some residents objected on the grounds it was troublesome to separate waste, but administrators visited them and respectfully explained the reasons for change, which encouraged the residents to cooperate.

5.2 Summary Based on the Experience of the Three Municipalities for Major Waste Management Issues

Compliance with the Law

In many developing countries, compliance with the law is an issue even when the law is well developed. One of the reasons for the lack of compliance with the law may be that the law does not take into account the culture of the country and the behavior of its citizens. In other cases, the rules and standards necessary for the realization of the law are not established. It is essential for the law to be effective, that; (1) the law must take into account the culture of the country and the behavior of its citizens, and (2) the necessary rules and standards must be established to realize the law. In the case of Tokyo 23 Cities, local governments have formulated ordinances and taken measures based on national laws in conjunction with the enactment or revision of waste management-related laws.

Collection Improvement

Holding waste generators accountable is important for improving waste collection. Some municipalities have changed the collection system from station collection to door-to-door collection, as in the case of Fujisawa City. This is because it is expected that clarifying the responsibility of residents as waste generators will result in thorough source separation of waste and promotion of waste reduction. While door-to-door collection is acceptable for small and medium-sized municipalities, it is difficult for large municipalities. As developing countries will be required to improve waste collection, including separate collection, it is necessary to clarify the responsibility of waste generators according to the size of the municipality.

Recycling

In order to initiate recycling, a strong commitment from the administrative head is necessary, as in the case of Shibushi City. It is also important that all stakeholders share the policy and plan. To do so, it is effective to start with a small area on a trial basis first. It is desirable to carefully select the area on trial ahead of the others and to expand the implementation areas in stages. This introduction method is recommended even for smaller municipalities. In this process, it is important to check the waste flow from waste to recyclables. Especially in developing countries, recycling is often based solely on economics. In addition, there are cases where non-recyclable waste (recycling residues) is disposed of inappropriately. Attention should be paid to the proper disposal of recycling residues.

Consensus-building with Residents (Resident Cooperation)

When introducing a source separation and separate collection system, it is desirable to provide detailed explanations to each person as much as possible, as in the case of Shibushi City. In Japan, even in large cities, leaflets explaining the separation method are distributed through regular meetings of neighborhood associations, for example, so that each person can be informed of the separation method. It is important to collect and analyze data on waste (waste amount, waste composition, etc.) that can clearly indicate the need for source separation, and to share the results with residents.

In general, people may have an excessive aversion to facilities they are not familiar with. It is an effective way to provide people with an opportunity to actually experience a facility tour in order to dispel the aversion to the facility and to change attitudes.

After construction, it is necessary to create a mechanism for daily dialogue with residents, including facility tours, as in the case of Tokyo 23 Cities. In the tours, sharing information on facility operation, including operational data, environmental data, and the status of accidents at the facility, is important for developing a relationship of trust with residents.

Development of Treatment Facilities

In the construction plan of treatment facilities, it is important to involve residents from the early stages of the planning. In Japan, the construction plan is devised together with local residents and incorporates their requests from the early stages of the planning. This approach is based on the experience in dealing with past opposition movements against the construction of facilities.

In planning waste incineration facilities, waste quality changes should be noted. In Japan, most of the waste incineration facilities constructed during the high-growth period were later renovated with high-calorie countermeasures to cope with the subsequent increase in the calorific value of waste. In developing countries where waste incineration facilities are planned, it should be noted that waste quality will change with future economic growth.

Understanding waste quality is also important when planning compost or methane fermentation facilities. It is necessary to collect a lot of waste data on a daily basis. Even though composting and methane fermentation are excellent recycling methods, they have less effect on waste reduction than incineration, so if they do not work well, they will not be evaluated from the viewpoint of waste treatment. Especially in composting, if the quality of compost is not good, its market value will be low and it may have to be disposed of.

Although there are still few full-fledged waste treatment facilities (intermediate treatment facilities) in developing countries, it is important to develop treatment facility plans based on the predicted data of waste in the future.

Treatment Privatization

When outsourcing to the private sector, if the administration does not properly manage the contractor, the service will deteriorate, leading to a loss of trust from residents. Even in the case of private finance initiative (PFI) for waste management, it is important to clarify the division of responsibility for long-term risks with the private company and not to leave everything to the private company. In developing countries, lack of ownership may be observed in the introduction of privatization, so this point should be noted. Japan's track record (experience) shows that the DBO (Design-Build-Operate) method, rather than PFI, has been adopted. In the DBO method, basic conditions for which the municipality is fundamentally responsible are clarified, including the quantity and quality of waste, treatment and disposal of incinerated ash, compliance with stricter laws and regulations, and negotiations with residents.

Inter-municipal Waste Management

In many countries, municipal solid waste is managed within the local district in principle, but as in the case of Tokyo 23 Cities, inter-municipal waste management is adopted if necessary. This is because inter-municipal waste management is expected to ensure a stable and efficient waste management system and reduce waste management costs. Even in developing countries, there are many cases where it is desirable to implement inter-municipal waste management, such as the construction of landfill sites and waste-to-energy facilities. In Japan, the central government has established guidelines for inter-municipal waste management, and is also promoting inter-municipal waste management in emergency responses to disasters etc.

Topic 7. Waste Management Challenges in Developing Countries and Lessons Learned from JICA Projects

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1 Introduction

The amount of waste generated annually around the world is rising at an unprecedented rate due to rapid urbanization and population growth. According to “What a Waste 2.0 - A Global Snapshot of Solid Waste Management to 2050”, published by The World Bank in 2018, the amount of waste generated each year is projected to reach 3.4 billion tons over the next 30 years if urgent action is not taken, up from 2.01 billion tons in 2016. By 2050, annual waste generation in the sub-Saharan Africa region is forecast to more than triple from 170 million tons in 2016, and more than double in South Asia, up from 330 million tons in 2016. This is due to diverse factors at different stages of waste management that have been systematically organized by JICA from a variety of perspectives (Table 7-1).

Waste problems in developing countries are therefore likely to become even more acute in the future, requiring measures to be taken as soon as possible. Accordingly, Japan has provided support to developing countries based on the knowledge and technologies the country has gained through its experience in overcoming challenges related to waste management. This topic will introduce the experiences of JICA through case studies in the six countries shown in Figure 7-1: the waste management challenges that faced each country, and how the experiences of Japan were utilized and the resulting impacts.

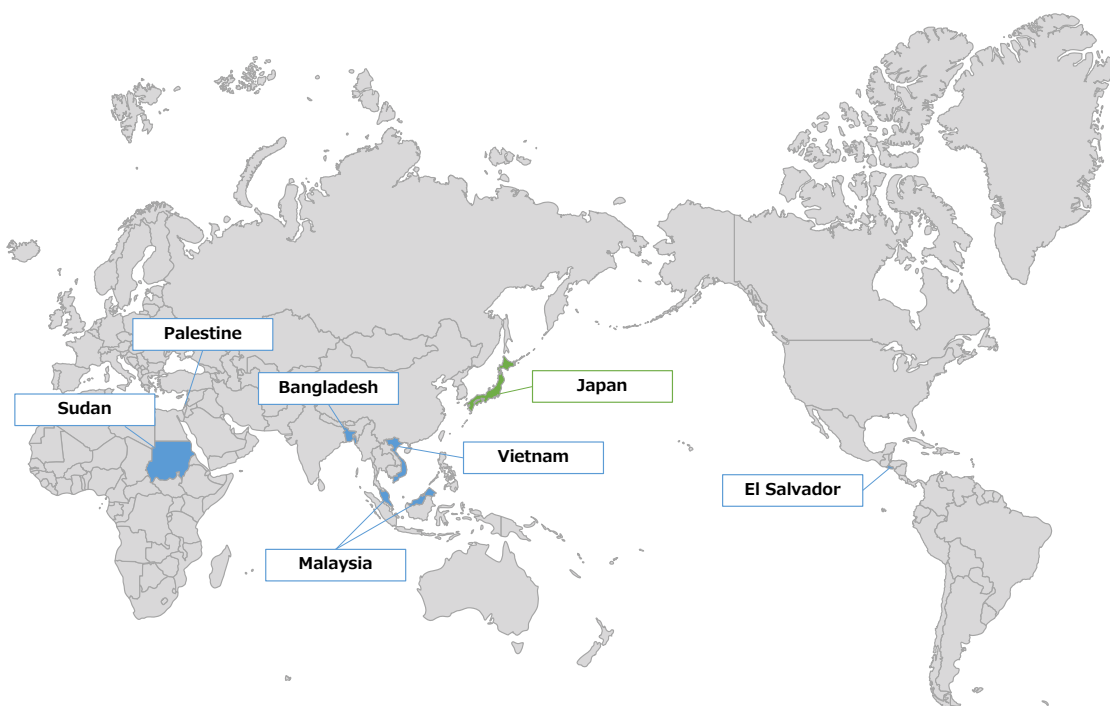


Figure 7-1 Locations of Countries Covered in Topic 7

Table 7-1 Specific Issues Related to Waste Management in Developing Countries

	Generation/Discharge & Storage	Waste Collection and Transport	Intermediate Treatment & Recycling	Final Disposal
Social considerations	<ul style="list-style-type: none"> • Inadequate measures on control of generated waste • Retention and scattering of waste around collection sites (containers, etc.) 	<ul style="list-style-type: none"> • Elimination of services for low-income groups due to non-payment of fees • Low social status of collection workers • Waste picking during the collection process (including by workers, reduces collection efficiency) 	<ul style="list-style-type: none"> • Incoming waste that has not been completely sorted • Intermediate treatment and recycled products that are not compatible with economic activities (e.g., composting products for which a market has not been secured) • Resistance of residents to siting of facilities 	<ul style="list-style-type: none"> • Unsanitary and hazardous working conditions for waste Pickers • Resistance of local residents to disposal site locations
Institutional considerations	<ul style="list-style-type: none"> • Lack of rules on waste storage and discharge • Inadequate policies and systems in place to control waste generation and waste sorting for discharge • Lack of illegal dumping countermeasures 	<ul style="list-style-type: none"> • Lack of health and safety measures for workers • Inadequate contracts with private contractors, inadequate permit system and lack of supervisory capacity • Lack of, or inadequate collection plans • Lack of high-level planning (e.g., collection and transportation system concept) 	<ul style="list-style-type: none"> • Lack of health and safety measures for workers • Inappropriate contracts with private contractors and inadequate permit system • Environmental impacts (e.g., failure to set environmental standards) • Lack of high-level planning (e.g., recycling promotion policy) • Lack of future plans and operational plans 	<ul style="list-style-type: none"> • Lack of health and safety measures for workers • Lack of sanitation and safety measures and unregistered waste pickers • Inadequate contracting and permitting systems with private contractors and lack of supervisory capacity • Environmental impacts (e.g., failure to set environmental standards) • Lack of future plans and operational plans

	Generation/Discharge & Storage	Waste Collection and Transport	Intermediate Treatment & Recycling	Final Disposal
Organization	<ul style="list-style-type: none"> • Lack of guidance system for residents • Lack of cooperation from residents and communities 	<ul style="list-style-type: none"> • Weak management structure (e.g., unassigned managers, lack of workers, etc.) 	<ul style="list-style-type: none"> • Weak management structure (e.g., unassigned managers, lack of workers, etc.) 	<ul style="list-style-type: none"> • Weak management structure (e.g., unassigned managers, lack of workers, etc.)
Financial considerations	<ul style="list-style-type: none"> • Inadequate, or lack of storage and discharge containers at collection sites • Incomplete setting and collection of waste collection fees 	<ul style="list-style-type: none"> • Low setting of waste collection fee levels • Insufficient fee collection and management systems • Insufficient fee amount collected and used for other purposes than waste operations • Insufficient budget planning and allocation 	<ul style="list-style-type: none"> • Insufficient facility operation and maintenance budget planning and allocation • Insufficient amount of waste tipping fees collected 	<ul style="list-style-type: none"> • Lack of collection and management system for waste disposal fees • Insufficient amount of waste tipping fees collected and used for other purposes than waste operations • Insufficient budget planning and allocation
Technical considerations	<ul style="list-style-type: none"> • Insufficient waste sorting and separation • Inconsistency between discharge and collection methods 	<ul style="list-style-type: none"> • Lack of operation and maintenance techniques for equipment • Improper collection methods • Lack of collection and transportation equipment 	<ul style="list-style-type: none"> • Immature intermediate treatment technology • Lack of operation and maintenance technology • Environmental impacts (e.g., lack of measures to deal with pollutants) • Inadequate data management system (e.g., amount of incoming waste, etc.) 	<ul style="list-style-type: none"> • Improper disposal methods (e.g., open dumping) • Lack of operation and maintenance technology and equipment • Environmental impacts (e.g., lack of measures to deal with pollutants) • Inadequate data management system (e.g., amount of incoming waste, etc.)

Source: Excerpted from JICA “Issue-Specific Guidelines Waste Management” (2009) with some changes



2 Republic of the Sudan ~ Introduction of “Fixed-Time Fixed-Place (FTFP) Collection”~

Fixed-Time Fixed-Place (FTFP) collection is an effective method for improving collection services efficiency. When introducing FTFP collection, it is practical to initially implement the system on a trial basis in a designated pilot area, and after verifying its feasibility and issues, to consider full-scale implementation. It is essential when introducing FTFP collection, and for its continued implementation to carry out activities to build public awareness so as to ensure the vital cooperation of local residents.

Region: Northeast Africa

Capital: Khartoum

Area: 1.88 million km²

Population: 42.81 million (2019)

Ethnic groups: Primarily Arab, Nubia, Nuba, Fur, Beja
(mix of over 200 tribes)

Languages: Arabic (official language), numerous other
tribal languages

Religions: Islam, Christianity, traditional religions

Source: Ministry of Foreign Affairs Website “Republic of Sudan”

<https://www.mofa.go.jp/mofaj/area/sudan/data.html#section1> (accessed February 8, 2022)



2.1 Background

In Khartoum, the capital of the Republic of Sudan (hereinafter referred to as “Sudan”), waste was collected and transported by aging and inadequately maintained collection vehicles due to deterioration of the security situation and financial constraints. As a result, uncollected waste was scattered around the city, degrading the sanitary environment, especially in low-income neighborhoods. Residents were not sure when the waste they discharged would be collected. Residents also had very little interest in waste



Source: Yachiyo Engineering Co., Ltd.

Photo 7-1 Illegally Dumped Waste along the Road

management because adequate waste collection services were not provided, and waste management were implemented without their cooperation or involvement. Table 7-2 shows an overview of the major JICA waste management projects covering FTFP system in Sudan.

Table 7-2 Overview of JICA Waste Management Projects Covering FTFP in Sudan

Item	Content	
Project name	The Project for Strengthening Solid Waste Management in Khartoum State of Sudan	The Clean Cities Project in Sudan
Project period	May 2014 - March 2017	February 2021, ongoing
Target cities (Population)	Khartoum State (Approx. 7 million people)	Khartoum State (Approx. 8.64 million people) • North Kordofan State (Approx. 1.21million people) • Red Sea State (Approx. 650,000 people)
Overall goal	Improved waste management system persists in Khartoum State.	Solid waste management services in the target states will be improved.
Project purpose	Waste management in Khartoum State will be improved to an efficient and effective system.	The management capacity of the target state cleaning corporation will be improved.
Output	<ol style="list-style-type: none"> 1 Khartoum State Waste Management Master Plan will be revised. 2 Waste collection and transportation capacity will be improved. 3 Operation and management of final landfill will be improved. 4 Organizational and financial soundness related to waste management will be proposed. 	<ol style="list-style-type: none"> 1 The current status and issues of waste management in the target areas will be identified. 2 The waste management capacity of Khartoum Cleaning Corporation will be strengthened. 3 Strengthening the waste management capacity of the Red Sea Cleaning Corporation 4 Preparation of a national policy on solid waste management will be made based on the data and information collected from all provinces.

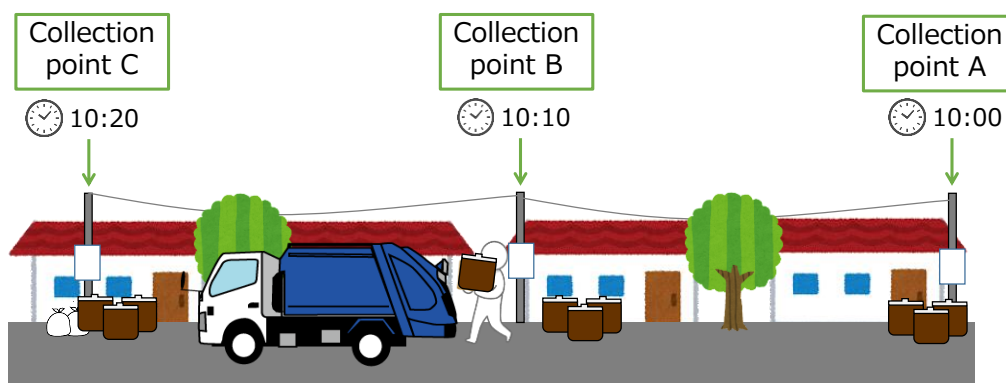
Source: Based on JICA “The Republic of the Sudan Project for Strengthening Solid Waste Management in Khartoum State Project Completion Report” (2017), “The Clean Cities Project in Sudan (Phase 1) Work plan” (2021)

2.2 Application of Japan's Experiences and Technologies

(1) Introduction of Fixed-Time Fixed-Place (FTFP) Collection

The applicability of FTFP collection, conditions for its introduction, and operational policies should all be carefully considered, taking into account the current collection services and lifestyles of residents. Implementation of pilot projects will make it possible to understand FTFP's effectiveness and related issues. In addition, it is important for the government to conduct continuous public awareness activities for residents to ensure that the system is smoothly introduced and facilitate its dissemination.

A decision was made to introduce FTFP collection - which has become a mainstream system in Japan - in Khartoum to improve waste collection. FTFP collection is a method of collecting waste discharged at designated collection times and locations, as shown in Figure 7-2. When introducing FTFP collection, it is necessary for residents and the municipality to coordinate the allocation of collection vehicles, collection routes, etc., as well as collection points and collection times.



Source: Yachiyo Engineering Co., Ltd.

Figure 7-2 Image of FTFP Collection

There are a number of advantages in introducing FTFP collection, which include maintaining the cleanliness of communities by prohibiting the discharge of waste outside of designated collection times, reducing time period collection that vehicles spend on routes, and increasing collection efficiency.

However, FTFP collection also comes with its own set of challenges: residents may feel burdened because they need to bring waste to specific places at designated times, the sense of individual responsibility may be diminished because it is impossible to identify the generators of the waste discharged, and it can sometimes be difficult to select and coordinate collection sites. Table 7-3 provides an overview of the main advantages and challenges of FTFP collection.

Table 7-3 Main Advantages and Challenges of FTFP

Item	Contents
Advantages	<ul style="list-style-type: none"> • Community cleanliness can be maintained by designating waste collection times and locations • Improved collection efficiency with less time spent by collection vehicles on routes • Lower collection costs by optimizing the number of vehicles and collection workers • Improved working environments for collection workers with no waste scattered around as a result of residents following rules when discharging waste • FTFP provides a good opportunity for residents to recognize waste as their own problem by carrying their own waste to the designated collection point • Local residents can provide guidance to one another about discharging waste
Challenges	<ul style="list-style-type: none"> • Difficulty identifying generators of discharged waste, which diminishes the sense of individual responsibility • Difficulty identifying generators of discharged waste, which makes it difficult to thoroughly enforce discharge rules • Potential difficulties in selecting collection sites • Potentially difficult for children, women, and the elderly to carry their waste to the stations

Source: Yachiyo Engineering Co., Ltd.

1) Pilot Project

In Khartoum, pilot projects (PP) were carried out in several areas to examine the possibility of full-scale introduction of FTFP collection. A PP is the process of implementing a system that is being considered for full-scale implementation, together with collecting data to test the system and determine whether it is suitable and achieves the objectives set out. The basic implementation flow of the PP is shown in Figure 7-3.

The most important tasks of this flow are “baseline survey” before PP implementation, “monitoring and awareness-raising activities” during PP implementation, and “follow-up survey” after PP implementation. In particular, collecting, analyzing, and verifying data before and after PP implementation makes it possible to measure the effectiveness of PP; if positive results can be confirmed by comparing specific items before and after PP implementation – e.g., improvement in residents satisfaction or fee collection rate – this would indicate that the possibility of introducing FTFP collection is high. Alternatively, if the desired results are not obtained, the results of the PP should be analyzed to identify the reasons why the FTFP collection system did not function as expected - such as inappropriate collection mechanism, confusion over discharge rules, lack of residents’ satisfaction - and to consider improvement measures. Should it be then determined that there is little possibility for improving the FTFP system in the PP area, it will be necessary to consider other collection methods. Surveys conducted before and after PP can also deepen understanding of the behavior and awareness of residents, collection workers, and other related parties, and are useful in identifying issues to be addressed when FTFP collection is introduced. In summary, the

implementation of PP will provide decision-making materials necessary for examining the future direction of the project and knowledge on matters to be considered during the full-scale introduction.



Source: Based on JICA “The Republic of the Sudan Project for Strengthening Solid Waste Management in Khartoum State Project Completion Report” (2017)

Figure 7-3 Basic Implementation Flow of Pilot Project

2) Public Awareness

A public awareness campaign was conducted in Khartoum to promote FTFP collection. FTFP collection places comparatively high burden on residents, which poses a challenge, and the system will not be successful without their cooperation. Therefore, government staff in Khartoum implemented public awareness building activities for the project team (consisting of government officials, community representatives, and other concerned parties) and residents, as shown in Table 7-4. Through these activities, it was possible to provide residents with opportunities to realize the benefits of FTFP collection and recognize that waste is their own problem.¹

¹ Time and Motion Survey: A survey is to observe and record the status of waste discharge and collection operations. The time and conditions of daily waste collection operations, such as vehicle inspection, movement to the collection area, loading and unloading of waste, etc., are recorded. The collected data is used to identify problems in waste discharge and collection operations, and to consider countermeasures.

Table 7-4 Examples of Awareness-Raising Activities Related to FTFP Implementation

Activity	Target group	Objectives	Details
Regular meetings	Project team ²	Share information on PP and FTFP collection (challenges, measures, etc.)	<ul style="list-style-type: none"> • Share the results of monitoring (about once/month) conducted in PP target areas • Discussions on measures to address shared challenges
Training	Project team	Team members are able to implement public awareness activities	<ul style="list-style-type: none"> • Basic information on FTFP collection (overview, advantages, necessity, etc.) • Division of roles between the administration and residents • Methods of communication with residents
Workshops	Project team	Study good practices from past examples and promote the use of FTFP collection	<ul style="list-style-type: none"> • Introduce case studies on FTFP collection (background to introduction, progress, details on awareness building activities, etc.)
Community meetings	Representatives from PP target areas (women and men leaders, youth leaders, religious leaders, etc.)	Obtain cooperation and understanding from residents on PP and FTFP collection	<ul style="list-style-type: none"> • Basic information on FTFP collection (overview, advantages, necessity, etc.) • Division of roles between the government and residents • Need to cooperate with residents • Resident behavior that must be improved
Study tours	Representatives of residents in PP target areas (women and youth groups, etc.)	Study good practices in regions where PP is being implemented smoothly	<ul style="list-style-type: none"> • Inspect areas where PP is being implemented smoothly • Administrative staff explain activities (i.e., awareness-raising activities for residents, efforts for on-time operation of collection vehicles, etc.)
Contests / campaigns	Residents	Promote understanding by, and the active participation of residents in FTFP collection	<ul style="list-style-type: none"> • Organize events (waste reduction idea contests, recycled craft contests, clean-up campaigns, etc.)
Educational tools	Residents	Promote understanding by, and the active participation of residents in FTFP collection	<ul style="list-style-type: none"> • Use tools to build awareness (videos, DVDs, TV commercials, leaflets/booklets, banners, posters, novelty goods, SNS, etc.) at residents' meetings, door-to-door visits, etc.
Door-to-door visits	Residents	Promote understanding by, and the active participation of residents in FTFP collection	<ul style="list-style-type: none"> • Conduct home visits using educational tools

Source: Based on JICA "The Republic of the Sudan Project for Strengthening Solid Waste Management in Khartoum State Project Completion Report" (2017)

² A team consisting of government officials, community representatives, and other interested parties. In Khartoum, it played a central role in the dissemination of FTFP collection.



Photo 7-2 Before PP Implementation
(Waste was left on the sides of roads and in vacant spaces, and scattered over a wide area.)



Photo 7-3 During PP Implementation
(The amount of scattered waste had been reduced. The area was kept clean.)



Photo 7-4 Study Tour



Photo 7-5 Door-to-door Visits by Administrative Staff
(Promoted cooperation among residents to prevent waste from being scattered and to keep the area clean.)

Source: Yachiyo Engineering Co., Ltd.

As a result of implementing the PP in Khartoum collection times decreased by about 20 minutes, as shown in Table 7-5. In addition, residents who have seen the improvements, such as waste collection services and a reduction in scattered waste resulting from the PP showed a willingness to pay fees. Fee collection rates improved from about 10% before the PP to about 40% after implementation. In the post PP survey, the number of residents who said they were satisfied with the collection service was about 50% before the PP was implemented, but increased to about 79% after the PP was implemented.

Table 7-5 Outcomes of Pilot Project

	Before implementation of PP	After implementation of PP
Collection times	91 to 99 minutes	76 to 79 minutes
Fee collection rate	Approx. 10%	Approx. 40%
Level of satisfaction of residents	50%	79%

Source: Based on JICA “The Republic of the Sudan Project for Strengthening Solid Waste Management in Khartoum State Project Completion Report” (2017)

After the Project

As the results of PP implementation FTFP collection was introduced, and waste discharge on days other than collection days and at locations other than the designated ones became less common. However, as of 2022, the FTFP collection has not yet taken root in Khartoum. The main challenges identified so far and possible countermeasures are as follows.

Challenges

- Strict observance of the system by collection trucks is difficult because of insufficient number of collection vehicles, inadequate maintenance, and difficulty to arrange alternative vehicles in case of breakdowns, etc.
- Due to insufficient study of routes served by collection trucks before they enter the FTFP area and after they leave it, sometimes the collection trucks were already full as they entered the FTFP collection area and could not finish collection in the area within the scheduled time.
- The time required for loading and unloading waste at transfer stations and final disposal sites resulted in long waits for the arrival of collection trucks at the FTFP area.
- The type of collection truck did not match the characteristics of the area, and the collection operation took longer than expected (e.g., the truck was too large to enter a narrow road).
- It was particularly difficult for children and women to take out waste from their homes to distant collection points by themselves.
- The waste disposal rules were not thoroughly enforced and various types of containers were used for waste discharge, and sometimes the waste containers were mistakenly collected as waste.
- Waste was scattered at the collection points due to damaged waste containers, etc.

Countermeasures

- Develop and review collection plan

When introducing FTFP collection, it is necessary to design collection routes based on the type and number of collection vehicles available, the characteristics of the collection area, and the number of households to be served (based on which the waste amount to be collected is

estimated), and then organize in detail the elements necessary to successfully implement the FTFP collection system; including the location of collection points, suitable collection time schedule, and methods for notifying the residents of the collection vehicles arrival or reminder to the residents of collection time as a backup for the FTFP system.

In the implementation phase of the plan, it is necessary to confirm on site whether residents are discharging waste at the designated collection points and times, collection crews are able to travel the collection routes on time and without difficulty, as well as to analyze data on waste collection rates, residents' satisfaction levels, and collection rates over time of collection fees if such fees are imposed. It is important to identify issues for improvement in the collection plan through a series of repetitive tasks, and continuously review and improve the plan.

- Training of collection crews and staff

If the collection crew members, who actually do the collection work do not understand the contents of the collection plan and their own roles, it will be difficult to provide smooth collection services. It is necessary to conduct training for collection crews (including on-the-job training, etc.) and PPs for practical collection work to improve their knowledge and skills. Furthermore, the collection crew members should be able to guide residents on waste discharge rules. Collection plans need to incorporate the opinions of collection crew staff in the field on the suitable methods to educate residents, amongst others. Involving collection crews and staff in planning will both raise their motivation as well as ensure that the countermeasures for the issues confronted in the actual work are reflected in the plans.

- Thoroughly inform local residents of the waste disposal rules

FTFP collection is often a new initiative in developing countries, and it is necessary to continuously deepen the understanding of all parties involved, not only before but also after FTFP introduction. Involving residents, who are the generators of waste, is particularly important. If the method and time of waste discharge are not thoroughly understood, the amount of waste left uncollected will increase and the sanitary environment will likely deteriorate. In Japan, the government actively informs residents of the rules for waste discharge through the distribution of waste sorting charts, briefings for residents, SNS and smartphone applications, and other means. When setting rules for waste discharge, it is important to confirm local characteristics and residents requests through PP, and incorporate them into the plan to promote understanding on the part of residents and facilitate smooth waste discharge and collection.

2.3 Lessons

(1) Evaluation of Feasibility through PP Implementation, Identification of Ongoing Challenges and Improvements, and Reflection in Collection Plans

By implementing PP for collecting and analyzing data before and after the introduction of FTFP collection, it is possible to quantitatively evaluate FTFP effectiveness. The issues identified in Khartoum at the time of the introduction of the FTFP collection were also found in projects in other countries, and lessons learned can be utilized to other cases. In the planning stage, information necessary for FTFP collection - type and number of collection vehicles, characteristics of the area to be collected (road conditions, etc.), collection routes, number of households to be collected, location of collection sites, etc. - should be shared in advance among the heads of administrative agencies in charge of waste management, officials in charge of collection planning (personnel and vehicle allocation planning), collection staffs, resident representatives, and other relevant parties. It is important to discuss solutions to possible problems through a series of collection and transportation processes. It is equally important to identify issues and points for improvement through periodic monitoring after the introduction of the FTFP collection, and to continuously review the collection plan.

(2) Need for Continuous Awareness Building Activities

While cooperative at the start of a project, residents can become less motivated with the passage of time. In order for the administration and residents to jointly work together continuously while recognizing their respective responsibilities, administration officials must promote understanding by local residents on waste management through regular meetings and awareness building activities, including public awareness programs and environmental education, and reflect the ideas and opinions collected from residents in waste management services. Regarding awareness-raising, it is important to combine various activities, such as holding community meetings and study tours as well as to maintain the continuity of these activities. There also needs to be a mechanism to involve key persons in the community in the activities and to encourage residents to change their behavior and ways of thinking. On the other hand, residents are also expected to be aware of their own responsibilities for the waste they generate and be actively involved in waste management services provided by the government.

3 Palestinian Interim Self-Government Authority, PA

~ Improving Waste Management through the Introduction of Inter-Municipal Waste Management ~



Inter-municipal waste management, in which waste collection vehicles and treatment facilities are shared and operated among multiple neighboring municipalities, regardless of their respective sizes, is one of the effective methods for achieving efficient waste management.

In introducing this case study two methods of waste management are highlighted; inter-municipal association which can serve as the foundation for an efficient waste management system, and public awareness activities to ensure that residents meet their obligations to pay the waste service fees and thereby secure the financial stability of the waste management system.

Region: Middle East
Administrative capital of
the Palestinian National
Authority (PNA): Ramallah
Area: 6,020 km²
Population: 4.97 million (2019)
Ethnic groups: Arab
Languages: Arabic
Religions: Islam (92%),
Christianity (7%), other (1%)



Source: Ministry of Foreign Affairs Website “Palestine” <https://www.mofa.go.jp/mofaj/area/plo/data.html#section1>
(accessed February 8, 2022)

3.1 Background

The Palestinian Interim Self-Government Authority (hereinafter referred to as “Palestine”) is divided into the West Bank bordering Jordan to the east and the Gaza Strip bordering the Mediterranean Sea to the west and Egypt to the south. The municipalities that make up Palestine are small and each municipality is responsible to collect and dispose of its waste. The waste collection rates were extremely low due to a lack of collection vehicles because of the short supply of financial resources in the municipalities providing the cleaning services.



Source: Yachiyo Engineering Co., Ltd.

Photo 7-6 Waste Burned in Disposal Site

The collected waste was not disposed of properly, and instead was openly burned or dumped, and sanitary conditions were poor.

With population growth and transportation barriers, Palestine faced challenges centered around a lack of access to disposal sites, waste management businesses that were not economically viable due to increasing operation and maintenance costs, and improper disposal practices, such as open burning, which created health hazards for residents and environmental pollution problems.³ Against this background, the autonomous government requested Japan to provide technical cooperation on capacity development in the field of waste management and the establishment of a model for waste management. Table 7-6 shows an overview of the waste management projects implemented in Palestine.

Table 7-6 Overview of Waste Management Projects Implemented in Palestine

Item	Content	
Project name	The Project for Capacity Development on Solid Waste Management in Jericho and Jordan River Rift Valley in Palestine	Project for Technical Assistance in Solid Wastes Management Phase 2
Project period	November 2005 - February 2010	January 2015 - July 2019
Target cities (Population)	Jericho and Jordan River Rift Valley (Approx. 50,000 people)	All of the West Bank of Palestine (Approx. 950,000 people)
Overall goal	<ol style="list-style-type: none"> 1. A basic policy on comprehensive waste management in local cities will be established in the Palestinian Authority and specific policies will be developed. 2. An effective waste management system modeled on the Jericho and Jordan Valley Region (hereinafter referred to as “JJRRV”) will be disseminated to local cities throughout Palestine. 	Environmental and socially responsible waste management services will be provided throughout Palestine on a sustainable basis.
Project purpose	<ol style="list-style-type: none"> 1. A sustainable and hygienic waste management system will be introduced in JJRRV. 2. JJRRV's improvement case experience will serve as a model case for improving waste management in other Palestinian cities. 	A sustainable waste management system by the Regional Administrative Council (“JSC”) will be established equally throughout the Palestinian West Bank under policies, plans, institutions, support and coordination well be developed by the Regional Authority (“MoLG”).

³ Due to the long-standing conflict with Israel over land, Palestine has become an enclave, and its land area continues to shrink due to repeated Israeli settlement activities. In order to travel between Palestinian areas, one must pass through “checkpoints” set up by Israel on the border. Palestinians are not allowed to enter without an Israeli permit.

Item	Content	
Output	<ol style="list-style-type: none"> 1. A project management system will be established. 2. Waste management organization system in JJRRV will be established. 3. The current status of waste management at JJRRV will be identified 4. A policy (action plan) for improvement of waste management at JJRRV will be developed 5. An action plan for improving waste management at JJRRV will be established. 6. The Action Plan is implemented, improvements are realized and JJRRV's activities are disseminated. 7. Training sessions will be held in Japan to acquire and disseminate basic knowledge on waste management. 	<ol style="list-style-type: none"> 1. MoLG's capacity to provide guidance, support and coordination in the area of waste management to JSCs will be strengthened through its activities with the five target JSCs. 2. MoLG's capacity to develop standards, regulations and guidelines for waste management will be enhanced. 3. MoLG's capacity to develop national policies and plans for waste management will be strengthened. 4. MoLG's organizational management capacity will be strengthened.

Source: Based on JICA “The project for capacity development on solid waste management in Jericho and the Jordan River Rift Valley : consolidation improvement report of solid waste management” (2010), Project for Technical Assistance in Solid Waste Management in Palestine (phase-2) : Final report” (2019)

3.2 Application of Japan’s Experiences and Technologies

(1) Creating a Foundation for the Introduction of Inter-Municipal Waste Management

When establishing an inter-municipal association, which serves as a foundation for inter-municipal waste management, it is important to minimize the burden on the individual municipalities. Rather than purchasing new equipment or hiring new personnel at the outset, it is necessary to make effective use of existing resources held by each municipality, and to devise ways to combine and utilize them.

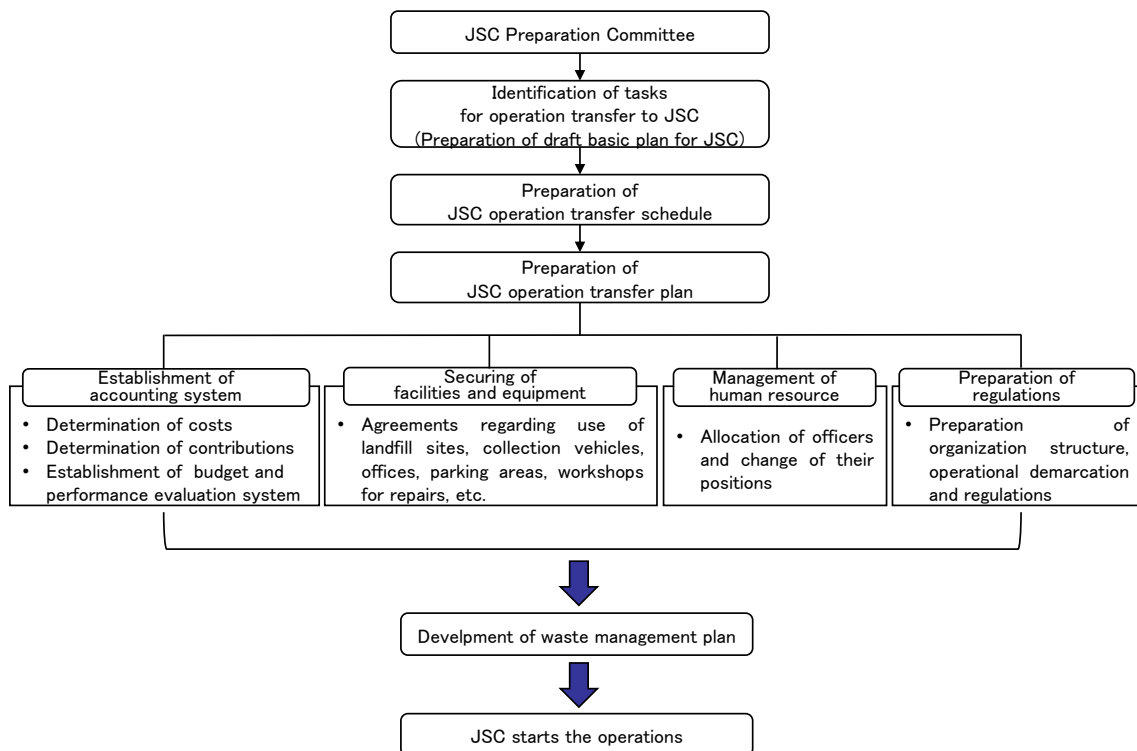
Waste management in Palestine, which had been carried out by smaller municipalities, is to be implemented by a regional association called the Joint Service Council (hereinafter referred to as “JSC”), under a collaborative initiative by several municipalities. The JSC aims to create an inter-municipal waste management system that will place a small burden on each municipality and provide stable waste management services throughout the entire region. In addition to reducing the budgetary burden on each municipality through the efficient operation and maintenance of collection vehicles and sharing the final disposal site, the inter-municipal system will allow for an increase in the size of the disposal sites and improve the efficiency of construction and operation.

The objectives of establishing JSC in Palestine are to: (1) implement environmental protection measures, such as the introduction of sanitary landfills, (2) promote waste reduction and recycling, (3) develop efficient waste management practices, and (4) promote projects where residents, business and

the government can work together. Figure 7-4 shows the basic flow of implementation, up to the establishment of JSC in Palestine, Figure 7-5 shows the basic JSC organizational structure, and Table 7-7 shows the JSC stakeholders and their roles.

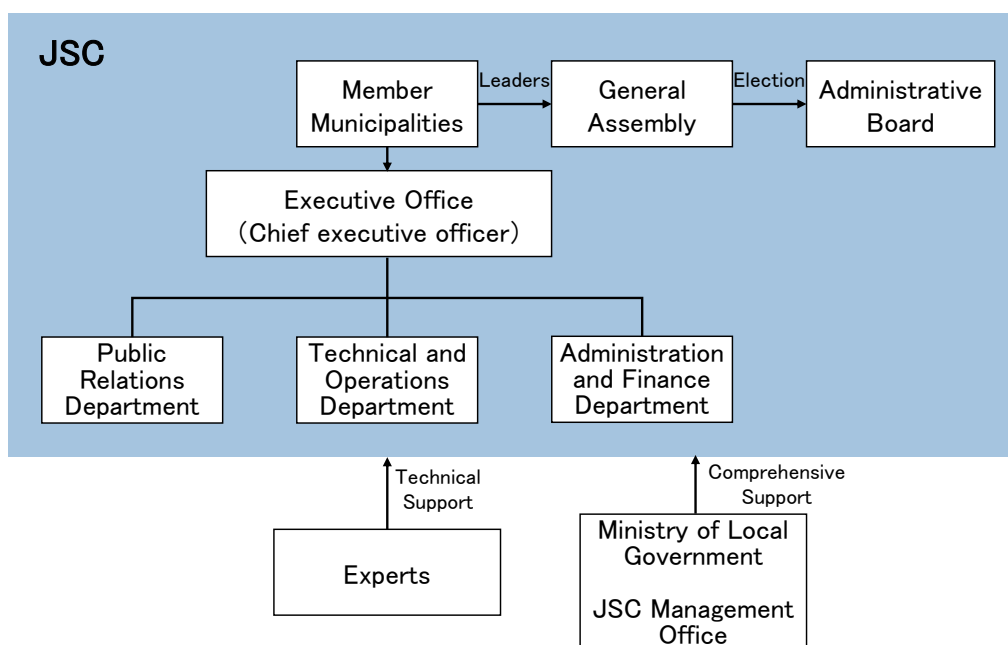
In the example of Jericho and the Jordan Valley region, JSC is composed of 17 municipalities, led by the city of Jericho, the main city in the region. For those municipalities that were reluctant to establish a JSC due to a lack of understanding about inter-municipal waste disposal - such as the JSC mechanism, cost sharing, etc. - representatives from municipalities that were willing to establish a JSC visited them and held discussions on human resources allocation of and cost sharing. Based on these discussions, a draft basic plan was prepared, which included the basic policy of JSC, allocation of personnel and equipment, and budget for waste management. Further discussions on the draft basic plan led to the establishment of the JSC, which was agreed upon by all the member municipalities after considering an effective mechanism that would be less burdensome for each municipality. As shown in Table 7-8, the items decided upon at the time of establishment were formulated as formal regulations, and the rules were clarified to enable the smooth operation of the JSC among the many municipalities involved.

In Palestine, 12 new JSCs were established and 3 existing JSCs were rebuilt. The JSC in Jericho and the Jordan Valley region, was organized by 17 municipalities, creating a system that can provide waste collection services to approximately 50,000 residents.



Source: Based on JICA “The project for capacity development on solid waste management in Jericho and the Jordan River Rift Valley : consolidation improvement report of solid waste management” (2010)

Figure 7-4 JSC Preparation Flow for Starting Operations



Source: Based on JICA “The project for capacity development on solid waste management in Jericho and the Jordan River Rift Valley : consolidation improvement report of solid waste management” (2010)

Figure 7-5 Basic JSC Organizational Structure

Table 7-7 Parties and Roles of JSC

No.	Parties	Role
1	General Assembly	Determination of executive office membership, determination of budget, determination of supplemental budget, nomination and recall of new members, determination of agenda items, consideration of rule changes, determination of contributions, approval of implementation plan, determination of representatives on committees of other organizations
2	Administrative Board	Convening of general assembly, planning of cleaning projects in consideration of environmental protection, advice on collection and transportation, construction of transfer stations and landfills, maintenance, parking depots and containers, public relations for residents regarding environmental protection, human resource development, staff awareness and education, institutional development, and advice related to environmental improvement through cleaning service
3	Executive Office (Chief executive officer)	Planning and monitoring work related to cleaning services, convening board meetings, supervising staff work, making recommendations to the board regarding staff transfers, removal, and discipline, making recommendations to the board regarding new work, and making recommendations to the board regarding staff personnel, labor, compensation, occupational health and safety, education, and training
4	Public Relations Department	Publicize waste management projects to residents, research waste management projects
5	Technical and Operations Department	<ul style="list-style-type: none"> Planning and Maintenance Division Planning and development of waste management plans, long-term collection plans, long-term landfill plans, equipment purchase plans, and operation plans; maintenance of collection equipment and landfill

No.	Parties	Role
		heavy equipment; preparation of annual reports <ul style="list-style-type: none"> Collection Division Planning, formulating, and implementing collection work plans, dispatching collection equipment, and recording collection operations Landfill Management Department Develop, formulate, and implement an operational plan for the landfill
6	Administration and Finance Department	Budget, settlement of accounts, related to the contributions of each municipality, general coordination of property management, purchase of goods, contract administration, collection of fees and contributions
External	Ministry of Local Government (JSC Management Office)	Provide comprehensive support to JSCs throughout Palestine
External	Experts ⁴	Providing operational advice and technical assistance

Source: Based on JICA “The project for capacity development on solid waste management in Jericho and the Jordan River Rift Valley : consolidation improvement report of solid waste management” (2010)

Table 7-8 Main Provisions and Objectives of the JSC

No.	Provisions	Content	Purpose
1	Jobs	Duties and responsibilities	Clarify roles and responsibilities within the organization and unify the understanding of each department
2	Working Conditions	Working days, working hours, salaries	Clarify working conditions and unify understanding between JSC and officers/workers
3	System	Personnel, health and safety, appointment selection, performance evaluation	Establish a safe and secure work environment by improving the working environment for officers and workers
4	Operation	Equipment maintenance plan, facility maintenance plan, collection and transportation plan	Prevent stagnation in waste management operations by systematically operating and maintaining equipment

Source: Based on JICA “The project for capacity development on solid waste management in Jericho and the Jordan River Rift Valley : consolidation improvement report of solid waste management” (2010)

⁴ Refers to a team of experts consisting of several executive directors of other JSCs that were facilitating the operation and the director of the repository.

Topic 7. Waste Management Challenges in Developing Countries
and Lessons Learned from JICA Projects



**Photo 7-7 Waste Container Installed at a
Touristic Area
(Bethlehem JSC)**



**Photo 7-8 Waste Collection
(Gaza South JSC)**



**Photo 7-9 Waste Collection
(Ramallah - Al Bireh JSC)**



**Photo 7-10 Hebron Transfer Station
(Hebron JSC)**



**Photo 7-11 Zahrat Al-Finjan Landfill
(Jenin JSC)**



**Photo 7-12 Workshop
(Gaza North JSC)**

Source: Yachiyo Engineering Co., Ltd.

(2) Activities to Build Public Awareness on Waste Fee Collection

Operations of the Palestinian Regional Authority are supported by the collection of waste disposal fees from residents, so it is important to improve fee collection rates. When setting collection fees, it is important to set an amount that is affordable and acceptable for residents and to obtain their understanding and consent through steady public awareness activities.

Costs related to inter-municipal waste disposal in Palestine are covered by waste disposal fees collected from residents. In general, compared to other public services (e.g., electricity and water), waste management is often not a top priority for residents, and it is difficult to enforce fee collection systems without their understanding of the importance of collecting fees. While Palestinian residents tend to be less environmentally conscious, some are not aware of the JSC's activities or may be concerned whether the introduction of inter-municipal waste management will actually improve waste management conditions. Therefore, a variety of activities were implemented to help residents understand the need to collect fees, such as the organization of information sessions for residents, and production of newsletters, leaflets and posters, documentary films, and TV advertisements.

Among these activities, explanatory meetings with residents were prioritized, during which the administration could meet face-to-face with residents and hear their opinions directly. In order to make the meetings effective, the explanatory meetings were divided into three stages according to the residents' level of understanding. Stage 1 was designed to explain basic knowledge of waste management and an overview of the JSC to residents who had little knowledge of waste management and were unaware of the existence of the JSC. Stage 2 was an explanatory session that, in addition to the explanation in Stage 1, explained the services provided by the JSC and its business activities, such as cost sharing. Stage 3 was an opportunity to build consensus with residents on JSC's business plan based on the knowledge and information obtained in the Stage 1 and 2 meetings. By conducting the explanatory meetings in this manner, according to the residents level of understanding, it was possible to deepen the residents correct understanding of JSC activities, etc., and to encourage their cooperation in JSC projects and, ultimately, in the collection of fees.

Topic 7. Waste Management Challenges in Developing Countries and Lessons Learned from JICA Projects



Photo 7-13 Explanatory Meeting



Photo 7-14 Workshop with Residents

Source: Yachiyo Engineering Co., Ltd.

Table 7-9 Activities by JSC to Raise Awareness of Residents

No.	Items	Purpose
1	Newsletters	To publicize JSC activities to residents, the central government, other municipalities, donors, etc.
2	Leaflets	To distribute to government agencies, schools and residents participating in community meetings and inform them about waste management and JSC activities
3	Booklets	Same as above
4	Posters	To inform residents and others about waste management and JSC activities
5	Video production	To raise the awareness of residents and communities about the importance of JSC
6	Campaigns	To raise awareness of residents and students about waste issues
7	Community meetings	To discuss the importance and role of JSC, role of residents, and fees with people in each municipality

Source: Based on JICA "The project for capacity development on solid waste management in Jericho and the Jordan River Rift Valley : consolidation improvement report of solid waste management" (2010)

As shown in Table 7-10, in the City of Jericho and the Jordan Valley region, these long-term and ongoing awareness-raising activities have improved the public awareness of JSC and their level of satisfaction with collection services, which has helped increase fee collection rates.

Table 7-10 Results of Social Surveys Conducted by JSC (Jericho and the Jordan Valley Region)

No.	Items	Before awareness-raising activities	After awareness-raising activities
1	Awareness of JSC	70%	79%
2	Satisfaction with collection services	58%	70%
3	Fee collection rates	66%	81%

Source: Based on JICA "The project for capacity development on solid waste management in Jericho and the Jordan River Rift Valley : consolidation improvement report of solid waste management" (2010)

3.3 Lessons

(1) Improvement of Efficiency of Waste Management through Inter-Municipal Waste Management

Smaller municipalities, where resources are in chronically short, have difficulty continuing to implement quality waste management. One proposed solution is the introduction of a system called “inter-municipal waste management”, in which surrounding municipalities come together to jointly implement waste management. When introducing inter-municipal waste management, an inter-municipal association that will function as a secretariat must be established that will be run through the cooperation of participating municipalities.

In order to reduce the burden on each municipality during the organization creation phase, it is important to first investigate the existing equipment, human resources, capabilities, systems, financial resources, mechanisms, and facilities possessed by the municipalities comprising the JSC, and combine them for effective utilization, rather than purchasing new equipment or hiring new personnel at the outset. Reducing the burden in the initial stages will lead to the smooth establishment of the JSC and the continuation of its subsequent operations.

(2) Introduction of Waste Collection Fees

When starting the collection of waste disposal fees, it is important to set an amount that the residents can afford and accept. In the Jericho and Jordan Valley areas, as a result of discussions within JSC, a waste disposal fee was set at an amount that would cover the JSC operating costs and that would not be a burden on the residents. After repeated explanations and discussions with the local residents through explanatory meetings and other means, the residents finally agreed that the waste disposal fee was appropriate.

On the other hand, the actual collection of fees is difficult, and in order to continue the waste management, it is necessary to consider measures such as increasing the fees. In order to improve the rate of fee collection, not only the quality of waste disposal service needs to be improved, but also various measures such as continuous dialogue with residents, suspension and resumption of service, and fee collection together with other public services (electricity, water, etc.) are required.

4 Republic of El Salvador ~ Path to Proper Management of Sanitary Landfill Sites

In El Salvador, a sanitary landfill, developed and operated under the Fukuoka method, was introduced in 2008 with Japanese assistance, and continuously operated and maintained for more than 10 years. As a result of this project, similar landfills were being developed in other regions of the country.

After the completion of the project, the inter-municipal association has continued to work vigorously to develop and maintain the sanitary landfill, and has secured financial resources by seeking funding sources with the cooperation of the central government. Inter-municipal cooperation is also continuing, with explanations and agreements on revisions for waste disposal fees with each member local government.

Region: Central America

Capital: San Salvador

Area: 21,040 km²

Population: 6.49 million (2020)

Ethnic groups: Multi-ethnic groups

Mixed Spanish Caucasian and Indigenous people (approx. 84%)

Indigenous groups (approx. 5.6%),

European ancestry (approx. 10%)

Language: Spanish

Religion: Catholic

Source: Ministry of Foreign Affairs Website “Republic of El Salvador”

<https://www.mofa.go.jp/mofaj/area/elsalvador/data.html#section1> (accessed February 8, 2022)



4.1 Background

El Salvador did not have a waste management system in place, and waste was usually disposed in open dumps. The resulting increase in disposed waste caused groundwater pollution and soil contamination, creating adverse effects on people’s health and ecosystems.

To improve conditions, El Salvador enacted an *Environmental Law* in 1998 requiring all municipalities to close open dumping sites and build sanitary landfills by September 2007. There was an urgent need for the systematic and phased



Source: Yachiyo Engineering Co., Ltd.

Photo 7-15 Open Dumping Site

development of sanitary landfill sites and to reduce the volume of waste, leading the government of El Salvador to decide that it was necessary to bolster the waste management capacities of municipalities. The government of El Salvador requested Japan’s assistance on technical cooperation for construction, operation and maintenance of sanitary landfill site in December 2003 with the aim of establishing an inter-municipal waste management system, improving the capacities of people and institutions involved in the processes, and disseminating the outcomes to other municipalities in El Salvador and other Central American countries. In response to this request, a JICA technical cooperation project was implemented from November 2005 to March 2009 in the nine municipalities that make up “La Asociación Intermunicipal de Municipios del Norte del Departamento de la Unión” (hereafter referred to as ASINORLU). The project focused on improving and expanding landfill sites, their operations, maintenance and management, and 3R activities. Table 7-11 provides an overview of the project implemented in El Salvador.

Table 7-11 Overview of the Project Implemented in El Salvador

Item	Content
Project name	The project on Integrated Solid Waste Management for Municipalities in El Salvador
Project period	November 2005 - May 2009
Target cities	San Salvador (Central government), San Miguel (Project execution unit), La Union Province (Landfill, Clean association)
Overall goal	Municipalities implement appropriate Integrated Solid Waste Management (ISWM) to improve the environmental sanitary condition in the Republic of El Salvador.
Project purpose	The Central Government, MARN, MSPAS and ISDEM, strengthen their capacity to apply ISWM to municipalities in the Republic of El Salvador, and decide to implement the ISWM strategic promotion plan within its authority.
Outputs	<ol style="list-style-type: none"> 1. The central government in cooperation with ASINORLU develops sustainable models in the nine municipalities of ASINORLU for ISWM. 2. The central government develops ISWM guidelines, which are feasible and adapted to the present conditions of municipalities in the Republic of El Salvador. 3. The counterpart personnel in the central government acquire the knowledge and experiences on ISWM. 4. The counterpart personnel in the central government acquire the capabilities to conduct training and to raise awareness on ISWM of municipal administrators 5. The central government develops a draft strategic promotion plan of ISWM in the Republic of El Salvador.

Source: Based on JICA “The Project for Integrated Solid Waste Management for Municipalities in the Republic of El Salvador Project Completion Report” (2009)

4.2 Application of Japan's Experiences and Technologies

(1) Construction and Proper Maintenance, Management and Expansion of Sanitary Landfill Sites Using the Fukuoka Method

The improvement of the open dump site and construction of a sanitary landfill site dramatically improved the appearance of the site and the surrounding environment and served to motivate employees and other stakeholders. These conditions made it possible for the association's operations to become self-sustaining. The association has continued to implement activities even after the conclusion of the project, including the expansion of landfill site and a search for funding sources.

In order to improve the open dump site into a sanitary landfill, it was necessary to obtain an environmental permit by conducting an environmental analysis in accordance with the *Environmental Law* of El Salvador. The purpose of the environmental analysis for this project was to determine concrete ways to mitigate environmental pollution caused by the open dump site. ASINORLU conducted surveys on the site topography, geology, and surrounding water quality, as well as fault investigations, and submitted an environmental report describing the necessary mitigation measures - including water quality monitoring and the application of soil cover - to the Department of Environment and Natural Resources. This resulted in a permit for open dump site improvements being granted in October 2006.

Phase 1 of the project involved temporarily moving disposed waste from Santa Rosa de Lima Landfill, which was initially an open dump, and installing leachate collection and gas venting pipes. The relocated waste was then returned to the improved cells, cover soil was applied, and some areas were closed. In addition, fencing and gates were installed, drainage ditches and site roads were constructed, and improvement construction work was completed in approximately three months. The landfill site improved in Phase 1 was used until a new sanitary landfill site was completed in Phase 2.

Phase 2 of the project involved construction and equipment procurement (backhoe loader, bulldozer, and dump truck) of a sanitary landfill using the semi-aerobic landfill method (Fukuoka method) developed in Japan. In the semi-aerobic landfill system, gas venting pipes and leachate collection and drainage pipes are installed to allow air to flow naturally into the interior waste layers. The supply of oxygen to the interior of the disposed waste layers increases the speed of waste decomposition, decreases the concentration of pollutants in the leachate, and suppresses odors and methane gas emissions. As a result, the stabilization period of the landfill site is shortened. The Fukuoka method is becoming popular in developing countries because inexpensive local materials such as waste tires, drums, bamboo, and rubble can be substituted as materials for pipes and paving stones. (for more details on the Fukuoka method, refer to "Topic 4-3.3 (4) Categorizing by Microbe Environment: Anaerobic, Semi-aerobic, and Aerobic Landfills".)

Table 7-12 shows an overview of the technologies used in each phase of the project.

Table 7-12 Overview of Technologies Used in Each Phase of the Sanitary Landfill Construction and Proper Operation and Maintenance

Phase	Technology Overview
Obtaining environmental permit	(1) Environmental diagnosis - Survey of geological features, water quality, etc. (2) Suggesting Mitigation Measures - Water quality monitoring, Soil cover, etc.
Phase 1 - Improvement of open dump site December 2006 - March 2007	(1) Relocating existing wastes, using the sanitary landfill technique (2) Definitive closure of some areas (3) Countermeasures to the waste pickers
Phase 2 - Sanitary landfill Construction October 2007 - July 2008	(1) Construction of Semi-aerobic sanitary landfill (Fukuoka method) (2) Staff acquired experience in implementing soil cover, heavy equipment operation and maintenance, etc.
Sanitary landfill Operation and Maintenance	Preparation of operation and maintenance manual, Daily soil cover, Leachate recirculation, Operation of aerators, Preventive maintenance of machinery

Source: Based on JICA “The Project for Integrated Solid Waste Management for Municipalities in the Republic of El Salvador Project Completion Report” (2009)

Photos of open dumping before construction (2005), the sanitary landfill site (Phase I) and the newly constructed sanitary landfill (Phase II, 2007) are shown in Photo 7-18~7-24. Waste is no longer scattered around the sanitary landfill site as it was with open dumping, which indicates a dramatic improvement in environmental conditions as well.

The reasons behind the site’s proper maintenance as a sanitary landfill is the application of daily soil cover over the freshly disposed waste, thorough cleaning of storm water drains and site roads, and preventive maintenance of heavy equipment. On-the-job training (OJT) for employees responsible for operating the landfill site, who were hired at the time the sanitary landfill was being constructed, also played an important role in achieving appropriate maintenance and management of the site. Particular focus was placed on providing guidance for the landfill operations in areas of the site where impermeable liners were laid to avoid damaging the liner system when landfilling. The development of a manual on the maintenance and management of landfill sites also helped to reinforce landfill operation and maintenance capabilities.

This change from open dumping to a sanitary landfill site raised confidence and motivated ASINORLU and staff at the landfill, which in turn, led to the sustainable operation and maintenance practices of the landfill site after the project was completed.



Photo 7-16 Leachate Collection Pipes



Photo 7-17 Sanitary Landfill under Construction (Phase 2)



Photo 7-18 Practice of Applying Soil Cover



Photo 7-19 The Use of Aerators in the Leachate Pond

Source: Yachiyo Engineering Co., Ltd.



Photo 7-26 Newly Constructed Sanitary Landfill (Phase 2)

Source: Yachiyo Engineering Co., Ltd.

View of the Open Dump Site, during Phase 1 and 2

After the Project

After the project was completed in 2009, in 2017 a new Fukuoka Method landfill area was constructed as Phase 3. This new landfill area had an expected landfill period of four years, and was supported by a German financial institution - the construction cost of approximately US\$1.8 million is to be repaid by the central government as a loan.

In the meantime, ASINORLU implemented the planning and design of the new landfill area, reclaimed the valley land between the phases in order to keep the landfill in use longer, and sought financing sources with the cooperation of the central government, etc. While the amount of waste received at the end of 2008 was about 30 ton/day, the amount of waste received in 2021 was approximately 120 ton/day. Construction on a new landfill area using the Fukuoka Method, with an expected landfill period of seven years, is scheduled to start in 2022. This project, Phase 4 will cost approximately US\$2.8 million and will be funded by the government of El Salvador. This is the first time that funding from the government of El Salvador is being used for the construction of a sanitary landfill site, and is in recognition of ASINORLU's ongoing activities. Procuring funds for construction, maintenance, etc. can always be a challenge in developing countries, but as in this case, sources of funding must be systematically sought and found to expand the landfill in the future.



Photo 7-27 Landfill of Phase 3 (Lower part) Photo 7-28 Landfill of Phase 3 (Upper part)



Photo 7-29 Panoramic View of the Landfill of Phase 3

Source: Yachiyo Engineering Co., Ltd.

Sanitary Landfill (August 2021)

(2) Introduction and Expansion of Regional Waste Treatment through Inter-Municipal Cooperation

ASINORLU made efforts to gain understanding of the need for inter-municipal waste management and the importance of the 3Rs through consensus building and careful explanation to each member municipality in the association. ASINORLU also conducted environmental education programs and facility tours for the residents of these municipalities so that they could better support their municipalities. Efforts such as these resulted in the smooth operation of inter-municipal waste management.

ASINORLU, the regional association responsible for the operation, maintenance and management of the disposal site, is composed of nine cities. It is necessary to reach agreements with each of the nine cities on setting disposal (tipping) fees to be paid to ASINORLU in order for waste to be accepted at the landfill site. The key points of this process are shown in Table 7-13.

Table 7-13 Key Points in the Process for Introduction of Inter-Municipal Waste Management by ASINORLU

Process	Key points
Agreement on disposal costs	<p>ASINORLU carefully explained to the mayors of each city and others that payment of disposal fees based on the amounts of waste delivered to the landfill is necessary for the operation and management of the landfill.</p> <p>Examples of items explained to the mayor</p> <ul style="list-style-type: none"> • Concept of Sanitary Landfill • Personnel required to implement waste management • Operation and maintenance of sanitary landfill and necessary costs • Outline of ASINORLU waste management plan • Disposal fees to be paid to ASINORLU by each city, etc.
Public participation	<p>Through environmental education and 3R activities at schools and city offices, ASINORLU promoted citizens understanding of waste management. In addition, ASINORLU actively conducted educational tours of landfill sites.</p> <p>Examples of Environmental Education programs in schools</p> <ul style="list-style-type: none"> • Separation of PET bottles, aluminum cans, and steel • Bus tours to sanitary landfills and open dump sites • Creation of posters and leaflets, promotion of the use of eco-bags, etc.
Strengthening organizational capacity	<p>The capacity of staff in charge was strengthened through presentations at workshops and seminars and by acquiring knowledge through training in Japan. In addition, personnel and budget were secured to strengthen ASINORLU's organizational structure.</p> <p>Examples of workshops and seminars</p> <ul style="list-style-type: none"> ● Regional and national seminars (2 times during project period) <p style="padding-left: 20px;">Target: Administrative officials, municipal officials, etc. related to waste management in Central American countries</p>

Topic 7. Waste Management Challenges in Developing Countries and Lessons Learned from JICA Projects

	<p>Examples of contents: The following items related to waste management, collection and transportation, public awareness and environmental education, environmental and social considerations, 3R promotion, final disposal, organization, system, finance, 3R promotion, final disposal, organization, system, finance, etc.</p> <p>● Municipal training courses (6 times during project period)</p> <p>Target: Mayors, Technicians, NGOs, community leaders</p> <p>Improved capacity: Ability to select participants according to objectives Ability to tailor the program to the participants attending Ability to prepare presentation materials and conduct presentations, etc.</p>
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Source: Based on JICA “The Project for Integrated Solid Waste Management for Municipalities in the Republic of El Salvador Project Completion Report” (2009)



Photo 7-30 Briefing to the Mayor



Photo 7-31 Site Visit at the Regional and National Seminar

Source: Yachiyo Engineering Co., Ltd.

After the Project

● Treatment Fees Collected from Each City

As of September 2021, 26 cities transport waste to the Santa Rose de Lima landfill operated by ASINORLU, of which 17 cities have been added to the nine member cities of the association. As a result, the disposal fees collected from each city have increased to cover the maintenance and labor costs for the disposal site, as shown in Table 7-14. Disposal costs are determined based on the cost of fuel, facility operation and maintenance, and increased staffing costs, etc. ASINORLU ensured the sustainable operation of the inter-municipal landfill by revising fees as appropriate. Since waste management is not always a high priority for mayors, ASINORLU provided detailed explanations to each mayor and obtained their consent to increase the cost for disposal. ASINORLU provided explanations whenever a new mayor took office, in particular, seeking their understanding about the importance of waste management. As of 2021, each municipality is responsible for collection and transportation as in the original plan.

Table 7-14 Changes in Disposal Costs Collected from Cities

Paying entity	2008~	2016~	2020~	2022~ (provisional)
Disposal site host city	17 USD/ton	17 USD/ton	17 USD/ton	25 USD/ton
Other 8 cities in ASINORLU	23 USD/ton	23 USD/ton	23 USD/ton	25 USD/ton
Cities outside ASINORLU	26 USD/ton	26 USD/ton	35 USD/ton	35 USD/ton
Tariffs (dangerous items, etc.)	55 USD/ton	75 USD/ton	75 USD/ton	75 USD/ton

*: **Red color:** Adjustment of fees
 Source: Yachiyo Engineering Co., Ltd.

● **Environmental Education and Awareness-Raising Activities**

Environmental education has been expanded to all elementary schools (203 schools) in the nine member cities of ASINORLU. The disposal site has been improved to accommodate visitors, with an educational building available for lectures and an observation deck open to visitors. This has resulted in an increase in the number of students and local government officials visiting the site.

ASINORLU is also devising its own way to promote the 3Rs as a new initiative by exchanging recyclables, such as PET bottles and cardboard for vouchers called “eco-dollars” and setting up stores where these eco-dollars can be used and exchanged for daily necessities. This activity aims to promote the source separation and separate collection of waste by providing incentives for separate discharge of recyclables, and to make the 3Rs an indispensable and familiar part of daily life for residents by exchanging eco-dollars for daily necessities.



Photo 7-32 Educational Building for Lectures (near the Landfill)



Photo 7-33 Observation Deck for Visitors

Source: Yachiyo Engineering Co., Ltd.



Photo 7-34 The Conversion of PET Bottles into Eco-dollar Bills

Source: by ASINORLU



Photo 7-35 Purchasing Goods with Eco-dollar Bills

Column: Waste Bank in Indonesia

In Indonesia, the Ministry of Environment and Forestry Decree No. 13 (2012) provides guidelines for promoting 3R activities through “Waste Bank”, and certain support is provided by the government, including the development of facilities. Waste Banks are generally operated on a volunteer basis at the community level, and as of 2017 were in operation in more than 4,000 locations nationwide.

Waste banks purchase recyclables - PET bottles, plastic containers, empty cans, empty bottles, used paper, etc. - brought in by residents and sell them to recycling companies when a certain amount is collected. Residents are provided with a bank book equivalent to a regular bank passbook, and the amount equivalent to the market value of the recyclables (the purchase amount) is recorded in the book. After a certain period of time, the accumulated amount can be withdrawn as cash. The activities of the Waste Bank are said to have contributed to raising awareness of the 3Rs, changing the behavior of residents regarding waste separation, and beautifying the community.



Photo 7-36 “Sakura Waste Bank” in Palembang City

Source: Yachiyo Engineering Co., Ltd.



Photo 7-37 Mobile Waste Bank in Palembang City

● **Expanding Inter-Municipal Waste Management to Other Parts of El Salvador and Other Countries**

Attempts are being made to develop the inter-municipal waste management model in other parts of El Salvador based on ASINORLU's experiences. Table 7-15 provides an overview of the associations in El Salvador that have attempted to introduce inter-municipal waste disposal and the sanitary landfill sites they own. Two other sanitary landfill sites are being operated as regional waste disposal sites, in addition to ASINORLU. The experience gained by ASINORLU, including detailed explanations to each of the member cities of the association, was instrumental to the success of inter-municipal waste management.

However, one inter-municipal waste disposal facility was constructed but not put into operation, and two disposal sites were not constructed due to opposition from residents. Both of the sites that were not constructed were new construction sites, and the projects were abandoned due to opposition from local residents to the planned sites and the inability to relocate residents to other areas. Waste-related facilities, including the landfill, are described as NIMBY⁵ facilities, and the failure to properly disclose information and respond to local residents was the cause of the setback, highlighting the difficulty of reaching a consensus with local residents on the construction of new landfill sites.

Especially the case of the new acquisition of land highlighted the need for the government to avoid selecting sites unilaterally and to only do so through exchange with residents in the surrounding area before selecting a site.

ASINORLU has also provided guidance in the field on waste management to municipalities in Honduras for a period of five years since 2013, and is providing guidance online in response to a request from Peru in 2020. Consequently, ASINORLU's activities related to the ongoing operation and maintenance of the sanitary landfill site and inter-municipal waste management have become a model not only for municipalities in El Salvador, but for other Latin American countries as well.

Reasons why ASINORLU has continued activities even after this project ended may be explained by the fact that staff gained confidence in their ability to improve people's lives and the environment by transforming open dumps into sanitary landfills.

⁵ NIMBY is an abbreviation for "not in my backyard", a term used to describe residents who agree that a facility is necessary for the public, but are opposed to it being built on, or near their own residential property, or have such an attitude.



**Photo 7-38 Panoramic View of Sanitary
Landfill**

Source: Yachiyo Engineering Co., Ltd.



Photo 7-39 Gas Venting Pipes

**Chalatenango landfill, August 2021 – an Example of Inter-Municipal Landfill Spreading
throughout the Country in El Salvador**

Table 7-15 Overview of Associations that Have Attempted to Introduce Inter-Municipal Waste Management in El Salvador and their Sanitary Landfill Sites

No.	No. Municipalities	Construction of disposal site	Landfill system	Status of operation	Status of expansion	Funding sources for facility development and improvement	Difficulties faced, other
1	ASINORLU 9	Completed	Fukuoka Method	In operation	Completed	Phase I: JICA Phase II: JICA Phase III: KfW* ¹ Phase IV: Central government budget (provisional)	Continued with support from JICA. No particular issues with regional waste treatment system itself. There were issues with development in Phase III, but support was obtained from KfW* ¹ through donor coordination by MARN* ²
2	5	Completed	Phase I: Fukuoka Method Phase II: Semi-anaerobic* ³	In operation	Completed	Phase I: DAC* ⁴ (With support from central government) Phase II: KfW* ¹	Regional waste treatment was introduced based on ASINORLU's experience. Development costs were provided through support from DAC* ³ and KfW* ¹ with donor coordination by MARN* ² .
3	13	Completed	Phase I: Fukuoka Method Phase II: Semi-anaerobic* ³	In operation	Completed	Phase I: DAC* ⁴ Phase II: KfW* ¹	Although residents were opposed to the site, agreement was received from each city as a result of detailed explanations based on ASINORLU's experience. The relationship between the mayors was also good.
4	12	Completed	Fukuoka Method	Failed to be put into operation	None	El Salvador government, Spanish Cooperation Fund	In addition to opposition from residents, the project had to be abandoned when 35 households could not be relocated.
5	9	Not completed	—	Failed to be constructed	—	—	Consent was not obtained from residents for the construction site of the new proposed disposal facility.
6	19	Not completed	—	Failed to be constructed	—	Design: KfW* ¹	The original land was too small, and some local governments opposed the acquisition of new land for the project. Funds were raised, but the project was abandoned due to opposition.

*1: KfW: Kreditanstalt für Wiederaufbau (German state-owned investment and development bank)

*2: MARN: Ministerio de Medio Ambiente y Recursos Naturales

*3: The El Salvadoran side of the sanitary landfill developed with KfW funds is a semi-anaerobic system

*4: DAC: Development Assistance Committee

Source: Yachiyo Engineering Co., Ltd.

4.3 Lessons

(1) Political - Examining the Impacts of Changes in Government Administration

In El Salvador, the term of office for the President is five years, while the term of office for mayors is three years. A change in government, including political party, can result in significant changes in policy. In some cases, waste management falls in priority, budgets are reduced and, the introduction of inter-municipal waste management by associations has been postponed for reasons such as these. Every time the mayor of a city in the association changes, it is important for staff from the association to visit the city and provide a detailed explanation of the situation to the new mayor and city council.

(2) Financial - Securing Funding

It is important for the central government to establish a budgetary framework for the development of inter-municipal waste management facilities. Only with this framework can inter-municipal cooperation be promoted in detail, and it will be easier to obtain the commitment of each municipality. The role of the central government should be to raise funds from donors and promote the allocation of the country's budget.

(3) Public Participation - Importance of Disclosing Information

An important factor in promoting inter-municipal waste management is the fair disclosure of information about project plans and outlines, and impacts on areas around facilities from the early stages of the planning process. As a first step, it is important to provide examples of proper development and operation and maintenance of landfill sites to avoid NIMBY-related problems.

Participation by residents and communities is an essential part of the waste management process, and incorporating their opinions, including opposing views, into project plans from an early stage and solving problems that arise will put the project on a fast track to implementation. There have been several cases where projects did not make it to the implementation phase due to failures to disclose information. Encouraging residents to actually visit sites through field trips to landfill sites and treatment facilities will also help them see waste issues as something that concerns them and will dispel causes for anxiety.

(4) Organizational - Securing Human Resources

As counterparts of projects move on, the experience and knowledge from the project and results of training in Japan may leave with them. However, in ASINORLU, counterparts are still directly involved in waste management, and significant developments have been observed even after the project ended. When staff are replaced within an organization, it is necessary to devise ways to retain the skills and methods developed through the project within the organization.

(5) Organizational - Improvement of Staff Motivation

In order to continuously maintain and manage a facility, it is important to motivate and maintain the staff involved in operation and maintenance management. In addition to a good working environment and a stable salary, visualization of work results, appropriate evaluation of work, and attention from others can also effectively motivate employees.

(6) Country Differences - Challenges in Expanding Systems to Other Countries

El Salvador is working on expanding lessons learned to other countries in Latin America based on ASINORLU's experience. However, it is not always possible to be applied successfully due to differences in laws and political systems in target countries. Conditions in other countries must be taken into account, and cooperation is needed to develop countermeasures to address this.

5 People's Republic of Bangladesh ~ Community Participation in Waste Management

With the introduction of the “ward-based approach” Bangladesh has strengthened its waste management based on the smallest administrative unit. Under this approach the collection service area is subdivided into wards, each of which has its own administrative structure under the city’s administrative reach, and can administer on its own parts of its waste management. It is also important to improve the working environments of the cleaners.

Region: South Asia

Capital: Dhaka

Area: 147,000 km²

Population: 164.68 million (2020)

Ethnic groups: Bengalis, other minority groups

Language: Bengali (national language)

Religions: Islam (90.4%), other

(Hinduism, Buddhism, Christianity)



Source: Ministry of Foreign Affairs Website “People’s Republic of Bangladesh”

<https://www.mofa.go.jp/mofaj/area/bangladesh/data.html#section1> (accessed February 8, 2022)

5.1 Background

The population of Dhaka, the capital of Bangladesh⁶, is estimated to be over 20 million. With rapid urbanization, the city is facing growing urban environmental problems, such as waste, air and water pollution. In Dhaka, waste management was being collectively implemented by the city government, but in such a large city it was difficult for an individual organization to be consistent in managing the discharge, collection and transport, intermediate treatment, and final disposal of waste. In addition,



Source: Yachiyo Engineering Co., Ltd.

Photo 7-40 Illegal Dumping in the City

waste management in Dhaka City had been stagnating due to weak organizational structures, lack of equipment, and low sanitary awareness among the population. Table 7-16 provides an overview of major waste management projects implemented in Bangladesh through the support of JICA.

⁶ The term “Dhaka City” refers to the former Dhaka City before the partition of the city into North and South Dhaka in 2011, which is now the combined area of Dhaka North City and Dhaka South City. In this material, “Dhaka City” is used for the sake of convenience.

**Table 7-16 Overview of Projects Implemented in Bangladesh Related to Community
Participation in Waste Management**

Item	Content	
Project name	Project for Strengthening of solid waste management in Dhaka city	Project for Strengthening of Solid Waste Management in Dhaka North City, Dhaka South City and Chittagong City
Project period	February 2007 - March 2013	July 2017 -
Target cities (Population)	Dhaka City (Approx. 12 million people)	Dhaka North City (Approx. 6.11 million people) Dhaka South City (Approx. 4.49 million people) Chittagong City (Approx. 2.58 million people)
Overall goal	Waste management services in Dhaka City will be implemented sustainably.	Proper waste management will be implemented in Dhaka North City and Dhaka South City based on the New Master Plan for Waste Management (hereinafter referred to as the "New Master Plan"). Appropriate waste management is implemented in Chittagong City.
Project Goal	Waste management services in Dhaka City will be improved.	Waste management system in Dhaka North City and Dhaka South City will be improved based on the New Master Plan. Waste management system will be improved in Chittagong City.
Output	<ol style="list-style-type: none"> (1) Capacity for management and coordination of waste management activities will be improved. (2) Capacity for waste collection and transportation will be improved. (3) Proper operation and maintenance of final disposal sites (4) Accounting system for waste management will be improved. 	<ol style="list-style-type: none"> (1) A new master plan for Dhaka North City and Dhaka South City with a target year of 2032 will be developed. (2) Ward-based approach activities will be improved in Dhaka North City and Dhaka South City (3) Chittagong City will formulate a waste collection and transportation plan and introduce an appropriate waste collection and transportation system. (4) Sustainable workshop management system will be established in Dhaka North City, Dhaka South City and Chittagong City. (5) Information exchange meetings on waste management initiatives among all Special Municipal Authorities and the medium-sized municipalities in Dhaka North City and Dhaka South City will be held under the leadership of the Department of Local Government of the Ministry of Local Government and Regional Development. (6) Public information campaign on waste management in Dhaka North City and Dhaka South City will be promoted. (7) Measures to extend the life of existing disposal sites in Dhaka North City and Dhaka South City will be implemented, and new disposal sites will be secured.

Source: Based on JICA "Project for Strengthening of solid waste management in Dhaka city (extension) Project Completion Report" (2013), "Project for Strengthening of Solid Waste Management in Dhaka North City, Dhaka South City and Chittagong City (Phase 1) Project Completion Report" (2019)

5.2 Application of Japan's Experiences and Technologies

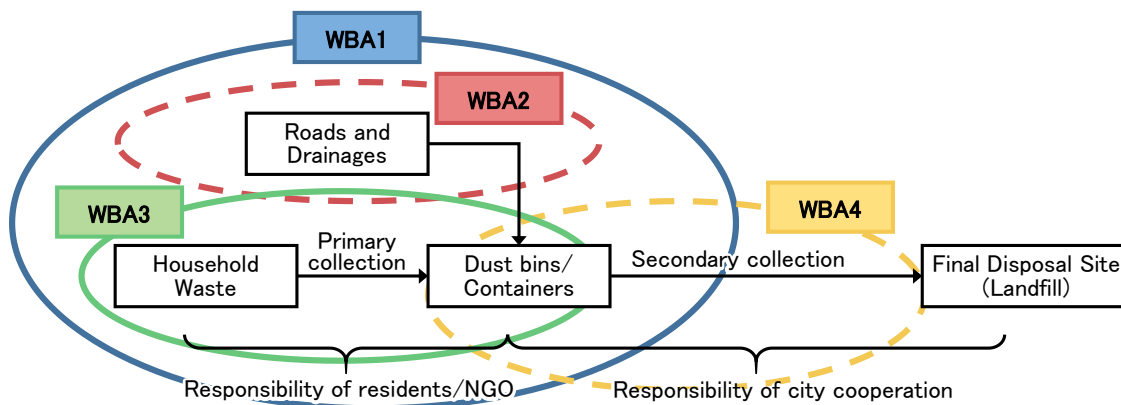
(1) Ward Based Approach (WBA)

The Ward Based Approach is a method for implementing and improving waste management in each ward, the smallest administrative unit in Dhaka City, through four activities: (1) construction of ward cleaning offices and strengthening field management, (2) improvement of working environment for cleaner, (3) promotion of public participation, and (4) improvement of collection and transportation.

Waste management operations, especially waste collection and transportation, cannot be improved simply by the introduction of collection vehicles and other equipment, but require fundamental improvements in the collection system, such as improved staff capacity and more efficient allocation of collection vehicles. However, in a large city like Dhaka, it is difficult to centralize the management of waste discharge, collection, transportation, and disposal in the Dhaka City Waste Management Department alone. Therefore, the Ward Based Approach (WBA), a management method for stable and continuous implementation of field-led waste management in wards⁷, which are the smallest administrative units in Dhaka City, was introduced. Through WBA, for each ward, various activities such as staff training and awareness raising, improvement of organizational functions, improvement of equipment, and improvement of collection systems are combined in a synergistic manner to improve waste management. As shown in Figure 7-6 and Table 7-17, WBA consists of four activities: (1) Construction of ward cleaning offices and strengthening field management, (2) Improvement of working environment for cleaner, (3) Promotion of public participation, and (4) Improvement of collection and transportation. WBA's goals were to achieve a minimum civilian⁸ standard of living and to provide administrative services to all residents of Dhaka.

⁷ The smallest administrative unit of a city area. Multiple wards make up a single zone. As of 2022, there are approximately 130 wards in Dhaka City (Dhaka North City: 54 wards in 10 zones; Dhaka South City: 75 wards in 10 zones). The population per ward consists of tens to hundreds of thousands of people.

⁸ Civil Minimum: The minimum standard of living conditions that a municipality is required to guarantee for the livelihood of its residents.



WBA 1	Construction of ward cleaning office and strengthening of site management
WBA 2	Improvement of the working environment for cleaners
WBA 3	Activities of public awareness
WBA 4	Improvement of waste collection and transportation

Source: Based on JICA “Project for Strengthening of Solid Waste Management in Dhaka North City, Dhaka South City and Chittagong City (Phase 1) Project Completion Report” (2019)

Figure 7-6 Framework of WBA

Table 7-17 Advantages and Challenges Related to the Ward-based Approach in Dhaka

WBA	Content	Advantages	Challenges
WBA 1	<ul style="list-style-type: none"> • Construction of ward cleaning offices and strengthening management in the field (office construction, management of cleaner) 	<ul style="list-style-type: none"> • Provides a space for cleaner to meet, store cleaning tools, and take breaks. • Offers a point of contact for residents to reach out to the government with questions or complaints on waste management. 	<ul style="list-style-type: none"> • Difficulty acquiring land for construction of ward cleaning offices. May be difficult to raise funds for the operation and maintenance of cleaning offices.
WBA 2	<ul style="list-style-type: none"> • Improvement of working environment for cleaner (conducting safety trainings, preparing work manuals, providing safety equipment) 	<ul style="list-style-type: none"> • Allows cleaner to work in a safe and hygienic environment. • Leads to increased awareness on health and safety and improves work efficiency. 	<ul style="list-style-type: none"> • Takes time to try and change awareness of cleaner on waste management and safety.
WBA 3	<ul style="list-style-type: none"> • Promotion of public participation (preparation and implementation of action plans for public awareness and community cleanup activities, etc.) 	<ul style="list-style-type: none"> • Allows residents and workers to work together on waste management. • Makes sustainable and hygienic waste management possible. 	<ul style="list-style-type: none"> • Takes time to attempt to change the attitudes of residents towards waste.
WBA 4	<ul style="list-style-type: none"> • Improvement of collection and transportation (removal of dust bins, improvements to containers, introduction of fixed-time fixed-place collection (FTFP) method) 	<ul style="list-style-type: none"> • Improves efficiency of collection work with the introduction of compactor trucks and other equipment. • Allows waste to be collected in a hygienic manner. 	<ul style="list-style-type: none"> • Takes time to change collection systems because the behaviors of both residents who discharge the waste, and government workers, who collect the waste, must be changed. • Difficulties may arise when vested interests are involved.

1) WBA1 - Construction of Ward Cleaning Offices and Strengthening Field Management

The development of a base office is important for waste management in the ward. In Dhaka City, the office is used as an important place with many roles, such as an office space for the cleaning supervisor - the government official responsible for waste management in the ward - to perform his/her management duties, a work office for the cleaner, and a contact point for residents related to waste management.

A cleaning supervisor was assigned to each ward, but since there were no offices, the cleaning supervisor, while also responsible for management in the ward, was often in the field together with the cleaner, patrolling the cleaning and collection sites in the ward. Therefore, in order to create a base in each ward to help wards improve waste management on their own, ward cleaning offices were constructed, and their functions strengthened. The offices were built to serve a number of functions, including; as a point of contact for residents to reach out with complaints, a base for labor management and guidance for cleaner, a place for cleaner to take breaks, and a storage space for cleaning tools. Cleaning supervisors, who had been more engaged in patrolling the sites, were now able to concentrate on their own ward management duties, in addition to their patrol work.



Photo 7-41 Ward Cleaning Office

Source: Yachiyo Engineering Co., Ltd.



Photo 7-42 Meeting with Cleaners in Ward Cleaning Office

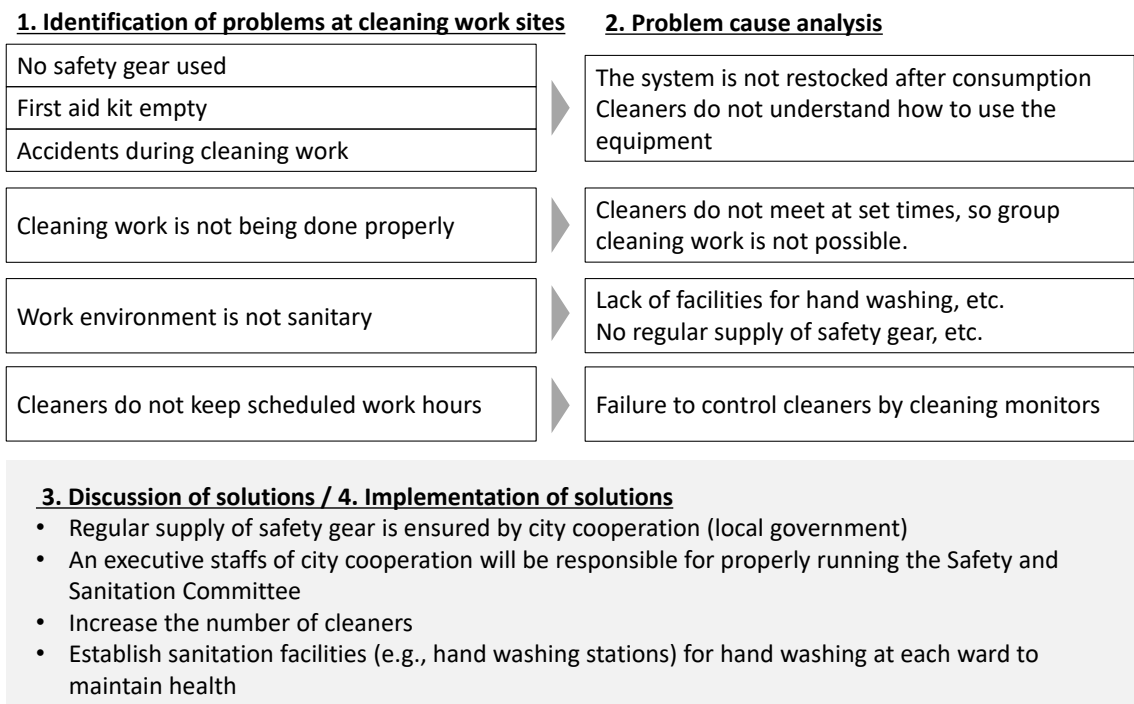
2) WBA2 - Improvement of the Working Environment for Cleaner

Efforts to improve the working environment for cleaners are not limited to simply improving the environment, but can also lead to increased awareness of the fact that cleaners are involved in waste management as government employees, which in turn can improve their motivation. A better working environment also ensures that work is not disrupted due to the absence of cleaner because of injury or illness, which also helps with the provision of stable services.

In Dhaka, the social status of cleaner is very low, and they face discrimination because of their occupation. Furthermore, awareness on hygiene and safety of cleaner is extremely poor. They work in unhygienic environments handling waste directly with their bare hands. In addition, because they worked without basic knowledge about waste collection, they did not understand points that needed to be taken into consideration during collection, which often resulted in traffic accidents. Not only do such accidents and illnesses affect the staffing and dispatch plans of the cleaner, making it difficult to provide stable and continuous waste management services, but the decline in the quality of waste management also leads to loss of trust from the residents, who are the service beneficiaries.

To avoid this situation, it is important to take steps to ensure that cleaner can work in a safe and sanitary environment. In Dhaka City, a safety and health committee was established to raise safety and health awareness and improve work efficiency, thereby providing a foundation for ensuring the occupational safety of the cleaner. A manual with diagrams was prepared for cleaner so that even those who couldn't read were able to understand the contents, and points to be kept in mind relating their work were made known to them. In addition, safety gear such as masks and gloves were distributed to cleaner to protect their health and safety, and information on how to use first aid kits and nearby hospitals were provided. Furthermore, a workshop was held to share with the cleaner the aims of waste management in Dhaka and to encourage their awareness that they, as city employees, are involved in the waste management.

The implementation of the four steps shown in Figure 7-7, i.e., (1) identify problems at the cleaning work site, (2) analyze the causes of the problems, (3) discuss solutions, and (4) implement the solutions, was facilitated for the on-site staff, including the cleaning supervisors who manage the cleaners. Regular implementation of these steps led to monitoring of the cleaning work environment and implementation of solutions.



Source: Based on JICA “Project for Strengthening of solid waste management in Dhaka city (extension) Project Completion Report” (2013),

Figure 7-7 Major Challenges, Causes and Proposed Solutions identified at Cleanup Work Sites



Photos 7-43 Workshop for Cleaner
 (The Director General of the Waste Management Department explained the waste management projects that should be aimed at, etc.)

Source: Yachiyo Engineering Co., Ltd.



Photos 7-44 Part of the Cleaner Work Manual
 (The manual is designed with many figures for both literate and illiterate staff)

3) WBA3 - Promotion of Public Participation

Public participation is an essential part of waste management. One of the most effective ways to promote public participation is to identify key people, such as community leaders or influential people in the area and set up a community organization that includes them. Having these community organizations conduct awareness-raising activities for residents in the same area makes it possible to create an environment where residents can educate one another.

In Dhaka City, many residents previously did not know the location of the nearest collection point, and some residents would dump their waste on the street or in vacant lots. As a result, the deterioration of local sanitation environment became a problem, and the city considered how to involve residents in waste management and maintain local sanitation environment. The focus was on the existence of various local residents organizations, such as voluntary mutual self-help groups, religious groups, and youth clubs. In order to implement community-based participatory waste management, it was necessary to attract the attention of many residents and encourage them to change their behavior, and the participation of influential figures in the community was essential. Therefore, a survey was conducted to identify representatives and influential figures of local residents' organizations in each ward and new residents' organizations for waste management were established, with the identified individuals as key persons.

Activities were mainly carried out through these community organizations to encourage the participation and cooperation of local residents in waste management. Activities included a march by local residents calling for city beautification projects, campaigns to raise awareness of the environment through plays and musical events, and clean-up campaigns organized together with cleaners. An active community organization in one of the wards was monitoring conditions of road cleanliness. This resulted in the cleanup of illegal dumping sites that were discovered over the course of activities in cooperation with residents. Other community organizations also contributed to activities to beautify the community through independent voluntary activities.



Photo 7-45 River Cleanup Campaign by Residents' Groups

Source: Yachiyo Engineering Co., Ltd.



Photo 7-46 Residents Cleanup Activities

4) WBA4 - Improvement of Collection and Transportation

There are a number of different methods used to collect and transport waste, such as those that utilize dust bins, containers, and compactor trucks. It is important to identify the features of each of these methods and introduce collection methods that are appropriate for each individual area.

Waste collection and transportation in Dhaka City is classified into primary and secondary collection. Primary collection is the transportation of waste from the source to the collection point (in the case of Dhaka City, dustbins and containers). There are primary collectors who carry out this primary collection on behalf of residents and others, and rickshaw⁹ vans are used for collection. Secondary collection is the collection of waste from dustbins and containers in the city and transport the waste to the final disposal site, which is handled by the government. The aim of WBA4 is to improve collection and transportation, especially secondary collection.

In Dhaka City, waste collection by open trucks had been the mainstream, but the area around the dustbin, where waste can be discharged 24 hours a day, was always overflowing with waste, resulting in unsanitary conditions. Later, the city gradually switched to container collection, but like the dustbins, the waste can be discharged 24 hours a day, so the unsanitary conditions persisted. In addition, containers were often placed along the side of the road, and large containers blocked parts of the road, causing traffic congestion. Therefore, in order to remove large dustbins and containers, Dhaka City introduced compactor trucks for secondary collection. In parallel, the city introduced fixed- place collection, in which waste is discharged at a designated time and place. Unlike dustbins and containers, the time that waste was kept in the city was reduced, contributing to improved sanitation.



**Photo 7-47 Waste Collection from
Dustbins by open Trucks**

Source: Yachiyo Engineering Co., Ltd.



**Photo 7-48 Waste Collection by Compactor
(Fixed-Place Collection at Regular Intervals)**

⁹ A three-wheeled bicycle with a box-shaped cargo box. It is mainly used for primary collection in Dhaka.

After the Project

Although collection operations have improved with the introduction of compactors, the complete removal of dustbins and containers and the establishment of regular, fixed- place collection have not been achieved (as of March 2022). As shown in Table 7-18, Dhaka City decided to continue using dustbins and containers because the collection methods using dustbins and containers provided the residents with many advantages, such as ease of waste removal, the ability to transport large amounts of waste at a time, and high collection efficiency. On the other hand, the careless placement of dustbins and containers along the side of the road and in other areas of the city contributed to the deterioration of the sanitary environment, so the city started promoting the installation of containers inside of transfer stations that are enclosed by walls, aiming to shift to waste collection that has less impact on the surrounding environment.



Photo 7-49 Containers Installed at a Transfer Station

Source: Yachiyo Engineering Co., Ltd.



Photo 7-50 Workers Collecting Waste around a Container at a Transfer Station

Table 7-18 Advantages and Disadvantage of Primary Collection Methods

Type	Advantages	Disadvantage
Dust bins and containers	<ul style="list-style-type: none"> • Waste can be discharged at any time • Efficient because a large amount of waste can be transported at one time • Easier to maintain compared to compactor trucks 	<ul style="list-style-type: none"> • Loading takes time and labor (if the collection vehicle is an open truck). • Waste tends to be scattered around dust bins and containers, which degrades the sanitary environment • Depending on where they are placed, they become a source of traffic congestion.
Compactor trucks	<ul style="list-style-type: none"> • Suitable for the collection of large volumes as compactor trucks can compress waste • Can be used to collect waste in a sanitary manner 	<ul style="list-style-type: none"> • Difficult to transport a large amount of waste at one time compared to containers • Complex structure makes maintenance difficult

5.3 Lessons

(1) To Improve Integrated Waste Management

WBA is an effective method for developing site-driven participatory waste management in the community. The construction of the ward cleaning office provides administrative work space for the cleaning supervisors and a place for the cleaner to rest and store their safety gear. It also serves as a point of contact for residents to casually discuss waste management issues, helping to build a relationship between the government and residents.

Protecting the occupational safety of cleaner is also important to avoid the sudden absence of staff due to injury or illness, especially if weakness in occupational safety interferes with collection work. Collection services can be improved by selecting appropriate collection methods, allowing services to be provided that not only consider the sanitation of local residents and the surrounding environment, but also the health and safety of the cleaner who perform collection work.

In order to encourage the participation of residents, who play an essential role in promoting proper waste management, it is important to identify local representatives and influential people in the community and establish a resident's organization led by these individuals. The existence of such an organization will establish a foundation for local residents to work together and contribute to the implementation of activities to improve the sanitation environment in the community.

Column: Identification of Constraints and Introduction of Appropriate Technologies

Regional characteristics, even in the same country or city, are completely different. There are a number of factors that are related to waste management systems, such as topography, religion, climate, politics, and the presence of residential and commercial facilities. It is therefore difficult to properly dispose of waste without a waste management system that is suited to these characteristics. It is necessary to identify these characteristics and consider what type of waste management system would be best suited. Examples of constraints in the waste management sector are shown in the table below.

Table 7-19 Examples of Constraints in the Waste Management Sector

No.	Constraints		Measures
1	Human and technological factors	Lack of human resources and capacity	Conduct trainings, promote public participation, implement simple systems
		Energy insufficiency	Securing new energy sources (small-scale power generation facilities, use of biogas/landfill gas, etc.)
		Shortage of construction materials	Use locally available materials
2	Financial factors	Lack of funds	Introduce low-cost technologies, mobilize external funds
3	Organizational structure and institutional factors	Unclear division of roles and authority	Establish legal systems and neutral professional organizations
		Insufficient development and maintenance of laws and regulations	
4	Social factors	Social systems	Community and NGO partnerships for public participation, environmental education, and waste picker countermeasures
		Culture and customs	
5	Geographical factors	Steep slopes, lowlands, highlands, etc.	Innovations in design
		Arid regions	Reuse and recycle water
		Flood-prone areas	Introduce flood prevention measures and technologies
		Regions with high and low temperatures	Review/revise design conditions
6	Environmental factors	Land shortages	Introduce space-saving and advanced technologies
		Presence of wildlife	Innovations in design
		Presence of pests and vermin	Innovations in design and usage
		Presence of endemic diseases	Education on causes of infection, dissemination of proper techniques (e.g., introduction of incineration, implementation of soil cover at final disposal sites, etc.)
		Insufficient environmental capacity	Innovations in equipment/facility layouts and treatment methods

*: Refers to the allowable capacity of a pollutant that does not cause problems in the natural environment.

Source: Based on Kitawaki Hidetoshi "Appropriate technology in the field of environmental health in developing countries" (1997), JICA "To Support Capacity Development in the Waste Sector in Developing Countries Toward Improving the Waste Management Capacity of Society as a Whole" (2005)

6 Malaysia ~ Data Management Systems, Dissemination of 3R Activities and Environmental Education ~



A multifaceted approach was taken in Malaysia to promote waste reduction, including the establishment of a data and information management system, source separation, 3R activities and environmental education.

Malaysia has a per capita GDP of approximately US\$10,000 (in 2020) and is positioned as a middle-developed country. The waste management level corresponding to the country's stage of development set by JICA is shifting from the second stage "reduction of environmental burden and pollution prevention" to the third stage "establishment of a sound material-cycle society through the 3Rs". Therefore, the results of this project have many implications for developing countries seeking to transition from one stage to another.

Region: Southeast Asia

Capital: Kuala Lumpur

Area: 330,000 km²

Population: 32 million (2017)

Ethnic groups: Malay (approx. 69%), Chinese (approx. 23%), Indian (approx. 7%)

Languages: Malay (national language), Chinese, Tamil, English

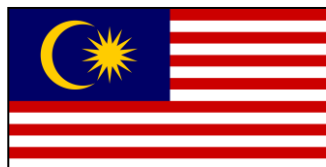
Religions: Islam (official religion, 61%), Buddhism (20%),

Confucianism/Daoism (1.0%),

Hinduism (6.0%), Christianity (9.0%), other

Source: Ministry of Foreign Affairs Website "Malaysia"

<https://www.mofa.go.jp/mofaj/area/malaysia/data.html#section1> (accessed February 8, 2022)



6.1 Background

In Malaysia, prior to the transfer of waste management and recycling administration to the central government (National Solid Waste Management Department) in 2011, waste management was a local government task and the Ministry of Housing and Local Government (MHLG) was in charge of waste administration. Since the mid-1980s, Malaysia has experienced an increase in the amount of waste generated due to urbanization and diversification of lifestyles in line with economic development, as well as problems with disposal costs and securing landfill sites. Therefore, the National Development Policy has emphasized the concepts of reduce, reuse, recovery, and recycling, and made recommendations on the use of environmentally friendly products. In addition, the Ministry of Housing and Local Governments (MHLG) has been promoting recycling and raising awareness with

citizens on the 3Rs at the national level, while local governments have promoted recycling activities.

However, these efforts were limited to only a few local governments that had an advanced level of environmental awareness, and recycling rate was only 2% to 5%. In this context, the Malaysian government requested the support of Japan to implement a project with the aim of developing a clear concept, strategy and plan for the creation of a sound material-cycle society. The project was implemented during the period from July 2004 to July 2006. Table 7-20 provides an overview of the project.

Table 7-20 Overview of Project Implemented in Malaysia

Item	Content
Project name	The Study on National Waste Minimization in Malaysia
Project period	July 2004 - July 2006
Target cities	Kuala Lumpur (Government agencies), Penang, Subang Jaya, Miri, Johor
Project Purpose	<ol style="list-style-type: none"> (1) Formulate master plans, action plans, and guidelines to promote waste reduction (reduce, reuse, recycle) based on the National Strategic Plan for Solid Waste Management. (2) Strengthening of public sector organization for waste reduction
Output	<ol style="list-style-type: none"> (1) Waste Minimization Master Plan (Target: Municipal waste across Malaysia, Target year: 2020) (2) Solid Waste Minimization Action Plan for Federal Government (Target year: 2010) (3) Guideline <ul style="list-style-type: none"> • Guidelines for the Enhancement of 3Rs Activities in Schools • Guideline for Formulation of Local Action Plan on Waste Minimization • Guidelines for Source Separation of Municipal Solid Waste • 3Rs Action Guide (4) Implementation of the pilot projects <ul style="list-style-type: none"> • PP-I : National Recycling Information System • PP-II : Local Waste Minimization Unit and Source Separation of Municipal Solid Waste • PP-III : Waste Minimization Awareness and 3Rs Programme and Activities in Schools (5) Solid Waste Minimization Action Plan for Local Authorities in model cities (Subang Jaya, Kinta Selatan, Miri, Penang)

Source: Based on JICA "The Study on National Waste Minimization in Malaysia Final Report" (2006)

6.2 Application of Japan’s experiences and technologies

(1) Development of a Data and Information Management System

Creating a database of information related to waste is effective when used in planning and promoting efficient waste management. However, it is important to have a structure in place that can be used to maintain and manage the system, including securing the necessary human resources.

In Japan, the Ministry of the Environment of the central government, requests local governments to submit data to a centralized database on waste. (for more details on the database created by the Ministry of the Environment of Japan, refer to “Topic 1-2.1 Management of Waste-Related Data”.) One of the Japanese technologies that has been applied under the project in Malaysia is for creating databases on waste. The basic structure of the information management system is shown in Figure 7-8. A database was created in an information management system using data on the collection of recyclable materials digitally submitted by local governments and key information related to recycling. The database contains the following information.

- General information about the local government: address, contact information of officer(s) in charge, website URL, etc.
- Collection centers, collection container locations, administrators
- Types of recyclable materials collected
- List of related organizations submitted by the local government

This database has made it possible to access and search key data, as well as create tables and graphs for purposes of research, analysis, and publication.

Creation of a database is important because it leads to the creation of waste flow diagrams and preparing plans using the data. In order to make effective use of the data, training of personnel submitting the data and those managing the data is also required. Therefore, on-the-job training was provided to national and local government officials on how to input and manage data.



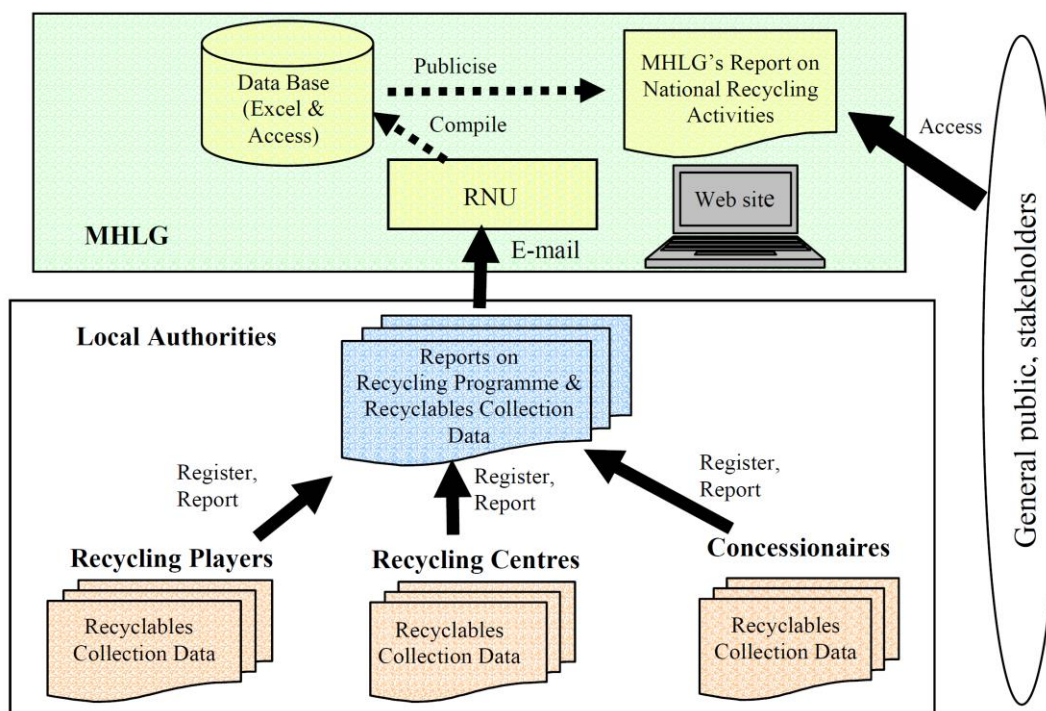
Photo 7-51 On-the-job Training on Data Management for Municipal Employees

Source: Yachiyo Engineering Co., Ltd.

AMOUNT OF WASTE RECYCLED

MONTH	CARDBOARD		PLASTIC		METAL		TOTAL		% OF WASTE RECYCLED
	TONS	RM	TONS	RM	TONS	RM	TONS	RM	
Sept ⁰³	48.129	11,069	2.89	722.50	1.61	72.4	48.133	2,515	4.9.53
Oct ⁰³	38.887	10,499	3.44	860.00	1.80	81.0	38.892	2,169	4.8.93
Nov ⁰³	42.517	11,904	3.44	852.50	1.55	69.750	42.521	1,345.8	4.8.36
Dec ⁰³	50.084	14,093	4.46	1,115	4.34	2,170	50.192	1,308	4.6.51
Jan ⁰⁴	53.124	15,043	4.70	1,175	1.74	870.00	53.732	1,088	4.8.73
Feb ⁰⁴	38.370	10,763	3.8	952.50	3.21	1,605	38.377	1,320	4.8.00
Mar ⁰⁴	38.600	11,696	1.6	400.00	2.2	1,326	38.604	1,342	4.8.50
Apr ⁰⁴	39.534	12,657	2.56	640.00	2.19	1,752	44.300	1,504.9	4.2.40
May ⁰⁴	38.128	12,582	1.66	747.00	2.47	1,728	38.132	1,505.7	4.4.30
June ⁰⁴	30.863	10,184	2.67	1,201	2.59	1,295	36.123	1,2,680	4.1.69
Jul ⁰⁴	32.193	9,657	1.25	562.00	1.93	1,091.50	32.891	1,091.1	4.4.49
Aug ⁰⁴									
TOTAL	450.2	13,007	22.4	9,226	25.6	14,038	461.104	15,351	

Photo 7-52 Example of Data Collection Form at a Recycling Center



*: A concessionaire is a private contractor that operates a collection business under a concession contract with the government.

Source: JICA, Yachiyo Engineering Co., Ltd., EX Research Institute Ltd. "The Study on National Waste Minimisation in Malaysia Final Report" (2006)

Figure 7-8 Basic Structure of the Information Management System (IMS)

After the project was completed

On the website¹⁰ of the Ministry of Housing and Local Government, data on waste is available to the public and can be downloaded by anyone in Excel format. The data has been accumulated since 2012, and in addition to basic data such as the amount of waste generated, recycling rate, and disposal sites, the number of complaints and illegal dumping are also available.

¹⁰ Ministry of Housing and Local Government Website, data viewing page: <https://www.data.gov.my/>
It is possible to search for data of waste by searching for "Sisa Pepejal "(Malay for solid waste).

(2) Source Separation

Separation at the source is essential for waste reduction. Collection methods and waste to be sorted were established according to different conditions - such as single-family houses, apartment buildings, office buildings, mega-marts, and hotels - and source separation was conducted.

In order to reduce waste, it is necessary to understand waste flows and separate waste at source. Five target groups were selected in this project to verify source separation under different conditions: (1) general households (single-family houses), (2) general households (apartment complexes), (3) office buildings, (4) mega-marts, and (5) hotels. Methods differ for each of the source separation systems introduced and implemented in the target groups, and were selected according to the local characteristics of the collection methods and collectors. An overview of source separation systems is shown in Table 7-21.

Table 7-21 Overview of Source Separation Systems

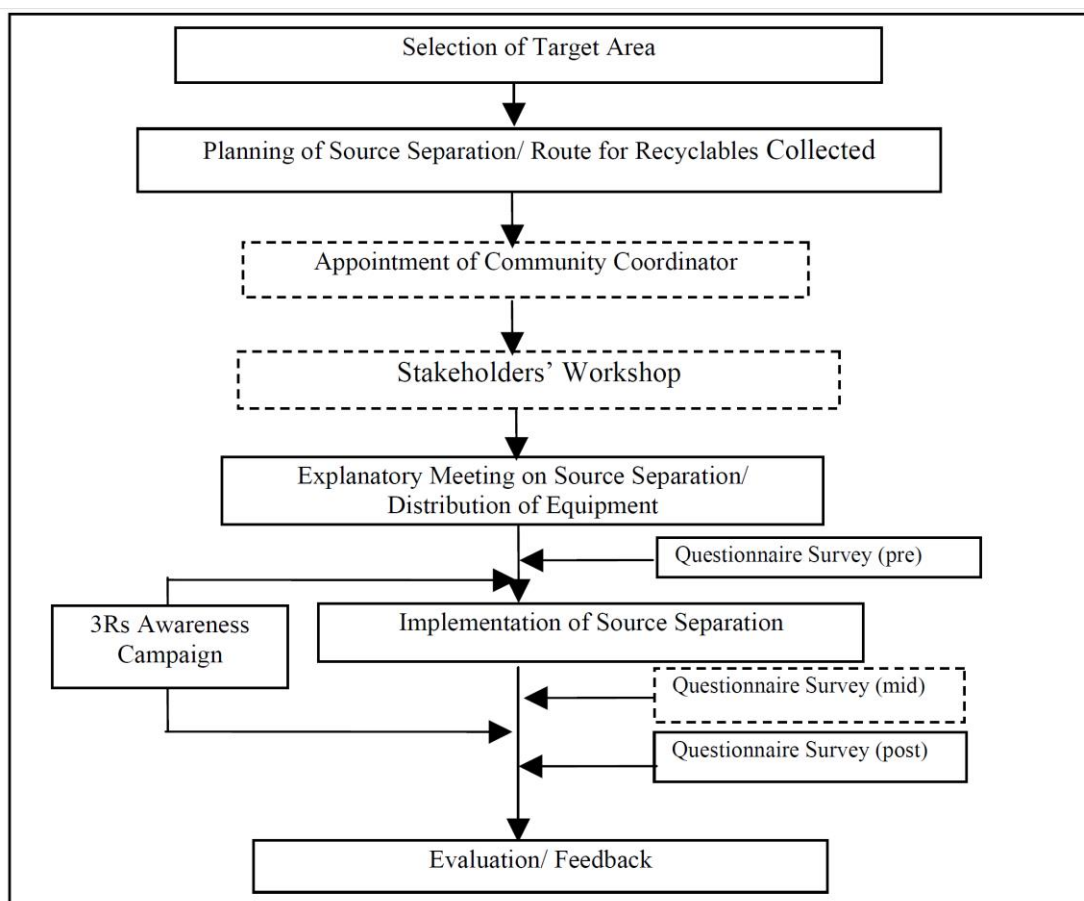
Target	Activity	Target items	Equipment/facility	Collectors	Collection frequency
General households (single-family houses)	Door-to-door collection	Paper Plastic Metal Glass	One HDPE* container Separated into 2 types	Recycling companies	Once/week
	Door-to-door collection Station collection		One Plastic bag and one box for waste paper Separated into 3 types	NGOs	Once biweekly
				City contracted collectors	Once/week
General households (apartment complex)	Station collection		Three Plastic bags and collection containers (4 locations) Separated into 4 types	Recycling companies	Once/week
Office buildings	Reduced paper consumption	Paper	Three types of collection containers	Concessionaire	Once/week
Mega-marts	Establishment of purchase center	Paper, plastic, metal, glass	Cabin for purchase center	Concessionaire	Daily
Hotels	Separation by housekeepers and guests		Collection containers, bags, boxes	Recycling companies	Once/week

*: HDPE : High-density polyethylene

Source: JICA, Yachiyo Engineering Co., Ltd., EX Research Institute Ltd. "The Study on National Waste Minimization in Malaysia Final Report" (2006)

Figure 7-9 shows the procedures used in separating waste at source in the project. After targets were selected, waste was separated at source through the establishment of separation methods and collection routes for resources, and the organization of workshops and briefings to obtain stakeholders' understanding and cooperation. Finally, source separation guidelines were developed to promote separation at source.

Since there was no clear specific law regarding source separation for commercial facilities, the project team coordinated individually with each business operator targeted for the pilot project, such as Mega Mart, hotels, etc., in the context of social contribution such as CSR (Corporate Social Responsibility). For each business operator, it took time to coordinate with the pilot project for introduction of source separation, because they were required to bear the costs of labor for sorting the waste, costs to purchase containers for the sorted recyclables, as well as to allocate personnel and consider a location for placing the containers. It is necessary to enact a law that stipulates the responsibilities of business operators, similar to Japan's recycling-related laws.



Source: JICA, Yachiyo Engineering Co., Ltd., EX Research Institute Ltd. "The Study on National Waste Minimization in Malaysia Final Report" (2006)

Figure 7-9 Flow Chart of Source Separation Activities



Photo 7-53 Briefing on Source Separation Activities to Residents



Photo 7-54 Collection of Recyclables from Single Family Homes

Source: JICA, Yachiyo Engineering Co., Ltd., EX Research Institute Ltd. "The Study on National Waste Minimization in Malaysia Final Report" (2006)

(3) 3R Activities and Environmental Education

Environmental education in schools is effective in promoting the 3Rs, and it is expected that the students will spread the 3Rs to their families and the society. In Malaysia, a key point was to classify the schools into levels according to the extent that the 3Rs were being promoted in each school, and then set and implement 3R activities according to that level. When implementing programs, it was also important to devise methods for selecting target schools, such as selecting schools with different levels of 3R activities and those with relatively high levels of awareness through questionnaires and briefing sessions

Prior to the start of activities, guidelines were developed for promoting the 3Rs in schools in collaboration with the ministries in charge of waste management, Ministry of Education, local governments, and school teachers. Based on these guidelines the schools were classified into levels according to the extent existing waste reduction programs were already being implemented. The guidelines also indicated the need to incorporate PDCA (Plan, Do, Check, Act) cycles to review and improve 3R activities that have been planned and implemented. For example, the "Check" component of PDCA included specific instructions for use, such as measuring the amount of paper, PET bottles, cans, and other waste generated at the school each day and evaluating the numerical amount of weight reduction achieved by recycling. It was important to initially provide appropriate guidance to school teachers so that guidelines could be properly implemented in educational settings, and therefore 3R workshops were also organized for teaching staff. An overview of these guidelines is shown in Table 7-22.

Table 7-22 Overview of Guidelines Promoting 3R Activities in Schools

Purpose	(1) Streamlining 3R activities in schools (2) Promoting participatory approach (3) Evaluating 3R activities (4) Ensuring the sustainability of 3R programs in schools
Classification of schools	Level 1: Schools with no waste reduction programs in place Level 2: Schools with basic waste reduction programs in place Level 3: Schools with active waste reduction programs in place
Contents	Chapter 1: What are the 3Rs? Chapter 2: Why do we need the 3Rs? Chapter 3: The PLAN-DO-CHECK-ACT approach Chapter 4: Where should we start? Chapter 5: Step 1: Planning (PLAN) Chapter 6: Step 2: Implementing (DO) Chapter 7: Step 3: Monitoring & measuring (CHECK) Chapter 8: Step 4: Reviewing & improving (ACT) Chapter 9: 3R PDCS for beginners (Level 1) Attachments

Source: JICA, Yachiyo Engineering Co., Ltd., EX Research Institute Ltd. "The Study on National Waste Minimization in Malaysia Final Report" (2006)

Next, 3R programs and 3R award programs were set up in the target cities, and each program was implemented after schools were selected in each city.

- Miri City: Nine schools were selected based on questionnaires and information sessions to confirm their intent to participate. A 3R award program was organized, with the winning school identification at the award ceremony where each school gave a presentation on their activities.
- Johor State: A total of six elementary and junior high schools having different levels of 3R activities were selected by the state board of education to conduct activities in classrooms, staff rooms, cafeterias and students' homes, as shown in Table 7-23.

Table 7-23 Overview of the 3R Program in Schools in Johor State

Level	Level 1	Level 2	Level 3
Purpose	<ul style="list-style-type: none"> • Improve level of awareness of the 3Rs among students and teachers • Reduce waste generated at schools 		
	<ul style="list-style-type: none"> • Introduce the concept of separating waste at source 	<ul style="list-style-type: none"> • Reduce the number of plastic bags in cafeterias 	<ul style="list-style-type: none"> • Impart a message on the 3Rs to families through students
Targets	Classrooms, staff rooms	Cafeterias	Students' homes
Activities	<ul style="list-style-type: none"> • Establish 3R organizations • Conduct waste surveys in classrooms • Set up collection points for recyclables in each classroom 	<ul style="list-style-type: none"> • Establish 3R organizations • Conduct waste surveys in cafeterias • Replace plastic bags with reusable cups for beverages • Encourage teachers and students to bring their own cups to school 	<ul style="list-style-type: none"> • Establish 3R organizations • Conduct waste surveys of households

Source: JICA, Yachiyo Engineering Co., Ltd., EX Research Institute Ltd. "The Study on National Waste Minimization in Malaysia Final Report" (2006)

The use of an inter-school competition to provide incentives to students in the 3R award program in Miri City was expected to increase the students' motivation to engage in 3R activities and build a sense of unity in the entire school as well. In addition, both schools in Johor and the families of students were included in 3R activities, so that activities could be extended to the families of students. Devising places and methods for implementing the 3Rs resulted in even more effective activities. Environmental education at schools has resulted in increased awareness of recycling and contributed to the spread of buy-back centers, which are facilities for purchasing recyclables.

In the project, the collected recyclables were handed over to a contractor, and efforts were made to reuse it at schools - such as making chairs from PET bottles, craft activities using unwanted materials, and making statues from aluminum cans. Resource waste obtained through recycling becomes meaningful as a resource when there are recipients and it is used effectively and appropriately. Therefore, in order to carry out 3R activities, it is a prerequisite that there is a place for effective use of separated recyclables.

Topic 7. Waste Management Challenges in Developing Countries
and Lessons Learned from JICA Projects



Photos 7-55 Awareness Survey on 3Rs in Schools



Photos 7-56 3R Workshop for Junior High School Students



Photos 7-57 3R Workshop for Government Officials



Photos 7-58 Guidance on Sorting by City Staff



Photos 7-59 3R Workshop for School Teachers



Photos 7-60 Seminar on Waste Reduction

Source: JICA, Yachiyo Engineering Co., Ltd., EX Research Institute Ltd. "The Study on National Waste Minimization in Malaysia Final Report" (2006)

6.3 Lessons

(1) Training and Securing Competent and Appropriate Human Resources

Data management, updates to networks, and monitoring are essential aspects of waste management operations. Therefore, in order to maintain data management systems, it is necessary to educate not only the central ministries and agencies that manage the databases, but also the local government administrators who collect and submit data, and to appoint competent, appropriate, and trained personnel to maintain the systems.

(2) Coordination between Stakeholders on Source Separation

It took time to coordinate with the parties concerned, as they were required to bear the costs of labor and sorting containers for the introduction of source separation, as well as to allocate personnel and secure an installation site. Source separation programs for commercial facilities, such as supermarkets and hotels, faced various problems such as informing customers and gaining their understanding of cost burdens, etc. in terms of coordinating and negotiating with stakeholders. These problems lay beyond the control of local governments and the project team, and caused significant delays in the implementation of the program. For separation at source, it is necessary to coordinate with households and commercial facilities separately, and pay particular attention to the interests of stakeholders of commercial facilities.

(3) Strategic Implementation of Educational and Dissemination Programs through Inter-agency Collaboration

In order to introduce sustainable waste reduction practices, it is necessary to teach the philosophy of the 3Rs to the younger generation through practical school education and extracurricular activities. Collaborative activities between ministries responsible for waste management (in this case, the Ministry of Housing and Local Government) and the Ministry of Education are essential for the introduction of sustainable and strategic educational and awareness programs suitable to students. The Ministry of Education and teachers were involved from the initial stage in developing guidelines to promote 3R activities in schools, which made the guidelines even more applicable in educational settings. It is important for multiple ministries and agencies to collaborate in order to efficiently implement educational and awareness programs.

Column: Implementation of the E-Waste Management System in Malaysia

E-waste refers to waste from electrical and electronic equipment, which contains hazardous substances such as lead and mercury, as well as rare metals. This makes recovery of these wastes important from the perspective of the sustainable use of resources.

Since 2019, E-waste in Malaysia has been managed under ministries responsible for collection, treatment and disposal under laws and regulations on hazardous waste in Malaysia for industrial systems (manufacturing and assembly of electrical and electronic equipment). However, the disposal of electrical and electronic equipment waste from households and businesses is in a legal grey zone, as specific roles and responsibilities for its management have not been legally clarified and systems for its implementation have not been specified within the government. Therefore, most electrical and electronic equipment wastes (air conditioners, PCs, and cell phones that include rare metals) that contain a significant amount of recyclables are collected by resource recovery and recycling companies, including those in the informal sector, either free of charge or for a fee, disassembled or dismantled using simple processes, and then recyclables are recovered and sold. However, it is currently impossible to adequately control the health and safety hazards caused by inappropriate treatment and disposal and the pollution caused by discharging hazardous substances into the environment.

In response, the ministry has promoted the development of legislation for “E-waste management regulations” and has specified the six items described in Table 7-24, in “electrical and electronic equipment waste” disposed by households and business establishments as “designated hazardous waste”, with an aim to establish the treatment flow shown in Figure 7-10. In connection with this, ministries and agencies are implementing the individual/station collection of E-waste and establishing/operating collection centers, while the private sector is collecting and purchasing such waste.

To formalize informal collection, it is desirable to visualize resource and financial flows. To this end, it is first important to understand the volume of household appliances sold (imported and produced domestically), which is the basic information for estimating the volume of E-Waste generated.

It was also estimated that in Malaysia, much of the E-Waste is collected on delivery of new appliances when they are replaced, but much of the collected E-Waste is passed on by delivery drivers to informal recyclers such as junk shops, etc. In order to eliminate the improper treatment of E-Waste, it is necessary to establish a system whereby E-Waste flows from generators through authorized channels (Authorized Collection Centers/ Collectors, Authorized Retailers) to formal treatment, as shown in Figure 7-10.

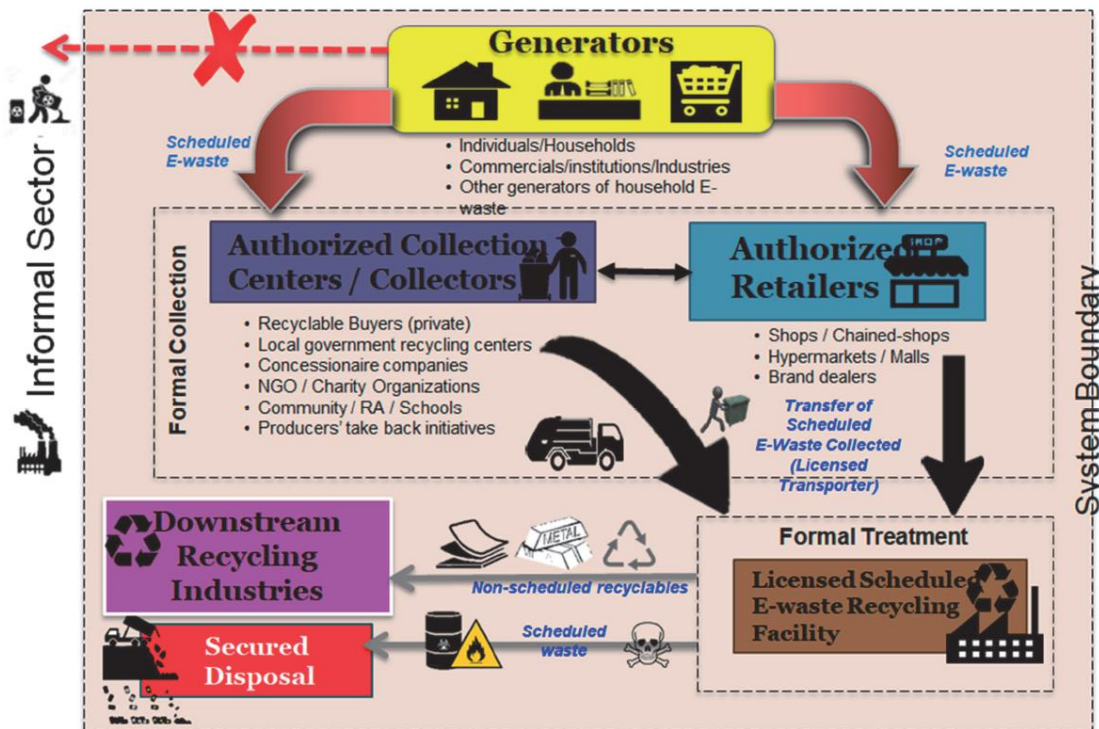
By clarifying the resale price to informal recyclers, price incentives can be considered to collect and process E-Waste through regular channels.

In other developing countries, laws are expected to be developed in the future from the perspective of environmental protection and resource recycling, which will cause shifting from informal to formal collection. It should be noted that employment opportunities will be lost in the informal sector, and that it will be necessary to obtain the cooperation of local residents in the separation and collection of waste.

Table 7-24 Waste Designated as Hazardous as Defined by E-Waste Management Regulations

1	TVs (including cathode-ray tube TVs and flat TVs)
2	Refrigerators
3	Washing machines (including clothes dryers)
4	Air conditioners (including integrated and separated types)
5	PCs (including desktops and laptops)
6	Cell phones (including feature phones, smartphones, and tablet PCs)

Source: Based on JICA “The Project for Implementation of Scheduled E-waste Management System in Malaysia Final Report” (2019)



Source: JICA “The Project for Implementation of Scheduled E-waste Management System in Malaysia Final Report” (2019)

Figure 7-10 E-Waste Recycling and Treatment Flow Based on the “E-Waste Management Regulation”

7 Socialist Republic of Vietnam ~ 3R Activities Involving Multiple Stakeholders~



Vietnam is taking a step forward from the realization of proper waste management to the establishment of a sound material-cycle society, and the project described in this section has launched 3R initiatives, including the introduction and dissemination of source separation. The efforts related to 3R activities involving various stakeholders, centering on local residents are introduced hereafter.

Region: Southeast Asia

Capital: Hanoi

Area: 329,241 km²

Population: 97.62 million (2020)

Ethnic groups: Kinh (Vietnamese people) approx. 86%,
53 other ethnic minorities

Language: Vietnamese

Religions: Buddhism, Catholicism, Caodaism, other

Source: Ministry of Foreign Affairs Website “Malaysia”

<https://www.mofa.go.jp/mofaj/area/vietnam/data.html#section1> (accessed February 8, 2022)



7.1 Background

Environmental pollution in Hanoi, the capital of Vietnam, was worsening due to un-collected solid waste scattered on public roads and illegal waste dumping in lakes. Under the nation’s environmental strategy to recycle 30% of waste by 2020, the government had been trying to promote a recycling movement for solid waste, but the collection of recyclables remained mainly limited to informal waste collectors.

The 3R Initiative, which combines the Reduce, Reuse and Recycle of waste, was positioned as a key component in the country’s environmental strategy. The Ministry of Natural Resources and Environment was established in 2002 to work with local governments on environmental measures related to water and air quality and solid waste management. However, due to a lack of technical, managerial and administrative capacities, the Vietnamese government requested technical cooperation from Japan to build up these capacities. As a result, Japan supported this project which was implemented from November 2006 to November 2009. Table 7-25 provides an overview of the project.



Source: Yachiyo Engineering Co., Ltd.

Photo 7-61 Collection Containers
Overflowing with Waste

Table 7-25 Overview of the Project Implemented in Vietnam

Item	Content
Project name	Implementation support for 3R INITIATIVE of Hanoi City for Cyclical Society
Project period	November 2006 - November 2009
Target cities (Population)	Hanoi City (Approx. 3 million people) Model districts Hoan Liem block (Approx. 8,000 people), Hai Ba Trung block (Approx. 11,000 people), Ba Dinh block (Approx. 25,000 people), Dong Da block (Approx. 29,000 people)
Overall goal	(1) Establish a sound material-cycle society in Hanoi (long-term goal) (2) Harmonized 3R initiatives based on sorted collection will be implemented in Hanoi (mid-term goal).
Project purpose	To prepare for a harmonized 3R approach based on separate collection throughout Hanoi City.
Output	(1) Through the model project of separate collection and composting of food waste, the collection situation in the model districts will be improved. (2) Awareness of residents in the model districts will be improved through 3R environmental education and PR activities based on the “Mottainai Spirit” (3) The food waste sorting and collection program, environmental education program, and 3R concept will be disseminated. (4) Based on the food waste sorting and collection program, a strategy paper and action plan to improve the municipal waste collection system will be developed.

Source: Based on JICA “Project for Implementation Support for 3R INITIATIVE in Hanoi City to Contribute to the Development of a Sound Material-Cycle Society Final Report” (2009)

7.2 Application of Japan’s Experiences and Technologies

(1) Public Participation Initiatives Involving Various Stakeholders

3R projects can be effectively promoted through the independent activities of the general public, such as students and community groups. In addition, raising the public awareness on the 3R activities through the media will contribute to successfully expanding these activities.

Hanoi’s 3R project, with its spirit of “*mottainai*”, which involved a diverse range of stakeholders, including residents, local communities, government, media, students, experts, the private sector, and NGOs, attempted to position local residents at the center of the project and turn the focus on them. This was an attempt to apply Japan’s experience and knowledge of public participation as a key factor in the sustainable implementation of waste management and the 3Rs.

Key Points on Public Participation:

1. Multi-faceted initiatives to raise awareness and encourage changes in the behaviors of residents
2. Involvement of various stakeholders with a focus on residents

Over the course of the project, 85 organizations and individuals, including representatives from government agencies, universities, the media, private companies, and model districts, came together to form the “3R Stars”, and actively adopted initiatives focused on the 3R Stars. The “3R Stars Meeting” organized by the members of the 3R Stars was held six times during the project period, and involved 650 participants from 85 organizations. The 3R Stars Meeting, along with the drafting of the “Action Plan for Expanding Sorted Collection throughout Hanoi” and “Strategy Paper for Promoting the 3R Initiative” provided the basis for discussions on revising the waste ordinances in Hanoi in order to secure funding for 3R activities.

Table 7-26 Groups that Engaged in the 3R Activities and their Contribution to these Activities

Group	Members	Activities
3R Stars	Government organizations, universities, the media, private companies, and representatives of residents in model districts	The 3R Stars Meeting was held six times during the project period, with 650 participants from 85 organizations. It served as a basis for discussing revisions to the Hanoi Waste Ordinance.
3R Volunteers Club	High school and university students	More than 50 activities were carried out in cooperation with the project. These activities included instruction on sorting waste on the streets and in parks, participation in environmental events and other 3R publicity activities, and extracurricular 3R classes at elementary schools.
3R Supporters	Residents groups in model districts	Conducted more than 20 3R promotional events. The groups focused on 3R awareness-raising activities, such as providing guidance on sorting in the community and preparing and distributing leaflets on sorting methods.

Source: Based on JICA “Project for Implementation Support for 3R INITIATIVE in Hanoi City to Contribute to the Development of a Sound Material-Cycle Society Final Report” (2009)

In addition, a team of about 10 JICA Overseas Cooperation Volunteers (JOCV) were sent from JICA’s head office to work on the project, which attracted media attention and gradually increased momentum for expanding the 3Rs. The project also received local support from two prominent individuals in Japan, Dr. Kitano Masaru, a Chemist and Ms. Kato Tokiko, a singer. In addition, the 3Rs gradually gained traction in Hanoi with the production of TV commercials and 3R songs as part of the PR activities which were covered in the local media.

These activities motivated the mayor of Hanoi to issue the Hanoi 3R Stars Declaration, which set targets for actions to be taken by the residents related to 3Rs. This is also believed to have contributed to changes in the behaviors of residents in relation to the introduction of source separation.

Targets for 10 Actions Related to 3R in the “Hanoi 3R Stars Declaration”

1. Contribution to building a recycling-based society
2. Promotion of 3Rs
3. Promotion of the *Mottainai* spirit
4. Support for introduction and expansion of waste separation at source
5. Promotion of eco-bag use
6. Terminate littering in public places such as streets
7. Support raising awareness on 3R
8. Support building partnerships to implement 3R activities between citizens, government, and the private sector
9. Supporting activities of 3R partners
10. Promotion of compost use in the agricultural sector

Topic 7. Waste Management Challenges in Developing Countries
and Lessons Learned from JICA Projects



Photo 7-62 3R Stars Meeting



Photo 7-63 3R Meeting with Residents



Photo 7-64 3R Event



Photo 7-65 JICA Booth at a 3R Event



Photo 7-66 Mottainai Fair Held by the 3R
Volunteers Club (annual event)



Photo 7-67 Publicity Activities on the
Street by 3R Volunteers



Photo 7-68 Waste Separation Explanation
and Discussion in the Women's Association



Photo 7-69 Environmental Education at
the Elementary School

Source: Yachiyo Engineering Co., Ltd.

After the Project

In 2020, the *Law on Environmental Protection* was amended to require residents to basically sort their waste into three categories: recyclables, food waste, and other waste. The Law stipulates that residents shall bear the cost of collection, transportation, and disposal of unsorted waste and other waste that cannot be reused or recycled, and also stipulates the collection of fees based on a pay-as-you-go system. The law also stipulates the reduction, reuse, and recycling of plastic waste for the purpose of preventing and controlling marine plastic pollution.

The Hanoi Urban Environment Company (Hanoi URENCO), in cooperation with its sponsors, launched the “Trash for Gift” program in 2020 to promote recycling and raise residents’ awareness on waste separation. Exchange stations have been set up in various locations in the city to exchange recyclables brought by citizens for “gifts” in the form of daily necessities every Saturday morning (the program was temporarily suspended due to the Covid-19, but resumed in November 2021).



Photo 7-70 Exchange Station of Trash for Gift Program



Photo 7-71 Daily Goods Exchanged as Gifts for Trash

Source: Yachiyo Engineering Co., Ltd.

(2) Separate Collection and Composting

Cooperation from residents is an essential aspect of source separation and separate collection of waste. Of no less importance is to secure recipients for the separated waste before implementing separate collection.

The same holds true for compost; it is necessary to confirm that there are buyers for compost or develop the market before the compost can be commercialized.

As a result of the model project implemented in the four districts (total of four districts: about 18,300 households, population of 72,820) there have been improvements in the separate collection of the recyclables, collection of the food waste, as well as composting.

- The introduction of fixed-time fixed-place (FTFP) collection using containers and collection vehicles

(trucks and hand-pushed waste carts) for use on narrow roads has made it possible to collect separated waste regularly even in densely populated residential areas. This has improved the rate of separate collection of food waste. With the cooperation of residents, the average weight reduction rate of before and after the model project ranged from 31.2% to 45% (as of August 2009).

- The quality of compost improved with upgrades to the composting process. A better understanding of the demand for compost was formed and then market expansion was attempted.

Key points on the introduction of separate collection:

1. Adequate advance preparation (including explanations to residents) and development of monitoring systems after implementation
2. Changes in behavior of residents and establishment of checking mechanisms
3. Consistency in separating waste items and collection systems
4. Introduction of fixed-time fixed-place (FTFP) collection and collection days
5. Securing recipients for separated recyclables (determine items to be separated)
6. Building momentum throughout the society on source separation (use of media, etc.)



Photo 7-72 Containers for Designated Wastes at Collection Points



Photo 7-73 Containers for Designated Wastes in the Park

Source: JICA “Project for Implementation Support for 3R INITIATIVE in Hanoi City to Contribute to the Development of a Sound Material-Cycle Society Final Report” (2009)

Key points on introducing composting:

1. Ensure compost quality by increasing the proportion of organic waste brought to facilities through separation at source or identification of suitable sources (e.g., market waste, etc.)
2. Shorten periods for maturing compost from 8 weeks (with an air blower fan) to 5 weeks by using the “turn-over” method with a wheel loader to mix fermenting compost and feed in air.
3. Secure demand for compost products through market research and development
4. Ease regulations on the quality of compost products and their use



Photo 7-74 Composting Facility



Photo 7-75 Production of Compost

Source: JICA “Project for Implementation Support for 3R INITIATIVE in Hanoi City to Contribute to the Development of a Sound Material-Cycle Society Final Report” (2009)

After the Project

• Separate collection

The separate collection that was introduced in the four districts of the city during the Hanoi 3R Project has almost ceased to be implemented since the project was completed. This may be due to the fact that collection in narrow alleys and transportation from waste collection points to collection vehicles were burdensome for collection workers, and that only one type of container could be installed. In order to implement separate collection, costs for collection containers, containers for separated waste items, additional collection vehicles, public awareness, and education and training of collection workers needed to be covered, but there was no budget allocated for these costs.

• Composting

After the project was completed, the amount of food waste brought to the composting plant from the model districts decreased (3,245 tons in 2012 compared to a total of 4,744 tons in 2008). Although a system to separate food waste had been introduced, the main reason for this decrease in food waste was that the inedible parts of fish, meat, and vegetables were removed in fresh markets before they were sold, which resulted in decreasing the amount of food waste generated by households.

In addition, management conditions at composting plants were becoming more difficult. The primary reasons were that the income from sales (500 VND/kg) was much lower than the production cost of compost (1,800 to 2,000 VND¹¹/kg), farmers preferred chemical fertilizers that provided immediate effects, and the demand for compost came from a location far from Hanoi where the manufacturing plant was located. All these negative factors made it difficult to expand the compost market, and an understanding of the soil improvement effects of compost could not be fully realized. During the Hanoi 3R project, the project team conducted surveys of compost demand and fertilizer

¹¹ VND: Vietnam Dongs, Currency Units in Vietnam (1USD ≅ 22,700VND January 2022)

effectiveness among customers and farmers, and then coordinated with the Ministry of Agriculture to promote acceptance of compost products among farmers, expand the market, and promote sales, but these efforts were mostly discontinued after the project was completed. As a result, the composting plant completed in 2002 was closed at the end of 2014.

Thus, it is not simply a matter of securing a sustainable source of compost. When introducing sorted collection, it is necessary to check in depth whether a sustainable source to receive sorted items including compost can be secured.

7.3 Lessons

(1) Mobilize and Promote Public Participation of a Wide Range of Stakeholders to Effectively Implement the 3Rs Initiative

The creation of the 3R volunteer program was an opportunity for young people to become interested in the 3Rs and environmental issues and led to independent activities involving residents. In addition, a wide range of stakeholders were invited to take part in discussions at the 3Rs Stars Meeting and to propose their ideas to policy-making organizations.

These activities encouraged public participation and increased the effectiveness and impacts of the project. The greater the interest and louder the voices of the residents, the harder it is for policymakers to ignore them. In today's world, it is necessary to find ways to engage the public that are appropriate to local conditions, such as the use of social networks.

(2) Need for Innovation when Introducing Source Separation

Public participation and behavioral changes are essential when introducing source separation. Even if rules for source separation are established, they will generally not be followed or sustained. Furthermore, consistency between source separation and collection systems and securing a place to pick up separated waste are also essential conditions. In order to introduce source separation and establish relating rules, the introduction of incentives for residents and pick-up locations is considered a challenge, but with the city's budget constraints, no solution has been found.

As with Hanoi's 3R initiatives, one solution may be to motivate residents by involving all stakeholders and guide the momentum of society as a whole in the same direction. However, since it is difficult to ensure sustainability only with the participation of local residents, synergistic effects from multifaceted efforts, such as technological and operational improvements at recycling facilities and the widespread use of reusable containers, are desired. In addition, in a large city such as Hanoi, the challenges of rapid urban expansion continue, and in the waste agenda as well, there is a need to review collection methods along with the development of transfer stations and incineration facilities, and to position source separation and 3Rs in consideration of this background.

Column: Waste Wise Cities Tool (WaCT)

The use of quantitative data to understand the status of municipal solid waste (hereafter referred to as MSW) management and the effectiveness and improvement of projects introduced in this Topic is an important lesson learned.

Furthermore, the use of data management tools such as the Waste Wise Cities Tool (WaCT) are useful for objectively evaluating the current status and issues in one's own country and city through comparison with other countries and cities, and for measuring the degree of achievement of common global goals, such as the Sustainable Development Goals (SDGs).

(1) What is WaCT?

In 2021, UN-Habitat (United Nations Human Settlements Programme) launched the Waste Wise Cities Tool (WaCT), which is a tool to collect information on municipal waste management, especially in low- and middle-income countries.

The tool helps to collect important information, through primary data collection and set parameters based on indicator 11.6.1 of Goal 11 of the SDGs. The statement of Goal 11 is to "Make cities and human settlements inclusive, safe, resilient and sustainable", and Indicator 11.6.1 is defined as the "Proportion of municipal solid waste collected and managed in controlled facilities out of total municipal waste generated, by cities".

By using this tool, it is possible to collect unified data from each country and easily compare the current situation among the countries. It will also enable the collection of information for the development of waste and resource management strategies and action plans, as well as for funding and stakeholder engagement.

(2) Expected Effects through WaCT

- Collect data on MSW generated, collected, and managed in controlled facilities, and establish a baseline;
- Identify the MSW recovery chain and its related factors, as well as check the environmental control level of waste management facilities;
- Measure plastic leakage from MSW management systems;
- Develop a Waste Flow Diagram (WFD) - waste flows and plastic leakage maps;
- Identify infrastructure gaps in MSW management system;
- Engage all waste chain stakeholders, from waste pickers, to recycling and collection companies, and in a participatory approach identify key intervention areas.

(3) How to Collect Data

WaCT consists of 7 steps as shown in Table 7-27. Through implementation of each step, the following items can be covered: (1) Preparation, (2) Discharge, Collection and Transportation, (3) Intermediate Treatment, (4) Final Disposal, and (5) Other Important Items (food waste, recycling, plastics leakage, greenhouse gas emissions and air pollution, etc.). The Guideline of Waste Wise

Cities Tool includes a summary of the work to be implemented in each step and considerations to kept in mind.

The collected data can be compiled and analyzed in a spreadsheet with macro functions called “WaCT Data Collection Tool”. After the application is approved by UN-Habitat, the “WaCT Data Collection Tool” can be used.

Table 7-27 Steps of WaCT

No.	Indicator
1. Preparation	
1.1	Gain political and senior management endorsement and support
1.2	Establish a working team
1.3	Prepare tools and equipment
1.4	Identify key stakeholders and partnerships
1.5	Prepare workflow and budget
1.6	Obtain necessary data from statistics office
2. Household MSW Generation and Composition	
2.1	Preparation
2.2	Waste sampling and waste composition analysis
2.3	Calculate per capita household solid waste generation
3. Non-Household MSW Generation	
3.1	Using the proxy for non-household MSW
3.2	Identify premises to be interviewed
3.3	Interview selected premises and each contracted collection company
3.4	Obtain waste data from public spaces
3.5	Calculate MSW generated by non-household sources
4. MSW Received by Recovery Facilities and Control Level of Recovery Facilities	
4.1	Identify recovery facilities
4.2	Arrange visits and interviews with identified recovery facilities
4.3	Evaluate the level of control of recovery facilities
4.4	Compile the collected information
5. MSW Received by Disposal Facilities and Control Level of Disposal Facilities	
5.1	Identify disposal facilities
5.2	Arrange visits and interviews with identified disposal facilities
5.3	Evaluate the level of control of disposal facilities
5.4	Compile the collected information
6. Waste Composition at Disposal Facilities	
6.1	Preparation
6.2	Waste sampling and composition analysis
7. Calculating Food Waste, Recycling, Plastic Leakage, Greenhouse Gas Emissions and Air Pollution	
7.1	Food waste
7.2	Recycling
7.3	City Plastic Leakage
7.4	Greenhouse Gas Emissions and Air Pollution

Source: Based on UN-Habitat “Waste Wise Cities Tool -Step by Step Guide to Assess a City’s Municipal Solid Waste Management Performance through SDG indicator 11.6.1 Monitoring” (2021)

(4) References

- Website of Waste Wise Cities
(<https://unhabitat.org/waste-wise-cities>)
- Guideline for Waste Wise Cities Tool (English/French)
(<https://unhabitat.org/wwc-tool>)
- User Manual for Waste Wise Cities Tool (English)
(<https://rwm.global/docs/WaCT-DCA-Manual.pdf>)
- Introduction to the Waste Wise Cities Tool (English)
(https://www.youtube.com/watch?v=_SnL6Bdxn70)

Appendices

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Chronological Table

Year	Transition	Events concerning Waste Management		Social Situation	Waste Generation (million tons)		GDP per capita (thousand JPY)
		Legal Framework	Technology		Municipal Waste	Industrial Waste	
1950	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="background-color: #f4a460; width: 10px; height: 100%;"></div> <div style="background-color: #f4a460; padding: 2px;">Public Health Improvement</div> <div style="background-color: #f4a460; width: 10px; height: 100%;"></div> <div style="background-color: #f4a460; padding: 2px;">Pollution Problems and Living Environment Protection</div> <div style="background-color: #f4a460; width: 10px; height: 100%;"></div> <div style="background-color: #f4a460; padding: 2px;">Establishment of a Sound Material-Cycle Society</div> </div>	1954 Public Cleansing Act		1954 to 1973 High Economic Growth Period	6		
1960		1963 Act on Emergency Measures concerning the Development of Living Environment Facilities		1964 Tokyo Olympic Games	9		178
		1967 Basic Law for Environmental Pollution Control			16		343
1970		1970 Waste Management Act		ca.1970 Pollution became tangible 1970 Osaka Expo 1971 War against Waste in Tokyo 1973 Oil Crisis ("Oil Shock") 1975 Okinawa Expo	28		722
		1976 Amendment of Waste Management Act		1979 Second Oil Crisis	42	236	1,361
			1979 Waste Treatment Facility Structure Guideline 1979 Final Disposal Site Structural Guidelines	1979 Tokyo Summit			
1980		1981 Wide-area Coastal Environment Development Center Act			44	292	2,123
		1983 Septic Tank Law		1985 Tsukuba Expo 1986 Tokyo Summit 1986 to 1991 Bubble Economy Period	42	312	2,731
1990				1990 Osaka Expo	50	395	3,655
		1991 Amendment of Waste Management Act	1991 Guidelines for the Promotion of Planned Disposal of Fishery Waste				
	1991 Law for the Promotion of Effective Utilization of Resources						
	1992 Act to Promote the Development of Specified Facilities for the Disposal of Industrial Waste						
	1992 Japanese Basel Act						
	1993 Basic Environment Law		1993 Tokyo Summit				
		1994 The First Basic Environmental Plan					
	1995 Containers and Packaging Recycling Law		1995 Great Hanshin Earthquake	52	394	4,113	
	1997 Act on Special Measures Concerning the Promotion of New Energy Usage	1997 Guidelines for Prevention of Dioxin Emissions from Waste Management	1997 The 3rd Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change; Kyoto Conference				
	1997 Amendment of Waste Management Act		1998 Nagano Olympic Games				
	1998 Home Appliance Recycling Law	1998 Waste Treatment Facility Performance Guidelines					
	1999 Law Concerning Special Measures against Dioxins	1999 Basic Guidelines for the Promotion of Measures against Dioxins					
	1999 Act on Promotion of Private Finance Initiative						
2000	2000 Basic Act for Establishing a Sound Material-Cycle Society	2000 Final Disposal Site Performance Guideline	2000 Kyushu/Okinawa Summit	55	406	4,165	
	2000 Construction Material Recycling Law	2000 The Second Basic Environmental Plan					
	2000 Food Waste Recycling Law						
	2000 Act on Promoting Green Procurement						
	2000 Amendment of Waste Management Act						
	2001 Act on Special Measures concerning Promotion of Proper Treatment of PCB Wastes		2001 Reorganization of Central Ministries				
	2002 End-of-Life Vehicle Recycling Law						
	2003 Act on Special Measures concerning Removal of Environmental Problems Caused by Specified Industrial Wastes						
	2003 to 06 Amendment of Waste Management Act						
		2005 Manual for Calculation of Remaining Capacity of Final Disposal Sites	2005 Aichi Expo	53	422	4,114	
		2006 The Third Basic Environmental Plan					
		2006 Guideline for Living Environment Impact Assessment of Waste Management Facilities					
	2009 Act on Promoting Treatment of Marine Debris		2009 Eco Point System				
2010	2010 Amendment of Waste Management Act			45	386	3,901	
	2011 Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electricity Utilities		2011 The Great East Japan Earthquake				
	2012 Small Home Appliance Recycling Act	2012 The Forth Basic Environmental Plan					
		2014 Guideline for Disaster Waste Management					
	2015/17 Amendment of Waste Management Act			44	391	4,193	
		2016 Guideline for Formulation of Basic Waste Treatment Plan					
		2017 Mercury Waste Guidelines					
		2018 The Fifth Basic Environmental Plan					
		2018 Manual for Treatment of Infectious Waste					
2020	2020 Amendment of Waste Management Act	2020 Guidelines for Prevention of COVID-19 Infection related to Waste					
	2022 Plastic Resource Recycling Promotion Act		2021 Tokyo Olympic Games				

Source: Waste Generation Amount: History and Current State of Waste Management in Japan (Ministry of Environment)
GDP per capita: Annual Report on the Japanese Economy and Public Finance 2020 (Cabinet Office)

WASTE MANAGEMENT AND PUBLIC CLEANSING LAW

(Law No. 137 of 1970)

Amended by Law No. 71 of 1974, No. 47 and No. 68 of 1976, No. 43 of 1983, No. 87 of 1987,
No. 95 of 1991, No. 105 of 1992, No. 89 and No. 92 of 1993, No. 84 of 1994, No. 91 of 1995,
No. 85 of 1997, No. 54 of 1998, No. 64, No. 87, No. 151 and No. 160 of 1999, No. 91
and No. 105 of 2000, No. 66 of 2001.

<https://www.env.go.jp/en/laws/recycle/01.pdf>

Original Japanese

Chapter I General Provisions

Chapter II Municipal Solid Waste

Section 1 Municipal Solid Waste Management

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Section 3 Municipal Solid Waste Disposal Facility

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Chapter III Industrial Waste

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Section 7 Export and Import of Industrial Waste

Chapter III-II Waste Management Center

Chapter IV Miscellaneous Regulations

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Supplementary Provision

Chapter I General Provisions

(Purpose)

Article 1

This law is enacted for the purpose of preserving the living environment and improving public health through the restriction of waste discharge, appropriate sorting, storage, collection, transport, recycling, disposal, or the like of waste and conservation of a clean living environment.

(Definitions)

Article 2

- 1 In this Law, "waste" refers to refuse, bulky refuse, ashes, sludge, excreta, waste oil, waste acid and alkali, carcasses and other filthy and unnecessary matter, which are in solid or liquid state (excluding radioactive waste and waste polluted by radioactivity).
- 2 In this Law, "municipal solid waste" refers to waste other than industrial waste.
- 3 In this Law, "specially controlled municipal solid waste" refer to those municipal solid waste specified by a Cabinet Order as wastes which are explosive, toxic, infectious or of a nature otherwise harmful to human health or the living environment.
- 4 In this Law, "industrial waste" refer to the waste categories defined below:
 - 1) Ashes, sludge, waste oil, waste acid, waste alkali, waste plastics and others specified by a Cabinet Order among all the wastes left as a result of business activity.
 - 2) Imported waste (excluding the kinds of waste defined in the preceding Item, those wastes attributable to navigation of a ship or aircraft (confined to the items specified by a Cabinet Order), which are defined as "navigational waste" in Paragraph 1 of Article 15-4-2, and waste personally carried into Japan by persons entering it (confined to the items specified by a Cabinet Order), which are defined as "carried-in waste" also in Paragraph 1 of Article 15-4-2).

5 In this Law, "specially controlled industrial waste" refer to those industrial wastes specified by a Cabinet Order as wastes which are explosive, toxic, infectious or of a nature otherwise harmful to human health and the living environment.

6 In this Law, the term "electronic information processing systems" refer to those electronic information processing systems which have the electronic computer (including the input and output devices; same in the following) pertaining to the use of the Information Processing Center specified in Paragraph 1 of Article 13, connected to the input and output devices of the entrepreneurs specified in Paragraph 1 of Article 12, commissioned transporters specified in Paragraph 2 of the same Article and commissioned disposers specified in Paragraph 3 of the same Article by way of telecommunication lines.

(Principle of Management within Japan and Restriction of Imports)

Article 2-2

- 1 Waste generated within Japan shall be appropriately managed of within Japan whenever it is possible.
- 2 Imports shall be restricted so as to prevent them from hindering appropriate management of waste within Japan.

(Responsibilities of Citizens)

Article 2-3

- 1 The citizens shall cooperate with the central government and local governments in their activities for waste reduction by restricting their waste discharge, using recycled Articles or otherwise contributing toward the recycling and re-use of waste, sorting waste prior to discharge, managing of waste by themselves as far as possible and so on.

(Responsibilities of Businesses)

Article 3

- 1 The businesses shall appropriately manage of, the waste left as a result of their business activities.
- 2 The businesses must endeavor to reduce the amount of waste by recycling or re-use of waste. The businesses shall assess the handling or processing difficulty of the waste generated when the products, their containers or whatever they manufacture, process and seller the like are discarded. They shall develop such products, containers or the like which are unlikely to present handling or processing difficulty, provide information on appropriate management of the waste generated when the products, their containers or the like are discarded, or take some other actions to ensure appropriate management of the said products, containers or the like without difficulty.
- 3 In addition to the preceding duties in this Article, the businesses shall cooperate with the central government and local governments in their activities to reduce waste, ensure appropriate management and so on.

(Responsibilities of the Central government and Local Governments)

Article 4

- 1 The municipalities (self-governing bodies of cities, towns and villages) shall endeavor to promote residents' voluntary activities to reduce their municipal solid waste in their respective administrative areas and take the necessary action for proper management of those municipal solid waste. They shall also endeavor to perform the management work efficiently by improving the ability of the management personnel, consolidating disposal facilities and developing operation techniques.
- 2 The prefectural governments shall endeavor to give the necessary technical advice to the municipalities under their administration to ensure their adequate performance of the duties prescribed in the preceding Paragraph and shall endeavor to grasp the conditions of industrial waste in the respective prefectures and take the necessary action for proper management of such industrial waste.
- 3 The central government shall collect information about waste, keep it in orderly arrangement and use it, take measures for promotion of waste management technology development and also take suitable action for proper and smooth waste management throughout Japan. The central government shall endeavor to give the necessary technical and financial assistance to the municipalities and to the prefectural governments for adequate performance of their duties mentioned in the preceding two Paragraphs.
- 4 To suppress discharge of waste and ensure their proper management, the central government, prefectural governments and municipalities shall all endeavor to enlighten both the general public and businesses on the importance of appropriate solid waste management.

(Maintaining Cleanliness)

Article 5

- 1 Land or building owners (or caretakers in the absence of such owners; and the same will apply hereinafter) shall endeavor to maintain cleanliness of the land or buildings in their possession or under their care.
- 2 The owners of buildings shall conduct thorough cleaning of the whole building in accordance with a plan which shall be prescribed by the municipality.
- 3 No person shall be allowed to soil a park, square, camping site, skiing ground, seaside resort, road, river, port or any other public place.
- 4 The caretakers of the aforementioned places shall exert themselves to keep the places clean.
- 5 The municipalities shall provide public toilets and waste baskets where they are needed and keep them sanitary.
- 6 A person or company who operates a transport business with trains, ships or airplanes equipped with toilets shall treat the night soil in a way not disruptive to the living environment.

(Basic Policy)**Article 5-2**

- 1 The Minister of the Environment shall specified forth a basic policy (hereinafter referred to as "basic policy") for promoting measures comprehensively and systematically on restraint of the waste discharge, waste reduction by recycling and other proper management of waste.
- 2 The basic policy shall include the following matters
 - 1) Basic direction on waste reduction and other proper management of waste
 - 2) Matters in relation to set up targets for waste reduction and other proper management of waste
 - 3) Basic matters in order to promote measures on waste reduction and other proper management of waste
 - 4) Basic matters on maintenance of waste disposal facilities
 - 5) Besides those prescribed in each of the preceding Paragraphs, necessary matters for waste reduction and other proper management of waste
- 3 The Minister of the Environment shall specified forth a basic policy, and consult with the heads of the administrative bodies concerned, before trying to change them.
- 4 The Minister of the Environment shall specified forth a basic policy, and make an announcement when changing them without delay.

Article 5-4

The central government and prefectural governments shall endeavor to take the necessary action for achieving the waste management plan.

(Waste Management Plan by the Prefectural Governments)**Article 5-5**

- 1 The prefectural governments shall specified forth a plan for waste reduction and other proper management of waste in their respective administrative areas in line with a basic policy (hereinafter referred to as "waste management plan").
- 2 The waste management plan shall include the following matters in regard to waste reduction and other proper management of waste in their respective administrative areas in accordance with the standards specified by the Ordinance of the Ministry of the Environment.
 - 1) Estimate of the volume of waste to be generated and that to be managed.
 - 2) Basic matters on waste reduction and other proper management of waste.
 - 3) Matters on systems which are necessary in order to secure the proper management of municipal solidwaste.
 - 4) Matters on maintenance of industrial waste disposal facilities.
 - 5) Besides those prescribed in each of the preceding Items, necessary matters on waste reduction and other proper management of waste.
- 3 The prefectural governments shall specified forth a waste management plan, and seek advice from the Council specified by the provision of Article 43 of the Basic Environment Law (Law No. 91 of 1993), other bodies which have council system or the

municipalities concerned, before changing them.

- 4 The prefectural governments shall set forth a waste management plan, and make an announcement when changing them without delay.

(Council for Promotion of Waste Reduction)

Article 5-7

- 1 The municipalities may organize a council for promotion of waste reduction which is to contemplate matters related to reduction of waste and others.
- 2 The necessary matters related to the organization and operation of the said council shall be prescribed by ordinances.

(Promoters of Waste Reduction)

Article 5-8

- 1 The municipalities may commission suitable persons with a social reputation and both enthusiasm about and expert knowledge and views of proper management of municipal solid waste as promoters of waste reduction.
- 2 The promoters of waste reduction shall cooperate with the municipalities in taking measures for reduction of municipal solid waste and in carrying out other activities.

Chapter II Municipal Solid Waste

Section 1 Municipal solid waste Management

(Municipal Solid Waste Management Plan)

Article 6

- 1 The municipalities shall specified forth a definite plan for management of municipal solid waste in their respective administrative areas (hereinafter referred to as a "municipal solid waste management plan").
- 2 The municipal solid waste management plan shall include the following matters in regard to the management of municipal solid waste in their administrative areas according to the Ordinance of the Ministry of the Environment.
 - 1) Estimate of the volume of municipal solid waste to be generated and that to be managed.
 - 2) Matters related to measures for suppressing discharge of municipal solid waste.
 - 3) Kinds of municipal solid waste to be presorted for collectors and descriptions of those kinds.
 - 4) Fundamentals of proper municipal solid waste management and also the fundamentals relating to the authorities/persons carrying out such management.
 - 5) Matters pertaining to the improvement or expansion of municipal solid waste disposal facilities.
 - 6) Other matters necessary for the management of municipal solid waste.
- 3 The municipalities shall specified forth a municipal solid waste management plan in line with the basic plan in Paragraph 4 of Article 2 of the Municipalities Law (Law No. 67 of 1947).
- 4 Each municipality shall endeavor to make its municipal solid waste management plan consistent with similar plans of other municipalities with which the particular municipality is in close in terrelations and that significantly affect the municipal solid waste management in its administrative area.
- 5 The municipalities shall set forth a municipal solid waste management plan, and make an announcement when changing them without delay.

(Management by Municipalities)

Article 6-2

- 1 The municipalities shall collect, transport and dispose of (including recycling and the same will apply hereinafter (except for Paragraph 3 of Article 7, Article 7-3, Paragraph 6 of Article 8-2, Paragraph 2 of Article 9, Paragraph 2 of Article 9-2, Paragraph 11 of Article 9-3, Paragraph 1 of Article 13-11, Article 15-12, Paragraph 1 of Article 15-15, Paragraph 2 of Article 16-2, Paragraph 2 of Article 23 and Article 24, and the same will apply hereinafter) municipal solid waste in their municipal areas before they interfere with the conservation of the living environment, according to the municipal solid waste management plan.
- 2 Standards on collection, transport and disposal of municipal solid waste (excluding specially controlled municipal solid waste;

the same will apply in the rest of Article 6-2) which are to be conducted by the municipalities (excluding the standards pertaining to the place and method of ocean disposal, defined by the Law Relating to the Prevention of Marine Pollution and Maritime Disaster (Law No. 136 of 1970), for those of municipal solid waste which may be disposed of in a sea and which will be referred to as the "municipal solid waste management standards") and standards for the case in which a municipality commissions someone else collect, transport and dispose of municipal solid waste shall be prescribed in a Cabinet Order.

- 3 Standards on collection, transport and disposal of specially controlled municipal solid waste which are to be conducted by the municipalities (excluding the standards pertaining to the place and method of ocean disposal, defined by the Law Relating to the Prevention of Marine Pollution and Maritime Disaster, for those of specially controlled municipal solid waste which may be disposed of in a sea and which will be referred to as the "specially controlled municipal solid waste disposal standards") and standards for the case in which a municipality commissions someone else collect, transport and dispose of specially controlled municipal solid waste shall be prescribed in a Cabinet Order.
- 4 Owners of land or buildings must exert themselves to dispose of municipal solid waste in their land or buildings that are easily disposable without hindrance to the conservation of the living environment. As to the waste which the owners cannot dispose of by themselves, they must endeavor to cooperate with the municipalities in the collection, transport and disposal of municipal solid waste conducted by the municipalities by properly sorting and storing the said waste according to the municipal solid waste management plan or take other necessary action.
- 5 The mayors of municipalities are entitled to give owners of land or buildings where a large amount of municipal solid waste is generated due to their business activities in the particular administrative area, instructions regarding planning for reduction of the said municipal solid waste, the place to which they are to be transported, the method of transporting them and other necessary matters.

(Cooperation of Businesses)

Article 6-3

- 1 The Minister of the Environment is entitled to investigate the actual management of municipal solid waste by the municipalities and specify, on the basis of the results of the investigation, certain municipal solid waste which are currently treated and managed of by the municipalities and are deemed difficult to be treated and managed of properly in various parts of Japan with the municipalities' present management facilities and technique.
- 2 The mayors of the municipalities are entitled to demand the cooperation of the businesses manufacturing, processing, selling or otherwise handling a product, container or the like which will result in the generation of the municipal solid waste specified in the preceding Paragraph in order to facilitate the proper management of the said waste by the municipalities according to the Ordinance of the Ministry of the Environment.
- 3 The Minister of the Environment is entitled to demand to the Minister, who has the supervisory power over businesses that manufacture, process, sell or otherwise handle products, containers or the like which may result in the generation of the municipal solid waste specified in Paragraph 1 of this Article, to take necessary measures which enable municipalities to secure the cooperation from those businesses who manufacture, process, sell or otherwise handle the said products, containers or the like in managing the said waste originating from them.
- 4 Before specifying the municipal solid waste mentioned in Paragraph 1 of this Article, the Minister of the Environment shall consult the minister supervising the businesses that manufacture, process, sell or otherwise handle the products, containers or the like which may result in the generation of the municipal solid waste to be specified under Paragraph 1 of this Article.

Section 2 Municipal Solid Waste Management Service

(Municipal Solid Waste Management Service)

Article 7

- 1 No person is allowed to undertake as a contractor to collect and transport of municipal solid waste without permission from the prefectural governor with the jurisdiction over the area in which the person is to conduct the service (or of the area in which that person is to load and unload municipal solid waste if the person is to conduct a transport service only), except for businesses (limiting to the ones who transport the municipal solid waste by themselves) who undertake to collect and transport of municipal solid waste solely for recycling as contractors and anyone specified in the Ordinance of the Ministry of the Environment.
- 2 The permission prescribed in the preceding Paragraph becomes invalid upon the lapse of a period not less than one year in length prescribed by a Cabinet Order unless the permission is renewed for another period.

- 3** The mayors of the municipalities shall not grant the permission prescribed in the preceding Paragraph unless they judge that the application for it satisfies the following requirements:
- 1) It is difficult for the respective municipalities to collect and transport municipal solid waste.
 - 2) The application is in conformity with the municipal solid waste management plan.
 - 3) The facilities used by the contractors and the ability of the applicant are judged sufficient for the proper and continuous conducting of the said services in the light of the standards specified by the Ordinance of the Ministry of the Environment.
 - 4) The applicant is not any of the following:
 - a. A ward who is an adult, a warrantee or a person who declared bankrupt and not yet reinstated.
 - b. One who has been sentenced to imprisonment or severer punishment and is still short of one's fifth year from the execution or the interruption of the sentence.
 - c. One who has been sentenced to more than a fine because of violation of the Septic Tank Law (Law No. 43 of 1983) or any other law for the conservation of the living environment specified by a Cabinet Order, disobedience to action based on such law or law for prevention of unjustified action by gang (Law No. 77 of 1991. Except for Paragraph 7 of Article 31) or violation of Article 204, 206, 208, 208-2, 222 or 248 of the Criminal Law (Law No. 45 of 1907) or the Law Pertaining To Punishment for Act of Violence etc. (Law No. 60 of 1926) and is still short of one's fifth year from the execution or the interruption of the sentence.
 - d. One whose permit has been revoked under Article 7-3 or Article 14-3 (including the cases applied by replacing wordings in Article 14-6) or under the provision of Paragraph 2 of Article 41 of the Septic Tank Law and is short of one's fifth year from the revocation. (In the case of a legal person, this includes one who is an executive of that organization (an employee, a director or whoever executes the business, including a person who is recognized to have the same or more power to control the business as the above person no matter what kind of title one has, such as an advisor. The same will apply hereinafter in this Item and d. of Item 2 of Paragraph 3 of Article 14) within 60 days from the day it was notified the revocation under Article 15 of Administrative Procedures Act (Law No. 88 of 1993) and is short of its fifth year from the revocation).
 - e. One who gives good reason to suspect a wrong or dishonest act on one's part in connection with one's municipal solid waste management services.
 - f. A minor who lacks the abilities of an adult and whose lawful deputy is a person specified in one of a. to e. above.
 - g. A legal person having a director or employee who is a person specified in one of a. to e. above.
 - h. An individual having an employee who is a person specified in one of a. to e. above.
- 4** No person is allowed to undertake as a contractor the disposal of municipal solid waste without permission from the prefectural governor with the jurisdiction over the area in which the person is to conduct the service, except for a business (provided he/she is to dispose of the municipal solid waste by him/herself), a person undertaking the disposal of municipal solid waste solely for recycling as a contractor and anyone specified in the Ordinance of the Ministry of the Environment.
- 5** The permission prescribed in the preceding Paragraph becomes invalid upon the lapse of a period not less than one year in length prescribed by a Cabinet Order unless the permission is renewed for a further period
- 6** The mayors of the municipalities shall not grant the permission prescribed in Paragraph 4 of this Article. unless they judge that the application for it satisfies the following requirements:
- 1) It is difficult for the particular municipality to dispose of municipal solid waste.
 - 2) The application is in conformity with the municipal solid waste management plan.
 - 3) The facilities used for disposal service and the ability of the applicant are sufficient for the proper and continuous conducting of the waste disposal service in the light of the standards specified by the Ordinance of the Ministry of the Environment.
 - 4) The applicant is none of the persons specified in a. to h. of Item 4) of Paragraph 3 of this Article.
- 7** The permission prescribed in Paragraph 1 or 4 of this Article may be granted only with respect to a certain area in which municipal solid waste may be collected by the contractor or with conditions necessary for the conservation of the living environment attached to it.
- 8** The persons with the permission prescribed in Paragraph 1 of this Article (hereinafter referred to as "municipal solid waste collection and transport contractors") and those with the permission prescribed in Paragraph 4 (hereinafter referred to as "municipal solid waste disposal contractors") shall not collect a charge in excess of the amount for collection and transport or disposal prescribed by the provision of Paragraph 1 of Article 228 of the Municipalities Law in respect of their collection and transport or disposal of municipal solid waste.
- 9** The municipal solid waste collection and transport contractors and municipal solid waste disposal contractors shall perform their collection and transport or disposal activities in conformance with the municipal solid waste disposal standards (or the specially controlled municipal solid waste management standards in the case of municipal solid waste in that category).

- 10 The municipal solid waste collection and transport contractors and municipal solid waste disposal contractors shall not commission anyone else carry out their collection and transport or disposal activities.
- 11 The municipal solid waste collection and transport contractors and municipal solid waste disposal contractors shall keep books and enter in them the particulars about municipal solid waste management which are specified by the Ordinance of the Ministry of the Environment.
- 12 The books prescribed in the preceding Paragraph shall be stored as directed in the Ordinance of the Ministry of the Environment.

(Permission for Change or the Like)

Article 7-2

- 1 The municipal solid waste collection and transport contractors and municipal solid waste disposal contractors shall obtain the municipality's permission for any change of the scope of the collection and transport business or disposal business except discontinuation of part of the business.
- 2 The provisions in Paragraph 3 and 7 of the preceding Article will also apply to the said permission for a change of the scope of the collection and transport business, and the provisions of Paragraph 6 and 7 of the same Article will apply to the said permission for a change of the scope of the disposal business.
- 3 When a municipal solid waste collection and transport contractor or a municipal solid waste disposal contractor discontinues the whole or part of the collection-and-transport/disposal business or changes the address or any other matter specified by the Ordinance of the Ministry of the Environment., that contractor shall report it to the mayor of the municipality as prescribed by the Ordinance of the Ministry of Health and Welfare.

(Revocation of Permission or the Like)

Article 7-3

- 1 In case a municipal solid waste collection and transport contractor or a municipal solid waste disposal contractor becomes the person who falls under one of the following Items, the mayor of the municipality may revoke the permission or order that particular contractor to suspend the whole or part of the business for a prefixed period.
 - 1) When the person violates this Law or defies action taken under this Law (hereinafter referred to as "act against the Law"), demands or asks another person to act against the Law, or indicates or helps another person to do so.
 - 2) When the facility in which the person uses for their business or the capability of that person becomes not to satisfy the standards prescribed in Item 3) of Paragraph 3 or Item 3) of Paragraph 6 of Article 7.
 - 3) When the person becomes to be one of a. to h.of Item 4) of Paragraph 3 of Article 7.
 - 4) When the person violates the condition attached to the said permission specified in Paragraph 7 of Article 7.

(Prohibition of Renting the Name)

Article 7-4

Any municipal solid waste collection and transport contractor or municipal solid waste disposal contractor must not have any other persons perform collection or transport or disposal of municipal solid waste as a work under his own name.

Section 3 Municipal Solid Waste Disposal Facility

(Permission of Municipal Solid Waste Disposal Facility)

Article 8

- 1 Any person intending to install a municipal solid waste disposal facility (referring to a refuse treatment facility specified by the Cabinet Order (hereinafter referred to simply as "refuse treatment facility"), night soil treatment facility (except for the septic tank specified in Item 1) of Article 2 of Septic Tank Law; same in the following) and final disposal site of municipal solid waste specified by the Cabinet Order; same in the following) (except for a municipality intending to install a municipal solid waste disposal facility for disposal of municipal solid waste under the provision of Paragraph 2 of Article 6-2), must have granted the permission of the prefectural governor with jurisdiction over the place of installation of said municipal solid waste disposal facility (or mayor of a city or head of a special ward operating public health centers; same in the following except for Paragraphs 1 of Article 20-2).
- 2 Anyone intending to procure the said permission shall file an application containing the following particulars under the Ordinance of the Ministry of the Environment.
 - 1) Name or title and address and, if a corporate person, name of its representative
 - 2) Place of installation of the municipal solid waste disposal facility
 - 3) Type of the municipal solid waste disposal facility

- 4) Type of the waste disposed at the municipal solid waste disposal facility
 - 5) Disposal capacity of the municipal solid waste disposal facility (or, in the case of a final disposal site for municipal solid waste, square meterage of the place used for landfill disposal of municipal solid waste and landfill capacity)
 - 6) Plan concerning installation including location and structure of the municipal solid waste disposal facility
 - 7) Plan concerning operation and maintenance of the municipal solid waste disposal facility
 - 8) Where the facility is a final disposal site for municipal solid waste, plan for prevention of disasters
 - 9) Any other matters specified by Ordinance of the Ministry of the Environment
- 3 As prescribed in the Ordinance of the Ministry of the Environment, a document which states the result of assessment on effects that the installation of that municipal solid waste disposal facility would cause the living environment in the surrounding areas shall be attached to the application mentioned in the preceding Paragraph.
 - 4 When a permission prescribed in Paragraph 1, for a municipal solid waste disposal facility (only those specified by the Cabinet Order) is applied, the prefectural governor shall notify the particulars mentioned in Item 1) to 4) of Paragraph 2, the date of application and the place of reference without delay, and shall provide the application of Paragraph 2 as well as the document of Paragraph 3, for public reference for a month from the date of that notification.
 - 5 When a notification is made under the preceding Paragraph, the prefectural governor shall notify, without delay, the mayors of the areas concerned in the installation of that municipal solid waste disposal facility in terms of the conservation of the living environment, and listen to their opinion from the point of the conservation of the living environment with specifying a certain period of time.
 - 6 When a notification is made under Paragraph 4, a person concerned in the installation of that municipal solid waste disposal facility may submit a comment from the standpoint of the conservation of the living environment to the prefectural governor by the day of two weeks from the following day of the termination of the period of reference.

(Standard of Permission or the like)

Article 8-2

- 1 The prefectural governor shall not grant the permission prescribed in Paragraph 1 of the preceding Article, unless they judge that the application of the said permission satisfies every Item of the following.
 - 1) The plan of the installation of that municipal solid waste disposal facility shall comply with the technical standards specified in the Ordinance of the Ministry of the Environment.
 - 2) The plan of the installation and the plan of operation and maintenance shall have adequate consideration incorporated for conservation of the living environment in the surrounding area of said municipal solid waste disposal facility.
 - 3) The capability of the applicant is sufficient for the proper and continuous conducting of the installation and operation and maintenance of the municipal solid waste disposal facility in accordance with the plan of its installation and the plan of its operation and maintenance in the light of the standards specified by the Ordinance of the Ministry of the Environment.
 - 4) The applicant is none of the persons specified in a. to h. of Item 4) of Paragraph 3 of Article 7.
- 2 The prefectural governors may not grant the permission of the Paragraph 1 of the preceding Article, when they judge that it may become difficult to satisfy the air environment standards (specified by the Cabinet Orders as those on environmental conditions relating to air pollution by substances generated by refuse treatment facility or industrial waste disposal facility which is specified by Cabinet Orders; the same will apply to Item 2) of Article 15-2), since refuse treatment facility or industrial waste disposal facility (limited to those specified by the Cabinet Orders; the same will apply to the following of this Item and Item 2) of Article 15-2) would become concentrated too much by installing the facility (limited to those specified by the Cabinet Orders; the same will apply to the following of this Item and Item 2) of Article 15-2) relating to the said permission.
- 3 When the prefectural governor is to grant the permission of Paragraph 1, preceding Article (limited to those pertaining to the municipal solid waste disposal facility specified in Paragraph 4 of the same Article), he/she must hear in advance the opinions of the specialists about the matters cited in Item 2) of Paragraph 1 with respect to the matters specified by the Ordinance of the Ministry of the Environment concerning the conservation of living environment.
- 4 The permission prescribed in Paragraph 1 of this Article may be granted with necessary conditions for the conservation of the living environment attached to it.
- 5 A person to whom the permission prescribed in Paragraph 1 of this Article has been granted shall not use the municipal solid waste disposal facility before it is inspected by the prefectural governor and the governor judges that it satisfies the technical standards mentioned in Paragraph 2 of this Article.

- 6 The Minister of the Environment is entitled to give necessary instructions on the actions taken by the prefectural governor to the application of Paragraph 1 of the preceding Article in case that there is an urgent need for the conservation of living environment.
- 7 The Minister of the Environment is entitled to give necessary instructions on the inspection by the prefectural governor specified in Paragraph 5 in case that there is an urgent need for the conservation of living environment.

(Operation and Maintenance of Municipal Solid Waste Disposal Facility)

Article 8-3

A person having the permission of Paragraph 1 of Article 8, granted must have the municipal solid waste disposal facility pertaining to said permission operation and maintenance in accordance with the technical standards specified in the Ordinance of the Ministry of the Environment and the plan of operation and maintenance stated in the application Paragraph 2 of the same Article pertaining to said permission (or, when the permission of Paragraph 1 of Article 9, is granted with respect to said plan, the plan after alteration).

(Record and Reference)

Article 8-4

As prescribed in the Ordinance of the Ministry of the Environment, a person to whom the permission prescribed in Paragraph 1 of Article 8 (provided only concerning the municipal solid waste disposal facility prescribed in Paragraph 4 of the same Article) has been granted shall record the matters specified by the Ordinance of the Ministry of the Environment on its operation and maintenance of the disposal facility, and place them in the disposal facility (when it is impossible, place them in the nearest office of the installer of the facility) and show the record to satisfy the request by those who have interest in conservation of their living standard in relation to its operation and maintenance.

(Reserve Fund for Maintenance)

Article 8-5

- 1 On a specific final disposal site for municipal solid waste (the final disposal site for municipal solid waste that is the municipal solid waste disposal facility specified by the Ordinance of the Ministry of the Environment, the same will apply hereinafter), a person to whom the permission prescribed in Paragraph 1 of Article 8 (they will hereinafter be referred to as a "installer of a specific final disposal site for municipal solid waste ") shall reserve for the amount of money specified by the prefectural governors in accordance with Paragraph 4. as a reserve fund for the maintenance of each final disposal site every year until the landfill disposal completes, in order to conduct its maintenance properly after the completion of the landfill disposal in relation to that disposal site.
- 2 A reserve fund for the maintenance shall be made for the Japan Environmental Corporation under the Ordinance of the Ministry of the Environment.
- 3 A reserve fund for the maintenance shall be administered by the Japan Environmental Corporation.
- 4 The amount of the reserve fund for the maintenance cost shall be calculated by the prefectural governors in accordance with the standard for calculation specified by the Ordinance of the Ministry of the Environment based on the fee needed for maintaining the specific final disposal site for municipal solid waste as well as the time required for the landfill.
- 5 The Japan Environmental Corporation shall remunerate interest for the reserve fund for the maintenance under the Ordinance of the Ministry of the Environment.
- 6 A installer of a specific final disposal site for municipal solid waste may get refunded the reserve fund for the maintenance as prescribed in the Ordinance of the Ministry of the Environment, if they will maintain the final disposal site after the completion of the landfill disposal under the other Ordinance of the Ministry of the Environment.
- 7 When the position of a person procuring the permission prescribed in Paragraph 1 of Article 8 is succeeded by another person under the provision of Paragraph 3 of Article 9-5, Paragraph 1 of Article 9-6 or Paragraph 1 of Article 9-7, it shall be regarded that the reserve fund for the maintenance of the installer has been reserved by its successor.
- 8 In addition to the provisions in the preceding Paragraphs, the matters concerning the reserve fund for the maintenance as well as its refund are given in the Ordinance of the Ministry of the Environment.

(Special Provision for Activities of the Japan Environmental Corporation)

Article 8-6

- 1 The Japan Environmental Corporation shall perform the activities prescribed in Article 18 of the Japan Environmental Corporation Law (Law No. 95 of 1965, it will be referred to as the "Corporation Law" in the next Paragraph) as well as the

following activities in order to achieve the purpose of this law.

- 1) Administrating the reserve fund for the maintenance as prescribed in Paragraph 3 of the preceding Article (including the case applied under Article 15-2-3).
 - 2) Activities incidental to those prescribed in the preceding Item.
- 2 When the Japan Environmental Corporation perform their activities under the preceding Paragraph, “the Waste Management and Public Cleaning Law (Law No. 137 of 1970)” mentioned in Item 4) of Paragraph 1 of Article 18 of the Corporation Law means “the Waste Management and Public Cleaning Law (Law No.137 of 1970) and it will hereinafter be referred to as “the Waste Management Law””, “the said law” means “the Waste Management Law”, “the Waste Management and Public Cleaning Law” mentioned in Item 6 of the same Paragraph means “the Waste Management Law”, “shall administer” mentioned in Paragraph 1 of Article 25 of the Corporation Law means “shall administer, and the accounting relating to the activities prescribed in Paragraph1 of Article 8-6 of the Waste Management Law shall be administered separately from the other accountings”, “this law” mentioned in Paragraph 2 of Article 40, Paragraph 1 of Article 41 and Paragraph 1 of Article 44 of the Corporation Law means “this law as well as the Waste Management Law”, “things” mentioned in Item 5) of Paragraph 1 of Article 35 means “things as well as activities prescribed in Paragraph 1 of Article 8-6 of the Waste Management Law”, and “Article 18” mentioned in Item 3) of Article 47 of the Corporation Law means “Article 18 as well as Paragraph1 of Article 8-6 of the Waste Management Law”.

(Permission of Change or the Like)

Article 9

- 1 When a person having the permission of Paragraph 1 of Article 8 granted desires to change any of the matters cited in Items 4) through 7) of Paragraph 2 of the same Article, he/she must obtain the permission of the prefectural governor as provided by the Ordinance of the Ministry of the Environment. However, the preceding shall not apply if the change is a minor change specified in the Ordinance of the Ministry of the Environment.
- 2 The provisions of Paragraphs 3 to 6 of Article 8, and Paragraphs 1 to 4 of Article 8-2 will apply to the permission of the preceding Paragraph, the provision of Paragraph 5 of the same Article will apply to the person being granted the permission of the preceding Paragraph, the provision of Paragraph 6 of the same Article will apply to actions taken by the prefectural governors to the permission of the preceding Paragraph, and the provision of Paragraph 7 of the same Article will apply, under the said Paragraph, to inspections taken by the prefectural governors specified by the provision of Paragraph 5 of the same Article.
- 3 When the person having the permission of Paragraph 1 of Article 8 granted has made a minor change specified by the provision of Paragraph 1 of the Ordinance of the Ministry of the Environment, or when there was a change in the matters cited in Item 1) of Paragraph 2 of the same Article or any other matters specified by the Ordinance of the Ministry of the Environment, or when he/she disused the municipal solid waste disposal facility (except where said municipal solid waste disposal facility is a final disposal site for municipal solid waste) pertaining to said permission or stopped the municipal solid waste disposal facility or reopened said stopped municipal solid waste disposal facility, he/she must immediately report to that effect to the prefectural governor.
- 4 When a person to whom the permission mentioned in Paragraph 1 of Article 8 has been granted in respect of the final disposal site completes the landfill disposal (including disposal for creating a useful subterranean space; the same will apply hereinafter) for the said site, that person shall give notice to the prefectural governor within thirty days from the day of completion of the landfill work under the Ordinance of the Ministry of the Environment together with the particulars specified by the said Ordinance.
- 5 The person having the permission of Paragraph 1 of Article 8 granted, where the municipal solid waste disposal facility pertaining to said permission is a final disposal site for municipal solid waste, may disuse the said final disposal site, provided he/she has previously obtained the confirmation of the prefectural governor for compliance of the condition of the said final disposal site with the technical standards specified by the Ordinance of the Ministry of the Environment, as provided by the Ordinance of the Ministry of the Environment.

(Revocation of Permission or the like)

Article 9-2

- 1 The prefectural governors may revoke the permission of Paragraph 1 of Article 8 pertaining to the said municipal solid waste disposal facility, or order the necessary improvements of the said municipal solid waste disposal facility to the person being granted the permission of the same Paragraph within a specified period of time or the suspension of the use of the said municipal solid waste disposal facility for a specified period of time, when there is a case which falls under one of the following Items.
 - 1) Where the structure of municipal solid waste disposal facility pertaining to the permission of Paragraph 1 of Article 8 or its operation and maintenance is recognized as not complying with the technical standards provided in Item 1) of Paragraph 1 of Article 8-2 or Article 8-3 or the plan concerning installation or plan for operation and maintenance specified forth in the application of Paragraph 2 of Article 8 pertaining to the said permission (or if the permission of Paragraph 1 of the preceding

Article is granted for that plan, the modified plan is applied).

- 2) When the capability of the person who was granted the permission of Paragraph 1 of Article 8 is recognized as not satisfying the standards specified by the Ordinance of the Ministry of the Environment in Item 3) of Paragraph 1 of Article 8-2.
 - 3) When the person who was granted the permission of Paragraph 1 of Article 8 takes actions which violate the Law, or demands, asks or indicates another person to act against the Law, or helps another person to do so.
 - 4) When the person who was granted the permission of Paragraph 1 of Article 8 becomes to be one of a. to h. of Item 4) of Paragraph 3 of Article 7.
 - 5) When the person who was granted the permission of Paragraph 1 of Article 8 violates the condition attached to the said permission under the provision of Paragraph 4 of Article 8-2.
- 2 The provision of Paragraph 6 of Article 8-2 will apply to actions by the prefectural governors taken under the provision of the preceding Paragraph.

(Notification of Municipal Solid Waste Disposal Facility Pertaining to Installation by Municipality)

Article 9-3

- 1 When a municipality is to install a municipal solid waste disposal facility for disposing municipal solid waste according to the provision of Paragraph 1 of Article 6-2, it must notify to that effect to the prefectural governor with a document stating the matters cited in the respective Items of Paragraph 2 of Article 8 and another document stating the result of investigation of any impacts of the installation of said municipal solid waste disposal facility on the living environment in the surrounding area, as provided by the Ordinance of the Ministry of the Environment.
- 2 The head of a municipality making a notification according to the provision of the preceding Paragraph shall, in preparing a document stating the matters listed in items of Paragraph 2 of Article 8, as provided in the preceding Paragraph, public reference the document stating the result of investigation specified in the preceding Paragraph as prescribed by regulations of the matters specified by the Cabinet Order and give an opportunity to the persons having interests in installation of the municipal solid waste disposal facility pertaining to said notification to present written opinions from the viewpoint of conservation of the living environment.
- 3 If he/she judges that the municipal solid waste disposal facility referred to in the preceding Paragraph does not satisfy the technical standards mentioned in Item 1) of Paragraph 2 of Article 8, the prefectural governor may order the said municipality to modify or cancel the plan within thirty days from the day of receipt of the notification (within sixty days from the said day in respect of the final disposal site).
- 4 The municipality making the notification under this Article shall not construct the municipal solid waste disposal facility or change its structure or scale before the lapse of the period allowed for the governor in the preceding Paragraph unless the said municipality has received the governor's notice of his approval of the plan for installation or change.
- 5 The superintendent of the said disposal facility notified under the provision of Paragraph 1 of this Article shall conduct the operation and maintenance of that municipal solid waste disposal facility in accordance with the technical standard prescribed in Article 8-3 as well as the operation and maintenance plan stated in the document which mentions the matters prescribed in each Item of Paragraph 2 of Article 8, under the Article 8-3 on the notification (the modified version, if the notification on the plan was made under Paragraph 7 of this Article.).
- 6 The superintendent of the said disposal facility notified under the provision of Paragraph 1 of this Article (only notified under the provision of 4 of this Article) shall conduct recording about operation and maintenance of the municipal solid waste disposal facility in accordance with the Ordinance of the Ministry of the Environment, and providing the record of the municipal solid waste disposal facility (When it is impossible, provide at nearest office), and show the record to satisfy the request by people having interest in conservation of their living standard, as provided by the Ordinance of the Ministry of the Environment.
- 7 The municipality making the notification under Paragraph 1 of this Article should notify the prefectural governor with a document mentioning the matters prescribed in the Ordinance of the Ministry of the Environment, when it intends to change the matters prescribed in Item 4) to 7) of Paragraph 2 of Article 8 under the Ordinance of the Ministry of the Environment (excluding a slight change specified by the Ordinance of the Ministry of the Environment).
- 8 The provisions of Paragraph 2 and 3 will apply to the notification prescribed in the preceding Paragraph, and the provision of Paragraph 4 will apply to the municipality making the notification under the preceding Paragraph. In this case, "the preceding Paragraph" in Paragraph 2 shall be interpreted as "Paragraph 7", "that Paragraph" as "the preceding Paragraph", "Paragraph 1" in Paragraph 4 as "Paragraph 7" and "not to construct a municipal solid waste disposal facility" as "not to change the matters

specified in Item 4) to 7) of Paragraph 2 of Article 8”.

- 9 If the prefectural governors judge that the structure of the said municipal solid waste disposal facility notified under the provision of Paragraph 1 of this Article or its operation and maintenance does not satisfy the technical standard specified in Item 1) of Paragraph 1 of Article 8-2 or Article 8-3, or the installation plan or the operation and maintenance plan stated in the document mentioning the matters prescribed in each Item of Paragraph 2 of Article 8, under Paragraph 1 on the notification (the modified version, if the notification on those plans was made under Paragraph 7 of this Article.), they may order the installer or the superintendent to make the necessary improvements of the municipal solid waste disposal facility or to suspend its operation for a fixed period of time.
- 10 The provisions in Item. 3) to 5) of Article 9 will apply to the municipality making the notification of the municipal solid waste disposal facility under Paragraph 1 of this Article. In this case, "the proviso of Paragraph 1" in Paragraph 3 of that Article shall be interpreted as "Paragraph 7 of Article 9-3", "permission" as "notification", "permission" in Paragraph 4 and 5 of this Article as "notification".
- 11 According to 3) or 9) of Article 8, the provisions of 6), Article 8-2 will apply to the management which shall be pursued by the Prefectural governor.

(Precaution and Provision for Surrounding Areas)

Article 9-4

A person to whom the permission mentioned in Paragraph 1 of Article 8 has been granted and a municipality making the notification of the installation of a municipal solid waste disposal facility under Paragraph 1 of the preceding Article (both of them will hereinafter be referred to as a "installer of a municipal solid waste disposal facility") shall take the necessary precaution and make the necessary provision for the conservation and enhancement of the living environment in areas surrounding the municipal solid waste disposal facility.

(Transfer of Municipal Solid Waste Disposal Facility or the Like)

Article 9-5

- 1 A person having transferred or borrowed a municipal solid waste disposal facility pertaining to the permission of Paragraph 1 of Article 8 from the person procuring the said permission (it shall be referred to as a "installer of the facility of the permission being granted" in Paragraph 3, Paragraph 1 of the next Article and Article 9-7), he/she has to get the permission from the prefectural governor under the Ordinance of the Ministry of the Environment.
- 2 The provision of Paragraph 1 of Article 8-2 will apply to the permission of the preceding Paragraph.
- 3 A person to whom the waste disposal facility was transferred or borrowed with the permission prescribed in Paragraph 1 shall succeed the status of the installer of the facility of the permission being granted pertaining to the said municipal solid waste disposal facility.

(Merger and Division)

Article 9-6

- 1 In the case of the merger of the corporation which is the installer of the facility of the permission being granted (except for the case when the installer of the facility of the permission being granted continues to exist after the merger with the corporation which is not a installer of the facility of the permission being granted), or the case of the division (limited to the case in which the municipal solid waste disposal facility pertaining to the said permission will be succeeded), the corporation which continues to exist after the merger, the corporation which is established through the merger, or the corporation which succeeds the said municipal solid waste disposal facility through the division, shall succeed the status of the installer of the facility of the permission being granted, when the permission is given by the prefectural governor on the said merger or the division.
- 2 The provision of Paragraph 1 of Article 8-2 (limited to the sections concerning the provisions of Item 3) and 4)) will apply to the permission of the preceding Paragraph.

(Inheritance)

Article 9-7

- 1 If the property of the installer of the facility of the permission being granted is inherited, the inheritor shall succeed the status of the person procuring the permission.
- 2 The inheritor who succeeded the status of the installer of the facility of the permission being granted under the provision of the preceding Paragraph shall give notice to the prefectural governor within thirty days from the day he/she inherited it, as specified by the Ordinance of the Ministry of the Environment.

Section 4 Special Provision on Recycling of Municipal solid waste

Article 9-8

- 1** A person who undertakes or intends to undertake the recycling of municipal solid waste prescribed in the Ordinance of the Ministry of the Environment may obtain an approval from the Minister of the Environment of meeting all of the Item of the following Items under the Ordinance of the Ministry of the Environment.
 - 1) Contents of recycling shall satisfy the standards specified in the Ordinance of the Ministry of the Environment for not causing any disruption for conservation of the living environment..
 - 2) A person who undertakes or intends to undertake the recycling shall satisfy the standards specified in the Ordinance of the Ministry of the Environment.
 - 3) The facility for recycling constructed or to be constructed by the person prescribed in the preceding Item shall satisfy standards specified in the Ordinance of the Ministry of the Environment.
- 2** The Minister of the Environment shall grant the approval, when he approves that the recycling prescribed in the application for the said approval satisfies every Item of the preceding Paragraph.
- 3** Despite of the provisions of Paragraph 1 or 4 of Article 7 or Paragraph 1 of Article 8, a person who was granted the approval of Paragraph 1 of this Article may collect or transport the municipal solid waste under the said approval and may construct the municipal solid waste disposal facility under the said approval.
- 4** A person who was granted the approval of Paragraph 1 of this Article shall be regarded as a municipal solid waste collection and transport contractor or a municipal solid waste disposal contractor when the provisions of Paragraph 9, 11 and 12 of Article 7 and Article 19-3 are applied, and as a installer of a municipal solid waste disposal facility when the provision of Paragraph 1 of Article 18 is applied.
- 5** The Minister of the Environment shall revoke the approval prescribed in Paragraph 1, when he realizes that the recycling becomes not to satisfy any one of Item of the provision of this Paragraph.
- 6** In addition to the provisions in the preceding Paragraphs, the necessary matters concerning the approval of Paragraph 1 are given in the Cabinet Orders.

Section 5 Export of Municipal solid waste

Article 10

- 1** Any person intending to export municipal solid waste must obtain the confirmation of the Minister of the Environment that the export of municipal solid waste comes under the respective items in the following.
 - 1) The municipal solid waste to be exported are deemed difficult to be treated of properly in Japan in the light of the available disposal equipment and technique for the said municipal solid waste in Japan.
 - 2) The municipal solid waste to be exported are not of the preceding description but satisfy the standards specified in the Ordinance of the Ministry of the Environment as substances not hindering the proper disposal of municipal solid waste in Japan.
 - 3) It is judged that the municipal solid waste to be exported will certainly be managed of in a manner not short of the municipal solid waste management standards (or the specially controlled municipal solid waste management standards if the said municipal solid waste fall under that category).
 - 4) The application for the acknowledgment is made by the following authorities/person.
 - a. Municipality
 - b. One specified by the Ordinance of the Ministry of the Environment
- 2** The provisions in the preceding Paragraph, however, are not applicable to the following authorities/persons.
 - 1) Anyone going out of Japan and personally carrying municipal solid waste who is specified by the Ordinance of the Ministry of the Environment.
 - 2) The central government or anyone specified by the Ordinance of the Ministry of the Environment.

CHAPTER III INDUSTRIAL WASTE

Section 1 Industrial Waste Management

(Management by Businesses and Local Governments)

Article 11

- 1** The businesses shall be required to manage of their industrial waste by themselves.
- 2** The municipalities may manage of those industrial waste which can be managed of together with municipal solid waste and

which are judged to be in need of their management, either solely or jointly with someone else as part of their work.

- 3 The prefectural governments are entitled to manage of, as part of their work, the industrial waste which is judged to be in need of their management in order to ensure the proper management of industrial waste.

(Management by Businesses)

Article 12

- 1 In a case where a business transports or disposes of their industrial waste (excluding specially controlled industrial waste; the same will apply in the rest of this Article except for Paragraph 3 to 5) by themselves, it shall be in accordance with the standards on the collection, transport and disposal of industrial waste specified in the Cabinet Order. In a case where a business transports or disposes of their industrial waste(excluding specially controlled industrial waste; the same will apply in the rest this Article) by themselves, it shall be in accordance with the standards on the collection, transport and disposal of industrial waste specified in the Cabinet Order (excluding standards on the place and method of ocean dumping, if such standards are specified in the Law Relating to Prevention of Marine Pollution and Maritime Disaster, in respect of industrial waste which may be disposed of in the sea, if such industrial waste is specified in the above-mentioned standards specified in the Cabinet Order). (The above-mentioned standards specified in the Cabinet Order will hereinafter be referred to as "industrial waste management standards".).
- 2 The business shall store the industrial waste till the time of management without hindering the conservation of the living environment in accordance with the technical standards specified in the Ordinance of the Ministry of the Environment (which will hereinafter be referred to as "industrial waste storage standards").
- 3 If businesses (including contractors of intermediate treatment (who treat industrial waste intermediately within the whole process of its generation to final disposal (landfill disposal, disposal into the sea (which is conducted in accordance with the standards prescribed in the Law Relating to the Prevention of Marine Pollution and Maritime Disaster in regard to the place to be dumped and its methods) or recycling), and the same will apply hereinafter) and the same will apply in the next Paragraph, Paragraph 5 and Paragraph 3 to 5 of the next Article) are to commission anyone else to transport or dispose of their industrial waste(excluding specially controlled industrial waste, and including industrial waste of intermediate treatment(which is treated in the intermediate process within the whole of its generation to final disposal), they shall commission to industrial waste collection and transport contractors specified in Paragraph 8 of Article 14 or someone else prescribed by the Ordinance of the Ministry of the Environment for their transport, and to industrial waste disposal contractors specified by the same Paragraph or someone else prescribed by the Ordinance of the Ministry of the Environment for their disposal.
- 4 When businesses are to commission anyone else to transport or dispose of their industrial waste under the provision of the preceding Paragraph, they shall act in accordance with the standards prescribed in the Cabinet Order.
- 5 When businesses are to commission anyone else to transport or dispose of their industrial waste under the preceding 2 Paragraphs, they shall endeavor to take the necessary action for proper management of the said industrial waste in the whole process from its generation to final disposal.
- 6 A business who has places of business equipped with a industrial waste disposal facility mentioned in Paragraph 1 of Article 15 for treating of the industrial waste generated there as a result of the business activities shall appoint an industrial waste manager in each place of business in order to execute its business associated with the management of industrial waste appropriately. However, the places of business where the business itself is an industrial waste manager are excluded.
- 7 Businesses specified by the Cabinet Order as those who have places of business generating industrial waste abundantly as a result of their business activities (referred to as " generator who emits a large quantity of waste " in the next Paragraph) shall make the plan on reduction and other management of industrial waste from the said places in accordance with the standards specified by the Ordinance of the Ministry of the Environment and submit it to the prefectural governors.
- 8 Generator who emits a large quantity of waste shall report the status of executing the plan mentioned in the preceding Paragraph to the prefectural governors as specified by the Ordinance of the Ministry of the Environment.
- 9 The prefectural governors shall publish the plan mentioned in Paragraph 7 as well as the status of its execution mentioned in the preceding Paragraph as specified by the Ordinance of the Ministry of the Environment.
- 10 The Minister of the Environment shall consult with the heads of the administrative organs before he/she is to set forth the Ordinance of the Ministry of the Environment mentioned in Paragraph 7 as well as to modify it.
- 11 The provisions of Paragraph 11 and 12 of Article 7 also apply to those businesses generating industrial waste as a result of

their activities who are specified by the Cabinet Order. However, "municipal solid waste" in Paragraph 11 of Article 7 shall be interpreted as "industrial waste".

(Management of Specially Controlled Industrial Waste by Businesses)

Article 12-2

- 1** When businesses are to transport or dispose of their specially controlled industrial waste by themselves, it shall be in accordance with the standards on the collection, transport and disposal of specially controlled industrial waste specified in the Cabinet Order (excluding standards on the place and method of ocean dumping, if such standards are specified in the Law Relating to Prevention of Marine Pollution and Maritime Disaster, in respect of specially controlled industrial waste which may be disposed of in a sea, if such specially controlled industrial waste is specified in the above-mentioned standards specified in the Cabinet Order). (The above-mentioned standards specified in the Cabinet Order will hereinafter be referred to as "specially controlled industrial waste management standards".).
- 2** The business shall store the specially controlled industrial waste till the time of management without hindering the conservation of the living environment, in accordance with the technical standards specified in the Ordinance of the Ministry of the Environment (which will hereinafter be referred to as "specially controlled industrial waste storage standard").
- 3** When a business is to commission anyone else to transport or dispose of their specially controlled industrial waste (including industrial waste of intermediate treatment, and the same shall apply in the next Paragraph and Paragraph 5), that business shall act in accordance with the standards specified in the Cabinet Order and commission an industrial waste collection and transport contractor mentioned in Paragraph 8 of Article 14-4 or someone else prescribed by the Ordinance of the Ministry of the Environment to transport the specially controlled industrial waste and commission a specially controlled industrial waste disposal contractor also mentioned in Paragraph 8 of Article 14-4 or someone else prescribed by the Ordinance of the Ministry of the Environment to dispose of them.
- 4** When businesses are to commission anyone else to transport or dispose of their specially controlled industrial waste under the provision of the preceding Paragraph, they shall act in accordance with the standards prescribed in the Cabinet Order.
- 5** When businesses are to commission anyone else to transport or dispose of their specially controlled industrial waste under the preceding two Paragraphs, they shall endeavor to take the necessary action for proper management of the said specially controlled industrial waste in the whole process from its generation to final disposal.
- 6** Businesses who have places of business where specially controlled industrial waste is generated as a result of the business activities shall appoint a specially controlled industrial waste manager in each place of business in order to perform their work associated with specially controlled industrial waste management appropriately. However, the places of business where the business itself is in charge of specially controlled industrial waste management are excluded.
- 7** The specially controlled industrial waste manager to be appointed under the provision of the preceding Paragraph shall possess the qualification specified in the Ordinance of the Ministry of the Environment.
- 8** Businesses specified by the Cabinet Order as those who have places of business generating specially controlled industrial waste abundantly as a result of their activities (referred to as "generator who emits a large quantity of waste" in the next Paragraph) shall make the plan on reduction and other management of specially controlled industrial waste from the said places in accordance with the standards specified by the Ordinance of the Ministry of the Environment and submit it to the prefectural governors.
- 9** Generator who emits a large quantity of waste shall report the status of executing the plan mentioned in the preceding Paragraph to the prefectural governors as specified by the Ordinance of the Ministry of the Environment.
- 10** The prefectural governors shall publish the plan mentioned in Paragraph 8 as well as the status of its execution mentioned in the preceding Paragraph as specified by the Ordinance of the Ministry of the Environment.
- 11** The Minister of the Environment shall consult with the heads of the administrative organs before he/she is to set forth the Ordinance of the Ministry of the Environment mentioned in Paragraph 8 as well as to modify it.
- 12** The provisions of Paragraph 11 and 12 of Article 7 also apply to businesses generating specially controlled industrial waste as a result of their activities. "Municipal solid waste" in Paragraph 11 of Article 7, however, shall be interpreted as "specially controlled industrial waste".

(Control Manifest of Industrial Waste)

Article 12-3

- 1 When businesses (including contractors of intermediate treatment) generating industrial waste as a result of their activities are to commission someone else to transport or dispose of those waste (including industrial waste of intermediate treatment, and the same shall apply to Paragraph 1 of Article 12-5) (except the cases specified in the Ordinance of the Ministry of the Environment), that business shall issue to the party commissioned to transport the said waste (or the party commissioned to dispose of them if he is commissioned to perform that function alone) a control manifest of industrial waste indicating the kind of industrial waste, its quantity, the name of the party commissioned to transport or dispose of the waste and other matters specified by the Ordinance of the Ministry of the Environment (which will hereinafter be referred to as "control manifest") at the time of delivering those waste pertaining to the said commission.
- 2 The party commissioned to transport the said industrial waste (who will hereinafter be referred to as "commissioned transporter") shall enter the particulars specified by the Ordinance of the Ministry of the Environment in the control manifest issued under the provision of the preceding Paragraph after completion of the transport, and send a copy of the said manifest within a period prescribed by the said Ordinance to the party issuing the manifest under the said provision (who will hereinafter be referred to as "issuer"). If anyone has been commissioned to dispose of the waste in this case, the control manifest shall be forwarded to that commissioned party.
- 3 After completion of the disposal, the said commissioned party (who will hereinafter be referred to as "commissioned disposer") shall enter the particulars prescribed by the Ordinance of the Ministry of the Environment (in case that disposal is the final one, particulars specified by the Ordinance of the Ministry of the Environment as well as the effect of a completion of the final disposal) in the control manifest issued in accordance with the provision in the former part of the preceding Paragraph or the control manifest forwarded in accordance with the provision in the latter part of the said Paragraph and send a copy of the control manifest to the issuer who has commissioned the said party to dispose of the waste, within a period prescribed by the Ordinance of the Ministry of the Environment. If the control manifest has been forwarded to the said party in accordance with the latter part of the preceding Paragraph, another copy of that manifest shall be sent to the party who has forwarded the manifest.
- 4 When the commissioned disposer receives a copy of the control manifest containing the effect of a completion of the final disposal of industrial waste of intermediate treatment pertaining to the said disposal under the provision of the former part of the preceding Paragraph, this Paragraph or Paragraph 5 of Article 12-5, as specified by the Ordinance of the Ministry of the Environment, he/she shall enter the effect of a completion of the final disposal in the control manifest issued in accordance with the provision of the Paragraph 1 or the control manifest forwarded in accordance with the provision of the latter part of Paragraph 2, and send a copy of the control manifest to the issuer who has commissioned the said disposal, within a period prescribed by the Ordinance of the Ministry of the Environment.
- 5 When the issuer receives a copy of the control manifest transmitted under the provisions of the preceding three Paragraphs or Paragraph 5 of Article 12-5, he/she must confirm on the said copy of the control manifest that the transportation or disposal has completed and keep the said copy of the control manifest for a period specified by the Ordinance of the Ministry of the Environment from the day of receipt of said transmittal.
- 6 The issuer shall prepare a report on the control manifest in accordance with the Ordinance of the Ministry of the Environment and submit it to the prefectural governor.
- 7 In case the issuer receives no copy of the control manifest prescribed in the provisions of Paragraph 2 to Paragraph 4 and Paragraph 5 of Article 12-5 within the period prescribed by the Ordinance of the Ministry of the Environment, or he/she receives a copy of the control manifest, in which the particulars specified by these provisions are not entered, or a copy of the control manifest, in which false information are entered, the issuer shall promptly investigate the transport or disposal by the commissioned party and take appropriate action in accordance with the said Ordinance.
- 8 Apart from the provisions in the preceding Paragraphs of this Article, necessary prescriptions concerning the control manifest are given in the Ordinance of the Ministry of the Environment.

(Prohibition of Issuing False Control Manifests)

Article 12-4

The industrial waste collection and transport contractors specified by Paragraph 8 of Article 14 or the specially controlled industrial waste collection and transport contractors specified by Paragraph 8 of Article 14-4 and the industrial waste disposal contractors specified by Paragraph 8 of Article 14 or the specially

controlled industrial waste disposal contractors specified by Paragraph 8 of Article 14-4 must not enter the false information on particulars prescribed by Paragraph 2, 3 or 4 of the preceding Article and issue that control manifest, notwithstanding they were not commissioned to transport or dispose of industrial waste.

(Use of Electronic Information Processing System)

Article 12-5

- 1 When the businesses specified in Paragraph 1 of Article 12-3 (limited to such entrepreneur whose input and output devices are connected by way of telecommunication lines to the electronic computer pertaining to the use of the information processing center specified in Paragraph 1 of Article 13-2 (referred to simply as “information processing center” in this Article); referred to as “businesses using the electronic manifest system” in the following in this Article) commissions transportation or disposal of the industrial waste to any other person (except the case to be specified by the Ordinance of the Ministry of the Environment provided in Paragraph 1 of Article 12-3), asks the transportation or disposal commissioned person (limited to those persons whose input and output devices are connected to the electronic computer used by the information processing center by way of telecommunication lines; same in the following in this Article) to report the completion of transportation or disposal of the said industrial waste via the information processing center in use of the electronic information processing system, and, as provided by the Ordinance of the Ministry of the Environment, has registered the type and quantity of the industrial waste pertaining to the said commission, name or title of the person having the transportation or disposal commissioned and any other matters specified by the Ordinance of the Ministry of the Environment in the information processing center in use of the electronic information processing system within a period specified by the Ordinance of the Ministry of the Environment after delivering industrial waste pertaining to the said commission, it is not required to deliver a control manifest notwithstanding the provision of Paragraph 1 of Article 12-3.
- 2 In case that the commissioned transporter or the commissioned disposer is asked to report by the businesses using the electronic manifest system according to the provision of the preceding Paragraph, when the transportation or disposal of the industrial waste pertaining to the said report is completed, as provided by the Ordinance of the Ministry of the Environment, he/she must report that effect (in case that disposal is the final one, the effect of a completion of the final disposal) to the information processing center by using the electronic information processing system within a period specified by the Ordinance of the Ministry of the Environment, notwithstanding the provisions of Paragraphs 2 and 3 of Article 12-3.
- 3 When the commissioned disposer receives a copy of the control manifest containing the effect of a completion of the final disposal of industrial waste of intermediate treatment pertaining to the said disposal under the provisions of Paragraph 5 and Paragraphs 3 and 4 of Article 12-3, as provided by the Ordinance of the Ministry of the Environment, he/she must report that effect to the information processing center by using the electronic information processing system within a period specified by the Ordinance of the Ministry of the Environment, notwithstanding the provisions of the said Paragraphs.
- 4 Upon receipt of the report according to the provisions of the preceding two Paragraphs, the information processing center shall immediately notify the businesses using the electronic manifest system who has commissioned the transportation or disposal of industrial waste pertaining to the said report that the commissioned transporter or the commissioned disposer has completed the said transportation or disposal (in case that disposal is the final one, the effect of a completion of the final disposal).
- 5 When the commissioned disposer receives the report of the effect of a completion of the final disposal of industrial waste of intermediate treatment pertaining to the said disposal under the provision of the preceding Paragraph and the party who commissioned the said disposal is not businesses using the electronic manifest system, he/she must enter the effect of a completion of that final disposal in the control manifest issued in accordance with the provision of the Paragraph 1 of Article 12-3 or the control manifest forwarded in accordance with the provision of the latter part of Paragraph 2 of the same Article, and send a copy of that control manifest to the issuer who has commissioned the said disposal, within a period prescribed by the Ordinance of the Ministry of the Environment.
- 6 Upon receipt of the notification according to the provision of Paragraph 4, the businesses using the electronic manifest system must confirm, upon the notification, the completion of the said transportation or disposal.
- 7 The information processing center must record the information pertaining to registration under the provision of Paragraph 1 and report under the provision of Paragraph 2 or 3 in the file provided in the electronic computer pertaining to its use and keep the information for a period specified by the Ordinance of the Ministry of the Environment from the day of receipt of the said report.
- 8 The information processing center must report the matters concerning the registration under the provision of Paragraph 1 and the report under the provision of Paragraph 2 or 3 to the prefectural governor, as provided by the Ordinance of the Ministry of

the Environment.

- 9 When the information processing center does not receive a report under the provision of Paragraph 2 or 3 within the period specified by the Ordinance of the Ministry of the Environment in regard to the registration according to the provision of Paragraph 1, it must immediately notify the businesses using the electronic manifest system and of having the said registration listed to that effect in use of the electronic information processing system.
- 10 When the businesses using the electronic manifest system receives a notification under the provision of the preceding Paragraph or receive a notification under the provision of Paragraph 4 and that report prescribed by the provision of Paragraph 2 or 3 contains the false information, he/she must immediately grasp the condition of transportation or disposal of the industrial waster pertaining to the said notification and take appropriate measures, as provided by the Ordinance of the Ministry of the Environment.
- 11 Except as provided in the preceding Paragraphs, any other necessary matters concerning the electronic information processing system shall be determined by the Ordinance of the Ministry of the Environment.

(Advice)

Article 12-6

If the prefectural governor judges that a business, commissioned transporter or commissioned disposer mentioned in Paragraph 1 of Article 12-3 does not observe the provision of any of Paragraph 1 to 7 of the same Article or Paragraph 1 to 3, 5, 6 or 10 of the preceding Article, the prefectural governor is entitled to advise that party to take appropriate action for proper management of industrial waste.

(Management by Local Governments)

Article 13

- 1 The collection, transport and disposal of industrial waste which the prefectural governments or municipalities are obliged to perform as part of their work, under the provision of Paragraph 2 or 3 of Article 11, shall all be carried out in accordance with the industrial waste management standards (or the specially controlled industrial waste disposal standards in respect of industrial waste in that category).
- 2 The prefectural governments or municipalities shall collect charges for the installation of an industrial waste disposal facility and the collection, transport and disposal of industrial waste by them in accordance with the prefectural or municipal ordinance.
Section 2 Information Processing Center and Industrial Waste Appropriate Management PromotionCenter Subsection 1 Information Processing Center

(Designation)

Article 13-2

- 1 The Minister of the Environment may designate a legal parson coming under Article 34 of the Civil Law (1896 Law No. 89) and being recognized as to be capable of adequately and exactly executing the works specified in the following Article, upon his/her application, as an information processing center which is limited to only one throughout the country.
- 2 When the Minister of the Environment has made the designation according to the provision of the preceding Paragraph, he must publicly notify the name and address of said information processing center and the location of its office.
- 3 When the information processing center changes its name or address or the location of its office, it must give notice to that effect in advance to the Minister of the Environment.
- 4 Upon receipt of such notice under the provision of the preceding Paragraph, the Minister of the Environment must publicly notify the particulars of said notice.

(Services)

Article 13-3

The information processing center shall execute the works specified in the following.

- 1) Use and management of electronic computers and other machines required for processing the registration according to the provision of Paragraph 1 of Article 12-5, reports according to the provision of Paragraph 2 or 3 of the same Article, and office works pertaining to the notification according to the provisions of Paragraphs 4 and 9 of the same Article (referred to as "registration and report works" in the following Item) by the electronic information processing system.
- 2) Preparing necessary programs, data and files for processing registration and report works by the electronic information

processing system and keeping them.

- 3) Recording and keeping the record according to the provision of Paragraph 7 of Article 12-5, and reporting under the provision of Paragraph 8 of the same Article.
- 4) Works incidental to the works specified in the preceding three Items.

(Operational Rules)

Article 13-4

- 1 The information processing center must, before starting the works specified in the Items of the preceding Article (referred to as “information processing works” in the following), determine the rules concerning the information processing works with respect to the method of executing the information processing works, matters concerning the fee and other matters specified by the Ordinance of the Ministry of the Environment (referred to as “operational rules” in the following and obtain the approval of the Minister of the Environment. The same shall apply in the case of changing the working rules.
- 2 The Minister of the Environment may order to change the approved operational rules under the preceding Paragraph when he/she recognizes that said operational rules are no longer adequate for appropriate and exact execution of the information processing works.

(Operation Plan or the like)

Article 13-5

- 1 The information processing center shall prepare every fiscal year an operation plan and a budgetary statement of income and expenditure and obtain the approval of the Minister of the Environment, as provided by the Ordinance of the Ministry of the Environment. The same in the case of changing them.
- 2 The information processing center must prepare an operation report and a statement of income and expenditure concerning the information processing works after termination of every fiscal year and submit them to the Minister of the Environment, as specified by the Ordinance of the Ministry of the Environment.

(Suspension or Discontinuation of Services)

Article 13-6

The information processing center shall not suspend or discontinue all or part of the information processing works unless the permission of the Minister of the Environment is obtained.

(Duty of Keeping Secret)

Article 13-7

An officer or a staff member of the information processing center or a person who was once in such position must not leak a secret he could know with respect to the information processing works.

(Books)

Article 13-8

The information processing center must maintain books, as provided by the Ordinance of the Ministry of the Environment, enter the matters specified by the Ministry of Health and Welfare Ordinance regarding the information processing works and keep them.

(Report and On-site Inspection)

Article 13-9

- 1 The Minister of the Environment may have the information processing center submit necessary reports on the information processing works or the financial condition or have his/her personnel enter the office of the information processing center and inspect the condition of information processing works or books, documents and other Articles only to the extent required for securing adequate operation of the information processing works.
- 2 The personnel making an on-site inspection according to the provision of the preceding Paragraph must carry an identification certificate and show it to the individuals concerned.
- 3 The power of on-site inspection according to the provision of Paragraph 1 shall not be construed as that authorized for the sake of criminal.

(Supervisory Order)

Article 13-10

The Minister of the Environment may give necessary orders to the information processing center with respect to the information

processing works to the extent required for enforcement of the provisions of this subsection.

(Revocation of Designation)

Article 13-11

- 1 When the information processing center comes under any of the following Items, the Minister of the Environment may revoke the designation under the provision of Paragraph 1 of Article 13-2 (referred to simply as “designation” in the following in this Article).
 - 1) When recognized that the information processing works are no longer appropriately and exactly carried out.
 - 2) When there was an unlawful act regarding the designation.
 - 3) When violating either any of the provisions of this subsection or an order or disposition based said provision or performed the information processing works without following the approved operational rules in Paragraph 1 of Article 13-4.
- 2 When the Minister of the Environment revoked the designation according to the provision of the preceding Paragraph, he must publicly notify to that effect. Subsection 2 Industrial Waste Appropriate Management Promotion Center

(Designation)

Article 13-12

The Minister of the Environment may designate a corporation established under Article 34 of Civil Law and intended for promoting voluntary activities of businesses for securing appropriate management of industrial waste and recognized as to be capable of appropriately and exactly carrying out the services specified in the subsequent Article, upon its application, as the industrial waste appropriate management promotion center (referred to as “appropriate management promotion center” in the following) which is limited to only one throughout the country.

(Services)

Article 13-13

The appropriate management promotion center shall execute the works cited in the following.

- 1) Giving necessary advice or guidance to businesses for check or improvement of the method and system of industrial waste management.
- 2) Collecting information concerning the industrial waste collection and transportation contractors and industrial waste disposal contractors and furnishing such information to businesses.
- 3) Training the businesses and their employees for appropriate management of industrial waste.
- 4) Developing enlightenment activities and public relations which will contribute to securing appropriate management of industrial waste.
- 5) Where industrial waste is inappropriately disposed, extending cooperation including execution of the removal of said industrial waste and funding to the prefectures taking the measures of removing hazards or the like under the provision of Paragraph 1 of Article 19-8.
- 6) Executing works incidental to the works cited in the preceding Items.

(Special Provisions for Permission or the like of Industrial Waste Management Service)

Article 13-14

- 1 When the appropriate management promotion center or person entrusted by the center undertakes removal of industrial waste or the like upon request for cooperation under the provision of Article 19-9, said center or person may execute the removal and other necessary acts as a trade without permission notwithstanding the provision of Paragraph 1 or 4 of Article 14 or Paragraph 1 or 4 of Article 14-4.
- 2 In the case of entrusting the acts specified in the preceding Paragraph to any other person, the appropriate management promotion center must follow the standards specified by the Cabinet Order.

(Fund)

Article 13-15

- 1 The appropriate management promotion center shall provide a fund for the works specified in the Items of Article 13-13 and may appropriate the total amount of the contributions from the businesses on condition that they are appropriated for the expenses required for the works.
- 2 The Minister of the Environment shall try to obtain necessary cooperation of the businesses for the contributions to the fund provided in the preceding Paragraph.

(Application of Provisions of Other Articles)

Article 13-6

The provisions of Paragraphs 2 through 4 of Article 13-2, Article 13-5, Article 13-10 and Article 13-11 shall apply by analogy to the appropriate management promotion center. In this case, the wording "information processing works" in Article 13-5, Article 13-10 and Item 1) of Paragraph 1 of Article 13-11 shall be interpreted as "works cited in the Items of Article 13-13," and in Item 3) of the same Paragraph "either - - or said" be interpreted as "or said" and "when violated or performed the information processing works without following the approved working rules in Paragraph 1 of Article 3-4" be interpreted as "when violated."

Section 3 Industrial Waste Management Service

(Industrial Waste Management Service)

Article 14

- 1 No person is allowed to undertake as a service the collection and transport of industrial waste (excluding specially controlled industrial waste; the same will apply in the rest of this Article to Article 14-3-2 and Article 15-4-2) without permission from the prefectural governor with the jurisdiction over the area in which the person is to conduct the service (or of the area in which that person is to load and unload industrial waste if the person is to conduct a transport service only), except for a service (provided he/she is to transport the industrial waste by him/herself), a person undertaking the collection and transport of industrial waste solely for recycling as a business and anyone specified in the Ordinance of the Ministry of the Environment.
- 2 The permission mentioned in the preceding Paragraph becomes invalid upon the lapse of a period not less than five years in length prescribed by a Cabinet Order, unless the permission is renewed for another year.
- 3 The prefectural governors shall not grant the permission mentioned in Paragraph 1 of this Article unless they judge that the application for it satisfies the following requirements:
 - 1) The facilities used for the service and the ability of the applicant are judged sufficient for the proper and continuous conducting of the said service in the light of the standards set by the Ordinance of the Ministry of the Environment.
 - 2) The applicant is none of the persons specified in the following.
 - a. The person is any of the one who comes under a. to e. of Item 4) of Paragraph 3 of Article 7.
 - b. A gang member who is specified by Paragraph 6 of Article 2 of the Law for Prevention of Unjustified Action by Gang (referred to as "gang member" in this Item) or the one who becomes not a gang member but still is short of one's fifth year from that day (referred to as "gang member or the like" in this Item).
 - c. In regard to sales activities, a minor who lacks the abilities of an adult and whose lawful deputy is a person specified in one of a. or b..
 - d. A legal person whose director or employee specified by the Cabinet Order is a person specified in one of (a) or (b).
 - e. A legal person whose activities are controlled by a gang member or the like.
 - f. An individual and an employee specified by the Cabinet Order is a person specified in one of a. or b.
- 4 No person is allowed to undertake as a service the disposal of industrial waste without permission from the prefectural governor with the jurisdiction over the area in which the person is to conduct the service, except for a business (provided he/she is to dispose of the industrial waste by him/herself), a person who is to dispose of industrial waste solely for recycling as a business and anyone specified in the Ordinance of the Ministry of the Environment
- 5 The permission mentioned in the preceding Paragraph becomes invalid upon the lapse of a period not less than five years in length prescribed by a Cabinet Order unless the permission is renewed for another period.
- 6 The prefectural governors shall not grant the permission mentioned in Paragraph 4 of this Article unless they judge that the application for it satisfies the following requirements:
 - 1) The facilities used for the business and the ability of the applicant are sufficient for the proper and continuous conducting of the waste disposal service in the light of the standards specified by the Ordinance of the Ministry of the Environment.
 - 2) The applicant is none of the persons specified in a. to f. of Item 2) of Paragraph 3.
- 7 4 of this Article may be granted with conditions necessary for the conservation of the living environment attached to it.
- 8 A person who has procured the permission mentioned in Paragraph 1 of this Article (who will hereinafter be referred to as "industrial waste collection and transport contractor") and one who has procured the permission mentioned in Paragraph 4 of this Article (who will hereinafter be referred to as "industrial waste disposal contractor") shall perform their industrial waste collection and transport activities and industrial waste disposal activities respectively in conformance with the industrial waste management standards.
- 9 Any other persons than the industrial waste collection and transportation contractors, industrial waste disposal contractors and others specified by the Ordinance of the Ministry of the Environment, shall not have the collection, transportation or disposal

of industrial waste entrusted.

10 The industrial waste collection and transport contractors and industrial waste disposal contractors shall not commission anyone to collect and transport or dispose of industrial waste, but they may re-commission someone to collect and transport or dispose of the industrial waste committed to them by a service, in conformance with the standards prescribed by a Cabinet Order, or commission someone to perform their collection and transport function or disposal function in accordance with the Ordinance of the Ministry of the Environment.

11 The provisions in Paragraph 11 and 12 of Article 7 also apply to the industrial waste collection and transport contractors and industrial waste disposal contractors. "Municipal solid waste" in Paragraph 11 thereof, however, shall be interpreted as "industrial waste".

(Permission for Change or the Like)

Article 14-2

1 An industrial waste collection and transport contractor or industrial waste disposal contractor shall obtain the prefectural governor's permission for any change of the scope of the collection and transport service or disposal service except discontinuation of part of the service.

2 The provisions of Paragraph 3 and 7 of the preceding Article also apply to the permission for a change of the scope of the collection and transport service mentioned in the preceding Paragraph, and the provisions of Paragraph 6 and 7 thereof apply to the permission for a change of the scope of the disposal service also mentioned in the preceding Paragraph.

3 The provision of Paragraph 3 of Article 7-2 shall apply to the industrial waste collection and transport contractors and industrial waste disposal contractors. "Municipal solid waste" in the same Paragraph, however, shall be interpreted as "industrial waste", and "mayor of the municipality" as "prefectural governor". "Mayor of the municipality" in Article 7-3 shall be interpreted as "prefectural governor".

(Revocation of Permission or the like)

Article 14-3

In case a industrial waste collection and transport contractor or industrial waste disposal contractor becomes the one who falls under one of the following Items, the prefectural governor may revoke the permission or order that particular contractor to suspend the whole or part of the service for a prefixed period.

- 1) When the person violates laws, or demand or ask another person to act against laws, or indicate or help another person to do so.
- 2) When the facility in which the person uses for the service or the capability of that person becomes not to satisfy the standards prescribed in Item 1) of Paragraph 3 or Item 1) of Paragraph 6 of Article 14.
- 3) When the person becomes to be one of a. to f. of Item 2) of Paragraph 3 of Article 14.
- 4) When the person violates the condition attached to the said permission specified in Paragraph 7 of Article 14.

(Prohibition of Nominal Transfer)

Article 14-3-2

The industrial waste collection and transportation contractors and industrial waste disposal contractors must not have any other person perform collection or transportation or disposal of industrial waste as a trade under their own names. Section 4 Specially Controlled Industrial Waste Management Service

(Specially Controlled Industrial Waste Management Service)

Article 14-4

1 No person is allowed to undertake as a service the collection and transport of specially controlled industrial waste without permission from the prefectural governor with the jurisdiction over the area in which the person is to conduct the service (or over the area in which the person is to load and unload specially controlled industrial waste if he is to conduct a transport service only), except for a service (provided he is to transport the specially controlled industrial waste by him/herself) or anyone specified in the Ordinance of the Ministry of the Environment.

2 The permission mentioned in the preceding Paragraph becomes invalid upon the lapse of a period not less than five years in length prescribed by a Cabinet Order unless the permission is renewed for another period.

3 The prefectural governor shall not grant the permission mentioned in Paragraph 1 of this Article unless he/she judges that the application for it satisfies the following requirements:

- 1) The facilities used for the service and the ability of the applicant are judged sufficient for the proper and continuous conducting

of the said service in the light of the standards set by the Ordinance of the Ministry of the Environment.

- 2) The applicant is none of the persons specified in a. to f. of Item 2) of Paragraph 3 of Article 14.
- 4 No person is allowed to undertake as a service the disposal of specially controlled industrial waste without permission from the prefectural governor with the jurisdiction over the area in which that person is to conduct the disposal service, except for a business (provided he is to dispose of the specially controlled industrial waste by him/herself) and anyone specified in the Ordinance of the Ministry of the Environment.
- 5 The permission mentioned in the preceding Paragraph becomes invalid upon the lapse of a period not less than five years in length prescribed by a Cabinet Order unless the permission is renewed for another period.
- 6 The prefectural governor shall not grant the permission mentioned in Paragraph 4 of this Article unless he judges that the application for it satisfies the following requirements:
 - 1) The facilities used for the service and the ability of the applicant are sufficient for the proper and continuous conducting of the waste disposal service in the light of the standards set by the Ordinance of the Ministry of the Environment.
 - 2) The applicant is none of the persons specified in a. to f. of Item 2) of Paragraph 3 of Article 14.
- 7 The permission mentioned in Paragraph 1 or 4 of this Article may be granted with conditions necessary for the conservation of the living environment attached to it.
- 8 A person who has procured the permission mentioned in Paragraph 1 of this Article (who will hereinafter be referred to as "specially controlled industrial waste collection and transport contractor") and one who has procured the permission mentioned in Paragraph 4 of this Article (who will hereinafter be referred to as "specially controlled industrial waste disposal contractor") shall perform specially controlled industrial waste collection and transport activities and specially controlled industrial waste disposal activities respectively in conformance with the specially controlled industrial waste management standards.
- 9 Any other persons than the specially controlled industrial waste collection and transportation contractors, specially controlled industrial waste disposal contractors and others specified by the Ordinance of the Ministry of the Environment must not have the collection and/or transportation or disposal of industrial waste entrusted.
- 10 The specially controlled industrial waste collection and transport contractors and specially controlled industrial waste disposal contractors shall not commission anyone to collect and transport or dispose of specially controlled industrial waste, but they may re-commission someone to collect and transport or dispose of the specially controlled industrial waste committed to them by a service, in conformance with the standards prescribed by a Cabinet Order, or commission someone to perform their collection and transport function or disposal function in accordance with the Ordinance of the Ministry of the Environment.
- 11 Despite the provision in Paragraph 1 or 4 of Article 7, the specially controlled industrial waste collection and transport contractors, specially controlled industrial waste disposal contractors and some other persons specified by the Ordinance of the Ministry of the Environment may undertake as a service the collection and transport or disposal of special municipal solid waste in accordance with the Ordinance of the Ministry of the Environment. In that case, they shall conduct their waste collection and transport service or disposal service in conformance with the specially controlled municipal solid waste management standards.
- 12 The provisions of Paragraph 11 and 12 of Article 7 also apply to the specially controlled industrial waste collection and transport contractors and specially controlled industrial waste disposal contractors. "Municipal solid waste" in Paragraph 11 of Article 7, however, shall be interpreted as "specially controlled industrial waste (including specially controlled municipal solid waste in the case of a contractor conducting a specially controlled industrial waste collection and transport or disposal service under the provision of Paragraph 11 of Article 14-4)".

(Permission for Change or the Like)

Article 14-5

- 1 A specially controlled industrial waste collection and transport contractor or specially controlled industrial waste disposal contractor shall obtain the prefectural governor's permission for any change of the scope of the collection and transport service or disposal service except discontinuation of part of the service.
- 2 The provisions of Paragraph 3 and 7 of the preceding Article also apply to the permission for a change of the scope of the collection and transport service mentioned in the preceding Paragraph, and the provisions of Paragraph 6 and 7 thereof apply to the permission for a change of the scope of the disposal service also mentioned in the preceding Paragraph.

- 3** The provision of Paragraph 3 of Article 7-2 also applies to the specially controlled industrial waste collection and transport contractors and specially controlled industrial waste disposal contractors. "Municipal solid waste" in that provision, however, shall be interpreted as "specially controlled industrial waste", and "mayor of the municipality" as "prefectural governor".

(Application of Provisions of Other Articles)

Article 14-6

The provision of Article 14-3 also applies to specially controlled industrial waste collection and transport contractors and specially controlled industrial waste disposal contractors. In this case, "Item 1) of Paragraph 3 or Item 1) of Paragraph 6 of Article 14-3" in Item 2) of the same Article shall be interpreted as "Item 1) of Paragraph 3 or Item 1) of Paragraph 6 of Article 14-4", and "Paragraph 7 of Article 14" in Item 4) of the same Article as "Paragraph 7 of Article 14-4".

(Prohibition of Nominal Transfer)

Article 14-7

The specially controlled industrial waste collection and transportation contractors and specially controlled industrial waste disposal contractors must not have any other person perform the collection or transportation or disposal of specially controlled industrial waste as a trade under their own names.

Section 5 Industrial Waste Disposal Facility

(Industrial Waste Disposal Facility)

Article 15

- 1** Any person desiring to install an industrial waste disposal facility (referring to those waste plastics treatment facilities, final disposal site for industrial waste and other industrial waste disposal facilities which are specified by the Cabinet Order; same in the following) must obtain the permission of the prefectural governor with the jurisdiction over the place of installation of said industrial waste disposal facility.
- 2** The person desiring to obtain the permission of the preceding Paragraph must file an application stating the matters listed below, as provided by the Ordinance of the Ministry of the Environment.
 - 1) Name or title and address, and in the case of a legal parson, name of its representative
 - 2) Place of installation of the industrial waste disposal facility
 - 3) Type of the industrial waste disposal facility
 - 4) Type of industrial waste disposed at the industrial waste disposal facility
 - 5) Disposal capacity of the industrial waste disposal facility (or, in the case of a final disposal site for industrial waste, area and landfill capacity of the site used for landfill disposal of industrial waste)
 - 6) Plan for installation including location, structure or the like of the industrial waste disposal facility
 - 7) Plan for operation and maintenance of the industrial waste disposal facility
 - 8) In the case of a final disposal site for industrial waste, plan for disaster prevention
 - 9) Any other matters specified by the Ordinance of the Ministry of the Environment.
- 3** The application of the preceding Paragraph must accompany a document stating the result of investigation of any effects of the installation of said industrial waste disposal facility on he living environment in the surrounding area, as provided by the Ordinance of the Ministry of the Environment.
- 4** The prefectural governor, when he received an application for permission of Paragraph 1 for an industrial waste disposal facility (limited to those specified by the Cabinet Order), must without delay publicly notify the matters cited in Items 1) through 4) of Paragraph 2 and the date of application and place of reference, and offer the application of the said Paragraph and the document of the preceding Paragraph for a period of one month from the day of said publication.
- 5** The prefectural governor, when he has made the notification according to the provision of the preceding Paragraph, must without delay notify to that effect to the heads of the municipalities concerned for conservation of the living environment with respect to installation of said industrial waste disposal facility and hear the opinions of said heads of municipalities from the standpoint of conservation of the living environment with a period specified.
- 6** Where there was the notification under the provision of Paragraph 4, any person who has interests in the installation of said industrial waste disposal facility may file a statement of opinion from the standpoint of conservation of the living environment with the prefectural governor by the day elapsing two weeks calculated from the day next to the day of expiration of the reference of the same Paragraph.

(Standards on Permission)

Article 15-2

- 1 The prefectural governor shall not grant the permission specified in Paragraph 1 of the preceding Article, unless he judges that the application for that permission satisfies both of the following requirements:
 - 1) A plan for installation of industrial waste disposal facilities shall satisfy the technical standards set by the Ordinance of the Ministry of the Environment(or by the ordinances of the Office of the Prime Minister and the Ministry of Health and Welfare in the case of a final disposal site for industrial waste).
 - 2) The plan for installation and the plan for operation and maintenance of industrial waste disposal facilities shall have adequate considerations incorporated for conservation of the living environment in the surrounding area of the said industrial waste disposal facilities as well as the surrounding area specified by the Ordinance of the Ministry of the Environment.
 - 3) The capability of the applicant is sufficient for the proper and continuous conducting of the installation and operation and maintenance of industrial waste disposal facilities in accordance with the plan of its installation and the plan of its operation and maintenance in the light of the standards set by the Ordinance of the Ministry of the Environment.
 - 4) The applicant is none of the persons specified in a. to f. of Item 2) of Paragraph 3 of Article 14.
- 2 The prefectural governors may not grant the permission of the Paragraph 1 of the preceding Article, when they judge that it may become difficult to satisfy the air environment standards, since refuse treatment facilities or industrial waste disposal facilities would become concentrated too much by installing the facility relating to the said permission.
- 3 The prefectural governor, before giving the permission of Paragraph 1 of the preceding Article (limited that which pertains to the industrial waste disposal facility specified in Paragraph 4 of the same Article), must hear the opinions concerning the matters specified in Item 2) of Paragraph 1 from the persons owning special knowledge on the matters specified by the Ordinance of the Ministry of the Environment with respect to conservation of the living environment.
- 4 The permission of Paragraph 1 of the preceding Article, may have necessary conditions attached for conservation of the living environment.
- 5 The person having the permission of Paragraph 1 of the preceding Article, granted (referred to as “installer of industrial waste disposal facility” in the following) shall not use the industrial waste disposal facility pertaining to said permission before it is recognized upon inspection by the prefectural governor that it is in conformity with the plan for installation stated in the application of Paragraph 2 of the preceding Article, pertaining to said permission.

(Operation and Maintenance of Industrial Waste Disposal Facility)

Article 15-2-2

The installer of an industrial waste disposal facility must operation and maintenance said industrial waste disposal facility in accordance with the technical standards specified in the Ordinance of the Ministry of th Environment and the plan for operation and maintenance stated in the application of Paragraph 2 of Articl 15, pertaining to the permission of said industrial waste disposal facility (or, when the permission of Paragraph 1 of Article 15-2-4 is granted for the plan, the plan after change).

(Application by Analogy)

Article 15-2-3

The provision of Article 8-4 applies to a installer of an industrial waste disposal facility (only those who were granted the permission of Paragraph 1 of Article 15 on the industrial waste disposal facility prescribed in Paragraph 4 of the same Article), and the provision of Article 8-5 applies to the person who was granted the permission of the same Article for the final disposal site for industrial waste prescribed by the Ordinance of the Ministry of the Environment.” In this case, “the permitted municipal solid waste disposal facility” and “the municipal solid waste disposal facility” in Article 8-4 shall be interpreted as “the industrial waste disposal facility”, “a specific final disposal site for municipal solid waste” in Paragraph 1 of Article 8-5 as “a specific final disposal site for industrial waste”, “a final disposal site for municipal solid waste that is the municipal solid waste disposal facility” as “a final disposal site for industrial waste that is the industrial waste disposal facility”, ”Paragraph 1 of Article 8” as “Paragraph 1 of Article 15”, “a specific final disposal site for municipal solid waste” in Paras.4 and 6 of Article 8-5 as “specific final disposal site for industrial waste”, “Paragraph 3 of Article 9-5, Paragraph 1 of Article 9-6 and Paragraph 1 of Article 9-7” in Paragraph 7 of Article 8-5 as “Paragraph 3 of Article 9-5, Paragraph 1 of Article 9-6 and Paragraph 1 of Article 9-7 which are applied in Article 15-4”, and “Paragraph 1 of Article 8” as “Paragraph 1 of Article 15”.

(Permission of Change or the like)

Article 15-2-4

- 1 The installer of an industrial waste disposal facility must obtain the permission of the prefectural governor, as provided by the Ordinance of the Ministry of the Environment when he desires to change any of the matters cited in Items 4) through 7) of

Paragraph 2 of Article 15, pertaining to said permission. Provided, the preceding shall not apply when hr change is a minor change specified by the Ordinance of the Ministry of the Environment.

- 2 The provisions of Paragraph3 to Paragraph 6 of Article 15 and Paragraph 1 to Paragraph 4 of Article 15-2 also apply to the permission mentioned in the preceding Paragraph, and the provision of Paragraph 5 of the same Article applies to a person who has procured the said permission.
- 3 The provisions of Paragraphs 3 through 5, Article 9 shall apply by analogy to the installer of an industrial waste disposal facility. In this case, the wording, in Paragraph 3 of the same Article, “provisoion of Paragraph 1” shall be interpreted as “provision of Paragraph 1of Article 15-2-4,” “Item 1) of Paragraph 2 of the same Article” be interpreted as “Item 1) of Paragraph 2 of Article 15,” “municipal solid waste disposal facility pertaining to said permission” be interpreted as “said industrial waste disposal facility,” and “municipal solid waste” be interpreted as “industrial waste” and “municipal solid waste disposal facility” be interpreted as “industrial waste disposal facility” and, in Paragraphs 4 and 5 of the same Article, “municipal solid waste disposal facility pertaining to said permission” be interpreted as “said industrial waste disposal facility” and “municipal solid waste” be interpreted as “industrial waste.”

(Revocation of Permission or the Like)

Article 15-3

The prefectural governors may revoke the permission of Paragraph 1 of Article 15 pertaining to the said industrial waste disposal facility, or order the installer to make the necessary improvements of the said industrial waste disposal facility within a specified period of time or suspend its operation for a specified period of time, when there is a case which falls under one of the following Items.

- 1) Where the structure of industrial waste disposal facility pertaining to the permission of Paragraph 1 of Article 15 or its operation and maintenance is recognized as not complying with the technical standards provided in Item 1) of Paragraph 1 of Article 15-2 or Article 15-2-2 or the plan concerning installation or plan for operation and maintenance set forth in the application of Paragraph 2 of Article 15 pertaining to the said permission (or if the permission of Paragraph 1 of the preceding Article is granted for that plan, the modified plan is applied).
- 2) When the capability of the installer of industrial waste disposal facilities is recognized as not satisfying the standards specified by the Ordinance of the Ministry of the Environment in Item 3) of Paragraph 1 of Article 15-2.
- 3) When the installer of industrial waste disposal facilities takes actions which violate the Laws, or demands, asks or indicates another person to act against the Laws, or helps another person to do so.
- 4) When the installer of industrial waste disposal facilities becomes to be one of a. to f. of Item 2) of Paragraph 3 of Article 14.
- 5) When the installer of industrial waste disposal facilities violates the condition attached to the said permission under the provision of Paragraph 4 of Article 15-2.

(Application of Provisions of Other Articles)

Article 15-4

- 1 The provision of Article 9-4 also applies to the installer of industrial waste disposal facilities, and the provisions of Article 9-5 to Article 9-7 apply to industrial waste disposal facilities. In this case, "municipal solid waste disposal facilities" in Article 9-4 shall be interpreted as "industrial waste disposal facilities", "Paragraph 1 of Article 8" in Article 9-5 as "Paragraph 1 of Article 15", and "Paragraph 1 of Article 8-2" in Paragraph 2 of the same Article and Paragraph 2 of Article 9-6 as "Paragraph 1 of Article 15-2". Section 6 Special Provisions Pertaining to Recycling of Industrial Waste Article 15-4-2 As specified by the Ordinance of the Ministry of the Environment, any person performing or desiring to perform recycling of industrial waste specified by the Ordinance of the Ministry of the Environment may obtain approval of the Minister of the Environment for conformity with any of the following Items.
 - 1) That the contents of said recycling comply with the standards specified by the Ordinance of the Ministry of the Environment as one not hazardous to conservation of the living environment.
 - 2) That the contents of said recycling comply with the standards specified by the Ordinance of the Ministry of the Environment as one not hazardous to conservation of the living environment.
 - 3) That the facility which the person specified in the preceding Item installs or going to install for use for said recycling complies with the standards specified by the Ordinance of the Ministry of theEnvironment.
- 2 The provision of Paragraph 2 of Article 9-8 shall apply to the approval of the preceding Paragraph, and the provisions of Paragraphs 3 and 4of the same Article to the person having the approval of the preceding Paragraph granted. In such case, the wording in Paragraph 3 of the same Article “Paragraph 1 or 4 of Article 7 or Paragraph 1 of Article 8” shall be interpreted as “Paragraph 1 or 4of Article 14 or Paragraph 1ofArticle 15”; “municipal solid waste” be interpreted as “industrial waste”; “municipal solid waste disposalfacility” be interpreted as “industrial waste disposal facility”; and in Paragraph 4 of the same Article “Paragraphs 9, 11 and 12 of Article 7” be interpreted as “Paragraphs 8, 9 and 11 of Article 14”; “municipal solid waste

collection and transportation contractor” be interpreted as “industrial waste collection and transportation contractor” and “municipal solid waste disposal facility” be interpreted as “industrial waste disposal facility”; and in Paragraphs 5 and 6 of the same Article “Paragraph 1” be interpreted as “Paragraph 1 of Article 15-4-2.” Section 7 Export and Import of Industrial Waste

(Permission for Import)

Article 15-4-3

- 1 A person intending to import waste (excluding navigational waste and carried-in waste; the same will apply to Paragraph 3 of this Article) shall procure the Minister of the Environment's permission.
- 2 The Japanese central government and other authorities/persons specified in the Ordinance of the Ministry of the Environment are not subject to the provision of the preceding Paragraph.
- 3 The Minister of the Environment shall not grant the said permission unless he judges that the application for it satisfies the following requirements:
 - 1) It is judged that the waste to be imported (which will hereinafter be referred to as "foreign waste") are likely to be properly treated of in Japan in the light of the currently available equipment and technique for disposal of the said foreign waste.
 - 2) The applicant must fall under one of the following categories:
 - a. An industrial waste disposal contractor or specially controlled industrial waste disposal contractor with a scope of service including the disposal of the particular foreign waste
 - b. A person with an industrial waste disposal facility capable of disposing of the said foreign waste (excluding the contractor specified in a. hereof).
 - c. One specified by the Ordinance of the Ministry of the Environment
- 4 The permission mentioned in Paragraph 1 of this Article may be granted with conditions necessary for the conservation of the living environment attached to it.

(Special Provision of Importer of Foreign Waste)

Article 15-4-4

- 1 An importer of foreign waste (except a business) shall be regarded as a business subject to the provisions of Paragraph 1 of Article 11, Paragraph 1 to 4 of Article 12 and Paragraph 1 to 5 of Article 12-2. (Application of Provisions of Other Articles) Article 15-4-5 The provision of Article 10 also applies to anyone exporting industrial waste. "Municipality" in Item 4) of Paragraph 1 of that Article, however, shall be interpreted as "business" (provided he exports the said industrial waste by him/herself). The other necessary replacements of terms in the provision of that Article are prescribed by a Cabinet Order.
- 2 The provisions of Paragraph 1 of Article 12-3 and Paragraph 1 of Article 12-5 will also apply to an importer of foreign waste (excluding a business who generates industrial waste as a result of his/her activities).

CHAPTER III-II WASTE MANAGEMENT CENTER

(Designation)

Article 15-5

- 1 The Minister of the Environment is entitled to designate a legal person of dealing with investment and donation of the central government and local governments (limited to those specified by the Cabinet Order), or other legal person of being applied to be the said legal person specified by the Cabinet Order or the selected contractor specified in Paragraph 5 of Article 2 of the Private Finance Initiative Law (Law No. 117 of 1999), which is established for the purpose of support of proper, wide-area management of waste, in each prefecture in compliance with his/her application as a waste management center (which will hereinafter be referred to as "center") provided the said legal person is judged to be capable of performing the activities prescribed in the following Article.
- 2 When so designating a legal person as a center, the Minister of the Environment shall publicize the name and address of that center and the location of its office.
- 3 When intending to change its name or address or the location of its office, the center shall give the Minister of the Environment advance notice.
- 4 When receiving such advance notice prescribed in the preceding Paragraph, the Minister of the Environment shall publicize the particulars of the notice.

(Activities)

Article 15-6

A center shall perform all or some of the following activities in accordance with the Ordinance of the Ministry of the Environment:

- 1) Management of specially controlled municipal solid waste and installation, improvement, operation and maintenance of a facility for disposal of such waste on commission from municipalities.
- 2) Management of the municipal solid waste specified in Paragraph 1 of Article 6-3 and installation, improvement, operation and maintenance of a facility for disposal of such waste on commission from municipalities.
- 3) Management of the municipal solid waste, and the installation, improvement, operation and maintenance of a facility for disposal of such waste on commission from municipalities (excluding the activities prescribed in the preceding two Items).
- 4) Management of specially controlled industrial waste and installation, improvement, operation and maintenance of a facility for disposal of such waste.
- 5) Management of industrial waste and installation, improvement, operation and maintenance of a facility for disposal of such waste (excluding the activities prescribed in the preceding Paragraph).
- 6) Activities incidental to those prescribed in each of the preceding Paragraphs.

(Fund)

Article 15-7

- 1 A center shall raise a fund for its activities prescribed in Items 2), 4) and 5) of the preceding Article by collecting contributions from businesses and others on condition that those contributions will be spent to meet the expenses entailed by all or part of the said activities of the center.
- 2 The Minister of the Environment shall endeavor to secure the needed cooperation of businesses and others in the form of contribution to the fund mentioned in the preceding Paragraph through the minister with the supervisory power over the businesses and others.

(Operational Plan)

Article 15-8

- 1 In each fiscal year, a center shall prepare an operational plan and a budgetary statement of income and expenditure and submit them to the Minister of the Environment in accordance with the Ordinance of the Ministry of the Environment. To revise its operational plan, the center shall prepare a revised operational plan and a revised income and expenditure budget and submit them to the Minister of the Environment.
- 2 After the end of each fiscal year, a center shall prepared an operation report and a year-end income and expenditure report and submit them to the Minister of the Environment in accordance with the Ordinance of the Ministry of the Environment.

(Separate Bookkeeping for Different Groups of Activities)

Article 15-9

A center shall keep books separately for the following groups of activities, establishing separate accounts fo them:

- 1) Activities prescribed in Items 1) and 3) of Article 15-6 and or and those incidental to them
- 2) Activities prescribed in 2 of Article 15-6 and those incidental to them
- 3) Activities prescribed in Items 4) and 5) of Article 15-6 and those incidental to them

(Charges)

Article 15-10

A center shall collect charges not short of the reasonable cost incurred under efficient management for its installation of an industrial waste disposal facility and management of industrial waste.

(Granting of Subsidy or the Like)

Article 15-11

- 1 When a center constructs or improves a municipal solid waste disposal facility on commission from municipalities under the provision of Article 15-6, the central government may grant to the center a subsidy for the expenses for the installation or improvement work which is to be granted to municipalities under the provision of Article 22 or a subsidy included in the budget.
- 2 If the subsidy originally intended for municipalities is granted to the center under the provision of the preceding Paragraph, the center shall be regarded as a subsidized business or the like under the Law Pertaining to Proper Appropriation of Funds for Subsidies and Others in Budget.

(Disposal of Assets and Other Matters)

Article 15-12

- 1 A Cabinet Order shall prescribe the manner of management and the manner of disposal for the assets at the final disposal site for municipal solid waste (confined to a site for water area reclamation with municipal solid waste) installed on commission from municipalities and other necessary matters pertaining to the management and disposal of the said assets.
- 2 In case the assets mentioned in the preceding Paragraph are disposed of within a period specified in a Cabinet Order, the remainder, if any, after deduction of the expenses prescribed by a Cabinet Order from the total disposal price of the assets shall be distributed to the party who bore the cost of constructing or improving the final disposal site and to the party who subsidized that party. The same applies to the remainder, if any, after deduction of the cost prescribed by a Cabinet Order from the value of the assets kept under management even after the said prescribed period as appraised upon lapse of that period.

(Report and Inspection)**Article 15-13**

- 1 The Minister of the Environment is entitled to have a center submit the necessary report on the activities prescribed in all the Paragraphs of Article 15-6 or the assets or have its officials inspect activities, books and documents or the like at the office of the center only to the extent necessary to ensure proper performance of the said activities.
- 2 The officials sent for the inspection under the provision of the preceding Paragraph shall carry with them an identification certificate and show it to the individuals concerned.
- 3 The power to make the inspection under the provision of Paragraph 1 of this Article shall not be understood as the right of criminal investigation.

(Supervisory Order)**Article 15-14**

The Minister of the Environment is entitled to issue a necessary supervisory order to a center with regard to the activities prescribed in any of the Paragraphs of Article 15-6 only to the extent necessary to ensure observation of a provision in this chapter.

(Revocation of Designation and Other Matters)**Article 15-15**

- 1 In any of the following cases, the Minister of the Environment may revoke the designation of Article 15-5 (which will hereinafter be referred to as "designation"):
 - 1) The center is judged to be incapable of properly and adequately performing the activities prescribed in any Paragraph of Article 15-6.
 - 2) The center commits an illegitimate act regarding the designation.
 - 3) The center violates any provision in this chapter, disobeys an order based on such provision or defies a punishment based on such provision.
- 2 When he revokes the designation under the provision of the preceding Paragraph, the Minister of the Environment shall publicize the revocation.

(Administrative Works Conducted by Prefectural Governors)**Article 15-6**

A part of the administrative works given to the Minister of the Environment as its authority specified by this Chapter shall be conducted by prefectural governors as specified by the Cabinet Order.

CHAPTER IV MISCELLANEOUS REGULATIONS**(Prohibition of Dumping)****Article 16**

No person shall unnecessarily dump waste.

(Prohibition of Incineration)**Article 16-2**

No one shall incinerate waste except the following methods.

- 1) Incineration of waste, which is conducted in accordance with the municipal solid waste disposal standards, the specially controlled municipal solid waste disposal standards, the industrial waste disposal standards and the specially controlled

industrial waste disposal standards.

- 2) Incineration of waste, which is conducted in accordance with the other laws or disposal method based on these laws.
- 3) Incineration of waste, which has no other way to incinerate for the reason of the public good or the social custom, or which only has a slight impact to the living environment of the surrounding area as specified by the Cabinet Order.

(Restrictions on Use of Excreta)

Article 17

Excreta shall not be applied as a fertilizer unless the method of application is in accordance with the standard which is specified by the Ordinance of the Ministry of the Environment.

(Collection of Report)

Article 18

- 1 The prefectural governors and the mayors of municipalities are entitled to demand from businesses, municipal solid waste and industrial waste collection and transport contractors, municipal solid waste and industrial waste disposal contractors, installers of a municipal solid waste disposal facility (including the superintendents of facilities installed by municipalities for the purpose of disposal of municipal solid waste under Paragraph 1 of Article 6-2) and installers of an industrial waste disposal facility, and the information processing center the Necessary reports on storage, collection, transport or disposal of waste or the structure or operation and maintenance of a municipal solid waste or industrial waste only disposal facility only to the extent necessary for enforcement of this Law.
- 2 The Minister of the Environment is entitled to demand from a person who intends to import or has alinterpretedly imported foreign waste or one who intends to export waste the necessary report on the import of foreign waste or the export of waste, to the extent necessary for enforcement of this Law.

(Spot Inspection)

Article 19

- 1 The prefectural governors and the mayors of municipalities are entitled, only to the extent necessary for the enforcement of this Law, to have their officials enter the office or the place of business of a business, municipal solid waste or industrial waste collection and transport contractor or municipal solid waste or industrial waste disposal contractor or the land or building where a municipal solid waste or industrial waste disposal facility is located and inspect books and other documents related to the storage, collection, transport and disposal of waste or related to the structure or operation and maintenance of a municipal solid waste or industrial waste disposal facility or collect samples of the waste without paying any price only to the extent required for a test.
- 2 The Minister of the Environment is entitled, only to the extent necessary for the enforcement of this Law, to have his/her officials enter the office, the place of business or the like of a person who intends to import foreign waste or has alinterpretedly imported them or one who intends to export waste and inspect books and other documents or collect samples of the waste without paying any price only to the extent required for a test.
- 3 The officials making the said spot inspection under the provision of Paragraph 2 of this Article shall carry an identification certificate with them and show it to the individuals concerned.
- 4 The right of spot inspection under Paragraph 1 and 2 of this Article shall not be construed as the right of criminal investigation.

(Measure In Respect of Product or the Like)

Article 19-2

To ensure proper management of waste, the Minister of the Environment is entitled to demand from the minister with the regulative power over manufacturing, processing, sales and other business a measure to have those businesses place a mark indicating the material and the method of processing it on a product, container or the like manufactured, processed, sold or otherwise handled by the said businesses.

(Order for Improvement)

Article 19-3

To ensure proper management of municipal solid waste or industrial waste, the heads of the regional governments named in Paragraph 1 or 2 of this Article in the case specified are entitled to order a person storing, collecting, transporting or disposing of those waste (a business, municipal solid waste collection and transport contractor, municipal solid waste disposal contractor, industrial waste collection and transport contractor, industrial waste disposal contractor, specially controlled industrial waste collection and transport contractor or specially controlled industrial waste disposal contractor (who will be referred to as

"contractor or the like" in the rest of this Article) or an importer of foreign waste (excluding a business) to change the method of storing, collecting, transporting or disposing of the waste or take some other necessary measure by a prefixed time limit.

- 1) The mayor of the municipality in case collection, transport or disposal of municipal solid waste nonconforming with the municipal solid waste management standards (specially controlled municipal solid waste management standards in the case of waste of that description) is performed by a person of whom conformance with the said standards is required.
- 2) The prefectural governor in case storage, collection, transport or disposal of industrial waste nonconforming with the industrial waste disposal standards or industrial waste storage standards (specially controlled industrial waste management standards or specially controlled industrial waste storage standards in the case of waste of that description) is performed by a person of whom conformance with the said standards is required.

(Order for Actions)

Article 19-4

- 1 In the case where disposal of municipal solid waste nonconforming with the municipal solid waste disposal standards (the specially controlled municipal solid waste disposal standards in the case of specially controlled municipal solid waste) is conducted and it is recognized that there occurs or may occur a difficulty for conservation of the living environment, the mayor of the municipality may order, to the extent required, the person executing the said disposal (excluding a municipality executing the said disposal under the provision of Paragraph 1 of Article 6-2, and including, when the said disposal was made upon entrustment in violation of the provision of Paragraph 10 of Article 7, or Paragraph 3 or 4 of Article 12, the person assigned such entrustment, and he/she shall be referred to as "disposer or the like" in Article 19-7) to take necessary measures for removal or prevention of occurrence of the difficulty (referred to as "measures for removal or the like of difficulty" in the following) within a specified time.
- 2 When an order according to the provision of the preceding Paragraph is rendered, a statement of order setting forth the matters specified by the Ordinance of the Ministry of the Environment must be delivered.

Article 19-5

- 1 In the case where disposal of industrial waste nonconforming with the industrial waste disposal standards (the specially controlled industrial waste disposal standards in the case of specially controlled industrial waste) is conducted and it is recognized that there occurs or may occur a difficulty for conservation of the living environment, the prefectural governor (in the case of the person conducted the said disposal is the one who imported the said industrial waste, the Minister of the Environment or the prefectural governors, and the same shall apply in the next Article and Article 19-8) may order, to the extent required, the person of the following (referred to as "disposer or the like" in the next Article and Article 19-8) to take necessary measures for removal of the difficulty within a specified time.
 - 1) The person who conducted the said disposal (excluding the municipality or prefecture which conducted the said disposal as their work under the provision of Paragraph 2 or 3 of Article 11).
 - 2) When the said disposal was made upon entrustment in violation of the provision of Paragraph 3 or 4 of Article 12, Paragraph 3 or 4 of Article 12-2, Paragraph 10 of Article 14 or Paragraph 10 of Article 14-4, the person assigned such entrustment.
 - 3) The person, in the case which falls under one of the following, with regard to duties relating to control manifests in the whole process of disposal from generation of the said industrial waste to its disposal (including duties relating to the use of the electronic information processing system, in the case it is used).
 - a. In violation of the provision of Paragraph 1 of Article 12-3, the person who did not issue a control manifest, or issued a control manifest without entering the particulars specified by the same Paragraph or with entering the false information.
 - b. In violation of the provision of the former part of Paragraph 2 of Article 12-3, the person who did not send a copy of a control manifest, or sent a copy of a control manifest without entering the particulars specified by the former part of the same Paragraph or with entering the false information.
 - c. In violation of the provision of the latter part of Paragraph 2 of Article 12-3, the person who did not forward a control manifest.
 - d. In violation of the provision of Paragraph 3 or 4 of Article 12-3 or Paragraph 5 of Article 12-5, the person who did not send a copy of a control manifest, or sent a copy of a control manifest without entering the particulars specified by these provisions or with entering the false information.
 - e. In violation of the provision of Paragraph 5 of Article 12-3, the person who did not keep a copy of a control manifest.
 - f. In violation of the provision of Paragraph 7 of Article 12-3, the person who did not take necessary measures.
 - g. The person who made the false registration when registering under the provision of Paragraph 1 of Article 12-5.
 - h. In violation of the provision of Paragraph 2 or 3 of Article 12-5, the person who did not report or report the false information.
 - i. In violation of the provision of Paragraph 10 of Article 12-5, the person who did not take necessary measures.
 - 4) The person who conducted the said disposal, or the one who demanded or asked to the person who are specified in the preceding two Items to do the said disposal or to take actions which are against the provisions of the preceding two Items (hereinafter

referred to as "the said disposal or the like"), or indicated or helped these persons to do the said disposal or the like.

- 2 The provision of Paragraph 2 of the preceding Article will also apply to the orders made under the provision of the preceding Paragraph.

Article 19-6

- 1 In the case prescribed by Paragraph 1 of the preceding Article, when it is recognized that there occurs or may occur a difficulty for conservation of the living environment as well as that it falls under every of the following Item, the prefectural governor may order the business who generates the said industrial waste as a result of the business activities (in the case of the said industrial waste of being industrial waste of intermediate treatment, contractors in the whole process of disposal from its generation to the said disposal and contractors of intermediate treatment excluding disposers or the like, and they shall be referred to as "generator or the like" hereinafter) to take necessary measures for removal of the difficulty within a specified time. In this case, the said measures shall be ranged considerably from the points of the nature of the said industrial waste, its quantity, the way of disposal and the other circumstances.
 - 1) From the points of resources or other circumstances of disposers or the like, it is difficult to take necessary measures to remove the difficulty by disposers or the like alone, or it would not be enough, even if they did so.
 - 2) Generators or the like are not paying the proper amount of money on disposal of the said industrial waste and they know or can know the said disposal will be conducted, or it is appropriate to make generators or the like take measures for removal of the difficulty in the light of the provision of Paragraph 5 of Article 12 or Paragraph 5 of Article 12-2.
- 2 The provision of Paragraph 2 of Article 19-4 will also apply to the orders made under the provision of the preceding Paragraph.

(Measures for Removal or the like of Difficulty for Conservation of Living Environment)

Article 19-7

- 1 In any of the cases cited in Items of Paragraph 1 of Article 19-4, where it is recognized that there occurs or may occur a difficulty for conservation of the living environment and that any of the following Items is applicable, the person specified in each Item may take by him/herself the whole or part of the measure for removal, etc of difficulty. In such case, if Item 2) is recognized to be applicable, he must publicly notify in advance and with a period specified that the measure for removal or the like of said difficulty should be taken and that when the measure for removal or the like of said difficulty is not taken, he would take by him/herself the measure for removal or the like of said difficulty and collect the expense required for said measure.
 - 1) Under the provision of Paragraph 1 of Article 19-4, where disposers or the like ordered to take measures for removal of the difficulty do not act by the specified time pertaining to the said order, take but insufficiently or are not likely to take.
 - 2) Where it is difficult, in giving the order to take measures for removal of the difficulty under the provision of Paragraph 1 of Article 19-4, to specify the disposer to whom measures for removal of the difficulty be ordered because of the absence of negligence.
 - 3) Where there is an urgent need to take measures for removal of the difficulty and there is no time to order to do so under the provision of Paragraph 1 of Article 19-4.
- 2 When the mayor of the municipality has taken, wholly or partly, measures for removal of the difficulty in the preceding Paragraph under the same Paragraph, he may have disposers or the like bear the expense required for measures for removal of the difficulty, as provided by the Ordinance of the Ministry of the Environment.
- 3 For collection of the expense to be borne under the provision of the preceding Paragraph, the provisions of Articles 5 and 6, Administrative Acts Subrogation Law will be applied.

Article 19-8

- 1 In the cases specified by Paragraph 1 of Article 19-5, where it is recognized that there occurs or may occur a difficulty for conservation of the living environment and that any of the following Items is applicable, prefectural governors may take by themselves the whole or part of measures for removal of the difficulty. In this case, if Item 2 is recognized to be applicable, they must publicly notify in advance and with a specified period that measures for removal of the said difficulty should be taken and that when measures for removal of the said difficulty is not taken, they would take by themselves measures for removal of the said difficulty and collect the expense required for the said measures.
 - 1) Under the provision of Paragraph 1 of Article 19-5, where disposers or the like ordered to take measures for removal of the difficulty do not act by the specified time pertaining to the said order, take but insufficiently or are not likely to take.
 - 2) Where it is difficult, in giving the order to take measures for removal of the difficulty under the provision of Paragraph 1 of Article 19-5, to specify the disposer to whom measures for removal of the difficulty be ordered because of the absence of negligence.
 - 3) Under the provision of Paragraph 1 of Article 19-6, where generator or like ordered to take measures for removal of the

difficulty do not act by the specified time pertaining to the said order, take but insufficiently or are not likely to take.

- 4) Where there is an urgent need to take measures for removal of the difficulty and there is no time to order to do so under the provision of Paragraph 1 of Article 19-5 or Paragraph 1 of Article 19-6.
- 2 When the prefectural governors have taken, wholly or partly, measures for removal of the difficulty in the provision of the preceding Paragraph (excluding the cases relating to Item 3)) under the same Paragraph, they may have the said disposers or the like bear the expense required for measures for removal of the difficulty, as provided by the Ordinance of the Ministry of the Environment.
- 3 When the prefectural governors have taken, wholly or partly, measures for removal of the difficulty in the provision of Paragraph 1 (In the case which may be concerned with Item 3 only)) under the same Paragraph, they may have the said generator or the like bear the expense required for measures for removal of the difficulty, as provided by the Ordinance of the Ministry of the Environment.
- 4 When it is recognized that the prefectural governors have taken, wholly or partly, measures for removal of the difficulty in the provision of Paragraph 1 (In the case which may be concerned with Item 4 only) under the same Paragraph and that it falls under every of Item of Paragraph 1 of Article 19-6, they may have the said generator or the like bear the expense required for measures for removal of the difficulty, as provided by the Ordinance of the Ministry of the Environment. In this case, the amount to be borne to the said businesses who generate waste or the like shall be considerable from the points of the nature of the said industrial waste, its quantity, the way of disposal and the other circumstances.
- 5 For collection of the expense to be borne under the provision of the preceding Paragraph, the provisions of Articles 5 and 6 of Administrative Acts Subrogation Law shall be applied.

(Cooperation of Appropriate Management Promotion Center)

Article 19-9

When the prefectural governor is to take the measure for removal or the like of a difficulty for conservation of the living environment under the provision of Paragraph 1 of preceding Article, he/she may request the Appropriate Management Promotion Center to cooperate for implementation of the measure for removal or the like of the difficulty as specified by the Ordinance of the Ministry of the Environment.

(Preparation of Record of Final Disposal Site and Other Matters)

Article 19-10

- 1 The prefectural governor shall prepare a record of final disposal sites of which he was notified under 4 of Article 9 (or according to Paragraph 10 of Article 9-3 or Paragraph 3 of Article 15-2-4) and keep that record.
- 2 The particulars to be entered in the record prescribed in the preceding Paragraph and other necessary matters associated with the preparing and keeping of the record are prescribed by the Ordinance of the Ministry of the Environment.
- 3 The prefectural governor shall show the record prescribed in Paragraph 1 of this Article or a copy of it to a party concerned in response to his/her request.

(Environmental Sanitation Supervisor)

Article 20

Prefectural governors shall appoint environmental sanitation supervisors from the staff who possess the qualifications specified by the Ordinance of the Ministry of the Environment for the purpose of inspection under Paragraph 1 of Article 19 or for the purpose of advising about waste disposal under Paragraph 2 of Article 53 of the Septic Tank Law.

(Waste Recycling Business)

Article 20-2

- 1 A person who undertakes waste recycling as a business is eligible for registration of his/her place of business by the prefectural governor with the jurisdiction over the place where the said of business is located, in accordance with the Ordinance of the Ministry of the Environment, provided the facilities used for the business and the ability of the applicant for the said registration are judged sufficient for the proper and continuous conducting of the service and therefore conform to the standards set by the Ordinance of the Ministry of the Environment.
- 2 The necessary matters pertaining to the registration mentioned in the preceding Paragraph are prescribed by a Cabinet Order.
- 3 Only the persons registered under the provision of Paragraph 1 hereof may use the name "registered waste recycling business".

- 4 The municipalities are entitled to demand from persons registered in accordance with the provision of Paragraph 1 hereof the necessary cooperation in recycling municipal solid waste in the respective municipalities.

(Technical Manager)

Article 21

- 1 The installer (or the superintendent in the case of a facility installed by a municipality for management of municipal solid waste under the provision of Paragraph 1 of Article 6-2) of a municipal solid waste disposal facility (except a night soil treatment facility and the final disposal site specified by a Cabinet Order) or the installer of a final disposal facility of industrial waste (except a final disposal site for industrial waste specified by a Cabinet Order) is required to place technical manager in charge of the technical work for the operation and maintenance of the municipal solid waste or industrial disposal facility. However, municipal solid waste and industrial waste disposal facilities which are managed by a superintendent who also serves as technical manager are excepted.
- 2 The technical manager shall supervise the other personnel engaged in the operation and maintenance of the municipal solid waste or industrial waste disposal facilities so as to ensure the conformance of the said municipal solid waste or industrial waste disposal facilities with the technical standards mentioned in Paragraph 3 of Article 8 or 2 of Article 15-2.
- 3 The technical manager mentioned in Paragraph 1 hereof shall possess the qualification prescribed by the Ordinance of the Ministry of the Environment.

(Government Subsidy)

Article 22

The central government is entitled to give a municipality a subsidy for part of the following expenses in accordance with a Cabinet Order:

- 1) Expenses incurred for installation of refuse treatment facilities and night soil treatment facility.
- 2) Expenses for the disposal of waste specially required due to a disaster or some other cause.

(Special Assistance)

Article 23

The central government shall endeavor to provide financial assistance or mediate such assistance for the installation of municipal solid waste or industrial waste disposal facilities or other disposal facilities for the purpose of conservation of the living environment and enhancement of public health.

(Promotion or the like of Information Exchange)

Article 23-2

The central government shall endeavor to promote the exchange of information between the central government and the prefectural governments and between the respective prefectural governments so that the office works pertaining to the industrial waste which the prefectural governors execute and take necessary measures according to the condition of execution of said office works.

(Getting Advice on Permission or the like)

Article 23-3

- 1 When prefectural governors are about to give permission specified in Paragraph 1 or 4 of Article 14, Paragraph 1 or 4 of Article 14-4, Paragraph 1 of Article 15, Paragraph 1 of Article 9-5 which is applied by being interpreted under Article 15-4 or Paragraph 1 of Article 9-6 which is applied by being interpreted under Article 15-4, they shall get advice from the Superintendent-General of the Metropolitan Police or the chief of prefectural police on whether or not there are cases applying to b. to f. of Item 2) of Paragraph 3 of Article 14 (in the cases applying to c., d. or f., limited to those only relating to b., and the same shall apply to the next Paragraph and the next Article).
- 2 When prefectural governors are about to conduct disposal specified Article 14-3 (including the cases applied by being interpreted under Article 14-6) or Article 15-3, they may get advice from the Superintendent-General of the Metropolitan Police or the chief of prefectural police on whether or not there are cases applying to b. to f. of Item 2) of Paragraph 3 of Article 14.

(Advice to Prefectural Governors)

Article 23-4

The Superintendent-General of the Metropolitan Police or the chief of prefectural police may give advice to prefectural governors on industrial waste collection and transportation contractors, industrial waste disposal contractors, specially controlled industrial waste collection and transportation contractors, specially controlled industrial waste disposal contractors and installers of industrial waste disposal facilities (which will hereinafter be referred to as "industrial waste collection and transportation contractors or the

like" in this Article) when it is judged to be needed that prefectural governors to take an appropriate action against that industrial waste collection and transportation contractors or the like because there are good reasons to suspect that there are cases applying to b. to f. of Item 2) of Paragraph 3 of Article 14.

(Inquiry to Administrative Organs Concerned or the like)

Article 23-5

Prefectural governors may inquire for or ask for the corporation on administrative works specified by this Law besides those specified by Article 23-3 to administrative organs or local governments which are concerned.

(Request for Reexamination)

Article 24

A person who is dissatisfied with the decision of the request for reexamination of the disposition (limited to those relating to the Item 1) statutory commissioned administrative service specified by Article 24-4) made by the mayor of a municipality or special ward having public health centers installed according to the provisions of this Law, may file a request for reexamination with the Minister of the Environment.

(Fee)

Article 24-2

A person applying for the acknowledgment prescribed in Paragraph 1 of Article 10 (or applying for it under Paragraph 1 of Article 15-4-5) and one applying for the permission prescribed in Paragraph 1 of Article 15-4-3 shall pay a fee fixed by a Cabinet Order in accordance with the actual cost.

(Execution of Administrative Works by the Minister of the Environment under Emergency)

Article 24-3

- 1 The administrative works given to the prefectural governors as their authorities specified by Paragraph 1 of Article 18 or Paragraph 1 of Article 19 (limited to those relating to municipal solid waste disposal facilities) shall be conducted by the Minister of the Environment or prefectural governors when the Minister of the Environment recognizes that they are necessary for conservation of the living environment. In this case, the provisions relating to prefectural governors (limited to those relating to the said administrative works) under this Law shall be applicable to the Minister of the Environment as those relating to the said Minister.
- 2 In the case specified by the preceding Paragraph, when the Minister of the Environment or prefectural governors conduct the said administrative works, they shall cooperate closely each other to do so.

(Division of Administrative Works)

Article 24-4

Administrative works to be conducted by prefectures, municipalities or special wards having public health centers installed under the provisions of Paragraph 6 of Article 12-3, Paragraph 8 of Article 12-5, Article 12-6, Paragraphs 1 and 6 of Article 14 (including the cases applied in Paragraph 2 of Article 14-2), Paragraph 1 of Article 14-2, Paragraph 3 of Article 7-2 which is applied in Paragraph 3 of Article 14-2, Article 14-3 (including the cases applied in Article 14-6), Paragraphs 1, Paragraph 3 (including the cases applied in Paragraph 2 of Article 14-5), Paragraph 4 and Paragraph 6 (including the cases applied in Paragraph 2 of Article 14-5) of Article 14-4, Paragraph 1 of Article 14-5, Paragraph 3 of Article 7-2 which is applied in Paragraph 3 of Article 14-5, Paragraph 1 of Article 15, Paragraphs 4 to 6 of Article 15 (including the cases applied in Paragraph 2 of Article 15-2-4), Paragraphs 1 to 3 (including the cases applied in Paragraph 2 of Article 15-2-4) and Paragraph 5 of 15-2, Paragraph 4 of Article 8-5 which is applied in Article 15-2-3, Paragraph 1 of Article 15-2-4, Paragraphs 3 to 5 of Article 9, which are applied in Paragraph 3 of Article 15-2-4, Article 15-3, Paragraphs 1 and 2 of Article 9-5, Article 9-6 and Paragraph 2 of Article 9-7 which are applied in Article 15-4, Paragraph 1 of Article 18 (limited to the cases relating to industrial waste or industrial waste disposal facilities), Paragraph 1 of Article 19 (limited to the cases relating to industrial waste or industrial waste disposal facilities), Article 19-3 (limited to the cases relating to Item 2), Paragraphs 1 of Article 19-5, Paragraph 2 of Article 19-4 which is applied in Paragraph 2 of Article 19-5, Paragraphs 1 of Article 19-6, Paragraph 2 of Article 19-4 which is applied in Paragraph 2 of Article 19-6, Article 23-3 and Article 23-4, shall fall under the Item 1) statutory commissioned administrative service specified in Item 1) of Paragraph 9 of Article 2 of the Local Autonomy Law.

(Process Measures)

Article 24-5

When an order is decided on, improved or abolished in accordance with this Law, the order may, within the limits reasonable and necessary for that decision, improvement or abolishment, prescribe certain process measures (including process measures regarding punishment).

CHAPTER V PENAL REGULATIONS

Article 25

A person described in any of Items of this Article shall be imprisoned for five years or less or fined 10,000,000 yen or less, or subjected to both of these punishments.

- 1) One who undertakes as a service the collection and transport or disposal of municipal solid waste or industrial waste in violation of Paragraph 1 or 4 of Article 7, Paragraph 1 or 4 of Article 14 or Paragraph 1 or 4 of Article 14-4.
- 2) One who undertakes as a service the collection and transport or disposal of municipal solid waste or industrial waste in violation of Paragraph 1 of Article 7-2, Paragraph 1 of Article 14-2 or Paragraph 1 of Article 14-5.
- 3) One who disobeys the order specified in Article 7-3, Article 14-3 (including the cases applied in Article 14-6), Paragraph 1 of Article 19-4, Paragraph 1 of Article 19-5, or Paragraph 1 of Article 19-6.
- 4) One who commissioned another person to dispose of industrial waste in violation of Paragraph 3 of Article 12 or Paragraph 3 of Article 12-2.
- 5) A person who has had any other person perform the collection or transportation or disposal of municipal solid waste or industrial waste in violation of the provision of Article 7-4, Article 14-3-2 or Article 14-7.
- 6) One who constructs a municipal solid waste or industrial waste disposal facility in violation of Paragraph 1 of Article 8 or Paragraph 1 of Article 15.
- 7) A person who has changed the matters cited in Items 4) through 7) of Paragraph 2 of Article 8 or matters cited in Items 4) through 7) of Paragraph 2 of Article 15 in violation of the provision of Paragraph 1 of Article 9 or Paragraph 1 of Article 15-2-4.
- 8) One who dumps industrial waste in violation of Article 16.

Article 26

A person described in any of Items of this Article shall be imprisoned for three year or less or fined 3,000,000 yen or less, or subjected to both of these punishments.

- 1) One who commissions someone to management and disposal municipal solid waste or industrial waste in violation of Paragraph 10 of Article 7, Paragraph 4 of Article 12, Paragraph 4 of Article 12-2, Paragraph 10 of Article 14 or Paragraph 10 of Article 14-4.
- 2) One who disobeys the order specified in Article 9-2, Article 15-3 or Article 19-3.
- 3) A person to whom municipal solid waste disposal facilities or industrial waste disposal facilities were transferred or borrowed in violation of Paragraph 1 of Article 9-5 (including the cases applied in Article 15-4).
- 4) A person who exported municipal solid waste or industrial waste in violation of Paragraph 1 of Article 10 (including the cases applied in Paragraph 1 of Article 15-4-5).
- 5) One who is commissioned to to management and disposal industrial waste in violation of Paragraph 9 of Article 14 or 9 of Article 14-4.
- 6) One who imports foreign waste in violation of Paragraph 1 of Article 15-4-3.
- 7) One who violates the conditions attached to the permission under Paragraph 4 of Article 15-4-3.
- 8) One who dumps municipal solid waste in violation of Article 16-2.

Article 27

One who violates Article 13-7 shall be imprisoned for one year or less or fined 500,000 yen or less.

Article 28

One who uses a municipal solid waste or industrial waste disposal facility in violation of Paragraph 5 of Article 8-2 (or the same provision applied in accordance with Paragraph 2 of Article 9) or Paragraph 5 of Article 15-2(or the same provision applied in accordance with Paragraph 2 of Article 15-2-4) shall be imprisoned for six months or less or fined 500,000 yen or less.

Article 29

A person described in any of Items of this Article shall be fined 500,000 yen or less.

- 1) In violation of the provision of Paragraph 1 of Article 12-3 (including the cases applied in Paragraph 2 of Article 15-4-5), the person who did not issue a control manifest, or issued a control manifest without entering the particulars specified by the same Paragraph or with entering the false information.
- 2) In violation of the provision of the former part of Paragraph 2 of Article 12-3, the person who did not send a copy of a control manifest, or sent a copy of a control manifest without entering the particulars specified by the former part of the same Paragraph or with entering the false information.
- 3) In violation of the provision of the latter part of Paragraph 2 of Article 12-3, the person who did not forward a control manifest.
- 4) In violation of the provision of Paragraph 3 or 4 of Article 12-3 or Paragraph 5 of Article 12-5, the person who did not send a copy of a control manifest, or sent a copy of a control manifest without entering the particulars specified by these provisions or with entering the false information.

- 5) In violation of the provision of Paragraph 5 of Article 12-3, the person who did not keep a copy of a control manifest.
- 6) In violation of the provision of Article 12-4, the person who issued a control manifest with entering the false information.
- 7) The person who made the false registration when registering under the provision of Paragraph 1 of Article 12-5.
- 8) In violation of the provision of Paragraph 2 or 3 of Article 12-5, the person who did not report or report the false information.

Article 30

A person described in any of Items 1) to 6) of this Article shall be fined 300,000yen or less:

- 1) One who fails to keep books or enter the prescribed particulars in them in violation of Paragraph 11 of Article 7 (or the same provision applied in accordance with Paragraph 11 of Article 12, Paragraph 12 of Article 12-2, Paragraph 11 of Article 14 or Paragraph 12 of Article 14-4), makes false entries or fails to store the said books in violation of Paragraph 12 of Article 7 (or the same provision applied in accordance with Paragraph 7 of Article 12, Paragraph 8 of Article 12-2 and Paragraph 12 of Article 14-4).
- 2) One who fails to make the report prescribed by Paragraph 3 of Article 7-2 (or the same provision applied in accordance with 3 of Article 14-2 or Paragraph 3 of Article 14-5), 3 of Article 9 (or the same provision applied in accordance with Paragraph 3 of Article 15-2-4), Paragraph 4 of Article 9 (or the same provision applied in accordance with 3 of Article 15-2-4) or Paragraph 2 of Article 9-7 (or the same provision applied in accordance with Article 15-4) or makes a false report. 3) One who fails to record, makes a false record or fails to prepare the said record in violation of Article 8-4(or the same provision applied in accordance with Article 15-2-3).
- 4) One who fails to appoint an industrial waste manager in violation of Paragraph 6 of Article 12 or a specially controlled industrial waste manager in violation of Paragraph 6 of Article 12-2.
- 5) One who fails to make the report (except for the matters concerning the information processing center, the same will apply hereinafter) prescribed by Article 18 or makes a false report.
- 6) One who denies access for the inspection or the collection of samples mentioned in Paragraph 1 or 2 of Article 19, or impedes or avoids the said inspection or sample collecting action.
- 7) One who fails to place technical manager in charge of the technical work in violation of Paragraph 1 of Article 21.

Article 31

When coming under any of the following Items, the officer or personnel of the information processing center or waste management center committing the violating act shall be punished with a fine of 300,000 yen or less.

- 1) When discontinued all of the information processing works without obtaining the permission specified in Article 13-6.
- 2) When failed to provide books or enter in the books or entered false entries in violation of the provision of Article 13-8, or failed to keep the books in violation of the provision of Article 13-8.
- 3) When failed to make the report under the provision of Paragraph 1 of Article 13-9, Paragraph 1 of Article 15-13 or Article 18 or made a false report.
- 4) When refused, obstructed or evaded the inspection under the provision of Paragraph1 of Article 13-9 or Paragraph 1 of Article 15-13.

Article 32

When a representative of a legal parson or an agent, employee or any other worker of a legal parson or an individual did an act violating of the provisions cited in the following Items with respect to the works of the legal parson or individual person, the actual offender shall be punished, and further the legal parson shall have a fine specified in the applicable Item imposed, and the individual person shall have a fine under this Article imposed.

- 1) Item 8) of Article 25 (limited to the cases only relating to industrial waste): A fine of 100,000,000 yen or less.
- 2) Article 25 (except for the cases of the preceding Item), Article 26 or Articles 28 through 30: A fine under this Article.

Article 33

One who attaches the qualification "registered waste recycling business" to his/her own name in violation of Paragraph 3 of Article 20-2 shall be fined 100,000 yen or less.

The Basic Environment Law
Law No.91 of 1993. Effective on November 13, 1993
<http://www.env.go.jp/en/laws/policy/basic/index.html>

- Chapter 1 General Provisions (Articles 1-13)
Chapter 2 Basic Policies for Environmental Conservation
Section 1 Guidelines for Policy Formulation (Article 14)
Section 2 Basic Environment Plan (Article 15)
Section 3 Environmental Quality Standards (Article 16)
Section 4 Environmental Pollution Control in Specific Areas (Articles 17 and 18)
Section 5 Implementation of Policies for Environmental Conservation by the State (Articles 19-31)
Section 6 International Cooperation for Global Environmental Conservation etc. (Articles 32-35)
Section 7 Implementation of Policies by Local Governments (Article 36)
Section 8 Bearing of Costs and Financial Measures (Articles 37-40)
Chapter 3 Environment Council etc.
Section 1 Environment Council (Articles 41-44)
Section 2 Conference on Environmental Pollution Control (Articles 45 and 46)
Supplementary Provision

Chapter I General Provisions

(Purpose)

Article 1

The purpose of this law is to comprehensively and systematically promote policies for environmental conservation to ensure healthy and cultured living for both the present and future generations of the nation as well as to contribute to the welfare of mankind, through articulating the basic principles, clarifying the responsibilities of the State, local governments, corporations and citizens, and prescribing the basic policy considerations for environmental conservation.

(Terminology)

Article 2

- 1 For the purpose of this law, "environmental load" means any adverse effects on the environment generated by human activities which may cause interference with environmental conservation.
- 2 For the purpose of this law, "global environmental conservation" means environmental conservation regarding such phenomena as global warming the ozone layer depletion, marine pollution, decrease in wildlife species and others which are caused by human activities and affect the environment of the entire globe or a large part of it, which contributes to the welfare of mankind as well as to the healthy and cultured living of the people.
- 3 For the purpose of this law, "environmental pollution" ("Kogai" in Japanese) means, among interference with environmental conservation, air pollution, water pollution (including a deterioration of water's unadulterated state other than the water quality and the quality of the bottom. The same shall apply hereinafter except for Article I6 Paragraph 1.), soil contamination, noise, vibration, ground subsidence (excluding subsidence caused from land excavation for mineral exploitation. The same shall apply hereinafter.) and offensive odors affecting an extensive area as a result of business and other human activities, which cause damage to human health or the living environment (including property closely related to human life, as well as fauna and flora closely related to human life and their living environment. The same shall apply hereinafter.).

(Enjoyment and Future Success of Environmental Blessings)

Article 3

Environmental conservation shall be conducted appropriately to ensure that the present and future generations of human beings can enjoy the blessings of a healthy and productive environment and that the environment as the foundation of human survival can be preserved into the future, in consideration that preserving the healthy and productive environment is indispensable for healthy and cultured living for the people, and that the environment is maintained by a delicate balance of the ecosystem and forms the foundation of human survival, which is finite in its carrying capacity and presently at risk of being damaged by the environmental load generated by human activities.

(Creation of A Society Ensuring Sustainable Development with Reduced Environmental Load)

Article 4

Environmental conservation shall be promoted so that a society can be formulated where the healthy and productive environment is conserved and sustainable development is ensured by fostering sound economic development with reduced environmental load,

through practices on environmental conservation such as reducing as much as possible the environmental load generated by socio-economic and other activities, which are voluntarily and positively pursued by all the people sharing fair burden; and so that interference with environmental conservation can be anticipatively prevented through enhancing scientific knowledge.

(Active Promotion of Global Environmental Conservation through International Cooperation)

Article 5

Global environmental conservation shall be actively promoted in cooperation with other countries, utilizing Japan's capacities and resources, and in accordance with Japan's standing in the international community, in consideration of the fact that global environmental conservation is a common concern of mankind as well as a requirement in ensuring healthy and cultured living of the people into the future, and that the Japanese economy and society is closely interdependent with the international community.

(Responsibility of the State)

Article 7

The local governments are responsible for formulating and implementing policies with regard to environmental conservation corresponding to national policies and other policies in accordance with the natural and social conditions of the local governments' jurisdiction, pursuant to the basic principles.

(Responsibility of Corporations)

Article 8

- 1 In conducting business activities, corporations are responsible for taking necessary measures to prevent environmental pollution, such as the treatment of smoke and soot, polluted water and wastes, etc. resulting from their activities, and to properly conserve the natural environment, pursuant to the basic principles.
- 2 In manufacturing, processing or selling products, or engaging in other business activities, corporations are responsible for taking necessary measures for ensuring proper disposal of the wastes generated from products and other goods related to their activities, so as to prevent interference with environmental conservation, pursuant to the basic principles.
- 3 Besides the responsibilities prescribed in the preceding two Paragraphs, in manufacturing, processing or selling products, or engaging in other business activities, corporations are responsible for making efforts to reduce the environmental loads resulting from the use or disposal of the products and other goods related to their activities; and for making effort to use recyclable resources and other materials and services which contribute to reducing the environmental loads in their activities, so as to prevent interference with environmental conservation, pursuant to the basic principles.
- 4 Besides the responsibilities prescribed in the preceding three Paragraphs, corporations are responsible for making voluntary efforts to conserve the environment such as reduction of the environmental loads in the course of their business activities; and for cooperating with the policies implemented by the State or local governments with regard to environmental conservation, pursuant to the basic principles.

(Responsibility of Citizens)

Article 9

- 1 Citizens shall make efforts to reduce the environmental loads associated with their daily lives so as to prevent interference with environmental conservation, pursuant to the basic principles.
- 2 Besides the responsibility prescribed in the preceding Paragraph, citizens are responsible for making efforts to conserve the environment and for cooperating with the policies implemented by the State or local governments with regard to environmental conservation, pursuant to the basic principles.

(Environment Day)

Article 10

- 1 In order to promote awareness and understanding of environmental conservation among corporations and the people, and to encourage willingness to pursue activities related to environmental conservation, there shall be designated the Environment Day.
- 2 The Environment Day shall be June 5th.
- 3 The State and local governments shall make efforts to carry out events which support the spirit and objective of the Environment Day.

(Legislative Measures etc.)

Article 11

The Government shall take legislative, financial and other measures required to implement the policies with regard to environmental conservation.

(Annual Report)

Article 12

- 1 The Government shall submit annually to the Diet a report on the state of the environment and the policies implemented with regard to environmental conservation.
- 2 The Government shall make and submit annually to the Diet a document explaining the policies the Government is going to implement considering the State of the environment as described in the report in the preceding Paragraph.

(Prevention of Air Pollution and the like by Radioactive Substances)

Article 13

The measures to prevent air pollution, water pollution and soil contamination caused by radioactive substances shall be implemented under the Atomic Energy Basic Law (Law No.186 of 1955) and other related legislation.

Chapter II Basic Policies for Environmental Conservation

Section 1 Guidelines for Policy Formulation

Article 14

The formulation and implementation of the policies for environmental conservation set forth in this chapter shall be administered comprehensively and systematically, coordinating the various measures, pursuant to the basic principles and aiming at ensuring the following objectives.

- 1) To maintain natural elements of the environment such as air, water and soil in good condition so as to protect human health, to conserve the living environment and to properly preserve the natural environment.
- 2) To protect the biodiversity such as the diversity of ecosystems and wildlife species, and to orderly conserve the various features of natural environment such as in the forest, farmlands and waterside areas in accordance with the natural and social conditions of the area.
- 3) To maintain rich and harmonious contacts between people and nature.

Section 2 Basic Environment Plan

Article 15

- 1 The Government shall establish a basic plan with regard to environmental conservation (hereinafter referred to as the " Basic Environment Plan") in order to comprehensively and systematically promote the policies for environmental conservation.
- 2 The Basic Environment Plan shall stipulate the following matters.
 - 1) The outline of the comprehensive and long-term policies for environmental conservation
 - 2) Besides the preceding matter, the matters required to comprehensively and systematically promote the policies for environmental conservation
 - 3) The Prime Minister shall formulate a draft of the Basic Environment Plan and ask the Cabinet for its decision, after hearing the opinion of the Central Environment Council.
 - 4) The Prime Minister shall promulgate the Basic Environment Plan without delay when the Cabinet has made its decision in accordance with the preceding Paragraph.5. The preceding two Paragraphs shall apply mutatis mutandis to changes of the Basic Environment Plan.
 - 5) The preceding two Paragraphs shall apply mutatis mutandis to changes of the Basic Environment Plan.

Section 3 Environmental Quality Standards

Article 16

- 1 With regard to the environmental conditions related to air pollution, water pollution, soil contamination and noise, the Government shall respectively establish environmental quality Standards, the maintenance of which is desirable for the protection of human health and the conservation of the living environment.
- 2 In the event that the standards referred to in the preceding Paragraph establish more than one category and stipulate that land or water areas to which those categories are to be applied should be designated, the Government may delegate to the prefectural governors concerned the authority to designate those land or water areas, in accordance with Cabinet Order.

- 3 With regard to the standards set forth in Paragraph 1, due scientific consideration shall always be given and such standards shall be revised whenever necessary.
- 4 The Government shall make efforts to attain the standard provided for in Paragraph 1 by comprehensively and effectively implementing policies concerning environmental pollution control which are set forth in this chapter (hereinafter referred to as the "environmental pollution control policies").

**Section 4 Environmental Pollution Control in Specific Areas
(Formulation of Environmental Pollution Control Program)**

Article 17

- 1 The Prime Minister shall instruct the prefectural governors concerned to formulate programs on measures for environmental pollution control (hereinafter referred to as the "Environmental Pollution Control Program"), concerning areas specified as either of the following categories, by presenting the basic directions of the environmental pollution control policies to be implemented in those areas.
 - 1) Areas where environmental pollution is currently serious and where it is recognized that it is very difficult to prevent environmental pollution unless the environmental pollution control policies are comprehensively implemented.
 - 2) Areas where environmental pollution is likely to become serious due to the rapidly increasing concentration of population, industry etc., and where it is recognized that it will be very difficult to prevent environmental pollution unless the environmental pollution control policies are comprehensively implemented.
- 2 The basic directions provided for in the preceding Paragraph shall be formulated on the basis of the Basic Environment Plan.
- 3 When the prefectural governor concerned has received the instruction provided for in Paragraph 1, he/she shall formulate an Environmental Pollution Control Program in accordance with the basic directions provided for in the same Paragraph and shall submit it to the Prime Minister for his/her approval.
- 4 Prior to issuing the instruction under Paragraph 1 or giving the approval required under the preceding Paragraph, the Prime Minister shall ask the Conference on Environmental Pollution Control for its decision.
- 5 Prior to issuing the instruction under Paragraph 1, the Prime Minister shall hear the opinions of the prefectural governors concerned.

(Promotion of Attainment of Environmental Pollution Control Program)

Article 18

The State and local governments shall make efforts to take measures necessary for the attainment of the Environmental Pollution Control Programs.

**Section 5 Implementation of Policies for Environmental Conservation by the State
(Consideration in Formulation of Policies by the State)**

Article 19

The State shall consider environmental conservation when formulating and implementing policies which are deemed to influence the environment.

(Promotion of Environmental Impact Assessment)

Article 20

The State shall take necessary measures to ensure that, when corporations are engaged in alteration of land shape, construction of new structures and other similar activities, they will conduct in advance, surveys, forecasts or evaluations of the environmental impact of such activities and will give proper consideration to environmental conservation based on the results of them.

(Regulations to Prevent Interference with Environmental Conservation)

Article 21

- 1 The Government shall take the following regulatory measures to prevent interference with environmental conservation.
 - 1) Regulatory measures necessary to prevent environmental pollution, inter alia, by setting the Standards with which corporations must comply regarding such activities as emission of substances causing air pollution, water pollution, soil contamination or offensive odors; generation of noise or vibration; and the taking of underground water causing ground subsidence.
 - 2) Regulatory measures necessary to prevent environmental pollution with regard to land use and construction of facilities causing

pollution in an area where the pollution is serious or is likely to become serious.

- 3) Regulatory measures necessary to prevent interference with appropriate conservation of the natural environment regarding activities which may cause those interference, such as alteration of land shape, construction of new structures, cutting of trees and other activities in areas where conservation of the natural environment is especially required.
 - 4) Regulatory measures necessary to prevent interference with appropriate protection of natural objects with regard to such activities as capturing collecting, damaging which may cause those interference as to natural objects necessary to be protected such as the wildlife, geographical and geological features of land or sources of hot springs.
 - 5) Regulatory measures necessary to prevent both environmental pollution and interference with conservation of the natural environment where both of them occur or may occur.
- 2 Besides the regulatory measures provided for in the preceding Paragraph, the State shall make efforts to take necessary regulatory measures similar to Subparagraph 1 and 2 of the preceding Paragraph, in order to prevent interference with environmental conservation with regard to human health and the living environment.

(Economic Measures to Prevent Interference with Environmental Conservation)

Article 22

- 1 In order to encourage persons who are conducting the activities generating or causing to generate environmental load (referred to as the "load activities" in this Article) to take appropriate measures such as introduction of facilities which reduce the environmental load, and thus to prevent interference with environmental conservation, the State shall make efforts to take necessary measures to provide necessary and appropriate economic assistance to those persons taking into consideration their economic situation.
- 2 In consideration of the fact that the measures, which aim at encouraging persons who are conducting the load activities to undertake voluntarily to reduce the environmental load by means of imposing appropriate and equitable economic surcharges on them, are expected to be effective in preventing interference with environmental conservation, and that such measures are internationally recommended; the State shall appropriately conduct surveys and researches on the effectiveness of implementing such measures with regard to prevention of interference with environmental conservation and on the effects of such measures on Japanese economy; and should it be deemed necessary to implement such measures, the State shall make efforts to acquire the understanding and cooperation of tile people with regard to utilization of such measures to prevent interference with environmental conservation. In this case, should such measures be implemented for global environmental conservation, the State shall consider international collaboration so as to appropriately ensure the effectiveness of such measures.

Article 23

(Promotion of Construction of Facilities and Other Projects for Environmental Conservation)

- 1 The State shall take necessary measures to promote projects for prevention of interference with environmental conservation, i.e. construction of public facilities such as buffer zones, and other projects such as dredging of sludge and protection and breeding of the endangered wildlife.
- 2 The State shall take necessary measures to promote projects which contribute to prevent interference with environmental conservation, i.e. the construction public facilities such as sewerage, public waste disposal facilities, traffic facilities (including transportation facilities) which contribute to reduce the environmental load, and other projects such as improvement of forests.
- 3 The State shall take necessary measures to promote projects for appropriate improvement and sound use of the natural environment, including such public facilities as parks and green areas.
- 4 The State shall take necessary measures to promote appropriate use of the public facilities provided for in the preceding two Paragraphs and other measures to increase the function of environmental conservation with regard to these facilities.

(Promotion of Use of Products Contributing to Reduction of Environmental Load)

Article 24

- 1 The State shall take necessary measures such as providing corporations with technical assistance so that, in manufacturing, processing or selling products, or engaging in other business activities, they can appropriately consider the reduction of the environmental load associated with products and other goods, by voluntarily assessing in advance the environmental load generated by the use or disposal of the products and other goods.
- 2 The State shall take necessary measures to encourage use of recyclable resources and other materials, products and services which contribute to the reduction of environmental load.

(Education and Learning on Environmental Conservation)

Article 25

The State shall take necessary measures to increase corporations' and citizens' understanding of environmental conservation and to encourage their willingness to engage in activities related to environmental conservation, by means of promoting environmental education and learning and improving public relations activities with regard to environmental conservation.

(Measures to Promote Voluntary Activities by Private Organizations)

Article 26

The State shall take necessary measures to promote voluntary activities with regard to environmental conservation such as tree planting and the recovery of recyclable resources conducted by corporations, citizens or private bodies organized by these entities (hereinafter referred to as the "private bodies etc.").

(Provision of Information)

Article 27

The State shall make efforts to appropriately provide necessary information on environmental conservation including the state of the environment, so as to promote the education and learning provided for in Article 25 and to contribute to the activities voluntarily conducted by the private bodies etc. provided for in the preceding Article, in consideration of the protection of the rights and benefits of individuals and legal entities.

(Implementation of Researches)

Article 28

The State shall conduct surveys on the state of the environment, researches on forecast of environmental changes and other studies for formulation of policies with regard to environmental conservation.

(Improvement in Systems for Monitoring and Others)

Article 29

The State shall make efforts to establish systems of monitoring, patrolling, observations, measurements, examinations and inspections in order to ascertain the state of the environment and to properly implement the policies with regard to environmental conservation.

(Promotion of Science and Technology)

Article 30

- 1 The State shall promote science and technology with regard to understanding of the mechanisms of environmental changes, reduction of environmental load, development of methods to evaluate comprehensively both the effects on the environment caused by the economy and the blessings on the economy derived from the environment, and other science and technology with regard to environmental conservation.
- 2 In order to promote science and technology with regard to environmental conservation, the State shall establish research systems, promote research and development, disseminate the results of research and development, train researchers, and take other necessary measures.

(Settlement of Environmental Pollution Disputes and Relief of Damage)

Article 31

- 1 The State shall take necessary measures to effectively implement mediation, arbitration, etc. with regard to disputes related to environmental pollution, and take other necessary measures to smoothly resolve problems arising from environmental pollution.
- 2 The State shall take necessary measures to smoothly implement measures for relieving the damage caused by environmental pollution.

Section 6 International Cooperation for Global Environmental Conservation etc.

(International Cooperation for Global Environmental Conservation etc.)

Article 32

- 1 The State shall make efforts to take necessary measures to secure international collaboration for global environmental conservation and to promote other international cooperation for global environmental conservation; and to assist conservation of the environment in developing regions and the environmental features being recognized of its international value, which contribute to both the welfare of mankind and the healthy and cultured living of the Japanese people (referred to as the "environmental conservation in developing regions etc." in this Article) and to promote other international cooperation for environmental conservation in developing regions etc.

- 2 The State shall make efforts to take necessary measures to smoothly promote international cooperation with regard to both global environmental conservation and environmental conservation in developing regions etc. (hereinafter referred to as the "global environmental conservation etc."), including training experts on the international cooperation with regard to global environmental Conservation etc., and the collection, arrangement and analysis of information on global environmental conservation etc. e.g. the state of the environment in areas outside Japan.

(Ensuring International Cooperation for Monitoring, Observation and Others)

Article 33

The State shall make efforts to ensure international collaboration so as to effectively promote the monitoring, observation and measurement of the environmental situation with regard to global environmental conservation etc. It shall also make efforts to promote international cooperation to carry out surveys, examinations and researches with regard to global environmental conservation etc.

(Measures to Promote Activities by Local Governments and Private Organizations)

Article 34

- 1 In consideration of importance of the roles played by local governments in promoting international cooperation with regard to global environmental conservation etc., the State shall make efforts to take necessary measures e.g. providing information, to promote such activities by local governments for international cooperation.
- 2 In consideration of the importance of voluntary activities conducted by private bodies etc. outside Japan for the international cooperation with regard to global environmental conservation etc., the State shall make efforts to take necessary measures e.g. providing information, to promote such activities by private bodies etc.

(Considerations in Implementation of International Cooperation and Others)

Article 35

- 1 The State, in implementing international cooperation, shall make efforts to consider global environmental conservation etc. in the areas where the international cooperation is implemented.
- 2 The State shall make efforts to take necessary measures e.g. providing information to corporations, so that the corporations can properly consider global environmental conservation etc. in the areas outside Japan where these corporations conduct their business activities.

Section 7 Implementation of Policies by Local Governments

Article 36

Local governments shall comprehensively and systematically implement and promote policies corresponding to the national policies provided for in Section 5 and other policies necessary for environmental conservation in accordance with the natural and social conditions of the local governments' jurisdiction. In this case, the prefecture shall mainly implement the policies for a large area and comprehensively coordinate the policies administered by the municipalities.

Section 8 Cost Bearing and Financial Measures

(Cost Bearing by Causers)

Article 37

The State and local governments shall take necessary measures to ensure that, when the State, local governments or their equivalents (referred to as the "public corporation entities" in this Article) implement a project which is deemed necessary and appropriate in order to prevent environmental pollution or interference with conservation of the natural environment (referred to as the "interference related to environmental pollution etc." in this Article) considering the necessity of prompt prevention of the interference, the scale of the project and other circumstances, persons who have caused the circumstances necessitating the project are required to bear appropriate and equitable share of the entire or a part of the expenses to implement the project, upon recognizing it is appropriate to make them bear the cost taking into account the extent of interference related to environmental pollution etc. caused by and the degree of responsibility attributed to their activities.

(Cost Bearing by Beneficiaries)

Article 38

The State and local governments shall take necessary measures to ensure that, when persons receive a special benefit from the implementation of nature conservation projects carried out in areas where conservation of the natural environment is especially required, those persons are required to bear appropriate and equitable share of the entire or a part of the expenses to implement such projects in accordance with the degree of benefit received.

(Financial Measures for Local Governments)

Article 39

The State shall make efforts to take necessary financial measures and other measures with regard to the expenses borne by the local governments to formulate and Implement policies for environmental conservation.

(Cooperation between the State and Local Governments)

Article 40

The State and local governments shall cooperate on implementing policies for environmental conservation.

Chapter III Environment Council etc.

Section 1 Environment Council

(Central Environment Council)

Article 41

- 1 There is hereby established a Central Environment Council (hereinafter referred to as the "Council") in the Environment Agency.
- 2 The Council shall be in charge of the following tasks.
 - 1) To handle the task provided for in Article 15 Paragraph 3 with regard to the Basic Environment Plan.
 - 2) To Study and discuss the basic matters with regard to environmental conservation in response to the consultation by the Prime Minister.
 - 3) To Study and discuss the important matters with regard to environmental conservation in response to the consultation by the Director General of the Environment Agency or other ministers concerned.
 - 4) In addition to the tasks referred to in preceding three subparagraphs, delegated tasks as provided for by other laws and ordinances.
- 3 The Council may submit its opinions to the Prime Minister, the Director General of the Environment Agency or other ministers concerned, with regard to the matters provided for in the preceding paragraph.

(Organization of the Central Environment Council)

Article 42

- 1 The Council shall be comprised of no more than 80 members.
- 2 The Council may designate special members when necessary to Study and discuss specific matters.
- 3 The Council members and special members shall be appointed by the Prime Minister from among academics or those having expertise or experiences with regard to environmental conservation.
- 4 The Council members and special members shall serve on a part-time basis.
- 5 Beside those provided for in the preceding paragraphs, matters necessary for the organization and administration of the Council shall be stipulated by Cabinet Order.

(Prefectural Environment Council)

Article 43

- 1 The prefecture shall establish a Prefectural Environment Council to study and discuss the basic matters and others with regard to environmental conservation within the prefecture's jurisdiction.
- 2 The matters necessary for the organization and administration of the Prefectural Environment Council shall be stipulated by prefectural ordinances.

(Municipal Environment Council)

Article 44

The municipality may establish a Municipal Environment Council, as stipulated by municipal ordinances, to study and discuss the basic matters and others with regard to environmental conservation within the area of the municipality.

**Section 2 Conference on Environmental Pollution Control
(Establishment and Mandates)**

Article 45

- 1 There is hereby established a Conference on Environmental Pollution Control (hereinafter referred to as the "Conference") as a special organization in the Prime Minister's Office.
- 2 The Conference shall perform the following mandates.
 - 1) To deal with matters provided for in Article 17 Paragraph 4 with regard to the Environmental Pollution Control Program.
 - 2) In addition to the task referred to in the preceding subparagraph, to discuss the planning of basic and comprehensive policies for environmental pollution control and promote the implementation of such policies.
 - 3) In addition to the tasks referred to in preceding two subparagraphs, delegated tasks as provided for by other laws and cabinet orders.

(Organization etc.)

Article 46

- 1 The Conference is comprised of a chairman and Conference members.
- 2 The Prime Minister shall be the chairman.
- 3 Members shall be appointed by the Prime Minister from among the heads of the ministries and agencies concerned.
- 4 There shall be secretaries of the Conference.
- 5 Secretaries shall be appointed by the Prime Minister from among officials of the ministries and agencies concerned.
- 6 Secretaries shall assist the chairman and members in dealing with mandates of the Conference.
- 7 The administrative work of the Conference shall be handled by the Environment Agency.
- 8 Besides those provided for in the preceding paragraphs, matters necessary for organization and operation of the Conference shall be provided for by Cabinet Order.

Supplementary Provision

This law shall enter into force on the day of its promulgation except for the provisions of Articles 43 and 44, which shall enter into force on the day stipulated by Cabinet Order within a year since the promulgation of this law.

The Fifth Basic Environment Plan
(Cabinet decision on April 17, 2018)

https://www.env.go.jp/policy/kihon_keikaku/plan/plan_5.html
https://www.env.go.jp/policy/kihon_keikaku/plan/plan_5/attach/ref_en-01.pdf

Original Japanese

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Introduction

Japan is fast becoming a society marked by a decreasing birthrate and rapidly aging demographics, leading to an overall population decline. In addition, there is continuing internal migration mainly among young people from rural to urban areas, which has resulted in an uneven population distribution across different regions of the country, with a sharp drop in rural areas particularly among young people and those of working age. This has had a serious impact on efforts to conserve the environment. For example, a decrease in the number of farmers and foresters has resulted in a greater amount of abandoned cultivated land and forests without

sound management, leading generally to a deterioration of biodiversity and ecosystem services. In this way, environmental, economic and social challenges are inseparably linked, and are set to become ever-more complex.

Turning our attention to the international community, 2015 witnessed the most major environmental developments to take place since the year 2012, when Japan's Fourth Basic Environment Plan was formulated. Reflecting the global environmental crises, countries quickly adopted the "2030 Agenda for Sustainable Development" which incorporates the Sustainable Development Goals (SDGs), and the "Paris Agreement". Indeed, 2015 could be considered as a turning point in international environmental diplomacy. With the entry into force of the Paris Agreement, the global community has steered major efforts towards building a carbon-neutral society, and ESG (Environment, Society and Governance) investment has become a major international trend. Thus, now is the time to start moving towards a new civilized society, with a major shift in our basic thinking (paradigm shift).

This is the first Basic Environment Plan prepared after the adoption of the SDGs and the Paris Agreement. Recognizing this, the Plan should appropriately respond to these new international developments as well as to changing domestic situations. In doing so, it is important to utilize the concepts of SDGs by addressing multiple issues in an integrated manner. It is particularly important to recognize that the basic approach adopted in this Plan is different from that adopted previously. In the previous plans, priorities were set separately in each of the environmental fields with a focus upon directly addressing specific environmental issues. This Plan, on the other hand, sets up six interdisciplinary cross-cutting strategies, such as specific measures to solve several different issues in a complementary manner. By doing so, this Plan aims to adopt and embody the basic approach of the "Integrated Improvements on Environment, Economy and Society (I2ES)" proposed in the Third Basic Environment Plan. Even though at first glance they might be considered unrelated to the environment, quite a few activities actually have considerable environmental dimensions, such as efficient use of resources and pursuit of a low carbon emissions pathway. Making stakeholders more clearly aware of the usefulness of this approach could greatly contribute to further dissemination of I2ES. This is indeed one of the intended roles that this Plan should play.

Going forward, environmental policies will be required to create innovations across all perspectives including those concerning socio-economic systems, lifestyles, as well as technologies. Future policies have to be effective in addressing relevant environmental issues to the fullest extent. Furthermore, they should be designed so as to bring about synergistic effects that contribute to solving economic and social challenges concerned simultaneously (i.e. simultaneous solutions), drawing upon interlinkages that exist among different challenges. These will open up "new avenues for growth" that ensure quality of life is maintained into the future.

The momentum has already started to build. Even in rural areas that are most seriously affected by current economic and social problems, there are a few local governments, business entities, and nongovernment organizations that are revitalizing their areas by applying creative thinking and sustainably utilizing rich natural resources. The government is required to find out about these emerging efforts and to share their innovative practices among all stakeholders concerned, which will contribute to realizing I2ES throughout Japan.

The key to achieving I2ES is to first form a self-reliant and decentralized society in tune with local needs, and then have various elements complement each other among neighboring communities making use of available regional resources. This concept could be called the "Circulating and Ecological Economy" and it will be an effective concept to maximize the potential of each region across Japan, making use of the wide range of resources found in mountainous, agricultural and fishing villages as well as in cities. Regions across Japan are certainly facing difficult challenges arising from declining populations, falling birthrates, and aging demographics, on the one hand, yet these regions are also endowed with various resources such as beautiful natural landscapes. As such, local communities can serve as effective models for achieving I2ES. Ultimately, it is essential to maximize the sustainable use of regional resources.

New environmental policies are required to contribute to international communities as well as to respond to national challenges. Japan has a great deal of experience in overcoming serious problems concerning pollution. In addition, Japan has successfully developed and implemented advanced technologies for energy saving and resource efficiency. Furthermore, it embodies traditional wisdom such as the "Mottainai" spirit and harbors a long history of living in harmony with nature. With the exacerbation of environmental problems on a global scale, Japan's advanced environmental technologies and infrastructures, underlying ideas, systems, and human resources together provide an exemplary model for improving the state of the global environment.

For Circulating and Ecological Economy to be reliably put into practice, it will become increasingly important to forge partnerships with a wide range of stakeholders. This will enable us to provide various viewpoints, which will lead to the development of human resources to realize I2ES. In other words, enhancing and strengthening partnerships can nurture relevant human resources.

By way of illustration, environmental policy as a whole can be considered as a tree, with priority strategies representing its "flowers" and the "environmental policies to support priority strategies" making up its "trunk" and "roots". Without a trunk and roots, the tree

will not bloom and only when the flowers bloom will the tree bear fruit for future generations. Just as the roots and trunk of a tree form the main support, it is vital to steadily advance environmental policies to support priority strategies.

Certain progress has been made towards restoration following the Great East Japan Earthquake, including through decontamination and reconstruction of infrastructure. However, overall restoration is still only half completed. Remaining challenges include safe handling of contaminated soils produced by decontamination and radioactive wastes generated by the accident. All government agencies must conduct concerted efforts to continue addressing these remaining issues. It is also a matter of urgency to make Japan fully resilient against potential large-scale natural disasters such as earthquakes centered directly within Tokyo as well as those caused by the Nankai Trough.

Over the course of humankind's coexistence with nature, we have built up knowledge and perspective on how to thrive on this planet. We need to make full use of this capacity in conjunction with information and communication technologies (ICTs) and other modern science and technologies, thereby ensuring minimal environmental impacts even as Japan's economy grows. Environmental impacts can be kept to a minimum in three ways: (i) "circulation" of materials and natural resources, (ii) "symbiosis" between nature and human beings, as well as "symbiosis" between regions through maintenance and rehabilitation of sound ecosystems, and (iii) realization of "low carbon" societies through various measures including those mentioned above. This kind of circulation and symbiosis based society ("Environmental and Life Centered Civilized Society") stands to provide the image of a sustainable society that Japan can aim for.

Based on the Basic Environment Act enacted in 1993, and taking into consideration the overall developments accumulated over the previous four basic plans, this Plan will describe ideas and measures to further develop sustainable societies as mentioned above.

We hope that this Plan will serve as a guide on future directions not only for the government but also for all various stakeholders concerned.

Part 1 Environmental, economic and social conditions and direction of development of environmental policies

Chapter 1 Current state of environment, economy, and society, and recognition of challenges

Japan is now faced with complex crises and challenges related to all three areas of environment, economy, and society.

With its declining birthrate and aging population, it is inevitable that the total population of the country will continue to drop over the coming decades. In addition to this, migration from rural to urban areas, particularly of young people, has accelerated the uneven distribution of Japan's population across its various regions. Consequently, the numbers of young people and those of working age are rapidly dwindling in rural areas. These demographic changes have weakened local communities and in turn have become obstacles to delivering effective administrative services by local governments. The changes have seriously affected various administrative sectors of certain localities, including local environmental conservation efforts. For example, the decrease in the labor market for agricultural and forestry workers has resulted in a surplus of abandoned uncultivated land, and forests without sound management are increasing. Similarly, agricultural and other damage caused by unmanaged wildlife is becoming worse due to a decrease in hunters and so on. In such areas, vulnerability to natural disasters is rising, abundant nature such as Satochi-Satoyama (socio-ecological production landscapes) is being lost, and diverse wildlife and associated rich cultures are being put at stake.

The Great East Japan Earthquake in March 2011 and the subsequent accidents at TEPCO's Fukushima Daiichi Nuclear Power Plant, brought about enormous human, physical and economic damage. The disaster brought into sharp relief the inflexibility of centralized and large-scale energy supply systems. At the same time, the disaster also drew attention to the potential of localized energy systems in effectively complementing major infrastructure. In affected areas, a certain amount of progress has been made to restore the region through decontamination and reconstruction of infrastructure. However, overall restoration is still only half completed. Remaining challenges include safe handling of contaminated soils produced by decontamination and radioactive wastes generated by the accident. Looking at Japan overall, infrastructure which was rapidly constructed during the period of high economic growth is now showing signs of deterioration. Thus, it is also a matter of urgency to make Japan fully resilient against potential large-scale natural disasters such as earthquakes centered directly within Tokyo or those caused by the Nankai Trough.

In contrast to Japan's continued demographic shift, the world's population is increasing, mainly in countries in Africa and other parts of Asia. This will lead to a growth in global demand for natural resources, energy, water and food, which could in turn have major implications for the Japanese economy in the future. Although the Japanese economy has improved in terms of employment and income in recent years, burgeoning economic growth in developing countries has resulted in a reduction of relative presence of the Japanese economy on the international stage. It is important to encourage economic growth to ensure it remains globally competitive. This can be achieved by restructuring the Japanese economy as well as strengthening international competition by enhancing technological innovations such as artificial intelligence (AI) and the Internet of Things (IoT) which are essential parts of

the Fourth Industrial Revolution, together with a substantial increase in inbound tourism.

Bearing all this in mind, global-scale environmental crises are likely to seriously exacerbate the various aforementioned challenges facing Japan.

The "2030 Agenda for Sustainable Development" (hereinafter the "2030 Agenda") adopted at the UN General Assembly in September 2015 has 17 goals and 169 targets¹ as sustainable development goals (SDGs). SDGs include goals related to water and sanitation, energy, sustainable cities, sustainable production and consumption, climate change, terrestrial ecosystems, and marine resources. Some of them are directly related to global environmental issues, while others have indirect but close environmental links. This is understood as a clear reflection of the very real sense of crisis felt by the international community about global environmental sustainability.

Above all, serious and widespread irreversible impacts created by climate change are likely to extend to Japan. For example, there is concern that the risk of natural disasters is likely to be amplified. According to the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report, warming of the climate system is unequivocal. In addition, it has become clear that the world average temperature rise within the range up to 2100 is almost proportionate to cumulative CO₂ emissions from anthropogenic sources. The Paris Agreement, adopted in December 2015 as an international response to climate change, tries to hold the increase in the global average temperature to well below 2 °C, and aims to pursue efforts to limit the temperature increase to 1.5 °C. For this purpose, the Paris

Agreement aims to mitigate anthropogenic greenhouse gas emissions to practically zero (i.e. balancing emissions and removals of anthropogenic greenhouse gases) in the second half of this century. This has become a turning point on the path to building carbon-neutral societies throughout the world² This long-term goal of the Paris Agreement can be achieved by limiting cumulative emissions to less than a certain amount, taking into account the amount of removals by sinks. (The idea that there is a certain upper limit on the anthropogenic cumulative emissions in accordance with removals by sinks is called the "carbon budget"³.)

For this reason, Japan should continue to pursue rapid reductions of greenhouse gases emissions based upon the best available science. In response to the Paris Agreement, Japan formulated the Plan for Global Warming Countermeasures in May 2016⁴. While the amount of emissions in Japan has declined over the past three years, there are a number of factors that may contribute to an increase of these emissions in the future. These include: prolonged shutdown of nuclear power plants; potential expansion of coal-fired power plants; progress of transitioning from ozone depleting substances to hydrofluorocarbons (HFCs) that have no ozone depletion effect but have high global warming potential; and an increase in disposal of refrigerators and air conditioners using refrigerants that have high greenhouse effect including HFCs. There are certainly many challenges to overcome if the target is to be achieved. Japan's carbon productivity⁵ was among the highest in the world until the mid-1990s. However, as a result of steady improvements made by some European countries, Japan's international carbon ranking has declined since around 2000. Currently it is not even close to the top of the list.

In the G7 Leaders' Declaration of the Ise-Shima Summit in 2016, G7 countries committed to formulate ambitious mid-century long-term low greenhouse gas (GHG) emission development strategies well ahead of the 2020 deadline. G7 countries also recognized the importance of providing incentives such as domestic measures and enacting carbon pricing in furthering emission reduction activities. In June 2017, the US announced its withdrawal from the Paris Agreement. Immediately following that, Japan expressed its firm will⁶ to continue to commit to implementation of the Agreement. Countries around the world also reaffirmed their continued commitment. At the G7 Environment Ministers' Meeting, a communique⁷ was adopted, agreed by seven countries including the US.

Footnote

1 The "goal" of SDGs means the ultimate level of achievement at the global level for each of the issues covered by SDGs. On the other hand, the "targets" could be determined by governments, taking into account different situations in each country, keeping accordance with the global level goal concerned. Thus, targets are more detailed so as to include the final achievement level and intermediate levels by specifying the final target year and numerical figures. For example, Goal 12 states "Ensure sustainable consumption and production patterns", while Target 12.3 states "By 2030, halve per capita global food waste at the retail and consumer levels and reduce food losses along production and supply chains, including post-harvest losses."² To achieve the balance between the anthropogenic emissions of greenhouse gases and the removals by sinks in the second half of the century, i.e. carbon neutrality throughout the world

3 Carbon budget is sometimes used in the meaning of "carbon balance" with respect to carbon dioxide levels in the atmosphere.

4 Refer to the Part 2, Chapter 3, Section 1

5 GDP per greenhouse gas emissions. Differences in the industrial structure need to be taken into account when international comparison is made.

6 The official statement of Japan after the announcement of the US withdrawal from the Paris Agreement (Press release made by the Ministry of Foreign Affairs on June 2, 2017)

7 The environmental ministers of the six countries except for the US and the European Commissioner in charge of environment and climate issues reaffirmed the strong commitment to address climate change effectively and urgently and to implement the Paris Agreement rapidly and effectively, which continues to be a worldwide instrument to adapt to climate change impacts. The US decided not to participate in these commitments. However, as a signatory to the United Nations Framework Convention on Climate Change, the US indicated its willingness to continue reducing CO₂ emissions.

At the G20 in July 2017, G20 leaders including the US continued to commit to reducing greenhouse gas emissions including through innovation. In addition, G20 members except for the US reaffirmed a strong commitment to the Agreement, arguing that the accord

cannot be reversed. As observed in several national automobile policies⁸ and energy policies⁹, many developed countries are already pursuing efforts to realize a carbon-neutral society, with even a few developing countries following suit. Private sector efforts are also making good progress. Many private companies have set their own mid- and long-term reduction targets (e.g. Science-Based Targets¹⁰) and are taking measures. In the finance sector, ESG investment (i.e. investment that takes into consideration factors such as Environment, Social and corporate Governance) is expanding, and institutional investors are increasingly viewing environmental performance as one of the key factors for consideration in their investment decisions. Thus, the world has started to steer major efforts towards a carbon-neutral society, triggered by the entry into force of the Paris Agreement. Businesses are also waking up to the fact that it is not only climate change that is a direct risk, but there is also a risk associated with how we deal with the potential impacts of climate change (such as adaptation measures). In addition, changes are likely to spring up in the industrial structure in response to climate change, requiring support for issues such as fair workforce transition, creation of decent work and high quality employment.

Footnote

The global environment has been substantially altered by both uncontrolled developments on a global scale, and by climate change. This has resulted in the continued loss of biodiversity including a decline and loss in various genetic resources. If this trend persists at the current pace, as pointed out by many experts, the global ecosystem may exceed a critical threshold in the near future, which could result in a dramatic loss of biodiversity and a widespread decline of ecosystem services (i.e. various benefits for human beings such as food, water and a stable climate). As a result, the overall welfare of human beings may decline due to mid-to-long-term contractions of global supply, and demand for food and water.

The earth's natural resources are finite, yet demand continues to grow. Environmental impacts associated with mining and waste disposal are increasing. At the same time, there is a concern that mounting resource constraints will impact economic growth. Meanwhile, Japan made great improvements to resource productivity and recycling rates including through the promotion of the 3Rs (Reduce, Reuse and Recycle), which has been successful in reducing the amount of final disposal of waste—even despite the fact that recent progress has not been significant. Ultimately, Japan should further strengthen its efforts to raise resource productivity through the 3Rs, and promote the 3Rs internationally as a matter of priority in the future.

Environmental pollution of air, water, and soil is certainly not a problem that only existed in the past. Marine pollution due to marine litter including microplastics is a serious issue and global pollution due to anthropogenic emissions of mercury and other persistent, highly-accumulating hazardous chemical substances into the environment is becoming more serious. Thus, there is a global concern that human health and ecosystems are seriously affected by the above-mentioned pollution through water, air, and food chains. However, international actions by G7 countries and others to deal with marine litter, and efforts under the Minamata Convention on Mercury which entered into force in August 2017, have only just started. On the domestic front, the achievement of environmental standards in Japan is generally improving over the medium-to-long term, and countermeasures against extreme pollution that occurred nationwide have achieved certain results. Soil contamination by heavy metals, asbestos in buildings, and polychlorinated biphenyl (PCBs) that have yet to be detoxified persist as a negative legacy from the past. Remaining challenges also include atmospheric pollution with fine particulate matters (PM 2.5), and photochemical oxidants. Water pollution caused by eutrophication in enclosed water areas still also poses a problem. These issues should be tackled appropriately, including ensuring proper management of various chemicals from emerging industries, with a view towards protecting public health and living environment.

The explanation thus far points to the overall deteriorating of the environment, which forms the basis for our socio-economic activities. In an effort to objectively evaluate the influence of human activities on the earth's natural systems, some notable research on "planetary boundaries¹¹" has been carried out.

Footnote

⁸ Examples include new policies introduced in UK and France in 2017 to prohibit the sales of gasoline and diesel cars by 2040.

⁹ There was the launch of a coalition for the abolition of coal-fired thermal power plants announced at COP 23 of the UNFCCC, which was led by UK and Canada joined by a few developing countries such as Costa Rica and Fiji.

¹⁰ SBT (Science-Based Targets) aims to set reduction targets consistent with scientific knowledge to achieve the "2 °C target" defined in the Paris Agreement. It is a joint initiative by the World Wildlife Fund (WWF), the Carbon Disclosure Project (CDP), the World Resources Institute (WRI), and the United Nations Global Compact. SBT requires companies to set their greenhouse gas (GHG) target to match the reduction level necessary to maintain global temperature rise below 2 °C as compared to that of the pre-industrial revolution, as described in the 5th Assessment Report (AR 5) of the Intergovernmental Panel on Climate Change (IPCC). Japan announced in the Climate Change Summit held in Paris, France in December 2017, that it would support registration of Japanese companies and aim for certification of 100 companies by March 2020.

¹¹ "Annual Report on the Environment in Japan 2017", Johan Rockström et al. "A safe operating space for humanity".

The research has clearly indicated that human society could continue to develop and prosper, as long as human activities remain within the "safe operating space" of the earth's systems. Yet, the research also underlines that if such thresholds¹² are crossed, irreversible changes may take place, which will totally transform the natural environment on which human beings safely depend. Among the nine environmental factors covered by this research, the extinction rate of species and the circulation of nitrogen and phosphorus are evaluated to be in the high risk area, which is beyond the range of uncertainty. Climate change and land use change have been assessed to extend into the area of uncertainty associated with considerable risk. The research poses an

important question—how will human beings pursue wealth and affluence within the limits determined by the planetary boundaries?

Many of the above-mentioned crises and challenges confronting Japan go well beyond all the usual temporal and spatial ranges, and transcend specific policy areas. In addition, they are intrinsically related to one another, which makes it even more difficult to deal with them effectively. Japan may be seen as an "advanced nation" precisely because it is facing these crises and serious challenges ahead of other countries. One way of dealing with this is to give up trying to think how to solve these problems and become very pessimistic; another way is to learn to live with the problems and simply maintain the status quo. But of course, neither of these are viable options. Rather, we must change our mindset, and only then can we turn these challenges into opportunities.

With the entry into force of the Paris Agreement, the world is steadily steering towards carbon-neutral societies. Potential demand for advanced environmental technologies including those for energy efficiency promoted by Japanese companies, are thus likely to expand significantly. In fact, some Japanese companies have already begun initial efforts towards this end, viewing them as potential new business opportunities. Capitalizing on potential demands for such advanced technologies stands to be a major driving force for the Japanese economy. In Japan, the nation's infrastructure will soon need a comprehensive overhaul and such structural reform can be regarded as an excellent opportunity to render the country more resilient and attractive. As part of this, climate change adaptation and ecosystem-based disaster prevention/reduction¹³ could be more fully incorporated to enhance the effectiveness of such processes. Appropriate utilization of regional resources offers the key to simultaneous achievement of environmental conservation and regional economic revitalization. Meanwhile, many developing countries still face serious air pollution problems as well as rapidly increasing amounts of waste. Japan's wisdom and experience, especially with regard to the technologies it has developed in addressing severe pollution and waste issues in the past, could provide effective ways to solve these problems in developing countries. Taking fully into account the current state of Japan in view of the challenges described above, the Fifth Basic Environment Plan sets out major directions for the development of future environmental policies.

Footnote

Nature, September 24, 2009, Vol 461, and Will Steffen et al.

"Planetary boundaries : Guiding human development on a changing planet", Science, February 13, 2015, Vol347, Issue6223.

¹² At which level the "boundary" should be set is not determined only by natural science knowledge. While natural science provides the basis, social and policy judgments are needed regarding to what extent risks can be tolerated. The boundaries in this study are set with conservative and risk-averse approaches.

¹³ The 3rd United Nations World Conference on Disaster Risk Reduction held in March 2015 adopted the Sendai Framework for Disaster Risk Reduction which recognizes effectiveness of utilizing natural ecosystems for management and reduction of disaster risks.

Chapter 2 Basic concepts for the development of future environmental policies to build a sustainable society

1. What does a future sustainable society look like?

In light of the growing sense of crisis outlined in Chapter 1, modern society is becoming more complex than ever before, with environmental, economic and social aspects very closely linked. If we want to pass on a sound and abundant environment to the next generation, we must ensure that environmental considerations are fully incorporated into socio-economic systems, thereby securing environmental sustainability. The socio-economic systems themselves must also remain sound and sustainable. A sustainable society can only be achieved if actions are undertaken to improve environmental, economic and social aspects in an integrated manner. It is no longer acceptable to pursue economic/social development at the expense of environmental conservation, or to protect the environment by sacrificing economic or social gains. What is needed is to develop a "Win-Win" or synergistic approach that covers all three pillars of sustainable development. Current international trends such as adoption of SDGs, the entry into force of the Paris Agreement, and expansion of ESG investment, indicate that now is the time to enact a major paradigm shift, aimed at ultimately bringing about a new civilized society. Based on this recognition, this Plan presents a broad image of a "sustainable society" to be realized by putting in place the environmental policies set out below.

Following the definition of "sustainable development"¹⁴ proposed by the "UN Commission on Environment and Development" (Brundtland Commission) in 1987, the concept of "sustainable society" has been the basic direction set out in the "Basic Environment Act" (Act No. 91 of 1993) and subsequent Basic Environment Plans. The Fourth Basic Environment Plan (Cabinet decision on April 27, 2012) stated that the ideal sustainable society contains the premise that "the risk to human health and ecosystems is sufficiently reduced and "safety" is secured". The plan then sets out the definition of sustainable society, stating that each of the three environmental challenges, i.e. "low carbon", "circulation" and "harmony with nature", is to be achieved in an integrated manner with the participation of all major stakeholders, thereby ensuring a sound and rich environment from global to local levels. To further develop this definition, the Fifth Basic Environment Plan defines sustainable society as follows.

Footnote

¹⁴ Our Common Future defines "sustainable development" as "meeting the needs of the present without compromising the ability of future generations to meet their own needs."

The environment consists of the "circulation" of elements through photosynthesis and food chains cutting across the atmosphere, water, soil, as well as living creatures, and a delicate balance is maintained between ecological systems. Human beings are part of

this environment. However, economic activities have resulted in the exploitation of resources beyond the earth's environmental capacity. There has also been an excessive impact on the environment from discharged substances. As a result, the delicate equilibrium among ecosystems has been broken. The collapse of this balance is manifested in the form of climate change and loss of biodiversity. Now is the time to make use of the wisdom inherited from our ancestors who lived with natural laws and mechanisms, and take up new challenges to realize a new civilized society. We must strengthen our efforts to proactively drive innovations from all perspectives, thereby transforming society into a sustainable one based on SDGs.

While nature is certainly a source of abundance, it can sometimes result in serious threats to humans. Traditional beliefs in Japan do not oppose nature; rather the Japanese have developed a reverence towards the natural world, adapting and cultivating wisdom to live in harmony with nature. We need to make full use of this traditional knowledge in conjunction with ICTs and other modern science and technologies, thereby ensuring minimal environmental impacts even as Japan's economy grows. Environmental impacts can be kept to a minimum in three ways: (i) "circulation" of materials and natural resources, (ii) "symbiosis" between nature and human beings, as well as "symbiosis" between regions through maintenance and rehabilitation of sound ecosystems, and (iii) realization of "low carbon" societies through various measures including those mentioned above. This kind of circulation and symbiosis based society ("Environmental and Life Centered Civilized Society") provides a vision of a sustainable society that Japan can aim for. This Plan advocates building a "sustainable society" through innovative environmental policies, so that Japan becomes the most "advanced nation to solve modern challenges" ahead of other countries. Based on this future-oriented approach, we will work hard to address the mounting challenges facing Japan.

2. Expected roles of future environmental policies ~ Creating innovations in socio-economic systems, lifestyles, and technologies, and providing simultaneous solutions for economic and social challenges ~

In building a sustainable society, it is important to recognize that a sound and rich environment is the basis for socio-economic activities. There needs to be a transformation in our society so that efforts to promote economic growth and improvement of social infrastructure do not increase environmental burdens.

One important role that future environmental policies can serve is to create innovations across all perspectives including those concerning socio-economic systems, lifestyles, and technologies. Such innovations include incremental improvements of existing goods and services, as well as those that are outside the reach of conventional technologies and systems. For this to be realized, it is first necessary to present a vision of what a sustainable society might look like for society as a whole, then share it among all stakeholders including citizens and businesses. This will hopefully lead to a shared understanding that it is not only relevant to research and development for purposes of promoting future technology innovations, but also to facilitate greater financial investment from business. As such, the following measures are considered critical: provision of incentives to reward early movers of innovation; creation of market demand for environmental conservation; generation of new employment opportunities and equitable systems for transition of the labor market; internalization of externalities by imposing responsibilities on polluters in line with the polluter-pays principle; incorporation of environmental considerations from the planning stage; promotion of environmental awareness through environmental education and Education for Sustainable Development (ESD), as well as introduction of measures to promote partnership with a wide range of stakeholders. Taken together, these measures will contribute to building mechanisms to support more sustainable societies.

Another aim involves maximizing the impacts of future environmental policies. In fact, what is critical for future environmental policies is to contribute to providing solutions to economic and social challenges (hereinafter referred to as "simultaneous solutions"), fully recognizing the ways in which they are linked. Emerging challenges to the environment, economy and society are becoming not only more serious but they are also inter-related. For this reason, policy design must include elements which allows for environmental measures to contribute to addressing economic and social challenges, and at the same time, economic and social measures help in solving environmental issues.

Future environmental policies should create innovations across all perspectives including those concerning economic and social systems, lifestyles, and technologies, and facilitate simultaneous solutions for socio-economic challenges. These could open up "new avenues for growth" that ensure quality of life is maintained into the future.

3. Basic concepts for the development of future environmental policies

(1) Implementation of measures for I2ES

The environmental, economic and social challenges facing Japan now seem to be characterized by certain complexities due to the fact that dominant market trends in other sectors result in impacts on other areas. I2ES should be adopted as a basic approach to

address this complex set of challenges. However, this basic approach is different from those adopted by previous Basic Environment Plans, in which priorities were set separately in each of environmental fields with a focus upon directly addressing specific environmental issues in question. For this reason, this Plan underlines a need to strategically establish a focused, cross-cutting framework that accounts for interlinkages, and enables specific measures to help address various challenges in an integrated manner.

(2) Appropriate responses to international and domestic situations based upon the basic principles and concepts for environmental policies

Internationally agreed frameworks such as the 2030 Agenda and the Paris Agreement are key elements in building sustainable societies. They can take on the attributes of a “catalyst” to fundamentally change the direction of socio-economic activities over the next several decades. Indeed, there is a possibility that major changes such as those observed in the finance sector may affect other sectors in the future. A number of developed countries have already promoted efforts towards a carbon-neutral society, and some developing countries are also making similar efforts. On the other hand, Japan is lagging behind, and its international presence is diminishing. Failure to properly deal with these sustainability challenges may, in the future, affect the reliability and competitiveness of Japanese companies. It has even been pointed out that there is a risk of Japanese companies being excluded from global value chains. Yet, such a crisis also presents a good opportunity to enhance the position in the global value chain, by taking full advantage of Japan’s excellent environmental technologies.

A sustainable society as envisaged by this Plan should incorporate the important points mentioned above. By drawing upon the basic principles and concepts presented in previous Basic Environment Plans, accurately identifying major changes in international and domestic situations, and appropriately reflecting interests of future generations in decision-making, progress can be made to enhance national measures and to strengthen international cooperation.

(3) Utilization of the concepts of "Sustainable Development Goals" (SDGs)

SDGs with their interlinked 17 goals and 169 targets advocate an approach to address multiple challenges in an integrated manner. The SDGs also comprise a multiple-benefit approach, in which one particular measure can generate a positive array of subsidiary returns. The 2030 Agenda also states that "they are integrated and indivisible and balance the three dimensions of sustainable development: the economic, social and environmental." From an environmental perspective, the basic relationship among the goals could be understood as follows: the role of the environment is to function as the foundation, upon which socio-economic activities are carried out on a sustainable basis¹⁵.

Footnote

¹⁵This is basically consistent with the idea presented by the above-mentioned concept of the planetary boundaries. A

Some of the SDGs may seem difficult to achieve together and some of them indicate a relationship of trade-offs. This is why an integrated approach is needed to create synergies. It is, indeed, important to broaden our horizons to consider other goals, which enables us to adopt a win-win approach. We can then pursue "both" objectives with one action simultaneously, as opposed to "either/or".

In addition to the above, the 2030 Agenda outlining the SDGs has also declared the promotion of "allinclusive" partnership, which encourages all stakeholders to participate. It is not appropriate to conduct relevant actions based solely on building upon feasibilities and realities of the existing society. Rather it is important to adopt a "back-casting" approach, by which the image of a future society we seek can guide what we need to do now¹⁶. In other words, we must let the future dictate “our next steps”. These basic concepts underlying SDGs are instrumental in promoting I2ES.

Furthermore, making the SDGs a reality is directly linked to addressing various regional challenges in Japan. Major improvements could be made to a range of regional plans, by using the basic concepts of SDGs, focusing on and fully incorporating local perspectives.

Footnote

remaining question of this research could be to further elaborate how to pursue rich economies and societies under these limits of the earth.

¹⁶ UN Sustainable Development Solutions Network (SDSN), “Getting Started with the SDGs”, December 2015.

Chapter 3 Principles and methods of environmental policy

The following principles should be given full consideration, for successful implementation of the measures to realize a sustainable society elaborated in Chapter 2, as well as priority strategies and their supporting environmental policies also described in Part 2, and the measures listed in the system of environmental protection measures outlined in Part 4.

1. Principles of environmental policy

Environmental efficiency

Sustainable development requires economic development without compromising the integrity of environmental conservation. This translates into a need for efforts to raise "environmental efficiency", i.e. reducing environmental impacts per unit of goods and services generated, thereby avoiding an increase in environmental burdens, despite an increase in wealth or expansion of the economy(decoupling).

Concepts of risk assessment and precautionary approach

Many environmental problems are associated with some scientific uncertainty. Examples include environmental impacts of global warming, and the effects of chemical substances on health and ecosystems. In such cases, environmental risk assessment should be carried out based on the scientific knowledge available at the time, evaluating to what extent a particular issue generates impacts on health and environment, and looking at the probability of such impacts occurring. The next critical step would be to judge the necessity and urgency of countermeasures, taking into account the predetermined acceptable level of risk, and then to set priorities and put countermeasures in place.

Still the fact remains that there will always be some uncertainty left in identifying causes of the problem and in evaluating consequent impacts, and in planning and implementing countermeasures, even if those countermeasures were put in place based on the latest scientific knowledge at that time. However, if no measures are taken because of uncertainty, then once the problem does occur, it may well cause massive damage and incur massive costs associated with countermeasures which then become necessary. The consequences could be long-term or even irreversible.

For this reason, scientific uncertainty should not be the reason for delaying measures to tackle problems that may cause environmental problems. Every effort should be made to enhance scientific knowledge, and preventive measures should be taken based on the "precautionary approach". This fundamental approach has already been adopted in various environmental policies to deal with, among others, global warming, biodiversity conservation, chemical substances, and air pollution. For example, the "Basic Act on Biodiversity" (Act No. 58 of 2008) has provisions supporting the precautionary approach. Many of the international conventions ratified by Japan also include the precautionary approach. This points to a growing need to implement domestic measures based on the precautionary approach. From now on, it will be vital to continue promoting and developing policies underpinned by this approach.

Since the Great East Japan Earthquake, the importance of risk assessment and the precautionary approach has been reaffirmed not only from the disaster prevention point of view, but also from the environmental policy perspective. Indeed, risk assessment should be carried out as objective as possible based upon scientific knowledge, thereby promoting policies that are fully in line with the concept of "environmental risk" and the "precautionary approach".

In order to make policy decisions when there is some level of uncertainty, it is essential to form a consensus with stakeholders and citizens. In that case, all-out efforts should be made to promote communications among stakeholders, and policymakers should hold full accountability.

Even after policy decisions have been made, for example, in the area of biodiversity conservation, regular review should continue for necessary additions and other changes of policy measures in accordance with the adaptive approach, drawing on newly accumulated scientific knowledge.

Polluter-pays principle

The "polluter-pays principle", a standard for allocating environmental expenses, is important to incorporate the cost of environmental measures in the market through pricing, thereby promoting the more rational use of scarce environmental resources. In addition, it should be noted that the polluter-pays principle in Japan has been discussed as a principle of justice and equality that would contribute to bearing the cost of decontamination and relief measures for victims. Corporate management and consumption behavior should be encouraged to take safety and environmental aspects into account by reflecting the cost of preventing environmental pollution caused by accidents and operations in the prices of products and services.

In addition to the above, it is important to utilize the principle of "extended producer responsibility".

This means that producers have certain responsibilities physically and financially until the postconsumption stage in the product life-cycle. We should also apply another principle of "taking measures at pollution source" through, for example, eco-designing and eco-manufacturing so as to minimize the emissions of pollutants and wastes as much as possible from the start.

2. Approaches to implement environmental policies

Based on major environmental policy directions elaborated above, and to find solutions to individual environmental policy

challenges listed in Part 2, it is necessary to prioritize policies, improve cost-effectiveness, and reduce expenses borne by society as a whole. Up until now, various policy approaches such as direct regulation, subsidies, tax incentives, and public awareness raising have been implemented. However, there is still a need for developing new policy approaches, improving existing policy approaches, and expanding the scope of policy application. This is indicated in Chapter 2, Section 5 of the Basic Environment Act. The environmental policy approaches that satisfy specific policy objectives are outlined below.

Direct regulation approach

Direct regulation specifies certain goals and compliance matters to be achieved by society as a whole, then utilizes laws and other control measures to achieve them. It is effective for prevention of environmental pollution and land use control for conservation of natural environment.

Regulatory frameworks approach

This approach intends to achieve regulatory objectives by presenting goals, with mandatory actions and procedures to achieve them. This approach is effective to take preventive or advanced measures to deal with new environmental pollution for which quantitative target setting and specific compliance matters are difficult to set, while making full use of creativity and ingenuity of those subject to regulation.

Economic approach

This approach aims to achieve policy objectives by providing economic incentives to stakeholders so that they take economically rational actions in the market. Specific measures include subsidies, financial support by tax incentives, imposing an economic burden via taxation, emissions trading, and feed-in-tariffs (FIT), among others. This approach is effective for those to whom the command and control measures such as those two mentioned above cannot be applied. This approach utilizes changes in market prices to make stakeholders reduce environmental burdens.

Voluntary approach

This approach seeks to achieve policy objectives by way of encouraging businesses to set voluntary targets for their own actions. It is particularly effective in cases where businesses have widely expressed their commitments to society and their progress is checked by the government, i.e. almost equal to a social commitment. This creates an incentive for technological innovation, and contributes to raising environmental awareness and bringing in environmental education/learning for stakeholders concerned. This approach is expected to be effective in cases where businesses need to deal with complicated environmental problems quickly and flexibly by making full use of their expert knowledge and ingenuity.

Information approach

This approach promotes the disclosure and provision of information on the environmental load of business activities, products and services so that businesses actively engaged in sound environmental practices and producing environmentally friendly goods can be selected for investment and procurement. Publishing environmental reports and demonstrating environmental performance are notable examples, which are expected to be effective in promoting environmental considerations of all stakeholders including suppliers of products and services.

Procedural approach

This approach intends to incorporate procedures and criteria for environmental considerations into the decision-making processes of a particular actor or entity. Examples include Environmental Impact Assessment (EIA), and the Pollutant Release and Transfer Register (PRTR) to require documenting and reporting the amounts of release and transfer of chemical substances in the environment. This approach is considered effective in integrating environmental considerations into actions of each entity.

Action approach

This is an approach to meet policy objectives through direct implementation of necessary actions by public entities, i.e. national and local governments. This contrasts with other approaches mentioned above which intend to exert certain pressure to non-public actors.

In addition to those listed above, the Basic Environment Act also mentions a few other approaches, including measures to promote understanding through environmental education and learning. Applying only one of these approaches proved effective in addressing pollution problems resulting from specific large-scale sources in the past. However, the modern policy challenges are the simultaneous realization of a low carbon and a sound material-cycle society in harmony with nature, moving towards a truly sustainable society, through I2ES. Obviously application of a single policy measure alone cannot be effective to deal with modern challenges. New and innovative policy approaches are needed. Also an appropriate combination of policy options could be made by way of an effective policy mix, taking fully into account nature and characteristics of policy objectives. By doing that, policy packages could be developed to draw on synergies that exist among different policy approaches.

When considering and implementing individual measures according to this Plan, it is necessary to consider an appropriate combination of various policy approaches elaborated above.

Part 2 Putting the environmental policy into action

Part 1 Chapter 1 described the current state of Japan regarding environment, economy and society. This Plan covers environmental measures over the next five years, and specific measures described in Part 2 will be implemented, based upon what should be achieved by 2030 and 2050, as well as the review of the Fourth Basic Environment Plan, keeping in mind SDGs for development targets set for 2030, Japan's mid-term target for greenhouse gas emission reductions by 2030, and the long-term goals of the Paris Agreement set for the second half of this century.

Chapter 1 Concepts of priority strategy setting

1. Establishment of a priority strategy based on the administrative plan for each area

Complex modern challenges can only be tackled by setting a cross-cutting strategy that enables specific measures to address various problems in an integrated manner, keeping in mind that a plan has been in place for each of the major policy areas of the environment.

A sustainable society can only emerge if economic activities shift towards a green economy that enables sustainable production and consumption. Japan's national land is the basis of its socioeconomic activities and it should be ensured that the national land is sustainable and remains resilient against disasters. Furthermore, each region should come up with a solution for its own economic and social challenges by making the best use of local resources. Citizens in urban and rural areas should be more engaged with each other, by preserving the environment closest to them, and forming a space with further reduced environmental risks so that citizens can enjoy lives that are healthy and prosperous.

There needs to be research, development, demonstration and dissemination of environmental technologies supporting Japan's economy, land, community, and way of life. Of course, developing these technologies not only contributes to sustainable development and reduction of the environmental loads on a global scale, it also contributes to the promotion of Japan's environmental businesses. Therefore, it is important for Japan to implement policy measures that contribute to environmental conservation of the planet as a whole.

Bearing the above in mind, this Plan has six priority strategies as listed below:

- (1) Formulation of a green economic system for realizing sustainable production and consumption
- (2) Improvement of value of national land as stock
- (3) Sustainable community development using local resources
- (4) Realization of a healthy and prosperous life
- (5) Development and dissemination of technologies supporting sustainability
- (6) Demonstration of Japan's leadership through international contributions and building strategic partnerships

Each strategy will be elaborated in Chapter 2, while Chapter 3 will explain the measures that support priority strategies in detail.

There is some overlap between the six priority strategies. Rather than strictly separating each strategy, this overlap will enable one policy measure to address more than one priority issue, thereby creating the synergy needed to accelerate the realization of a sustainable society.

Some of the measures are relevant to several priority strategies, but are listed under the one considered most substantially related. Thus, in implementing each of the measures, broad attention needs to be paid to interlinkages that exist between the priority strategies concerned.

2. Enriching and strengthening partnerships

(1) Role of each entity as a prerequisite for partnership

In putting these environmental policies in place, every entity that makes up society should be aware of its own responsibility to the environment. We must realize that addressing environmental measures can bring great benefits for our lives, as well as for regional and corporate management. We must also recognize a major risk will emerge if we neglect or postpone environmental measures. Keeping these in mind, voluntary and proactive efforts are required to reduce environmental loads as much as possible by each entity through understanding the role to be played and the significance of participation in environmental conservation under a fair allocation of responsibilities according to each respective position.

The following points clarify the roles that the government should play in order to enhance and strengthen partnerships, as well as the roles that local governments, businesses, non-government organizations and citizens are expected to perform.

National government

The national government plays a role in promoting comprehensive environmental conservation measures by establishing a framework to encourage participation and close cooperation among national and local governments, businesses, non-government organizations, and citizens with close governmental coordination so that the environment can be conserved through the participation of society as a whole. The national government presents respective goals, directions and roles of all entities for their environmental conservation efforts. The government also creates a foundation to facilitate actions by all entities through a transformation of the overall socio-economic systems and incorporation of environmental considerations in utilization of the national land.

The national government promotes voluntary and proactive efforts by all entities through promotion of environmental education and learning, support for activities of non-government organizations, and provision of information. The government also promotes dialogues among all entities to enable networks and partnerships to be more firmly established.

Furthermore, the national government will proactively and broadly incorporate environmental considerations into its own initiatives.

Local governments

Local governments are key to promoting regional priority strategies and play a major role as promoters of regional environmental conservation as the basis for building a sustainable society. It is the local government that is expected to act as the coordinator for regional actions. Local governments are expected to implement comprehensive environmental conservation measures in the region, working closely with related departments, and in collaboration with local residents, businesses, nongovernment organizations, other local governments and national organizations concerned. Taking the regional characteristics into account, local governments present goals and major directions of various initiatives in the region. Local governments also lay a regional basis by promoting operationalization of various policy systems concerned, as well as developing social infrastructure, and promote actions by each entity

Furthermore, local governments will proactively and broadly incorporate environmental considerations into their own initiatives.

Businesses

Businesses account for a major part of economic activities and as such, businesses play an important role in reducing environmental loads. Businesses are expected to take voluntary and proactive efforts across the entire value chain of products and services. Such efforts could include not only pollution prevention but also efficient use of resources and energy, reduction of wastes, and reduction of environmental loads throughout production to distribution processes.

In particular, businesses are expected to gain new business opportunities for their market expansion by developing new technologies for environmental conservation, as well as promoting environmentally friendly product designs, and devising product distribution processes.

Businesses providing products and services that contribute to environmental conservation play an important role in the creation of a sustainable society with less environmental loads. In fact, their products and services are expected to provide a basis for other entities to implement their respective environmental measures. Therefore, active development is expected. Financial institutions, investors and others are also expected to create a flow of funds for building a sustainable society through environmentally-friendly investment.

Non-government organizations

Non-government organizations set up by citizens and businesses, such as NPOs/NGOs, educational institutions, research institutes, scientific communities, cooperatives, labor unions and others, are involved in a wide range of autonomous and organizational initiatives on environmental conservation. Their activities provide an important contribution to building a basis for efforts to promote environmental conservation. These organizations have a pivotal role in constructing a society in which every entity proactively participates in environmental conservation, featured by well-nuanced efforts such as grassroots activities and private international cooperation.

In addition to carrying out specific environmental conservation activities, non-government organizations are expected to make evaluations on efforts made by public agencies, businesses and individuals, to act as a bridge for conveying information among different entities through, for example, communicating expert information to the public in an easy-to-understand manner, and to offer policy recommendations drawing on their respective expertise.

Educational institutions, research institutes, and scientific communities in particular are expected to further enhance scientific knowledge as well as sharing data and providing information, and promoting innovative technology development based on the most recent scientific knowledge.

Citizens

Environmental impacts resulting from our daily lives are on the increase, which makes it necessary for citizens to shift towards more sustainable lifestyles.

Citizens need to deepen their understanding concerning the relationship between people and the environment, and should try to incorporate environmental considerations into their behaviors to reduce environmental loads caused by their daily lives.

They are expected to take voluntary and proactive actions to improve their immediate environment.

Furthermore, building a sustainable society requires that citizens' views are reflected in the decisionmaking processes, thus they are expected to actively participate in various opportunities provided by national and local governments.

(2) Enriching and strengthening partnerships

Partnership is stated as one of the "Five Ps¹⁷" that form basic elements underlying the SDGs. Diversifying partnerships among a variety of entities will become more and more important to ensure a steady implementation of the Basic Environment Plan. Partnerships among different entities concerned are a vital element for successful implementation of priority strategies and related supporting policies. Environmental information is indispensable in promoting proactive participation of entities concerned. Thus, each entity is encouraged to provide the environmental information they have according to the needs of other stakeholders, thereby enhancing and strengthening partnerships at each stage of policy implementation.

Indeed, partnership is of particular importance to ensure appropriate and effective implementation of specific policies in support of priority strategies.

The following initiatives require enhanced and strengthened partnerships:

- ◇ Further promotion of environmental education based on the concept of ESD through all-inclusive partnership among administrators, schools, companies, residents, community associations, NPOs, NGOs, scientific communities, cooperatives, and others.
- ◇ Promotion of voluntary efforts by companies to contribute to measures to deal with global warming, and proactive and voluntary actions by citizens through promotion of public campaigns that facilitate wise choices.
- ◇ Promotion of technological development and dissemination to conserve the rich environment for the future through partnerships between government, industry and academia such as open innovation.
- ◇ Promotion of risk communications through dialogue and joint-thinking between the national government, local governments, businesses, non-government organizations, and citizens to further deepen mutual trust. All entities are encouraged to work together to reduce environmental risks and realize a sustainable society.
- ◇ Promotion of international collaboration at all levels, between the government of Japan and other national governments as well as international organizations, and among municipalities, businesses, and non-government organizations.

These enhanced actions will make it possible to cultivate multifaceted viewpoints, and will lead to equipping human resources with the skills to realize II2ES. In other words, enhancing and strengthening partnerships will contribute to human resource development.

Identifying and awarding best practices that contribute to II2ES could be one of specific measures to enhance and strengthen partnerships, which enables such good practices to be widely shared across the whole society, thereby encouraging each stakeholder to take voluntary initiatives and to further strengthen partnership among all entities.

Footnote
17 People, Planet, Prosperity, Peace, Partnership

3. Building a sustainable community - Creating the Circulating and Ecological Economy

In order to build a sustainable society across the entire country, each region needs to be sustainable. For this reason, each region is required to autonomously pursue the implementation of efforts toward II2ES, while taking advantage of its own characteristics. But in today's modern era in which socioeconomic activities are carried out over a wide area, it is impossible to isolate socio-economic

activities in a closed region; as such, it is vital for regions to become complementary to each other.

This Plan aims to create a "Circulating and Ecological Economy"¹⁸ that produces new value chains, complements and supports regional resources by building broader networks, which is composed of natural connections (connections among forests, the countryside, rivers and the sea) and, economic connections (composed of human resources, funds, and others), while making full use of mountainous, agricultural and fishing villages, and cities. Each region will demonstrate its strengths by utilizing its unique characteristics, thereby building a self-reliant and decentralized society where different resources are circulated within each region, and symbiosis and exchange with neighboring regions according to unique characteristics of each region.

"Circulating and Ecological Economy" incorporates the concept of "Regional Circular Sphere" indicated in the "The Second Fundamental Plan for Establishing a Sound Material-Cycle Society" (Cabinet decision on March 25, 2008). The concept underlines the importance of promoting resource circulation at optimal scales according to the characteristics of regions concerned, and the nature of resources to be recycled. Basically, resources suitable for circulation in a small area should be circulated in the smallest zone possible, while resources suitable for circulation in a larger area should be circulated in a much more expanded area, thereby resource circulation could be optimized with a combination of overlapping circular areas according to resources to be circulated. "Regional CES" also incorporates the concept of "Social-ecological Sphere" indicated in the "National Biodiversity Strategy of Japan 2012-2020" (Cabinet decision on September 28, 2012), which takes consideration of communities and people closely connected with the supply and demand of local ecosystem services, or the blessing of nature, in a holistic way, and promotes deepening and enhancing collaboration and mutual support. As such, Regional CES is a concept that aims to promote the utilization of regional resources, and ultimately realize low carbon development, as detailed below.

"Circulating and Ecological Economy" could be applied to small areas at the community or municipality level (including special wards in Tokyo) in certain cases, but may be appropriately applied in a scale even larger than river basins and prefectures, in other cases. Circulating and Ecological Economy will therefore cover a variety of geographical areas from the level of villages, through municipalities, to that of prefectures and river basins.

"Circulating and Ecological Economy" has in its scope almost all resources including foods, products, circular resources, renewable resources, artificial stocks, natural capital¹⁹, as well as basic chemical elements such as carbon and nitrogen. All of these resources are circulating through every stage of human socio-economic activities such as production, distribution, consumption, disposal, as well as through natural systems. In order to make resources circulation appropriate, first of all, inputs of resources including materials and energies should be minimized as much as possible, thereby utmost efficiency could be achieved. In addition, "Circulating and Ecological Economy" minimizes environmental burdens through diversified and multilayered resource circulation, and mobilizes regions through promoting circular regional economies.

Footnote

¹⁸ The idea of "Circulating and Ecological Economy" is proposed in "Building a society by integrated policy approach on low-carbon, resource circulation, and living in harmony with nature ~ Creating environmental and life centered civilized society ~ (recommendation)" (Central Environment Council, July 2014).

¹⁹ Circular resources (livestock manure, food waste, sewage sludge, plastic, metal etc.), renewable resources (wood, renewable energy sources such as geothermal, wind and hydropower etc.), artificial stock (social capital, buildings etc.), and natural capital (forest, soil, water, air, biological resources, etc.)

"Circulating and Ecological Economy" will ensure a symbiotic relationship with nature, between people, environment and living creatures in particular, recognizing the fact that humans are a part of environment and are living creatures themselves. Based upon this recognition, "Circulating and Ecological Economy" will ensure symbiosis between nature and humankind from the perspectives of both conservation of secondary nature and suppliers and consumers of local ecological services. "Circulating and Ecological Economy" also promotes symbiosis among different regions ranging from mountainous, agricultural and fishing villages, and cities.

The key to creating "Circulating and Ecological Economy" is to re-discover regional resources and to utilize them properly. To find new values in overlooked resources of each region will be the first step moving towards I2ES. For example, power generation and heat use utilizing regional biomass ensures low carbon and resource saving by replacing fossil fuels and reducing long-distance transportation. It also creates economic and social benefits through increasing employment for the region, and strengthening resilience by securing energy locally in times of disaster. Benefits could be even greater if utilized biomass is derived from thinning of local forests and management of secondary nature (i.e. Satoyama), which will certainly contribute to sound management of forests and conservation of rich natural environment (i.e. ecosystem services), thereby creating multiple benefits cutting across economy, society and environment.

"Circulating and Ecological Economy" is a new approach, which is not only beneficial for mountainous, agricultural and fishing villages but also for cities. People in urban areas could become more aware of or even "visualize" the fact that they are supported by agricultural, forestry, and fishing products from mountainous, agricultural and fishing villages, and other benefits from nature (i.e. ecosystem services). This could lead to concrete actions to support villages through increased participation in nature conservation activities and expanded purchase of products from environmentally sound agriculture. In other words, "Regional CES"

is a concept to maximize the vitality of all regions, making full use of mountainous, agricultural and fishing villages as well as cities.

This Plan will mobilize all the measures listed in the priority strategies centering on initiatives in Chapter 2 "3. Sustainable community development using local resources". It will create innovations across all perspectives including those concerning socio-economic systems, lifestyles, and technologies. The Plan aims to realize sustainable societies by developing multifaceted and multilayered policies that cover from regions of Japan to the rest of the world through creation of "Circulating and Ecological Economy."

Chapter 2 Development of environmental policies for each priority strategy

1. Formulation of a green economic system for realizing sustainable production and consumption

(Basic concept)

In order to ensure sustainable production and consumption patterns, this Plan will aim for socioeconomic system innovation, as well as improved resource productivity²⁰ and carbon productivity (economic growth can be achieved while reducing natural resource inputs and greenhouse gas emissions).

From this point of view, decision-making and investment decisions are encouraged that will contribute to the construction of a sustainable society and promote environmental business as well as encouraging the expansion of supply and demand of green products and services (in particular by expanding overseas demand) by cultivating environmental business to become the driving force of the Japanese economy. At the same time we will work to reduce environmental impacts and create a virtuous circle for the economy.

Further, it is necessary to transform Japan's energy supply and demand structure by promoting thorough energy conservation and making maximum use of the renewable energy that is available in Japan which is a major pillar of our measures against global warming. At the same time, through reduction of primary energy imports, energy self-sufficiency will expand, contributing to better energy security. This will also contribute to the improvement of international balance of payments and the strengthening of industrial competitiveness in Japan. From this point of view, we will encourage efforts towards the maximum introduction of energy conservation and renewable energy by companies, consumers and others.

From the viewpoint of resource circulation, Japan must develop an economy that moves towards the ultimate form of socio-economy whose material flow is in harmony with the circulation of nature. This requires a break from the old economic system designed to create a successful model enabling efficient economic activities based on "concentration" and "homogenization", which made "goods" and "money" the source of competitiveness to create added value. What is required now is to propel innovation based on the Fourth Industrial Revolution and ensure it is reflecting across all industries and areas of social life. It would be possible to transform the economy as a whole from one based on "quantity" to one based on "quality" and improve labor productivity²¹, by ensuring that "people (human resources)" and "data" are represented as sources of value. By connecting diversity with "selfreliance" to bring about "integration", the new business model can be expanded to one that produces more added value, by "providing necessary products and services to those who need them, when necessary, and only in the amounts needed". This will optimize material flow of the current economic society into a flow that reduces environmental impacts and encourages thorough resource circulation throughout the entire life cycle.

In order to boost the efforts of companies etc., it is essential to promote the greening of the economic system. As seen in ESG Investment, investors are increasingly looking at environmental considerations of companies as one of the factors for investment decisions. In line with this growing trend, we will promote the greening of the whole tax system and green finance that shifts the flow of capital into the development of sustainable society such as investment and loans to markets related to environmental fields including climate change countermeasures, resource circulation and harmony with nature.

Footnote

²⁰ Added value per input amount of natural resources. When comparing internationally, it is necessary to pay attention to differences in industrial structure, etc.

²¹ Value added per labor input

(1) Expansion of environmental business and mainstreaming of environmental considerations in corporate strategy

(Expansion of environmental business)

Environmental businesses in Japan continue to expand in market size creating viable opportunities for employment. To further expand environmental business and set it as a driving force for the Japanese economy, there should be continuous monitoring of corporate environmental business and promotion of green products and services supplied by companies over the short run. We also need to gain a better understanding of the market size of environmental business, develop best operating practices as well as promote

efforts to secure and nurture human resources and improve productivity, including policies for such promotion. Environmental business will be thus supported through various measures (described below) such as green procurement, green contract, expansion of green finance, and greening of the whole tax system.

(Promotion of environmental management throughout the value chain)

As ESG investment expands globally, Japan is seeing a growing interest in the activities of companies with environmental considerations. Companies are required to respond to environmental issues such as climate change and degradation of natural capital, not only within their own company but also the entire value chain including their business partners. This trend will broaden the scope of activities of companies with environmental consideration and will be a major driving force for building a sustainable society.

To promote further expansion, companies are to be encouraged to calculate and reduce emissions associated with the value chain, quantify and visualize reduction amounts through the value chain, and support the formulation of mid and long-term reduction targets based, for example, on the ScienceBased Targets for individual companies. Introduction of environmental management systems will be promoted based on the PDCA cycle such as ISO 14001 and Eco Action 21 for small and mediumsized enterprises (SMEs) throughout the value chain.

We will also encourage companies to promote further environmental management through active disclosure of environmental considerations and the direction of future efforts with improvements in comparability and trustworthiness of information, through making their environmental reports public.

Furthermore, for the purpose of creating new corporate value by incorporating environmental aspects into corporate management, we will encourage companies to conduct in-house and external training to develop human resources to work on environmental management and conservation within their companies and guide the greening of the economy and society.

(Understanding and promotion of new business models such as servicizing and sharing economy)

With the use of IoT and AI, there has been a rapid expansion of businesses focusing on providing functions of a product as services, i.e. servicizing (e.g., product lease and rental, ESCO (Energy Service Company) business), and sharing economy²² (e.g., car sharing, cycle sharing, temporary lodging at private residence) which is one form of servicizing. Expansion of these new business models are expected to encourage long-life of products and easy-to-recycle designs, and encourage conversion from the conventional mass-production and mass-consumption type economic systems. For this reason, there needs to be better understanding of these new business models including contribution to low carbonization and resource saving, and they should be promoted widely through “visualization” of their environmental benefits.

Footnote

²² Economic activities that other individuals etc. can use such as idle assets etc. that can be utilized possessed by individuals etc. (assets (space, goods, money, etc.) and abilities (skills, knowledge etc)).

(Green procurement / Green contract)

In order for companies to expand the supply of green products and services, it is essential to expand demand for such products and services. For this purpose, the national government, etc. works actively on the initiative of green procurement and green contract, and we carry out public awareness raising to encourage green procurement and green contract of local governments, companies and individuals. To move green procurement forward, a review will be conducted on the roles and directions of the "Act on Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities" (Act No. 100 of 2000).

(Promotion of advanced Japanese green products/services/environmental infrastructure)

Demand for green products and services is not limited to Japan. Efforts towards a carbon-neutral society have accelerated internationally with the entry into force of the Paris Agreement. Developing countries are also now looking to maintaining a good environment along with economic development, so this provides opportunities for Japan to promote superior green products and services. Through top sales utilizing bilateral policy dialogues and regional forums, among others, we will promote infrastructure exports to improve the environment of developing countries. Promotion can be packaged with systems, technologies and finance together, and will also contribute to diverse business development in Japan. To promote green products, negotiations will resume on the EGA (Environmental Goods Agreement) so that a conclusion can be reached as soon as possible to promote free trade of goods contributing to environmental protection and climate change countermeasures.

(2) Improvement of the balance of payments and strengthening of the industrial competitiveness through maximum use of domestic resources

(Promotion of all-out efforts for energy conservation)

Improving energy efficiency is one of the main global warming measures and at the same time it is the key to productivity improvement.

Based on the "Act on the Rational Use of Energy" (Act No. 49 of 1979, hereinafter referred to as the "Energy Conservation Act"), we will implement further energy management and promote the introduction of energy-saving facilities and equipment. Improvements should also be made on the energy efficiency of household appliances and automobiles utilizing the equipment top runner system. SMEs are not included in the specified businesses²³ under the Energy Conservation Act, but we will promote energy conservation efforts by SMEs, by encouraging them to recognize the need for energy conservation, to support their investment in energy conservation, and promote detailed assistance needed by SMEs through the "Energy Conservation Regional Consultation Platforms".

Footnote

²³ Operators with energy consumption (converted to crude oil equivalent) of the entire business operation of 1,500 kl / year or more

Regional efforts by local governments will be strengthened through the support of the formulation and implementation of action plans developed based on the "Act on Promotion of Global Warming Countermeasures" (Act No. 117 of 1998).

Furthermore, utilizing IoT for example, a new energy saving (negative watt) trading market will be established so that consumers themselves can manage their energy use in a more proactive manner.

In order to reduce environmental loads of the entire supply chain in the field of logistics, there will be more collaboration between consigners requesting cargo transport and cargo shipping companies engaged in cargo transportation, as well as efficient and low carbon transport modes by introducing vehicles that contribute to high efficiency of truck transportation such as articulated lorries as well as promoting a modal shift. To simultaneously conserve energy and reform workstyles, low carbon transportation and delivery systems will be constructed through collaboration among those concerned. Measures will include creating a "carbon free port", reduction of re-delivery by utilizing delivery boxes, joint transportation among companies, combination of freight and passenger transport, and other efforts using IoT.

(Maximum introduction of renewable energy)

Utilizing the abundant renewable energy that is available in Japan in combination with energy saving and energy storage can lead not only to CO2 reduction but can also to the improvement of energy selfsufficiency and the revitalization of regional economies. This could be achieved with the proper application of the Act of Partial Revision of the "Act on Special Measures Concerning Procurement of Electricity from Renewable Energy Sources by Electricity Utilities" (Act No.59 of 2016), which was implemented in April 2017 to prompt the cost efficient introduction of renewable energy. Taking other comprehensive measures such as overcoming grid system restrictions and research and development will promote development of a self-sufficient power supply over the mid to long-term, in harmony with the nature and local societies, while finding a balance between the maximum introduction of different renewable energy sources, and alleviating the burden on citizens.

Technological developments will be promoted for higher efficiency and lower cost of solar power equipment. For wind power generation, technologies will be developed to enhance the efficiency of electricity generation, lower costs, upgrade grid operations, and expand the introduction of offshore wind power generation. Stakeholders will be consulted to examine the idea of promoting wind power generation based on a zoning approach, which separates areas where wind power could be introduced, from areas where priority is given to nature conservation and other living environments. We will also take up measures to speed up EIA. For hydroelectric power generation, we will promote the installation of power generation capacities in existing dams that have no power generation facilities, as well as replacing the old facilities installed in other existing dams, coordinating with stakeholders concerned. For small and medium hydroelectric power generation, there are many undeveloped sites so these will be utilized as an energy source to lay a foundation of decentralized energy supply and demand structure of the region, taking into account the associated business challenges such as high cost. This will require rapid and smooth installation of equipment for geothermal power generation by reducing investment risk, promoting understanding of local residents, accelerating EIA, and further rationalization of the regulations and systems concerned as necessary.

As renewable energy is expanded, a critical issue is fluctuations in electricity generation, and the resultant loads on the grid system. This requires much wider operation of the grid system, acquisition of power sources that have higher capabilities to respond to changes in demand, and demand response adjusted to supply capability, and introduction of batteries on both grid side and demand side (including utilization as batteries for electric vehicles), as well as storage using hydrogen, strengthening inter-regional connection lines, thereby further expanding the capacity of the electricity grid to accommodate renewable energy, and at the same time introducing a self-reliant and decentralized renewable energy system off grid.

There is also a need to make more effective use of heat produced by renewable energy sources (such as solar heat, geothermal heat,

snow and ice heat, hot spring heat, seawater heat, river heat, and sewage heat) and un-utilized waste heats. We support the introduction of renewable energy heat supply facilities and demonstrate and construct models that make effective use of various thermal energies in the region, taking fully into account economic efficiency and local characteristics.

(Expansion of the use of hydrogen)

Hydrogen is expected to contribute to the improvement of total energy efficiency utilized in fuel cells, which could be a part of a decentralized energy system. It will also contribute to stabilization of the grid system being used as storage of electricity produced by renewable energy (Power-to-Gas), as well as to the reduction of greenhouse gas emissions in the transport sector.

In order to expand the use of hydrogen in the domestic, business and industrial sectors, we will promote the dissemination of residential fuel cells (i.e. Ene-Farm) as well as technological development and demonstration of fuel cells for offices and industrial power generation to make them less costly and more efficient. This will require hydrogen-related facilities to be incorporated into existing energy systems such as power generation and heat supply, thereby building a low carbon hydrogen supply chain.

For industrial vehicles such as fuel cell vehicles (FCV), fuel cell buses and fuel cell forklift trucks, development of necessary technologies will be promoted to lower prices and improve performance and encourage wider use.

Hydrogen stations are essential for the operation of FCV and they will be systematically set up while looking at the possibility to use hydrogen produced from renewable energy. In addition to promoting technological development aimed at reducing costs associated with hydrogen stations, we will also consider reviewing relevant regulations based on the improvement of safety and reliability of the technologies concerned.

Technological development for stable production and transportation of hydrogen at low cost will be vital, as well as promotion of technological development and demonstration of hydrogen production, transportation and storage technologies with as few CO2 emissions as possible, such as hydrogen production from renewable energy and hydrogen transformation of un-utilized energy sources.

This will require expanding the use of hydrogen according to the "Basic Hydrogen Strategy"²⁴ including efforts elaborated above.

Footnote

24 Decision by Ministerial Council on Renewable Energy, Hydrogen and Related Issues (December 26, 2017)

(Utilization of biomass as energy and circular resources)

Expanding the use of biomass-derived energy and products could be effective to create the vitality of mountainous, agricultural and fishing villages, and return profits to local areas. This is expected to lead to a virtuous cycle of the regional economy.

Comprehensive utilization of woody biomass including expansion of power generation and heat use by woody biomass aims to promote the expansion of the use of domestic timber including that produced through thinning, thereby promoting the growth of wood and forestry industry. Food waste will be thoroughly used as animal feeds and fertilizers, for which demand should be expanded through the promotion of agriculture, forestry and fishery based upon materials circulation. Wet biomass such as livestock excreta, sewage sludge, and food waste not converted into animal feeds and fertilizers should be used for power generation and heat use utilizing biogas produced by the methane fermentation process. Residual liquid left in the process could be used as fertilizer for agriculture. These actions will promote environmentally friendly and disaster-resilient towns and villages centered on the biomass industry.

(Utilization of circular resources, urban mining)

Use of domestic circular resources contributes, in the same way as renewable resources do, to improvement of the balance of payments in addition to reducing the environmental burden associated with transportation. Upstream measures will be strengthened such as environmentally conscious designs, sustainable procurement, reduce, reuse, and increasing the use of recycled materials. Such efforts should be made by all stakeholders concerned to ensure efficient resource circulation throughout the entire life cycle. We aim to promote low carbon and resource circulation models such as sharing and re-manufacturing, and others fully utilizing IT, and support will be given to efforts on improving resource productivity in each industry.

Particular focus will be put on efficient use of urban mining (i.e. extraction of useful resources included in used products). We will analyze how metals could be collected, looking at the impact and effect of recycling of small household appliances. Further full use will be made of the local characteristics, including collaboration among various entities such as venous/recycling industries and material industries, thereby maximizing the total amount of metals recovered, including base metals and rare metals.

Citizens will be encouraged to participate in 3R activities associated with the Tokyo Olympic and Paralympic Games in 2020,

through a project to produce Olympic medals using metals recycled from small household appliances.

(3) Formulation of a green economic system through finance

(Promotion and expansion of ESG investment etc.)

In recent years, ESG investment has been expanding. Many asset owners such as pension fund (funding contributors) and asset managers have signed onto the "Principles for Responsible Investment" (PRI) advocated under the initiative of the United Nations in 2006. The Government Pension Investment Fund (GPIF) —the world's largest institutional investor—is one such institution. The result is a burgeoning global ESG investment since 2012. This movement is spreading to other sectors such as banking and insurance. There has been some expansion of ESG investment in Japan, but not as much as that in other parts of the world. Japan needs to encourage stakeholders and investors to be more aware of the importance of ESG investment, get a clearer understanding and move ahead with further expansion. Therefore, we will encourage more companies to disclose environmental information and optimize the quality of that information to improve corporate value. A platform will be maintained and improved to boost active dialogue between investors and companies.

(Promotion of investment and loans to green projects)

In order to meet the 2 ° C target and achieve the SDGs, huge investments are required for projects that contribute to global warming countermeasures and prevention of degradation of natural capital. In order to attract private investment to such projects, we will support low carbon projects where private funds are not sufficiently supplied, and support green bond issuance and subsequent investment.

(4) Tax system as the basis of green economic system

(Promotion of greening of the whole tax system)

Promoting greening of environment-related taxation systems including energy taxes and vehicle taxes is an important program to build the basis of the green economic system because it leads to the further promotion of environmental conservation through incorporating environmental considerations into the actions of various stakeholders including companies and citizens. We will promote greening of the whole tax system, through synthetic and systematic survey and analysis of environmental and other effects from environment-related taxes, while considering the situation of foreign countries.

Using tax revenue from the special tax measure of the Petroleum and Coal Tax for climate change mitigation, we will steadily implements measures to control energy-originated CO2 emissions.

2. Improvement of value of national land as stock

(Basic concept)

Given the declining population, declining birth rate and aging population, apparent impacts of climate change, energy issues, intensifying global competition, aging of infrastructure, as well as an increase in land which can no longer be appropriately managed, it is important to promote various policies for sustainable national land management. In order to deal with these issues, it is necessary to incorporate environment considerations in both hardware and software of social infrastructure development and land use, and to develop national land that can respond to economic and social challenges.

Therefore, measures will be implemented to conserve the diversity of the national land based on live in harmony with nature. Conserving the natural environment also leads to sustainable use of ecosystem services and support of industry and living in Japan, and it also serves as a source of high value added goods and services. Not only pristine natural areas, but also local natural environments such as Satochi-Satoyama (socio-ecological production landscapes) and agricultural lands, parks, and green spaces in urban areas lead to an improved quality of life (QOL), with accompanying health benefits.

Furthermore, we will implement policies focused on encouraging the creation of sustainable and attractive cities. Cities could be made more compact and consequent sustainable regional public transport networks could contribute to the reduction of CO2 emissions due to less traffic. Central urban areas are being revitalized to ensure a healthy lifestyle by increasing the amount of walking and bicycling. The volume of construction waste and construction byproducts could be reduced through appropriate maintenance and effective utilization of stock, and this would also encourage low carbon housing, thereby building up a good housing stock as a foundation for current and future living.

Policies will also be implemented on improving resilience using environmental infrastructure and green infrastructure²⁵. We believe that strengthening of regional capacity to prevent and reduce disasters utilizing diversified functions held by the natural environment,

the provision of a stable supply of energy including in times of disaster through the introduction of self-reliant and decentralized energy system, as well as the provision of a consistent waste treatment system during both periods of disaster and non-disaster periods, will lead to improved resilience. It is essential to ensure a safer living environment by encouraging relocation from areas with high disaster risk to low risk areas.

Footnote

25 Green infrastructure is a sustainable and attractive landscape building that utilizes various functions of the natural environment (provision of habitats for living creatures, formation of good landscape, suppression of temperature rise, and disaster prevention and reduction). This implies both a way of thinking and method for promoting community development.

(1) Maintenance of the diversity of the national land centered on living in harmony with nature

(Maintaining, enhancing and utilizing natural capital)

For ensured and sustained benefits of nature and sound socio-economic activities in all regions, we will promote properly evaluating, maintaining, enhancing the value of natural capital as stock and its sustainable conservation and use by mainstreaming biodiversity across sectors.

Japan is a nation of many islands that stretch a long way from north to south, and as such various wildlife including many endangered species and endemic species inhabit and flourish here. It is necessary to harmonize human activities and maintain biodiversity through habitat conservation with endangered species, as well maintaining and revitalizing various natural environments damaged in the past such as rivers, wetlands, tidal flats, and algae fields. We will also promote measures against invasive alien species, and promote wildlife management, while maintaining connections among forests, the countryside, rivers and the sea. In this way, national land use will also be promoted responding to economic and social challenges with environmental considerations incorporated.

(Maintenance and conservation of forests)

It is necessary to promote diversified and healthy forests in order to demonstrate the multifaceted functions of forests such as conservation of national land, water source recharge, conservation of biodiversity, and measures to deal with global warming. Thus, forest management should ensure timely and appropriate re-forestation and thinning over certain regions, and promotion of mixed forests of conifers and broadleaf trees according to local natural conditions. For this purpose, we will establish a new forest management system aimed at making forestry a new growth industry, and realizing sound management of forest resources. At the same time, forest maintenance and conservation should be promoted through utilization of new tax schemes such as a forest environmental tax (tentative title) and a forest environment transfer tax (tentative title).

(Establishment of ecosystem networks)

We will establish ecosystem networks according to catchment basins centered on rivers, utilizing conspicuous large bird species as symbols. Specifically, the following measures should be promoted: recovery of dis-continued rivers, regeneration of flood plains and wetlands, sound connections between rivers and man-made water bodies such as waterways, ponds, swamps and paddy fields in the river basins, conservation and restoration of habitats of endangered animals and plants, promotion of environmentally sound agriculture, support for branding of environmentally sound agricultural products, and promotion of natural resource-based tourism. In this way, both biodiversity conservation and revitalization and mobilization of regions will be simultaneously promoted. At the same time, the efforts described above could contribute to securing pathways for animals and plants to move and migrate according to changes in natural environment brought about by climate change.

(Conservation of marine environment)

In order to promote conservation and sustainable use of the marine environment, while fully taking into account related international frameworks such as SDGs, the following comprehensive measures should be taken: establishment and sound management of marine protected areas, conservation of vulnerable ecosystems such as coral reefs, proper responses to ocean acidification, measures to deal with marine litter including microplastics, prevention of marine pollution, comprehensive coastal area management, harmonization of exploitation and conservation of oceans, monitoring and research as a basis for proper management of the ocean environment.

(Maintenance and restoration of sound water circulation)

It is essential to re-discover that water is common property for all human beings, that water should circulate healthily, and that the benefits associated with water should be handed down to future generations. Based upon this recognition, comprehensive measures should be taken to maintain or restore healthy water circulation. In line with the understanding described above, the "Water Circulation Basic Act" (Act No. 16 of 2014), was enacted, increasing the momentum for efforts to address various problems concerning water circulation such as droughts, floods and water pollution. Comprehensive and integrated watershed management should be promoted based upon the "Water Circulation Basic Plan" (Cabinet decision on July 10, 2015). Collaboration among stakeholders concerned should be promoted by strengthening of institutional arrangements, which include establishment of a river

basin water circulation council as well as formulation of a watershed circulation plan by local governments and other organizations concerned.

(Appropriate land management responding to a declining population and national land use that conserves, regenerates, and utilizes the natural environment)

In the face of a declining population, sound management and effective use by land owners is the basis for appropriate land management. In cases where the owner is not able to carry out appropriate land management and use or where the owner cannot be identified, it becomes necessary to identify someone other than the land owner for appropriate land management and use. Sustainable management of national land requires various measures such as proper management and circular utilization of renewable resources and energy including local biomass, learning wisdom and technologies concerning good management and utilization of local resources such as practices known as traditional Satochi-Satoyama (socio-ecological production landscapes) management, and development of specific mechanisms to enable various stakeholders such as city residents and businesses to manage common natural resources (i.e. commons) together.

In cases where proper land management is not possible even after the above mentioned measures are considered, first of all, management costs should be reduced as much as possible according to local conditions. Then, possibilities should be examined to identify alternative land use by finding new objectives such as creation of habitats of endangered animals and plants or buffer zones in case of disasters. Specific measures include regeneration of the natural environment such as transition to natural forests and restoration of wetlands.

(Measures against invasive alien species)

Based on the priority on conservation of biodiversity, the following measures should be promoted: designation of invasive alien species, regulation on raising, importing, and transferring such species, enhanced awareness regarding proper raising, and activities to control and remove such species. In the case of unintended introduction of invasive species such as red imported fire ants, quick countermeasures at or near possible points of entry should be carried out.

(2) Creation of sustainable and attractive cities and communities

(Realization of compact urban space with neighborhood nature)

Effective sustainable cities require a concentration of key urban functions in core areas, with residents living in the surrounding zones and along public transportation lines, thereby constructing compact cities that connect through networks of public and other transportation means. In cases where compact cities enable concentration of supply (heat sources) and demand for heat, support for the introduction of local heat supply systems could be effective in promoting local heat utilization. Such systems will enhance feasibilities of un-utilized local renewable heat energies generated using solar, geothermal, snow and ice, and sewage, among others. Promotion of a public transportation network centered on light rail transit systems (LRT) / bus rapid transit systems (BRT) will contribute to the mitigation of greenhouse gas emissions through consequential reductions in the volume of automotive traffic. Compact cities could be promoted through "visualizing" the reduction of environmental burdens to be realized by these measures.

In addition, the formation of an ecosystem network in urban areas in tandem with compact cities will be promoted through the construction of livable cities with green and blue (water) areas, and the conservation and creation of agricultural lands, parks, green spaces, waterways, non-concretized rivers (with sand and gravel) all of which could contribute to maintaining certain biodiversity in cities.

(Formation of "Small hubs")

In hilly and mountainous areas marked with sharp population decrease and aging, it is important to maintain a "community living area" as an integral daily life zone. In this way, we will promote the formation of "small hubs" in an effort to create a sustainable community. At these hubs, the availability of local thermal energy will increase, and options for introducing renewable energy utilizing local resources will also grow, thereby contributing to reducing greenhouse gas emissions through the introduction of support for such measures.

(Maintenance and utilization of traffic networks)

Declining population and aging makes it difficult to maintain transportation services for daily life. Revitalization of private bus services through rearrangement of local bus routes, and effective introduction of community buses and demand-based transport systems could be effective in maintaining and sustaining transportation networks for daily life.

Public transportation encourages the use of local resources, improves the attractiveness of the area and encourages interaction with other regions, leading to the development of broader regional economic activities such as production, logistics, and tourism. In

addition, improvement of services will be promoted through collaboration among multiple public transportation companies, and introduction of park and ride systems. ICTs could provide information on local traffic routes for smooth transportation.

We will also promote initiatives to encourage bicycle use, together with relevant safety measures. Such initiatives include measures such as provision of parking lots and paths for bicycles, utilization and dissemination of cycling-trains and bike-sharing schemes, which contributes to reducing overall environmental impacts.

(Appropriate maintenance and effective utilization of the existing infrastructure stock)

The value of stocks of existing infrastructure composed of public facilities including water supply and sewerage systems and waste treatment facilities, transport infrastructure, and energy infrastructure, should be improved. They could be rearranged, renovated, and re-modified, by ensuring prolonged use, improved disaster prevention function, and promotion of energy efficiencies.

We will promote measures to create high-quality social stock and prolonged use by modifying functions according to changes in social demand, including prolonged use of existing houses by modification, as well as promote the net-Zero Energy Buildings (ZEB) and the net-Zero Energy Houses (ZEH).²⁶

Effective use of existing buildings in good condition should be promoted as lodging and communications facilities through renovation for regional revitalization, or as medical and caring facilities for the elderly.

(3)Improvement of resilience by use of environmental and green infrastructure

(Securing consistent safety in usual times and in times of accident / disaster)

In order to carry out collection and treatment of household garbage, human waste and disaster waste properly and promptly in usual times and in times of disaster, the waste treatment system should be strengthened in a multilayered manner at all levels from municipal, through regional, to national. Management of chemical substances has been developed mainly based on the assumption that it will be carried out in usual times. In the case of disasters and accidents, therefore, there remains a significant risk of environmental pollution with chemical substances. Thus, we will promote various measures to minimize this risk.

Renewable energy should be promoted to the maximum extent as self-reliant and decentralized energy sources for each region by combining with, whenever appropriate, co-generation and fuel cells. Waste treatment facilities could also be promoted as regional energy and disaster prevention centers. All of those listed above will enable prompt energy provision in time of disasters, and promote coherent initiatives to strengthen resilience of national land, reduce carbon emissions, and promote resource circulation.

(Promotion of green infrastructure and Eco-DRR)

We will pursue efforts to strengthen green infrastructure and make national land and community sustainable and attractive in both hard and soft aspects of improving social infrastructure and land use, drawing upon various functions of the natural environment (e.g. provision of habitats for living creatures, formation of good landscape, suppression of temperature rise, and disaster risk reduction).

Eco-DRR²⁷ should be promoted by evaluating the disaster risk reduction function of the ecosystem, conserving and restoring the relevant ecosystem functions. For example, effective initiatives should be promoted to conserve and restore wetlands which function as reservoirs to accommodate floods, and to conserve diversified and healthy forests for maintaining resilience of national land. In so doing, we will respond to challenges associated with changes in the social structure, particularly those posed by population decline and aging of the social infrastructure and to drastic worsening of natural disasters, together with contribution to the conservation of biodiversity.

(Promotion of climate change adaptation measures²⁸)

In order to contribute to the creation of a resilient and sustainable society that can deal with climate change, adaptation measures should be taken, based on the "National Plan for Adaptation to the Impacts of Climate Change " (Cabinet decision on November 27, 2015), which include strengthening of an information base regarding climate change adaptation, and promotion of adaptation measures in agriculture and disaster prevention sectors of each region. Support will be provided to all entities including local governments and private companies so that adaptation related business opportunities are generated in Japan and overseas through branding of agriculture, forestry and fishery products, and developing infrastructure technologies that build resilience against natural disasters.

Footnote

²⁶ Buildings / houses whose annual primary energy consumption is zero at net.

²⁷ Ecosystem-based Disaster Risk Reduction

²⁸ Regarding the adaptation, the Working Group II Background Box SPM.2 of IPCC Fifth Assessment Report explains "the process of adjustment to actual and expected climate and its effects.

3. Sustainable community development using local resources

(Basic concept)

Local socio-economic activities are based on diverse local resources, which include local energy, natural resources, urban infrastructure, and industrial assets, as well as local culture, local features, and institutions/communities.

Accordingly, in order for a local area to be sustainable, it is important to enhance socio-economic activities by improving the quality of local resources and maximizing utilization of the natural capital, the artificial capital and the human capital of the area in a sustainable way. In local areas, issues arising from the declining population, decreasing birthrate and aging of society have become obvious. However, all areas have various potential resources, and therefore comprise viable sites for pursuing I2ES.

From this point of view, we will implement measures to maximize the utilization of local resources in a sustainable manner. The introduction of self-reliant and decentralized energy utilizing local renewable sources is expected to improve local energy balance and contribute to the promotion of employment and resilience of the national land. It is also expected that utilizing circular resources and renewable resources will restrict the inputs of natural resources and the outflow of funds from the area, hereby reducing the amount of final disposal of waste, and contributing to local revitalization through the growth of recycling industry. Furthermore, conservation of the rich natural environment is expected to contribute to supporting both local culture and features, thereby enhancing the provision of local products for high value-added tourism and agricultural, forestry and fishery products. In this way, local areas will contribute to developing major parts of Circulating and Ecological Economy.

In addition, we will implement measures to promote the creation of a wide area network, in order to educate and foster human resources who support such efforts, promote symbiosis and exchange between mountainous, agricultural and fishing villages, and cities, and to widen financial flows within the area.

In advancing such a sustainable community, it is important for local governments to promote measures to achieve SDGs. For this reason, we will select SDGs Future Cities and SDGs Model Programs for Local Governments, and provide financial support. Strong support is also provided by the SDGs Task Force, a body established based upon collaboration among all Ministries concerned. Success stories and good practices will be widely communicated, leading to further implementation of sustainability efforts supporting local revitalization.

(1) Maximizing utilization of local energy and biomass resources

(Introduction of renewable energy utilizing local resources)

Utilization of diverse renewable energy sources such as solar, wind power, hydropower, geothermal power, biomass, heat from renewable energy sources such as geothermal and hot springs, according to local characteristics, could improve local energy balance and contribute to the construction of a strong local economy. In addition, joint implementation of projects related to renewable energy, energy conservation, and elderly persons watching systems will create new employment and help maintain and develop local vitality.

Most renewable energy production is self-reliant and decentralized. Thus, it will, together with power generation and heat use at waste treatment facilities, contribute to improving local resilience in times of disaster, hence also it is effective to strengthen resilience of the national land.

(Promotion of new local power producers and suppliers)

Drawing on the ingenuity of private companies, new power producers and suppliers in a local area that utilize local renewable energy can sustainably promote low carbon development as their business activity. The formation of businesses entities should be promoted to support the diffusion of self-reliant low carbon activities in local areas.

(Promotion of farming photovoltaics (FPV))

FPV is an approach to install photovoltaics (PV) equipment above farmland, while continuing to carry out farming. Installation of FPV has started in various regions. Encouraging the use of FPV will promote stabilization of farmers' management and self-utilization of renewable energy electricity for agricultural facilities, storage batteries and agricultural machinery so as to contribute to local revitalization and improvement of energy balance.

(Community development with un-utilized biomass resources)

Woody biomass such as thinned timber and logged trees in riverine areas, as well as agriculture and forestry biomass such as rice straw and rice husk, will be used as materials and energy sources, with a view to creating sustainable businesses. Agriculture, forestry and biomass operators working together with local governments will formulate a biomass utilization plan, leading to

improved local energy balance, promotion of agriculture and forestry, and revitalization of local areas.

Taking into account the amount of viable resources, we will establish a "local-scale ecosystem", which is made up of elements ranging from people who can make sustainable use of woody biomass resources scattered in the area as materials and energy, to power generation and heat use. By doing so, sustainable, self-reliant and decentralized energy will be secured, which will lead to a virtuous circle of local economies, conservation and rehabilitation of forests, and contribute to conservation of biodiversity at Satochi-Satoyama (socio-ecological production landscapes).

(Resource circulation including utilization of waste biomass in local areas)

Resource circulation in local areas includes waste biomass such as food waste, livestock excreta, sewage sludge, paper, construction-generated wood, and sludge from Johkasou (decentralized wastewater treatment system). The responsibility for disposing of these waste products rests with waste generating entities, complemented by municipalities having overall responsibility concerning general waste disposal. Keeping this basic framework in mind, under cooperation with diverse stakeholders such as agricultural, forestry and fishery workers, local circular resources and renewable resources should be circulated and utilized through reuse, recycling and energy use, promoting sustainable community development, thus contributing to local revitalization.

(2) Maximizing utilization of local natural resources and tourism resources

(Local revitalization centering on national parks etc.)

An increase in the number of tourists from overseas visiting national parks leads to a boom in tourist guide businesses and an increase in the amount of spending for tourism, which contributes to economic and regional revitalization. National parks in Japan should be branded as world-class "National Parks", encouraging people to make more use of them. Conservation measures will be carried out where necessary. Furthermore, by utilizing ICTs and other means to carry out promotion activities and also by using park fees and private funds, a mechanism will be promoted for sustainably conserving the local natural environment as an important tourism resource, thereby creating a virtuous cycle of revitalization of the local economy and nature conservation. National gardens such as the Kokyo Gaien and Shinjuku Gyoen attract an increasing number of visitors including overseas tourists. Efforts to improve the quality as gardens and the convenience and safety facilities will be promoted to further increase the number of visitors.

(Promotion of tourism including ecotourism)

Tourism including ecotourism and green tourism contributes to local revitalization by sustainably utilizing local natural resources while conserving the area.

For areas that are engaged in ecotourism, the creation of a sustainable community will be promoted, which takes full advantage of the local-specific attractions, by supporting human resource development such as guides and coordinators who can explain about natural tourism resources in the area, create attractive programs, and communicate what the area has to offer, while conserving local natural tourism resources. These actions will be also supported by strategic public relations activities.

In addition, efforts will be made to promote, among others, green tourism including agricultural experiences and blue tourism.

(Utilization of diverse cultural resources from nature)

In Japan, there are local features rooted in the nature of each area, and diverse histories and cultures unique to the area emerging from this background. These features and cultures are closely linked with nature. Scenery and landscapes will be further refined including agricultural fields, old Japanese-style houses, local streets, beaches, as well as the cultural resources unique to each area such as traditional festivals, folk performing arts, traditional crafts, and traditional foods. These tourism resources will be linked with many types of tourism to ensure they are sustainably used and passed on to future generations.

(Improvement of added value of local industries focusing on environmental conservation and sustainability)

Increasing areas are taking biodiversity conservation and sustainable farming into consideration, thereby producing and selling value added agricultural, forestry and fishery goods. These include branding of agricultural products linked with conservation of wildlife symbolizing the local areas, such as ibises and storks, as well as the certification system applied to the Globally Important Agricultural Heritage Systems (GIAHS) in recognition of the conservation and succession of traditional agriculture, forestry and fishery practices. Initiatives will be promoted to fully enhance the value of local resources and raise attractiveness by local ingenuity.

Natural capital that has nurtured the distinctive features of local areas has the potential to generate added value, and in so doing also lead to the creation of new businesses. The so-called sextiary industries (primary x secondary x tertiary industries) of agriculture will be promoted utilizing natural capital. We will also promote the creation of an attractive environment for certain businesses by connecting them through a supportive transportation network and IT systems, which in turn will lead to an increase in people

relocating to rural areas, or moving back to the country areas where they grew up. Local on-site efforts will be supported by analyzing and sharing success stories and future challenges on initiatives that has generated added value through the sextiary industries.

(Drastic measures to strengthen capture of designated wildlife species for management)

Culling projects to control designated wildlife (i.e. Sika deer and wild boar) will be promoted, requiring intensive control on a wider geographical scale. To enhance population control, recruitment and education of hunters will be promoted according to different purposes and functions under different control systems. In addition, the development and diffusion of effective and efficient new technologies will be promoted, using ICTs and sharp shooting technologies. Also control measures will be promoted in accordance with target wildlife. Further, we will encourage local businesses to make planned and sustainable use of some of the captured wildlife as resources such as wild game meat (i.e. gibier) and leather.

(3) Symbiosis and exchange among mountainous, agricultural and fishing villages, and cities, and creation of a wide-area network

(Efforts to connect and support forests, the countryside, rivers, and the sea)

We will establish a natural connection (resources from nature) and an economic connection (funds, human resources) between cities and mountainous, agricultural and fishing villages through conservation and regeneration of forests, the countryside, rivers and the sea, and sustainable use of resources. Specifically, we will pursue a virtuous cycle of biodiversity conservation and local economic revitalization through sustainable use (e.g. development of environmentally conscious products, branding and promotion of tourism) of local resources from forests, the countryside, rivers and the sea (e.g. food, materials and energy), thereby aiming at integration of low-carbonization, resource circulation and harmony with nature.

(Symbiosis and exchange among mountainous, agricultural and fishing villages, and cities)

We will utilize local resources from agriculture, forestry, fishery and tourism, and increase population exchanges in collaboration with various fields such as education and welfare. Based on movements such as returning to rural areas, we aim for symbiosis through mutual contribution of mountainous, agricultural and fishing villages, and cities. Specifically, we will promote ecotourism, green tourism and blue tourism as well as long-stay tourism. In addition, these exchanges between cities and mountainous, agricultural and fishing villages will not remain temporary. Thus, we will promote the development of "an area where you want to live" and develop further exchange between the two areas moving progressively from dual-residence lifestyle, through migration to settlement. Furthermore, we will promote efforts to reuse vacant old Japanese-style houses in rural areas, and provide them to those who wish to relocate, or reconstruct them for sightseeing or interactive purposes for local residents. At the same time, we will support efforts for students to carry out exchange whereby universities in the Tokyo area establish satellite campuses in rural areas (including use of closed school buildings), as well as universities in rural areas and those in Tokyo implementing a joint credit system. On the other hand, actions are being taken to maintain sound urban landscape by dismantling deteriorating, unusable facilities before they become hazardous and eventually collapse. We will recycle dismantled waste as much as possible and dispose of it appropriately. In this way, in accordance with local circumstances, we will regenerate the local environment including restoration of security and landscape, revitalization of local area, and conservation of nature. At the same time, we will promote the reduction and recycling of construction waste such as concrete blocks and construction sludge.

(Community development through human development)

To make local areas more self-reliant and sustainable, what is essential are good human resources, who understand the relationship between the environment, economy and society, who are capable of identifying and sustainably utilizing local resources, and are effective in connecting with various experts. Based on the concept of ESD, we will seek to promote "human resource development" aimed at creating sustainable communities that feature cooperation with diverse stakeholders, thereby cultivating human resources that can promote more effective partnerships and exchange with other regions.

(Expansion of green finance in local areas)

For low-carbon projects conducted in local areas where private funds are not sufficient, we will work together with local governments and financial institutions to promote commercialization and fundraising. That will lead to simultaneous solutions for local economic and social challenges and for local environmental issues.

We will also promote understanding of green finance among local financial institutions that play a major role in creating local investment flows, while expanding green finance in local areas across the whole of Japan.

4. Realization of a healthy and prosperous life

(Basic concept)

Japanese culture is based on harmony with nature, nurturing Japanese sensibility through long-term interaction with nature.

Traditional arts and a sophisticated manufacturing culture have emerged. However, due to dependence on overseas resources, rapid urbanization, population decline and aging of society, connections between people and nature and those among people are being diluted, and traditional communities are being lost. Our lives are supported by various natural resources (i.e. ecosystem services) from forests, the countryside, rivers and the sea. In order to maintain and improve the vitality of Japan, it is essential to create diverse and attractive Circulating and Ecological Economy, making full use of unique local features. The values of unique nature including forests, the countryside, rivers and the sea should be recognized in each region, to reconstruct the connection between people and nature, and within communities.

People's values, lifestyles and workstyles are directly and indirectly affecting the global environment through consumption behaviors, and use of fuels, energy and resources. Technological innovations such as AI and IoT will bring major changes in lifestyles and workstyles. For example, the sharing economy represented by car sharing is expected to lead to a reduced environmental load by effectively utilizing resources in society as a whole, which could lead to a new lifestyle that replaces overconsumption and throw-away culture. By transforming our lifestyles and workstyles, and selecting goods and services in a more environmentally-conscious way, we will create new demands, which lead to innovation of new goods and services. Thus, it is indeed necessary to promote innovation across various lifestyles.

Japanese values and lifestyles have become more diversified, and recently there has been increasing awareness among urban residents particularly the youth, about relocation to rural agricultural areas. Even urban residents can maintain connections with forests, the countryside, rivers and the sea. For example, having some contacts with neighborhood nature and local nature and culture in everyday life and leisure time can boost the connection between people and nature, and this can be reflected in daily life. Contact with nature is also useful for maintaining and promoting health and has a positive effect on the mind and body. In response to a declining and aging population, we must re-examine how we live and work, and shift to a way of living that is environmentally friendly, healthy and high quality.

The environment is the foundation of people's health and prosperous lives, yet it faces various risks posed by adverse effects both on people and ecosystems associated with pollution of water, air and soil with chemical substances, and heat island effects. Thus, environmental risk assessment as well as precautionary approaches are considered effective to better deal with such risks.

(1) Switching to environmentally friendly, healthy and high quality living

(Switching to a sustainable lifestyle and consumption)

Consumers should not only pursue "low cost" and "convenience", but should also be aware of the hidden social costs, recognizing that their consumption behaviors affect the environment and society. ESD could raise such awareness, and promote understanding of sustainable lifestyles including consumption behavior considering people, society and environment (i.e. ethical consumption) such as local revitalization and employment.

The small choices that we make in our daily lives can make major changes for the future, with environmentally friendly choices having a positive impact on households, health and lifestyle. We will further extend a national campaign, called "COOL CHOICE", to encourage people to choose lowercarbon products and services.

We will promote reduction of unnecessary containers and packaging, and the use of reused goods and recycled products. Reduction and reuse can be further encouraged by using IT to promote servicizing, sharing, repair and reuse.

At the Tokyo Olympic and Paralympic Games in 2020, "Sustainable Sourcing Codes" have been established based on the "Sustainability Plan (1st edition)". Through procurement of Japanese food materials such as agricultural products that match these codes, we will encourage easy-to-understand actions to communicate about sustainable Japanese food culture in Japan and overseas. The Tokyo Olympic and Paralympic Games will be a good opportunity to expand the use of eco-friendly agricultural, forestry and fishery products, with certification issued to indicate this. Other efforts will consider biodiversity in the promotion of organic agriculture that avoids chemically synthesized fertilizers and pesticides. We will work on local production for local consumption as well as disseminating traditional Japanese food culture or Washoku.

(Reduction of food waste)

To reduce food waste, we will promote coordinated efforts among business entities, consumers, and local and national governments. This includes revision of commercial habits to make the entire food chain more efficient, which is difficult for individual companies to achieve, as well as promoting the introduction of high accuracy prediction of supply and demand in the production and distribution process, which utilizes big data analysis and AI. It also includes facilitating the "Enjoyable Ways to Not Waste Food Campaign" by local governments which consists of, for example, running the "3010 project" to reduce leftovers by setting a "time to eat" at parties, as well as encouraging households to use up all food materials. We also promote area-wide initiatives under the coordination

of, and with cooperation among local governments concerned. In addition, we will proceed with efforts regarding setting a target for the reduction of food waste, and measuring the amount of food waste.

(Low carbon and healthy housing)

Houses with high thermal insulation not only are low carbon but also contribute to maintaining comfort and health. We will promote the spread of zero energy housing (ZEH) to cover the amount of energy consumed annually by renewable energy, while achieving substantial energy saving through improvement of heat insulating and introduction of highly efficient equipment. ZEH will also be promoted to use domestic timber and other materials contributing to low-carbonization.

Senior citizens who reside in well-insulated and airtight housing can live healthy and comfortable lives at home, thereby avoiding brain and heart diseases caused by heat shock. In this way, we can ensure extended healthy lives for citizens, as well as controlling energy-related greenhouse gas emissions.

(Extension of healthy life expectancy by walking, riding bicycle, etc.)

Along with efforts such as making cities more compact and promoting the use of public transportation, we can create an attractive space and environment where more residents can move safely and comfortably on foot or by bicycle. This will increase the percentage of transportation on foot or by bike and reduce greenhouse gas emissions from transportation, as well as benefit health and ease traffic congestion.

(Promotion of a workstyle reform by teleworking)

By introducing teleworking and a flextime system using ICTs and promoting paperless offices, we will reduce transport-related CO2 emissions and see a decrease in paper consumption. This will also enable to improve a balance between work and life including childcare/nursing as well as to enhance productivity. We will support promotion of a workstyle reform through “visualization” of environmental effects.

By reviewing low-demand business hours such as late-night and round-the-clock retailing, we will contribute to securing the labor force even in the face of population decline, reducing personnel expenses, and maintaining the health of workers, thereby reducing greenhouse gas emissions at the same time.

We will promote safe, secure, low carbon medical care and nursing care by promoting effective use of ICTs.

(Extension of healthy life by “ONSEN stay”)

Modern day society brings with it many stresses and the need for a better work-life balance. As such, hot spring spa resorts offer suitable places for refreshment and healthy longevity. We will promote "ONSEN stay" that aims to ensure rejuvenation both physically and mentally by enjoying a variety of programs making full use of the surrounding nature, history, culture, food in addition to bathing in hot springs and interacting with local people and other visitors. We will also gather and analyze scientific data on the positive health benefits through close contact with nature, and promote efforts to encourage more contacts to extend healthy life expectancy.

(Improvement of quality of life by promoting proper care of pets)

Care of pets is one way for people and animals to coexist, enriching people’s lives and extending life expectancy in the process. We aim to realize a society where people and pets can live together, and comprehensively promote measures to encourage proper care by owners, including measures to prevent damaging neighborhood living conditions by inappropriately keeping too many pets at one place.

(2) Transformation of lifestyles more in contact with forests, the countryside, rivers and the sea

(Promotion to experience nature and lifestyles of mountainous, agricultural and fishing villages)

Today’s children have fewer opportunities to interact with nature, so they need not only education and learning in schools and communities, but also opportunities for original experiences to feel nature “through all five senses” wherever possible in their everyday life. We will build a social system to have children freely play in nature through creation of forests, the countryside, waterfronts and seashores, where necessary, creation of space in urban areas to interact with local nature, and promotion of long-stay activities in mountainous, agricultural and fishing villages. We will also promote the operation of the accreditation system for expanding opportunities for nature experiences and related activities as prescribed in Article 20 of the “Act on the Promotion of Environmental Conservation Activities through Environmental Education” (Act No. 130 of 2003, hereinafter referred to as the "Act on Promotion of Environmental Education etc.")

(Promotion of rural migration and dual-residence lifestyle that contribute to sound management of forests, the countryside,

rivers and the sea)

Through participation in conservation initiatives and activities to experience nature, some people start to feel the attraction of a rural lifestyle. We will provide information for those people through a unified information sharing system, and one-stop window for consultation. Aimed at encouraging lifestyles wherein people reside in cities during week and spend the weekend in rural areas—a so-called “dualresidence lifestyle”—while also encouraging relocation to rural areas, we will provide information necessary and enhance consultation support for daily life including housing, medical care and care of the elderly, employment opportunities in the agriculture, forestry and fisheries, and agricultural work for experience.

We will enrich the system to support dual-residence, dual-activity and dual-work lifestyles and develop a nationwide promotion campaign.

Younger generations in particular benefit from direct involvement in local activities, which will create a strong attachment to the regions concerned, thus expanding future possibilities to promote exchange of people. Therefore, we will promote opportunities for young people to study in mountain villages, and on remote islands, as well as to experience forests, the countryside, rivers and the sea.

(Creation of new timber demand and educating consumers)

In order to sustain the multifaceted functions of forests, it is necessary to continue sound management in an efficient and effective manner. We must secure a stable demand for timber and aim to develop and disseminate new products and technologies such as Cross Laminated Timber (CLT) and refractory materials. We will promote wooden construction of medium and large-scale buildings in rural and urban areas, diffusion of wooden interiors for core regional facilities such as public buildings and large stores as well as general households, and expansion of using wood in furniture, toys, and daily necessities.

To boost measures mentioned above, we will actively promote practical activities such as the “KiZukai (wood-using) movement”, a national movement to disseminate the significance of and expand the use of wood, as well as “Wood Education” to learn advantages and significance of wood use.

(3) Conservation of a good living environment as a basis for safe and secure life**(Maintenance and restoration of healthy and rich water environment)**

Conservation of water environment requires comprehensive understanding of an entire watershed including coastal waters into which a river flows, and appropriate measures according to features of each part of the watershed areas. We will continue to maintain the regulatory approach as the basis for policy measures, centered on water quality control through preventing pollution. In addition, we will evaluate, maintain and restore habitats for living creatures in accordance with the characteristics of watershed areas by considering factors other than water quality. Voluntary participation by various stakeholders and cooperation among them are essential.

(Ensuring good air environment)

Conservation of the air environment requires not only conventional air pollution prevention measures, but also additional measures as necessary based on scientific knowledge. We will work on comprehensive measures both inside and outside of Japan to ensure good air quality.

(Promotion of appropriate treatment of waste)

Proper treatment of waste is essential for environment conservation and improved public health. Responding to social conditions, we will promote three initiatives to promote the development of systems, structure, and technologies to properly process waste. First we will promote the design and implementation of systems for collection and transportation of waste, in line with an increase in the number of elderly households. Secondly, waste treatment facilities, the core of general waste treatment, need to be enhanced for improved energy utilization and concentrated to serve wider areas and utilized intensively over much longer periods. Third, we need to achieve sophisticated and labor-saving monitoring of appropriate treatment process by utilizing IoT and AI. With business operators taking full responsibility for waste they generate, we try to prevent the increase of illegal dumping and inappropriate treatment of waste by precautionary actions and early response. In addition, we will promote the development of environment for waste disposers to select high performance industrial waste disposal companies and the digitization of procedures on waste, as well as consider the use of information including on-line manifest.

(Comprehensive management throughout the entire life cycle of chemical substances)

As a base to secure safety and peace of mind of citizens, it is necessary to evaluate and manage risks associated with chemicals across their entire life cycle ranging from production, through importation, utilization in products, and recycling, to final disposal of chemical substances. The World Summit on Sustainable Development (WSSD) indicates a goal of minimizing significant adverse

effects of chemicals on human health and the environment by 2020. Therefore, we will promote the proper use of chemical substances in order to minimize the environmental risk caused by chemical substances through improving environmental efficiency by safe and efficient production of chemicals as well as reducing the environmental burden of chemical substances. Furthermore, we will work on appropriate treatment at the times of disposal and recycling as well as promote communicating information on appropriate treatment.

(Promotion of measures against marine litter including microplastics)

We will conduct studies on marine litter including microplastics to gain accurate information on its distribution in the ocean and its impacts on marine ecosystems. At the same time, we will provide support for local governments to take measures for collection and treatment of marine litter, and preventing generation of the amount of marine litter. Further comprehensive actions will be promoted which include public awareness-raising, reduction of single-use plastic containers and packaging, improvement of separation practices after use, recycling, and ensuring appropriate treatment including prevention of illegal dumping. International cooperation regarding marine litter should be promoted based upon related international frameworks, as well as multilateral and bilateral collaboration.

(Creation of a comfortable sensory environment)

We will promote the creation of comfortable sensory environment for communities, utilizing fragrant trees and flowers. We also take measures against light pollution and promote star observation.

(Measures against heat island effect)

With the Tokyo Olympic and Paralympic Games in 2020 as impetus, and taking fully into account current thermal environment and future trends, we will promote heat island countermeasures based on reduction of anthropogenic heat, improvement of urban surfaces, urban structure and lifestyle, and implementation of adaptation measures to reduce the effects on human health.

5. Development and dissemination of technologies supporting sustainability

(Basic concept)

Technology is required to contribute not only to sustainability efforts in Japan but also the world, including achieving the 2 ° C target of the Paris Agreement and adapting to the effects of climate change. Development and dissemination of environmental technologies have to be promoted, which can assist in addressing impending social issues such as a declining population, a declining birthrate and aging society, as well as the issue of overdependence on overseas for energy and other natural resources. Such technologies could also contribute to regional revitalization, and help to minimize impacts of disasters.

Japan is considered as an advanced nation facing various social and other challenges. Thus, Japan will promote development of innovative technologies that contribute to solving these problems using emerging ICTs such as AI and IoT, and realize the Society 5.0²⁹ through social implementation of developed technologies and systems.

We will develop state-of-the-art environmental technologies that support sustainable production and consumption through securing stable and efficient use of energy and other resources, taking measures against climate change, promoting automation and labor-saving by utilizing ICTs.

Low impact environmental technologies have been advancing rapidly in recent years. They include technologies utilizing symbiotic relationship with organisms such as low pesticide agriculture using a symbiotic relationship between microorganisms and plants, technologies of anti-fouling materials that do not use any chemical compounds using "biomimetics" that obtain ideas from superior functions and shapes of living creatures, and technologies which enable the production of useful substances by microorganisms and plants other than fossil resources. These technologies enable low environmental impacts in a similar manner found in natural laws and mechanisms, by utilizing and mimicking functions of living organisms. Looking ahead to industrialization, we will promote the development of low impact environmental technologies (so-called "environment / life technologies") which utilize the natural laws and mechanisms as well as living organisms.

Furthermore, in order to promote social implementation of newly developed technologies and established ones in some cases, and to accelerate their dissemination and deployment, we will work jointly across all sectors of government to develop an integrated approach that features a promotion of standardization and rationalization of regulations.

Footnote

²⁹ Society 5.0, which is a form of the future society that we aim for the "5th Science and Technology Basic Plan"(Cabinet decision on January 22, 2016), by highly integrating cyber space and physical space, providing goods and services that responds to various needs and potential needs finely, without disparity due to region, age, sex, language, etc., thereby achieving both economic development and solving social challenges. It is a human-centered society where people can live a comfortable and high quality life filled with energy.

These technological developments should be based not only on scientific requirements such as substantiality, reproducibility, and objectivity, but also on comprehensive promotion of environmental research and technological development that ranges from basic research, development of underlying technologies, to social implementation. At the same time, it is certainly necessary to develop human resources capable of promoting such environmental research and technological development. Consequently, environmental research and technological development will be promoted based on the integrated innovation strategy as set out in “the Science and Technology Basic Plan”.

(1) Development of state-of-the-art technology supporting the realization of a sustainable society

(Ensuring efficient use of energy and secure a stable supply of energy)

In order to promote efficient energy use, we will further promote research, development and dissemination of energy conservation technologies, by, for example, developing next generation power electronics technologies using new materials such as gallium nitride for industries, offices and households, as well as for transportation (vehicles, ships, and aircrafts). We will also promote research and development on technologies for improving efficiency and lowering cost of renewable energy, upgrading system operation technologies that will contribute to expanding introduction and technologies for stabilizing energy utilization by hydrogen and stored energy, and will also promote the dissemination of next-generation vehicles³⁰ utilizing technologies mentioned above. Fukushima suffered significant damage due to the nuclear power plant accident. The Fukushima Innovation Coast concept developed subsequently contains components such as hydrogen production from renewable energy and full-scale operation of floating offshore wind power generation. By promoting this initiative, we will take early action to lead the way forward to a future energy society, thereby driving the world towards decarbonization.

Footnote

³⁰ In the "Automobile Industry Strategy 2014", hybrid vehicles, electric vehicles, plug-in hybrid vehicles, fuel cell vehicles, clean diesel cars, compressed natural gas vehicles, etc. are defined as next-generation vehicles.

(Responding to climate change)

In order to respond to climate change challenges, it is necessary to drastically reduce greenhouse gas emissions on a global scale, and contribute to climate change adaptation both in Japan and across the world.

The best way to promote climate change measures from a long-term and global perspective is to continue to gather the latest scientific knowledge within Japan as well as internationally. As to monitoring and observation of climate change, we continue to promote comprehensive observation of the global environment, using equipment such as satellites, radar, sensors, and marine vessels. We will also promote further development of observation technologies, development of technologies to calculate and verify greenhouse gas emissions, and their practical application. Regarding the Arctic region which has seen a noticeable impact from climate change, we have to advance observation and research including development of Arctic observation technologies. Based upon these observation results, we will develop research and development as a basis for overall climate change measures, including understanding climate change mechanisms through more sophisticated prediction models and simulation technologies using supercomputers, and also constructing an earth system model, thus contributing to the development of a global earth observation system.

To mitigate climate change, we will promote research and development for social implementation on innovative technologies that will contribute to drastic reduction of global greenhouse gas emissions, such as CCUS (Carbon dioxide Capture, Utilization and Storage), based on the "National Energy and Environment Strategy for Technological Innovation towards 2050 " (decided on April 19, 2016 Council for Science Technology and Innovation). Such technologies include carbon capture and storage (CCS) technology and artificial photosynthesis that produces carbon compounds from CO₂ as a raw material.

In addition, climate change adaptation requires technology development that enables prediction and evaluation of climate change and its impacts. In addition, the technology development is also promoted to contribute to solving economic and social challenges caused by climate change by integrating observation and prediction data of the global environment.

(Securing stable supply of resources and circular utilization)

A sustainable and sound material-cycle society is one that improves resource productivity and recycling rates, and controls the amount of final disposal, taking into consideration stable supply of resources and their lifecycles. Keeping the above in mind, we will promote research and development of resource efficient technologies, technologies to produce safer substitute materials, technologies to refine raw materials with reduced environmental loads, and technologies that recover, separate and regenerate resources from waste. We also promote research and development to provide high value added materials through a manufacturing process that draws upon resource regeneration technologies with reduced environmental impact.

(Utilization of ICTs such as AI, IoT)

Through the integration of cyber-space and physical-space utilizing ICTs such as AI and IoT, a new productivity revolution is

expected to materialize, which could not only contribute to decarbonization, energy conservation and improvement of resource productivity, but also overcome Japan's labor shortage resulting from its declining population, decreasing birthrate and aging population.

We will work on more efficient operation and management of factories, and better automatic control of consumer's electricity consumption through efficient demand-response devices, thereby contributing to promoting low carbon and energy conservation activities. We also promote efficient logistics, and improve the precision and yield in crushing and sorting of urban mines. We will further move ahead with digital twin technologies to shorten the time required to develop energy equipment and promote technologies to reduce CO2 emissions.

We will promote technological development to improve resource productivity by supplying products and services to people who need it, when they need it, and in the amounts they need. With this in mind, the following will be promoted: optimization of production volume and production timing by analyzing the weather and consumption patterns using AI, optimization of inspection, repair, exchange and reuse using IoT, and operationalization of sharing platforms on the Internet.

In addition, we will advance technology development for more efficient and effective environmental conservation in local areas, such as implementation of thinning in Satoyama using robot technology, and surveying and planning of natural parks using ICTs.

("Logistics Revolution" by utilizing new technologies)

We will promote efficient logistics through development and implementation of unmanned automatic delivery services in designated areas, utilization of drones, and wireless power transmission technology as the basis for above mentioned services. We will also promote an information sharing platform among businesses, so they can operate more efficiently and with fewer carbon emissions.

(2) Development of technologies applying natural laws and mechanisms

(Production of high-value-added chemical products from biomass)

Cellulose nanofiber³¹, which is a highly functional material made from, among others, forest resources and agricultural waste, is a plant-derived carbon-neutral material, and is a renewable resource which is biodegradable and recyclable. This material is expected to contribute greatly to global warming countermeasures through improvement of fuel economy and efficiency by reducing the weight of automobile parts, generators, household electric appliances, which ultimately contributes to building a sound material-cycle society sustainably using forest resources and the like.

Footnote

31 Ultra fine plant crystal fiber about 5 times as strong as steel but one fifth the weight

Chemical products derived from biomass can be expected to contribute to the realization of a low carbon and sound material-cycle society, so we will develop innovative underlying technology for separation, conversion, synthesis, etc. so as to produce high value added chemical products from biomass.

Assuming that biomass-based chemical products become widespread in the future, it is now necessary to study technical issues related to their recycling. Ahead of the social implementation of next generation materials such as cellulose nanofibers and biomass plastics, we are moving ahead with applications development, performance evaluation at the time of installation, demonstrating that composite and forming processes can also achieve low carbon performance, and addressing any issues at the time of recycling as mentioned above. In addition, we will promote research and development towards international standardization and commercialization of cellulose nanofibers and lignin. These efforts will lead to the spread of biomass-derived chemical products.

(Boosting innovative biotechnology)

In the field of biotechnology, integration with big data and AI technology has developed rapidly, making it possible to apply potential biological functions that have not yet been put to use. On the other hand, there is still only a small domestic market for expensive biotechnology products. This underlines that Japan is not making full use of this emerging technology.

We will strengthen the basic technology for advanced use of the genome, and integrate the development of innovative biotechnology by academia, together with public-private industrial technology infrastructure and the creation of a market. In this way, we will use new biotechnology to create new industries and realize a sound material-cycle society. In addition to encouraging industry, academia and government to develop technology to create functional materials from living organisms, we promote comprehensive measures including institutional improvements to realize a low-carbon society with innovative bio materials.

(Utilization of technology closer to natural laws and mechanisms)

Technology that profiles natural mechanisms based on research on biomimetics and symbiotic relationships is expected to bring

about a paradigm shift in the way we develop technology so that it minimizes the burden on ecosystems, and also brings with it technological innovations that will contribute to sustainability. In order to contribute to the development and practical application of these technologies, we will conduct survey research for research and development, and gain a better understanding of the current situation and challenges for industrial applications.

(Conservation and restoration of biodiversity)

In order to prevent loss of biodiversity and improve land value, we are conducting research and development on technologies related to the protection of threatened species, technologies concerning the control of invasive alien species, as well as technologies for monitoring, conservation and restoration of ecosystems including those of secondary nature.

Research and development will also be conducted both on technologies that evaluate and measure the economic and social value, and on technologies for sustainable management and utilization of ecosystem services and natural capital including genetic resources, as well as technologies to utilize ecological functions in the area of climate change adaptation.

(Ecosystem-based disaster risk reduction)

In terms of ecosystem-based disaster risk reduction and adaptation measures such as a forest function to prevent landslides, and a function of coral reefs to reduce wave energy and height, we will continue to advance research and development on construction methods, maintenance and management methods, and evaluation of relevant ecosystem functions. It is important to respond adaptively according to site conditions while developing regional consensus. We will also make efforts to collect and utilize traditional knowledge such as disaster history and technology related to disaster risk reduction specific to the area. We will also develop hybrid technologies that combine ecosystems and artificial structures.

(3) Promotion of early social implementation of technology to realize a sustainable society

(Acceleration of dissemination and development through standardization and streamlined regulations)

In order to institutionalize already established and newly developed technologies, and accelerate dissemination and development, an integrative approach is needed, which includes promotion of standardization and streamlining of regulations.

We will make efforts to review and demonstrate the legal system as well as the approval and permission procedures, corresponding to changes in technological progress. We will establish an environment and regulations as well as system regarding installation of energy systems and their security, and establish an EIA method and optimize its operation.

In addition, we will promote international standardization of technical guidelines and certification systems related to strengthening international competitiveness, expand and promote international standards on energy and environment management, and move forward with the creation and expansion of a broad-scale framework including local governments to put in place an energy platform.

(Support for technical evaluation / demonstration)

It is important for the national government to provide appropriate information on environmental technologies and support the dissemination of such technologies by evaluating and demonstrating utilities of such technologies developed by private companies.

Some environmental technologies can already be put to use, so we will ensure that they are effective for environmental conservation by having them objectively verified by third-party institutions, which enables end users to use them with confidence.

We also support technology development and demonstration on practical, versatile and economically efficient technologies that promote sound material-cycle society and proper treatment of waste.

In addition, in order to ensure that the technologies described in Chapter 2, 5. are fully developed and widely disseminated, we will support cost reduction, establishment of mass production methods, and efficient implementation.

6. Demonstration of Japan's leadership through international contributions and building strategic partnerships

(Basic concept)

Japan has vast experience to overcome serious pollution problems. In addition, despite the lack of mineral resources, we have also worked on development and implementation of relevant technologies to save of both energy and resources. In addition, we have the spirit of "Mottainai" that cherishes the value of everything useful (corresponding to the spirit of circulation) as well as wisdom and tradition (symbiosis's wisdom and tradition) that emphasize coexistence with nature, rather than opposition to it. In fact "Mottainai" and "Satoyama" have become common phrases across the world.

As environmental problems on a global scale become increasingly serious, Japan's superior environmental technologies and infrastructure, as well as supporting ideas, systems, and human resources could greatly contribute to the improvement of global environmental problems.

For these potential Japanese contributions to be realized internationally, it is particularly important what international rules should be like such as multilateral environment conventions and various guidelines associated with each convention. Therefore, Japan needs to be actively involved in developing fair and effective international rules.

In the process of formulating such international rules, it is always crucial to have discussions based on objective data and scientific bases. Therefore, we will contribute to the enrichment of relevant scientific knowledge as a basis for international rule-making.

Environmental problems respect no national borders, thus efforts to improve the environment in developing countries will also contribute to the improvement of the environment in Japan. This recognition will indicate potential demands in other countries for excellent Japanese environmental technologies and infrastructure. Many developing countries are still in the process of establishing various systems for the environment. Thus, if the systems introduced are consistent with those of Japan, local institutional conditions are considered very facilitative in promoting smooth international cooperation by Japan, and creating potential opportunities for Japanese companies. In the long term, economic disparity between emerging/ developing countries and Japan will shrink, while the economic and social situations of each country are expected to diversify. In this context, although the unilateral assistance by developed countries could remain important, the focus will shift to building a partnership to promote collaboration and share wisdom together, thereby leading to generating two-way collective innovations. From this point of view, we will pursue cooperation across all dimensions including institutional design, human resource development, dissemination of technology and infrastructure, with a view to building a sustainable society in developing countries, especially in the Asia-Pacific region. In particular, besides bilateral cooperation, we will promote cooperation in a multilayered manner through multi-level environmental cooperation with organizations such as the Association of Southeast Asian Nations (ASEAN).

As already elaborated, we will proceed with each priority strategy mentioned in Chapter 2 from 1. through 5., and realize the model advocated by the Circulating and Ecological Economy in Japan. Based upon that, Japan could present, utilizing its strengths in the international arena, a coherent package of its successful experiences to the world, including the Asia-Pacific, thus contributing to the formation of a sustainable region. In this way, we will proactively contribute to building a sustainable society around the world.

(1) Active involvement and contributions to international rule-making

(Active involvement in discussions of international rule-making)

We will actively participate in international negotiations in the environmental field, aiming to formulate rules that can make use of our strengths, and contribute to international consensus building.

Specifically, in the field of climate change, we will actively participate in discussions towards preparation of implementation guidelines (regarding mitigation, adaptation, transparency, global stocktake, market mechanisms, etc.) for the Paris Agreement scheduled in 2018. In particular, in implementing the Paris Agreement, it is important to improve the transparency of information regarding climate change countermeasures in each country. In cooperation with Global Environment Facility (GEF) and others, we will promote the effective use of the "Capacity Building Initiative for Transparency (CBIT)" to support capacity development in developing countries. We will contribute to improving transparency on measuring and reducing emissions in each country through ongoing global scale greenhouse gas observation using a satellite "IBUKI" in the GOSAT series, and through development and dissemination of monitoring methods utilizing ICTs. In formulating implementation guidelines, we will continue discussions while working in cooperation with countries and related organizations.

Regarding the field of natural environment, we will actively participate in following the achievement of the Aichi Biodiversity Targets, and lead the initiative to formulate and achieve new global targets (post-2020 global biodiversity framework) after 2020. Regarding chemical substances and waste management, we will utilize our knowledge and experience in negotiations developing guidelines for implementing the Minamata Convention on Mercury, and development of a successor framework to the "Strategic Approach to International Chemicals Management" (SAICM), thus contributing to further consensus building. In addition, we will promote cooperation with Europe and North America in order to ensure that chemical substances management in other countries is consistent with the system in place in Japan. In addition, at the G7, G20 and other forums, we will lead discussions on resource efficiency and promotion of 3Rs, contributing to a drastic improvement in global resource efficiency.

(Enhancement and active provision of scientific knowledge as a basis for international rules)

Scientific knowledge on climate change, biodiversity and ecosystem services, and resource circulation is a prerequisite for formulating international rules and this knowledge must continue to be enhanced. From this perspective, we will continue to support

IPCC, Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), and the UNEP International Resource Panel (IRP). Whenever evaluation reports are prepared, Japan will make inputs particularly based on knowledge in the Asia-Pacific region by, for instance, increasing the number of Japanese authors.

The greenhouse gas observation satellite "IBUKI" (GOSAT) series will continue to make observations of greenhouse gas concentration distribution, ensuring more accurate estimates of greenhouse gas emissions and removals. By making this data available to government agencies and scientists in various countries, we will contribute to the advancement of international research on climate change and effectiveness of countermeasures to address it.

With regard to marine litter including microplastics, we will promote efforts to harmonize methods of monitoring microplastics under the framework of G7 and others. This will contribute to clarifying the global distribution of microplastics in the ocean. Through information-sharing and international cooperation under multilateral and bilateral frameworks, we will contribute to getting a clearer understanding of the actual situation of marine litter, and how to prevent generations, especially in the Asian region.

As measures against transboundary air pollution (PM 2.5, photochemical oxidants, dust and sand storm (yellow sand)), Japan will provide knowledge to bilateral partners and share the latest information, and exchange opinions under a multilateral framework, with a view to widening the scope of air environmental management across the Asian region.

Regarding chemical substance management, Japan will contribute to the implementation of the Minamata Convention on Mercury by supporting the development of a mercury monitoring network. Japan will also contribute to international efforts under the Stockholm Convention by promoting the horizontal extension of monitoring technologies related to persistent organic pollutants (POPs).

(2) Support for building sustainable societies in other countries

(Dissemination of excellent environmental infrastructure overseas)

Through the Joint Crediting Mechanism (JCM) and Official Development Assistance (ODA), Japan will support introduction of various environmental infrastructure such as facilities for waste treatment, energy conservation, renewable energy, and pollution control, in developing countries, with the aim of improving local environment as well as expanding opportunities for Japan's environmental business.

Japan has a particular advantage in the resource recycling industry, and we plan to promote its international development, while fully taking into account the needs of developing countries. A package of support will be developed from feasibility studies to actual construction and maintenance, in terms of institutions, systems and technologies in the areas of waste-to-energy, recycling, domestic wastewater treatment, and mercury management.

(Support for climate change mitigation in developing countries)

Developing countries have increasing needs for climate change mitigation that require technical support. Taking a long-term perspective up to 2050, we will develop infrastructure to promote mitigation measures and reduce emissions by mainstreaming low-carbon technologies. This will be carried out by designing soft infrastructure, such as institutions, technologies and finance as a package, through funding mobilization, development of relevant plans, and establishing new institutions for the mainstreaming of effective technologies.

(Adaptation support in developing countries, international development of good practices in Japan)

It should be fully acknowledged that adaptation plans must be formulated and implemented based on scientific knowledge, and so Japan will create the "Asia-Pacific Climate Change Adaptation Information Platform (AP-PLAT)" to support adaptive behaviors in all sectors of developing countries vulnerable to climate change risks.

We will promote the "Satoyama Initiative", which is the result of the 10th Meeting of the Conference of the Parties to the Convention on Biological Diversity held in Japan in 2010. We will also demonstrate the international appeal of the Circulating and Ecological Economy to be built in Japan based on this Basic Plan.

(Institution building, capacity development support, and awareness raising in developing countries)

In the field of climate change, we will provide support for capacity development to improve access to various funds including the Green Climate Fund (GCF) for developing countries, support for capacity development by providing latest scientific knowledge, and support for the introduction of institutions and measures to reduce emissions of greenhouse gases. We will assist efforts to improve transparency of information on countermeasures taken by various stakeholders under partnership among those concerned as a basic information infrastructure, thereby create innovations in collaboration with developing countries.

In the field of natural environment, developing countries will need to build the capacity required to achieve the Aichi Targets, so we will provide technical assistance on the formulation and implementation of National Biodiversity Strategy, making use of the "Japan Biodiversity Fund" set up by the Secretariat of the Convention on Biological Diversity and "Nagoya Protocol Implementation Fund" set up by GEF.

We will cooperate with international organizations to proactively relay information across Asia on the long-term environmental and economic merits of proper waste management, by introducing advanced technology and promoting resource circulation. In cooperation with NGOs, we will also promote exchange and support at the grassroots level for raising public awareness about environmental conservation. In addition we will also take the lead in Asia in strengthening cooperation among countries to prevent illegal imports and exports of hazardous waste through the Asian Network Workshops.

In the field of chemical substances, we will support countries in Asia that are in the process of constructing a chemical substance management system to ensure coordination with the system already in place in Japan. We will also provide assistance for the implementation of the Minamata Convention on Mercury including technical cooperation for mercury management carried out by developing countries, making full use of the National Institute for Minamata Disease. Moreover, in order to improve air quality and reduce water pollution, we will promote and utilize a co-benefits approach that simultaneously realizes greenhouse gas emission reduction and improvement of the local environment through bilateral cooperation. In the field of water environment, we will aim to promote support for institution building and capacity development through a network of administrative officials across many Asian countries.

In addition, we will promote city-to-city collaboration to stimulate actions cutting across many sectors, drawing upon knowledge accumulated in many local governments.

Chapter 3 Development of environmental policies to support priority strategies

Japan's environmental policy originated from countermeasures taken against serious pollution that occurred during the period of high economic growth after World War II. The policy undoubtedly brought tangible environmental benefits responsible for much of today's dramatically improved living conditions. Our current standard of living tends to be thought of as "a given", but it must be remembered that it is in fact due to "a culmination of historical efforts" to improve environmental health.

Environmental policies that started to deal with pollution control now cover a wide range of issues including climate change, waste management, and biodiversity, and government plans in each of these areas have been formulated to deal with these issues. Countermeasures are making progress, but they fall short in many ways. The government will continue to promote measures in each field and strengthen measures to ensure responses are adequate.

By way of illustration, environmental policy as a whole can be considered as a tree, with the six priority strategies in the previous chapter as its "flowers" and the "environmental policies to support priority strategies" in this chapter making up its "trunk" or "roots". Without a trunk and roots, the tree will not bloom and only when the flowers bloom will the tree bear fruit for future generations. Just as the roots and trunk of a tree form the main support, it is vital to steadily advance environmental policies to support priority strategies.

1. Climate change measures

Based on the Paris Agreement, Japan has implemented various measures listed in the "the Plan for Global Warming Countermeasures" (Cabinet decision on May 13, 2016) formulated under the Act on Promotion of Global Warming Countermeasures, and progress is being made towards achievement of the mid-term target of a 26% greenhouse gas emission reduction by 2030 (compared with 2013; and by 25.4% compared with 2005). The Action Plan states that "Under the fair and effective international framework in which all major emitting countries participate, based on the Paris Agreement, Japan leads the international community so that major emitting countries can tackle emission reductions according to their capabilities, and with the long-term goal of reducing greenhouse gas emissions by 80% by 2050, aims at simultaneously achieving both global warming countermeasures and economic growth. Such a deep cut in emissions is difficult to achieve through the extension of existing measures so far. Therefore, we will pursue solutions through innovation such as development and deployment of innovative technologies that enables drastic emission reductions, and, while promoting domestic investment, enhancing the international competitiveness, and requesting opinions from the public, aims to achieve a deep cut in emissions through long-term, strategic actions, thereby contributing to global GHG emission reductions."

We fully recognize the current state of the environment, economy, and society, and will meet the challenges ahead by way of concrete measures. Based on the accumulation of lessons learned from practices of various measures both at home and abroad

including introduction of carbon pricing, we will promote policies that contribute to I2ES by utilizing regional resources, technological innovation, originality and ingenuity. This in turn will lead to economic revitalization, employment creation, and a solution to regional challenges. We will put in place policies leveraging a broad scope of actions to move forward with global warming countermeasures that promote the reduction of emissions while driving regional revitalization and economic development to support a high-quality of life for Japan's citizens, including through energy conservation, maximum introduction of renewable energy, further acceleration of technology development, social implementation, and lifestyle and workstyle reform.

Japan's electric power sector, for instance, accounts for about 40% of the country's energy-originated CO₂ emissions: low carbonizing this sector remains a significant challenge. Coal-fired power generation in particular has higher CO₂ emissions than other thermal power plants, bringing about moves mainly by developed countries to curb coal-fired power generation and the resulting CO₂ emissions. We will make every effort to meet the targeted emission factor of 0.37 kg - CO₂ / kWh, which is consistent with the reduction target and the energy mix of 2030. To comply with the Paris Agreement aimed at net zero emissions of anthropogenic greenhouse gases (balancing anthropogenic greenhouse gas emissions and removals) in the second half of this century, it is necessary to drastically reduce emissions from thermal power generation. In light of this, while paying close attention to domestic and overseas trends, actions will be taken to address global warming in the electric power sector.

Nuclear power is a low-carbon baseload power source that does not emit greenhouse gases when operating. Safety issues of nuclear power plants will be in line with the expert judgment of the Nuclear Regulation Authority, and nuclear power plants will be restarted if the Authority deems that regulatory standards are met. In such cases, it is crucial to gain the understanding and cooperation of stakeholders such as the local governments concerned.

We will move to reduce emissions of fluorocarbons, by strengthening comprehensive measures throughout the lifecycle of fluorocarbons from upstream to downstream (production, use, recovery, and destruction/recycle), in consideration of the Kigali Amendment to the Montreal Protocol.

In addition, it is important to consistently show the direction that the country is taking towards longterm substantial reductions so as to contribute to investment decisions and decision-making for bold low carbonization actions by all stakeholders. Based on the Paris Agreement, what is needed are significant reductions in domestic emissions based upon a long-term low-emission development strategy, thereby making maximum contributions to global emission reductions, and simultaneously achieving further economic growth in Japan

Measures listed in the "National Plan for Adaptation to the Impacts of Climate Change" will be implemented to adapt to the impacts of climate change.

2. Establishment of sound material-cycle society

Regarding the formation of a sound material-cycle society, based on the priority strategies set out in Chapter 2, comprehensive efforts will be made for the creation of a sustainable society according to the system of environmental conservation measures in Part 4. These measures will be promoted comprehensively and systematically according to the Fundamental Plan for Establishing a Sound Material-Cycle Society, based on the "Fundamental Law for Establishing a Sound Material-Cycle Society" (Act No. 110 of 2000).

3. Securing biodiversity and living in harmony with nature

Regarding initiatives to secure biodiversity and to live in harmony with nature, measures will be comprehensively and systematically promoted based on the National Biodiversity Strategy of Japan 2012-2020 formulated under the Basic Act on Biodiversity. In line with post-2020 global biodiversity framework expected to be decided at the 15th Meeting of the Conference of the Parties to the Convention on Biological Diversity in 2020, and based upon the priority strategies set out in Chapter 2 and the system of environmental conservation measures in Part 4, revisions to the national biodiversity strategy will be made after 2021.

4. Environmental risk management

Measures to protect public health and living environment by preventing pollution in the atmosphere, areas of public water, groundwater, and soil, and preventing environmental pollution from harmful chemical substances are the starting point of the environmental administration, thus these will be steadily promoted going forward.

(1) Environmental conservation of water, air and soil

We aim to meet environmental standards related to water, air and soil as the basis for our survival. We will implement appropriate

measures based on related laws, including the “Air Pollution Control Act” (Act No. 97 of 1968), “Water Pollution Prevention Act” (Act No. 138 of 1970), and the “Soil Contamination Countermeasures Act” (Act No. 53 of 2002). Particular focus will be placed on the following matters.

— 1 — Promotion of water pollution measures

Achieving and maintaining environmental water-quality standards requires respective responses to various types of wastewater such as that from factories, offices, and households, as well as waste water from non-point sources such as urban / agricultural land. To this end, we will promote the following measures to reduce pollutant loads: regulations to control effluent and the total emission reduction, based on the Water Pollution Prevention Act; regulations on the use of pesticides based on the “Agricultural Chemicals Control Act” (Act No. 82 of 1948); and putting in place various household wastewater treatment facilities such as sewage, facilities to deal with wastewater from agricultural settlement, and Johkasou(decentralized wastewater treatment system)from individual households. In addition to this, we will make every effort to comprehensively promote proper conservation, regeneration and sediment improvement of natural coasts, tidal flats, and seaweed beds, among others. Actions are also needed to facilitate treatment of drifting waste in enclosed coastal seas.

— 2 — Conservation of groundwater and ground environment, and sustainable groundwater use

We will promote and support actions in areas suffering from continuing ground subsidence, but where extraction of groundwater is not regulated by law. Effective technologies should be introduced to control the amount of groundwater extracted. Actions are also needed to prevent recurrence of subsidence by the regulation of extraction of groundwater in those areas that had ground subsidence in the past. Furthermore, thermal use of groundwater for renewable energy is on the increase in recent years, which has resulted in increasing extraction of groundwater. In view of this, we will undertake a study on ways to control extraction of groundwater and to carry out management to prevent ground subsidence.

— 3 — Promotion of PM2.5 and photochemical oxidant countermeasures

We will continue to appropriately implement countermeasures against fixed sources and mobile sources based on the Air Pollution Control Act. Comprehensive measures will be taken to reduce photochemical oxidants and precursors causing PM2.5, while paying economic and technical considerations, based on an understanding and full scientific knowledge of actual emissions, as well as looking at how emission control technologies are developed and disseminated.

— 4 — Promotion and enhancement of measures to prevent scattering of asbestos

In order to strengthen measures to prevent scattering of asbestos, further consideration will be given on the issues such as countermeasures for removal of asbestos-containing materials other than the specified construction materials for which countermeasures are already in practice, along with ensuring through preliminary surveys based on Air Pollution Control Act before demolition or refurbishment works begin and raising more awareness among orderers and contractors of such works.

— 5 — Appropriate management of environmental risks by countermeasures against soil pollution

For the appropriate risk management of soil contamination, relevant governmental and ministerial ordinances will be prepared, to implement the “Amendment to the Soil Contamination Countermeasures Act” (Act No.33 of 2017). We will also ensure safety through properly continued investigations and measures. In addition, we will ensure proper information disclosure and dissemination, aimed at bringing about improvements of sense of security and facilitation of land transactions.

— 6 — Initiative actions for the creation of a comfortable sensory environment

In order to effectively address problems concerning the living environment that adversely affect senses of people such as noise, vibration, offensive odor, heat stress, and light pollution, we will promote actions by local governments, necessary study and research and public awareness. The actions could include preparation and distributing manuals that set out regulations and good practices based on the Noise Regulation Act” (Act No.98 of 1968) and others. Also public awareness will be raised by providing guidelines on measures to deal with excessive heat, by researching the impact of excessive heat on humans, and by providing information to prevent heat illness.

Indicators to promote countermeasures

As stated above various countermeasures are implemented, and the progress is evaluated based on the following indicators:

(Indicators on water environmental conservation)

- ◇ Achievement of environmental quality standards concerning water pollution of areas of public water and groundwater
- ◇ Number of watershed circulation plans formulated

(Additional indicators on water environmental conservation)

- ◇ Monitoring spots for water quality

- ◇Pollutant loads in major enclosed water areas
- ◇Total quantity of waste dumped at sea
- ◇Amount of wastewater reuse
- ◇Number of groundwater springs
- ◇Forest areas (monolayer forest, multilayered forest, natural forest)
- ◇Areas of forest reserves
- ◇Areas of protected waterside zones from the water environment conservation point of view
- ◇Areas of tidal flats and seaweed beds in major enclosed coastal seas
- ◇Number of areas that started to create rural natural environment from the viewpoint of ecosystem conservation
- ◇Number of sites for activities to create Satoumi
- ◇Areas covered by joint conservation activities of the water environment around agricultural land
- ◇Water and green public spaces secured in urban areas
- ◇Number of participants in the national aquatic organisms survey

(Indicators on air quality conservation)

- ◇Achievement of environmental quality standards for each air pollutant
- ◇Achievement of environmental quality standards and guideline values of hazardous air pollutants
- ◇Achievement of environmental quality standards on automobile noise in areas along main trunk roads
- ◇Achievement of environmental quality standards on noise caused by Shinkansen and aircrafts
- ◇Achievement of environmental quality standards on noise in general areas

(2) Chemical substance management

With regard to the management of hazardous chemical substances, comprehensive countermeasures will be implemented from the viewpoint of protecting public health and the environment, including through the implementation of related laws and regulations, such as the “Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture” (Act 117 of 1973, hereafter Act on the Evaluation and Regulation of Chemical Substances), the “Act on Confirmation of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof” (Act No.86 of 1999). Particular attention will be placed on the following issues:

—1— Promotion of actions on risk minimization throughout the whole lifecycle of chemical substances

Chemical substance management will be based on the SAICM National Implementation Plan (InterMinisterial Meeting on SAICM, September 2012) with the objective as indicated at WSSD to achieve “by 2020, that chemicals are used and produced in ways that lead to the minimization of significant adverse effects on human health and the environment.” In particular, the following will be implemented:

- I. Risk assessment of chemical substances based on the Act on the Evaluation and Regulation of Chemical Substances, and designation of those found posing significant risks as Class II Specified Chemical Substances,
- II. Much wider assessment of toxicity through the development of Quantitative Structure-activity Relationship (QSAR),
- III. Regarding exposure assessment, development of methodologies for measuring the released amounts to the environment from the entire lifecycle of chemical substances, and improvement of the methodologies based on the PRTR system and other monitoring systems,
- IV. Based on the above, implementation of risk reduction focusing on the entire lifecycle of chemicals from manufacturing to disposal. For particularly high risk substances, risk management by continuing emission control based on the Air Pollution Control Act, Water Pollution Prevention Act, and the “Act on Special Measures against Dioxins” (Act No. 105 of 1999). A review of the domestic implementation plan corresponding to the framework of SAICM after 2020, as well as progress checks and updates various policy measures with check results.

—2— Promotion of survey research on chemical substances

Chemical substance countermeasures require administrative efforts based on scientific knowledge. Therefore, working to accumulate this knowledge, we will move forward with improving the efficiency and sophistication of risk assessment, as well as with conducting survey research on unresolved issues, thereby leading to detailed understanding of environmental risks and their reduction. In addition, research on chemical substance countermeasures will be promoted by various institutions including local environmental research institutes, and reliable and efficient implementation of surveys including monitoring will be carried out, followed by systematic organization and management of the accumulated survey data.

—3— Promotion of understanding and dialogue on management and risks of chemical substances

Partnership should be strengthened among stakeholders (national and local governments, citizens, NGOs, industry, and experts) aimed at sharing accurate information and communicating through dialogue on the risks of chemical substances. By making use of

methods for classification and labeling of chemicals such as GHS (Globally Harmonized System of Classification and Labelling of Chemicals) labels, and SDS (Safety Data Sheet), information can be shared among businesses and between business operators and consumers, thereby promoting understanding in schools and businesses about environmental risks.

—4— Japan Environment and Children’s Study (JECS)

We will establish an appropriate risk management system by clarifying environmental effects that chemical substances in the environment have on the physical and mental health of children, by conducting a large-scale and long-term cohort survey, targeting 100,000 mother-child pairs for the purpose of leading to a safe and secure child-rearing environment, tracking from the fetal stage during pregnancy until they become 13 years of age.

—5— Improvement of ecological risk assessment of pesticides

Looking at pesticides from the viewpoint of protecting the living environment, conventional risk assessment should be carried out based on acute effects on particular aquatic animals and plants, new risk assessment methods should be developed to detect effects from long-term exposures, and on organisms other than aquatic animals and plants used by conventional assessment, thereby with improving ecological risk assessment used currently for the pesticide registration system.

Indicators to promote countermeasures

As stated above various countermeasures are implemented, and the progress is evaluated based on the following indicators:

(Indicators on the residual conditions in the environment)

- ◇ Achievement of environmental quality standards, targets, guideline values on harmful substances designated
- ◇ Implementation status of various environmental and monitoring surveys (the number of chemical substances surveyed, that of survey sites, and that of different environmental media)
- ◇ For substances that are continuously monitored for long periods of time, such as POPs, study on indexing any increasing and decreasing trends in concentration (e.g. the number of substances whose concentration tends to decrease)

(Indicators on releases into the environment)

- ◇ Amounts of release and transfer of chemical substances which are designated under the PRTR system

(Indicators on risk assessment)

- ◇ Implementation status of screening evaluation and risk assessment based on the Act on the Evaluation and Regulation of Chemical Substances
- ◇ Implementation status of new ecological risk assessment for the pesticide registration system

(3) Environmental health measures

Proactive measures, including those given in (1) and (2) above, will be taken to prevent the occurrence of pollution related health damage. Prompt and fair protection and securement of health for pollution victims will also be promoted.

—1— Pollution health damage compensation

Based on the “Act on Pollution Health Damage Compensation” (Act No. 111 of 1973, hereafter Act on Compensation), and giving consideration to the polluter-pays principle, Japan will implement compensation benefits and programs of pollution health and welfare for acknowledged patients and provide prompt and fair relief.

—2— Implementation of activities to prevent damage to health by environmental pollution

Making use of the investment profit of the Pollution Health Damage Prevention Fund created in the Environmental Restoration and Conservation Agency, necessary projects will be conducted such as research to prevent health damage due to air pollution and to ensure the health of local residents

—3— Environmental health surveillance for air pollution

Along with the 1987 Partial Revision of the Act on Compensation (De-listing of the Type 1 designated areas), Environmental Health Surveillance for Air Pollution has been implemented with the aim of regularly and continuously monitoring the relationship between the health conditions of local populations and air pollution, and of taking measures required when necessary.

—4— Promotion of measures on Minamata disease

Based on laws such as the “Act on Special Measures Concerning Relief for Victims of Minamata Disease and Solution to the Problem of Minamata Disease” (Act No. 81 of 2009), we will implement compensation, medical treatment and welfare measures,

and revitalization and reconciliation of local communities in collaboration with relevant local governments and others so that all victims and local people can live in the community with peace of mind.

— 5 — Relief for asbestos health damage

Based on the “Act on Asbestos Health Damage Relief” (Act No.4 of 2006), prompt relief will be carried out for victims and others with health damage caused by asbestos. Moreover, based on the report of the Asbestos Health Damage Relief Subcommittee of the Environmental Health Subcommittee of the Central Environment Council, compiled in December 2016, we will study on health management methods, operation of the Asbestos Health Damage Relief System, and promotion of the research.

5. Various basic measures

In partnership with various stakeholders, we will carry out effective implementation of the priority strategies outlined in Chapter 2 and various measures listed in sections from 1 to 4 above. Specific actions taken will include implementation of EIA, enhancement of scientific knowledge, development of human resources through education, and analysis and provision of related information.

(1) EIA

Regarding EIA, the national government, local governments and related organizations will collaborate to develop a common basis for ensuring appropriate environmental considerations. We will conduct a comprehensive review on how to institutionalize a system that contributes to the reduction of cumulative and complex environmental impacts.

— 1 — Development of comprehensive measures for EIA system

We will consider how to implement strategic environmental assessment to properly incorporate environmental considerations in policies and plans to be developed before deciding actual sites and scales of development projects. Moreover, subsequent to EIA, we will make efforts to follow up by utilizing standardized reporting procedures. In addition, we will strive to gather information on projects not covered by the "Environmental Impact Assessment Act" (Act No. 81 of 1997). If necessary, we will also look at measures to promote environmental considerations in the planning and implementation of the projects not subject to the Environmental Impact Assessment Act.

— 2 — Implementation of qualified and efficient EIA system

We will take measures to properly and effectively operate the Environmental Impact Assessment Act including strengthening the review system, and regular reviewing and revision of enforcement. We will also promote the development of information infrastructure, such as providing basic environmental information and actual examples of EIA. We will also work on research and development as well as dissemination of the latest technical methodologies related to EIA, in addition to capacity building. Furthermore, studies and consideration will be carried out from environmental conservation perspectives on development projects possibly subjected to the Environmental Impact Assessment Act in the future and necessary measures will be taken.

(2) Promotion of research and development as a basis of policy decisions based on scientific knowledge

— 1 — Strengthening of institutions engaged in environment research and technology development

We will strengthen the basis for research and development concerning the environment with the following measures: implementation of research and development that contribute to environmental policies development utilizing the Environment Research and Technology Development Fund, strengthening functions of the National Institute for Environmental Studies (NIES) to maximize results of research and development as a core institution for environmental research, strengthening the role of local environmental research institutes, improvement of basic information that contributes to research, technology development and policy planning in the environmental field, strengthening cooperation with local public environmental research institutes, and capacity development through enhancement of training courses conducted at the National Environmental Research and Training Institute.

We will also promote academic research, and nurture the environment industry including creation of environmental business by enhancing support for research and development carried out by various entities such as private companies, universities and local governments. We will systematically collect and analyze information on research and development conducted jointly by public and private entities, and share such information with the public.

— 2 — Promotion of research and development as a basis of policy decisions based on scientific knowledge

Based on this Basic Plan, we will formulate a strategy to promote research and technology development for the environment. The strategy will lay the basis for NIES to revise its medium-to-long term goals. We will steadily implement research responding to the needs for further environment policy development, utilizing the Environment Research and Technology Development Fund.

(3) Promotion of environmental education and learning

Environmental education and learning will be carried out to develop capacity and qualification of those who will act as core persons to build a sustainable society, under the Act on Promotion of Environmental Education etc. and the basic policies stipulated by the government based on that Act according to the concept of ESD. In particular, the following points will be priority areas:

— 1 — Deepening and enriching environmental education through training practitioners

In practicing environmental education, it is especially important to foster the right spirit to create a sustainable society and nurture the skills necessary for problem-solving. To that end, each one of us should continuously learn lessons throughout our lifetime by developing attitudes from finding specific challenges in their daily lives in relation to surrounding nature and communities, making efforts to work on solutions for themselves, and reviewing resultant changes accordingly. The Ministries concerned will cooperate in the training of practitioners to ensure each actor involved in environmental education could recognize the importance of such learning and put it into practice.

— 2 — Expansion of “places to experience opportunities” where citizens can participate

“Learning by doing” is effective in fostering interest about the environment and encouraging motivation for creating a sustainable society. However, interests among parents toward participation remain low at present. Therefore, efforts will be made on the expansion of “places to experience opportunities” to build momentum for establishing a sustainable society and nurturing the skills necessary for problem-solving, in collaboration with various stakeholders including companies. We will carry out leadership training with the active involvement of citizens to enhance the effectiveness of learning by doing. This approach will be undertaken by making full use of the accreditation system for “places to experience opportunities” based on the Act on Promotion of Environmental Education etc., the registration system for initiatives to certify expert personnel, and the agreement system on environmental conservation.

— 3 — Promotion of learning through participation in diverse activities for environmental conservation and community development

Due to the declining birthrate and aging society, and expansion of regional economic disparity, there is concern that we may not be able to gain sufficient support among citizens to engage in activities for environmental conservation and in sustainable communities. On the other hand, we will have more time to spend on activities other than our work due to workstyle reform. As a result, the time will come when re-learning becomes a part of life. Our lives will no longer be based on a single road system, where new graduates are hired by companies and then work until retirement. Based upon the above, we will provide opportunities for young people, those of working age, and people just before retirement to participate in various activities for environmental conservation and sustainable community development, and promote learning through these activities.

— 4 — Support for business on environmental leadership development

Efforts will be promoted to train environmental leaders inside and outside companies with a view to appropriately integrate environmental considerations into corporate management, and generate new corporate values. Such environmental leaders are expected to have the capacity to tackle environmental management and environmental conservation, thereby promoting greening economy and society.

(4) Improvement and provision of environmental information

We will promote comprehensive and systematic utilization of public-private data in the environmental field based on "Declaration to be the World's Most Advanced IT Nation: Basic Plan for the Advancement of Public and Private Sector Data Utilization" (Cabinet decision on May 30, 2017) formulated based on the "Basic Act on the Advancement of Public and Private Sector Data Utilization" (Act No. 103 of 2016). We will promote steady improvement and utilization of statistical data for environmental policymaking to promote evidence-based policymaking (EBPM) based on the “Final Report of Statistical Reform Promotion Council” (approved by Statistical Reform Promotion Council in May 2017) and “Basic Plan on Public Statistics Improvement” (Cabinet decision on March 6, 2018). In particular, the following points will be prioritized.

— 1 — Improvement of environmental information to promote EBPM

We will collect and maintain a wide range of statistical data on environment, economy and society held by international organizations, the national government, local governments and private companies to steadily promote EBPM in environmental administration. Meanwhile, statistical information for policymaking will also be steadily improved.

— 2 — Promotion of information provision in response to user needs

We will strengthen efforts to promote open-data related to the environmental for mutual utilization of data held by the government,

local governments and businesses, based on the "Basic Principles on Open Data" (approved by Strategic Headquarters for the Promotion of an Advanced Information and Telecommunications Network Society, Strategic Conference for the Advancement of Public and Private Sector Data Utilization in May 2017). In the meantime, we will advance the provision of information based on user needs to enhance and strengthen partnerships, promote citizens' participation in environmental policies, and encourage a shift to sustainable lifestyles. Information should be available in a user-friendly manner, accessible anywhere anytime through the use of IT with both reliability and accuracy ensured.

6. Reconstruction after the Great East Japan Earthquake and responses to future large-scale disasters

(1) Reconstruction after the Great East Japan Earthquake

— 1 — Construction of Interim Storage Facility (ISF)

Necessary measures will be carried out with regard to establishing Interim Storage Facility (where soil from decontamination operations in Fukushima is managed and stored safely until final disposal), and continuous transport of the contaminated soil to such facilities, as well as treatment of radioactive material contaminated waste, and reduction as well as recycling of removed soil. Projects to promote these measures will be taken promptly and appropriately by all Ministries concerned with close cooperation among various stakeholders particularly with local governments.

— 2 — Development of specified reconstruction and revitalization bases (Reconstruction Hubs) in the Areas where Returning is Difficult (ARD)

We will promote integrated implementation of decontamination, dismantling, and infrastructure development at "Reconstruction Hubs" in the Areas where Returning is Difficult (ARD) along with the reconstruction and revitalization plan for approved and specified reconstruction and revitalization sites of each local government based on the "Act on Special Measures for the Reconstruction and Revitalization of Fukushima" (Act No. 25 of 2012 and revised in May 2017).

— 3 — Health management and response to health concerns of residents regarding radiation exposure through risk communication

The following points were raised as "Direction of the Immediate Measures by the Ministry of the Environment" in February 2015 based on the "Interim report of experts' meeting for the health management of the public following TEPCO Fukushima Dai-ichi nuclear power plant accident" (December 2014): (1) Promotion of initial radiation dose assessment after the accident, (2) Monitoring of disease morbidity trends in Fukushima Prefecture and neighboring prefectures, (3) Improvement of Fukushima health management surveys "thyroid ultrasound examination", and 4) Continuation and improvement of risk communications. Moving forward, support measures will be carried out including radiation dose assessment, research on radiation health effects, support for Fukushima health management surveys, and consultations by radiation counselor support center.

— 4 — Reconstruction of disaster-hit areas through resource circulation

Future-oriented reconstruction through resource circulation will be promoted by thermoelectric utilization of waste disposal facilities and improvement of low carbon-type recycling. At the same time, measures focusing on the natural connections among forests, the countryside, rivers and the sea, and circulation of funds within the community will be promoted.

(2) Response to natural disasters

— 1 — Disaster waste treatment

Recently, large-scale disasters have taken place almost every year in Japan. Among major challenges are the treatment of garbage and human waste because waste treatment facilities are significantly damaged, and the treatment of large amounts of disaster waste. It is now predicted that the Nankai Trough earthquake and an earthquake centered directly under Tokyo are likely to occur in the near future. If the treatment of large amounts disaster waste is impeded, recovery and reconstruction will be delayed significantly. The other concern is the fact that a single municipality, the body responsible for waste management, cannot singlehandedly cope with disaster waste treatment at the time of such a large-scale disaster.

Based on the above, we aim to strengthen in non-disaster time a waste treatment system on a more multi-layered basis cutting across the local, regional and nation levels. When a disaster hits, appropriate and prompt treatment of disaster waste will be conducted mainly by local municipalities in cooperation with regional units concerned, and nationwide frameworks, depending on the scale of disaster.

— 2 — Environmental conservation measures in disaster-hit areas

We will make every effort to widely disseminate the following information to prevent asbestos from scattering in the event of a disaster: gaining an understanding of asbestos use in building constructions in non-disaster time; warning neighbors; promoting

emergency measures and environmental monitoring at the time of disaster.

In addition we will provide information on countermeasures against pests and odors associated with disaster waste as well as measures to cope with odor at temporary toilets at evacuation shelters. Experts will be dispatched on an as-needed basis to provide guidance and advice by pinpointing causes of odor, and ways and means to control these matters.

Furthermore, support will be made in cooperation with local governments such as promoting pet-care at evacuation shelters and developing a temporary care system for affected pets, based on the guidelines developed by the experience of past disasters such as the Great East Japan Earthquake and the Kumamoto Earthquake.

Part 3 Effective implementation of the Basic Environment Plan

1. Implementation of the Plan

(1) Implementation of the Plan by government

In order to effectively implement the Basic Environment Plan, it is first important to share information about the intended direction of I2ES set out by this Plan both inside and outside the government, and to take action to support cooperation between all entities concerned.

In addition to the Cabinet meeting, the government will deepen common understanding of this direction through related ministerial meetings and meetings between relevant ministries and agencies, and work closely with relevant organizations to implement measures on environmental conservation raised in the Basic Environment Plan in a comprehensive and systematic manner. We will work to obtain a shared recognition on the way forward to institutionalize I2ES, among all stakeholders including local governments, businesses, private organizations and citizens.

In order to implement various measures listed in the Basic Environment Plan, we will put in place the necessary systems, financial arrangements and others, while verifying how effective the measures will be. Based on the progress of the Plan and the state of the environment, the government will work appropriately by adding necessary improvements, and promoting comprehensive implementation of various projects under the cooperation of relevant organizations. The government will also work to take financial and other necessary measures to cover the costs for environmental conservation actions taken by local governments voluntarily and proactively according to local situations.

Based on the Basic Environment Plan, the relevant ministries and agencies will promote environmental considerations, according to basic policies regarding environmental considerations both for actions by ordinary economic entities such as use of goods and energy in offices, conferences and events, and for policy development such as drafting new institutions which could significantly impact the environment. To enhance initiatives of environmental considerations, we will proactively promote efforts to improve environmental management systems through reviewing the implementation of measures for environmental considerations, and strengthening mechanisms to reflect the results of such reviews in each relevant activity.

(2) Implementation of Plans by non-government entities

It is necessary for all entities to cooperate and collaborate closely to voluntarily and actively promote various measures under a fair division of roles based on the Basic Environment Plan. Each entity is to make maximum efforts to incorporate environmental considerations into its own actions in line with the Plan's direction of I2ES. The procedural methods such as the environmental management system will be utilized to promote this challenge.

Along with the direction mentioned in the Plan, local governments are expected to proceed comprehensively and systematically with measures in line with the national government as well as with their own measures, by formulating a comprehensive environmental conservation plan in cooperation with the national government and in response to local natural and social conditions.

(3) Collaboration with various plans

Socio-economic activities are becoming more closely linked with the environmental issues of today. As a result, policies in a wide range of areas are now related to environmental policy. In formulating plans that are considered to have an impact on the environment, the national government must consider environmental conservation in line with I2ES. The following policies are prioritized in consideration for environmental conservation.

In terms of environmental conservation, there should be clear coordination between the Basic Environment Plan and other national plans.

In addition, other national plans, exclusively aimed at conserving the environment should be formulated and promoted in accordance

with the fundamental direction of the Basic Environment Plan.

For those plans that include components concerning environmental conservation, the part prescribing environmental matters shall be in line with the fundamental direction of the Basic Environment Plan. Therefore, both these plans and the Basic Environment Plan should be coordinated and mutually supportive. Particularly, for those plans for which specific laws and regulations require harmonization with the Basic Environment Plan, special care needs to be taken to ensure that they are in line with the fundamental direction of the this Plan.

2. Review of the progress of the Plan

(1) Implementation policy

The Central Environment Council will review the progress of the measures based on the Basic Environment Plan, while listening to the opinions of citizens of various categories to ensure the steady implementation of the Basic Environment Plan. The Council will report to the government on subsequent policy directions as needed.

—1—Progress review of individual measures stipulated in the Plan

The Council will review in FY2019 and FY2021 the progress of individual measures through interviews with related ministries on Part 2 Chapter 2 “Priority strategies”, Chapter 3 “Environmental policies to support priority strategies” and Part 4 “System of environmental conservation measures”. As for “1. Climate change measures”, the latest review results of the Plan for Global Warming Countermeasures and the National Plan for Adaptation to the Impacts of Climate Change will be utilized as much as possible. Regarding “2. Establishment of sound material-Cycle society” and “3. Securing biodiversity and living in harmony with nature”, the latest review results of the Fundamental Plan for Establishing a Sound Material-cycle Society and the National Biodiversity Strategy of Japan will be utilized as much as possible.

—2—Review of comprehensive progress of the Plan

The Council will review the priority strategies in FY2020 and FY2022 by referring to the review results of individual measures implemented in the previous year respectively. The review will emphasize how much progress has been made on “Innovations across all perspectives including those concerning economic and social systems, lifestyles and technologies” and “Simultaneous solutions for socio-economic challenges through environmental policy”. These two points are mentioned in Part 1 Chapter 2 as roles in future environmental policies. In addition, interviews will be conducted on good practices by public and private initiatives related to priority strategies. We will also review progress made on each of the measures as a part of environmental policies to support the priority strategies and the system of environmental conservation measures. Based on these results, a report will be compiled respectively on the comprehensive progress of the Basic Environment Plan.

—3—Utilization of indicators for understanding the progress

The review will use a set of indicators that collectively show the environmental situation and the progress made on various initiatives concerned. This will clarify the overall trends regarding progress of the Plan and contribute to ensuring the effectiveness of the Plan. Quantitative indicators will be used as much as possible. However, in case it is difficult or inappropriate to quantify the indicators due to the nature of the measures concerned, qualitative evaluation is used as a basis and quantitative indicators will be applied supplementary.

The characteristics and limitations of these indicators should be taken into account. It is also important to strive to gain broad understanding of stakeholders. Reviews will be routinely carried out so that the indicators accurately reflect the direction of the Plan and appropriately match the state of the environment, economy and society. Indicators should be revised flexibly as necessary, considering their continuity and further improvement.

(2) Utilization of review results of progress of the Plan

The review results by the Council will be utilized for planning national policies, and reflected in the annual report as stipulated in Article 12 of the Basic Environment Act, thereby communicated widely to a wide range of stakeholders.

3. Revision of the Basic Environment Plan

The government will revise the contents of the Plan approximately five years following its formulation. Based on the above mentioned review results by the Council, necessary consultations will be made with the Council. Considering the revision of the contents of the Plan, the Plan will be re-formulated when considered necessary.

In terms of the concrete goals of each area and specific measures contained in the Plan, it is important to respond flexibly and

appropriately, with a view to realizing a sustainable society envisaged, according to changes in the economy and society both in and outside Japan as well as considering and updating of progress of measures taken.

List of Terminology

No	Term	Description
1	Municipal Waste	Municipal waste is waste other than industrial waste. It is classified into business waste and household waste.
2	Extended Producer Responsibility (EPR)	EPR is the concept of the producer being responsible (physically or financially) for the appropriate reuse, recycling, and disposal of the product.
3	Environmental Impact Assessment (EIA)	EIA is a series of procedures followed to ensure proper environmental considerations are made by evaluating the environmental impact of the project, hearing the opinions of residents and relevant local governments, and reviewing the content of the assessment from a professional view when implementing a large-scale development project.
4	Ministry of Environment	The Ministry of Environment is a national administrative agency that promotes global environmental conservation, pollution prevention, preservation of the natural environment, and other environmental preservation activities. The Environment Agency, established in 1971, was reformed and became the Ministry of Environment with the reorganization of central ministries and agencies in 2001.
5	Chemical Recycling	Chemical recycling is recycling of used resources after their composition has been converted through chemical reactions. This mainly refers to the conversion of waste plastics into oil, gas, coke oven chemical fuel, etc.
6	Inter-Municipal Waste Disposal/Treatment	Inter-municipal waste disposal/treatment is a type of disposal/treatment with neighboring municipalities collaborating in order to optimize their waste management. The introduction of wide-area treatment will lead to "ensuring sustainable and appropriate treatment," "promoting climate change countermeasures," "promoting recycling and biomass utilization of waste," "strengthening disaster countermeasures," and "creating new value to the community."
7	Ministry of Health, Labour and Welfare	Ministry of Health, Labour and Welfare is a national administrative agency that promotes social welfare, social security, public health, improvement of the working environment for workers, and the securing of jobs. The Ministry of Health and Welfare and the Ministry of Labor merged in 2001 through the reorganization of central ministries and agencies. As a result, the Ministry of the Environment is now in charge of the affairs related to waste disposal and cleaning, which were under the jurisdiction of the Water Supply and Environment Department of the Public Hygiene Bureau of the Ministry of Health and Welfare.
8	Components of Waste	Components of waste is a generic term for the physical and chemical contents of waste. Typically, waste is classified by three components (combustible, ash, and moisture), unit volume mass (apparent specific gravity), physical composition (composition by type), chemical composition (elemental composition), and lower heating value.
9	Compost/Composting	Compost is material made from food waste and other organic wastes, and composting is the method to produce compost. Food, paper pulp, sludge from wastewater treatment in the petrochemical industry and livestock waste are used.
10	Thermal Recycling	Thermal recycling is the process of recovering and utilizing the heat generated during waste treatment, especially in incineration plants, as energy. In the EU, the concept of "energy recovery" is used to distinguish it from recycling.
11	Industrial Waste	Industrial waste refers to 20 types of waste generated by business activities, including cinders, sludge, oil, acid, alkali, and plastic. Many of them are discharged in large quantities and special techniques are required for disposal. The proper treatment is required by the Waste Management and Public Cleansing Law.

No	Term	Description
12	Principle of Waste Disposal within the Administrative Boundary	The principle of waste disposal within the administrative boundary is the idea that waste disposal should be done within the community where waste is generated. This principle has been advocated since the War against Waste, which is a conflict regarding site selection for waste treatment facilities in Tokyo, in the 1960s. However, there is no legal basis for the principle of waste disposal within the administrative boundary, and although it is a concept that is known throughout Japan, it does not deny wide-area disposal beyond the administrative boundaries.
13	Sound Material-Cycle Society	A sound material-cycle society is a concept proposed as an alternative to a mass-production, mass-consumption, and mass-disposal society. According to the “Basic Act for Establishing a Sound Material-Cycle Society (Law No. 110 of 2000)”, a material-cycle society is “a society in which consumption of natural resources is controlled and the burden on the environment is reduced as much as possible”. This is achieved by preventing products from becoming waste, as much as possible properly using the existing waste as resources, and ensuring the proper disposal of waste cannot be used.
14	Basic Act for Establishing a Sound Material-Cycle Society	<p>“Basic Act for Establishing a Sound Material-Cycle Society” is a law established in June 2000 to promote effective efforts toward the formation of a sound material-cycle society.</p> <p>In addition to the priorities of waste disposal: (1) control of generation, 2) reuse, 3) recycling, 4) heat recovery, and 5) proper disposal, the law specifies the following national measures for the establishment of a sound material-cycle society.</p> <ul style="list-style-type: none"> • Measures to control the generation of waste • Regulations and other measures to ensure "Responsibility by waste-generating business operators" • Measures based on "Extended Producer Responsibility", such as take-back of products, implementation of recycling and prior assessment of products • Promotion of using recycled products • Measures to obligate business operators to bear the cost of restoring the environment to its original state when environmental conservation issues arise
15	Leachate	Leachate is liquid that has seeped out of a landfill after water from the waste and rainwater permeate into the landfill through the waste layer. Leachate is discharged into the public sewage system only after the water has been treated at the waste water treatment plant and has met the water quality standard specified in the effluent agreement.
16	3Rs	3R stands for “Reduce”, “Reuse” and “Recycle”. In recent years, the concept of 4Rs, 5Rs, 6Rs has been introduced by adding other ideas to the 3Rs, for example, “Refuse” meaning not to accepting things that will become waste, “Repair” meaning repair, and “Recover” meaning collecting waste for recycling.
17	Zero Emission	Zero emission is a concept proposed by the United Nations University in 1994, and refers to a resource circulating social system that does not produce any waste by effectively utilizing all types of waste as raw materials. It aims to reduce the amount of waste generated by increasing the yield (ratio of products to raw materials) in the production process and to thoroughly recycle waste.
18	Transfer Station	Transfer station is a facility that compacts and transships waste in order to gather the waste in intermediate treatment plants or landfill sites efficiently. Waste collected by small- and medium-size collection vehicles is compacted at the transfer station and transhipped to larger trucks to carry large quantities of waste at one time, increase efficiency and save fuel costs.
19	Basel Convention	The Basel Convention is an agreement on the control of transboundary movements of hazardous waste and their disposal. It was adopted by the United Nations Environment Programme in 1989 and enacted in 1992.

No	Term	Description
20	Biomass	Biomass is a concept that expresses the quantity (mass) of biological resources (bio), such as organic resources excluding fossil resources, derived from plants and animals that can be recycled into energy or materials. It includes agricultural, forestry, and fishery products, rice straw, rice husks, food waste, livestock manure, and wood waste.
21	Waste	According to the Waste Disposal and Public Cleansing Law, waste is unwanted materials generated as a result of household and business activities.
22	Waste Management and Public Cleansing Law	Waste Management and Public Cleansing Law is basic law on waste management which describes the definition of waste, responsibilities for its disposal, and standards for disposal methods. The purpose of the law is to conserve the living environment and improve public health by controlling waste emissions, disposing of waste appropriately, and maintaining the cleanliness of the living environment.
23	Responsibility of Waste-Generating Business Operators	“Responsibility of waste-generating business operators” is the principle that waste generators are responsible for the proper disposal of waste from their business activities. In Japan, this is the basic principle of the Waste Management and Public Cleansing Law, and it obliges waste generators to submit plans for the reduction and proper disposal of industrial waste and to confirm the completion of final disposal through manifests.
24	Public Comment	Public comment is a procedure in which the government publicly announces their proposals and other information to the public in the decision-making process, and takes into account the opinions and information submitted from the citizens when the government establishes, revises, or abolishes regulations.
25	Fukuoka Method (Semi-aerobic Landfill Structure)	Fukuoka Method is an example of the structure of a final disposal site, also known as a semi-aerobic landfill system, developed by Fukuoka University and Fukuoka City. The Fukuoka method requires a leachate collection and drainage system consisting of stones and perforated pipes at the bottom of the landfill. This allows leachate in the waste layer to be drained quickly, and thermal convection occurs inside the layer due to the fermentation heat generated by the decomposition of the waste. This will then lower the moisture content in the layer, and air is naturally supplied from the collection and drainage pipes. As a result, the decomposition of waste while maintaining aerobic conditions in the waste layer is made possible.
26	Material Recycling	Material recycling consists of collecting used products and waste from production processes, processing and using them as raw materials or materials for new products.
27	Manifest System	Manifest system is a procedure in which business operators discharging waste manage the flow of waste and ensure proper disposal by issuing documents for industrial waste management (manifest) to a waste disposal operator, and by receiving the copy from the waste disposal operator after the disposal of waste is completed.
28	Precautionary Approach	Precautionary approach is the concept stated in Principle 15 of the Rio Declaration, which sets forth 27 general principles for sustainable development adopted at the Earth Summit in 1992. The Rio Declaration states, "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation".
29	Life Cycle Cost (LCC)	LCC is the total cost of a product or structure on the stages of procurement, manufacturing, use, and disposal. It is also an important basis for estimating cost-effectiveness, and consists of initial construction costs and running costs such as energy, maintenance, repair, and renewal costs.

No	Term	Description
30	Recycling Laws	Various recycling laws exist in Japan to reduce the volume of waste and to promote the effective use of resources by promoting recycling and other measures. Specifically, there is the “Containers and Packaging Recycling Law”, “Home Appliance Recycling Law”, “End-of-Life Vehicle Recycling Law”, “Food Waste Recycling Law”, “Construction Material Recycling Law”, and “Small Home Appliance Recycling Act”.

List of References

No.	Name of Documents	Language ^{*1}	Issue Year	Issuing Organization ^{*2}
Waste Management in General				
1	History and Current State of Waste Management in Japan	JP, EN	2014	MoE
2	Annual Report on the Environment in Japan 2007-2008	JP, EN	2007-2008	MoE
3	Annual Report on the Environment, the Sound Material-Cycle Society and Biodiversity in Japan 2009-2020	JP, EN	2009-2020	MoE
4	日本の廃棄物処理(昭和47年度～令和元年度)	JP	1976-2020	MoE, MHLW
5	日本の3R推進の経験 -循環型社会の構築に向けて-	JP	2005	MoE
6	第四次循環型社会形成推進基本計画	JP	2018	MoE
7	廃棄物処理施設整備計画	JP	2018	MoE
8	ごみ処理基本計画策定指針	JP	2016	MoE
9	広域化・集約化に係る手引き	JP	2020	MoE
10	市町村分別収集計画策定の手引き(九訂版)	JP	2019	MoE
11	廃棄物処理施設環境影響評価調査指針	JP	2006	MoE
12	廃棄物処理施設生活環境影響調査指針	JP	2006	MoE
13	廃棄物処理施設長寿命化総合計画作成の手引き(ごみ焼却施設編)	JP	2021	MoE
14	G20 海洋プラスチックごみ対策実施枠組の概要	JP	2020	MoE
15	一般廃棄物処理有料化の手引き	JP	2013	MoE
16	循環型社会への改革・Recipe Book -3R 推進交付金(循環型社会形成推進交付金)ガイド	JP	2006	MoE
17	循環型社会形成推進交付金等申請ガイド(施設編)	JP	2021	MoE
18	循環型社会形成推進地域計画作成マニュアル	JP	2005	MoE
19	不思議な水銀の話(第2版)	JP	2021	MoE
20	水銀廃棄物ガイドライン(第3版)	JP	2021	MoE
21	石綿含有廃棄物等処理マニュアル(第3版)	JP	2021	MoE
22	災害廃棄物対策指針(改訂版)	JP	2018	MoE
23	Disaster Waste Management Guideline for Asia and the Pacific	EN	2018	MoE, JSMCWM
24	海岸漂着物対策を総合的かつ効果的に推進するための基本的な方針	JP	2019	MoE
25	海洋プラスチックごみ対策アクションプラン	JP	2019	MoE
26	プラスチック資源循環戦略	JP	2019	MoE
27	G20 大阪サミットにおける海洋プラスチックごみ対策に関する成果	JP	2019	MoFA
28	海洋プラスチックごみ対策に関する国際協力	JP	2019	MoFA
29	大阪ブルー・オーシャン・ビジョン実現のための日本のマリーン・イニシアティブ	JP	2019	MoFA
30	官民連携事業(PPP/PFI)のすすめ	JP	2020	MLIT
31	家電リサイクル法 [担当者向けガイドブック 2021]	JP	2022	METI
32	PPP/PFI 手法導入優先的検討規程 運用の手引	JP	2017	CAO
33	日本の産業廃棄物管理における経験と発展 -急速に工業化する開発途上国に向けて-	JP	2013	UNEP
34	Global Mercury Assessment 2018	EN	2018	UNEP
35	Waste Wise Cities Tool -Step by Step Guide to Assess a City's municipal Solid Waste Management Performance through SDG indicator 11.6.1 Monitoring	EN	2021	UN-Habitat
36	Guidelines for Environmental and Social Considerations	JP, EN	2022	JICA
37	Guideline for Promoting Waste to Energy Facility Projects	JP, EN	2017	JICA
38	Build Back Better-Supporting Nepal for Earthquake Recovery	EN	2017	JICA
Municipalities				
39	一般廃棄物処理基本計画	JP	2015	TMG
40	令和2年版 事業概要	JP	2020	TMG
41	令和元年 清掃事業年報	JP	2019	TMG
42	令和元年度 清掃工場等作業年報	JP	2019	TMG
43	大田区一般廃棄物処理基本計画	JP	2021	Ota City

No.	Name of Documents	Language ^{*1}	Issue Year	Issuing Organization ^{*2}
44	東京都清掃事業百年史	JP	2000	TMG Bureau of Environment
45	令和3年度 東京23区清掃一部事務組合清掃事業概要	JP	2021	Claen Authority of TOKYO
46	Tokyo Model (Overview)	JP, EN	2018	Claen Authority of TOKYO
47	横浜市災害廃棄物処理計画	JP	2018	Yokohama City
48	藤沢市一般廃棄物処理基本計画	JP	2017	Fujisawa City
49	令和2年度 藤沢市一般廃棄物処理実施計画	JP	2020	Fujisawa City
50	藤沢市災害廃棄物処理計画	JP	2018	Fujisawa City
51	令和元年度 清掃事業の概要	JP	2020	Fujisawa City
52	相模原市次期一般廃棄物最終処分場基本構想	JP	2021	Sagamihara City
53	福岡方式 準好気性埋立構造とは？	JP	2013	Fukuoka City
54	What is an Organic Waste Composting Project?	JP, EN	2009	Kitakyushu City
55	志布志市一般廃棄物処理基本計画	JP	2016	Shibushi City
Others				
56	災害廃棄物分別・処理実務マニュアル	JP	2012	JSMCWM
57	開発途上国における環境衛生分野の適正技術	JP	1997	Hidetoshi KITAWAKI
58	ごみ処理施設の計画・設計要領 2017改訂版	JP	2017	JWMA
59	廃棄物最終処分場整備の計画・設計・管理要領 2010改訂版	JP	2010	JWMA
60	廃棄物計画 計画策定と住民合意	JP	2000	Toru Furuichi (Kyoritsu Shuppan Co., Ltd.)

*1 JP: Japanese, EN: English

*2 MoE: Ministry of the Environment, MHLW: Ministry of Health, Labour and Welfare, MoFA: Ministry of Foreign Affairs, MLIT: Ministry of Land, Infrastructure, Transport and Tourism, METI: Ministry of Economy, Trade and Industry, CAO: Cabinet Office, TMG: Tokyo Metropolitan Government, JSMCWM: Japan Society of Material Cycles and Waste Management, JWMA: Japan Waste Management Association, UNEP: United Nations Environment Programme, JICA: Japan International Cooperation Agency

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- Upper middle: Shin-Koto Incineration Plant (2019) (Tokyo Metropolitan Government)
- Upper right: Unloading Waste in Osaka Landfill Site (2021) (Osaka Bay Regional Offshore Environmental Improvement Center)
- Bottom left: New Sea Surface Disposal Site (2018) (Tokyo Metropolitan Government Bureau of Environment)
- Bottom middle: Waste Collection (2021) (Shibushi City)
- Bottom right: Compacted Cans for Recycling (2021) (Shibushi City)

